



# **TRANSPORTATION IMPACT ANALYSIS CAROLINA NORTH DEVELOPMENT**

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# Introduction

- A Transportation Impact Analysis (TIA) has been completed by VHB on behalf of the Town:
  - The Scope was developed
  - The Consultant was selected
  - The University funded the TIA effort
  - The University participated in the development of the TIA
  - The TIA will be finalized after this review period
- Two reports are available on the Town website
  - Draft TIA Executive Summary (+/- 50 pages)
  - Draft TIA Main Report (+/- 300 pages)



# Introduction

- Future Scenario Definition
  - Two development scenarios were defined by the University:
    - An 800,000 square foot scenario for early phase analysis (2015)
    - A 3,000,000 square foot scenario as a longer-term phase of development (2025)
  - These horizon years were selected testing of impacts, but are not predictions of specific development levels for these two years.



# Introduction

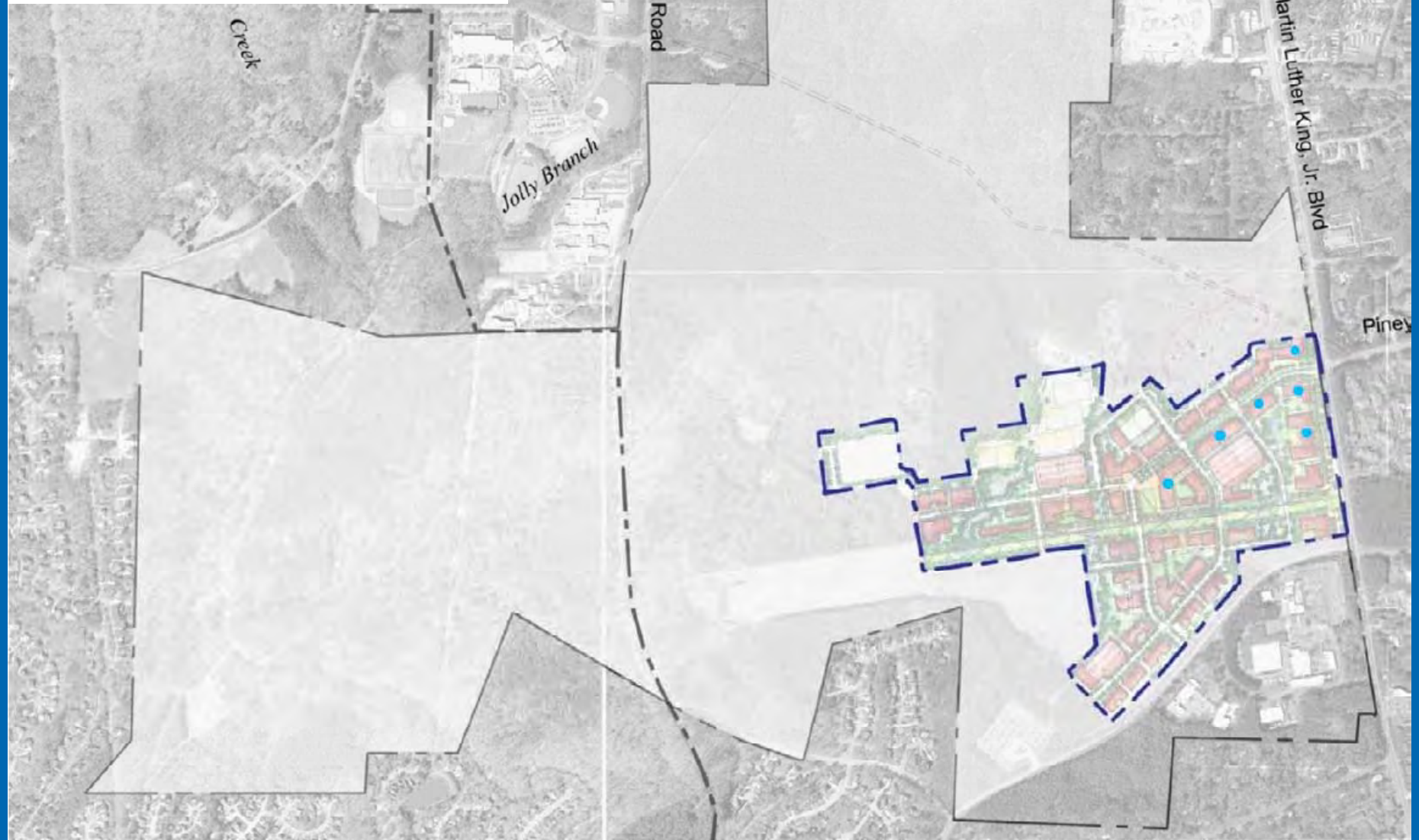
- Issues addressed by the TIA
  - Existing and future conditions assessment (without the project)
  - Trip generation, mode split, and trip distribution
  - Assessment of parking supply on transportation impacts
  - Traffic impacts (traffic operations and neighborhood impacts)
  - Transit impacts
  - Pedestrian and bicycle facility needs
  - Review of crash history near Carolina North
  - Potential mitigation measures
  - Air quality and greenhouse gas analysis

# TIA DEVELOPMENT PLAN

## 2025 TIA Phase 2

(3 million square foot program)

● 2015 TIA Phase 1 Building Sites  
800,000 sf





## TRANSPORTATION IMPACT ANALYSIS (TIA) CAROLINA NORTH DEVELOPMENT

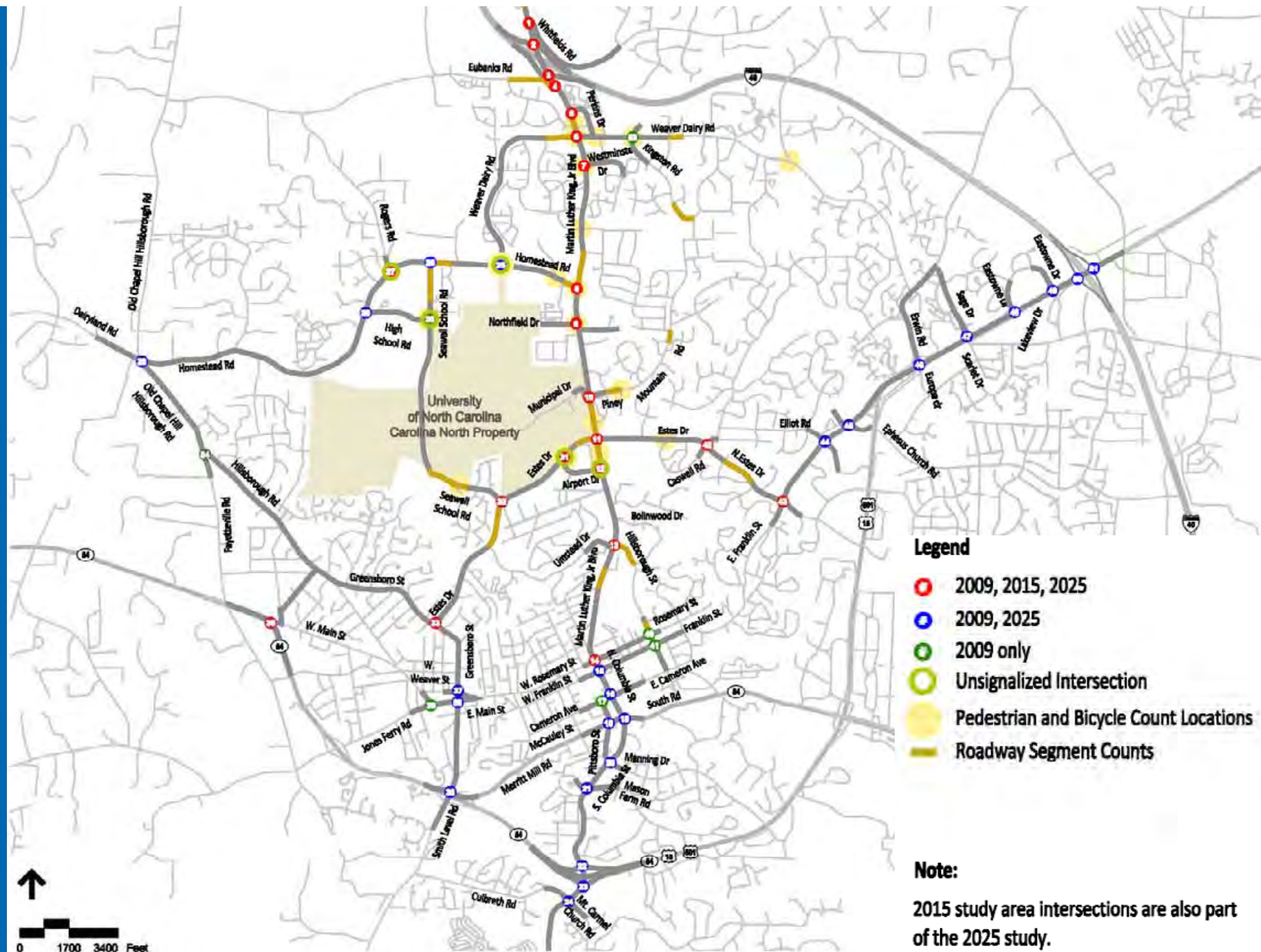
### TIA DEVELOPMENT PLAN

Land Use	Short-Term (2015)	Longer Term Increment	Total TIA Development (2025)
Academic	410,000	870,000	1,280,000
Private*	180,000	520,000	700,000
Civic/Retail	10,000	60,000	70,000
Housing**	200,000	550,000	750,000
Health Care	0	200,000	200,000
<b>Total</b>	<b>800,000</b>	<b>2,200,000</b>	<b>3,000,000</b>

\* Includes Innovation Center approved at 85,000 sf

\*\* 1,000 gsf/unit results in 200 units for Short-Term and 750 total housing units







# Existing Traffic Volumes

Martin Luther King, Jr. Blvd. +/- 28,000 vpd  
(near Homestead Road)

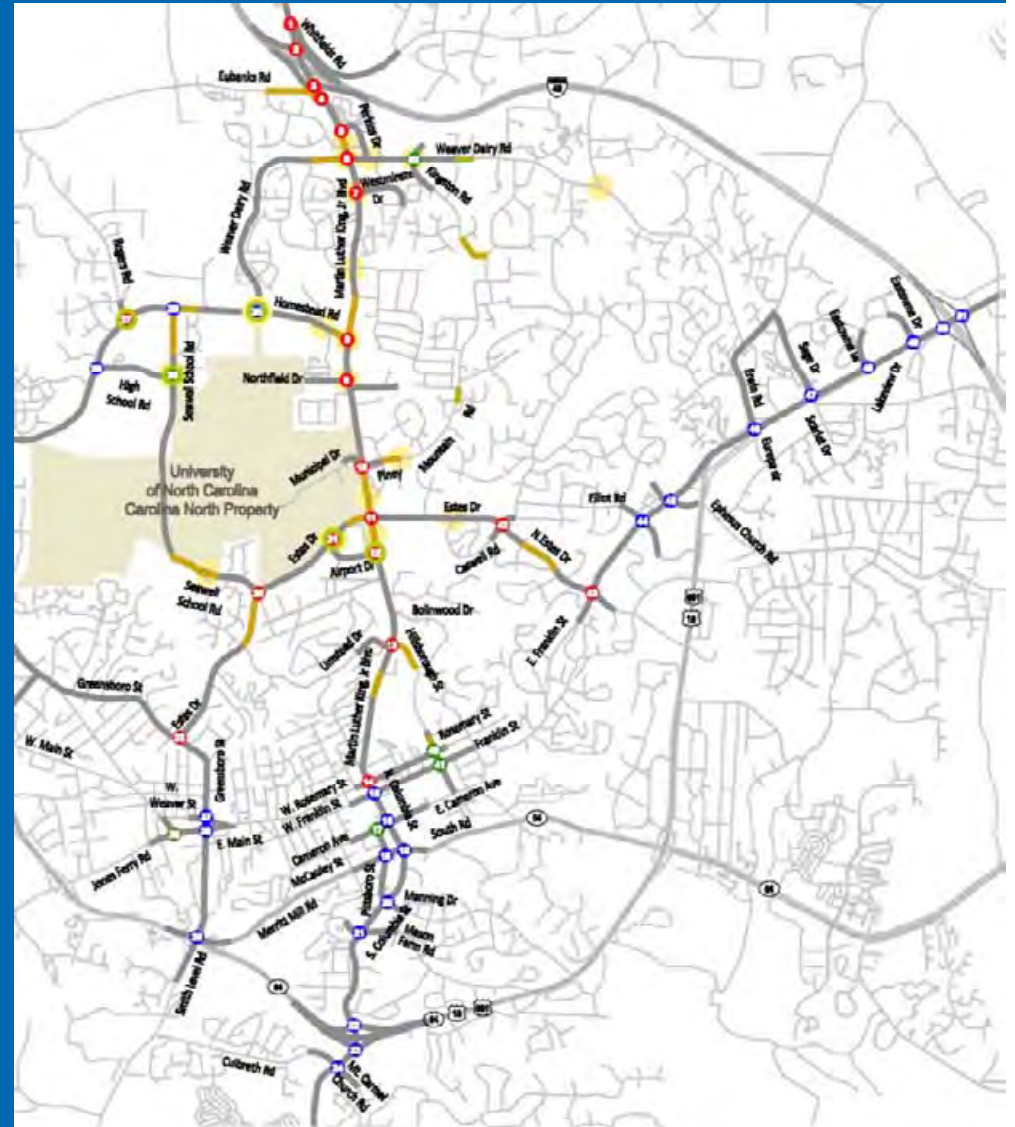
Estes Drive +/-13,000 vpd  
(near Caswell Road)

Homestead Road +/- 9,500 vpd  
(west of Martin Luther King, Jr. Blvd)

Hillsborough Street +/- 7,800 vpd  
(east of Martin Luther King, Jr. Blvd)

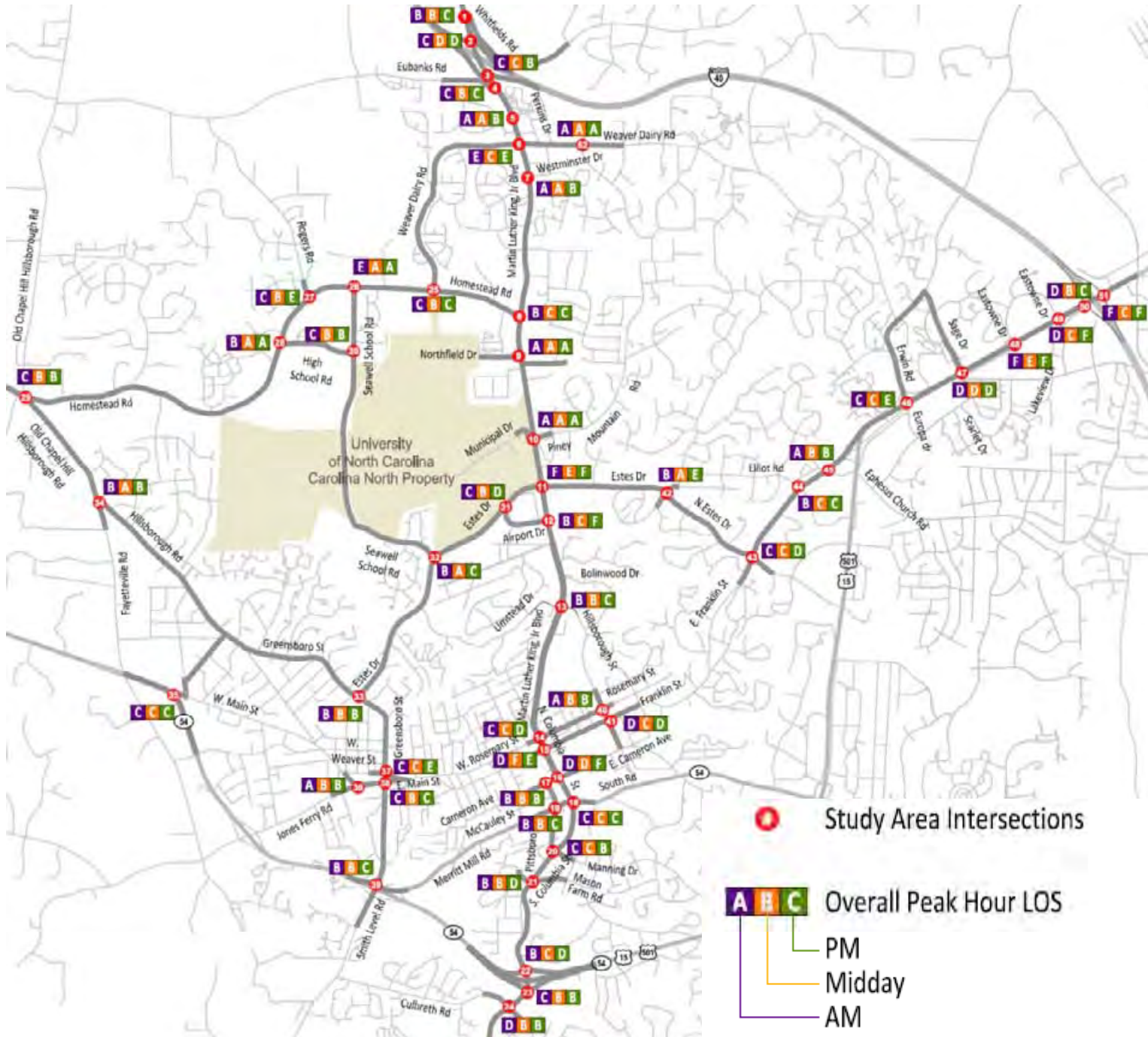
Seawell School Road +/- 4,500 vpd  
(west of Martin Estes Drive)

Piney Mountain Road +/- 2,900 vpd  
(east of Martin Luther King, Jr. Blvd)



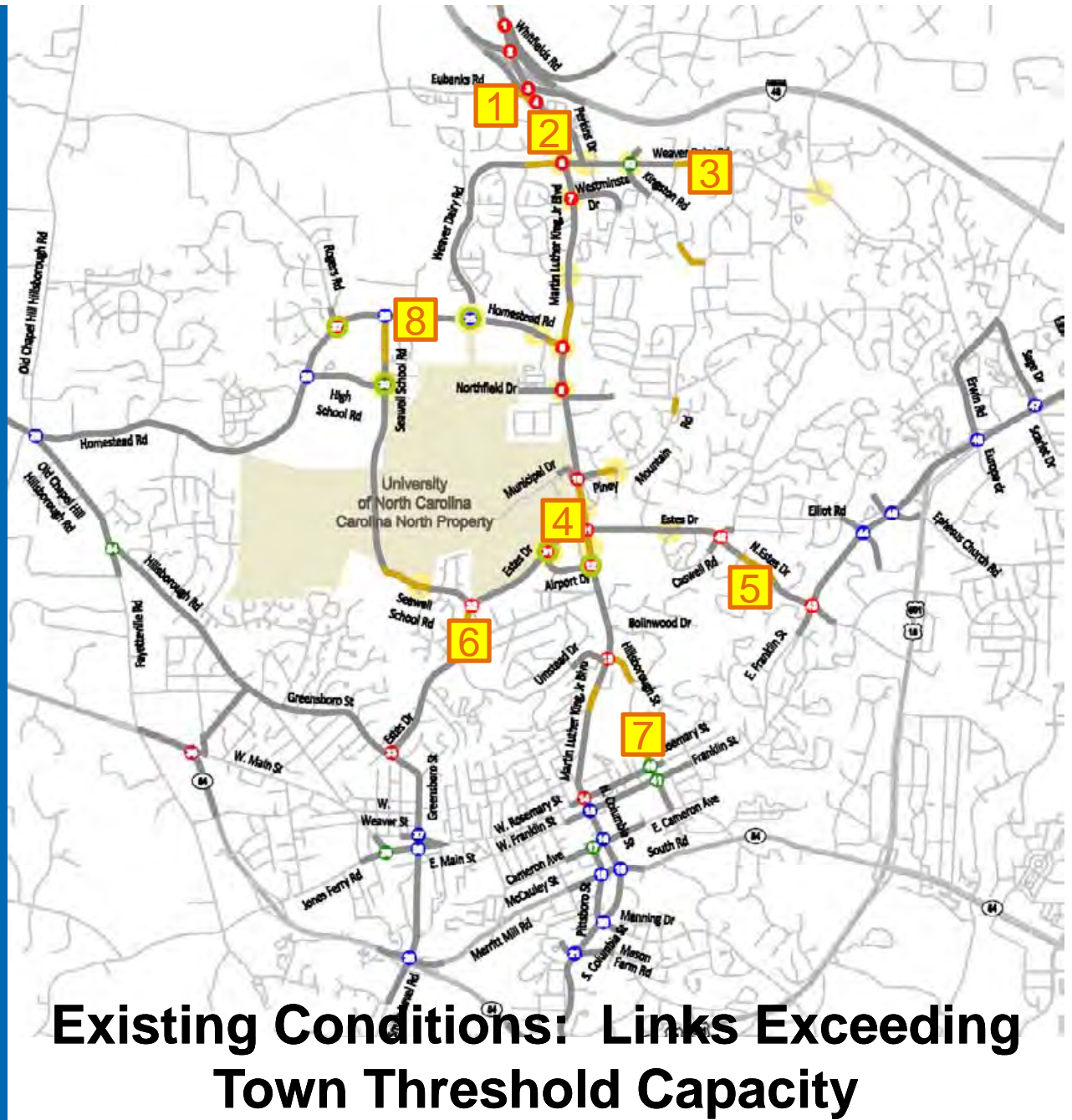


# Existing Traffic Operations





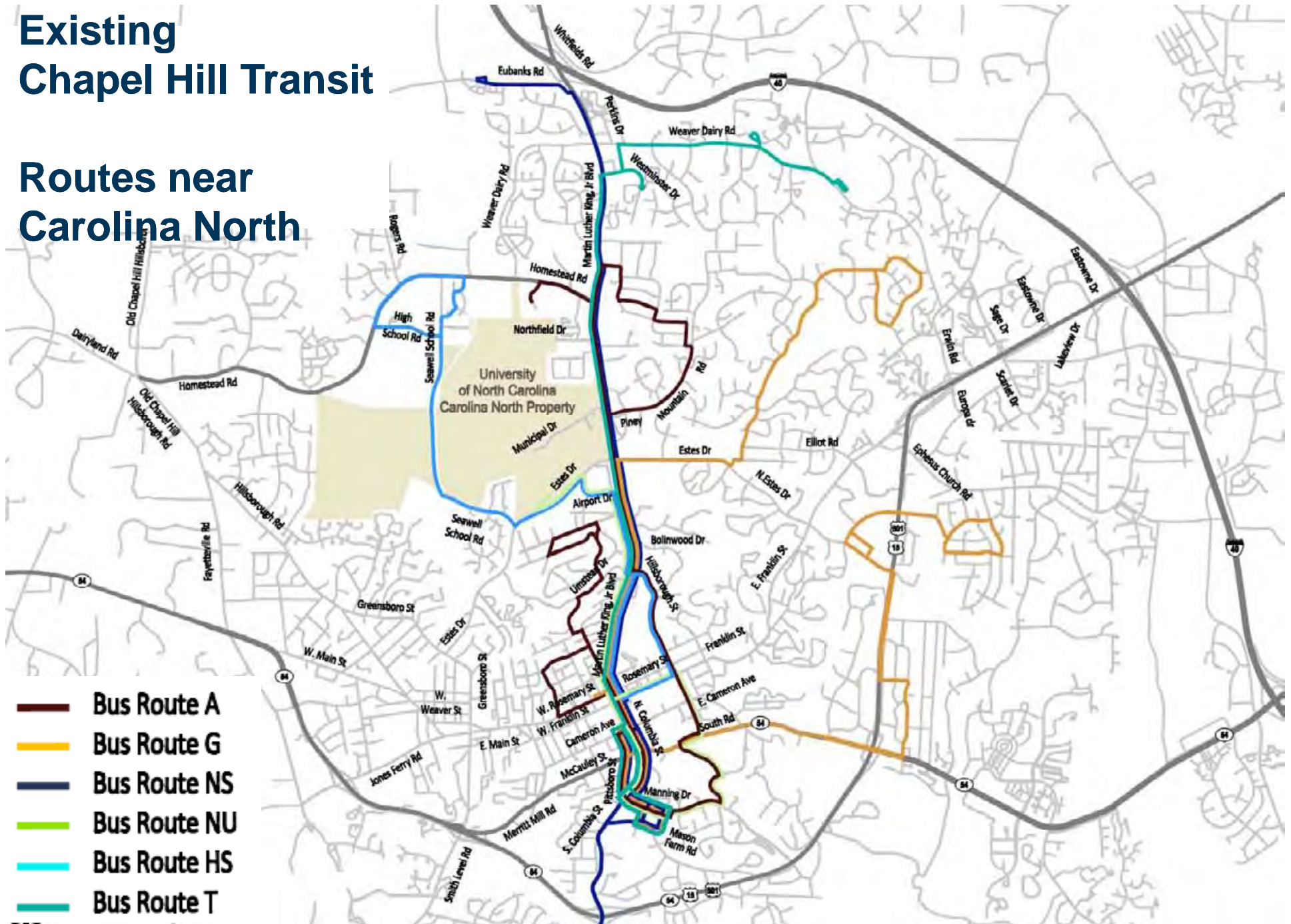
1. Eubanks Road @
2. Martin Luther King, Jr.
3. Martin Luther King, Jr. Blvd  
@ Northwoods Dr
4. Weaver Dairy Road @  
Timberlyne Road
5. N. Estes Drive @  
Halifax Road
6. N. Estes Drive @  
Airport Drive
7. Estes Drive Ext @  
Seawell School Road
8. Hillsborough Street @  
Rosemary Street
9. Homestead Road @  
Seawell School Road





# Existing Chapel Hill Transit

## Routes near Carolina North

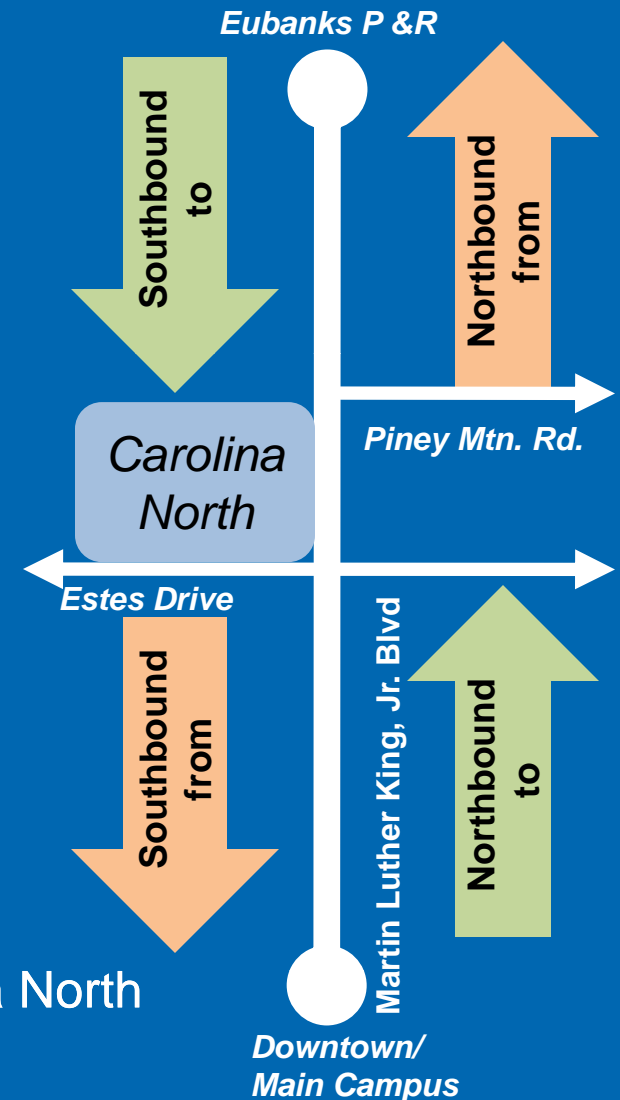




# Existing Available Transit Capacity to & from Carolina North

	to CN*	from CN*
• Morning Peak Hour		
– Northbound:	510	315
– Southbound:	150	235
• Midday		
– Northbound:	315	250
– Southbound:	365	370
• Evening Peak Hour		
– Northbound:	150	105
– Southbound:	205	370

\* Combined Capacity of six routes serving Carolina North







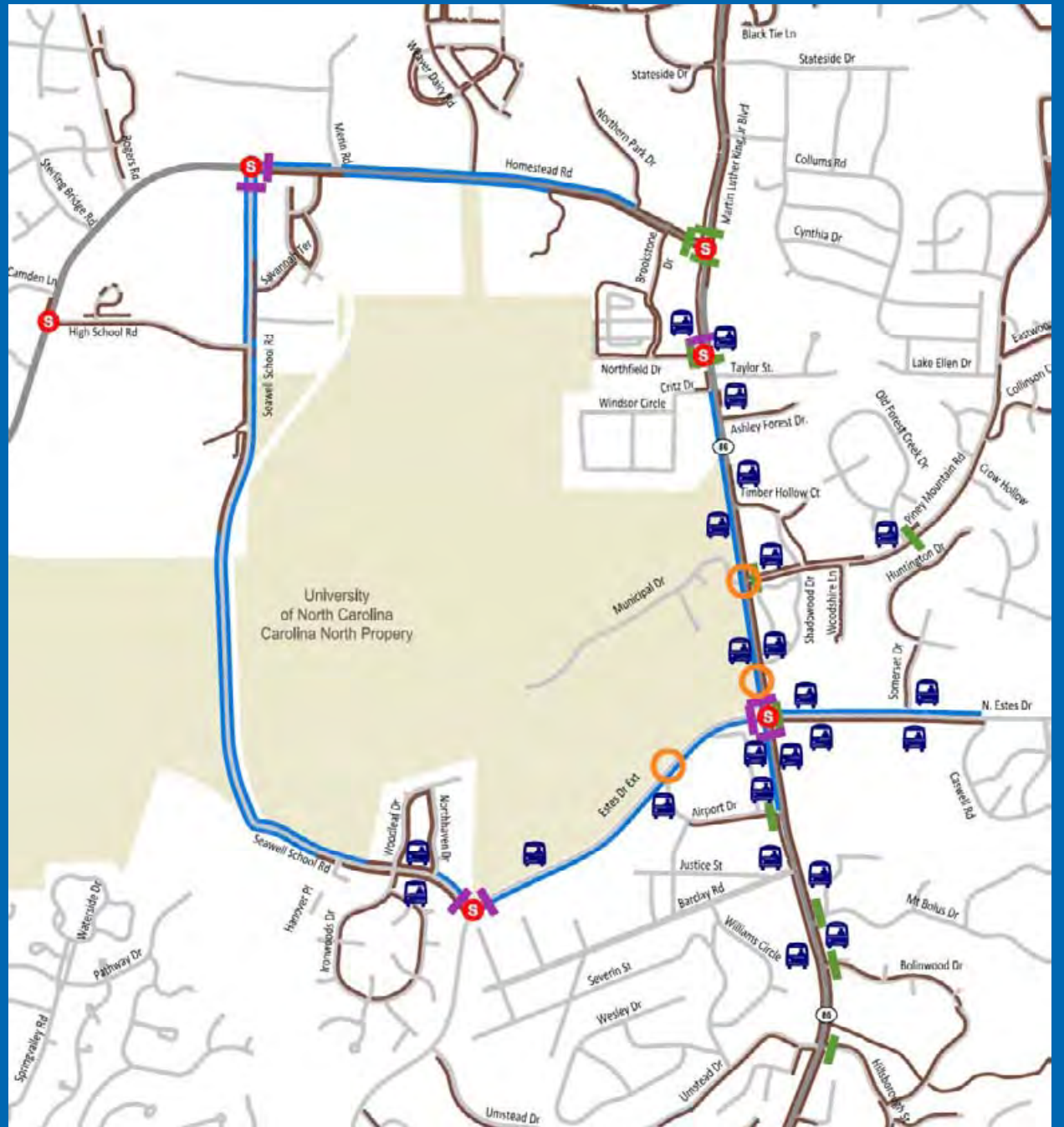
# Pedestrian & Bicycle Conditions





# Pedestrian Facilities

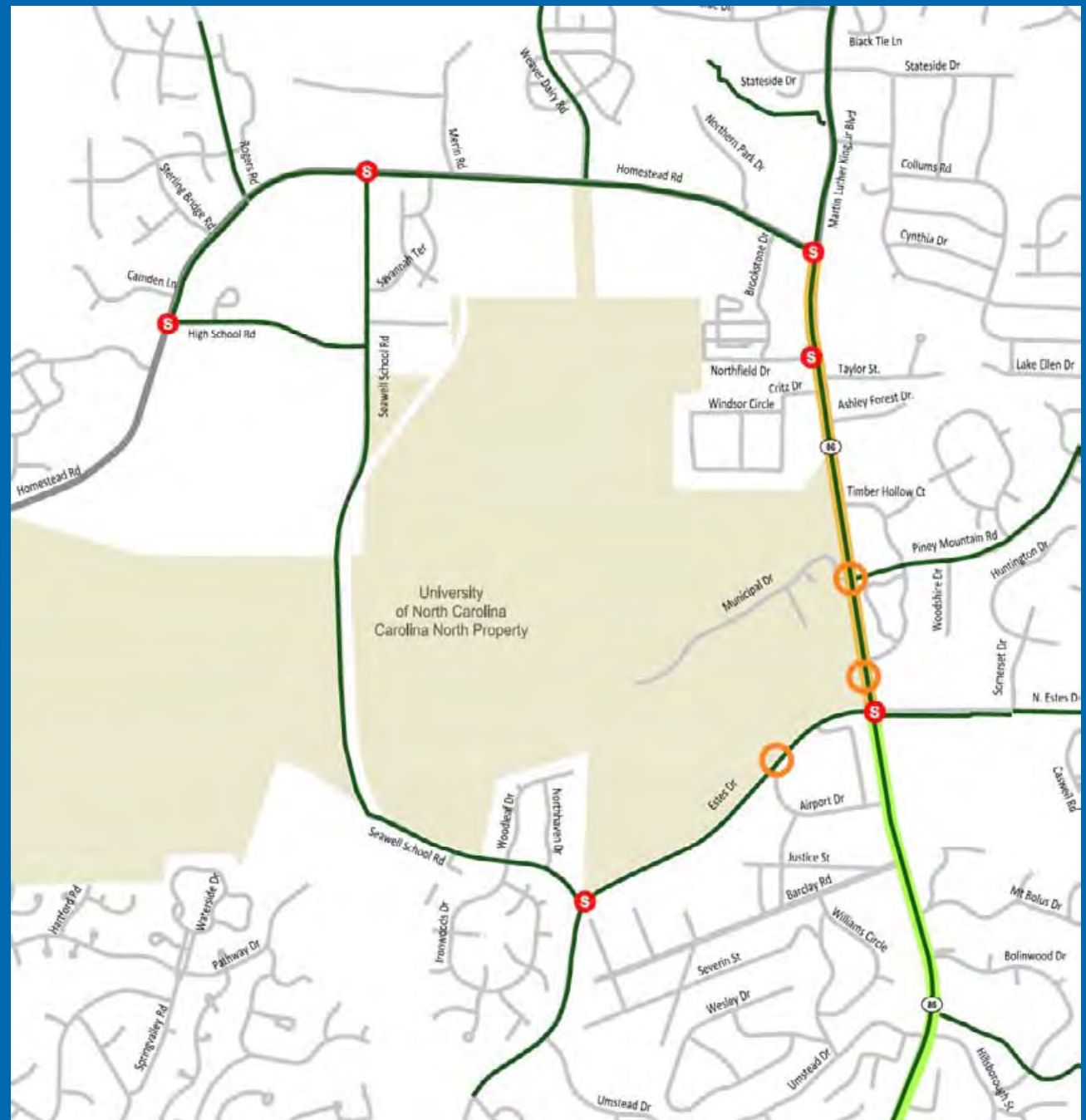
-  Signalized Intersections
-  Existing Sidewalk
-  Existing Crosswalk
-  Access Points
-  Existing Bus Stop





# Bicycle Facilities

- Signalized Intersections
- Existing Bicycle Network
- Existing Bicycle Network - Paved Striped Shoulders
- Existing Bicycle Network - Shared Lane Pavement Markings
- Access Points







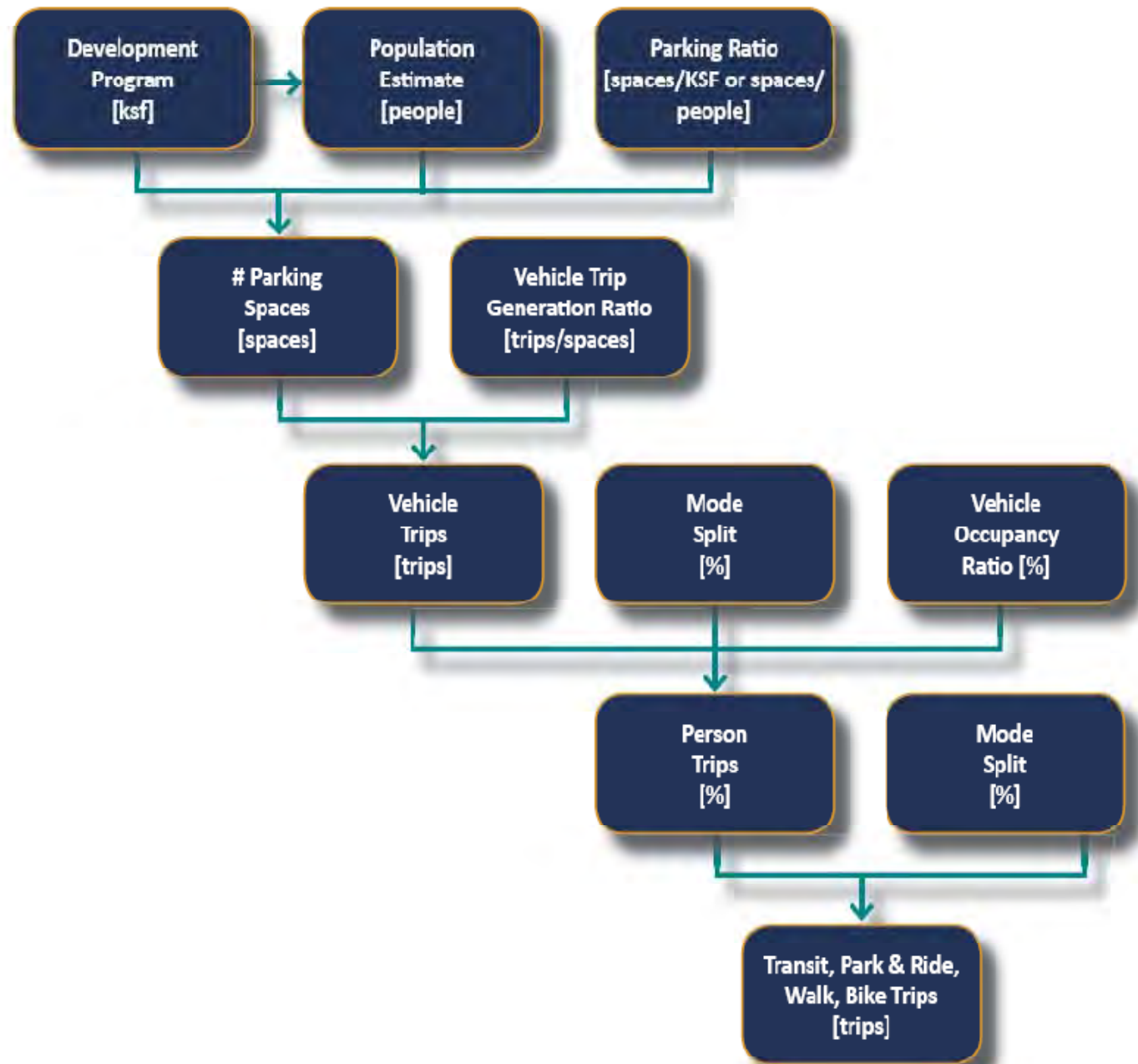
# Impact Assessment

- Travel Forecasting Methodology
- Traffic Impacts
- Transit Impacts
- Pedestrian and Bicycle Facility Needs
- Potential Mitigation Measures





## TRIP GENERATION METHODOLOGY





## TRIP DISTRIBUTION METHODOLOGY

♦ CN Students

UNC Geo-coded  
Data  
[person/TAZ]

Triangle Region  
Travel  
Demand Model

♦ CN Employees  
♦ CN Residents

Internal  
Distribution Trips  
[trips]

External  
Distribution  
[% by Gateway]

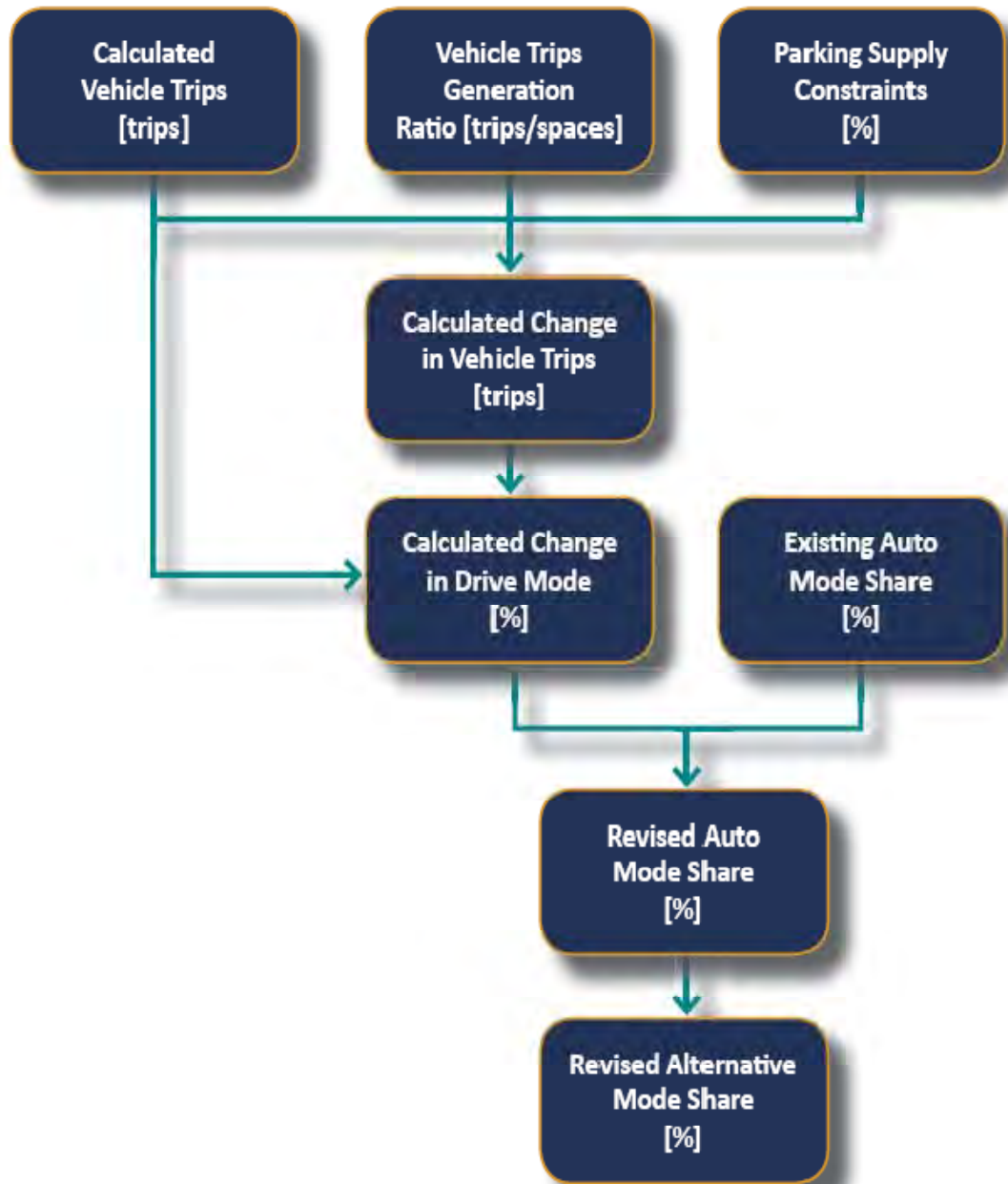
Site Generated  
Trips  
[trips]

Distribution  
Assignment  
[%]

# Parking  
Spaces  
[spaces]



## MODE SPLIT METHODOLOGY





# 2015 (800,000 sf) Parking Ratios

Use	Early Phase	Baseline	-10 %
University/ Employee	0.65/ employee	0.50/ employee	0.45/ employee
University/ Student	0.33/student	0.25/student	0.23/student
University/ Visitors	0.20/1,000 sf	0.20/1,000 sf	0.18/1,000 sf
Private R&D	2.65/1,000 sf	2.50/1,000 sf	2.25/1,000 sf
Housing	1.25/unit	1.25/unit	1.13/unit
Civic/Retail	1.50/1,000 sf	1.50/1,000 sf	1.35/1,000 sf
Fields	35/field	35/field	32/field
<b>Total Spaces</b>	<b>1,743</b>	<b>1,526</b>	<b>1,373</b>





# 2025 (3,000,000 sf) Parking Ratios

Use	Baseline	-10 % Ratio	-20 % Ratio
University/ Employee	0.50/employee	0.45/employee	0.40/employee
University/ Student	0.25/student	0.23/student	0.20/student
University/ Visitors	0.20/1,000 sf	0.18/1,000 sf	0.16/1,000 sf
Private R&D	2.50/1,000 sf	2.25/1,000 sf	2.0/1,000 sf
Housing	1.25/ unit	1.13/unit	1.00/unit
Civic/Retail	1.50/ 1,000 sf	1.35/1,000 sf	1.20/1,000 sf
Medical/Employee	0.50/employee	0.45/employee	0.40/employee
Medical/Patient -Visitor	2.50/1,000 sf	2.25/1,000 sf	2.00/1,000 sf
Fields	35/field	32/field	28/field
<b>Total Spaces</b>	<b>5,834</b>	<b>5,254</b>	<b>4,668</b>



# Mode Split

## 2007 University and Town-wide Data

Mode	Univ. Employee	Univ. Student	Other
Drive to Site	67 %	36 %	92 %
Transit	9 %	32 %	3 %
Park & Ride	15 %	9 %	4 %
Walk/Bike	9 %	23 %	1 %
Total	100 %	100 %	100 %



# Trip Generation

**Table 5: Carolina North Trip Generation 2015 (TIA Phase One) – 800,000 sf**

Trip Type	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Vehicle	5,049	420	115	535	265	399	665
Park & Ride	1,248	120	22	141	65	109	174
Transit	1,941	126	84	210	124	135	259
Walk/Bike/Other	1,497	57	71	128	87	84	171
<b>Total</b>	<b>9,734</b>	<b>722</b>	<b>292</b>	<b>1,014</b>	<b>542</b>	<b>727</b>	<b>1,269</b>

**Table 6: Carolina North Trip Generation 2025 (TIA Phase Two) – 3,000,000 sf**

Trip Type	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Vehicle	23,261	1,929	554	2,484	990	1,736	2,726
Park & Ride	4,089	398	73	471	197	355	551
Transit	6,438	416	310	726	347	417	764
Walk/Bike/Other	5,957	186	260	446	255	272	528
<b>Total</b>	<b>39,746</b>	<b>2,929</b>	<b>1,197</b>	<b>4,127</b>	<b>1,788</b>	<b>2,781</b>	<b>4,569</b>



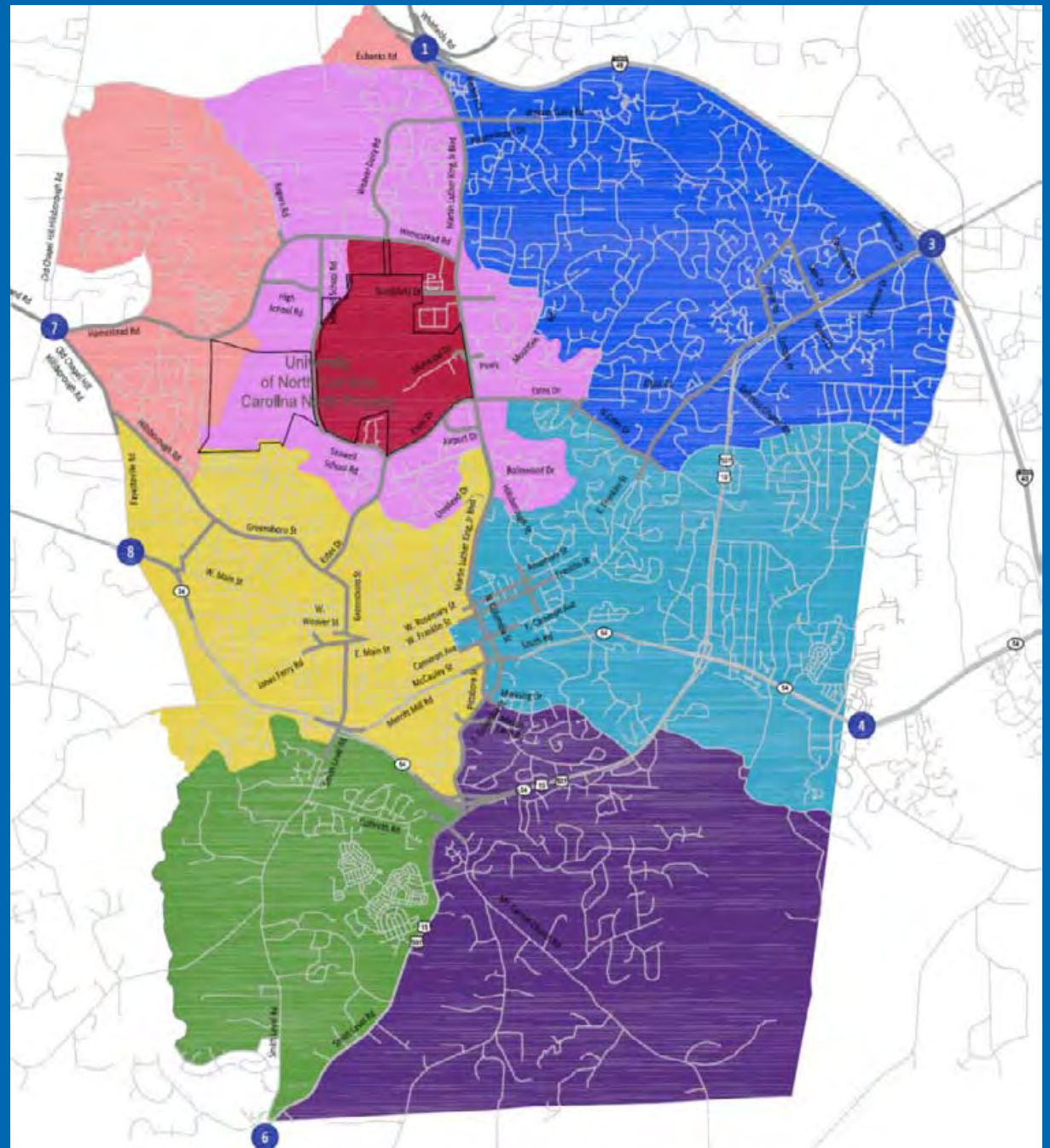
# Trip Distribution

## Gateway

- Carolina North (1 TAZs)
- 101 (5 TAZs)
- 102 (37 TAZs)
- 103 (38 TAZs)
- 104 (27 TAZs)
- 105 (6 TAZs)
- 106 (11 TAZs)
- 200 - Adjacent Zones (12 TAZs)
- # Gateway Locations

40 % within  
Chapel Hill – Carrboro

60 % external to  
Chapel Hill - Carrboro

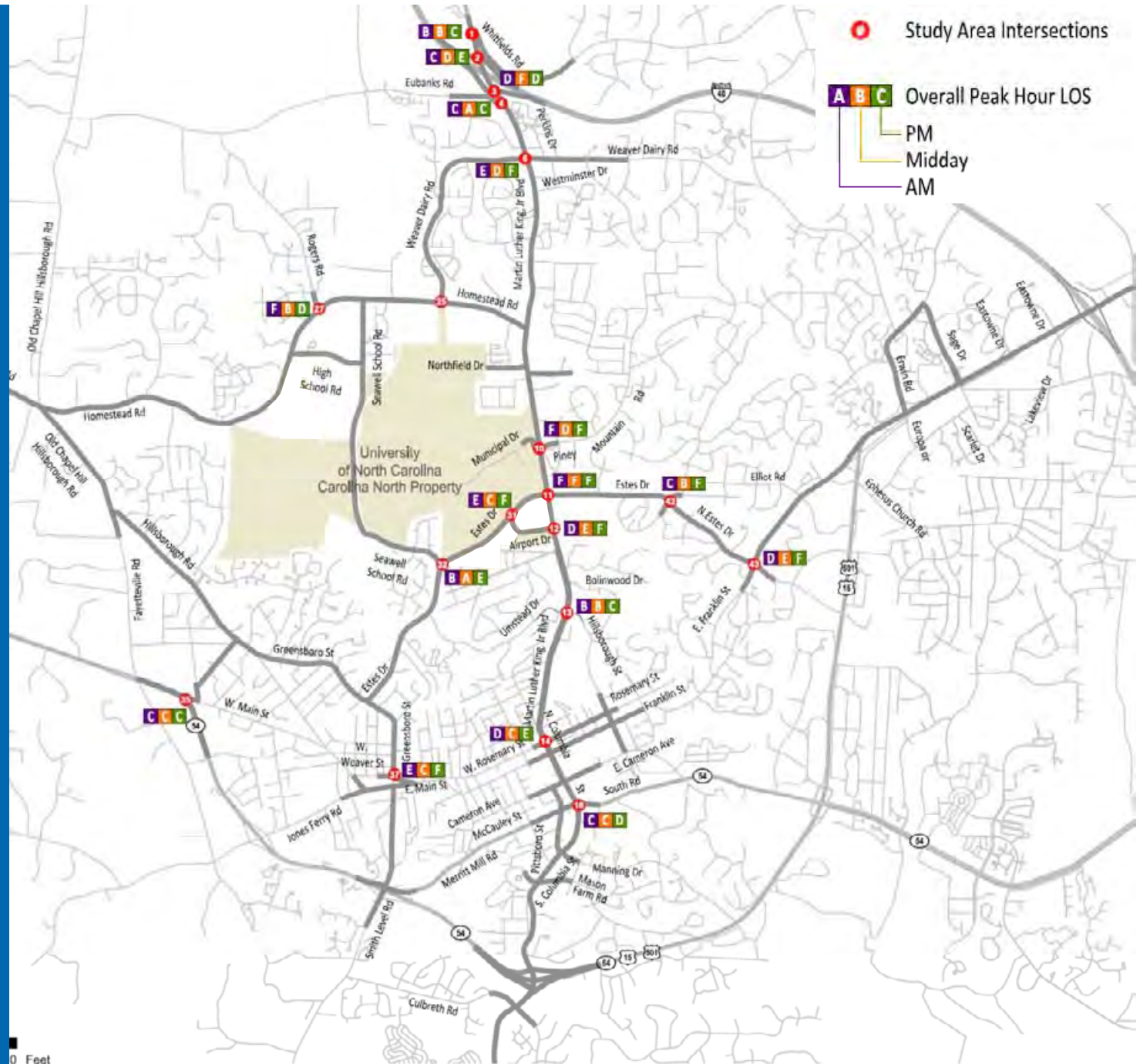








# 2015 Build Intersection Level-of-Service

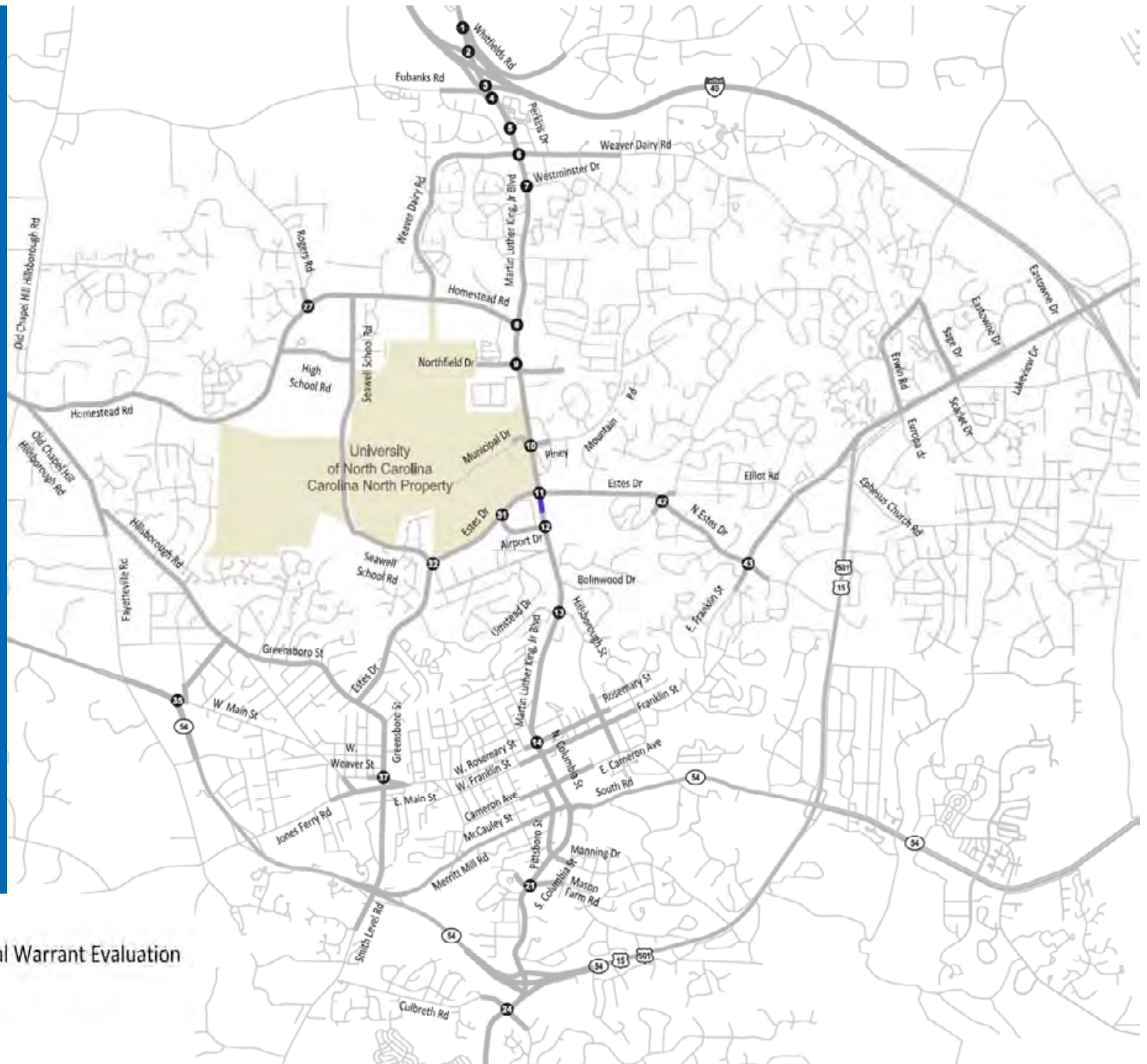






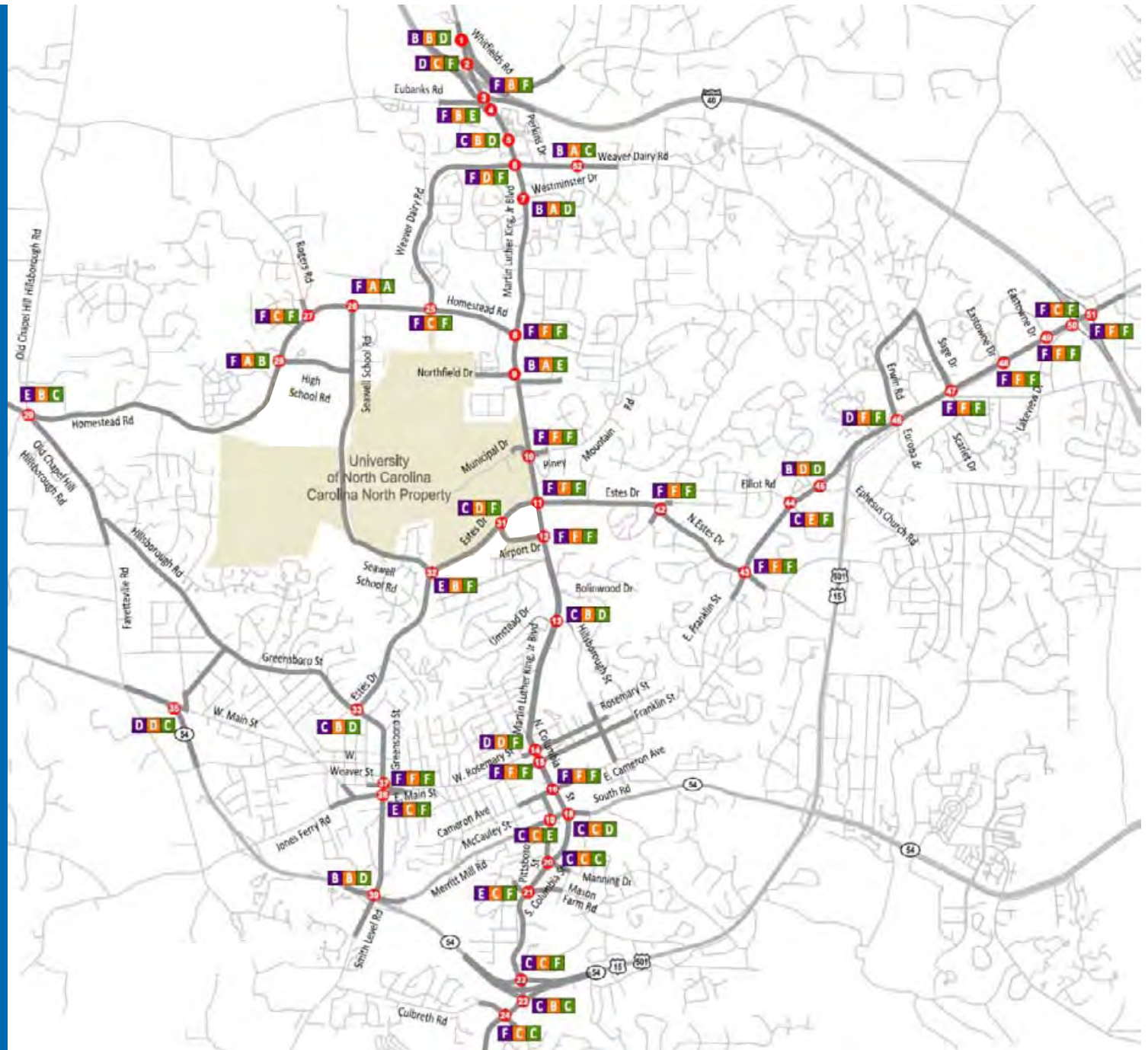
## 2015 Intersection Impacts and Potential Mitigation

- Signal Timing Improvement
- Intersection Signalization / Signal Warrant Evaluation
- Geometric Improvement
- Substantial Reconstruction

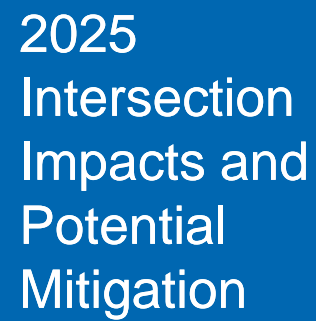




# 2025 Build Intersection Level-of-Service









## Streets Evaluated for Traffic Calming Implementation

### Carolina North Traffic Expected

- Piney Mountain Road
- Hillsborough Street (Chapel Hill)
- Seawell School Road
- North Elliott/Curtis/Caswell Roads

### Carolina North Traffic Possible

- Northwoods Road
- North Lakeshore Drive
- Barclay Road







- Route NS reaches capacity
- 2 additional vehicles needed
- 400 to 500 additional park & ride spaces needed
- Other service adjustments may be needed





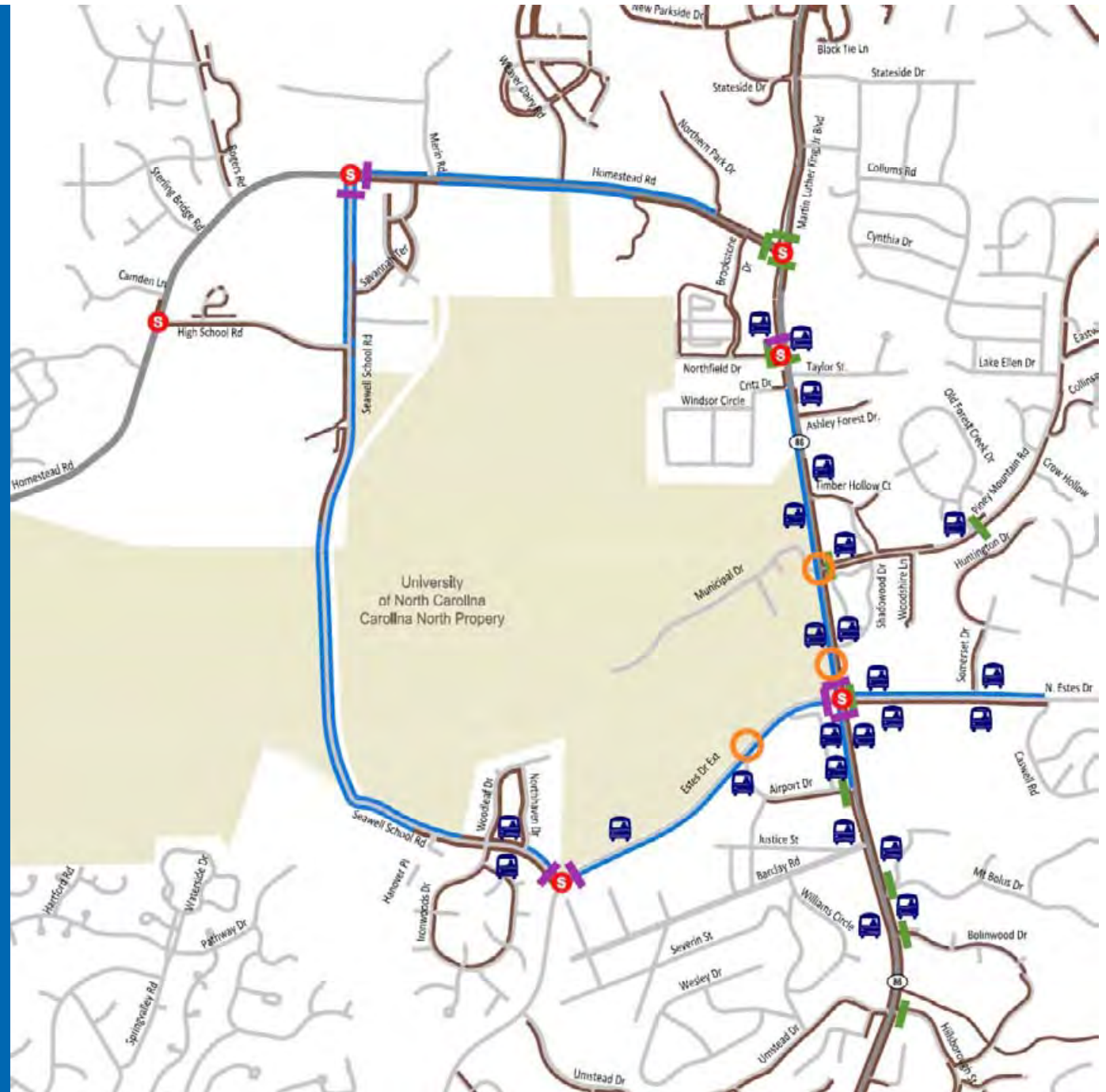
- More service needed on Routes NS, A, T, G
- +/- 10 additional vehicles needed
- Approximately 1,500 additional park & ride spaces
- Route structure may need to change







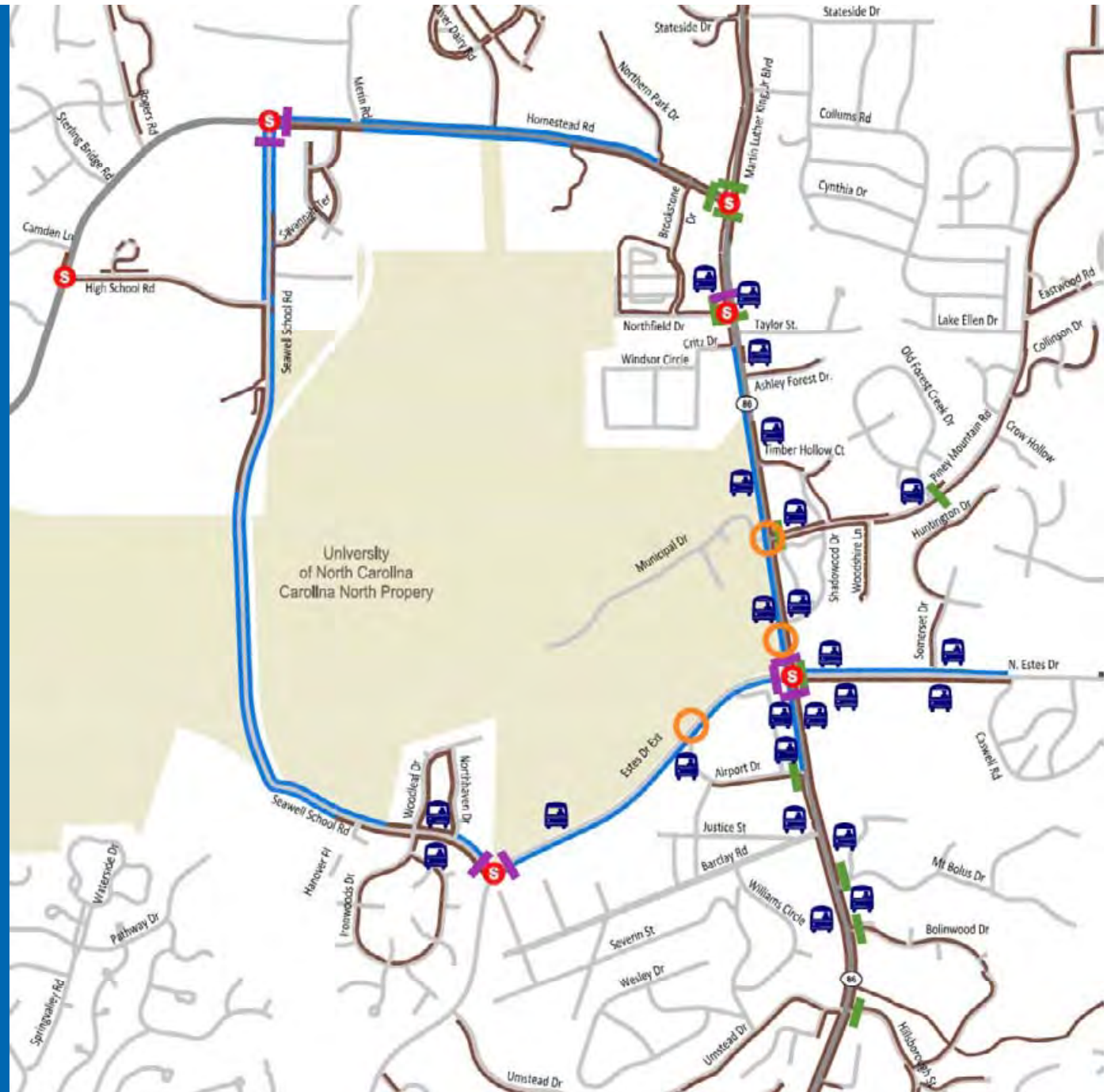
# Pedestrian Facility Needs





# Bicycle Facility Needs

-  Signalized Intersections
-  Existing Sidewalk
-  Proposed Sidewalk
-  Existing Crosswalk
-  Proposed Crosswalk
-  Access Points
-  Existing Bus Stop





# Sensitivity Analysis

## Different Parking Ratios

- TIA Phase 1 (800,000 sf)
  - Early Phase Ratios (15 % more parking)
  - Constrained Ratios (10 % less parking)
- TIA Phase 2 (3,000,000 sf)
  - Constrained Ratios (A) 10 % less parking
  - Constrained Ratios (B) 20 % less parking



# Sensitivity Analysis

## Different Parking Ratios

- TIA Phase 1 (800,000 sf)
  - No substantial change in traffic findings
  - Fewer park & ride spaces (reduced from 460 to 290) with early phase parking ratios
  - More park & ride spaces (increased from 460 to 570) with 10 % reduction in on-site parking
  - One additional bus needed





# Sensitivity Analysis

## Different Parking Ratios

- TIA Phase 2 (3,000,000 sf)
  - Site-generated volumes are reduced through study area intersections, but does not change mitigation measures
  - More park & ride spaces needed
    - Increased from 1,520 to 2,030 with 10 % reduction in on-site parking
    - Increased from 1,520 to 2,540 with 20 % reduction in on-site parking
  - More transit service needed
    - 14 additional buses in service with 10 % reduction
    - 20 additional buses in service with 20 % reduction



# 2015 Mitigation Summary

- Traffic Mitigation
  - Lane designation and signal system changes
  - Additional turn lane at Martin Luther King, Jr. Blvd and Estes Drive
  - Signalize Martin Luther King, Jr. Blvd and Airport Drive (for transit connection)
  - Signalized site access from Estes Drive aligned with Airport Drive
- Traffic Calming
  - Further exploration with neighborhoods on roadways expected to carry Carolina North traffic



# 2015 Mitigation Summary

- Pedestrian and Bicycle Facilities
  - Complete sidewalk network near Carolina North
  - Provide more crossing opportunities
  - Complete bicycle lane network near Carolina North
- Transit
  - Route adjustments to provide stops within the site
  - Fleet increases to support additional ridership and longer travel times
  - Signal priority & potential bus lanes on Martin Luther King, Jr. Blvd.
  - Park & ride increases



# 2025 Mitigation Summary

- Traffic Mitigation
  - Reconstruct Martin Luther King, Jr. Blvd from north of Piney Mountain Road to south of Airport Drive
  - Reconstruct Estes Drive from west of Airport Drive to east of Martin Luther King, Jr. Blvd
  - Evaluate potential signalization/roundabout at:
    - Homestead Road at Weaver Dairy Road Extension
    - Homestead Road at Rogers Road
  - Turn lane additions at several other intersections (see map)
- Traffic Calming
  - Monitor traffic conditions in residential neighborhoods for traffic calming implementation





# 2025 Mitigation Summary

- Pedestrian and Bicycle Facilities
  - Provide improved pedestrian and bicycle facilities with reconstruction of Martin Luther King, Jr. Blvd and Estes Drive
- Transit
  - Additional route adjustments to provide stops within the site
  - Additional fleet increases to support additional ridership and longer travel times
  - Additional park & ride increases
  - Potential route restructuring to provide more direct routes to Carolina North

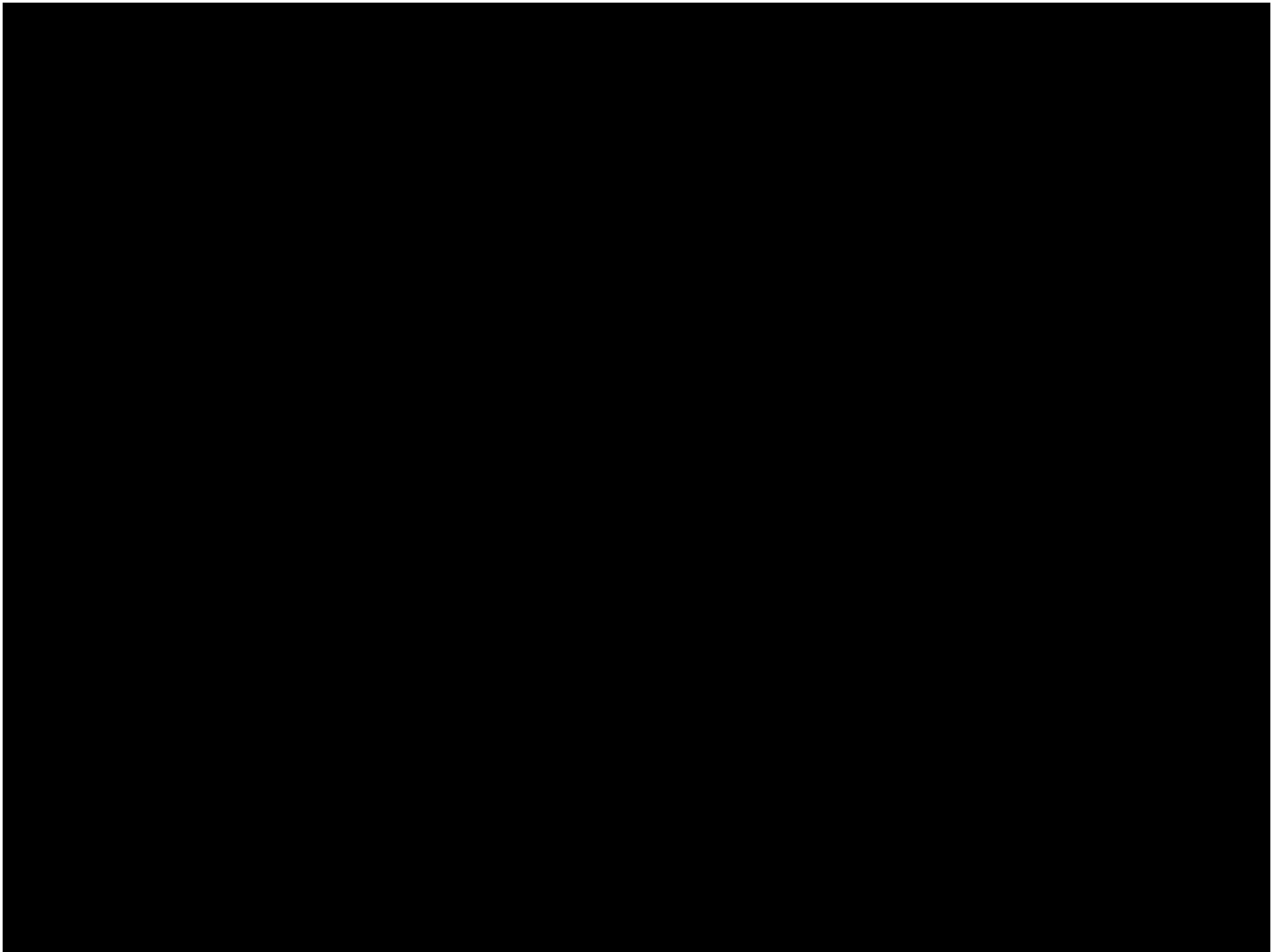
# Concept Plan Review



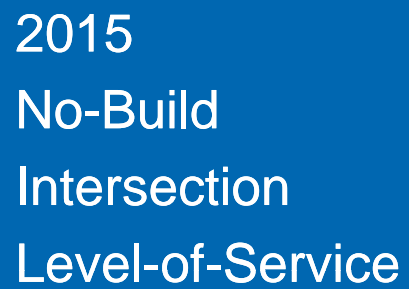


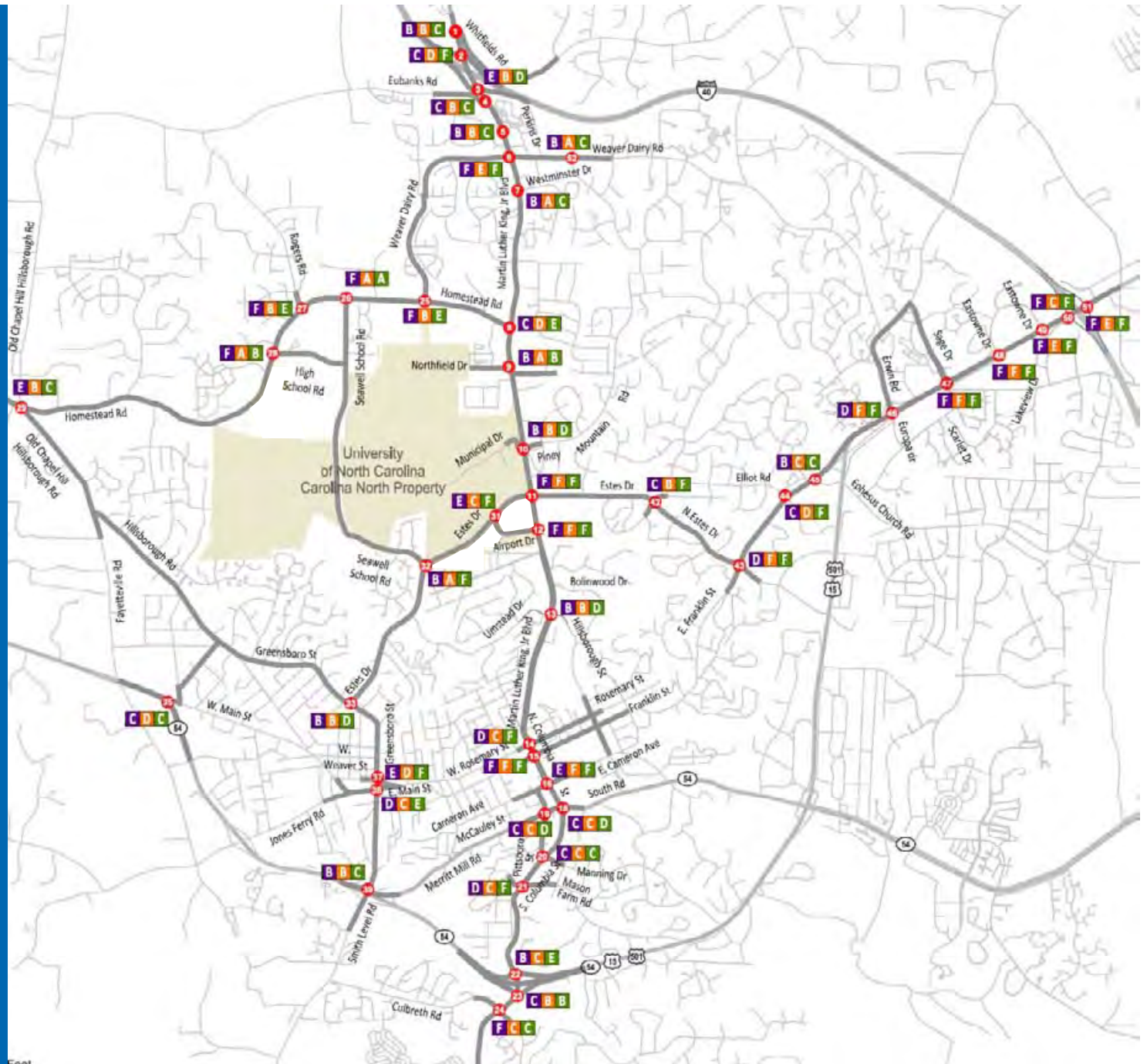
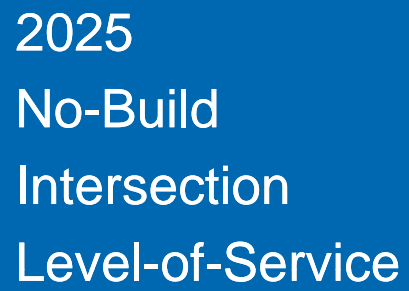
# **TRANSPORTATION IMPACT ANALYSIS CAROLINA NORTH DEVELOPMENT**

## **Question and Comments**











# Air Quality/Greenhouse Gas

Pollutant	2009 Existing Condition	2015 No-Build Condition	2015 Build Condition	2015 Build with Mitigation <sup>2</sup>	2015 "Early Phase Ratio" Build <sup>2</sup>	2015 "Constrained Ratio" Build (10%) <sup>2</sup>
Carbon Dioxide (CO <sub>2</sub> ) <sup>1</sup>	94,096.7	114,600.3	152,322.3	152,297.1	158,427.2	152,216.3
Build vs. Mitigation Scenario Difference				-25.20	+6,104.90	-80.80 <sup>3</sup>
Pollutant		2025 No-Build Condition	2025 Build Condition	2025 Build with Mitigation <sup>2</sup>	2025 "Constrained Ratio" Build (10%) <sup>2</sup>	2025 "Constrained Ratio" Build (20%) <sup>2</sup>
Carbon Dioxide (CO <sub>2</sub> )		112,143.1	191,460.0	191,017.6	191,157.0	190,912.0
Build vs. Mitigation Scenario Difference				-442.40	-303.00	-548.00

1 Tons per Day

2 The proposed improvements are described in Chapter 5 – *Mitigation Measures/Recommendations*.

3 Scaled based on 3 msf output due to model inconsistency

Mobile source improvements include the proposed roadway/traffic improvements and parking constraint scenarios.