

Traffic Analysis

Access to the facility is one of the most important factors in its success in serving the community and region. The users can expect safe, efficient and convenient access to the site. The following sections present the evaluation of the roadways which will serve the expanded facility. It identifies existing deficiencies, potential solutions, and the increased level of capacity necessary to support the additional traffic associated with the site. Scenarios include analysis of the facility as a stand along project in addition to development in conjunction with a transit-supportive program.

6.1 Existing Conditions

An evaluation of the transportation infrastructure necessary to support the proposed Eubanks Park-and-Ride expansion begins with an understanding of the existing transportation system within the study area. Traffic conditions were evaluated by assembling and evaluating traffic counts at 14 intersections and on five roadway segments identified by the Town. This section discusses the traffic count locations, identifies the study area, and evaluates intersection and roadway capacity.

6.1.1 Traffic Volume Counts

The traffic data utilized for the traffic analysis portion of this study was collected in the month of September of 2011 at the locations in the following table.

Table 6-1: Study Area Intersections

No.	Intersection
1	Eubanks Rd. and Millhouse Road
2	Eubanks Rd. and Northwood Dr.
3	Martin Luther King, Jr. Blvd. (NC 86) & Whitfield Rd.
4	Martin Luther King, Jr. Blvd. (NC 86) & I-40 WB Ramps
5	Martin Luther King, Jr. Blvd. (NC 86) & I-40 EB Ramps
6	Martin Luther King, Jr. Blvd. (NC 86) & Eubanks Rd.
7	Martin Luther King, Jr. Blvd. (NC 86) & Perkins Dr.

Table 6-1: Study Area Intersections (Cont)

No.	Intersection
8	Martin Luther King, Jr. Blvd. (NC 86) & Weaver Dairy Rd.
9	Martin Luther King, Jr. Blvd. (NC 86) & Westminster Dr.
10	Martin Luther King, Jr. Blvd. (NC 86) & Homestead Rd.
11	Homestead Rd. and Rogers Rd.
12	Eubanks Rd. and Rogers Rd.
13	Eubanks Rd. and Old NC 86
14	Martin Luther King, Jr. Blvd. (NC 86) & Millhouse Rd./Mt. Sinai Rd.

Average daily traffic (ADT) volume counts were also conducted at five locations in September of 2011 using automatic tube counters. Tube counts included the collection of speed data as well as traffic volumes. These counts were conducted at the following locations:

1. Eubanks Road, east of Millhouse Road
2. Eubanks Road, west of Millhouse Road
3. Eubanks Road, west of Rogers Road
4. Millhouse Road, north of Eubanks Road
5. Millhouse Road, north of the Railroad Tracks

6.1.2 Existing Capacity Analysis

An evaluation of the traffic for each studied intersection was conducted to determine the existing operational Level-of-Service (LOS). LOS is a qualitative measure that describes the operating conditions within an intersection and the perception of those conditions by the facility's users. There are six levels of service defined for each facility type. Each level is assigned a letter from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. The following is a more detailed description of the levels of service:

LOS A: Operations with very low delay. This occurs when progression is extremely favorable. Most vehicles do not stop at all.

LOS B: Operations with stable flow. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

LOS C: Operations with stable flow. This generally occurs with fair progression and/or longer cycle lengths. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.

LOS D: Approaching unstable flow. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume to capacity (V/C) ratios. Many vehicles stop. Operations below this threshold are typically considered unacceptable.

LOS E: Unstable flow. This is considered to be the limit for acceptable delay. These high delays generally indicate poor progression, long cycle lengths, and high V/C ratios.

LOS F: Substantial delay. This condition often occurs with oversaturation or with high V/C ratios. Poor progression and long cycle lengths may also cause such delay levels.

In addition to intersection analysis, analysis of the five roadway segments identified by the Town was also performed. The Town's *Guidelines for Traffic Impact Analysis* requires the roadway segments to be analyzed based on a daily volume to capacity ratio (v/c) where the threshold capacities are established by roadway classification. These threshold capacities are identified in Table 6-2.

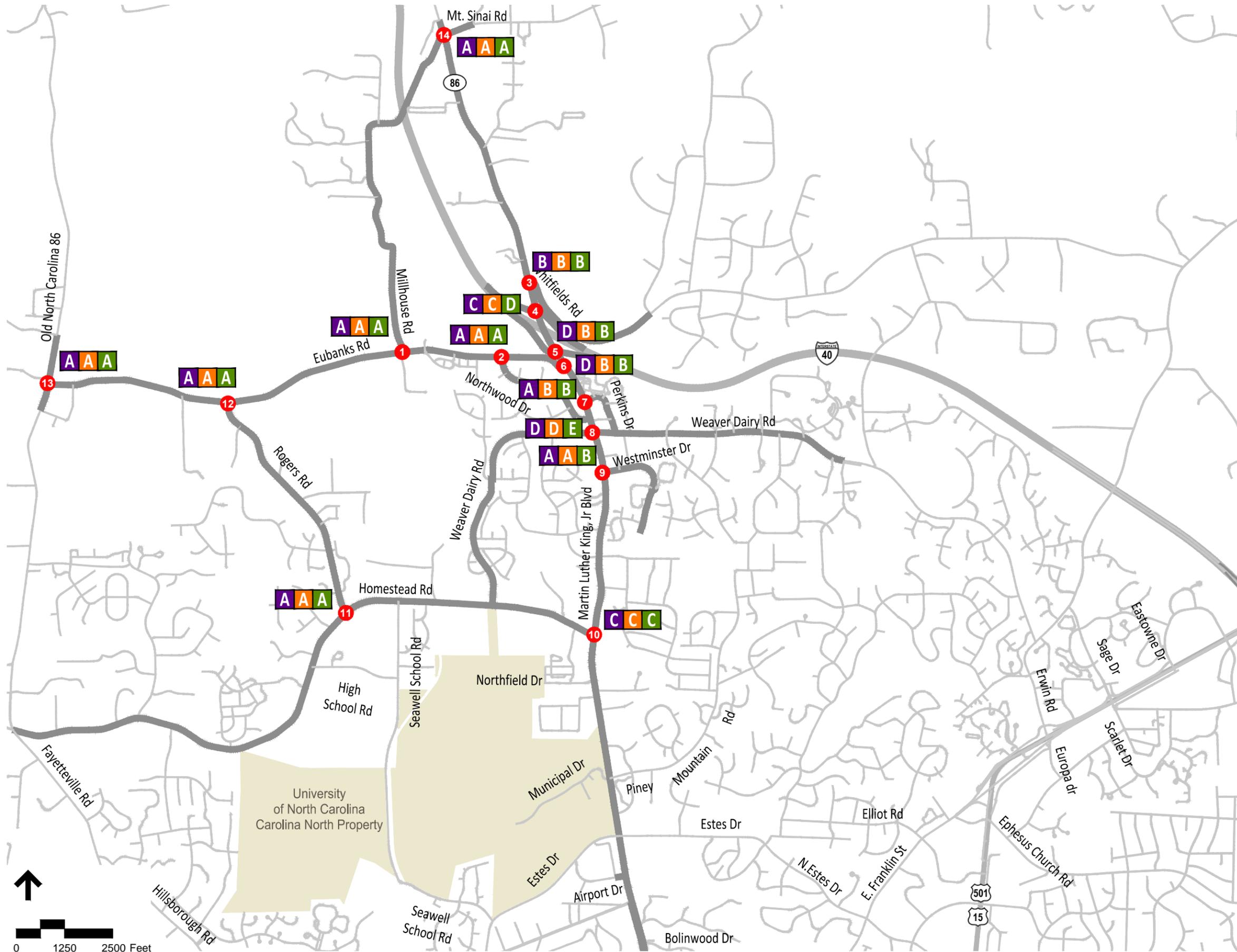
Table 6-2: Chapel Hill Threshold Capacities by Roadway Classification

Facility Type	Lanes	Threshold Capacity
Local Residential	2	1,500 (ADT)
Local Non-Residential	2	2,500 (ADT)
Collector (no residential access)	2	7,000 (ADT)
Minor Arterial	2	550 each way (Peak Hour)
Major Arterial	4	1,600 each way (Peak Hour)
Major Arterial	6	2,400 each way (Peak Hour)

6.1.3 Intersection Capacity Analysis Results

The existing lane geometry, signal timing information obtained from the Town of Chapel Hill, and the peak hour traffic volumes were input into Synchro 7 software to conduct the existing conditions capacity analysis. The existing peak hours (AM, midday, and PM) were analyzed and the Highway Capacity Manual (HCM) output reports generated by the Synchro 7 software are summarized and reported. The overall intersection results indicating the Existing Levels of Service are presented in Figure 6-1.

- The westbound left-turn movements at Whitfield Road and I-40 WB off-ramps onto southbound Martin Luther King, Jr. Boulevard are operating at LOS E due to traffic volumes approaching the limit of the existing lane capacity.
- The eastbound I-40 off-ramp movements are also projected to operate at LOS E due to conflict with significant through volumes on Martin Luther King, Jr. Boulevard.
- The eastbound left-turn movement on Eubanks Road onto northbound Martin Luther King, Jr. Boulevard is operating at LOS F, since it conflicts with significant through volumes on Martin Luther King, Jr. Boulevard.
- The intersection of Martin Luther King, Jr. Boulevard with Weaver Dairy Road operates at an overall LOS E due to significant lane capacity deficiencies in the westbound direction and a lack of exclusive right-turn lanes on Martin Luther King, Jr. Boulevard.
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Legend

- Study Area Intersections**
- 1 Eubanks Road and Millhouse Road
 - 2 Eubanks Road and Northwood Drive
 - 3 Martin Luther King Jr. Blvd and Whitfield Road
 - 4 Martin Luther King Jr. Blvd and I-40 Westbound Ramps
 - 5 Martin Luther King Jr. Blvd and I-40 Eastbound Ramps
 - 6 Martin Luther King Jr. Blvd and Eubanks Road
 - 7 Martin Luther King Jr. Blvd and Perkins Drive
 - 8 Martin Luther King Jr. Blvd and Weaver Dairy Road
 - 9 Martin Luther King Jr. Blvd and Westminster Drive
 - 10 Martin Luther King Jr. Blvd and Homestead Road
 - 11 Homestead Road and Rodgers
 - 12 Eubanks Road and Rodgers Road
 - 13 Eubanks Road and Old North Carolina 86
 - 14 86 and Mt. Sinai Road and Millhouse Road

Overall Peak Hour LOS

A	B	C
PM	Midday	AM

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Figure 6-1
2011 Existing Levels-of-Service

Chapel Hill, North Carolina

Analysis of Weekday AM Peak Hour

In general, the primary flow of traffic during the weekday AM peak hour flows into the Town from outlying areas and from the interstate system. In this local study area, much of the local traffic is destined for either I-40 eastbound or for southbound Martin Luther King, Jr. Boulevard towards the center of Town and the University. The traffic capacity analysis has revealed that all intersections were calculated to operate at an *overall* acceptable LOS (D or better) during the weekday AM peak hour. However, there are several key intersections along Martin Luther King, Jr. Boulevard that have individual turning movements operating at LOS E and F. Of note are the following movements that will ultimately be impacted by any traffic generated by an expanded Park-and-Ride lot:

- The westbound left-turn movements at Whitfield Road and I-40 WB off-ramps onto southbound Martin Luther King, Jr. Boulevard are operating at LOS E due to traffic volumes approaching the limit of the existing lane capacity.
- The eastbound right-turn movement from I-40 EB to southbound Martin Luther King, Jr. Boulevard is currently operating at LOS F due to a volume approaching 800 vehicles per hour in dual right-turn lanes right turns on red are not permitted. This volume also competes for signal time with significant amount of southbound and northbound traffic volume on Martin Luther King, Jr. Boulevard.
- The eastbound left-turn movement on Eubanks Road onto northbound Martin Luther King, Jr. Boulevard is operating at LOS E, with 350 vehicles per hour in a single left-turn lane.
- Five of nine of the lane groups at the intersection with Martin Luther King, Jr. Boulevard and Weaver Dairy Road are operating at LOS E or F.

Analysis of Weekday Midday Peak Hour

In general, there is no primary directional flow of traffic that is evident during the weekday midday peak hour due to many short distance lunchtime trips. The midday peak primarily affects intersections and roadways that serve as access routes to lunchtime destinations. The traffic capacity analysis has revealed that all intersections were calculated to operate at an overall acceptable LOS (D or better) during the weekday midday peak hour. Several movements at intersections along Martin Luther King, Jr. Boulevard operate at LOS E (particularly at the Weaver Dairy Road intersection), however all V/C ratios do not exceed those during the other peak hour periods studied.

Analysis of Weekday PM Peak Hour

In general, the primary flow of traffic during the weekday PM peak hour flows out of the Town towards the interstate and outlying areas. The traffic capacity analysis has revealed that one signalized intersection within the study area is calculated to operate at an unacceptable overall LOS (E or F) during the weekday PM peak hour. Of note, the following deficiencies are identified for this time period:

- The westbound left-turn movements at Whitfield Road and I-40 WB off-ramps onto southbound Martin Luther King, Jr. Boulevard are operating at LOS E due to traffic volumes approaching the limit of the existing lane capacity.
- The eastbound I-40 off-ramp movements are also projected to operate at LOS E due to conflict with significant through volumes on Martin Luther King, Jr. Boulevard.

- The eastbound left-turn movement on Eubanks Road onto northbound Martin Luther King, Jr. Boulevard is operating at LOS F, since it conflicts with significant through volumes on Martin Luther King, Jr. Boulevard.
- The intersection of Martin Luther King, Jr. Boulevard with Weaver Dairy Road operates at an overall LOS E due to significant lane capacity deficiencies in the westbound direction and a lack of exclusive right-turn lanes on Martin Luther King, Jr. Boulevard.

6.1.4 Roadway Segment Capacity Analysis Results

Average daily traffic (ADT) volume counts were conducted at five locations throughout the study area. Table 6-3 presents the current ADT volumes on each roadway segment.

Table 6-3: 2011 Existing ADT Volumes

ID	Roadway Section	Fall 2011 ADT
1	Eubanks Road, east of Millhouse Road	8,019
2	Eubanks Road, west of Millhouse Road	5,048
3	Eubanks Road, west of Rogers Road	3,850
4	Millhouse Road, north of Eubanks Road	2,812
5	Millhouse Road, north of Railroad Tracks	1,255

Roadway segment capacity analysis was performed using the ADT volumes collected. As shown in Table 6-4, the roadway segment analysis has revealed that the following segments exceed the Town of Chapel Hill's pre-established capacity thresholds during one or more of the peak periods studied:

- Eubanks Road, east of Millhouse Road
- Eubanks Road, west of Millhouse Road
- Millhouse Road, north of Eubanks Road

Table 6-4: 2011 Existing Roadway Segment Capacity Analysis

ID	Roadway Section	Town Classification	V/C Ratio*			
			AM	Midday	PM	AADT
1	Eubanks Road, east of Millhouse Road	Collector				1.15
2	Eubanks Road, west of Millhouse Road	Collector				1.07
3	Eubanks Road, west of Rogers Road	Minor Arterial	0.24	0.05	0.13	
4	Millhouse Road, north of Eubanks Road	Local Non-Res				1.12
5	Millhouse Road, north of Railroad Tracks	Local Non-Res				0.50

*Based on Town of Chapel Hill's Road Classification

Although traffic volumes on some of these segments exceed the planning capacity, this is closely related to the classification of the roadway rather than an actual capacity limitation; thus indicating that the section classification may need to be revisited and not necessarily a candidate for widening.

6.2 Traffic Forecasting

The transit service has corresponding traffic patterns. The land use creates the trips and the modal choices travelers make determine the paths on which the demand falls. The traffic forecasting involved an iterative process of evaluating the trip generation for multiple land development projects and the development of Carolina North. The forecasted volumes are a compilation of four values as shown below:

Background + Offsite + Edge + Park-and-Ride = Total

Background: Annual Increase 1.5% from 2011 to 2015; 1.25% from 2015 to 2035

Offsite: Approved development Not Constructed

The Edge: On-site Land Development

Site: Projected Peak Demand

6.2.1 Offsite

The following is a list of the land development project incorporated into this study (see Figure 6-2). The Traffic Impact Study reports for each project were reviewed and the traffic assigned to travel through the study area was brought into what is termed the “offsite” traffic. These projects were not yet built during the time of the data collection and are therefore accounted for here.

- UNC Development Plan
- Innovation Center (Not included in 2015)
- Residence Inn (Not included in 2015)
- Fraley
- Chapel Hill North
- Chapel Watch Village
- Orange United Methodist Church
- Proposed American Board of Pediatrics Development
- Homestead Twins
- Bradley Ridge
- Sawmills Condominiums
- Purefoy
- Carolina North Project (260,000 sf Research only for 2015)
- Charterwood Development
- St. Paul AME Church

As part of the off-site traffic, Carolina North required unique identification. Carolina North trip forecasting was prepared following a complex methodology which was tested for sensitivity and accepted by the Town after detailed discussion. The method was brought forward for the 2015 analysis using 260,000 square feet of Research with a portion of trips assigned to the Carolina North site and another portion assigned as parking demand at the Eubanks Park-and-Ride Facility. The 2035 forecast included the build out of Carolina North.

6.2.2 The Edge

The Edge is the transit-supportive development which has a current proposal for working in partnership with the Town with the expansion of the Park-and-Ride. This study identifies The Edge separately than the other offsite development as an instrument of evaluating the relationship between the proposed plan and the expansion of the Park-and-Ride.

Table 6-5: Trip Generation for The Edge

Land Use	AM Peak Hour Trips			PM Peak Hour Trips		
	Enter	Exit	Total	Enter	Exit	Total
Residential	49	195	244	187	100	287
Office	191	26	217	36	177	213
Retail	524	437	961	1,036	1,025	2,061
Other	75	48	123	69	61	130
Raw Trip Sub Total	839	706	1,545	1,328	1,363	2,691
Internal Trip Capture	-42	-41	-83	-147	-148	-295
External Trips	797	665	1,462	1,181	1,215	2,396
Non-motorized Trip Reduction	-144	-124	-267	-219	-228	-445
External Auto Trips	653	541	1,195	962	987	1,951
Pass-By Trips (Retail Only)	-93	-93	-186	-290	-290	-580
Total New Auto Site Trips	560	448	1,009	672	697	1,371

The Edge trip generation follows standard ITE traffic forecasting methodology. The non-motorized trip reduction accounts for offsite pedestrian, bicycle, and transit travelers. Extensive discussion evolved around accounting for the patrons of The Edge that drive to the Park-and-Ride. Without question, there is an economic benefit to The Edge for the Park-and-Ride to be on the same site. However, from the traffic analysis perspective, between the internal capture, non-motorized trip reduction and the pass-by trip reductions, there is a high level of confidence that these patrons are accounted for without showing a separate line item for them. If a separate line item is expected, it is

recommended to pull 2%-3% from the non-motorized line item and move it to a "synergy" or "chain trip" line. The actual number is considered to be negligible.

6.2.3 Park-and-Ride Traffic

Trip rates into and out of the parking lot were developed from extensive research for the Carolina North traffic study. The same rates were applied to the parking space demand. The table below shows the calculations performed for the 2015 Analysis. The average existing trips were removed from the forecasted numbers, resulting in the "new" trips. The new trip values were assigned to the network and used in the analysis. The 2035 trips were conservatively calculated and values directly assigned to the network.

Table 6-6: Park-and-Ride Trip Generation

Parking Space Demand	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
2015 Park-and-Ride						
Trip Generation Rates	0.33	0.08	0.41	0.06	0.27	0.33
666 spaces	220	53	273	40	180	220
Existing - 10/24/2011	116	27	143	31	123	154
Existing - 11/08/2011	139	11	150	26	135	161
Average Existing Trips	128	19	147	29	129	158
New Park-and-Ride Peak Hour Trips	93	34	127	12	51	63
2035 Park-and-Ride						
Trip Generation Rates	0.33	0.08	0.41	0.06	0.27	0.33
970 spaces	320	78	398	58	262	320

6.2.4 Total Site Traffic

The land use at the overall site will have traffic from The Edge in combination with the Park-and-Ride. Table 6-7 provides a breakdown of the traffic associated with each contributor.

Table 6-7: Total Site Trip Generation Percentages

Trip Source	AM Peak Hour Trips			PM Peak Hour Trips			Averages
	Enter	Exit	Total	Enter	Exit	Total	
2015							
The Edge	653	541	1,194	962	987	1,949	
Eubanks Park-and-Ride	220	53	273	40	180	220	
Total			1,467			2,169	
% The Edge			81%			90%	86%
% Eubanks Park-and-Ride			19%			10%	14%
2035							
The Edge	653	541	1,194	962	987	1,949	
Eubanks Park-and-Ride	320	78	398	58	262	320	
Total			1,592			2,269	
% The Edge			75%			86%	81%
% Eubanks Park-and-Ride			25%			14%	19%

6.3 Traffic Distribution and Assignment

Traffic associated with the Park-and-Ride was assigned to the roadway network following existing traffic distribution with adjustments based on the regional land development patterns and expected transit demand. Figure 6-3 presents the distribution of traffic used in preparing the traffic assignments at the intersections for the analysis.



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Figure 6-3
Park and Ride Distribution

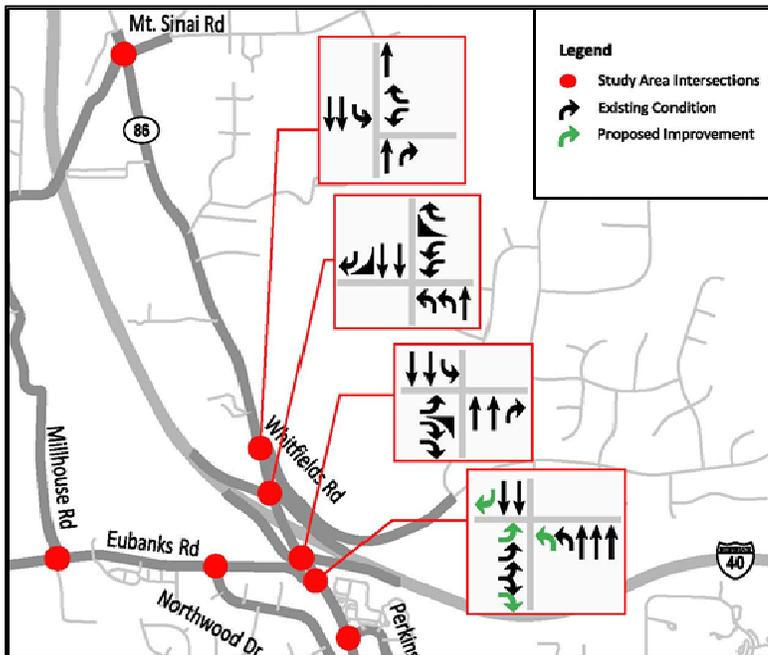
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6.4 2015 Traffic Analysis

An interim year analysis was conducted which includes offsite development, a first phase of the Park-and-Ride, and the completion of The Edge. The results provided information toward understanding the impacts at the interchange of I-40 and Martin Luther King, Jr. Boulevard and the level of improved infrastructure that would be necessary to support the expanded Park-and-Ride, as shown in Figure 6-4.

Two alternatives for an improved interchange operation without modifying the bridge were analyzed. The simplest was to add turn lanes at the Martin Luther King, Jr. Boulevard intersection with Eubanks Road. Table 6-9 presents the results of the analysis for the construction of the first phase of the Park-and-Ride without The Edge.

Figure 6-4: Conceptual Interchange Improvements



The results demonstrate that the interchange will function with an overall acceptable level-of-service; however, there are several movements which will endure long delays. These results indicate that the additional lanes may provide a short-term answer but not a long-term solution.

When combining the traffic associated with the development of The Edge, the need for an alternative is clearly presented. The alternative includes the realignment of the eastbound off-ramp closer to the bridge abutment; and creating a new signalized intersection through realignment of Eubanks Road with the eastbound on-ramp. Figure 6-5 illustrates these improvements, which is followed by the associated cost. With the improvements in place the levels-of-service in Table 6-10 can be achieved.

It is further noted that the results demonstrate the need to reconstruct the interchange to reach a long-term solution.

If The Edge does not move forward, the proposed mitigation and costs will need to be re-evaluated.

Figure 6-5: Conceptual Improvements for 2015 Volumes with The Edge



Table 6-8: Cost for 2015 Improvements with The Edge

Segment	Item	Description	Quantity	Unit	Cost per Unit	Cost
2015						
15A	WB Ramps	1 Extend second WB receiving lane	1700	LF	\$ 600	\$ 1,020,000
		2 Extend second WB left turn lane	1200	LF	\$ 600	\$ 720,000
15B	EB Off-Ramp	1 Approach 475 x 4 lanes, plus taper	1900	LF	\$ 600	\$ 1,140,000
		Extend EB decel lane	1000	LF	\$ 600	\$ 600,000
		2 Add NB lane	300	LF	\$ 600	\$ 180,000
		3 New Traffic Signal	1	Each	\$300,000	\$ 300,000
15C	EB On-Ramp/ Eubanks Rd	1 Realign 2 receiving lanes	1600	LF	\$ 600	\$ 960,000
		Extend EB accel lane	800	LF	\$ 600	\$ 480,000
		2 Realign Eubanks Rd -6 lane approach	1200	LF	\$ 600	\$ 720,000
		3 Add second SB right turn lane	600	LF	\$ 600	\$ 360,000
		4 Add second NB left turn lane	575	LF	\$ 600	\$ 345,000
		5 New Traffic Signal	1	Each	\$300,000	\$ 300,000
	Design		15%			\$ 1,068,750
	Contingency		10%			\$ 712,500
Interchange Subtotal						\$ 8,906,250
15D	Eubanks Rd	1 Eubanks Road 4-lane Divided	11400	LF	\$ 600	\$ 6,840,000
		2 New Traffic Signals	2	Each	\$ 300,000	\$ 600,000
	Design		15%			\$ 1,116,000
Eubanks Road Subtotal						\$ 8,556,000
Total						\$ 17,462,250

Table 6-9: Level-of-Service 2015 Expanded Park-and-Ride with Improvements

NUMBER	INTERSECTION	A P P R O A C H	WEEKDAY AM PEAK HOUR				WEEKDAY PM PEAK HOUR			
			Movement	Movement	Overall	Overall	Movement	Movement	Overall	Overall
			LOS	Delay	LOS	Delay (s)	LOS	Delay	LOS	Delay (s)
1	MLK Blvd (NC 86) at Whitfield Rd (SR 1730)	WBL	E	74.4	B	13.7	E	74.3	B	17.4
		WBR	D	49.4			D	44.9		
		NBT	A	4.1			A	6.8		
		NBL	A	0.2			A	1.1		
		SBL	A	3.3			A	7.4		
		SBT	A	3.7			A	4.9		
2	MLK Blvd (NC 86) at I-40 WB Ramps	WBL	E	57.6	C	31.5	E	57.1	C	31.4
		WBR	D	43.5			D	41.1		
		NBL	D	44.6			C	29.1		
		NBT	A	3.1			A	5.3		
		SBT	C	20.0			C	29.5		
		SBR	B	14.9			C	21.6		
3	MLK Blvd (NC 86) at I-40 EB Ramps	EBL	C	25.4	C	23.0	D	53.1	B	13.6
		EBR	D	47.8			E	68.2		
		NBT	C	34.4			B	13.2		
		NBR	A	1.9			A	1.3		
		SBL	B	19.8			D	47.5		
		SBT	B	13.6			A	2.0		
4	MLK Blvd (NC 86) at Eubanks Rd (SR 1727)	EBL	F	96.5	C	26.3	E	74.5	B	15.2
		EBR	D	52.7			D	46.3		
		NBL	E	68.6			E	56.6		
		NBT	A	3.5			A	5.2		
		SBTR	C	20.3			A	8.2		
5	MLK Blvd (NC 86) at Perkins Dr	WBL	E	67.7	A	7.0	E	72.8	B	19.3
		WBR	D	53.2			D	44.6		
		NBTR	A	3.6			B	13.0		
		SBL	C	20.4			E	77.7		
		SBT	A	3.3			A	2.9		
6	MLK Blvd (NC 86) at Weaver Dairy Rd (SR 1733)	EBL	E	77.2	C	34.8	E	68.6	C	33.1
		EBT	E	57.4			E	59.3		
		WBL	E	62.5			E	63.1		
		WBT	D	51.2			D	53.3		
		WBR	D	37.6			D	53.1		
		NBL	F	84.7			D	53.3		
		NBT	C	26.8			C	21.8		
		NBR	C	34.3			B	19.1		
		SBL	D	46.6			E	56.5		
		SBT	B	15.0			C	20.5		
		SBR	B	10.5			B	17.7		

Table 6-10: Level-of-Service 2015 Expanded Park-and-Ride and The Edge with Improvements

NUMBER	INTERSECTION	A P P R O A C H	WEEKDAY AM PEAK HOUR				WEEKDAY PM PEAK HOUR			
			Movement	Movement	Overall	Overall	Movement	Movement	Overall	Overall
			LOS	Delay	LOS	Delay (s)	LOS	Delay	LOS	Delay (s)
1	MLK Blvd (NC 86) at Whitfield Rd (SR 1730)	WBL	E	74.6	B	16.8	E	71.9	B	15.8
		WBR	D	48.9			D	44.4		
		NBT	B	11.1			A	3.9		
		NBL	A	6.9			A	0.4		
		SBL	A	3.4			A	8.1		
		SBT	A	3.8			A	5.1		
2	MLK Blvd (NC 86) at I-40 WB Ramps	WBL	D	51.6	C	34.6	E	61.9	D	49.8
		WBR	C	34.6			C	31.6		
		NBL	C	33.0			E	56.9		
		NBT	A	2.6			C	22.3		
		SBT	D	37.3			D	54.4		
		SBR	C	31.1			C	31.1		
3	MLK Blvd (NC 86) at I-40 EB Ramps	EBL	C	24.5	C	32.6	D	42.7	B	20.0
		EBR	E	57.8			E	73.3		
		NBT	D	48.5			C	29.3		
		NBR	A	3.3			A	3.5		
		SBL	D	37.7			C	23.5		
		SBT	C	28.0			A	2.3		
4	MLK Blvd (NC 86) at Eubanks Rd (SR 1727)	EBL	E	77.6	C	31.3	E	68.9	C	29.3
		EBR	E	56.1			D	45.0		
		NBL	E	77.5			E	74.7		
		NBT	A	6.4			A	3.7		
		SBT	C	23.7			C	23.3		
		SBR	A	7.3			B	18.9		
5	MLK Blvd (NC 86) at Perkins Dr	WBL	E	69.0	A	7.8	E	76.8	C	20.4
		WBR	D	51.0			D	46.2		
		NBTR	A	4.4			B	11.3		
		SBL	D	49.7			D	53.2		
		SBT	A	1.6			B	14.3		
6	MLK Blvd (NC 86) at Weaver Dairy Rd (SR 1733)	EBL	E	76.6	D	43.7	E	68.7	D	37.5
		EBT	E	56.2			E	59.3		
		WBL	F	165.5			E	59.8		
		WBT	E	59.7			D	52.7		
		WBR	D	43.3			D	46.9		
		NBL	E	76.3			E	57.5		
		NBT	C	26.1			C	32.6		
		NBR	C	30.0			C	22.1		
		SBL	E	70.2			E	69.0		
		SBT	B	17.5			C	25.0		
		SBR	B	12.9			B	18.0		

6.5 2035 Traffic Analysis

An evaluation of the transportation impacts associated with the proposed Eubanks Park-and-Ride project relies on an understanding of the future transportation system surrounding the site without the proposed development. Since travel in the study area would continue to increase with or without the impacts generated by the Park-and-Ride facility expansion, understanding the future conditions without the proposed development makes it possible to compare the build impacts against a baseline condition. The following sections describe the transportation system in the future conditions without the Eubanks Park-and-Ride expansion.

6.5.1 2035 Future No-Build Traffic Analysis

Two types of background growth were evaluated: ambient growth and site specific growth. Ambient growth is generated by growth throughout the region. Site specific growth is generated by approved developments in the vicinity of the project.

To mitigate impacts to the transportation network from traffic associated with approved development projects, a series of roadway and intersection improvements are needed in the vicinity of the project property to offset the impacts of the traffic growth, which causes many individual turning movements and intersections in the vicinity of the site to degrade to LOS E or F. These improvements are an important consideration in the analysis of future traffic operations and were included in the intersection operations analysis for the year 2035 No-Build with Improvements Scenario illustrated in Figure 6-6. The following is a list of the improvements needed to offset the impacts of local and regional traffic growth:

Table 6-11: 2035 No-Build Needed Roadway Improvements

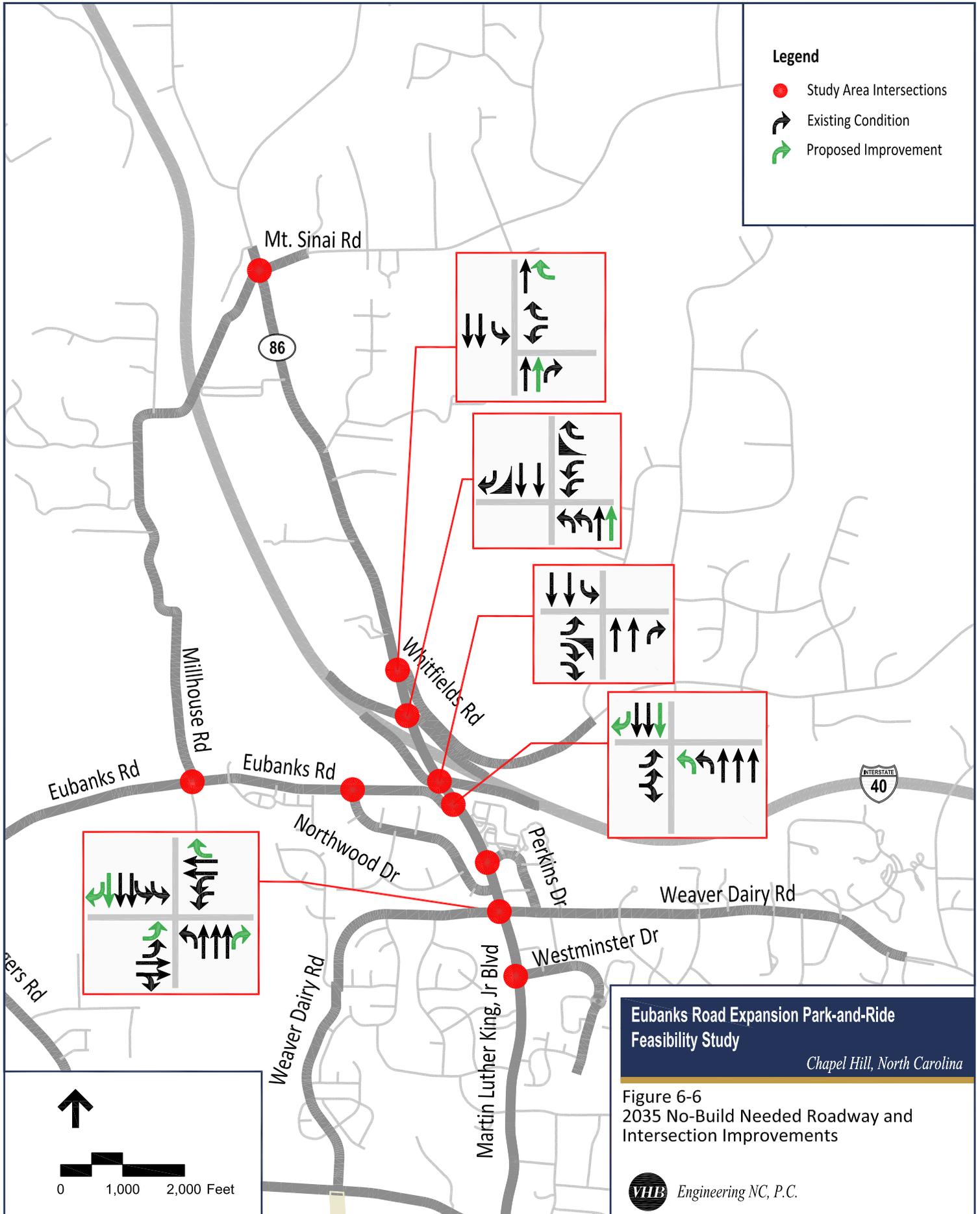
Location/Intersection	2035 No-Build Improvements Needed
Martin Luther King, Jr. Boulevard (NC 86) & Whitfield Road	➤ Add a 2 nd NB through lane on Martin Luther King, Jr. Boulevard from the I-40 WB ramp intersection that ends 500 feet to the north of Whitfield Road
Martin Luther King, Jr. Boulevard (NC 86) & I-40 WB Ramps	➤ Restripe the NB bridge lane configuration and widen Martin Luther King, Jr. Boulevard (north of the bridge only) to provide for 2 NB through lanes through the intersection
Martin Luther King, Jr. Boulevard (NC 86) & Eubanks Road	➤ Add a 3 rd southbound through lane from the I-40 EB ramp through the Homestead Road intersection ➤ Add a 200-ft SB right turn lane on Martin Luther King, Jr. Boulevard ➤ Add dual-left turn lanes on Eubanks Road

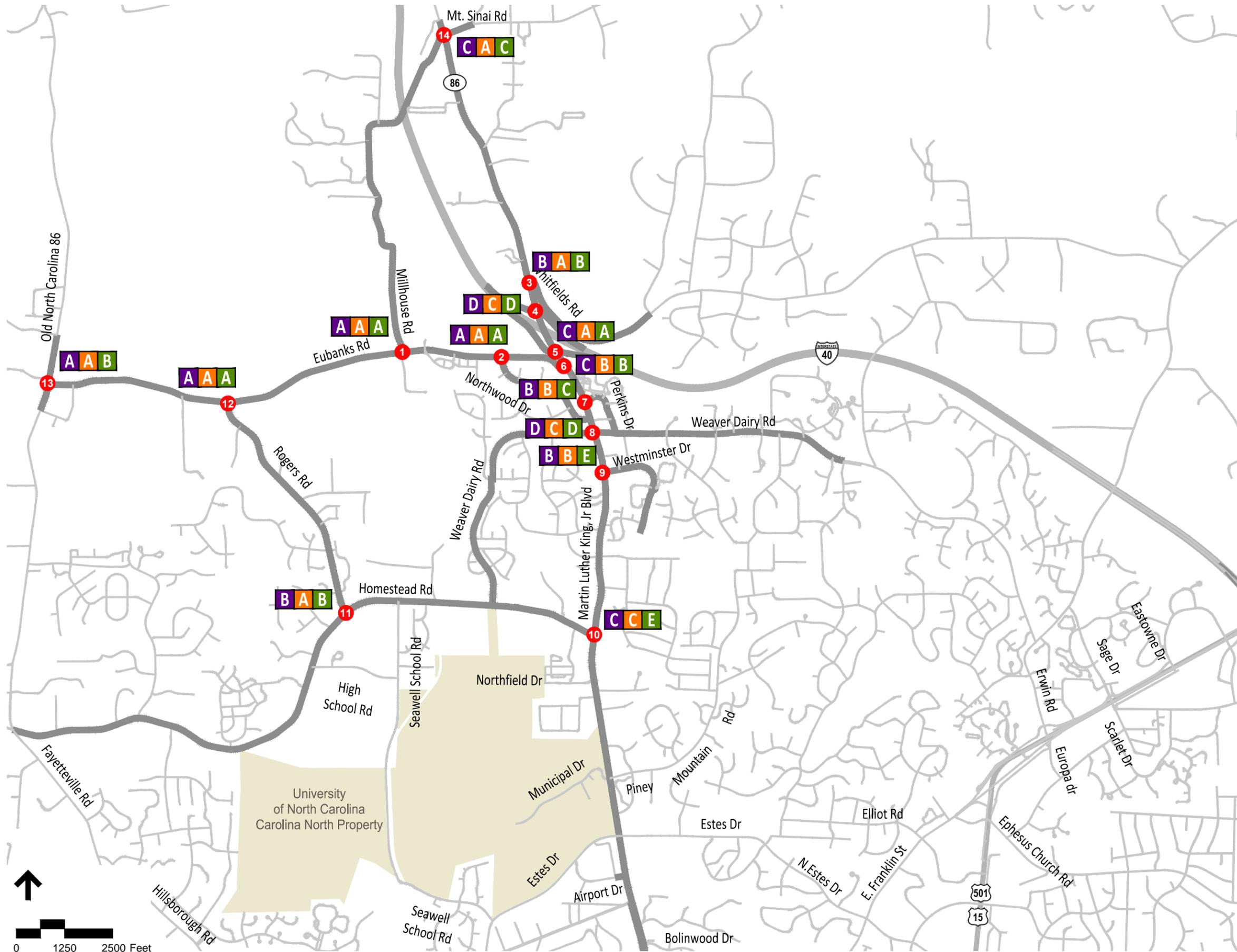
Table 6-11: 2035 No-Build Needed Roadway Improvements (Cont)

Location/Intersection	2035 No-Build Improvements Needed
Martin Luther King, Jr. Boulevard (NC 86) & Weaver Dairy Road	<ul style="list-style-type: none"> ➤ Add a 3rd SB through lane from the I-40 EB ramp through the Homestead Road intersection ➤ Construct an exclusive southbound right-turn lane ➤ Restripe to provide 2nd EB left-turn lane on Weaver Dairy and eliminate split phasing ➤ Add an exclusive WB right-turn lane on Weaver Dairy ➤ Add an exclusive NB right-turn lane on Martin Luther King, Jr. Boulevard
Martin Luther King, Jr. Boulevard (NC 86) & Homestead Road	➤ Add dual right turn lanes on eastbound Homestead Road
Homestead Road and Rogers Road	➤ Warrant 3 criteria met: Add a traffic signal
Old NC 86 and Eubanks Road	➤ Warrant 3 criteria met: Add a traffic signal
Martin Luther King, Jr. Boulevard (NC 86) & Millhouse Road/Mt. Sinai Road	➤ Warrant 3 criteria met: Add a traffic signal

6.6 Intersection Operations Analysis

Each studied intersection was evaluated with the future 2035 No-Build traffic volumes to determine the future LOS without the proposed project. The future lane geometry and signal timing information were input into Synchro 7 software along with future No-Build traffic volumes at the study area intersections to conduct the future No-Build capacity analysis. The capacity analysis results for the intersections within the study area are summarized in Figure 6-7.





- Legend**
- Study Area Intersections**
- 1 Eubanks Road and Millhouse Road
 - 2 Eubanks Road and Northwood Drive
 - 3 Martin Luther King Jr. Blvd and Whitfield Road
 - 4 Martin Luther King Jr. Blvd and I-40 Westbound Ramps
 - 5 Martin Luther King Jr. Blvd and I-40 Eastbound Ramps
 - 6 Martin Luther King Jr. Blvd and Eubanks Road
 - 7 Martin Luther King Jr. Blvd and Perkins Drive
 - 8 Martin Luther King Jr. Blvd and Weaver Dairy Road
 - 9 Martin Luther King Jr. Blvd and Westminster Drive
 - 10 Martin Luther King Jr. Blvd and Homestead Road
 - 11 Homestead Road and Rodgers
 - 12 Eubanks Road and Rodgers Road
 - 13 Eubanks Road and Old North Carolina 86
 - 14 86 and Mt. Sinai Road and Millhouse Road

Overall Peak Hour LOS

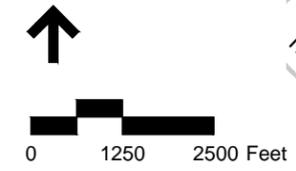
A B C

PM
Midday
AM

Eubanks Road Expansion Park-and-Ride Feasibility Study
Chapel Hill, North Carolina

Figure 6-7
2035 No-Build with Improvements
Intersection Levels-of-Service

Chapel Hill, North Carolina



6.7 Roadway Segment Analysis

In addition to intersection analysis, analysis of five roadway segments identified by the Town was also performed. The Town's Guidelines for Traffic Impact Analysis require the roadway segments to be analyzed based on a daily volume to capacity ratio where the threshold capacities are established by roadway classification. The results are shown in the following table.

Table 6-12: 2035 No-Build Roadway Segments ADT's

ID	Roadway Section	2035 ADT
1	Eubanks Road, east of Millhouse Road	11,131
2	Eubanks Road, west of Millhouse Road	6,888
3	Eubanks Road, west of Rogers Road	5,501
4	Millhouse Road, north of Eubanks Road	4,065
5	Millhouse Road, north of the railroad tracks	1,652

The roadway segment analysis has revealed that no additional roadway segments will exceed the Town of Chapel Hill's pre-established capacity thresholds during in the 2035 No-Build scenario beyond those in the 2009 Existing scenario. The links of Eubanks Road east of Millhouse Road and Millhouse Road north of Eubanks Road are projected to continue to operate over their threshold capacities. Consideration should be given to widening these roads to 3- or 4-lane sections (as applicable) is recommended.

Table 6-13: 2035 No-Build Roadway Segments Capacity

ID	Roadway Section	Town Classification	V/C Ratio*			
			AM	Midday	PM	AADT
1	Eubanks Road, east of Millhouse Road	Collector				1.59
2	Eubanks Road, west of Millhouse Road	Collector				0.98
3	Eubanks Road, west of Rogers Road	Minor Arterial	0.34	0.06	0.19	
4	Millhouse Road, north of Eubanks Road	Local Non-Res				1.63
5	Millhouse Road, north of the railroad tracks	Local Non-Res				0.66

6.8 2035 Future Build Traffic Analysis

Baseline Alternative – Site A

The traffic analysis for Site A is described below. Two scenarios were considered. The first scenario looks at adding the Park-and-Ride on Site A without additional mitigation. A second scenario provides a possible mitigation concept for the I-40 interchange and Eubanks Road interchange.

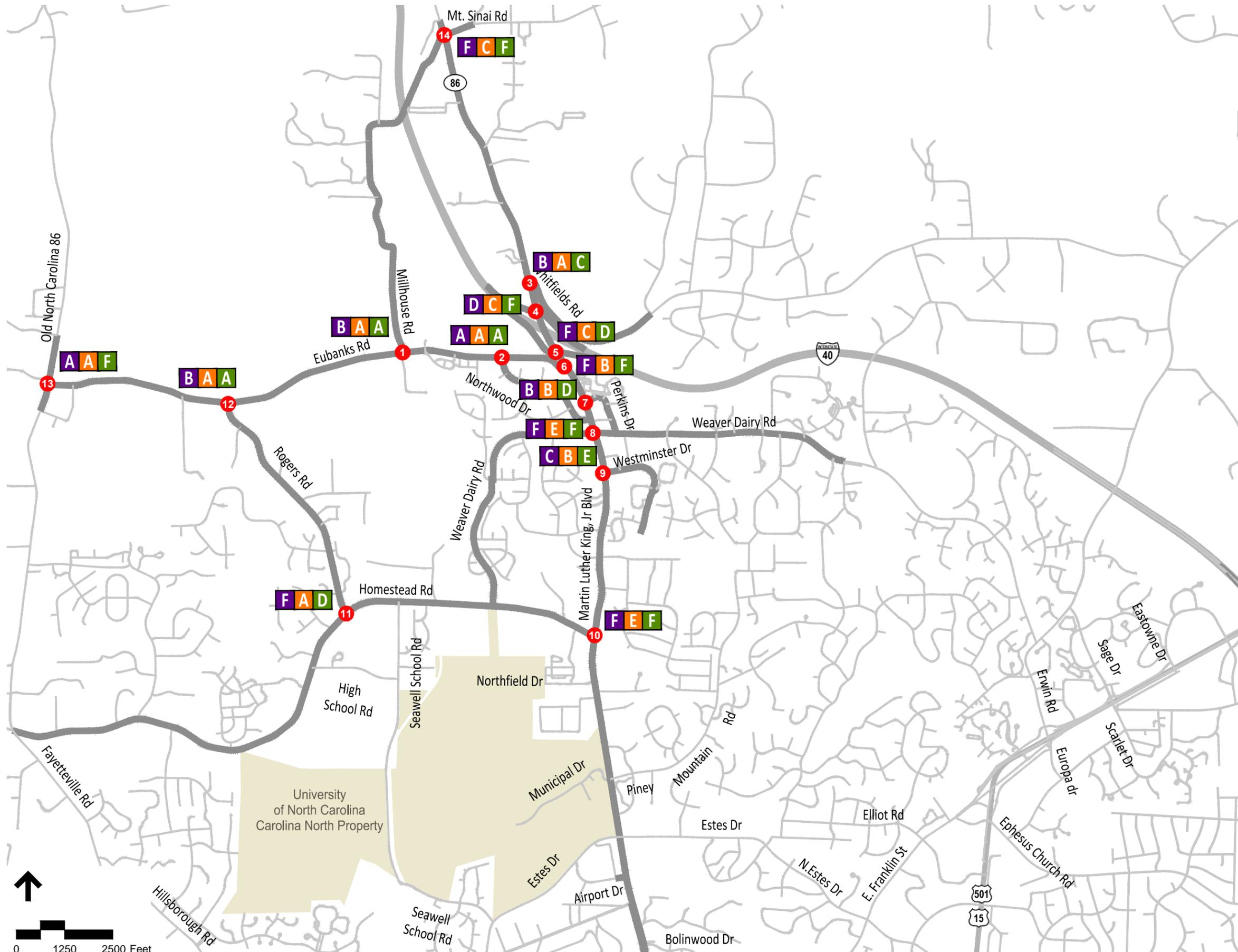
2035 Future Build Traffic Analysis – without Mitigation

This scenario represents 1) the roadway infrastructure in place to support the 2015 forecasted background and offsite traffic, including The Edge, in combination with 2) the 2035 background and Park-and-Ride expansion traffic. It should be noted that no potential traffic mitigation measures associated with the Eubanks Park-and-Ride lot were considered in this scenario, including signal timing changes. The Highway Capacity Manual (HCM) output reports generated by the Synchro 7 software were used for this analysis. The capacity analysis results for the intersections are summarized in Figure 6-8.

When comparing the results for the “2035 Build without Mitigation” scenario to the “2035 No-Build with Mitigation” scenario, the following intersections were found to operate at overall LOS E or F and the overall LOS deteriorated due to traffic volumes generated by the Eubanks Park-and-Ride expansion:

- Martin Luther King, Jr. Boulevard (NC 86) & Whitfield Road - PM
- Martin Luther King, Jr. Boulevard (NC 86) & I-40 Eastbound Ramps – AM, midday, PM
- Martin Luther King, Jr. Boulevard (NC 86) & Eubanks Road – AM, PM

It should be noted that the critically deficient turning movements within the study area for this scenario are the eastbound right-turn movement from the I-40 eastbound off-ramp, and the eastbound and southbound movements at the intersection of Eubanks Road and Martin Luther King, Jr. Boulevard. With the addition of the site traffic for the expanded Eubanks Park-and-Ride lot, there are significant queues and congestion projected to occur between these two closely spaced intersections. The volumes projected for this scenario essentially demand the removal the traffic signal on Martin Luther King, Jr. Boulevard at Eubanks Road in order to be able to process the volumes exiting and entering I-40 without causing negative impacts to the interstate system.



Legend

Study Area Intersections

- 1 Eubanks Road and Millhouse Road
- 2 Eubanks Road and Northwood Drive
- 3 Martin Luther King Jr. Blvd and Whitfield Road
- 4 Martin Luther King Jr. Blvd and I-40 Westbound Ramps
- 5 Martin Luther King Jr. Blvd and I-40 Eastbound Ramps
- 6 Martin Luther King Jr. Blvd and Eubanks Road
- 7 Martin Luther King Jr. Blvd and Perkins Drive
- 8 Martin Luther King Jr. Blvd and Weaver Dairy Road
- 9 Martin Luther King Jr. Blvd and Westminster Drive
- 10 Martin Luther King Jr. Blvd and Homestead Road
- 11 Homestead Road and Rodgers
- 12 Eubanks Road and Rodgers Road
- 13 Eubanks Road and Old North Carolina 86
- 14 86 and Mt. Sinai Road and Millhouse Road

Overall Peak Hour LOS

- A PM
- B Midday
- C AM

Eubanks Road Expansion Park-and-Ride Feasibility Study
 Chapel Hill, North Carolina

Figure 6-8
 2035 Build without Mitigation
 Intersection Level-of-Service

Chapel Hill, North Carolina

6.9 2035 Future Build Traffic Analysis – with Mitigation

A number of analysis iterations were completed in order to determine the potential roadway improvements that would be needed to offset the traffic impacts of the expanded Eubanks Park-and-Ride facility. In addition to the Park-and-Ride expansion, the 2035 traffic forecasts used for these analyses include the full build out of The Edge plus 13 land development projects. Effort was made to minimize the impacts and/or modifications proposed to the ramps and bridge for the NC 86/I-40 Interchange. As stated previously, the projected traffic volumes at the signalized intersection with Eubanks Road and Martin Luther King, Jr. Boulevard are too high to accommodate in such close proximity to the interchange without causing significant negative impacts on the interstate system. Therefore, one recommended improvement scenario suggests the removal of the traffic signal at Martin Luther King, Jr. Boulevard and Eubanks Road, and replacement with a grade-separated underpass.

This concept is illustrated in Figure 6-9. The roadway improvements include:

- Elimination of the traffic signal at the existing intersection of Eubanks Road and Martin Luther King, Jr. Boulevard.
- Create a direct connection from the I-40 EB off-ramp to Eubanks Road to provide direct access to the Park-and-Ride lot and reduce the weaving on Martin Luther King, Jr. Boulevard.
- Construct an underpass for Eubanks Road to cross underneath Martin Luther King, Jr. Boulevard and a system of ramps creating right ins/outs on Martin Luther King, Jr. Boulevard.
- Realign the on-ramp from northbound Martin Luther King, Jr. Boulevard to eastbound I-40 to reduce the volume on Martin Luther King, Jr. Boulevard that conflicts with Eubanks Road traffic.

The improvements are identified and labeled in segments which directly correspond to the cost estimates presented in Table 6-14. The naming convention references the associated year and sequential alphanumeric assignments.

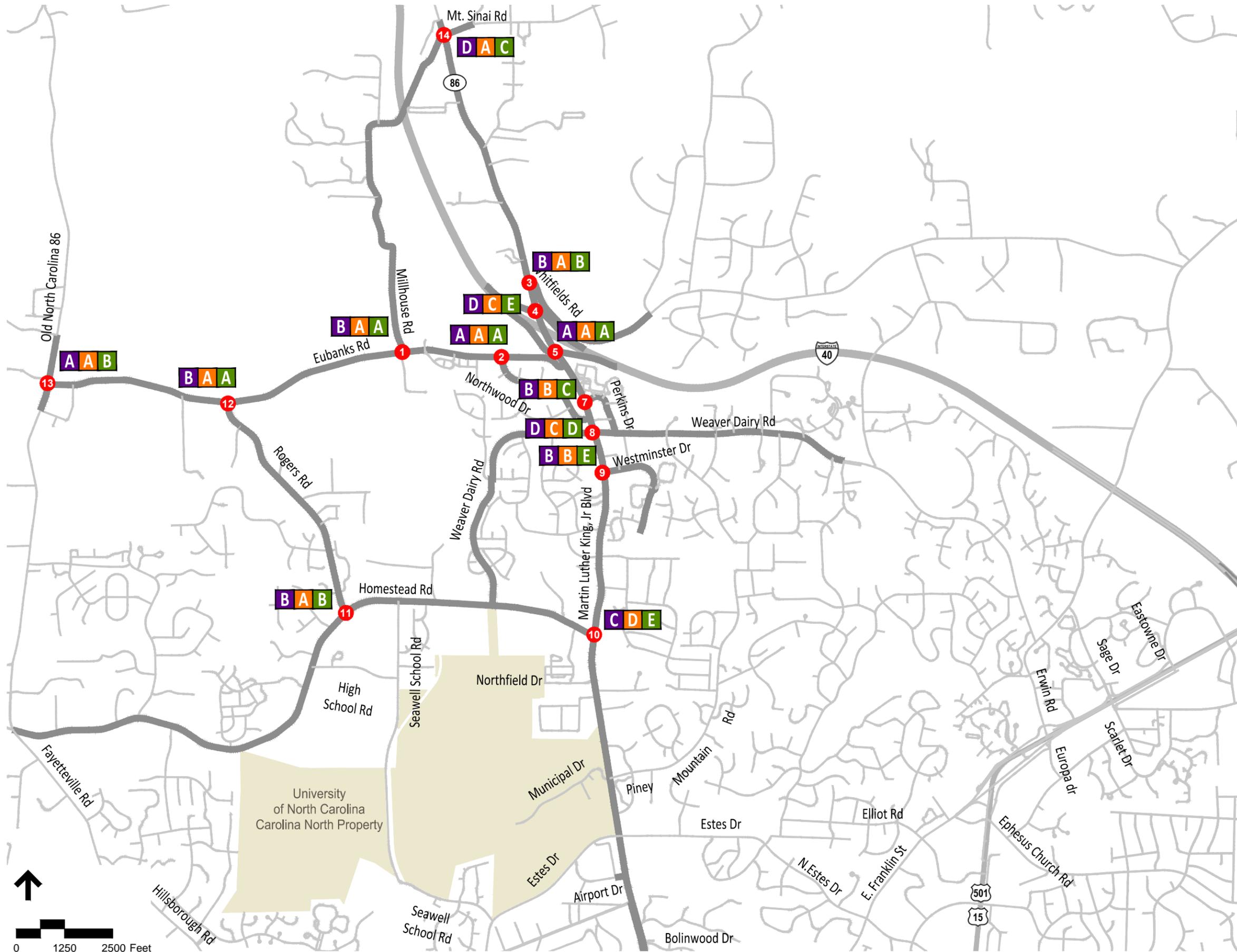
The capacity analysis results for the 2035 volumes with the above improvements are summarized in Figure 6-10.

Figure 6-9: Conceptual 2035 Interchange Modification



Table 6-14: Cost Estimate for Conceptual 2035 Interchange Modification

Segment	Item	Description	Quantity	Unit	Cost per Unit	Cost
2035						
35A	I-40 EB Off-Ramp/	1 Add I-40 EB Off-Ramp	425	LF	\$ 600	\$ 255,000
	Eubanks Rd	2 New Traffic Signal	1	Each	\$300,000	\$ 300,000
		3 Add 2 Lane Ramp to SB MLK	350	LF	\$ 1,100	\$ 385,000
		4 Add 4 Lanes to Eubanks Road	800	LF	\$ 1,800	\$ 1,440,000
35B	Eubanks Bridge	1 Add 2 Lane Ramp from NB MLK	880	LF	\$ 1,100	\$ 968,000
		2 Add Bridge	50 x 175	SF	\$ 300	\$ 2,625,000
		3 Add Median to MLK	530	LF	\$ 400	\$ 212,000
35C	I-40 EB On-Ramp/	1 Add 1 Lane to MLK	460	LF	\$ 600	\$ 276,000
	MLK	2 Add 1 Lane Ramp to I-40	1245	LF	\$ 600	\$ 747,000
		3 Add 12' MSE Wall	12 x 250	SF	\$ 50	\$ 150,000
	Design		15%			\$ 1,103,700
	Contingency		10%			\$ 735,800
Total						\$ 9,197,500



Legend

Study Area Intersections

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- 10 Martin Luther King Jr. Blvd and Homestead Road
- 11 Homestead Road and Rodgers
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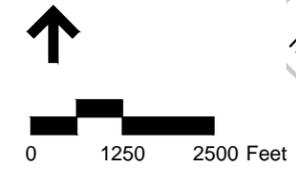
Overall Peak Hour LOS

- A PM
- B Midday
- C AM

Eubanks Road Expansion Park-and-Ride Feasibility Study
Chapel Hill, North Carolina

Figure 6-10
2035 Build with Mitigation Levels-of-Service

Chapel Hill, North Carolina



6.9.1 Alternate Mitigation – Site A

An alternative mitigation concept for the preferred site (Site A) was considered. With this alternate, a new roadway and bridge over I-40 is proposed. This new road and bridge connects the current intersection of Whitfield Road and NC 86 to Eubanks Road, serving the development area and Park-and-Ride. This alternative mitigation concept provides increased accessibility and route options to Site A which may be easier to construct since it does not require reconstruction of a major roadway while in service. This alternative mitigation concept is illustrated in Figure 6-11 with the associated costs following in Table 6-15.

Figure 6-11: Conceptual 2035 Proposed I-40 Bridge Crossing

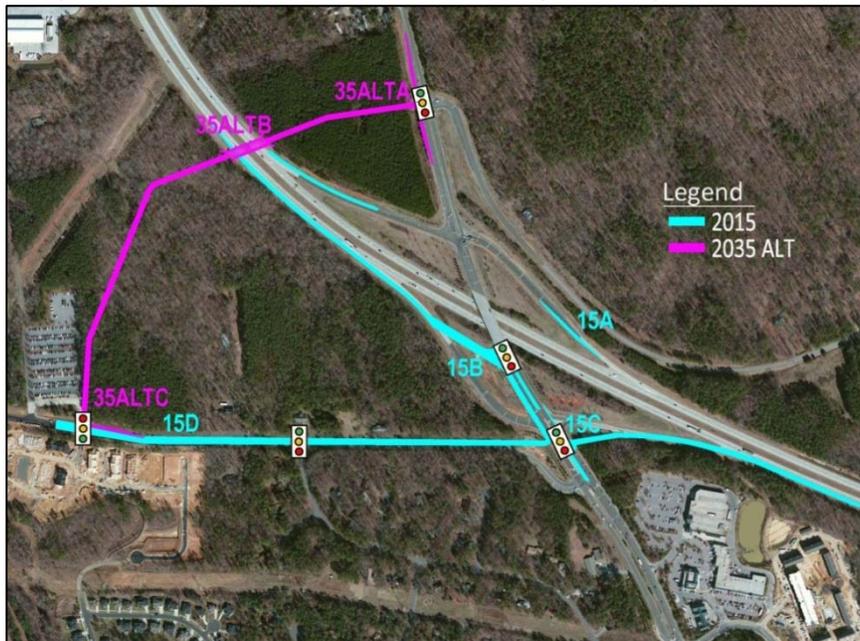


Table 6-15: Cost Estimate for Conceptual 2035 Proposed I-40 Bridge Crossing

Segment	Item	Description	Quantity	Unit	Cost per Unit	Cost
2035 Alternative						
35ALTA	Whitfield Ext	1 Add Turning Lanes	770	LF	\$ 600	\$ 462,000
		2 Add 2 Lane New Road	890	LF	\$ 1,100	\$ 979,000
		3 New Traffic Signal	1	Each	\$300,000	\$ 300,000
35ALTB	Bridge	1 Add Bridge Over I-40	70 x 230	SF	\$ 300	\$ 4,830,000
35ALTC	Whitfield Ext/ Eubanks	1 Add 2 Lane New Road	1880	LF	\$ 1,100	\$ 2,068,000
		2 Add Turning Lane	400	LF	\$ 600	\$ 240,000
	Design		15%			\$ 1,331,850
	Contingency		10%			\$ 887,900
Total						\$11,098,750

6.10 2035 Future Build Traffic Analysis – Site Located North of I-40

Although the roadway concepts provide capacity, it is important to recognize that the traffic mitigation costs for Site A are very high. Should these costs become prohibitive and outweigh the benefits associated with the additional economic development and the consistency with planning initiatives associated with Site A, Site F may be considered a viable site for the Park-and-Ride. An alternative traffic scenario with the future Park-and-Ride located on Site F in the northwest quadrant of the I-40/NC 86 interchange was analyzed to determine the needed roadway improvements to support the facility in this location. For this scenario, it was assumed that access to the future Park-and-Ride lot would occur at an entrance from NC 86 located approximately 600 feet north of the intersection with Whitfield Road. Below is a discussion of the analysis results.

A comparative traffic impact assessment of Site A and Site F was conducted to better understand the mitigation requirements for each site. One of the most significant differentiating factors between the two sites is the traffic impacts and type of mitigation that is likely to be required. In this analysis, Site A is evaluated as a baseline, as presented above, and Site F is analyzed as an alternative site.

6.10.1 Alternate Park-and-Ride Site – Site F

The future lane geometry for the 2035 No-Build with Mitigation scenario and the 2035 build peak hour traffic volumes with the future Park-and-Ride lot located in the northwest quadrant of the I-40/NC 86 interchange were input into Synchro 7 software to conduct the year 2035 Build without Mitigation scenario traffic capacity analysis. The traffic distribution on the roadway network is assumed to match the overall regional approach percentages as for the site location on Eubanks Road, but the specific final distribution approaches the site is as follows:

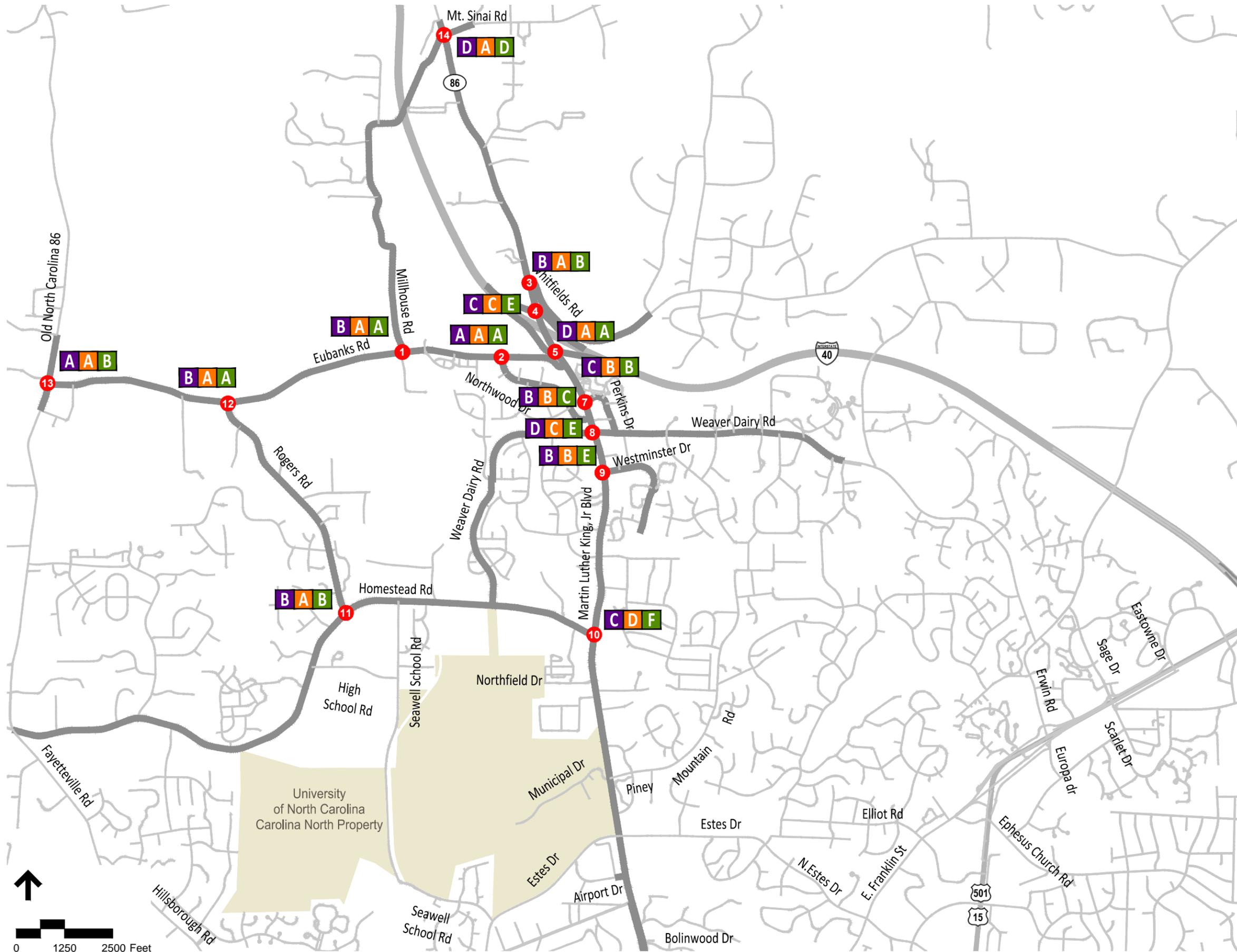
- 18% approaches from the north on NC 86
- 82% approaches from the south on NC 86, including the following breakdown:
 - 20% from Eubanks Road to the west
 - 8% from the south on MLK, JR. Boulevard from the Town of Chapel Hill
 - 32% from the west on I-40
 - 22% from the east on I-40

It should be noted that no potential traffic mitigation measures associated with the Eubanks Park-and-Ride lot were considered in this analysis scenario, except for signal timing modifications. The Highway Capacity Manual (HCM) output reports generated by the Synchro 7 software were used for this analysis. The capacity analysis results are summarized within Figure 6-12.

When comparing the results for the 2035 Build without Mitigation scenario for Site F to the 2035 No-Build with Mitigation scenario, it is important to note that no additional intersections are found to operate at LOS E or F beyond the No-Build scenario. This is because much of the traffic generated by the Park-and-Ride facility is added to turning movements at the interchanges that have sufficient available capacity. Therefore, no additional off-site roadway improvements would be needed to support the Park-and-Ride facility at this location.

As a means for access management, the following improvements are necessary to accommodate traffic at the proposed new entrance to the Park-and-Ride lot on NC 86:

- An exclusive southbound right-turn lane on NC 86 into the site entrance;
- An exclusive northbound left-turn lane on NC 86 into the site entrance;
- Install a traffic signal at the entrance to the Park-and-Ride lot on NC 86 in order to create gaps in through traffic on NC 86.



- Legend**
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 - 12 Eubanks Road and Rodgers Road
 - 13 Eubanks Road and Old North Carolina 86
 - 14 86 and Mt. Sinai Road and Millhouse Road

A B C Overall Peak Hour LOS

- PM
- Midday
- AM

Eubanks Road Expansion Park-and-Ride Feasibility Study
Chapel Hill, North Carolina

Figure 6-12
2035 Build North of I-40 without Mitigation Levels-of-Service

Chapel Hill, North Carolina

