



Coulter Jewell Thames, PA

MAIN OFFICE  
111 WEST MAIN STREET  
DURHAM, NC 27701  
p 919.682.0368 f 919.688.5646

Planning for the Future

## **CAROLINA FLEX PARK**

7000 and 7001 Millhouse Road

LIGHT INDUSTRIAL - CONDITIONAL ZONING DISTRICT APPLICATION

### **NARATIVE**

22 June 2017

#### **Developers Program**

The proposed Carolina Flex Park (CFP) is envisioned to provide space for research activities, light manufacturing, flex space, associated office space and storage for new and small business in Chapel Hill. We feel that this location, until recently without public utilities, is the most suitable location within Chapel Hill to serve this much needed mix of economic development spaces.

The property is comprised of 2 parts (currently with the same PIN reference) separated by Millhouse Road and the railway rights of way. The western parcel is a 1.7 acres rectangle, and the larger east portion is a 10.33 acre rectangle.

The program for the west parcel is proposed to be up to 25,000 sf of single level space to be used for smaller flex space users, i.e. artists' studios, plumbing contractors, start-up manufacturing businesses. It will have its own parking. This portion of the site is difficult to access from the adjacent street and therefore access into the site will be from the north through an easement on Town owned properties.

On the eastern portion of the CFP, comprising about 10.3 acres, we are proposing a mix of multi-story buildings totaling a maximum of 380,000 sf. These buildings will be served by access directly off Millhouse Road to surface parking throughout the site. Flex office provides space for those businesses that need research or manufacturing space as well as office and storage, assembly or light manufacturing, such as a contractor or craft business of some type. There is very little of this space available in Chapel Hill, but Chapel Hill has local business people who can benefit from such a space. The buildings fronting Millhouse Road on the eastern portion would be the

most architecturally significant and designed to present an attractive image to Millhouse Road.

The eastern portion of the property contains some amount of RCD and an ephemeral stream, and the proposed development will be sensitive to these features.

Surface Stormwater Management Facilities will be constructed to handle runoff from the Development and will meet the current storm management requirements.

The architecture of the buildings will be in keeping with recent construction on Millhouse Road.

We look forward to working with the town in obtaining approvals of this much needed mix of uses to serve the Chapel Hill business community - both existing and future.

## Site and Neighborhood Analysis

The development of the proposed Carolina Flex Park (CFP) would add to the Town of Chapel Hill Public Works and the Chapel Hill Transit developments directly north of the site. The property to the east is vacant land owned by the Town of Chapel Hill. The property directly to the south is a small family farm, and south of that is some office/warehousing development on the north side of Eubanks Road. To the west is the Orange County landfill. To the northwest of the site where Millhouse Road bends to the west and north are more small farms, mainly horse farms.

The topography of the site and in the immediate area is fairly flat, averaging under 5% slope. There is a stream, Old Field Stream, running to the east with buffer on the project parcel. Blackwood Mountain is located a little less than one mile to the north.

Access to the larger eastern portion of the parcel is good - Millhouse Road is a 38' wide paved street with curb and gutter on both sides and some existing sidewalk connecting to the Town Public Works and Transit developments to the north.

The site is wooded, as is much of the "vacant" land around the site. The farm to the south is cleared. The two public developments to the north are wooded except for the project areas.



Aerial of site (outlined in red) and surrounding properties.



**--DRAFT--  
REZONING APPLICATION:  
CONDITIONAL ZONING  
DISTRICT**



**TOWN OF CHAPEL HILL**  
Office of Planning and Sustainability  
405 Martin Luther King Jr. Blvd  
phone (919) 968-2728 fax (919) 969-2014  
www.townofchapelhill.org

Parcel Identifier Number(s) (PIN): 9870-89-0517

Date: 29 June 2017

**Section A: Project Information**

Project Name: Carolina Flex Park

Property Address: 7000 and 7001 Millhouse Road Zip Code: 27517

Use Groups (A, B, and/or C): B and C Existing Zoning District: MU-R-1

Project Description: Rezoning to LI-CZD conditional use zone. Development of buildings, parking, stormwater mitigation and landscaping on the entire parcel.

**Section B: Applicant, Owner and/or Contract Purchaser Information**

**Applicant Information** (to whom correspondence will be mailed)

Name: Coulter Jewell Thames PA Attn: Wendi Ramsden

Address: 111 W Main Street

City: Durham State: NC Zip Code: 27701

Phone: 919-682-0368 Email: wramsdenc@cjtpa.com

The undersigned applicant hereby certifies that, to the best of his knowledge and belief, all information supplied with this application is true and accurate.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Owner/Contract Purchaser Information:**

Owner  Contract Purchaser

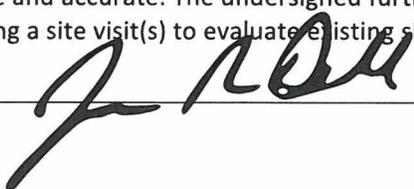
Name: Carolina Flex Park, LLC

Address: 50201 Governors Drive

City: Chapel Hill State: NC Zip Code: 27517

Phone: 919-260-1857 Email: jason@boldnc.com

The undersigned applicant hereby certifies that, to the best of his knowledge and belief, all information supplied with this application is true and accurate. The undersigned further authorizes Town staff to enter the property(ies) for the purposes of conducting a site visit(s) to evaluate existing site conditions.

Signature:  \_\_\_\_\_ Date: 6/22/17

**--DRAFT--  
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Name: Coulter Jewell Thames PA Attn: Wendi Ramsden

Address: 111 W Main Street

City: Durham State: NC Zip Code: 27701

Phone: 919-682-0368 Email: wramden@cjtpa.com

The undersigned applicant hereby certifies that, to the best of his knowledge and belief, all information supplied with this application is true and accurate.

Signature: *Wendi Ramsden* Date: 6.29.2017

**Owner/Contract Purchaser Information:**

Owner  Contract Purchaser

Name: \_\_\_\_\_

Address: 50211 Governors Drive

City: Chapel Hill State: NC Zip Code: 27517

Phone: \_\_\_\_\_ Email: jason@boldnc.com

The undersigned applicant hereby certifies that, to the best of his knowledge and belief, all information supplied with this application is true and accurate. The undersigned further authorizes Town staff to enter the property(ies) for the purposes of conducting a site visit(s) to evaluate existing site conditions.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_



**REZONING APPLICATION: CONDITIONAL ZONING DISTRICT  
SUBMITTAL REQUIREMENTS  
TOWN OF CHAPEL HILL  
Office of Planning and Sustainability**

**About:**

Conditional Rezoning applications are reviewed by the staff, Planning Commission and Town Council. The application is part of an open public process that enables the Town Council to discuss and decide on the key issues of rezoning proposal. If a rezoning is approved, the applicant may then submit a detailed final plans application to staff for compliance review with the technical development standards and with the Council CZD rezoning approval. At the beginning of the review process, the applicant is required to hold a Public Information Meeting to share the project and receive feedback from interested community members.

The following are possible questions that the Planning Commission Council may ask of an applicant during the discussion of a Conditional Rezoning. The attached application addresses these topics below. Please note that this list is not all inclusive. Contact our staff if you have any questions or if we can provide additional information ([planning@townofchapelhill.org](mailto:planning@townofchapelhill.org))

1. Would this project demonstrate compliance with the Comprehensive Plan?
  - a. Compliance with:
    - Small Area Plan:
    - Overlay Zone / NCD:
    - Study Area:
    - Goals / Themes:
2. Would the proposed project comply with the Land Use map? Is an Amendment Proposed to The Land Use Plan?
3. Is the project within the Town Limits? If no, is a petition for voluntary annexation proposed as a condition?
4. What is the proposed zoning district?
5. Would the proposed project require alternate conditions as part of a conditional rezoning approval?
6. Are there existing conditions that impact the site design (i.e. environmental features such as RCD, slopes, erosion and sedimentation, retention of trees and tree stands, stormwater drainage patterns, significant views into and out of the site)
7. Has the applicant addressed traffic impacts? Traffic and circulation issues?
8. Has the applicant discussed the project with adjacent neighbors?
9. How does this project relate to adjoining properties?
  - a. Are there impacts on adjoining properties
  - b. How does the application mitigate any impacts to adjoining properties?



## Overview

Site Description	
Project Name	Carolina Flex Park
Address	7000 and 7001 Millhouse Road
Property Description	12 acre rectangular parcel bisected by Millhouse Road and railway r/w
Existing Land Use	Vacant
Proposed Land Use	Light Industrial Flex Space
Orange County Parcel Identifier Numbers	9870890517
Existing Zoning	MU-R-1
Proposed Zoning	LI-CZD
Application Process	Conditional Rezoning Application
Comprehensive Plan Elements	
Overlay Districts	None

## Regulatory Land Use Intensity

Design/LUMO Standards		Requirement	Proposal	Status
Sec. 3.7 3.4.3(c)(7)	Use(s) and Use key (P,A, AY, YZ, Z)	P,A,AY YZ, Z with Council approval	P,A,AY YZ,Z as part of this application for approval	
Sec 3.8	Net Land Area	Min 17,000 sf	523,965 sf	
Sec 3.8	Gross Land Area		576,362 sf	
Sec. 3.8	Dimensional Standards	Street min 15' setback Interior min 10' setback Solar min 10' setback	Street min 15' setback Interior min 10' setback Solar min 10' setback	
Sec. 3.8	Height	Maximum 90'	Maximum 90'	
Sec. 3.8	Floor area total	NA	Maximum 405,000 sf	
Sec. 3.4.3.(c)(2)	Proposed Alternate Conditions	NA	NA	NA



## Site Design

	Design/LUMO Standards	Requirement	Proposal	Status		
<b>Landscape</b>	Secs. 5.6 3.4.3(c)(4)	East	West parcel no buffer East parcel 20'	West parcel 0 East parcel min 20'		
	Secs. 5.6 3.4.3(c)(4)	North	West parcel 20' East parcel 10'	West parcel min 20' East parcel min 10'		
	Secs. 5.6 3.4.3(c)(4)	South	West parcel no buffer East parcel no buffer	West parcel 0 East parcel 0		
	Secs. 5.6 3.4.3(c)(4)	West	West parcel 10' East parcel 15'	West parcel min 10' East parcel min 15'		
	Secs. 5.7 3.4.3(c)(5)	Tree Canopy	Min 20%	Min 104,800 sf (20%)		
	Sec. 5.11	Lighting Plan (footcandles)	Required at Final Plans	Will be provided at final plans		
	<b>Environment</b>	Sec. 3.6	Resource Conservation District	Yes	Shown on plans	
		Sec. 5.18	Jordan Riparian Buffer	Yes	Shown on plans	
Sec. 5.3.2		Steep Slopes	Yes	Shown on plans		
Secs. 5.4 3.4.3(c)(3)		Stormwater Management	Required at final plans	Will be provided at final plans		
Sec 3.7		Land Disturbance	Required at final plans	Will be provided at final plans		
Sec. 5.4		Impervious Surface	Maximum 70%	Maximum 366,755 sf (70%)		
Sec. 5.13		Solid Waste & Recycling	Yes	Will be provided on site, detailed at final plans		



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Design/LUMO Standards		Requirement	Proposal	Status	
Access & Circulation	Sec. 5.8	Street Standards	n/a	n/a	
	Sec. 5.8	Vehicular Access	Yes	Location shown on plans	
	Sec. 5.8	Bicycle / Greenway Improvements	Required at final plans	Will be provided on final plans	
	Sec. 5.8	Pedestrian Improvements	Required at final plans	Will be provided on final plans	
	Sec. 5.8	Distance from bus stop	No nearby route	n/a	N/A
	Sec. 5.8	Transit Improvements	Not on a transit route	n/a	N/A
	Secs. 5.9 3.4.3 (c)(6)	Vehicular Parking Spaces	Required at final plans	Will be provided on final plans	
	Secs. 5.9 3.4.3 (c)(6)	Bicycle Parking Spaces	Required at final plans	Will be provided on final plans	
	Sec. 5.9	Parking Lot Standards	Required at Final Plans	Will be provided on final plans	
Other	Sec. 5.12	Utilities			
	Sec. 3.4.3.(c)(2)	Proposed Alternate Conditions			

Symbol	Meaning	Symbol	Meaning
	Meets Standard	<b>A</b>	Alternate Condition Requested
<b>NA</b>	Not Applicable	<b>C</b>	Conditional Compliance



**REZONING APPLICATION: CONDITIONAL ZONING DISTRICT  
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**Submittal Requirements**

The following must accompany your application. Failure to do so will result in your application being considered incomplete.

X	<b>Application fees</b> ( <a href="#">refer to fee schedule</a> )	Total \$	
X	<b>Existing Recorded Documents</b> — Refer to Section 1	Application Fee \$	1,260.00
X	<b>Supplemental Documentation</b> — Refer to Section 2	Mailing Fee \$	16.00
n/a	<b>Stormwater Management Plan and Report</b> — Refer to Section 3	Engineering Review \$	
X	<b>Plan Sets</b> — Refer to Section 4	Fire / Life Safety \$	
X	<b>Mailing List</b> – Property owners within 1,000 foot perimeter of subject property ( <a href="#">see GIS notification tool</a> ). (mailing fee is double due to 2 mailings)		

Submit all Town Staff copies to the Development Services Desk on the 1<sup>st</sup> Floor of Town Hall.  
Submit External Agency copies directly to those agencies listed on the next page.

**Monthly Submittal Deadline (new submittals):** Last Thursday of the Month, 12 noon.

<input checked="" type="checkbox"/>	<b>First Submittal:</b>	<b>Town Staff</b>	<b>External Agencies</b>
	Complete set of documents required in sections 1-3	1 copy	No copies
	Transmittal Sheet (Confirm External Agency submittal on Town submittal)	1 copy	1 per agency
	<b>Plan Set Packets</b> , to include the following:	10 copies	1 per agency
	1. Project Fact Sheet (portion filled out by applicant; pages 1-5)		
	2. Plan sets, with the following requirements: <ul style="list-style-type: none"> <li>• Coversheet with project name, location, contact info, contents</li> <li>• Each sheet must be numbered and titled according to contents</li> <li>• Folded, collated plans are preferred, when possible.</li> </ul>		
	<b>Electronic Files</b> , to include the following:	1 copy	No copies
	1. One for each document required on application form		
	2. One file for each plan sheet, name must match page title/number		
	3. One “bundled” plan set file. <b>If this file exceeds 20MB, also submit multiple files with a size no larger than 20MB for application website.</b>		

<input checked="" type="checkbox"/>	<b>All Subsequent Submittals (weekly re-submittal deadline: Fridays at noon)</b>	<b>Town Staff</b>	<b>External Agencies</b>
	Same requirements as above. <b>* Confirm number of plan sets with Planner</b>	See above	See above
	Comment Response Letter	10 copies*	1 per agency
	Plan sets must include revision dates on each revised sheet Changes must be bubbled, called out, listed or otherwise noted.		



External Contacts – Plans Must be Sent Directly to These Reviewers.

**OWASA (Water / Sewer):**

Nick Parker  
400 Jones Ferry Rd  
Carrboro, NC 27510  
919-537-4201  
[NParker@owasa.org](mailto:NParker@owasa.org)

**NCDOT**

Chuck Edwards / DeAngelo Jones  
Physical: 115 E. Crescent Square Dr.  
Mailing: PO Box 766  
Graham, NC 27253-0766  
[cnedwards@ncdot.gov](mailto:cnedwards@ncdot.gov)  
[djones1@ncdot.gov](mailto:djones1@ncdot.gov)

1. Existing Recorded Documents

- a) HOA Documents
- b) Utility Easements
- c) ROW Plats
- d) Access Easements
- e) Drainage Easements
- f) Any other applicable easements or documents

2. Supplemental Documents

- a) Written Narrative with the following elements
  - 1) General description of developer's program
  - 2) Description and analysis of adjacent land uses, roads, topography, soils, drainage patterns, environmental constraints, environmental features, cultural features, and existing vegetation
- b) Stream Determination
- c) Jurisdictional Wetland Determination
- d) Traffic Impact Analysis or Approved Traffic Impact Analysis Exemption ([TIA requirements](#))
- e) Rezoning Statement of Justification.
  - The Statement of Justification for the requested map change shall be based upon one or more of the following:
    - The amendment would correct a manifest error in the map;
    - The amendment is warranted due to changed or changing conditions in the area or in the jurisdiction generally;
    - The amendment achieves the purposes of the Comprehensive Plan.
  - Respond to the following items in the purpose statement of the zoning district [LUMO 3.4.3 (b)]:
    - That the proposed rezoning would support and encourage space for job creating, innovative, light industrial uses that serve the needs of the community and region.
    - That the proposed rezoning is located within an innovative, light industrial opportunity area "I" on the land use plan.
    - That a LI-CZD is intended to be applied to areas within the Town limit so that municipal services can be



provided to properties containing innovative, light industrial uses.

- e) Statement of Compliance with Comprehensive Plan
- Conformance of the proposed development the Comprehensive Plan for development of Chapel Hill and its environs and response to the applicable goals of comprehensive plan.
  - Conformance of the proposed development to the Chapel Hill Land Use Plan
  - Relationship of the site to plans adopted as part of the comprehensive plan such as the Bike Plan, the Greenways Master Plan, adopted small area plans, etc...
  - Other considerations relevant to the proposed use.
- f) Statement of Justification for any proposed land uses categorized as "YZ" or "Z"
- Description: *Uses classified as "YZ" or "Z" in a conditional zoning district are permissible only with specific Town Council approval of a condition allowing those uses. Provide additional information and justification for any proposed "YZ" or "Z" uses.*
  - Provide tally of proposed uses in square feet of floor area and percentages of the total proposed floor area.
  - Respond to purpose statement of zoning district [LUMO 3.4.3 (b)]
  - Relationship of the proposed use and the character of development to surrounding uses, including possible conflicts between uses and how conflicts will be handled.
  - Effect on the value of surrounding properties determined to be contiguous property.
  - Other considerations relevant to the proposed use.
- g) Statement of Justification for any proposed alternate conditions [LUMO section 3.4.3(c)(2)D]
- Description: *Where actions, designs, or solutions proposed by the applicant are not literally in accord with applicable regulations, or other regulations in this appendix, The town council, in approving a conditional zoning district rezoning may determine that additional and/or alternate standards are appropriate in that particular case provided that the intent of the LI-CZD standards have been met to an equal or greater degree. Any alternate condition shall be explicitly indicated the conditional rezoning approval.*
  - Identify regulation, how it affects the proposed project, and how alternate condition would enable the project to meet the intent of the zoning district [LUMO 3.4.3 (b)] and standards [LUMO 3.4.3(c)(1)]

### 3A. Stormwater Management Plan

- a) Existing topography at minimum 2-foot intervals and finished grade.
- b) Natural drainage features, wetlands, streams, RCD buffers, Jordan Riparian Buffer Boundary, and floodplain boundaries.
- c) Existing utilities & easements including location & sizes of water, sewer, electrical, & drainage lines.
- d) Proposed land uses, surface types and approximate overall impervious surface area.
- e) Type, location and sizing calculations of Stormwater Control Measure (SCM).
- f) Location(s) of stormwater discharge / outlets.



### Plan Sets (10 copies to be submitted no larger than 24"x36")

Plans should be legible and clearly drawn. All plan sets sheets should include the following:

- Project Name
- Legend
- Labels
- North Arrow (North oriented toward top of page)
- Property Boundaries with bearing and distances
- Scale (engineering), denoted graphically and numerically
- Setbacks
- Streams, RCD Boundary, Jordan Riparian Buffer Boundary, Floodplain, and Wetland Boundaries, where applicable

### Area Map

- a) Project name, applicant, contact information, location, PIN, & legend
- b) Dedicated open space, parks, and greenways
- c) Overlay Districts, if applicable
- d) Property lines, zoning district boundaries, land uses, project names of site and surrounding properties, significant buildings, corporate limit lines
- e) Existing roads (public & private), rights-of-way, sidewalks, driveways, vehicle parking areas, bicycle parking, handicapped parking, street names
- f) 1,000 foot notification boundary

### Existing Conditions Plan

- a) Slopes, soils, environmental constraints, existing vegetation, and any existing land features
- b) Location of all existing structures and uses
- c) Existing property line and right-of-way lines
- d) Existing utilities & easements including location & sizes of water, sewer, electrical, & drainage lines
- e) Existing topography at minimum 2-foot intervals and finished grade
- f) Natural drainage features & water bodies, floodways, floodplain, RCD, Jordan Buffers & Watershed

### Rezoning Plan

Rezoning Plan: A plan that depicts the general configuration and relationship of the principal elements of the proposed development such as uses, intensity, location and size of parking and loading areas, access and circulation, open space, any areas containing an environmental constraints, a maximum building envelope with massing exhibits and the development envelope.

- a) Location of the development envelope. Development envelope means the area, as designated on the rezoning plan, containing building footprints, parking areas, loading areas, and other appurtenant impervious features (including outdoor areas used for storage). *Not included in the term development envelope are below ground utility lines, above-ground stormwater management areas, landscape and natural areas, and other non-impervious features.*



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Office of Planning and Sustainability**

- b) Location of Vehicular, pedestrian and bike accesses to site. Include location of existing and future greenways or other transportation facilities.
- c) Open spaces and landscaped areas
- d) Building envelope / height exhibit
- e) Tree preservation Area.
- f) Site data block.
- g) Stormwater management area
- h) Conceptual utility locations (optional)
- i) Conceptual grading plan (optional).
- j) Building footprints and parking layouts (optional)

DRAFT



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Bk:RB6157 Pg:394  
07/15/2016 03:42:16 PM 1/1

FILED Mark Gilton  
Register of Deeds, Orange Co., NC  
Recording Fee: \$.00  
NC Real Estate TX: \$.00

*(Handwritten initials)*

**ORANGE COUNTY, NORTH CAROLINA**

**REAL PROPERTY ABSTRACT FOR *EML*  
WILLS & ESTATES**

Prepared by Land Records/GIS Division Tax Administration

**PIN(S)** 9870890517

**ESTATE FILE:** *15E245*

<b>Name of Decedent (Index as Grantor):</b>  EFFIE MERRITT	<b>Date of Death:</b>  2015-01-24
<b>Name of Executor/Administrator:</b>  James I. Merritt	
<b>County in which "Probate" conducted:</b>  N/A	<b>Date Probate concluded:</b>  N/A
<b>Description of separate, distinguishable parcel(s) of real property, transferred by probate of this Estate. Enter full legal description.</b>  5 IRWIN NUNN	
<b>Name(s) of Heir(s)/Beneficiary(ies), Trustee(s). Index as Grantee(s).</b>  SHIRLEY M            BRADSHAW JAMES I                MERRITT <i>angela M.</i> <i>Belk</i>	

*Levi K. Berry*

Signature of person preparing this Estate Abstract

*7/15/16*

Date



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7000 and 7001 Millhouse Road

LIGHT INDUSTRIAL - CONDITIONAL ZONING DISTRICT APPLICATION

### STATEMENT OF JUSTIFICATION FOR "YZ" AND "Z" USES

29 June 2017

#### "Z" Uses

The uses shown in the code which are classified as "Z" in this proposed district and which may be incorporated into the final project are:

Business, general  
Business, office type (A, Z)  
Place of assembly (up to 2000 seats)  
Public use facility  
Recreational facility, commercial  
Recreational facility, non-profit

All of these uses would be possible in the building layouts. The buildings themselves would be architecturally similar to each other and designed to accommodate a wide range of uses and a flexibility to have a change in uses as tenants turn over. Business and office space would be accessory to other uses and would use a maximum of 95,000 sf.

#### "YZ" Uses

The uses shown in the code which are classified as "YZ" in this proposed district and which may be incorporated into the final project are radio, tv or wireless transmitting antenna, self storage facility, and supply yard. These uses have special conditions required.

#### Radio, tv or wireless transmitting antenna

This use is expected to be accommodated as rooftop cell tower. The code calls for a minimum 150,000 sf site for this use, and the project site included in the rezoning application meets this minimum size.

#### Self storage facility

The regulation calls for no more than half of any building to be used for conditioned self storage, and that the use will not be located on the ground floor. The project intends to provide a possibility for conditioned self storage space on upper levels of the buildings located east of Millhouse Road. No more than 50% of any building will accommodate this use. The maximum amount of self storage space would be 190,000 sf.

#### Supply yard

The regulation calls for supply yards to be located on all-weather surfaces draining to a storm mitigation facility and screened from internal and external streets. The project intends to offer the possibility of such space on the western portion of the parcel, located between the railway line and the county landfill.



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### **STATEMENT OF JUSTIFICATION FOR ALTERNATE CONDITIONS**

29 June 2017

The development will follow the LUMO requirements.

No alternate conditions are anticipated.



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### **REZONING STATEMENT OF JUSTIFICATION**

22 June 2017

The project site is located on both sides of Millhouse Road north of Eubanks Road and south of the Chapel Hill Transit Center. It is a 12-acre parcel bisected by the Millhouse Road and railway rights of way. The parcel is located within the Urban Services area, but outside the Town boundary. It is not located within a watershed protection district and there is no small area plan associated with the project site or surrounding parcels.

The rezoning is warranted due to changed conditions in the area. The project site is in an area identified by the Town as a Light Industrial Opportunity Area and the proposed development is intended to follow the applicable recently adopted ordinance sections related to the Light Industrial Conditional Zoning District.

We believe the proposed development is consistent with the goals outlined for the area in the 2020 Plan. The project will provide flex space not available at this scale elsewhere in town; space for existing businesses to grow, and space for new businesses to develop. The location will take advantage of existing good roadways and new utility services. The buildings will be attractive building with modern systems, landscaping, stormwater management, and friendly to car riders as well as pedestrians and cyclists. In addition to supporting the applicable themes of future development, this parcel is in an area identified by the Town as ripe for future light industrial development. This parcel is not within a small area plan or study area.



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### **STATEMENT OF COMPLIANCE WITH THE COMPREHENSIVE PLAN**

29 June 2017

The project site is located on both sides of Millhouse Road north of Eubanks Road and south of the Chapel Hill Transit Center. It is a 12-acre parcel bisected by the Millhouse Road and railway rights of way. The parcel is located within the Urban Services area, but outside the Town boundary.

We believe the proposed development is consistent with and applicable to five of the goals outlined for the area in the 2020 Plan.

The themes and goals outlined in the 2020 plan are:

1. A place for everyone
2. Community prosperity and engagement
3. Getting around
4. Good places, new spaces
5. Nurturing our community
6. Town and gown collaboration.

Goal 1. A Place For Everyone: Specifically this project would support PFE.4 - A community that provides all people with access to opportunities. The rezoning would allow for development of a large flex space park giving small startup businesses and established business alike a place to develop and grow outside the confines of traditional built spaces.

Goal 2. Community Prosperity and Engagement: But creating a new flex space park this project will add to the Town's revenues, foster the success of local business and provide flexible use space for new businesses to develop in Chapel Hill.

Goal 3. Getting Around: The development of this vacant parcel will provide additional pedestrian and bicycle connectivity along Millhouse Road, adding to the Town's Parks and Recreation multimodal trail plans.

Goal 4. Good Places, New Spaces: The proposed project will create flexible work space not currently available at this scale in Chapel Hill. The development is intended to provide outdoor green space as well.

Goal 5: Nurturing Our Community: The project will be developed to provide stormwater mitigation, will save more than the minimum tree coverage on site, and will provide another component of the multi modal trail system along Millhouse Road.

The rezoning request and proposed use support all of the applicable themes and goals. The use supports existing development in Town while providing the type of space not already available at this scale. The project will provide attractive buildings with landscaping, stormwater management, and friendly to car riders as well as pedestrians and cyclists.

**CAROLINA FLEX PARK**

**DRAFT TRAFFIC IMPACT STUDY**

**EXECUTIVE SUMMARY**



Prepared for:

The Town of Chapel Hill  
Public Works Department - Engineering

*Prepared by:*

***HNTB North Carolina, PC***

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July 2017

**HNTB**

# CAROLINA FLEX PARK

## **DRAFT** TRAFFIC IMPACT STUDY

### EXECUTIVE SUMMARY



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July 2017



## **EXECUTIVE SUMMARY - DRAFT**

### **Project Overview**

The construction of a new commercial development named Carolina Flex Park, located along Mill House Road, is being proposed in Chapel Hill. The project proposes to construct a total of approximately 400,000 square feet of general office, light industrial and self-storage space on two separate parcels separated by the existing Norfolk Southern/State University Railroad corridor adjacent to Mill House Road. **Figure ES-1** shows the general location of the site. The project is anticipated to be fully complete by 2021. This report analyzes the transportation impacts for the build-out scenario for the year 2022 (one year after anticipated completion), the no-build scenario for 2022, as well as 2017 existing year traffic conditions.

The proposed site concept plan shows the addition two internal vehicular access points that would have full movement access connections with Mill House Road – one to be located directly south of the Town of Chapel Hill transit facility and having access via easements through Town-owned parcels to the west of the Norfolk Southern (N-S) railroad tracks. No other vehicular access connections or transportation system changes are proposed. **Figure ES-2** displays the preliminary concept plan of the Carolina Flex Park development and nearby land uses and roadways. The project is expected to provide on-site surface parking lots with up to 580 total spaces. Future internal access connections to adjacent parcels are shown on the figure.

This report analyzes and presents the transportation impacts that the Carolina Flex Park development will have on the following intersections in the project study area:

- Mill House Road and Clyde Road / Town of Chapel Hill Public Works Driveway
- Mill House Road and Western Site Driveway
- Mill House Road and Eastern Site Driveway
- Mill House Road and Eubanks Road

The impacts of the proposed site at the study area intersections will be evaluated during typical weekday AM, noon, and PM peak hours.

### **Existing Conditions**

#### **Study Area**

The site is located in northern Chapel Hill along both sides of Mill House Road just to the north of the Eubanks Road corridor. The study area contains one signalized intersection and one unsignalized all-way stop intersection. It also includes the two future driveway connections from the site to Mill House Road. Eubanks Road is a minor arterial facility providing connectivity in northern Chapel Hill, connecting the NC 86 corridor to the east to rural areas to the west. Mill House Road is a local access facility for low density development and Town of Chapel Hill Public Works and Transit campuses.

#### **Site Traffic Generation**

With the addition of new peak hour trips during the AM, noon, and PM peak hours, there are potential site traffic impacts to the study area intersections. **Table ES-1** shows the site trip generation details, with generation rates and methodologies taken from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, Version 9*. Assumptions related to development densities and land uses were made to produce the most conservative trip generation levels, based on preliminary ranges of potential development provided by the Applicant.



**Table ES-1. Weekday Trip Generation Summary**

Land Use	Units	Daily			AM Peak Hour			Noon Peak Hour*			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Light Industrial	285K	1014	1014	2028	217	30	247	62	63	125	30	220	250
General Office - East	95K	632	632	1264	162	22	184	73	66	139	31	154	185
General Office - West	25K	229	229	458	55	8	63	28	36	64	18	88	106
<b>TOTALS</b>		<b>1875</b>	<b>1875</b>	<b>3750</b>	<b>434</b>	<b>60</b>	<b>494</b>	<b>163</b>	<b>165</b>	<b>328</b>	<b>79</b>	<b>462</b>	<b>541</b>

\* - No ITE Data Available, Assumed Averages and Proportions by Land Use of AM/PM Peak Hour Data

**Background Traffic**

Background traffic growth for the 2022 analysis year is expected to come from two sources - ambient regional traffic growth and specific development-related traffic growth. Based on existing information, several Town-approved development projects near the project study area may be expected to contribute to background traffic growth by the 2022 analysis year. To account for specific background traffic generators and region-wide growth, an ambient area-wide traffic growth percentage of 2.0 percent per year was applied to existing traffic volumes, based on historic daily traffic growth patterns in the project study area (NCDOT and Town of Chapel Hill daily traffic information). The nearby Carraway Village development was included as a specific background traffic generator for the 2022 analysis year.

**Impact Analysis**

**Peak Hour Intersection Level of Service (LOS)**

Study results indicate existing traffic operations at all study area intersections are acceptable during the AM, noon, and PM peak hours. Even with the addition of peak hour site-generated trips to the projected 2022 background traffic volumes, no study area intersections are projected to experience deficient traffic operations in any peak hour in the 2022 analysis year. A summary of the traffic operations for each intersection, related to vehicular delays (intersection average if signalized, critical movement if stop-controlled) and the corresponding Level-of-Service (LOS) is shown in **Table ES-2**.

**Access Analysis**

Vehicular site access is to be accommodated by two proposed full movement access driveways connecting to Mill House Road that will serve the eastern and western site parcels, respectively. Design details related to driveway throat lengths are not shown on the concept plan. Driveway distances and intersection spacing along Mill House Road should be adequate to meet Town and NCDOT design standards for the two proposed site driveway intersections.

Access for pedestrians and bicyclists is adequate in the project study area. Sidewalk is present on the eastern side of Mill House Road adjacent to the eastern site parcel. Unsignalized crosswalks are present at one quadrant of the two existing study area intersections. There are striped bicycle lanes painted on the both sides of Mill House Road between Eubanks Road and the Town Public Works Driveway. The proposed site concept plan indicates a future pedestrian access connection from the eastern site parcel to adjacent properties (Eubanks Park-and-Ride and Carraway Village development).

**Signal Warrant Analysis**

Based on projected 2022 traffic volumes, operational LOS/delay results, and current/proposed access plans, no study area intersection would warrant the installation of a traffic signal, based on the methodology found in the *2009 Manual on Uniform Traffic Control Devices (MUTCD)*.



**Table ES-2. Carolina Flex Park - LOS and Delay (Seconds/Vehicle) Summary**

Intersections	Peak Hour	2017 Existing		2022 No-Build		2022 Build		2022 Mitigated	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Mill House Road and Clyde Road / Town Public Works Driveway#	AM	A	9.5	A	10.0	A	12.0	N/A	N/A
	NOON	A	8.3	A	8.3	A	8.5	N/A	N/A
	PM	A	9.1	A	9.2	A	9.5	N/A	N/A
Mill House Road and Eubanks Road	AM	A	9.2	B	10.1	B	13.9	N/A	N/A
	NOON	A	6.3	A	6.5	A	8.4	N/A	N/A
	PM	A	7.4	A	8.0	B	18.4	N/A	N/A
Mill House Road and Eastern Site Driveway#	AM	N/A	N/A	N/A	N/A	C	21.5	C	15.3
	NOON	N/A	N/A	N/A	N/A	B	13.8	B	12.9
	PM	N/A	N/A	N/A	N/A	D	32.5	D	33.7
Mill House Road and Western Site Driveway#	AM	N/A	N/A	N/A	N/A	A	9.6	N/A	N/A
	NOON	N/A	N/A	N/A	N/A	A	9.1	N/A	N/A
	PM	N/A	N/A	N/A	N/A	A	9.3	N/A	N/A

N/A – Not Applicable or No Improvements Necessary  
 # - Worst-Case LOS/Delay for Unsignalized/Stop-Controlled Critical Movement

**Other Transportation-Related Analyses**

Other transportation-related analyses relevant to the 2001 Town of Chapel Hill Guidelines for the preparation of Traffic Impact Studies were completed as appropriate. The following topics listed in **Table ES-3** are germane to the scope of this study.

**Table ES-3. Other Transportation-Related Analyses**

Analysis	Comment
Long-Range Planning Level Daily Volume-Capacity Analysis	The proposed site could add over 3,000 daily trips to the study area network. However, the Mill House Road corridor currently carries less than 2,000 vehicles daily and its daily capacity can be estimated in the range of 10,000+ vehicles. The Eubanks Road corridor currently has an AADT of over 6,000 west of Mill House Road. Site traffic will primarily use this corridor to the east of Mill House Road for access and peak hour operational results for the Eubanks Rd/Mill House Rd intersection do not indicate any capacity issues.
Turn Lane Storage Requirements	Storage bay lengths at study area intersections were analyzed using Synchro and HCM 95 <sup>th</sup> percentile (max) queue length estimates for the 2022 Build Scenario. No unsignalized intersection is expected to have excessive peak hour queues or conditions that exceed existing turn lane storage. For improved traffic operations exiting the eastern site driveway along Mill House Road, separate left-turn and right-turn storage lanes are recommended in the actual driveway design. The signalized intersection at Eubanks Road and Mill House Road has 2022 PM peak maximum queue estimates that indicate that westbound and southbound approaches may exceed existing storage bays.
Appropriateness of Acceleration/Deceleration Lanes	The site concept plan shows no specifics related to acceleration/deceleration lanes along Mill House Road. Based on the existing 40 mph speed limit on Mill House Road and the fact that it will service a high projected volume of right-turning vehicles into the eastern site driveway, a separate northbound right-turn deceleration lane is recommended at the proposed site access point. No other specific acceleration/deceleration lane issues were analyzed in the project study area.
Pedestrian and Bicycle Analysis	Existing pedestrian and bicycle access and connectivity is adequate in the project study area. Sidewalk exists along the Mill House Road corridor on the east side of the road, though connectivity beyond Mill House Road along the Eubanks Road corridor is currently



Analysis	Comment
	lacking. Delineated bicycle lanes along Mill House Road are present in the project study area, but again, connectivity along the Eubanks Road corridor to any dedicated bicycle facilities are currently lacking.
Public Transportation Analysis	Public transportation service to the study area is adequate with multiple bus stops and multiple local bus routes on Old Oxford Road and Dobbins Drive proximate to the site.

**Mitigation Measures/Recommendations**

**Planned Improvements**

There are no Town of Chapel Hill or North Carolina Department of Transportation improvement projects for study area roadway facilities within the analysis year time frame of 2017-2022.

**Background Committed Improvements**

There are no specific geometric or operational improvements to study area roadway intersections or facilities related to background private development projects that are expected to be completed between 2017 and 2022. East of the study area, Eubanks Road will be improved to a widened cross-section through committed improvements from the Carraway Village development.

**Applicant Committed Improvements**

Based on the preliminary site concept plans and supporting development information provided, there are no specific external transportation-related improvements proposed adjacent to the Carolina Flex Park, other than the proposed easement for access through Town-owned parcels on the west side of the railroad tracks for the western site parcel and preliminary provisions for potential future cross-access from the eastern site parcel to adjoining properties and a potential future pedestrian access connection to the Eubanks Road Park-and-Ride/Carraway Village area.

**Necessary Improvements**

Based on traffic capacity analyses for the 2022 design year, and analyses of existing study area turning bay storage lengths and site access, the following improvements are recommended as being necessary for adequate transportation network operations (see **Figure ES-3**).

- 1) Construct northbound right-turn lane with 100 feet of vehicle storage and full taper at the Eastern Site Driveway connection with Mill House Road and design the access driveway for separate westbound left-turn and right-turn lanes with 150 feet minimum of full storage and driveway throat length.
- 2) For the Western Driveway access connection to Mill House Road, provide a minimum of 100 feet of driveway throat length to any future internal driveway access points from Town-owned parcels.
- 3) To minimize the potential for westbound queue blockages at the Eubanks Road intersection with Mill House Road, extend the existing westbound right-turn lane for a minimum of 200 feet of full storage and full taper.



NOT  
TO  
SCALE

### LEGEND

-  = Existing Study Intersection
-  = Proposed Site Access



Carolina Flex Park  
Traffic Impact Study

PROJECT STUDY AREA

DATE: July 2017

FIGURE ES-1



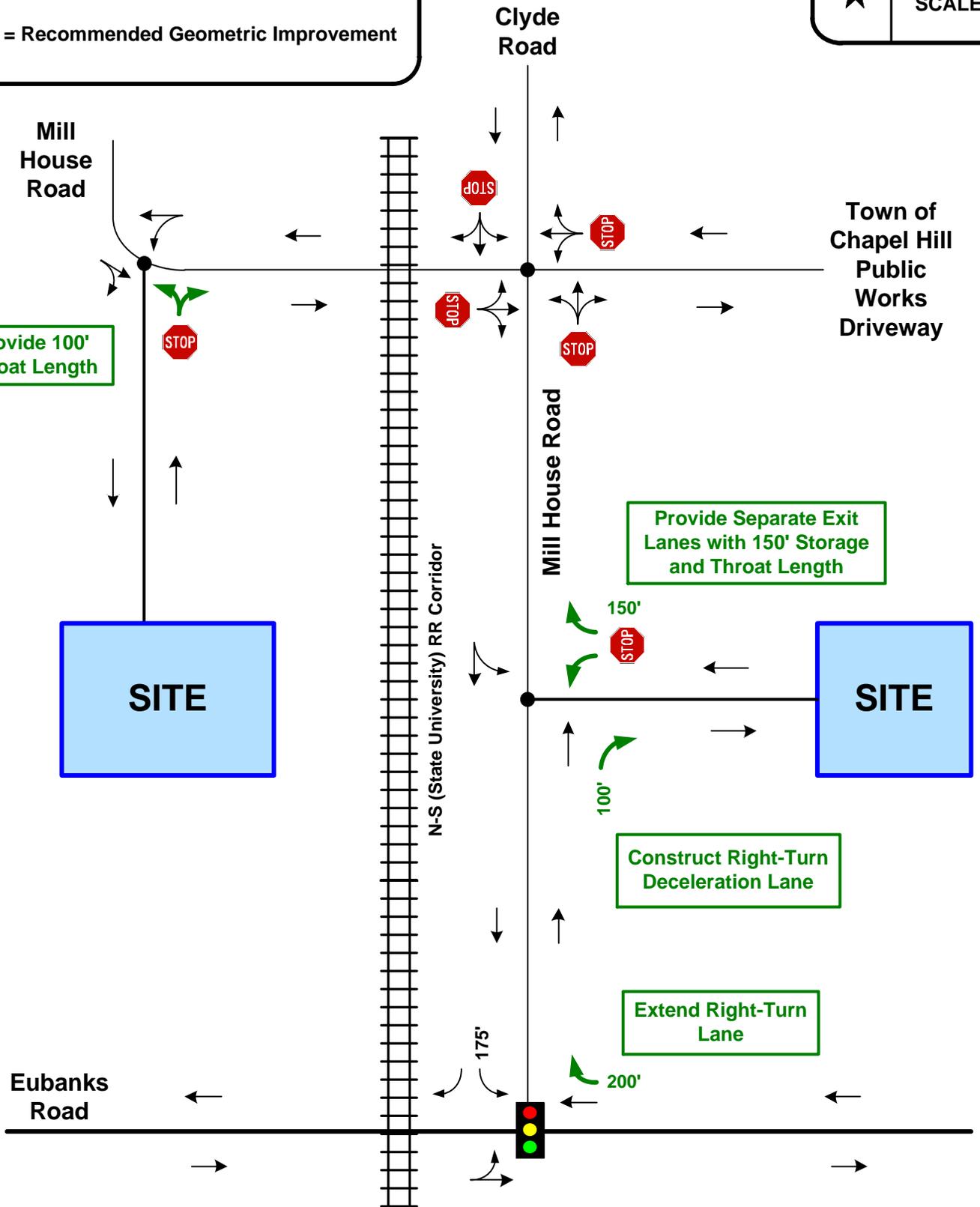
LEGEND

 = Recommended Geometric Improvement

**DRAFT**



NOT TO SCALE



Carolina Flex Park  
Traffic Impact Study

DATE: July 2017

RECOMMENDED IMPROVEMENTS

FIGURE ES-3

**CAROLINA FLEX PARK**

**DRAFT TRAFFIC IMPACT STUDY**



Prepared for:

The Town of Chapel Hill  
Public Works Department - Engineering

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July 2017

**HNTB**

# CAROLINA FLEX PARK

## **DRAFT** TRAFFIC IMPACT STUDY



### **Prepared for:**

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July 2017



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## **I. EXISTING CONDITIONS**

### **A. Project Overview**

The construction of a new commercial development named Carolina Flex Park, located along Mill House Road, is being proposed in Chapel Hill. The project proposes to construct a total of approximately 400,000 square feet of general office, light industrial and self-storage space on two separate parcels separated by the existing Norfolk Southern/State University Railroad corridor adjacent to Mill House Road. **Figure 1** (found in **Appendix A**) shows the general location of the site. The project is anticipated to be fully complete by 2021. This report analyzes the transportation impacts for the build-out scenario for the year 2022 (one year after anticipated completion), the no-build scenario for 2022, as well as 2017 existing year traffic conditions.

The proposed site concept plan shows the addition two internal vehicular access points that would have full movement access connections with Mill House Road – one to be located directly south of the Town of Chapel Hill transit facility and having access via easements through Town-owned parcels to the west of the Norfolk Southern (N-S) railroad tracks. No other vehicular access connections or transportation system changes are proposed. **Figure 2** displays the preliminary concept plan of the Carolina Flex Park development and nearby land uses and roadways. The project is expected to provide on-site surface parking lots with up to 580 total spaces. Future internal access connections to adjacent parcels are shown on the figure.

### **B. Site Location and Study Area**

This report analyzes and presents the transportation impacts that the Carolina Flex Park development will have on the following intersections in the project study area:

- Mill House Road and Clyde Road / Town of Chapel Hill Public Works Driveway
- Mill House Road and Western Site Driveway
- Mill House Road and Eastern Site Driveway
- Mill House Road and Eubanks Road

The impacts of the proposed site at the study area intersections will be evaluated during typical weekday AM, noon, and PM peak hours. The following study is based on background traffic for the existing year, 2017, the year following the estimated site build out year of 2021, as well as the estimated site-generated traffic produced by full occupancy of the proposed development.

There are several Town-approved/recently completed developments just outside the immediate project study area that were considered to be fully built-out by 2022 that are expected to potentially generate additional background traffic to the project study area. To account for any potential background traffic from these sites and overall regional traffic growth, an area-wide ambient future traffic growth percentage of 2.0 percent per year was applied to the existing volumes, based on conservative projections of historical average annual daily traffic (AADT) growth rate data provided by the Town of Chapel Hill and the North Carolina Department of Transportation (NCDOT). One Town-approved site, Carraway Village, located along Eubanks Road to the east, was included as a specific background traffic generating development.



**C. Site Description**

The Carolina Flex Park site is currently heavily wooded and undeveloped on both sides of Mill House Road. The site borders low density residential and institutional development (Town Transit and Public Works Campuses and County land fill). Some commercial development is located along Eubanks Road corridor to the south.



All vehicular access is proposed to enter and exit the site via two full access site driveways – both along Mill House Road. The driveway for the eastern portion of the development would connect just to the south of the Chapel Hill Transit facility. The western portion of the Flex Park would be accessed by a driveway that would require easements along two Town-owned parcels to the west of the railroad corridor. All parking will be provided on-site, though no site plan details related to parking are currently given. The proposed site concept plan, shown in **Figure 2**, shows the location of the local access driveways, potential internal driveway network and adjacent transportation facilities.

**D. Existing and Proposed Uses in Vicinity of Site**

The land uses and development in the study area along Mill House Road and Eubanks Road are primarily low density, with some commercial development along the Eubanks Road corridor and some surrounding institutional development (Town Transit and Public Works facilities, County land fill). The Existing Land Use Plan shown in the *2020 Town of Chapel Hill Comprehensive Plan* and adopted November 25, 2012, indicates that the existing site is designated as “undeveloped land”. The Future Land Use Plan, that is also a part of the Town Comprehensive Plan, indicates that the site would be designated as “Town/Village Center” for the eastern parcel – with a notation as a “development opportunity area” and remain as “undeveloped land” for the western parcel. The site is currently zoned MU - R-1 or “Mixed-Use/Low Density Residential”.

**E. Existing and Committed Surface Transportation Network**

**Roadways**

The Carolina Flex Park project study area features one major collector roadway, Eubanks Road, serving areas in northern Chapel Hill and rural areas to the west of the project site, as well as some smaller collector and local access streets. **Table 1** summarizes pertinent information on the study area roadway facilities. Average Annual Daily Traffic (AADT) data was taken from 2015 AADT mapping produced by the NCDOT Traffic Survey Unit. **Figure 3** shows the existing lane configuration, traffic control, and speed limits for these study area roadways.

**Table 1. Existing Study Area Roadways**

Road Name	Functional Class*	Study Area Cross-Section	2015 AADT	Speed Limit	Sidewalk	On-Street Parking
Eubanks Road	Major Collector	2 lane undivided	6,200	45	N	N
Mill House Road	Local	2 lane undivided	1,300	40	S	N

S – Some Sidewalk/On-Street Parking Present

\* - NCDOT Urban Functional Classification Map (2017). <https://ncdot.maps.arcgis.com/home/webmap/viewer.html>



Detailed descriptions of several of the major study area roadways are as follows:

- **Eubanks Road** is minor arterial/collector street that provides access to neighborhoods and commercial/institutional developments in north Chapel Hill. It is primarily a two-lane facility with auxiliary turn lanes at major intersections with a posted speed limit of 45 mph in the study area. On-street parking is not permitted. A railroad crossing, with lighted cross-bucks and gates is present just west of the Mill House Road intersection.
- **Mill House Road** is a local access roadway that provides connections to low density development and Town-owned facilities in the project study area. It also provides connectivity to the NC 86 corridor north of the project study area. It is a two-lane facility with a posted speed limit of 40 mph. On-street parking is not permitted and sidewalk and bicycle lanes are present from Eubanks Road to the Town-owned facilities. A railroad crossing with cross-bucks is present across the N-S railroad tracks.

**Intersections**

**Table 2** summarizes the two existing study area intersections, traffic control features, and pedestrian amenities at each. Laneage details and intersection turn bay lengths are also detailed on **Figure 3**.

**Table 2. Existing Study Area Intersection Details**

Intersection	Traffic Control	Signal Phases	Signal Operation	Cross walk	Ped Signals
Mill House Road and Clyde Road / Town Public Works Driveway	Unsig	N/A	N/A	Yes (1)	No
Mill House Road and Eubanks Road	Signal	2	Free-Run	Yes (1)	No

Signal – Signalized, Unsig – Unsignalized    Ped Signals (Number of Approaches Featuring Crosswalk/Signals)

**Bicycle Routes and Sidewalks**

Striped bicycle lanes are present on Mill House Road from Eubanks Road to the Town Public Works facility in the immediate study area. Pedestrian sidewalk exists along on at least one side of Mill House Road and portions of Eubanks Road. Sidewalks also connect the Town-owned campuses to Mill House Road. Crosswalks are present at the two study area intersections, though these crosswalks are currently unsignalized. **Figure 4** displays a schematic of existing pedestrian/bicycle facilities in the project study area.

**Transit Routes**

No current Chapel Hill Transit (CHT) routes directly serve the study area. Local route NS terminates at the Eubanks Road Park-and-Ride facility just to the east of the project study area along Eubanks Road and provides weekday bus service. **Table 3** details the current CHT NS route that could potentially serve the proposed Flex Park. Most buses run on 10 minute or 20 minute headways during weekday peak service periods. No regional bus service is provided in the study area. **Figure 5** displays transit routes and bus stops that currently exist in the project study area. Transit trips that would potentially be generated by the Carolina Flex Park are discussed in the following sections of this report.

**Recommended/Committed Surface Transportation Improvement Projects**

There are no committed/programmed NCDOT STIP projects, Town of Chapel Hill transportation improvement projects, or private development-related projects to improve roadway facilities in the study area that are expected to be complete by 2022.



**Table 3. Current Study Area Weekday Transit Service**

Route	Headways (minutes)			Study Area Stops	Destinations
	AM Peak	PM Peak	Off Peak		
<b>CHT Local Service</b>					
NS	10	20	10	• Eubanks Park-and-Ride	<ul style="list-style-type: none"> <li>• Downtown Chapel Hill</li> <li>• Southern Village</li> <li>• UNC Main Campus</li> </ul>

Source: Chapel Hill Transit 2016 Fall Ride Guide

**F. Existing Traffic Conditions**

**Figure 6** shows recent weekday AM, noon, and PM peak hour traffic volumes for the study area intersections. The counts used to determine these volumes were collected in May 2017 for all existing study area intersections during the weekday periods 7:00 - 9:00 AM, 11:30 AM – 1:30 PM, and 4:00 – 6:00 PM. The turning movement count output for all study area intersections is found in **Appendix B**. Traffic volume on Eubanks Road was moderate during the peak commuting periods, with higher eastbound flow in the AM peak and westbound flow in the PM peak. Traffic flows were light to moderate on the remaining study area roadways that function as collector or local access streets.

**Table 4. Traffic Count Information**

Traffic Count Location	Period Counted	Peak Hour	Count Date
Mill House Road and Clyde Drive / Town of Chapel Hill Public Works Driveway	AM Peak	7:45 – 8:45 AM	6/6/17
	Noon Peak	12:15 – 1:15 PM	
	PM Peak	4:45 – 5:45 PM	
Mill House Road and Eubanks Road	AM Peak	7:30 – 8:30 AM	6/6/17
	Noon Peak	12:15 – 1:15 PM	
	PM Peak	5:00 – 6:00 PM	

**II. 2022 BUILD-OUT YEAR+1 CONDITIONS**

**A. Future Ambient Area-Wide Traffic Growth Estimation**

Based on information on average daily traffic collected by the Town of Chapel Hill and the NCDOT, a yearly ambient traffic growth rate of 2.0 percent per year was used for the short-term 2022 design year capacity analyses. This rate is based on previous and anticipated growth trends for this area from Town and NCDOT average annual daily traffic (AADT) information on Eubanks Road from the period 2003-2015. In some cases, AADT's have risen more than two percent per year over the last 10-12 years, but recent results over the last 3-5 years indicate that the growth rate is flattening compared to older trends.

**B. Approved Background Development Traffic Estimation**

Per information from Town of Chapel Hill staff and information from the Town's Planning Department Development Activity Map (current as of June 2017), several developments that are either currently approved, under construction, or are expected to be built out and fully operational by the 2022 design analysis year, may potentially impact peak hour operations within the specific project study area. The majority of these are not proximate to the Mill House Road corridor and proposed Flex Park site, and



were their impacts were considered to be included in the regional ambient growth rate described above. One larger adjacent development to the east, Carraway Village (formerly the Edge), was considered to be a background traffic generator for this study. Its assumed peak hour site traffic volumes were taken from information in *The Edge – 2013 Traffic Impact Study Update* documentation (HNTB, 2013) and included in the traffic volume development scenarios for this study found in **Appendix C**. **Figure 7** shows the estimated 2022 Build-out Year+1 peak hour total traffic volume projections without site traffic that include the ambient and specific background generator totals.

## **C. Proposed Project Traffic**

### **i.) Trip Generation**

Projected trips for the proposed commercial site were generated from the *ITE Trip Generation Manual* (Institute of Transportation Engineers, 9<sup>th</sup> Edition, 2012). Adjustments to trip generation rates (due to internal trips, pass-by trips, transit trips, pedestrian/bicycle trips) were not included, to produce a conservative estimate of vehicular trip impacts. Separate trip generation calculations were completed for the eastern and western portions of the Flex Park site. NCDOT recommended procedures for trip generating variables and generation methodology (use of rates or linear regression equations) were applied to ITE calculations.

The Applicant did not define a specific square footage density of the proposed land uses. Estimated ranges of development size are given below:

- Eastern Parcel – Up to 95,000 square feet General Office, 95,000 square feet to 290,000 square feet of Light Industrial, Up to 95,000 Square Feet of Self-Storage – 380,000 square feet total.
- Western Parcel – 25,000 Square Feet of Flex Space.

To provide a conservative estimate of the maximum trip generating impact, trip rates for the proposed uses were compared and an estimate of 95,000 square feet of general office space and 290,000 square feet of Light Industrial space for the eastern parcel was used in this study. 25,000 square feet of general office space was assumed for the “flex” space amount for the western parcel.

**Table 5** shows the number of vehicular trips generated by the Carolina Flex Park development during the weekday AM, noon, and PM peak hours of adjacent streets, based on the ITE generation methodologies described above. A peak hour truck percentage of five percent was estimated for all site-generated traffic from the eastern portion of the site (which would contain the light industrial development). A truck percentage of two percent was estimated for the western parcel.

### **ii.) Adjustments to Trip Generation Rates**

Typically, raw ITE trip generation estimates for daily and peak hour trips have the potential to be adjusted for the following factors to reduce raw trip generation estimates to actual estimated vehicular trips produced by the Carolina Flex Park development. The following discussion highlights this process.

#### **a.) Internal Capture**

The land uses proposed for Carolina Flex Park do not exhibit the potential for internally-captured trips for on-site uses. No modifications or reductions were made to trip generation results to account for internal capture.



**Table 5. Weekday Vehicle Trip Generation Summary**  
**Carolina Flex Park**

**Carolina Flex Park - Weekday Trip Generation - East Site**

Land Use	Units	Daily			AM Peak Hour			Noon Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
General Light Industrial	285,000 SF	1,014	1,014	2,028	217	30	247	62	63	125	30	220	250
General Office Building	95,000 SF	632	632	1,264	162	22	184	73	66	139	31	154	185
Self-Storage	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TOTALS</b>		<b>1,646</b>	<b>1,646</b>	<b>3,292</b>	<b>379</b>	<b>52</b>	<b>431</b>	<b>135</b>	<b>129</b>	<b>264</b>	<b>61</b>	<b>374</b>	<b>435</b>

**Carolina Flex Park - Weekday Trip Generation - West Site**

Land Use	Units	Daily			AM Peak Hour			Noon Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
General Office Building	25,000 SF	229	229	458	55	8	63	28	36	64	18	88	106

Total Trip Generation Data	Daily			AM Peak Hour			Noon Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
	1,875	1,875	3,750	434	60	494	163	165	328	79	462	541



b.) Modal Split

The study area is served by the N-S CHT fixed bus route with frequent existing service and has facilities for pedestrians and bicyclists with some connectivity to trip attractions in areas of northern Chapel Hill near the site. However, to be conservative, no trip reductions for transit, pedestrians, or bicycles was made for this analysis. Count observations for pedestrians and bicyclists indicate that these modes only account for a small portion of existing trips in the project study area.

c.) Pass-by Trips

The proposed Carolina Flex Park development does not propose land use types that would typically generate pass-by trips. No pass-by trip reductions were considered for this study.

d.) Trip Generation Budget

Current information from the Applicant related to the Carolina Flex Park project indicates that the project will be built out in one phase. No adjustments or recommendations for a trip generation budget are made for this study if the development is ultimately built to the densities (maximum trip generating land use mixes) assumed for this study.

**iii.) Trip Distribution**

Trip distribution for site-related traffic was based on existing daily and peak hour traffic patterns on major study area thoroughfares, and engineering judgment, to determine the directional peak hour characteristics of traffic to and from the eastern and western site parcels from the major study area thoroughfares. No local trips to/from lower volume collector and local streets were estimated, though the possibility exists a small portion of trip-making may occur to/from these facilities. Trips were also distributed separately for the western and eastern site parcel locations. **Figure 8** presents the projected trip distribution traffic percentages for the proposed site in 2022.

**iv.) Trip Assignment**

**Figure 9** shows the corresponding weekday AM, noon, and PM peak hour site traffic volumes distributed on the 2022 study area network. Total volumes into and out of the site correspond to total external vehicular trips generated, based on the trip generation methodology developed previously. It was assumed that the proposed new site access points along Mill House Road and would be allowed full access for future traffic assignment.

**D. Future Traffic Forecasts with the Proposed Development**

**Figure 10** displays the 2022 Build-out+1 year projected study area traffic volumes with site traffic added. These traffic volumes represent the aggregate traffic growth over existing traffic volumes for ambient traffic growth, the Carraway Village specific background development traffic generator, and estimated site traffic assignments for the Carolina Flex Park site.

**III. IMPACT ANALYSES**

**A. Peak Hour Intersection Level of Service Analysis**

**i.) Methodology**

Evaluation of traffic operations on suburban arterials and local surface streets is most effective through the determination of level of service (LOS) criteria. The concept of level of service correlates qualitative aspects of traffic flow to quantitative terms. This enables transportation professionals to



take the qualitative issues, such as congestion and substandard geometrics, and translate them into measurable quantities, such as operating speeds and vehicular delays. The 2010 *Highway Capacity Manual (HCM 2010)* characterizes level of service by letter designations A through F. Level of service A represents ideal low-volume traffic operations, and level of service F represents over-saturated high-volume traffic operations. Level of service is measured differently for various roadway facilities, but in general, level of service letter designations are described by the following in **Table 6**.

**Table 6. Level of Service (LOS) Characteristics**

Level of Service Description	Per Vehicle Delay at Signal	Per Vehicle Delay at Stop Sign
<b>LOS A</b> > Free flow > Freedom to select desired speed and to maneuver is extremely high > General level of comfort and convenience for motorists is excellent	<b>&lt; 10.0 sec</b>	<b>&lt; 10.0 sec</b>
<b>LOS B</b> > Stable flow > Other vehicles in the traffic stream become noticeable > Reduction in freedom to maneuver from LOS A	<b>10.0 – 20.0 sec</b>	<b>10.0 – 15.0 sec</b>
<b>LOS C</b> > Stable flow > Maneuverability and operating speed are significantly affected by other vehicles > General level of comfort and convenience declines noticeably	<b>20.0 – 35.0 sec</b>	<b>15.0 – 25.0 sec</b>
<b>LOS D</b> > High density but stable flow > Speed/freedom to maneuver are very restricted > General level of comfort / convenience is poor > Small increases in traffic will generally cause operational problems	<b>35.0 – 55.0 sec</b>	<b>25.0 – 35.0 sec</b>
<b>LOS E</b> > Unstable flow > Speed reduced to lower but relatively uniform value > Volumes at or near capacity level > Comfort and convenience are extremely poor > Small flow increases or minor traffic stream disturbances will cause breakdowns	<b>55.0 – 80.0 sec</b>	<b>35.0 – 50.0 sec</b>
<b>LOS F</b> > Forced or breakdown flow > Volumes exceed roadway capacity > Formation of unstable queues > Stoppages for long periods of time because of traffic congestion	<b>&gt; 80.0 sec</b>	<b>&gt; 50.0 sec</b>

The minimum acceptable peak hour intersection level of service established for this project is LOS D for signalized intersections or LOS E for critical movements at unsignalized intersections, or no increase in delay for signalized intersections operating below LOS D or unsignalized intersection critical movements operating below LOS E without the inclusion of site traffic. The following four conditions were evaluated:

- Condition 1** - 2017 Existing Traffic
- Condition 2** - 2022 Traffic without Site Traffic
- Condition 3** - 2022 Traffic with Site Traffic Volumes Added
- Condition 4** - 2022 Traffic with Site Traffic and Improvements



The *Synchro Professional Version 9* operations analysis software was used to analyze peak hour conditions at signalized intersections. The Synchro software was also used to analyze peak hour conditions at unsignalized intersections, using its HCM 2010 unsignalized intersections output function. The methodology of evaluating each condition for signalized intersections is presented below:

- **Condition 1** – Use current Town of Chapel Hill data for the cycle length, splits and offsets of individual signalized intersections and report LOS and delay values from Synchro.
- **Conditions 2 and 3** – Reoptimize the cycle lengths and splits of individual intersections in Synchro, if existing timing data does not provide adequate overall intersection LOS. Adjust cycle lengths, splits, and offsets, if necessary, if the signal is currently operating in a coordinated system. The optimized signal timing information will be held constant for both Conditions, to provide a means to compare effects of the proposed site traffic.
- **Condition 4** – Optimize coordinated traffic signals for effects of recommended mitigation strategies that change existing/committed changes to lane geometrics. Evaluate the potential for different signal phasing schemes (left-turn lag phases, for example). Retain existing split minimums and any pedestrian timing values. Recommendations, if warranted, will be made to obtain at least LOS D for the intersection as a whole.

The net effect of this process is that direct comparisons, by movement, of delay and LOS between each of the three conditions are impossible because splits and cycle lengths can and do change between conditions. The pertinent statistic of this analysis is the *overall intersection level of service and delay*. Improvements to deficient intersections in Condition 3 were made by first attempting to adjust signal operations via changes in cycle lengths, splits and/or with acceptable adjustments to signal phasing. If that did not produce satisfactory results for all intersections, geometric improvements to improve intersection capacity were considered for the deficient intersections. **Appendix D** contains the Synchro output for all four conditions (where applicable).

The existing study area unsignalized all-way stop-controlled intersection was analyzed using the HCM 2010 unsignalized output function in Synchro. Its results, along with proposed two-way stop controlled intersections at the two site driveways, were evaluated on a per-movement basis, since HCM unsignalized methodologies do not produce an overall intersection level of service for unsignalized intersections. Thus, intersections with deficient (LOS F) movements in Condition 2 would need to be evaluated for improvements in Condition 3. This methodology differs from signalized intersections, where one or more movements at an intersection may be deficient in Condition 2, but as long as the overall intersection level of service does not fall below LOS D, no intersection improvements are deemed necessary. **Appendix E** contains the Synchro HCM 2010 unsignalized output for all stop-controlled intersections under study.

## ii.) 2017 Existing Conditions Results

**Table 7** presents the results for the existing year traffic conditions as compiled from field data. The table lists LOS and delay values for those movements that are in existence at this time. It also only lists data for individual movements encountering delay at the stop-controlled intersection (which does not have an overall intersection delay value produced in the HCM method). Currently, the two study area intersections operate at acceptable overall levels of service for the analyzed 2017 AM, noon, and PM peak hours.



**Table 7. Capacity Analysis Results for Study Area Intersections  
 Condition 1 – 2017 Existing Peak Hour Traffic**

Intersections	LOS			Average Vehicular Delay (seconds/vehicle)		
	AM	Noon	PM	AM	Noon	PM
<b>Mill House Road and Clyde Drive / Town Public Works Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
EB LT-TH-RT	A	A	A	8.0	7.0	7.0
WB LT-TH-RT	A	A	A	8.1	7.5	7.5
NB LT-TH-RT	A	A	A	9.5	7.9	7.9
SB LT-TH-RT	A	A	A	7.9	8.3	9.1
<b>Mill House Road and Eubanks Road</b>	A	A	A	9.2	6.3	7.4
EB LT-TH	A	A	A	9.6	6.3	7.0
WB TH	A	A	A	5.8	6.1	7.4
WB RT	A	A	A	0.1	0.1	0.1
SB LT	B	B	B	16.3	11.2	11.4
SB RT	B	A	B	14.9	10.0	12.0

N/A - Not Applicable, i.e. movement is non-existent or overall intersection values are not reported for unsignalized intersections

**iii.) 2022 No-Build Scenario (Condition 2) Results**

**Table 8** presents the results for the 2022 Build-out+1 analysis year estimated traffic conditions without the impacts of site-related traffic. This analysis includes the application of the 2.0 percent per year ambient growth factor to existing 2017 traffic volumes, along with projected site-related traffic from the Carraway Village development. During Condition 2 - 2022 Without Site Traffic, the two study area intersections are expected to operate at acceptable levels of service for all analyzed peak hours. For the Condition 2 analysis, existing 2017 signal timings at the free-running signal were conservatively held constant with 2017 existing year data for comparison purposes. All individual movement delays marginally increase, but not to deficient levels.

**iv.) 2022 Build Scenario (Condition 3) Results**

**Table 9** presents results for 2022 Build-out+1 year estimated traffic conditions, including impacts of site-related traffic increases. In general, the addition of site-related traffic will marginally increase delays at signalized intersection, but not cause it to become deficient (overall LOS E or F) in any peak hour. Delays will marginally increase for individual intersection movements for both signalized and unsignalized intersections. No unsignalized intersection critical movement delay is expected to drop to LOS F. Site access intersection operations are expected to be acceptable (LOS E or better for critical movements).



**Table 8. Capacity Analysis Results for Study Area Intersections  
 Condition 2 – 2022 Peak Hour Traffic Without Site**

Intersections	LOS			Average Vehicular Delay (seconds/vehicle)		
	AM	Noon	PM	AM	Noon	PM
<b>Mill House Road and Clyde Drive / Town Public Works Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
EB LT-TH-RT	A	A	A	8.2	7.1	7.1
WB LT-TH-RT	A	A	A	8.1	7.5	7.5
NB LT-TH-RT	A	A	A	10.0	8.0	8.0
SB LT-TH-RT	A	A	A	8.0	8.3	9.2
<b>Mill House Road and Eubanks Road</b>	B	A	A	10.1	6.5	8.0
EB LT-TH	B	A	A	10.5	6.6	7.5
WB TH	A	A	A	5.8	6.3	7.9
WB RT	A	A	A	0.1	0.1	0.1
SB LT	B	B	B	19.5	11.4	12.7
SB RT	B	B	B	17.7	10.0	13.3

N/A - Not Applicable, i.e. movement is non-existent or overall intersection values are not reported for unsignalized intersections

**Table 9. Capacity Analysis Results for Study Area Intersections  
 Condition 3 – 2022 Peak Hour Traffic With Site**

Intersections	LOS			Average Vehicular Delay (seconds/vehicle)		
	AM	Noon	PM	AM	Noon	PM
<b>Mill House Road and Clyde Drive / Town Public Works Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
EB LT-TH-RT	A	A	A	9.3	7.4	7.8
WB LT-TH-RT	A	A	A	8.6	7.7	7.8
NB LT-TH-RT	A	A	A	12.0	8.5	8.8
SB LT-TH-RT	A	A	A	8.4	8.5	9.5
<b>Mill House Road and Eastern Site Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
SB LT	A	A	A	9.5	8.0	7.8
WB LT-RT	C	B	D	21.5	13.8	32.5
<b>Mill House Road and Eubanks Road</b>	B	A	B	13.9	8.4	18.4
EB LT-TH	C	A	C	20.6	9.6	30.1
WB TH	A	A	B	6.4	8.5	19.4
WB RT	A	A	A	0.6	0.3	0.1
SB LT	C	B	B	28.0	14.4	17.4
SB RT	C	B	B	23.9	10.3	12.4
<b>Mill House Road and Western Site Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
WB LT	A	A	A	7.7	7.5	7.4
NB LT-RT	A	A	A	9.6	9.1	9.3

N/A - Not Applicable, i.e. movement is non-existent or overall intersection values are not reported for unsignalized intersections



**v.) 2022 Mitigation Scenario (Condition 4) Results**

Based on capacity analysis results in the previous section, no study area intersection was analyzed for mitigation improvements directly related to capacity analysis results. Recommendations found in **Section IV. D.** in this report consider geometric improvements to the Mill House Road and Eastern Site Driveway intersection related to safety and queuing issues at this location. **Table 10** shows the results of including separate driveway left and right-turn lanes and a northbound right-turn deceleration lane. These changes will have only small effects on intersection LOS and delay for individual movements.

**Table 10. Capacity Analysis Results for Study Area Intersections  
 Condition 4 – 2022 Peak Hour Traffic With Site and Mitigation**

Intersections	LOS			Average Vehicular Delay (seconds/vehicle)		
	AM	Noon	PM	AM	Noon	PM
<b>Mill House Road and Eastern Site Driveway</b>	N/A	N/A	N/A	N/A	N/A	N/A
SB LT	A	A	A	8.2	7.6	7.7
<b>WB LT</b>	C	B	D	15.3	12.9	33.7
<b>WB RT</b>	B	A	A	10.5	9.3	9.6

N/A - Not Applicable, i.e. movement is non-existent or overall intersection values are not reported for unsignalized intersections  
**BLUE** – Proposed Geometric Improvement

**B. Access Analysis**

Vehicular site access is to be accommodated by two proposed full movement access driveways connecting to Mill House Road that will serve the eastern and western site parcels, respectively. Design details related to driveway throat lengths are not shown on the concept plan.

Driveway distances along Mill House Road from its intersection with the proposed Western Site Driveway are approximately 160 feet (to the railroad crossing) and 240 feet (to the all-way stop intersection with the Town Public Works Driveway) and are acceptable, based on recommendations of 100 foot minimum corner clearance as set forth in the 2003 *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and the 200 foot minimum (intersection) spacing along local streets specified in the 2005 *Town of Chapel Hill Design Manual*. Distances for the eastern connection to Mill House Road to nearest intersections are approximately 450 feet to the Chapel Hill Transit Driveway and 1,700 feet to Eubanks Road – also acceptable per NCDOT and Town design standards. The proposed spacing between the street access connections and local driveways is more than the recommended 50 foot spacing along local streets/100 feet along collector streets found in Table 4-A-1 in the Town Design Manual.

Access for pedestrians and bicyclists is adequate in the project study area. Sidewalk is present on the eastern side of Mill House Road adjacent to the eastern site parcel. Unsignalized crosswalks are present at one quadrant of the two existing study area intersections. There are striped bicycle lanes painted on the both sides of Mill House Road between Eubanks Road and the Town Public Works Driveway. The proposed site concept plan indicates a future pedestrian access connection from the eastern site parcel to adjacent properties (Eubanks Park-and-Ride and Carraway Village development).



**C. Signal Warrant Analysis**

Based on projected 2022 traffic volumes, operational LOS/delay results, and current/proposed access plans, no study area intersection would warrant the installation of a traffic signal, based on the methodology found in the *2009 Manual on Uniform Traffic Control Devices (MUTCD)*.

**D. Sight Distance Analysis**

In general, sight distance issues entering/exiting the proposed Carolina Flex Park driveways should be minimal. For the eastern access point on Mill House Road, visibility along this section of Mill House Road is adequate as no significant horizontal or vertical curvature is present at this location. For the western access point on Mill House Road just west of the railroad corridor, there is significant horizontal curvature along Mill House Road in this area, but considering the 30 mph speed limit on Mill House Road in the immediate vicinity of the proposed driveway and the fact that the location is on the outside of the horizontal curve there should not be significant sight distance issues at this location either.

**E. Crash Analysis**

Data from the NCDOT Traffic Safety Unit was compiled from the TEAAS software package for the project study area. Crash statistics were compiled for the five year period 5/1/2012 to 4/30/2017 for the segment along Mill House Road from Eubanks Road to the Town Public Works Driveway / Clyde Road intersection. Raw corridor segment crash data is located in **Appendix F** and results are shown in **Table 11**.

Mill House Road Corridor

There were three (3) crashes reported along the Mill House Road study area corridor between Eubanks Road and the Public Works Driveway over the five year period (5/1/2012 to 4/30/2017). In this 0.53 mile segment, two crashes were reported near the Eubanks Road intersection along Mill House Road and one crash near the Chapel Hill Transit Driveway. **Table 11** presents a comparison between the Mill House Road study area crash rates and the latest North Carolina statewide rates for the period 2013-2015 (compiled by NCDOT Traffic Safety Unit). Overall, the number of crashes along Mill House Road in the project study area is slightly lower than statewide averages for similar facilities in most reported categories. Crash rates for wet pavement conditions are higher than statewide averages, but the small sample size (three crashes – one of which was in wet conditions) contributes to that result.

**Table 11. Study Area Crash Rate Comparison – Mill House Road Corridor**

Statistic	Crashes Per 100 Million Vehicle Miles	
	Mill House Road (Eubanks Road to Public Works Driveway)	North Carolina Statewide Average Rural Secondary Routes (2 Lanes Undivided)
Total Crash Rate	238.15	250.64
Fatal Crash Rate	0.00	2.70
Non-Fatal (Injury) Crash Rate	0.00	71.66
Night Crash Rate	79.18	110.36
Wet Crash Rate	79.18	45.00

\*\* - Data for Rural Secondary Roads



**F. Other Transportation-Related Analyses**

Other transportation-related analyses relevant to the 2001 Town of Chapel Hill Guidelines for the preparation of Traffic Impact Studies were completed, as appropriate. The topics listed in **Table 12** are germane to the scope of this study.

**Table 12. Other Transportation-Related Analyses**

Analysis	Comment
Long-Range Planning Level Daily Volume-Capacity Analysis	The proposed site could add over 3,000 daily trips to the study area network. However, the Mill House Road corridor currently carries less than 2,000 vehicles daily and its daily capacity can be estimated in the range of 10,000+ vehicles. The Eubanks Road corridor currently has an AADT of over 6,000 west of Mill House Road. Site traffic will primarily use this corridor to the east of Mill House Road for access and peak hour operational results for the Eubanks Road/Mill House Road intersection do not indicate any capacity issues.
Turn Lane Storage Requirements	Storage bay lengths at study area intersections were analyzed using Synchro and HCM 95 <sup>th</sup> percentile (max) queue length estimates for the 2022 Build Scenario. No unsignalized intersection is expected to have excessive peak hour queues or conditions that exceed existing turn lane storage. For improved traffic operations exiting the eastern site driveway along Mill House Road, separate left-turn and right-turn storage lanes are recommended in the actual driveway design. The signalized intersection at Eubanks Road and Mill House Road has 2022 PM peak maximum queue estimates that indicate that westbound and southbound approaches may exceed existing storage bays.
Appropriateness of Acceleration/Deceleration Lanes	The site concept plan shows no specifics related to acceleration/deceleration lanes along Mill House Road. Based on the existing 40 mph speed limit on Mill House Road and the fact that it will service a high projected volume of right-turning vehicles into the eastern site driveway, a separate northbound right-turn deceleration lane is recommended at the proposed site access point. No other specific acceleration/deceleration lane issues were analyzed in the project study area.
Pedestrian and Bicycle Analysis	Existing pedestrian and bicycle access and connectivity is adequate in the project study area. Sidewalk exists along the Mill House Road corridor on the east side of the road, though connectivity beyond Mill House Road along the Eubanks Road corridor is currently lacking. Delineated bicycle lanes along Mill House Road are present in the project study area, but again, connectivity along the Eubanks Road corridor to any dedicated bicycle facilities are currently lacking.
Public Transportation Analysis	Public transportation service to the study area is adequate in that the nearby Eubanks Road Park-and-Ride is serviced by the high capacity CHT NS bus route. Provision for a pedestrian connection from this bus stop to the eastern site parcel is recommended.

**G. Special Analysis/Issues Related to Project**

Based on discussions with Town of Chapel Hill staff, there are no special issues or analyses beyond the ones already discussed for this proposed project.



## **IV. MITIGATION MEASURES/RECOMMENDATIONS**

### **A. Planned Improvements**

There are no Town of Chapel Hill or North Carolina Department of Transportation improvement projects for study area roadway facilities within the analysis year time frame of 2017-2022.

### **B. Background Committed Improvements**

There are no specific geometric or operational improvements to study area roadway intersections or facilities related to background private development projects that are expected to be completed between 2017 and 2022. East of the study area, Eubanks Road will be improved to a widened cross-section through committed improvements from the Carraway Village development.

### **C. Applicant Committed Improvements**

Based on the preliminary site concept plans and supporting development information provided, there are no specific external transportation-related improvements proposed adjacent to the Carolina Flex Park, other than the proposed easement for access through Town-owned parcels on the west side of the railroad tracks for the western site parcel and preliminary provisions for potential future cross-access from the eastern site parcel to adjoining properties and a potential future pedestrian access connection to the Eubanks Road Park-and-Ride/Carraway Village area.

### **D. Necessary Improvements**

Based on traffic capacity analyses for the 2022 design year, and analyses of existing study area turning bay storage lengths and site access, the following improvements are recommended as being necessary for adequate transportation network operations (see **Figure 11**).

- 1) Construct northbound right-turn lane with 100 feet of vehicle storage and full taper at the Eastern Site Driveway connection with Mill House Road and design the access driveway for separate westbound left-turn and right-turn lanes with 150 feet minimum of full storage and driveway throat length.
- 2) For the Western Driveway access connection to Mill House Road, provide a minimum of 100 feet of driveway throat length to any future internal driveway access points from Town-owned parcels.
- 3) To minimize the potential for westbound queue blockages at the Eubanks Road intersection with Mill House Road, extend the existing westbound right-turn lane for a minimum of 200 feet of full storage and full taper.

## **Appendix A – Figures**



NOT TO SCALE

### LEGEND

-  = Existing Study Intersection
-  = Proposed Site Access



**Carolina Flex Park  
Traffic Impact Study**

**PROJECT STUDY AREA**

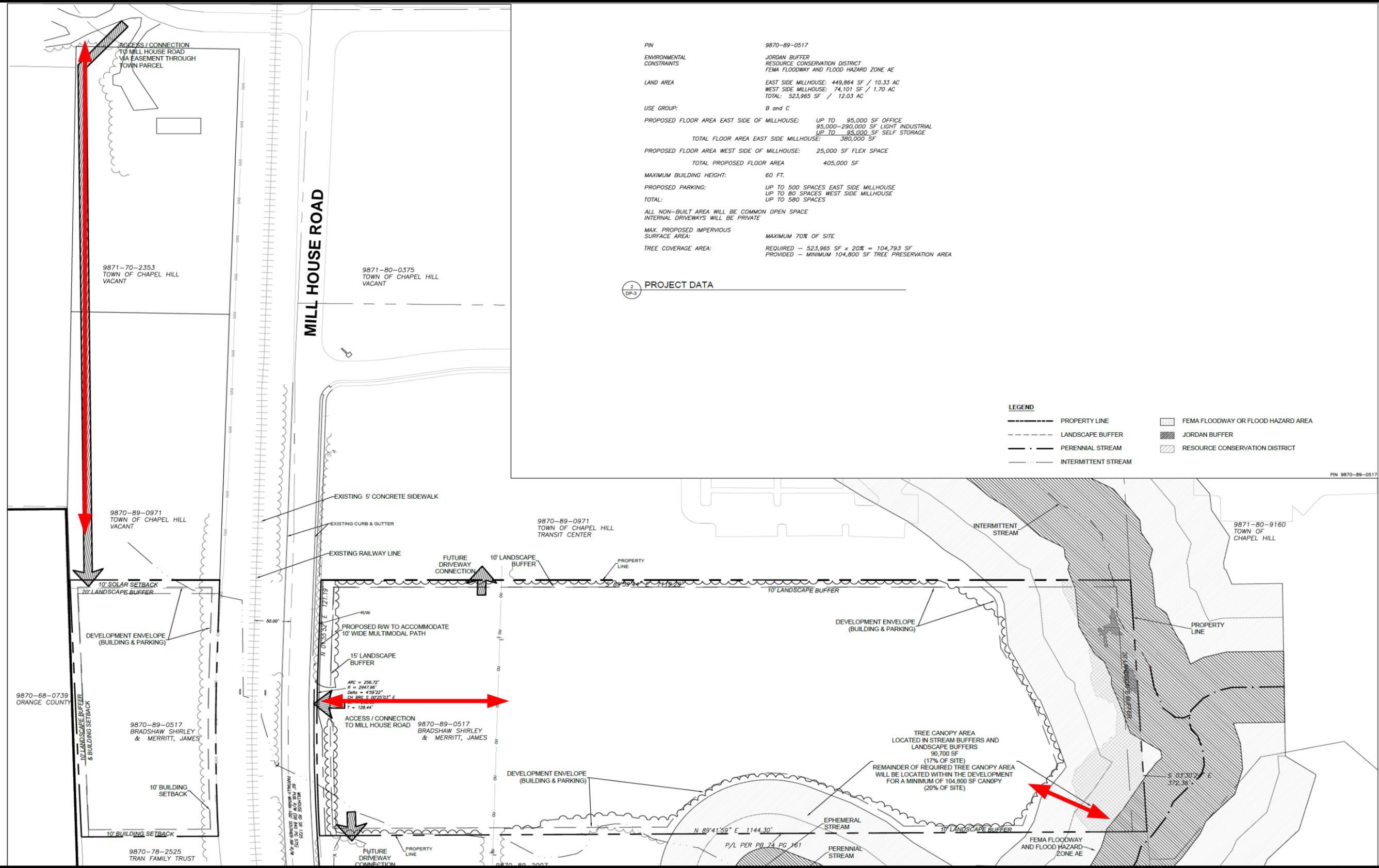
DATE: July 2017

**FIGURE 1**

PIN	9870-89-0517
ENVIRONMENTAL CONSTRAINTS	JORDAN BUFFER RESOURCE CONSERVATION DISTRICT FEMA FLOODWAY AND FLOOD HAZARD ZONE AE
LAND AREA	EAST SIDE MILLHOUSE: 449,864 SF / 10.33 AC WEST SIDE MILLHOUSE: 74,101 SF / 1.70 AC TOTAL: 523,965 SF / 12.03 AC
USE GROUP:	B and C
PROPOSED FLOOR AREA EAST SIDE OF MILLHOUSE:	UP TO 95,000 SF OFFICE 95,000-290,000 SF LIGHT INDUSTRIAL UP TO 95,000 SF SELF STORAGE
TOTAL FLOOR AREA EAST SIDE MILLHOUSE:	380,000 SF
PROPOSED FLOOR AREA WEST SIDE OF MILLHOUSE:	25,000 SF FLEX SPACE
TOTAL PROPOSED FLOOR AREA	405,000 SF
MAXIMUM BUILDING HEIGHT:	60 FT.
PROPOSED PARKING:	UP TO 500 SPACES EAST SIDE MILLHOUSE UP TO 80 SPACES WEST SIDE MILLHOUSE
TOTAL:	UP TO 580 SPACES
ALL NON-BUILT AREA WILL BE COMMON OPEN SPACE INTERNAL DRIVEWAYS WILL BE PRIVATE	
MAX. PROPOSED IMPERVIOUS SURFACE AREA:	MAXIMUM 70% OF SITE
TREE COVERAGE AREA:	REQUIRED - 523,965 SF x 20% = 104,793 SF PROVIDED - MINIMUM 104,800 SF TREE PRESERVATION AREA

**PROJECT DATA**

LEGEND	
---	PROPERTY LINE
- - -	LANDSCAPE BUFFER
— · — ·	PERENNIAL STREAM
— · · ·	INTERMITTENT STREAM
[Hatched Box]	FEMA FLOODWAY OR FLOOD HAZARD AREA
[Diagonal Hatched Box]	JORDAN BUFFER
[Cross-hatched Box]	RESOURCE CONSERVATION DISTRICT



**HNTB**

TOWN OF CHAPEL HILL

NOT TO SCALE

**LEGEND**

= PROPOSED SITE ACCESS

**Carolina Flex Park**  
Traffic Impact Study

**SITE CONCEPT PLAN**

DATE: July 2017

**FIGURE 2**

**LEGEND**

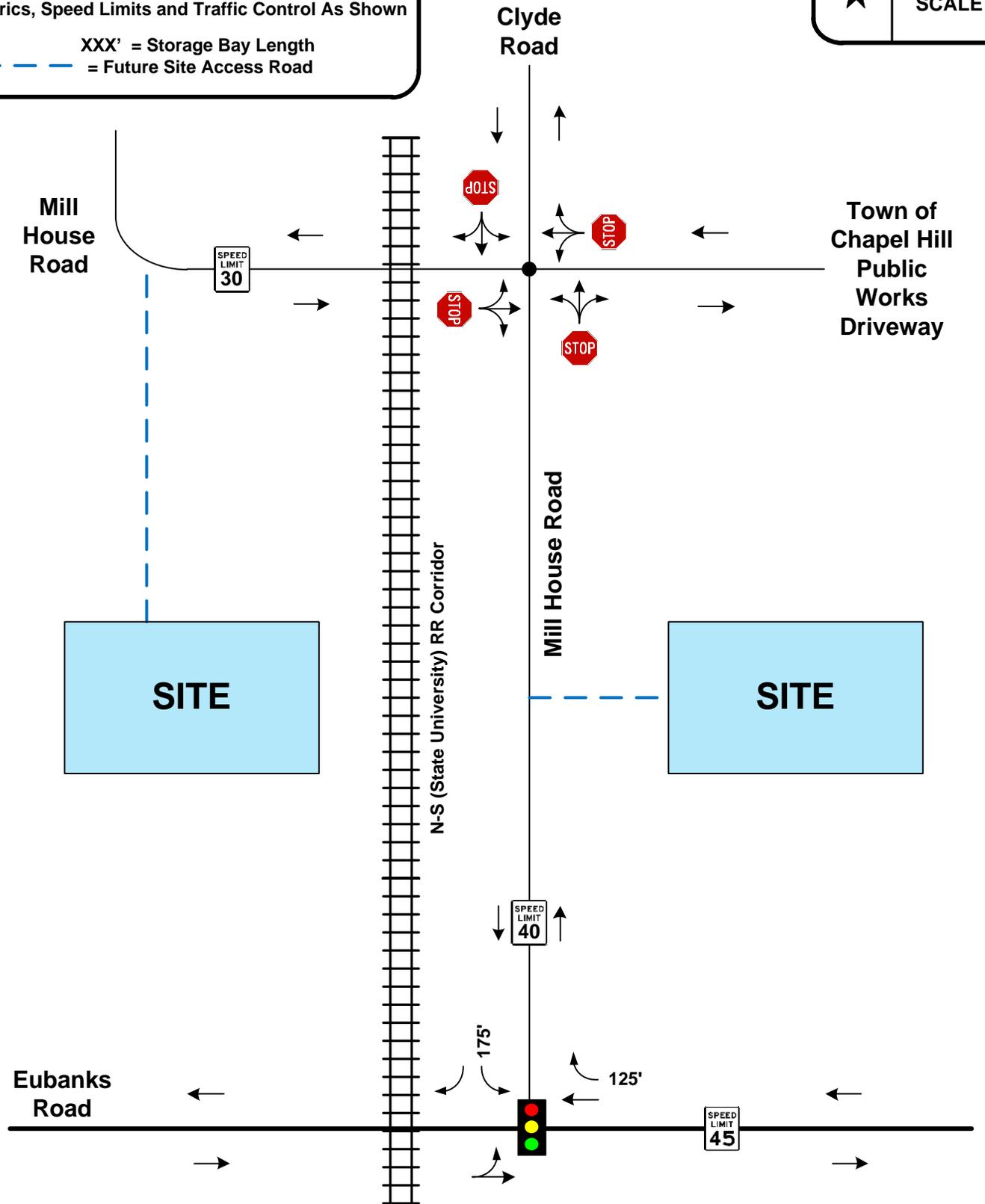
Geometrics, Speed Limits and Traffic Control As Shown

- XXX' = Storage Bay Length
- - - = Future Site Access Road

**DRAFT**



**NOT TO SCALE**



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**EXISTING LANEAGE AND GEOMETRICS**

**FIGURE 3**

**DRAFT**



**NOT TO SCALE**

**LEGEND**

-  Bike Lanes
-  Sidewalks
-  Unsignalized Crosswalks

Mill House Road

Clyde Road

Town of Chapel Hill Public Works Driveway

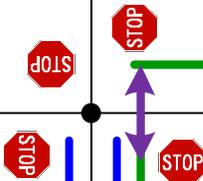
Town of Chapel Hill Transit Driveway



N-S (State University) RR Corridor

Mill House Road

Eubanks Road



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**STUDY AREA PEDESTRIAN & BICYCLE FACILITIES**

**FIGURE 4**

**DRAFT**



**NOT TO SCALE**

**LEGEND**



= PARK AND RIDE



= NS ROUTE

Mill House Road

Clyde Road

Town of Chapel Hill Public Works Driveway



Mill House Road

N-S (State University) RR Corridor

**SITE**

**SITE**

Eubanks Road



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**STUDY AREA TRANSIT ROUTES**

**FIGURE 5**

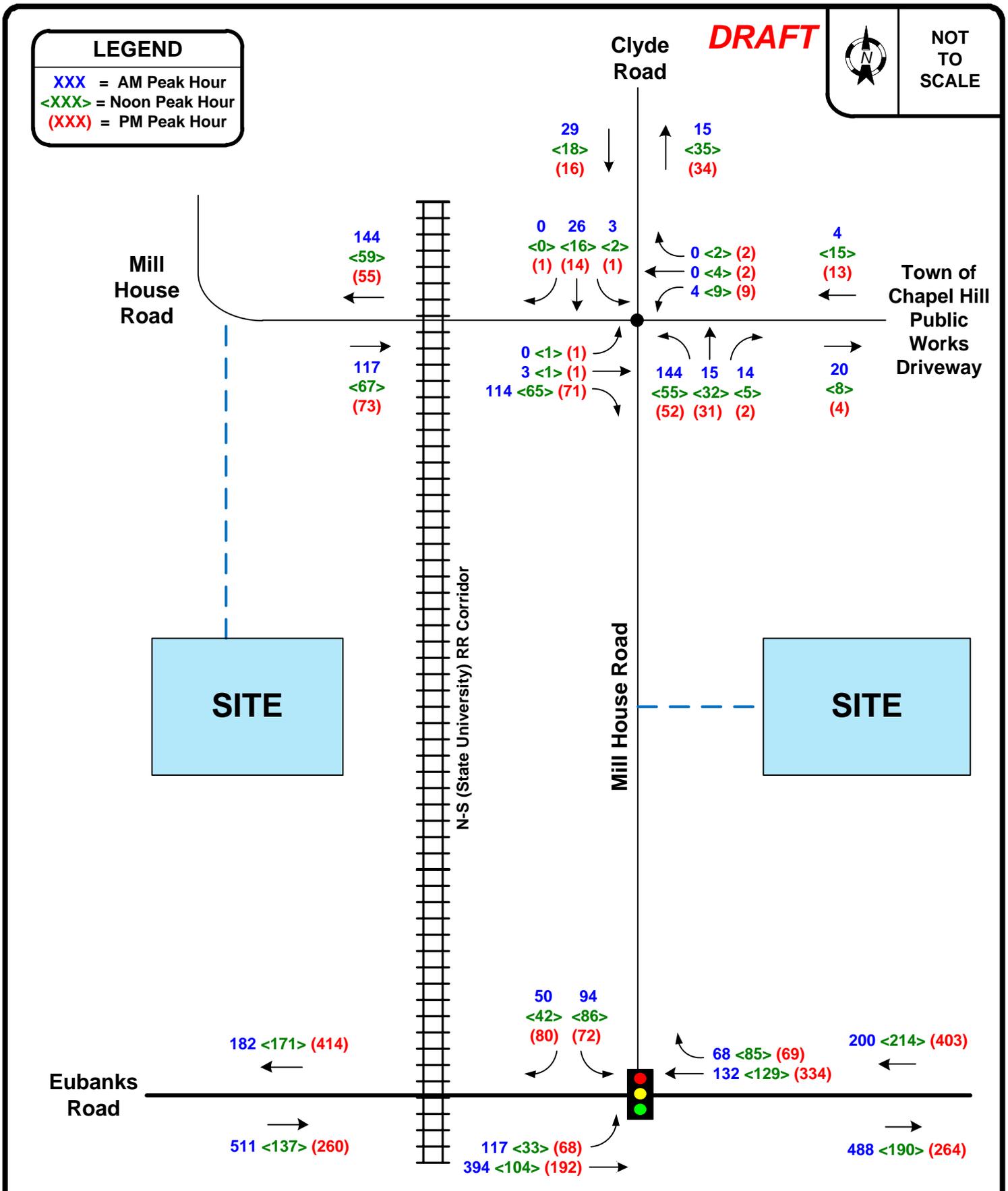
**LEGEND**

- XXX = AM Peak Hour
- <XXX> = Noon Peak Hour
- (XXX) = PM Peak Hour

**DRAFT**



**NOT TO SCALE**



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**2017 EXISTING PEAK HOUR TRAFFIC VOLUMES**

**FIGURE 6**

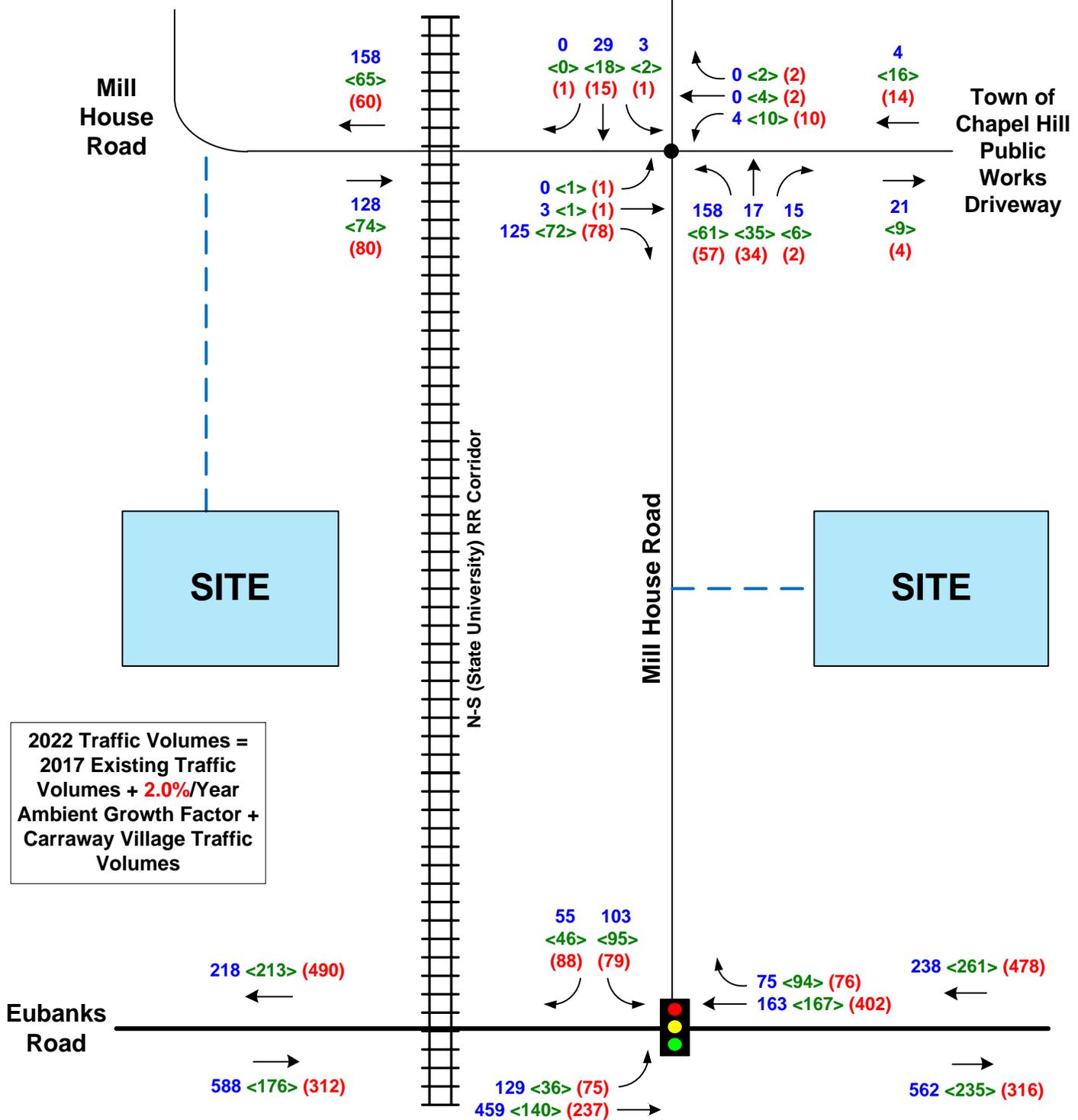
**DRAFT**



**NOT TO SCALE**

**LEGEND**

- XXX = AM Peak Hour
- <XXX> = Noon Peak Hour
- (XXX) = PM Peak Hour



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**2022 PEAK HOUR TRAFFIC VOLUMES  
WITHOUT SITE**

**FIGURE 7**

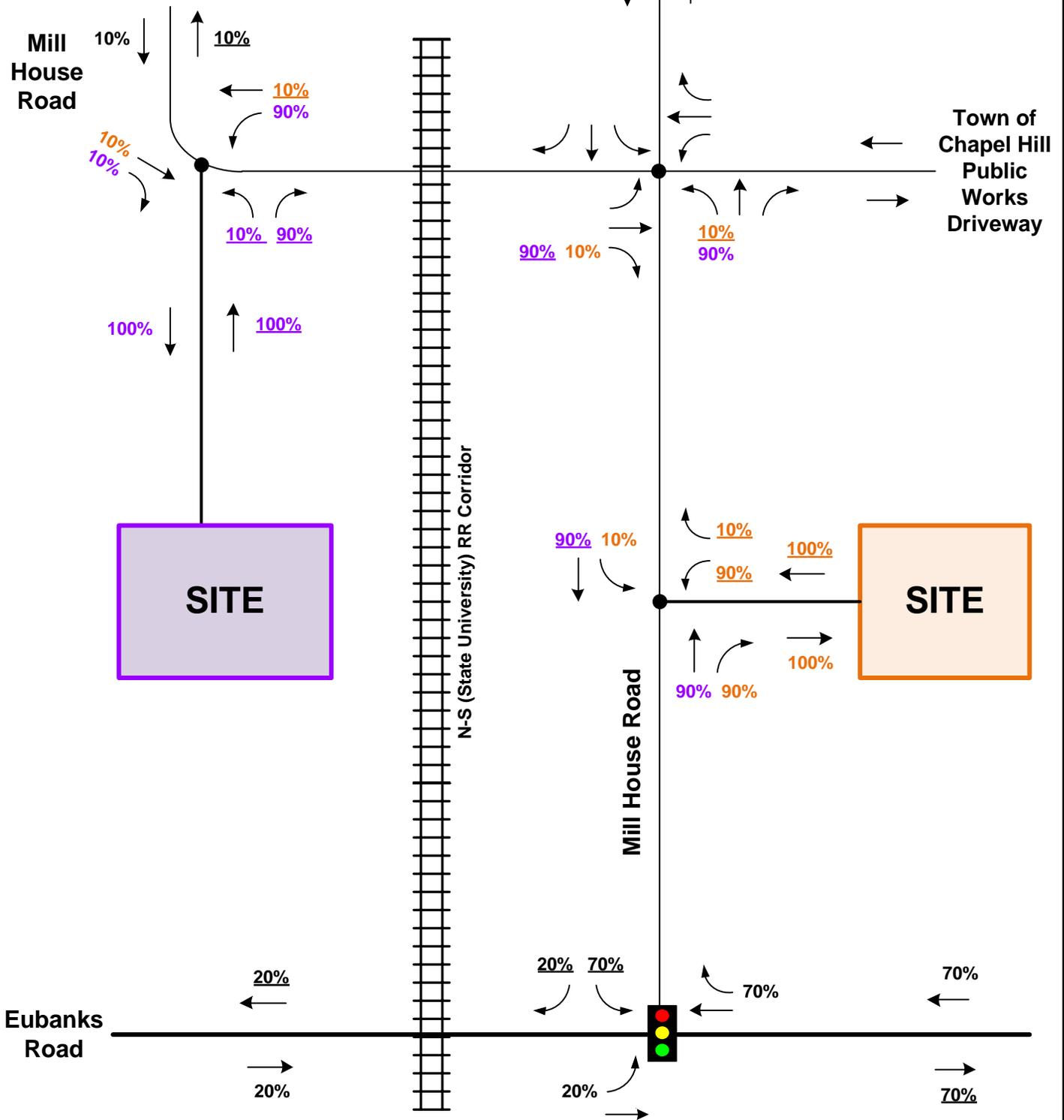
**LEGEND**

XX% / XX% = Peak Hour  
Enter / Exit Percentages  
Combined / West Site / East Site

**DRAFT**



**NOT TO SCALE**



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**2022 SITE TRIP DISTRIBUTION PERCENTAGES**

**FIGURE 8**

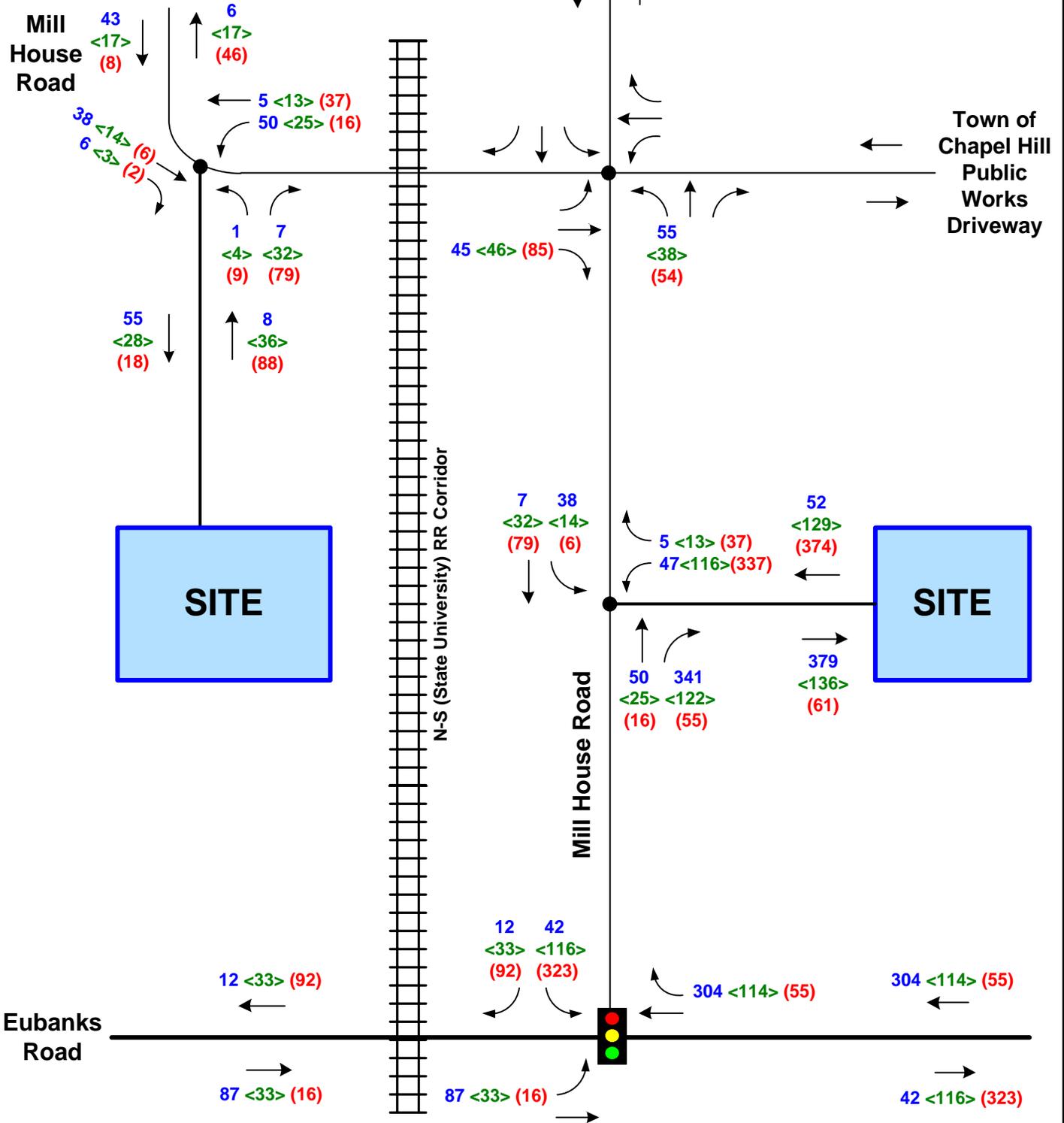
**DRAFT**



**NOT TO SCALE**

**LEGEND**

AM <Noon> (PM) Peak Hour  
Combined Enter / Exit Volumes



**Carolina Flex Park  
Traffic Impact Study**

DATE: July 2017

**2022 PEAK HOUR SITE TRAFFIC ASSIGNMENT**

**FIGURE 9**

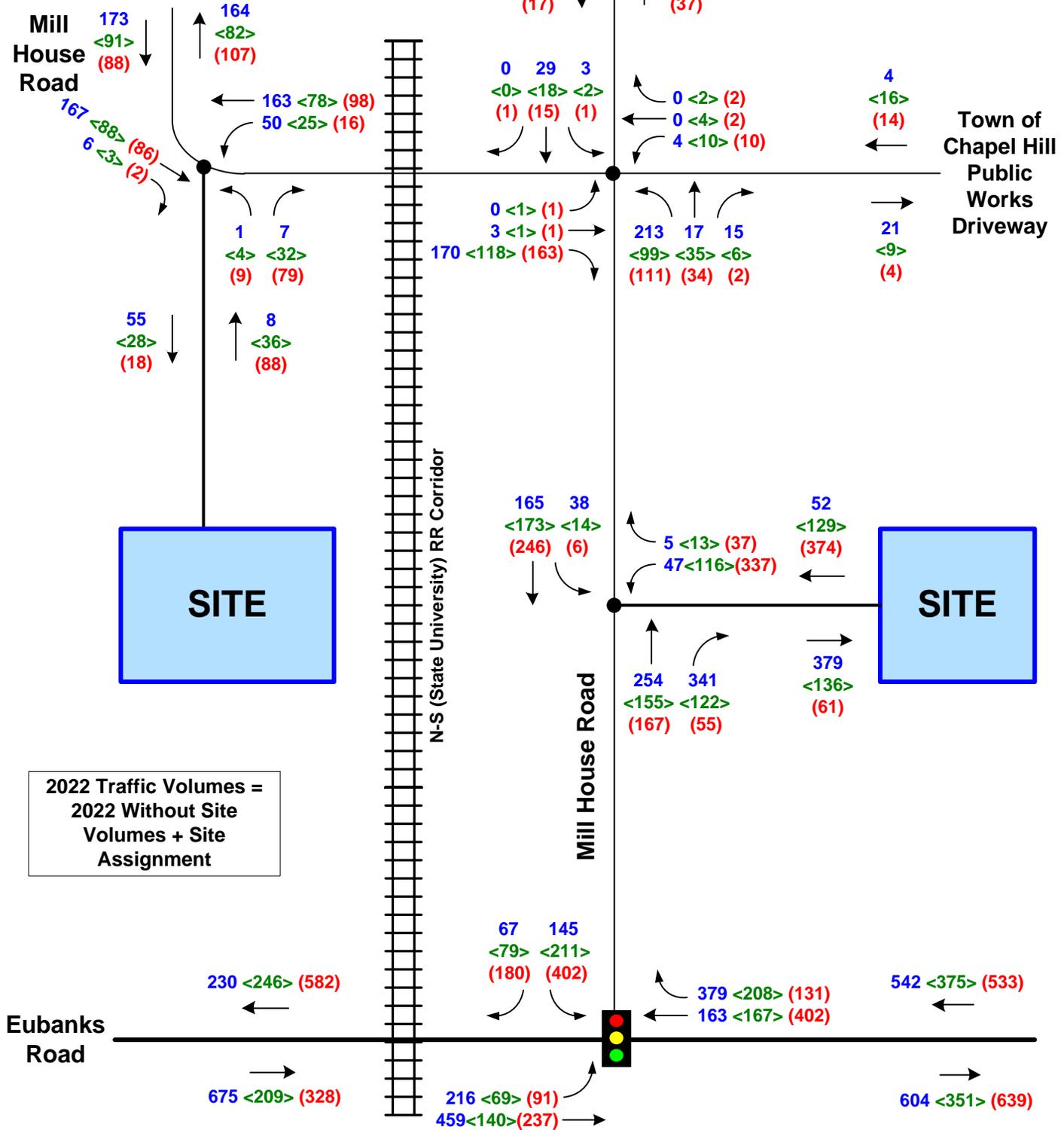
**DRAFT**



**NOT TO SCALE**

**LEGEND**

- XXX = AM Peak Hour
- <XXX> = Noon Peak Hour
- (XXX) = PM Peak Hour



2022 Traffic Volumes =  
2022 Without Site  
Volumes + Site  
Assignment



**Carolina Flex Park  
Traffic Impact Study**

**2022 PEAK HOUR TRAFFIC VOLUMES  
WITH SITE**

DATE: July 2017

**FIGURE 10**

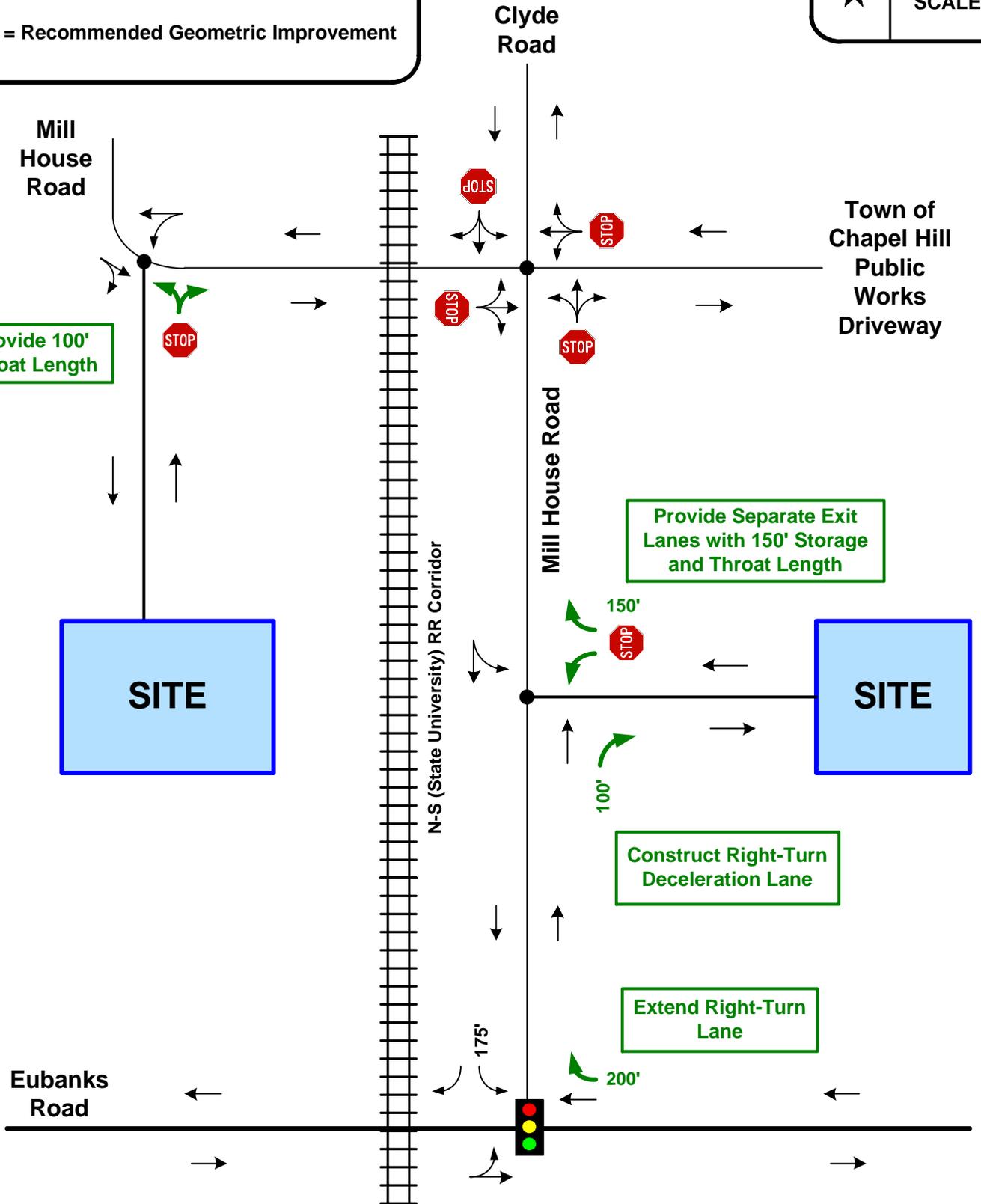
LEGEND

 = Recommended Geometric Improvement

**DRAFT**



NOT TO SCALE



Carolina Flex Park  
Traffic Impact Study

DATE: July 2017

RECOMMENDED IMPROVEMENTS

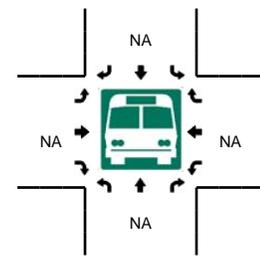
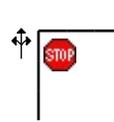
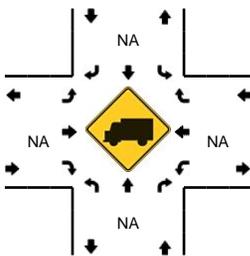
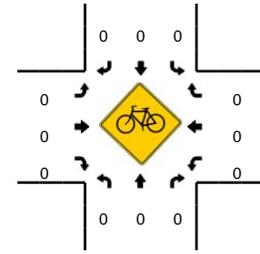
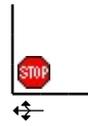
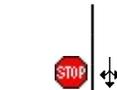
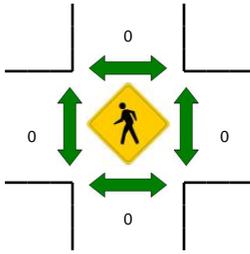
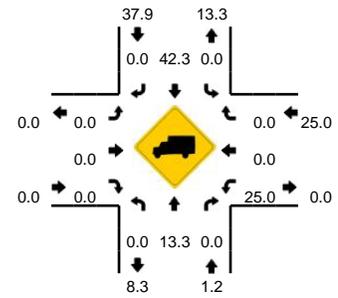
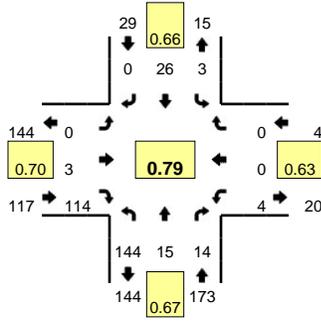
FIGURE 11

## **Appendix B – Traffic Count Data**

**LOCATION:** Clyde Rd -- Millhouse Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439401  
**DATE:** Tue, Jun 06 2017

**Peak-Hour: 7:45 AM -- 8:45 AM**  
**Peak 15-Min: 8:00 AM -- 8:15 AM**



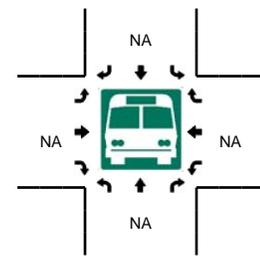
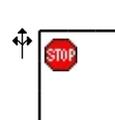
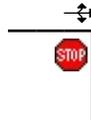
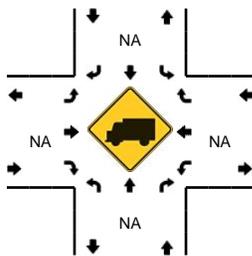
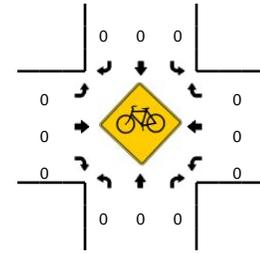
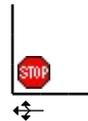
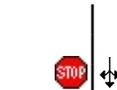
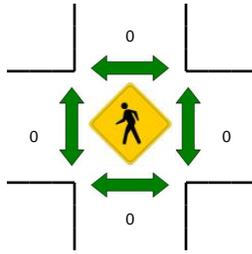
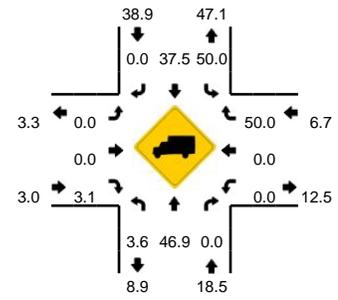
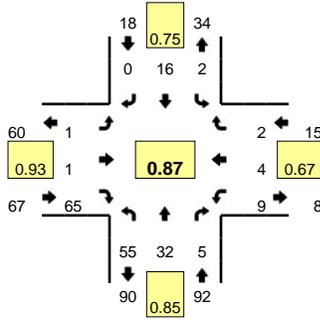
15-Min Count Period Beginning At	Clyde Rd (Northbound)				Clyde Rd (Southbound)				Millhouse Rd (Eastbound)				Millhouse Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	18	2	7	0	2	6	1	0	0	3	21	0	2	0	0	0	62	
7:15 AM	18	0	2	0	0	3	0	0	0	1	16	0	2	0	0	0	42	
7:30 AM	22	3	5	0	0	5	0	0	0	0	20	0	0	0	0	0	55	
7:45 AM	25	3	1	0	1	10	0	0	0	0	16	0	1	0	0	0	57	216
8:00 AM	56	2	7	0	1	6	0	0	0	1	27	0	2	0	0	0	102	256
8:15 AM	32	5	3	0	0	2	0	0	0	1	43	0	0	0	0	0	86	300
8:30 AM	31	5	3	0	1	8	0	0	0	1	28	0	1	0	0	0	78	323
8:45 AM	18	0	6	0	0	4	0	0	1	1	20	0	0	1	0	0	51	317
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	224	8	28	0	4	24	0	0	0	4	108	0	8	0	0	0	408	
Heavy Trucks	0	0	0		0	12	0		0	0	0		4	0	0		16	
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																	0	
Stopped Buses																	0	

Comments:

**LOCATION:** Clyde Rd -- Millhouse Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439402  
**DATE:** Tue, Jun 06 2017

**Peak-Hour: 12:15 PM -- 1:15 PM**  
**Peak 15-Min: 12:45 PM -- 1:00 PM**

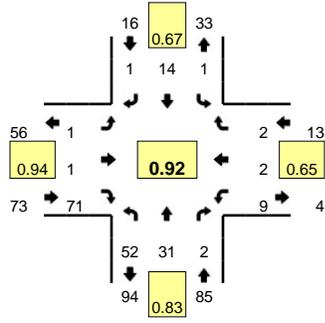


15-Min Count Period Beginning At	Clyde Rd (Northbound)				Clyde Rd (Southbound)				Millhouse Rd (Eastbound)				Millhouse Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
11:30 AM	16	6	1	0	0	5	0	0	0	0	19	0	1	2	1	0	51	
11:45 AM	17	9	0	0	0	3	0	0	0	0	20	0	1	1	0	0	51	
12:00 PM	7	5	0	0	0	2	1	0	0	0	15	0	6	0	0	0	36	
12:15 PM	12	12	1	0	1	4	0	0	0	1	18	1	1	0	1	0	52	190
12:30 PM	18	6	0	0	0	1	0	0	0	0	16	0	2	0	1	0	44	183
12:45 PM	15	10	2	0	1	5	0	0	0	0	18	0	3	1	0	0	55	187
1:00 PM	10	4	2	0	0	6	0	0	0	0	13	0	3	3	0	0	41	192
1:15 PM	12	9	3	0	0	3	0	0	0	1	13	0	2	0	1	0	44	184
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	60	40	8	0	4	20	0	0	0	0	72	0	12	4	0	0	220	
Heavy Trucks	8	28	0		0	8	0		0	0	4		0	0	0		48	
Pedestrians		0				0				0				0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

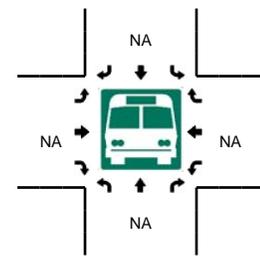
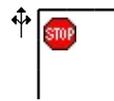
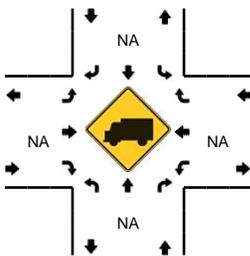
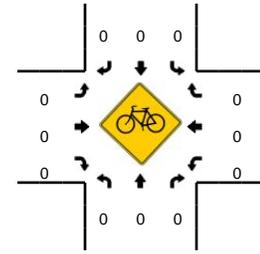
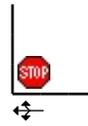
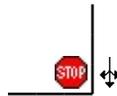
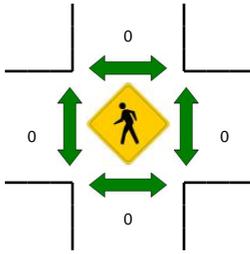
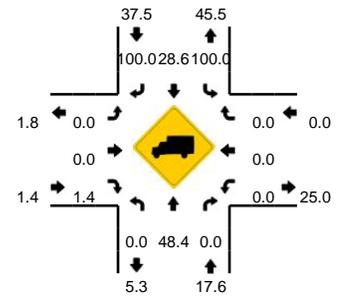
Comments:

**LOCATION:** Clyde Rd -- Millhouse Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439403  
**DATE:** Tue, Jun 06 2017



**Peak-Hour: 4:45 PM -- 5:45 PM**  
**Peak 15-Min: 4:45 PM -- 5:00 PM**



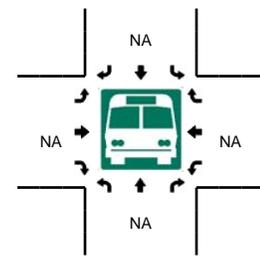
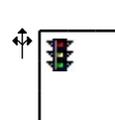
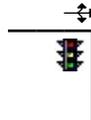
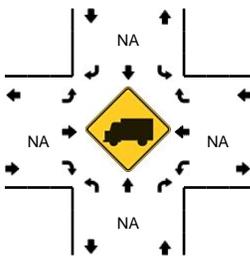
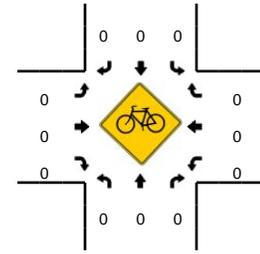
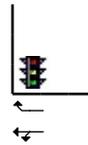
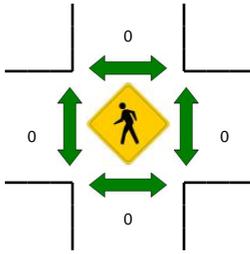
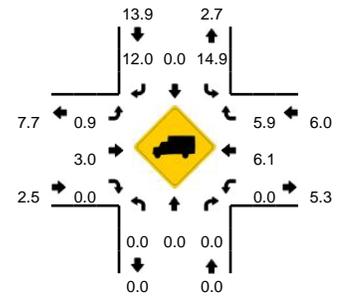
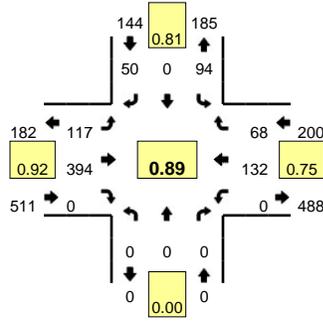
15-Min Count Period Beginning At	Clyde Rd (Northbound)				Clyde Rd (Southbound)				Millhouse Rd (Eastbound)				Millhouse Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	19	5	0	0	0	1	0	0	0	0	15	0	5	1	0	0	46	
4:15 PM	11	4	0	0	0	4	0	0	0	0	19	0	1	0	0	0	39	
4:30 PM	14	2	1	0	0	2	0	0	0	0	17	0	0	0	0	0	36	
<b>4:45 PM</b>	<b>15</b>	<b>6</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>51</b>	<b>172</b>
5:00 PM	14	8	0	0	0	2	0	0	0	0	20	0	1	1	0	0	46	172
5:15 PM	8	7	1	0	0	2	1	0	0	0	16	0	5	0	0	0	40	173
5:30 PM	15	10	0	0	1	4	0	0	0	1	16	1	1	0	1	0	50	187
5:45 PM	19	8	0	0	0	2	0	0	0	0	18	0	3	0	1	0	51	187
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
All Vehicles	60	24	4	0	0	24	0	0	0	0	76	0	8	4	4	0	204	
Heavy Trucks	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

Comments:

**LOCATION:** Millhouse Rd -- Eubanks Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439404  
**DATE:** Tue, Jun 06 2017

**Peak-Hour: 7:30 AM -- 8:30 AM**  
**Peak 15-Min: 7:30 AM -- 7:45 AM**



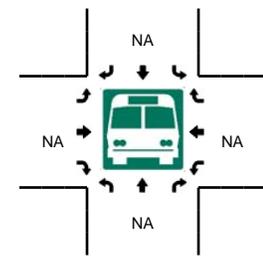
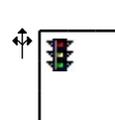
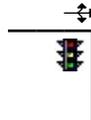
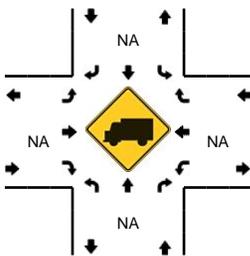
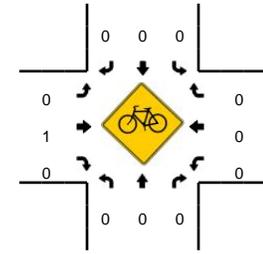
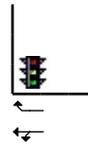
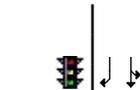
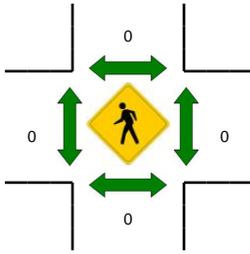
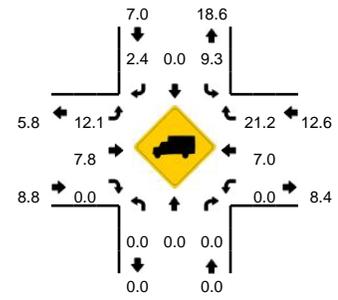
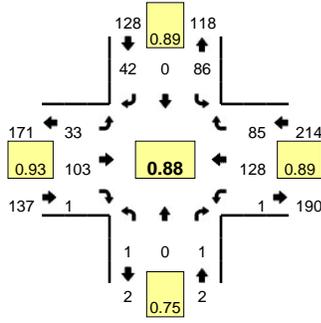
15-Min Count Period Beginning At	Millhouse Rd (Northbound)				Millhouse Rd (Southbound)				Eubanks Rd (Eastbound)				Eubanks Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	23	0	5	0	12	62	0	0	0	30	10	0	142	
7:15 AM	0	0	0	0	19	0	10	0	10	86	0	0	0	39	14	0	178	
7:30 AM	0	0	0	0	20	0	10	0	18	121	0	0	0	54	17	0	240	
7:45 AM	0	0	0	0	18	0	9	0	29	104	0	0	0	29	7	0	196	756
8:00 AM	0	0	0	0	18	0	18	0	47	85	0	0	0	29	25	0	222	836
8:15 AM	0	0	0	0	38	0	13	0	23	84	0	0	0	20	19	0	197	855
8:30 AM	0	0	0	0	27	0	16	0	26	97	0	0	0	34	22	0	222	837
8:45 AM	0	0	0	0	24	0	11	0	17	78	0	0	0	32	22	0	184	825
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	80	0	40	0	72	484	0	0	0	216	68	0	960	
Heavy Trucks	0	0	0	0	16	0	4	0	4	20	0	0	0	12	4	0	60	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Comments:

**LOCATION:** Millhouse Rd -- Eubanks Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439405  
**DATE:** Tue, Jun 06 2017

**Peak-Hour: 12:15 PM -- 1:15 PM**  
**Peak 15-Min: 12:45 PM -- 1:00 PM**



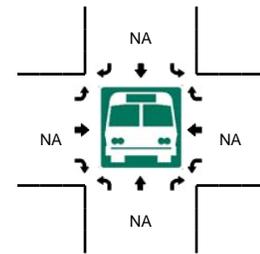
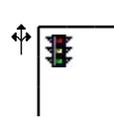
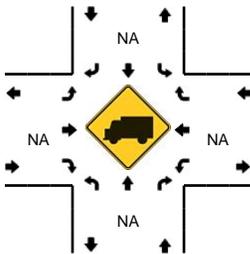
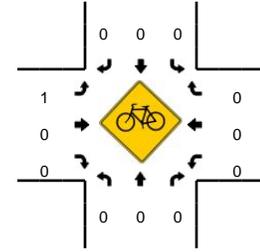
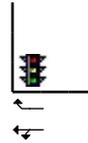
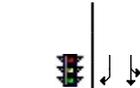
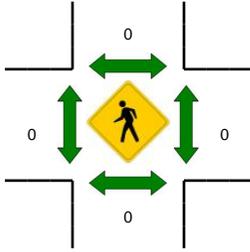
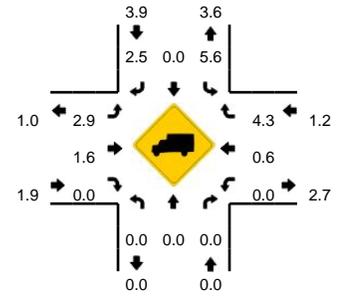
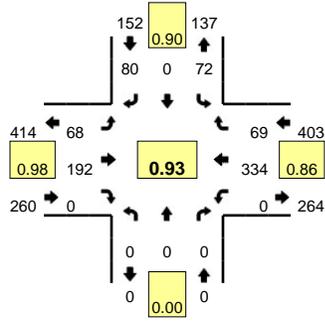
15-Min Count Period Beginning At	Millhouse Rd (Northbound)				Millhouse Rd (Southbound)				Eubanks Rd (Eastbound)				Eubanks Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
11:30 AM	0	0	0	0	20	0	12	0	6	28	0	0	0	39	27	0	132	
11:45 AM	0	0	0	0	16	0	9	0	10	21	0	0	0	23	21	0	100	
12:00 PM	0	0	1	0	23	0	9	0	6	27	0	0	1	22	15	0	104	
12:15 PM	0	0	0	0	20	0	16	0	10	27	0	0	0	26	25	0	124	460
12:30 PM	1	0	0	0	16	0	6	0	5	31	0	0	1	19	18	0	97	425
12:45 PM	0	0	1	0	24	0	11	0	13	25	1	0	0	37	25	0	137	462
1:00 PM	0	0	0	0	26	0	9	0	5	20	0	0	0	46	17	0	123	481
1:15 PM	0	0	0	0	15	0	9	0	9	29	0	0	0	39	22	0	123	480
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	4	0	96	0	44	0	52	100	4	0	0	148	100	0	548	
Heavy Trucks	0	0	0		8	0	0		8	4	0		0	12	36		68	
Pedestrians																	0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																	0	
Stopped Buses																	0	

Comments:

**LOCATION:** Millhouse Rd -- Eubanks Rd  
**CITY/STATE:** Chapel Hill, NC

**QC JOB #:** 14439406  
**DATE:** Tue, Jun 06 2017

**Peak-Hour: 5:00 PM -- 6:00 PM**  
**Peak 15-Min: 5:30 PM -- 5:45 PM**

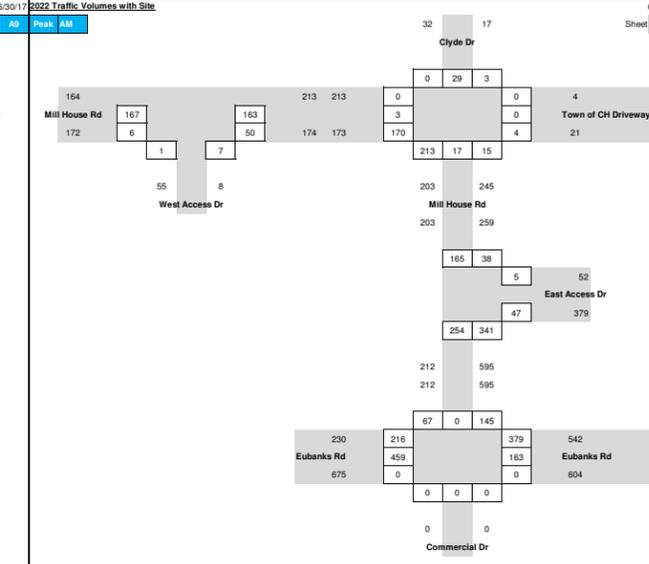
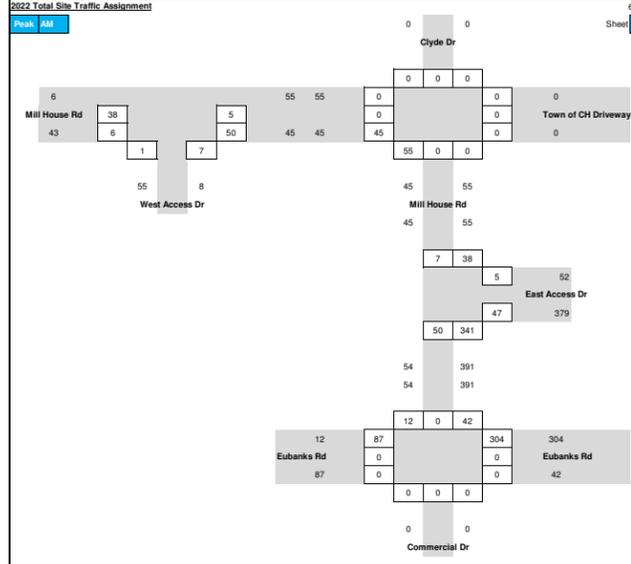
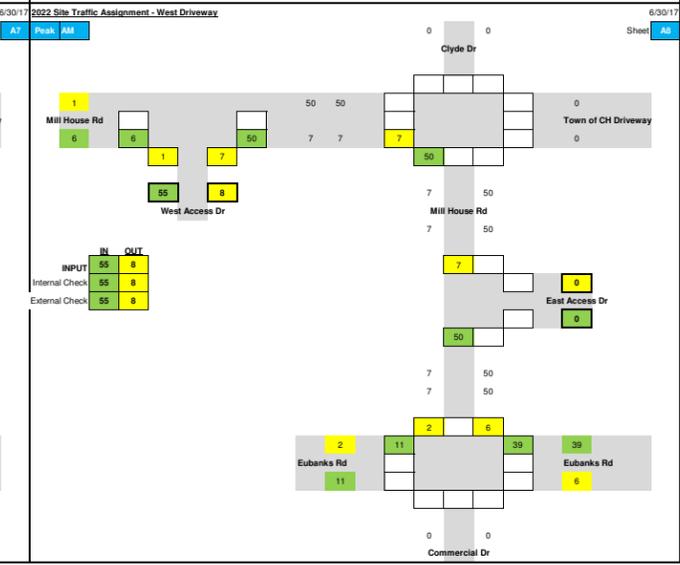
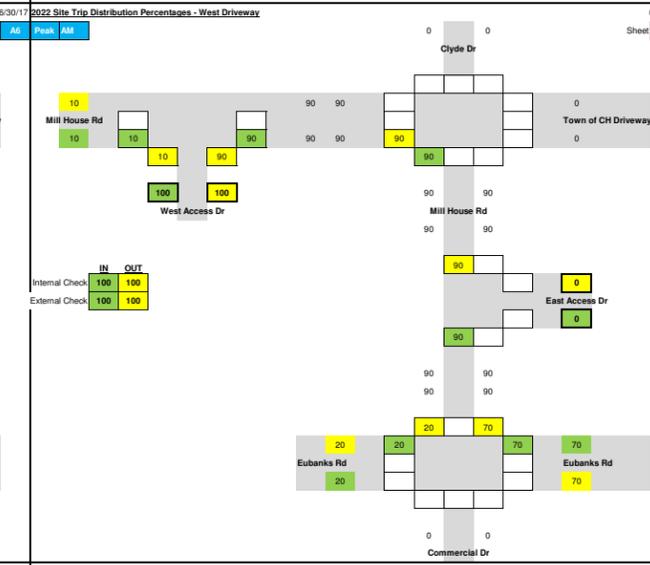
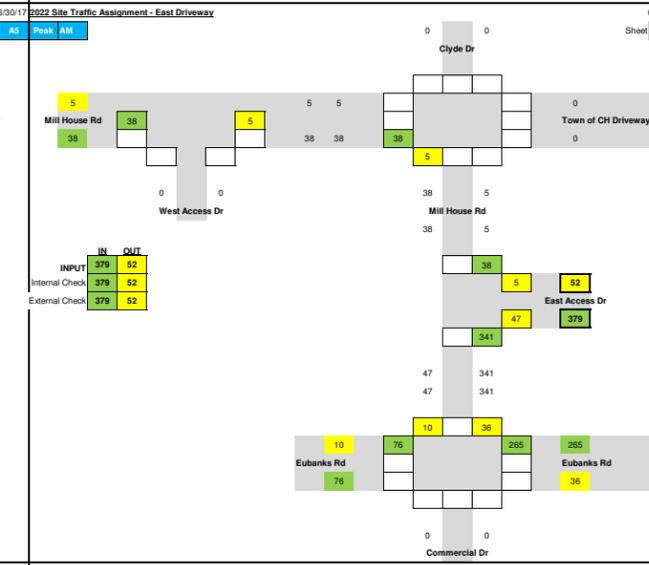
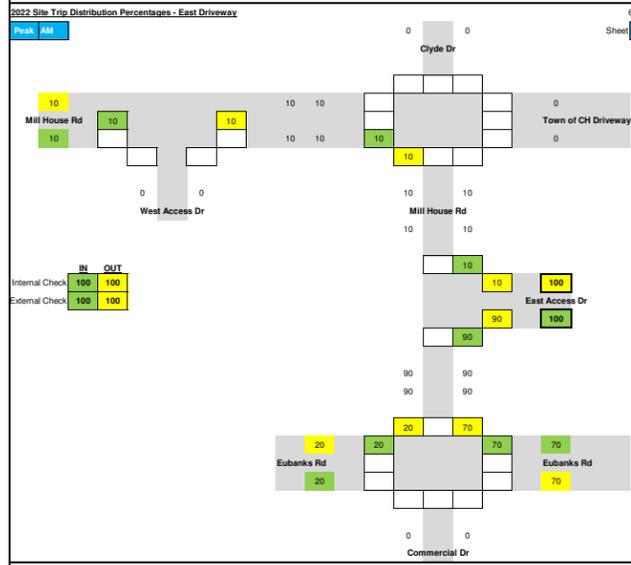
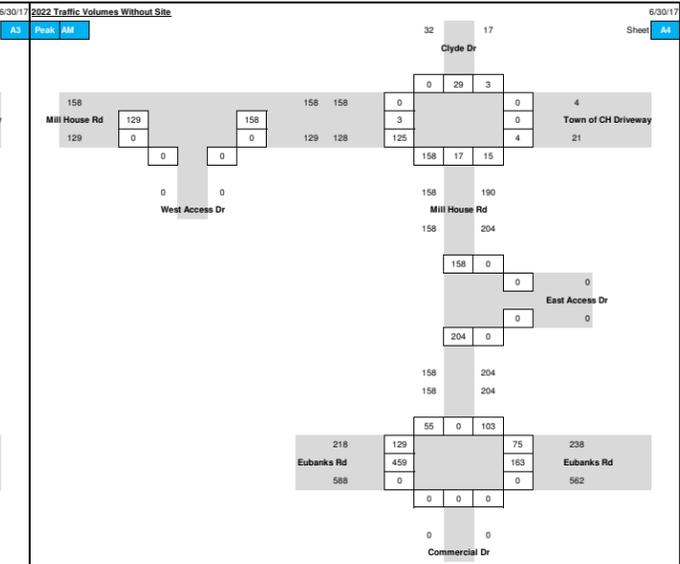
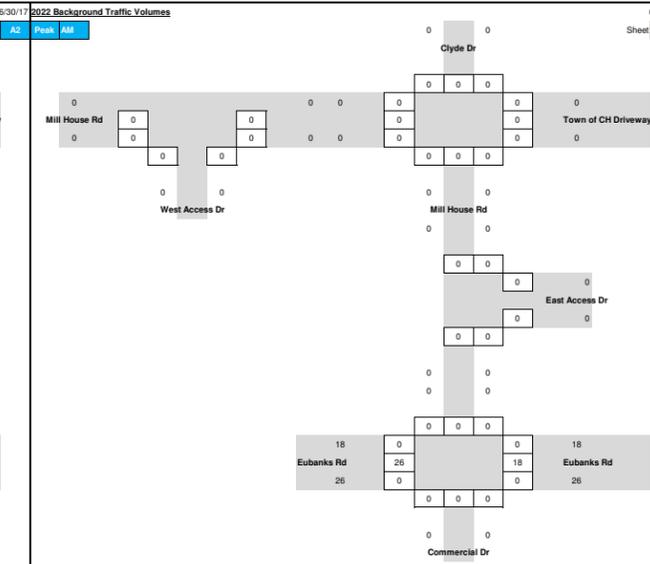
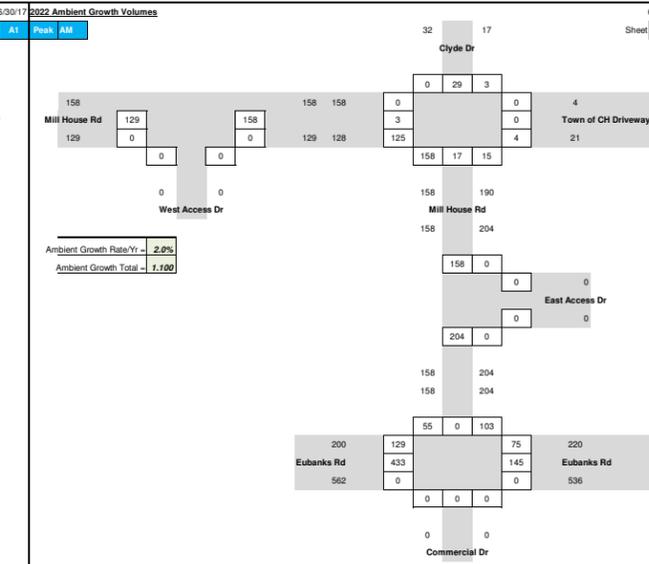
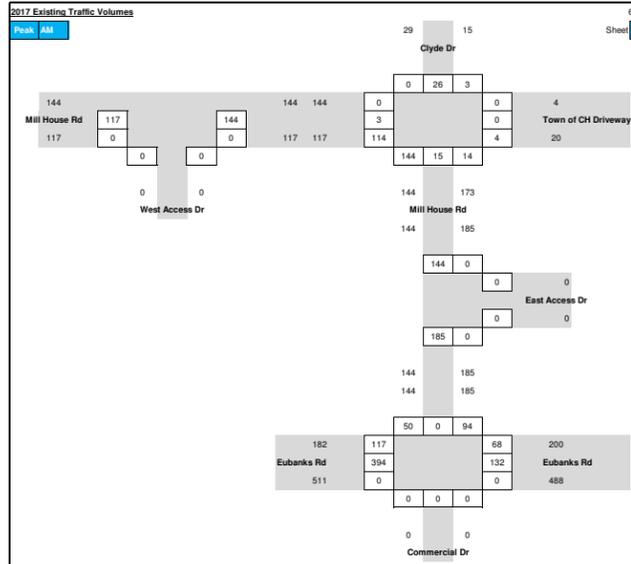


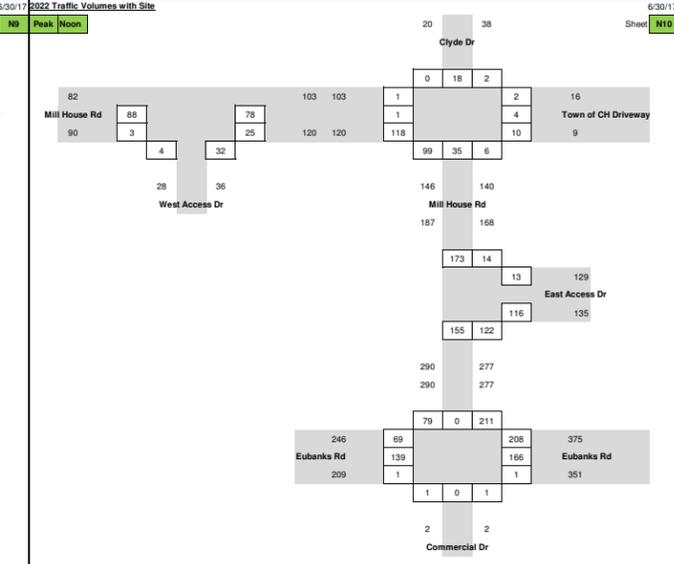
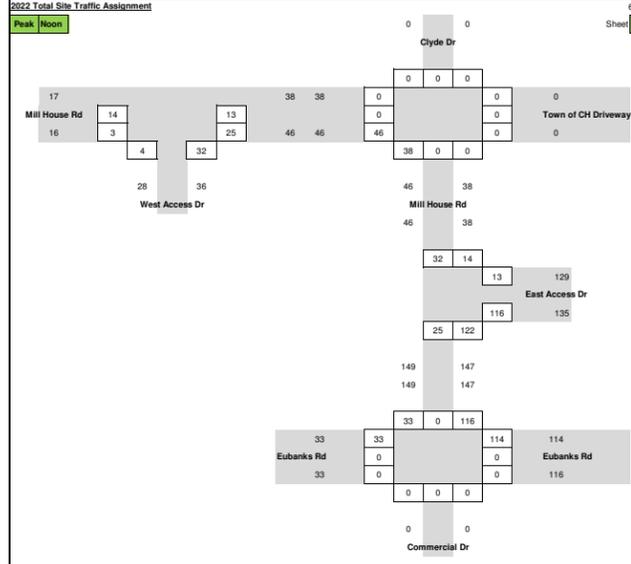
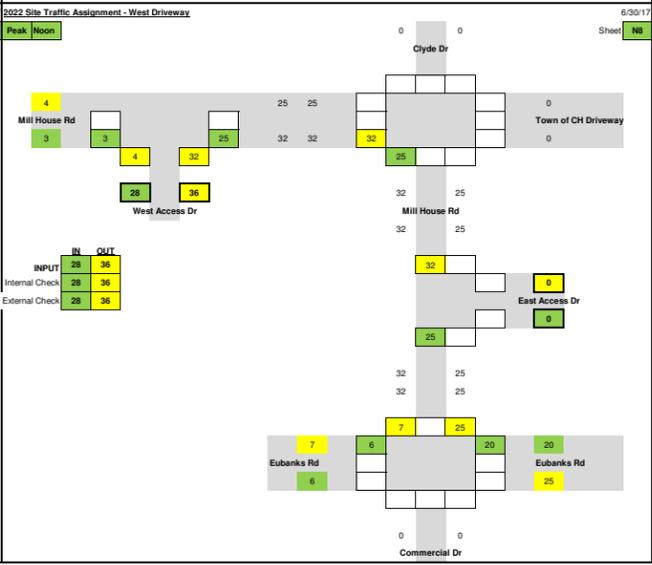
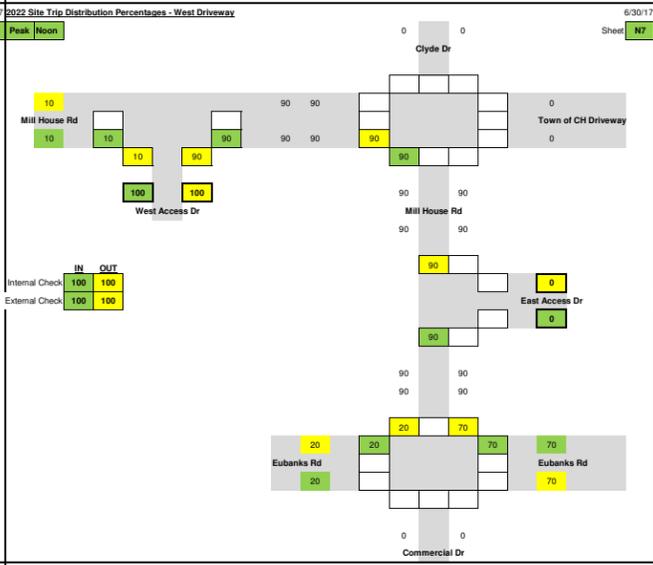
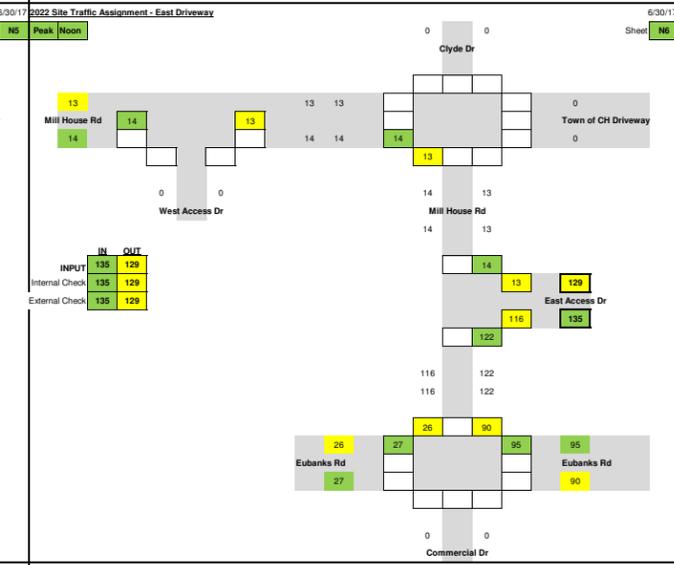
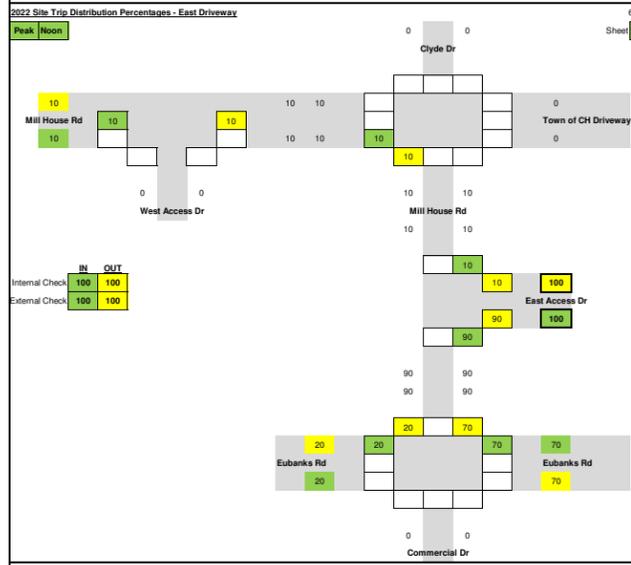
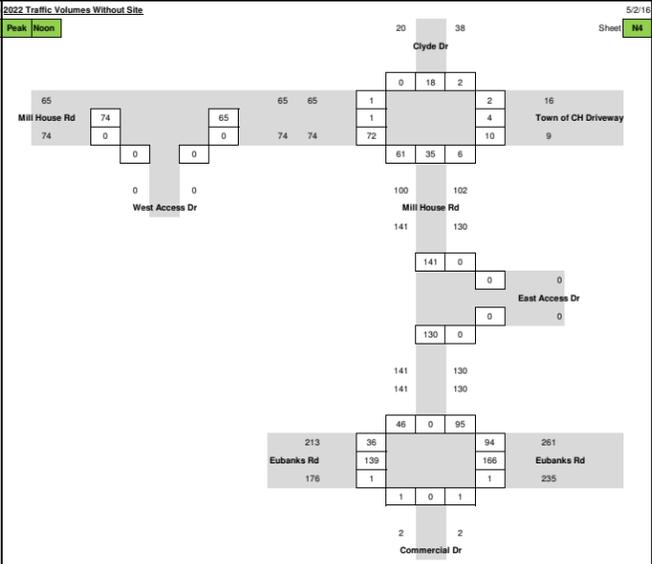
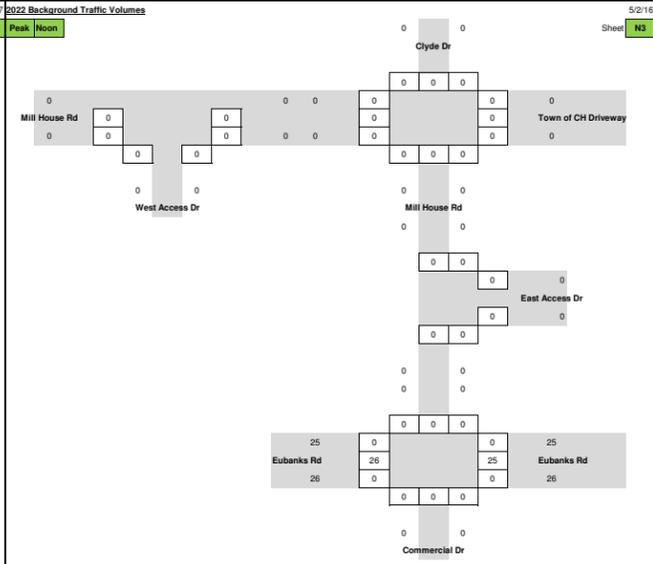
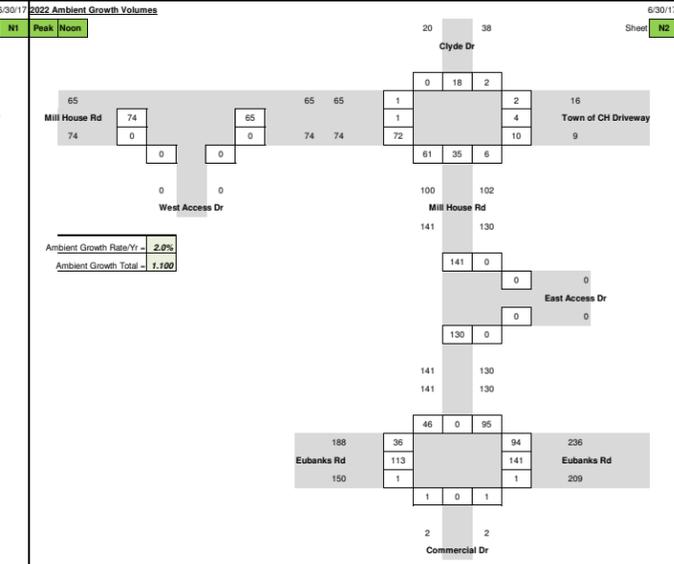
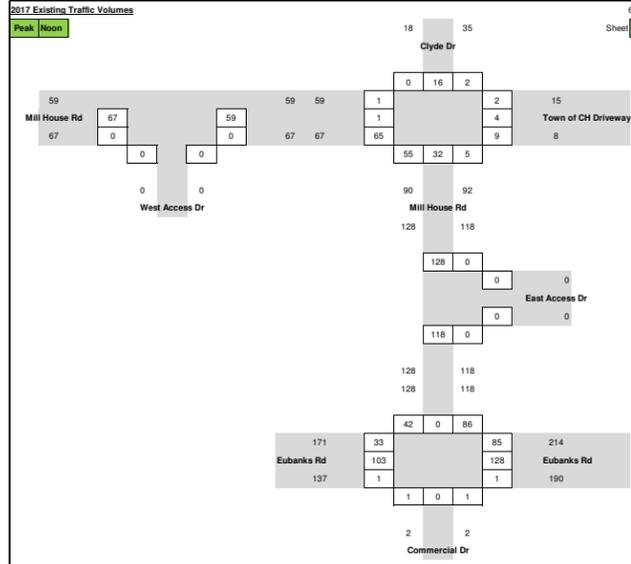
15-Min Count Period Beginning At	Millhouse Rd (Northbound)				Millhouse Rd (Southbound)				Eubanks Rd (Eastbound)				Eubanks Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	22	0	18	0	11	51	0	0	0	55	18	0	175	
4:15 PM	0	0	0	0	19	0	15	0	7	50	0	0	0	74	13	0	178	
4:30 PM	0	0	0	0	10	0	21	0	9	51	0	0	0	81	18	0	190	
4:45 PM	0	0	0	0	21	0	18	0	14	39	0	0	0	77	23	0	192	735
5:00 PM	0	0	0	0	21	0	23	0	12	52	0	0	0	73	16	0	197	757
5:15 PM	0	0	0	0	15	0	23	0	20	46	0	0	0	77	21	0	202	781
5:30 PM	0	0	0	0	19	0	18	0	17	48	0	0	0	104	14	0	220	811
5:45 PM	0	0	0	0	17	0	16	0	19	46	0	0	0	80	18	0	196	815

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	76	0	72	0	68	192	0	0	0	416	56	0	880
Heavy Trucks	0	0	0	0	4	0	4	0	4	4	0	0	0	0	8	0	24
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

**Appendix C – Traffic Volume Development**  
**Spreadsheets**







**Appendix D – Synchro Signalized Intersection Analysis**  
**Output**

## 2017 Existing

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017

	↖	→	←	↗	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↑	↗	↘	↙
Traffic Volume (vph)	117	394	132	68	94	50
Future Volume (vph)	117	394	132	68	94	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.989			0.950	
Satd. Flow (prot)	0	1851	1766	1501	1530	1406
Fl <sub>t</sub> Permitted		0.884			0.950	
Satd. Flow (perm)	0	1654	1766	1501	1530	1406
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.92	0.92	0.75	0.75	0.81	0.81
Heavy Vehicles (%)	1%	3%	6%	6%	15%	12%
Adj. Flow (vph)	127	428	176	91	116	62
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	555	176	91	116	62
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		22.6	22.6	37.8	8.9	8.9
Actuated g/C Ratio		0.60	0.60	1.00	0.24	0.24
v/c Ratio		0.56	0.17	0.06	0.32	0.19
Control Delay		9.6	5.8	0.1	16.3	14.9
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		9.6	5.8	0.1	16.3	14.9
LOS		A	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		9.6	3.9		15.8	
Approach LOS		A	A		B	
Queue Length 50th (ft)		69	16	0	18	9
Queue Length 95th (ft)		175	37	0	57	35
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1654	1766	1501	1044	959
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.34	0.10	0.06	0.11	0.06

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	37.8
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.56
Intersection Signal Delay:	9.2
Intersection Capacity Utilization	55.5%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	B

Splits and Phases: 1: Eubanks Road & Mill House Road

Ø2 60 s	Ø4 30 s
Ø6 60 s	

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶	↷	↷	↷
Traffic Volume (vph)	33	104	129	85	86	42
Future Volume (vph)	33	104	129	85	86	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.988			0.950	
Satd. Flow (prot)	0	1740	1749	1315	1615	1544
Fl <sub>t</sub> Permitted		0.917			0.950	
Satd. Flow (perm)	0	1615	1749	1315	1615	1544
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.93	0.93	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	12%	8%	7%	21%	9%	2%
Adj. Flow (vph)	35	112	145	96	97	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	147	145	96	97	47
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		17.0	17.0	31.3	7.6	7.6
Actuated g/C Ratio		0.54	0.54	1.00	0.24	0.24
v/c Ratio		0.17	0.15	0.07	0.25	0.13
Control Delay		6.3	6.1	0.1	11.2	10.0
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		6.3	6.1	0.1	11.2	10.0
LOS		A	A	A	B	A

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		6.3	3.7		10.8	
Approach LOS		A	A		B	
Queue Length 50th (ft)		13	13	0	12	6
Queue Length 95th (ft)		31	30	0	31	18
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1615	1749	1315	1292	1236
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.09	0.08	0.07	0.08	0.04

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	31.3
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.25
Intersection Signal Delay:	6.3
Intersection LOS:	A
Intersection Capacity Utilization:	38.3%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 1: Eubanks Road & Mill House Road



Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↖	↖	↖	↖
Traffic Volume (vph)	68	192	334	69	72	80
Future Volume (vph)	68	192	334	69	72	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.987			0.950	
Satd. Flow (prot)	0	1852	1835	1530	1660	1529
Fl <sub>t</sub> Permitted		0.832			0.950	
Satd. Flow (perm)	0	1561	1835	1530	1660	1529
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.98	0.98	0.86	0.86	0.90	0.90
Heavy Vehicles (%)	3%	2%	2%	4%	6%	3%
Adj. Flow (vph)	69	196	388	80	80	89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	265	388	80	80	89
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		17.9	17.9	32.3	7.7	7.7
Actuated g/C Ratio		0.55	0.55	1.00	0.24	0.24
v/c Ratio		0.31	0.38	0.05	0.20	0.24
Control Delay		7.0	7.4	0.1	11.4	12.0
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		7.0	7.4	0.1	11.4	12.0
LOS		A	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		7.0	6.1		11.8	
Approach LOS		A	A		B	
Queue Length 50th (ft)		25	39	0	10	11
Queue Length 95th (ft)		61	81	0	33	36
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1561	1835	1530	1288	1187
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.17	0.21	0.05	0.06	0.07

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	32.3
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.38
Intersection Signal Delay:	7.4
Intersection Capacity Utilization	49.8%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	A

Splits and Phases: 1: Eubanks Road & Mill House Road

Ø2 60 s	Ø4 30 s
Ø6 60 s	

## 2022 Without Site

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶	↶	↶	↶
Traffic Volume (vph)	129	459	163	75	103	55
Future Volume (vph)	129	459	163	75	103	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.989			0.950	
Satd. Flow (prot)	0	1850	1766	1501	1530	1406
Fl <sub>t</sub> Permitted		0.877			0.950	
Satd. Flow (perm)	0	1641	1766	1501	1530	1406
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.92	0.92	0.75	0.75	0.81	0.81
Heavy Vehicles (%)	1%	3%	6%	6%	15%	12%
Adj. Flow (vph)	140	499	217	100	127	68
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	639	217	100	127	68
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		26.8	26.8	42.6	9.7	9.7
Actuated g/C Ratio		0.63	0.63	1.00	0.23	0.23
v/c Ratio		0.62	0.20	0.07	0.37	0.21
Control Delay		10.5	5.8	0.1	19.5	17.7
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		10.5	5.8	0.1	19.5	17.7
LOS		B	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		10.5	4.0		18.8	
Approach LOS		B	A		B	
Queue Length 50th (ft)		92	22	0	23	12
Queue Length 95th (ft)		236	47	0	72	44
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1607	1730	1501	947	870
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.40	0.13	0.07	0.13	0.08

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	42.6
Natural Cycle:	45
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	10.1
Intersection Capacity Utilization	59.6%
Analysis Period (min)	15
Intersection LOS:	B
ICU Level of Service	B

Splits and Phases: 1: Eubanks Road & Mill House Road

Ø2 60 s	Ø4 30 s
Ø6 60 s	

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶	↶	↶	↶
Traffic Volume (vph)	36	140	167	94	95	46
Future Volume (vph)	36	140	167	94	95	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.990			0.950	
Satd. Flow (prot)	0	1746	1749	1315	1615	1544
Fl <sub>t</sub> Permitted		0.917			0.950	
Satd. Flow (perm)	0	1617	1749	1315	1615	1544
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.93	0.93	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	12%	8%	7%	21%	9%	2%
Adj. Flow (vph)	39	151	188	106	107	52
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	190	188	106	107	52
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		17.0	17.0	31.3	7.6	7.6
Actuated g/C Ratio		0.54	0.54	1.00	0.24	0.24
v/c Ratio		0.22	0.20	0.08	0.27	0.14
Control Delay		6.6	6.3	0.1	11.4	10.0
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		6.6	6.3	0.1	11.4	10.0
LOS		A	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		6.6	4.1		11.0	
Approach LOS		A	A		B	
Queue Length 50th (ft)		17	17	0	14	7
Queue Length 95th (ft)		41	39	0	34	19
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1617	1749	1315	1290	1233
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.12	0.11	0.08	0.08	0.04

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	31.3
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.27
Intersection Signal Delay:	6.5
Intersection Capacity Utilization	38.3%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	A

Splits and Phases: 1: Eubanks Road & Mill House Road

Ø2 60 s	Ø4 30 s
Ø6 60 s	

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↕	↕	↕
Traffic Volume (vph)	75	237	402	76	79	88
Future Volume (vph)	75	237	402	76	79	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.988			0.950	
Satd. Flow (prot)	0	1854	1835	1530	1660	1529
Fl <sub>t</sub> Permitted		0.820			0.950	
Satd. Flow (perm)	0	1539	1835	1530	1660	1529
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.98	0.98	0.86	0.86	0.90	0.90
Heavy Vehicles (%)	3%	2%	2%	4%	6%	3%
Adj. Flow (vph)	77	242	467	88	88	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	319	467	88	88	98
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		19.3	19.3	33.9	8.1	8.1
Actuated g/C Ratio		0.57	0.57	1.00	0.24	0.24
v/c Ratio		0.36	0.45	0.06	0.22	0.27
Control Delay		7.5	7.9	0.1	12.7	13.3
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		7.5	7.9	0.1	12.7	13.3
LOS		A	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		7.5	6.7		13.0	
Approach LOS		A	A		B	
Queue Length 50th (ft)		32	50	0	11	13
Queue Length 95th (ft)		80	108	0	41	45
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1539	1835	1530	1238	1140
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.21	0.25	0.06	0.07	0.09

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	33.9
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.45
Intersection Signal Delay:	8.0
Intersection Capacity Utilization	56.1%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	B

Splits and Phases: 1: Eubanks Road & Mill House Road

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## 2022 With Site

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017

	↖	→	←	↗	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↑	↗	↘	↗
Traffic Volume (vph)	216	459	163	379	145	67
Future Volume (vph)	216	459	163	379	145	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.984			0.950	
Satd. Flow (prot)	0	1845	1766	1501	1530	1406
Fl <sub>t</sub> Permitted		0.811			0.950	
Satd. Flow (perm)	0	1520	1766	1501	1530	1406
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.92	0.92	0.75	0.75	0.81	0.81
Heavy Vehicles (%)	1%	3%	6%	6%	15%	12%
Adj. Flow (vph)	235	499	217	505	179	83
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	734	217	505	179	83
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		32.2	32.2	56.4	13.0	13.0
Actuated g/C Ratio		0.57	0.57	1.00	0.23	0.23
v/c Ratio		0.85	0.22	0.34	0.51	0.26
Control Delay		20.6	6.4	0.6	28.0	23.9
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		20.6	6.4	0.6	28.0	23.9
LOS		C	A	A	C	C

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		20.6	2.4		26.7	
Approach LOS		C	A		C	
Queue Length 50th (ft)		159	28	0	49	22
Queue Length 95th (ft)		414	59	0	129	67
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1356	1575	1496	757	695
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.54	0.14	0.34	0.24	0.12

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	56.4
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.85
Intersection Signal Delay:	13.9
Intersection Capacity Utilization:	67.9%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 1: Eubanks Road & Mill House Road

60 s	30 s
60 s	

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↖	↖	↖	↖
Traffic Volume (vph)	69	140	186	208	211	79
Future Volume (vph)	69	140	186	208	211	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.984			0.950	
Satd. Flow (prot)	0	1727	1749	1315	1615	1544
Fl <sub>t</sub> Permitted		0.836			0.950	
Satd. Flow (perm)	0	1468	1749	1315	1615	1544
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.93	0.93	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	12%	8%	7%	21%	9%	2%
Adj. Flow (vph)	74	151	209	234	237	89
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	225	209	234	237	89
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effect Green (s)		13.8	13.8	33.5	9.6	9.6
Actuated g/C Ratio		0.41	0.41	1.00	0.29	0.29
v/c Ratio		0.37	0.29	0.18	0.51	0.20
Control Delay		9.6	8.5	0.3	14.4	10.3
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		9.6	8.5	0.3	14.4	10.3
LOS		A	A	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		9.6	4.1		13.3	
Approach LOS		A	A		B	
Queue Length 50th (ft)		25	22	0	33	11
Queue Length 95th (ft)		69	59	0	80	34
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1468	1749	1315	1215	1161
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.15	0.12	0.18	0.20	0.08

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	33.5
Natural Cycle:	40
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	8.4
Intersection Capacity Utilization	45.4%
Analysis Period (min)	15
Intersection LOS:	A
ICU Level of Service	A

Splits and Phases: 1: Eubanks Road & Mill House Road

Ø2 60 s	Ø4 30 s
Ø6 60 s	

Lanes, Volumes, Timings  
1: Eubanks Road & Mill House Road

07/10/2017

	↖	→	←	↗	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↑	↗	↘	↗
Traffic Volume (vph)	91	237	402	131	402	180
Future Volume (vph)	91	237	402	131	402	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-2%	3%		5%	
Storage Length (ft)	0			125	175	0
Storage Lanes	0			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>				0.850		0.850
Fl <sub>t</sub> Protected		0.986			0.950	
Satd. Flow (prot)	0	1850	1835	1530	1660	1529
Fl <sub>t</sub> Permitted		0.603			0.950	
Satd. Flow (perm)	0	1131	1835	1530	1660	1529
Right Turn on Red				No		No
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		40	
Link Distance (ft)		986	1018		559	
Travel Time (s)		14.9	15.4		9.5	
Peak Hour Factor	0.98	0.98	0.86	0.86	0.90	0.90
Heavy Vehicles (%)	3%	2%	2%	4%	6%	3%
Adj. Flow (vph)	93	242	467	152	447	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	335	467	152	447	200
Turn Type	Perm	NA	NA	pm+ov	Prot	Perm
Protected Phases		2	6	4	4	
Permitted Phases	2			6		4
Detector Phase	2	2	6	4	4	4
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	7.0	7.0	7.0
Minimum Split (s)	19.0	19.0	19.0	13.0	13.0	13.0
Total Split (s)	60.0	60.0	60.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%
Maximum Green (s)	54.8	54.8	53.8	24.6	24.6	24.6
Yellow Time (s)	4.2	4.2	4.4	3.8	3.8	3.8
All-Red Time (s)	1.0	1.0	1.8	1.6	1.6	1.6
Lost Time Adjust (s)		-0.2	-1.2	-0.4	-0.4	-0.4
Total Lost Time (s)		5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	Min	Min	Min	None	None	None
Act Effct Green (s)		19.1	19.1	51.0	21.7	21.7
Actuated g/C Ratio		0.37	0.37	1.00	0.43	0.43
v/c Ratio		0.79	0.68	0.10	0.63	0.31
Control Delay		30.1	19.4	0.1	17.4	12.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		30.1	19.4	0.1	17.4	12.4
LOS		C	B	A	B	B

Lanes, Volumes, Timings  
 1: Eubanks Road & Mill House Road

07/10/2017



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach Delay		30.1	14.7		15.8	
Approach LOS		C	B		B	
Queue Length 50th (ft)		85	112	0	97	37
Queue Length 95th (ft)		#212	196	0	222	93
Internal Link Dist (ft)		906	938		479	
Turn Bay Length (ft)				125	175	
Base Capacity (vph)		1106	1794	1496	830	764
Starvation Cap Reductn		0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		0.30	0.26	0.10	0.54	0.26

Intersection Summary

Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 51  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 18.4  
 Intersection Capacity Utilization 73.4%  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Eubanks Road & Mill House Road



**Appendix E – Synchro HCM 2010 Unsignalized  
Intersection Analysis Output**

## 2017 Existing

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	0	3	114	0	4	0	0	0	144	15	14
Future Vol, veh/h	0	0	3	114	0	4	0	0	0	144	15	14
Peak Hour Factor	0.92	0.70	0.70	0.70	0.92	0.63	0.63	0.63	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	13	2
Mvmt Flow	0	0	4	163	0	6	0	0	0	215	22	21
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8	8.1	9.5
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	83%	0%	100%	10%
Vol Thru, %	9%	3%	0%	90%
Vol Right, %	8%	97%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	173	117	4	29
LT Vol	144	0	4	3
Through Vol	15	3	0	26
RT Vol	14	114	0	0
Lane Flow Rate	258	167	6	44
Geometry Grp	1	1	1	1
Degree of Util (X)	0.315	0.189	0.009	0.056
Departure Headway (Hd)	4.391	4.065	5.029	4.611
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	806	888	714	778
Service Time	2.491	2.07	3.042	2.632
HCM Lane V/C Ratio	0.32	0.188	0.008	0.057
HCM Control Delay	9.5	8	8.1	7.9
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.4	0.7	0	0.2

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↕	
Traffic Vol, veh/h	0	3	26	0
Future Vol, veh/h	0	3	26	0
Peak Hour Factor	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	42	2
Mvmt Flow	0	5	39	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.9
HCM LOS	A

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↔				↔				↔	
Traffic Vol, veh/h	0	1	1	65	0	9	4	2	0	55	32	5
Future Vol, veh/h	0	1	1	65	0	9	4	2	0	55	32	5
Peak Hour Factor	0.92	0.93	0.93	0.93	0.92	0.67	0.67	0.67	0.92	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	3	2	2	2	50	2	4	47	2
Mvmt Flow	0	1	1	70	0	13	6	3	0	65	38	6
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7	7.5	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	1%	60%	11%
Vol Thru, %	35%	1%	27%	89%
Vol Right, %	5%	97%	13%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	92	67	15	18
LT Vol	55	1	9	2
Through Vol	32	1	4	16
RT Vol	5	65	2	0
Lane Flow Rate	108	72	22	24
Geometry Grp	1	1	1	1
Degree of Util (X)	0.127	0.072	0.026	0.033
Departure Headway (Hd)	4.237	3.599	4.259	5.022
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	844	977	828	709
Service Time	2.275	1.688	2.35	3.077
HCM Lane V/C Ratio	0.128	0.074	0.027	0.034
HCM Control Delay	7.9	7	7.5	8.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.4	0.2	0.1	0.1

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↔	
Traffic Vol, veh/h	0	2	16	0
Future Vol, veh/h	0	2	16	0
Peak Hour Factor	0.92	0.75	0.75	0.75
Heavy Vehicles, %	2	50	38	2
Mvmt Flow	0	3	21	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.3
HCM LOS	A

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	1	1	71	0	9	2	2	0	52	31	2
Future Vol, veh/h	0	1	1	71	0	9	2	2	0	52	31	2
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.65	0.65	0.65	0.92	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	48	2
Mvmt Flow	0	1	1	76	0	14	3	3	0	63	37	2
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7	7.5	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	61%	1%	69%	6%
Vol Thru, %	36%	1%	15%	88%
Vol Right, %	2%	97%	15%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	85	73	13	16
LT Vol	52	1	9	1
Through Vol	31	1	2	14
RT Vol	2	71	2	1
Lane Flow Rate	102	78	20	24
Geometry Grp	1	1	1	1
Degree of Util (X)	0.12	0.077	0.024	0.039
Departure Headway (Hd)	4.23	3.586	4.259	5.828
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	844	979	826	612
Service Time	2.273	1.682	2.359	3.882
HCM Lane V/C Ratio	0.121	0.08	0.024	0.039
HCM Control Delay	7.9	7	7.5	9.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.4	0.2	0.1	0.1

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↔	
Traffic Vol, veh/h	0	1	14	1
Future Vol, veh/h	0	1	14	1
Peak Hour Factor	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	100	29	2
Mvmt Flow	0	1	21	1
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.1
HCM LOS	A

## 2022 Without Site

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	0	3	125	0	4	0	0	0	158	17	15
Future Vol, veh/h	0	0	3	125	0	4	0	0	0	158	17	15
Peak Hour Factor	0.92	0.70	0.70	0.70	0.92	0.63	0.63	0.63	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	13	2
Mvmt Flow	0	0	4	179	0	6	0	0	0	236	25	22
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.3	8.2	10
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	83%	0%	100%	9%
Vol Thru, %	9%	2%	0%	91%
Vol Right, %	8%	98%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	128	4	32
LT Vol	158	0	4	3
Through Vol	17	3	0	29
RT Vol	15	125	0	0
Lane Flow Rate	284	183	6	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.358	0.21	0.009	0.063
Departure Headway (Hd)	4.54	4.14	5.128	4.681
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	797	867	697	765
Service Time	2.54	2.163	3.164	2.714
HCM Lane V/C Ratio	0.356	0.211	0.009	0.063
HCM Control Delay	10	8.3	8.2	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.6	0.8	0	0.2

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↕	
Traffic Vol, veh/h	0	3	29	0
Future Vol, veh/h	0	3	29	0
Peak Hour Factor	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	42	2
Mvmt Flow	0	5	44	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8
HCM LOS	A

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↔				↔				↔	
Traffic Vol, veh/h	0	1	1	72	0	10	4	2	0	61	35	6
Future Vol, veh/h	0	1	1	72	0	10	4	2	0	61	35	6
Peak Hour Factor	0.92	0.93	0.93	0.93	0.92	0.67	0.67	0.67	0.92	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	3	2	2	2	50	2	4	47	2
Mvmt Flow	0	1	1	77	0	15	6	3	0	72	41	7
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.1	7.5	8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	1%	62%	10%
Vol Thru, %	34%	1%	25%	90%
Vol Right, %	6%	97%	12%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	102	74	16	20
LT Vol	61	1	10	2
Through Vol	35	1	4	18
RT Vol	6	72	2	0
Lane Flow Rate	120	80	24	27
Geometry Grp	1	1	1	1
Degree of Util (X)	0.142	0.082	0.029	0.037
Departure Headway (Hd)	4.253	3.725	4.405	5.045
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	839	968	817	704
Service Time	2.301	1.725	2.407	3.114
HCM Lane V/C Ratio	0.143	0.083	0.029	0.038
HCM Control Delay	8	7.1	7.5	8.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.3	0.1	0.1

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↕	
Traffic Vol, veh/h	0	2	18	0
Future Vol, veh/h	0	2	18	0
Peak Hour Factor	0.92	0.75	0.75	0.75
Heavy Vehicles, %	2	50	38	2
Mvmt Flow	0	3	24	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.3
HCM LOS	A

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	1	1	78	0	10	2	2	0	57	34	2
Future Vol, veh/h	0	1	1	78	0	10	2	2	0	57	34	2
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.65	0.65	0.65	0.92	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	48	2
Mvmt Flow	0	1	1	83	0	15	3	3	0	69	41	2
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.1	7.5	8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	61%	1%	71%	6%
Vol Thru, %	37%	1%	14%	88%
Vol Right, %	2%	97%	14%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	80	14	17
LT Vol	57	1	10	1
Through Vol	34	1	2	15
RT Vol	2	78	2	1
Lane Flow Rate	112	85	22	25
Geometry Grp	1	1	1	1
Degree of Util (X)	0.132	0.088	0.026	0.041
Departure Headway (Hd)	4.249	3.709	4.404	5.853
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	838	972	817	608
Service Time	2.302	1.709	2.407	3.92
HCM Lane V/C Ratio	0.134	0.087	0.027	0.041
HCM Control Delay	8	7.1	7.5	9.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.3	0.1	0.1

**Intersection**

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↔	
Traffic Vol, veh/h	0	1	15	1
Future Vol, veh/h	0	1	15	1
Peak Hour Factor	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	100	29	2
Mvmt Flow	0	1	22	1
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.2
HCM LOS	A

## 2022 With Site

Intersection	
Intersection Delay, s/veh	10.7
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	0	3	170	0	4	0	0	0	213	17	15
Future Vol, veh/h	0	0	3	170	0	4	0	0	0	213	17	15
Peak Hour Factor	0.92	0.70	0.70	0.70	0.92	0.63	0.63	0.63	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	13	2
Mvmt Flow	0	0	4	243	0	6	0	0	0	318	25	22
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.3	8.6	12
HCM LOS	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	87%	0%	100%	9%
Vol Thru, %	7%	2%	0%	91%
Vol Right, %	6%	98%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	245	173	4	32
LT Vol	213	0	4	3
Through Vol	17	3	0	29
RT Vol	15	170	0	0
Lane Flow Rate	366	247	6	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.477	0.299	0.01	0.067
Departure Headway (Hd)	4.695	4.36	5.452	4.961
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	764	823	653	718
Service Time	2.741	2.394	3.51	3.02
HCM Lane V/C Ratio	0.479	0.3	0.009	0.067
HCM Control Delay	12	9.3	8.6	8.4
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2.6	1.3	0	0.2

**Intersection**

Intersection Delay, s/veh  
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↕	
Traffic Vol, veh/h	0	3	29	0
Future Vol, veh/h	0	3	29	0
Peak Hour Factor	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	42	2
Mvmt Flow	0	5	44	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.4
HCM LOS	A



HCM 2010 TWSC  
 3: Mill House Road & East Site Driveway

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**Intersection**

Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			A
Traffic Vol, veh/h	47	5	254	341	38	165
Future Vol, veh/h	47	5	254	341	38	165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	67	90	90	81
Heavy Vehicles, %	5	5	6	5	5	12
Mvmt Flow	52	6	379	379	42	204

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	857	569	0	0	758	0
Stage 1	569	-	-	-	-	-
Stage 2	288	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	324	516	-	-	840	-
Stage 1	561	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	306	516	-	-	840	-
Mov Cap-2 Maneuver	306	-	-	-	-	-
Stage 1	561	-	-	-	-	-
Stage 2	712	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	18.8		0		1.6
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	318	840
HCM Lane V/C Ratio	-	-	0.182	0.05
HCM Control Delay (s)	-	-	18.8	9.5
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.7	0.2

**Intersection**

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Vol, veh/h	167	6	50	163	1	7
Future Vol, veh/h	167	6	50	163	1	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	186	7	56	181	1	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	192	0	481	189
Stage 1	-	-	-	-	189	-
Stage 2	-	-	-	-	292	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1381	-	544	853
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1381	-	520	853
Mov Cap-2 Maneuver	-	-	-	-	520	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	724	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	790	-	-	1381	-
HCM Lane V/C Ratio	0.011	-	-	0.04	-
HCM Control Delay (s)	9.6	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	1	1	118	0	10	4	2	0	99	35	6
Future Vol, veh/h	0	1	1	118	0	10	4	2	0	99	35	6
Peak Hour Factor	0.92	0.93	0.93	0.93	0.92	0.67	0.67	0.67	0.92	0.85	0.85	0.85
Heavy Vehicles, %	2	2	2	3	2	2	2	50	2	2	47	2
Mvmt Flow	0	1	1	127	0	15	6	3	0	116	41	7
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.4	7.7	8.5
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	71%	1%	62%	10%
Vol Thru, %	25%	1%	25%	90%
Vol Right, %	4%	98%	12%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	120	16	20
LT Vol	99	1	10	2
Through Vol	35	1	4	18
RT Vol	6	118	2	0
Lane Flow Rate	165	129	24	27
Geometry Grp	1	1	1	1
Degree of Util (X)	0.198	0.137	0.03	0.039
Departure Headway (Hd)	4.336	3.828	4.566	5.279
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	819	942	788	682
Service Time	2.41	1.831	2.573	3.279
HCM Lane V/C Ratio	0.201	0.137	0.03	0.04
HCM Control Delay	8.5	7.4	7.7	8.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.7	0.5	0.1	0.1

**Intersection**

Intersection Delay, s/veh  
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↔	
Traffic Vol, veh/h	0	2	18	0
Future Vol, veh/h	0	2	18	0
Peak Hour Factor	0.92	0.75	0.75	0.75
Heavy Vehicles, %	2	50	38	2
Mvmt Flow	0	3	24	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.5
HCM LOS	A



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**Intersection**

Int Delay, s/veh 3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			A
Traffic Vol, veh/h	116	13	155	122	14	173
Future Vol, veh/h	116	13	155	122	14	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	85	90	90	89
Heavy Vehicles, %	5	5	19	5	5	7
Mvmt Flow	129	14	182	136	16	194

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	475	250	0	0	318	0
Stage 1	250	-	-	-	-	-
Stage 2	225	-	-	-	-	-
Critical Hdwy	7.15	6.25	-	-	4.15	-
Critical Hdwy Stg 1	6.15	-	-	-	-	-
Critical Hdwy Stg 2	6.15	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	495	781	-	-	1225	-
Stage 1	747	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	489	781	-	-	1225	-
Mov Cap-2 Maneuver	489	-	-	-	-	-
Stage 1	747	-	-	-	-	-
Stage 2	759	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	14.8		0		0.6
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	508	1225
HCM Lane V/C Ratio	-	-	0.282	0.013
HCM Control Delay (s)	-	-	14.8	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.1	0

**Intersection**

Int Delay, s/veh 2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	88	3	25	78	4	32
Future Vol, veh/h	88	3	25	78	4	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	98	3	28	87	4	36

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	241
Stage 1	-	-	99
Stage 2	-	-	142
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1491	747
Stage 1	-	-	925
Stage 2	-	-	885
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1491	732
Mov Cap-2 Maneuver	-	-	732
Stage 1	-	-	925
Stage 2	-	-	867

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	925	-	-	1491	-
HCM Lane V/C Ratio	0.043	-	-	0.019	-
HCM Control Delay (s)	9.1	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	1	1	163	0	10	2	2	0	111	34	2
Future Vol, veh/h	0	1	1	163	0	10	2	2	0	111	34	2
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.65	0.65	0.65	0.92	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	48	2
Mvmt Flow	0	1	1	173	0	15	3	3	0	134	41	2
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.8	7.8	8.8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	76%	1%	71%	6%
Vol Thru, %	23%	1%	14%	88%
Vol Right, %	1%	99%	14%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	147	165	14	17
LT Vol	111	1	10	1
Through Vol	34	1	2	15
RT Vol	2	163	2	1
Lane Flow Rate	177	176	22	25
Geometry Grp	1	1	1	1
Degree of Util (X)	0.223	0.189	0.028	0.044
Departure Headway (Hd)	4.54	3.871	4.67	6.193
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	795	930	768	580
Service Time	2.54	1.883	2.689	4.216
HCM Lane V/C Ratio	0.223	0.189	0.029	0.043
HCM Control Delay	8.8	7.8	7.8	9.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	0.7	0.1	0.1

**Intersection**

Intersection Delay, s/veh  
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations			↔	
Traffic Vol, veh/h	0	1	15	1
Future Vol, veh/h	0	1	15	1
Peak Hour Factor	0.92	0.67	0.67	0.67
Heavy Vehicles, %	2	100	29	2
Mvmt Flow	0	1	22	1
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.5
HCM LOS	A



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**Intersection**

Int Delay, s/veh 19.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		P			A
Traffic Vol, veh/h	337	37	167	55	6	246
Future Vol, veh/h	337	37	167	55	6	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	90	90	90
Heavy Vehicles, %	5	5	4	5	5	4
Mvmt Flow	374	41	201	61	7	273

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	519	232	0	0	262	0
Stage 1	232	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Critical Hdwy	7.15	6.25	-	-	4.15	-
Critical Hdwy Stg 1	6.15	-	-	-	-	-
Critical Hdwy Stg 2	6.15	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	463	800	-	-	1285	-
Stage 1	764	-	-	-	-	-
Stage 2	714	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	461	800	-	-	1285	-
Mov Cap-2 Maneuver	461	-	-	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	710	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	43.9		0		0.2
HCM LOS	E				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	481	1285
HCM Lane V/C Ratio	-	-	0.864	0.005
HCM Control Delay (s)	-	-	43.9	7.8
HCM Lane LOS	-	-	E	A
HCM 95th %tile Q(veh)	-	-	9	0

**Intersection**

Int Delay, s/veh 3.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Vol, veh/h	86	2	16	98	9	79
Future Vol, veh/h	86	2	16	98	9	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	0	0	-
Peak Hour Factor	94	90	90	94	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	91	2	18	104	10	88

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	94	233
Stage 1	-	-	93
Stage 2	-	-	140
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1500	755
Stage 1	-	-	931
Stage 2	-	-	887
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1500	745
Mov Cap-2 Maneuver	-	-	745
Stage 1	-	-	931
Stage 2	-	-	875

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	936	-	-	1500	-
HCM Lane V/C Ratio	0.104	-	-	0.012	-
HCM Control Delay (s)	9.3	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

## 2022 Mitigated

**Intersection**

Int Delay, s/veh 1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑	↗		↖
Traffic Vol, veh/h	47	5	254	341	38	165
Future Vol, veh/h	47	5	254	341	38	165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	150	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	67	90	90	81
Heavy Vehicles, %	5	5	6	5	5	12
Mvmt Flow	52	6	379	379	42	204

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	667	379	0	0	379	0
Stage 1	379	-	-	-	-	-
Stage 2	288	-	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.15	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.245	-
Pot Cap-1 Maneuver	419	661	-	-	1163	-
Stage 1	686	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	402	661	-	-	1163	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	14.8		0		1.4
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	402	661	1163	-
HCM Lane V/C Ratio	-	-	0.13	0.008	0.036	-
HCM Control Delay (s)	-	-	15.3	10.5	8.2	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	0.1	-

**Intersection**

Int Delay, s/veh 2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑	↗		↖
Traffic Vol, veh/h	116	13	155	122	14	173
Future Vol, veh/h	116	13	155	122	14	173
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	150	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	85	90	90	89
Heavy Vehicles, %	5	5	19	5	5	7
Mvmt Flow	129	14	182	136	16	194

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	407	182	0
Stage 1	182	-	-
Stage 2	225	-	-
Critical Hdwy	6.45	6.25	4.15
Critical Hdwy Stg 1	5.45	-	-
Critical Hdwy Stg 2	5.45	-	-
Follow-up Hdwy	3.545	3.345	2.245
Pot Cap-1 Maneuver	594	853	1375
Stage 1	842	-	-
Stage 2	805	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	586	853	1375
Mov Cap-2 Maneuver	586	-	-
Stage 1	842	-	-
Stage 2	795	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	586	853	1375	-
HCM Lane V/C Ratio	-	-	0.22	0.017	0.011	-
HCM Control Delay (s)	-	-	12.9	9.3	7.6	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	0	-

HCM 2010 TWSC  
 3: Mill House Road & East Site Driveway

07/10/2017

**Intersection**

Int Delay, s/veh 10.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑	↗		↖
Traffic Vol, veh/h	337	37	167	55	6	246
Future Vol, veh/h	337	37	167	55	6	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	150	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	90	90	90
Heavy Vehicles, %	5	5	4	5	5	4
Mvmt Flow	374	41	201	61	7	273

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	488	201	0
Stage 1	201	-	-
Stage 2	287	-	-
Critical Hdwy	6.45	6.25	4.15
Critical Hdwy Stg 1	5.45	-	-
Critical Hdwy Stg 2	5.45	-	-
Follow-up Hdwy	3.545	3.345	2.245
Pot Cap-1 Maneuver	534	832	1353
Stage 1	826	-	-
Stage 2	755	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	531	832	1353
Mov Cap-2 Maneuver	531	-	-
Stage 1	826	-	-
Stage 2	750	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.7	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	531	832	1353	-
HCM Lane V/C Ratio	-	-	0.705	0.049	0.005	-
HCM Control Delay (s)	-	-	26.4	9.6	7.7	0
HCM Lane LOS	-	-	D	A	A	A
HCM 95th %tile Q(veh)	-	-	5.6	0.2	0	-

## **Appendix F – Crash Data**



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**Summary Statistics**

**High Level Crash Summary**

<b>Crash Type</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
Total Crashes	3	100.00
Fatal Crashes	0	0.00
Non-Fatal Injury Crashes	0	0.00
Total Injury Crashes	0	0.00
Property Damage Only Crashes	3	100.00
Night Crashes	1	33.33
Wet Crashes	1	33.33
Alcohol/Drugs Involvement Crashes	0	0.00

**Crash Severity Summary**

<b>Crash Type</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
Total Crashes	3	100.00
Fatal Crashes	0	0.00
Class A Crashes	0	0.00
Class B Crashes	0	0.00
Class C Crashes	0	0.00
Property Damage Only Crashes	3	100.00

**Vehicle Exposure Statistics**

Annual ADT = 1300

Total Length = 0.53 (Miles)

0.853 (Kilometers)

Total Vehicle Exposure = 1.26 (MVMT)

2.02 (MVKMT)

<b>Crash Rate</b>	<b>Crashes Per 100 Million Vehicle Miles</b>	<b>Crashes Per 100 Million Vehicle Kilometers</b>
Total Crash Rate	238.45	148.17
Fatal Crash Rate	0.00	0.00
Non Fatal Crash Rate	0.00	0.00
Night Crash Rate	79.48	49.39
Wet Crash Rate	79.48	49.39
EPDO Rate	238.45	148.17

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**Miscellaneous Statistics**

Severity Index = 1.00  
EPDO Crash Index = 3.00  
Estimated Property Damage Total = \$ 4700.00

**Accident Type Summary**

<b>Accident Type</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
ANIMAL	1	33.33
LEFT TURN, DIFFERENT ROADWAYS	1	33.33
SIDESWIPE, OPPOSITE DIRECTION	1	33.33

**Injury Summary**

<b>Injury Type</b>	<b>Number of Injuries</b>	<b>Percent of Total</b>
Fatal Injuries	0	0.00
Class A Injuries	0	0.00
Class B Injuries	0	0.00
Class C Injuries	0	0.00
Total Non-Fatal Injuries	0	0.00
Total Injuries	0	0.00

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**Monthly Summary**

<b>Month</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
Jan	0	0.00
Feb	0	0.00
Mar	0	0.00
Apr	0	0.00
May	0	0.00
Jun	0	0.00
Jul	0	0.00
Aug	0	0.00
Sep	0	0.00
Oct	2	66.67
Nov	0	0.00
Dec	1	33.33

**Daily Summary**

<b>Day</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
Mon	0	0.00
Tue	1	33.33
Wed	2	66.67
Thu	0	0.00
Fri	0	0.00
Sat	0	0.00
Sun	0	0.00

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**Hourly Summary**

<b>Hour</b>	<b>Number of Crashes</b>	<b>Percent of Total</b>
0000-0059	0	0.00
0100-0159	0	0.00
0200-0259	0	0.00
0300-0359	0	0.00
0400-0459	1	33.33
0500-0559	0	0.00
0600-0659	0	0.00
0700-0759	0	0.00
0800-0859	1	33.33
0900-0959	0	0.00
1000-1059	0	0.00
1100-1159	0	0.00
1200-1259	0	0.00
1300-1359	0	0.00
1400-1459	0	0.00
1500-1559	1	33.33
1600-1659	0	0.00
1700-1759	0	0.00
1800-1859	0	0.00
1900-1959	0	0.00
2000-2059	0	0.00
2100-2159	0	0.00
2200-2259	0	0.00
2300-2359	0	0.00

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**Light and Road Conditions Summary**

<b>Condition</b>	<b>Dry</b>	<b>Wet</b>	<b>Other</b>	<b>Total</b>
Day	1	1	0	2
Dark	1	0	0	1
Other	0	0	0	0
Total	2	1	0	3

**Object Struck Summary**

<b>Object Type</b>	<b>Times Struck</b>	<b>Percent of Total</b>
ANIMAL	1	100.00

**Vehicle Type Summary**

<b>Vehicle Type</b>	<b>Number Involved</b>	<b>Percent of Total</b>
COMMERCIAL BUS	1	20.00
PASSENGER CAR	4	80.00

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Yearly Totals Summary

Accident Totals

Year	Total Accidents	Fatal Accidents	Injury Accidents	Property Damage Only Accidents
2012	0	0	0	0
2013	0	0	0	0
2014	1	0	0	1
2015	2	0	0	2
2016	0	0	0	0
2017	0	0	0	0
Total	3	0	0	3

Injury Totals

Year	Fatal Injuries	Class A, B, or C Injuries
2012	0	0
2013	0	0
2014	0	0
2015	0	0
2016	0	0
2017	0	0
Total	0	0

Miscellaneous Totals

Year	Property Damage	EPDO Index
2012	\$ 0	0.00
2013	\$ 0	0.00
2014	\$ 700	1.00
2015	\$ 4000	2.00
2016	\$ 0	0.00
2017	\$ 0	0.00
Total	\$ 4700	3.00

Type of Accident Totals

Year	Left Turn	Right Turn	Rear End	Run Off Road &			
				Fixed Object	Angle	Side Swipe	Other
2012	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	1

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<b>Year</b>	<b>Left Turn</b>	<b>Right Turn</b>	<b>Rear End</b>	<b>Run Off Road &amp; Fixed Object</b>	<b>Angle</b>	<b>Side Swipe</b>	<b>Other</b>
2015	1	0	0	0	0	1	0
2016	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0
Total	1	0	0	0	0	1	1

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Strip Diagram

Features	Milepost	Crash IDs
SR 1727   EUBANK	0.00	104535894   104590158
	0.01	
	0.02	
	0.03	
	0.04	
	0.05	
	0.06	
	0.07	
	0.08	
	0.09	
	0.10	
	0.11	
	0.12	
	0.13	
	0.14	
	0.15	
	0.16	
	0.17	
	0.18	
	0.19	
	0.20	
	0.21	
	0.22	
	0.23	
	0.24	
	0.25	
	0.26	
	0.27	
	0.28	
	0.29	
	0.30	
	0.31	
	0.32	
	0.33	
	0.34	
	0.35	
	0.36	
	0.37	
	0.38	
	0.39	
	0.40	104174372
	0.41	
	0.42	
	0.43	

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Features	Milepost	Crash IDs
	0.44	
	0.45	
	0.46	
	0.47	
	0.48	
	0.49	
	0.50	
	0.51	
	0.52	
SR 2200   CLYDE	0.53	

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**Study Criteria**

Study Name	Log No.	PH No.	TIP No.	K/A Cf.	B/C Cf.	ADT	ADT Route
MILLHOUSERDCHTIS				76.8	8.4	1300	40001725

Request Date	Courier Service	Phone No.	Ext.	Fax No.

County			Municipality						
Name	Code	Div.	Name	Code	Y-Line Ft.	Begin Date	End Date	Years	
ORANGE	68	7	All and Rural		0	6/1/2012	5/31/2017	5.00	

Location Text	Requestor
SR 1725 (Millhouse Rd) from SR 1727 (Eubanks Rd) to SR 2200 (Clyde Rd)	

Included Accidents	Old MP	New MP	Type
104174372		0.4	I

Excluded Accidents
104334162
104438704

**Fiche Roads**

Name	Code
SR 1725	40001725
MILLHOUSE	50020117
BLACKWOOD	50002851

**Strip Road**

Name	Code	Begin MP	End MP	Miles	Kilometers
SR 1725	40001725	0.000	0.530	0.530	0.853