Alternatives Analysis Final Report: Appendices

Durham-Orange County Corridor

Triangle Regional Transit Program
our transit future

APRIL 2012

Prepared for: TriangleTransit

Prepared by: URSTeam

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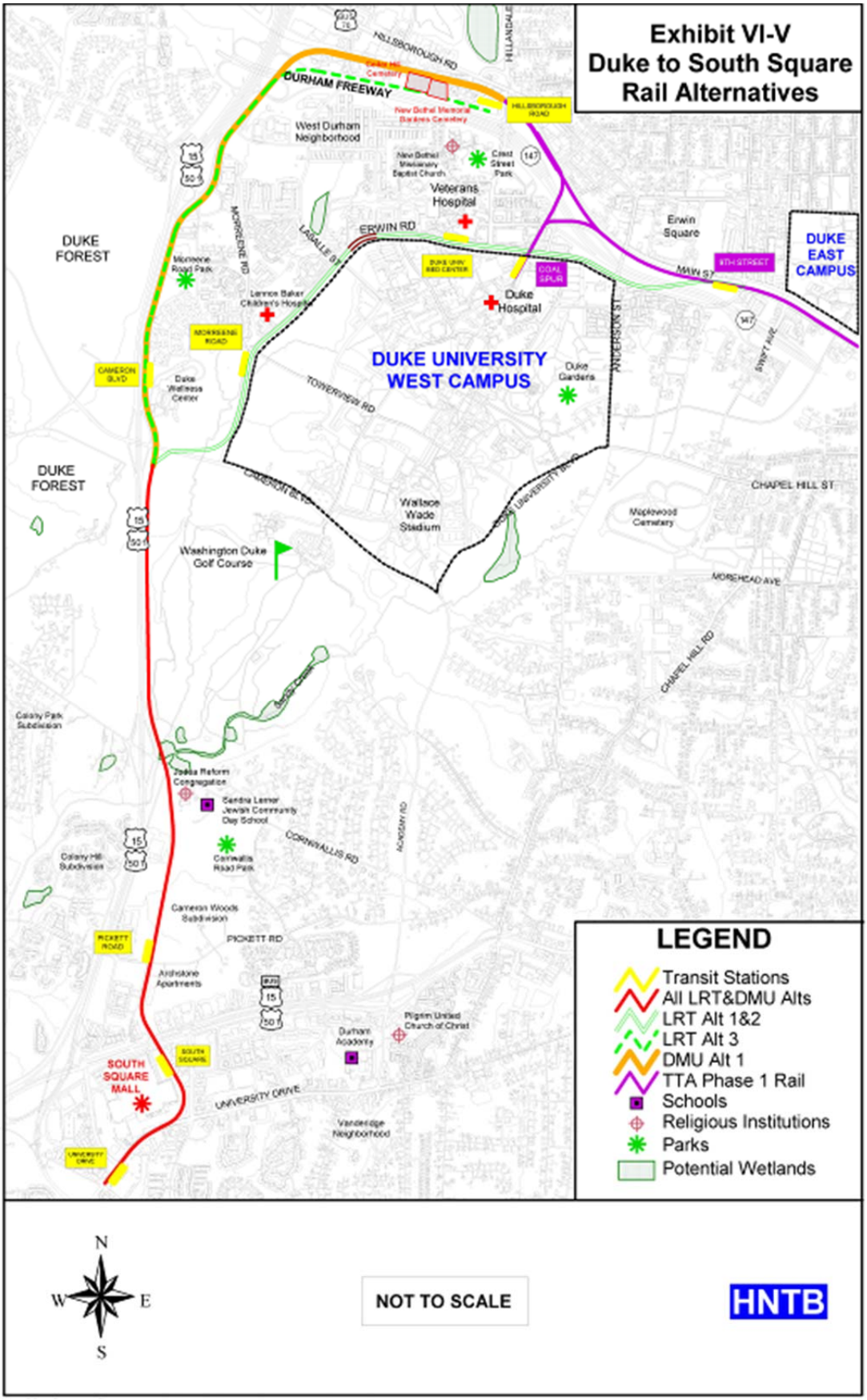
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HILLSBOROUGH RD
West Durham
Neighborhood
Veterans
Hospital
ERWIN RD
DUKE
FOREST
Erwin
Square
DUKE
EAST
CAMPUS
Duke
Hospital
DUKE UNIVERSITY
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Duke
Gardens
DUKE
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Schools
Religious Institutions
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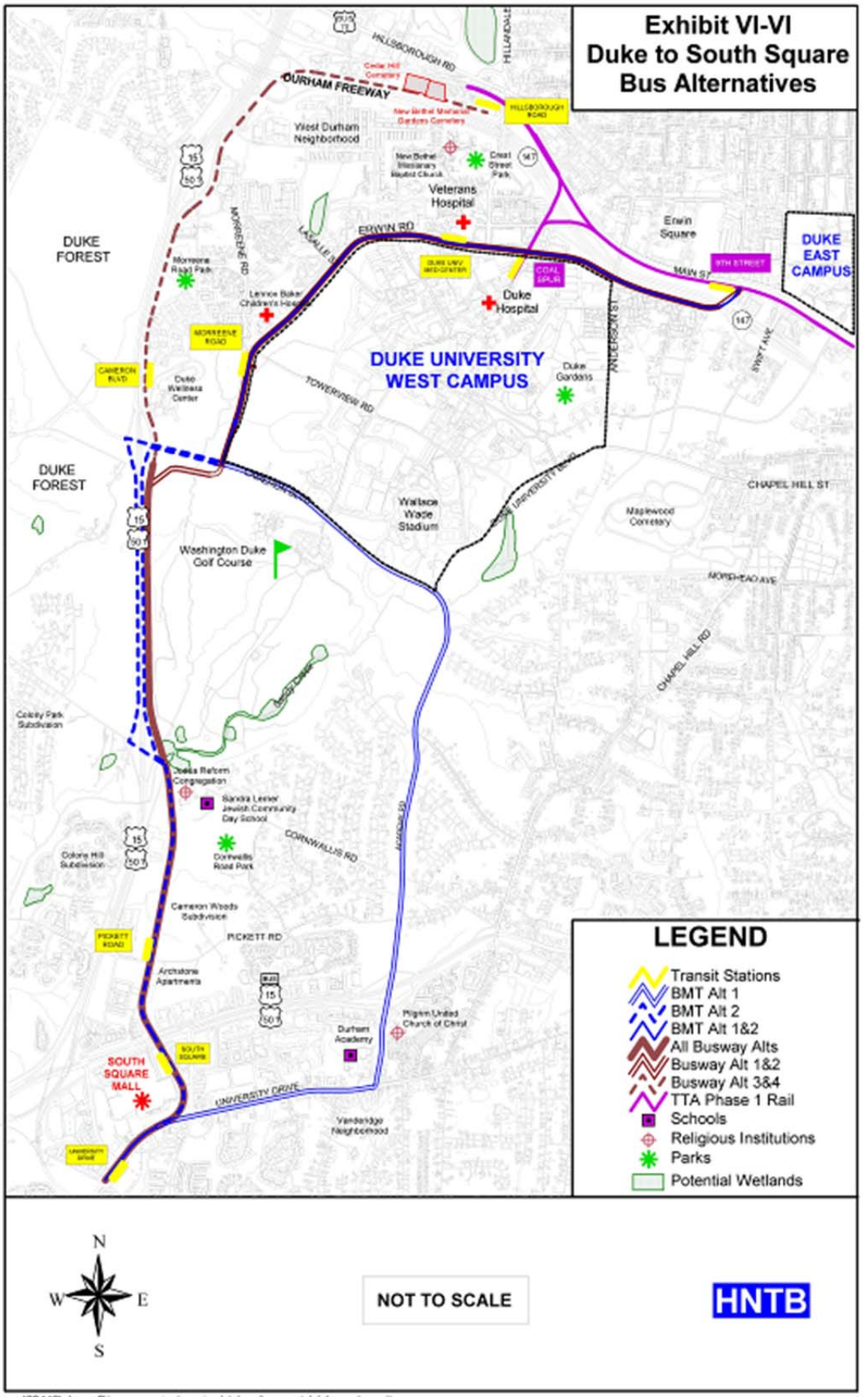
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Bus Alternatives
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DUKE
FOREST
DUKE
FOREST
Erwin
Square
DUKE
EAST
CAMPUS
Duke
Hospital
DUKE UNIVERSITY
WEST CAMPUS
Duke
Gardens
TOWERVIEW RD
Washington Duke
Golf Course
Wallace
Wade
Stadium
CHAPEL HILL ST
Maplewood
Cemetery
MORGAN CREEK
CHAPEL HILL RD
CORNWALLIS RD
Cornwallis
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Cameron Woods
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All Busway Alts
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TTA Phase 1 Rail
Schools
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Parks
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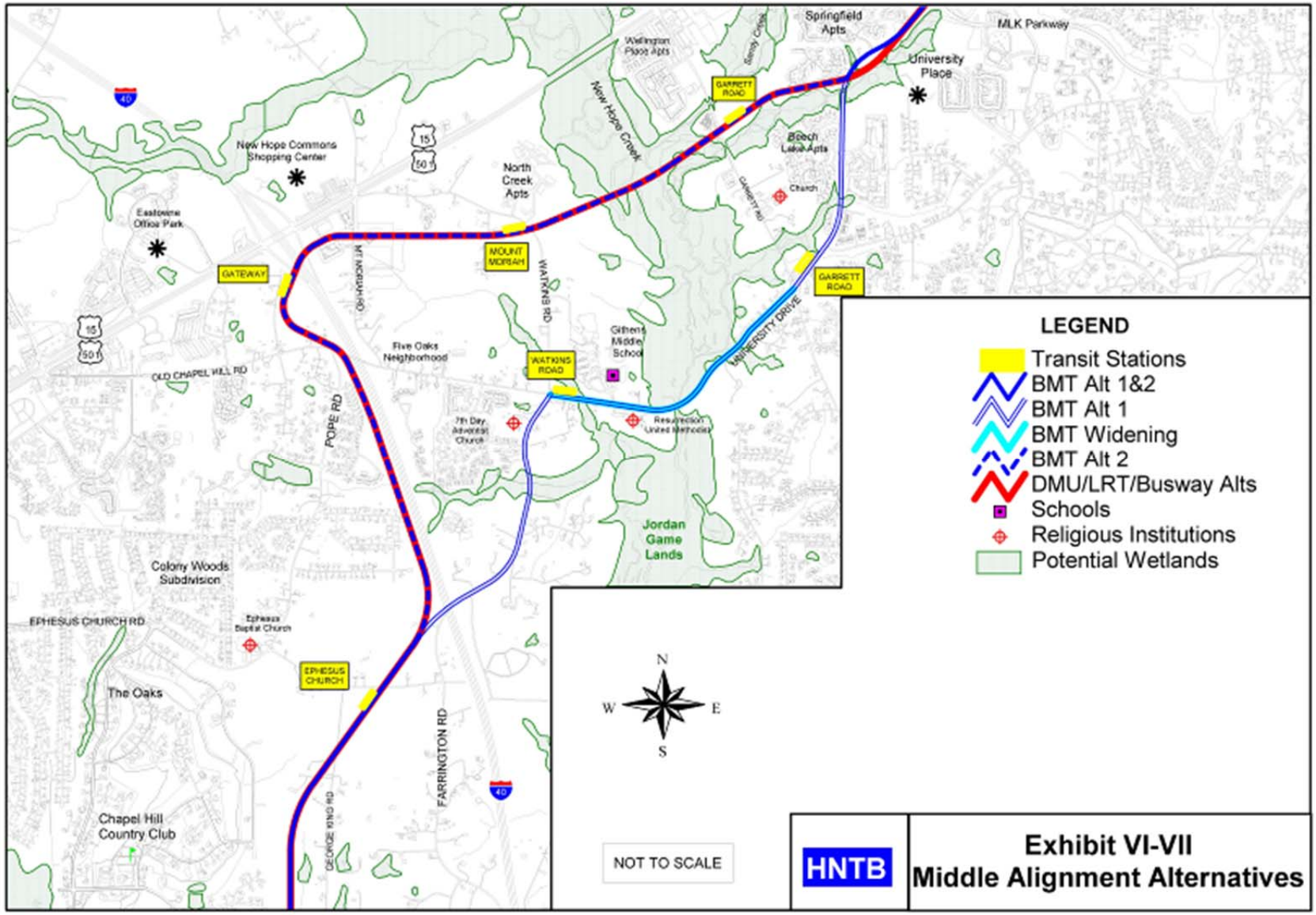
Springfield Apts
MLK Parkway
University Place
Wellington Place Apts
Sandy Creek
New Hope Creek
GARRETT ROAD
Beech Lake Apts
Church
New Hope Commons Shopping Center
North Creek Apts
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7th Day Adventist Church
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Jordan Game Lands
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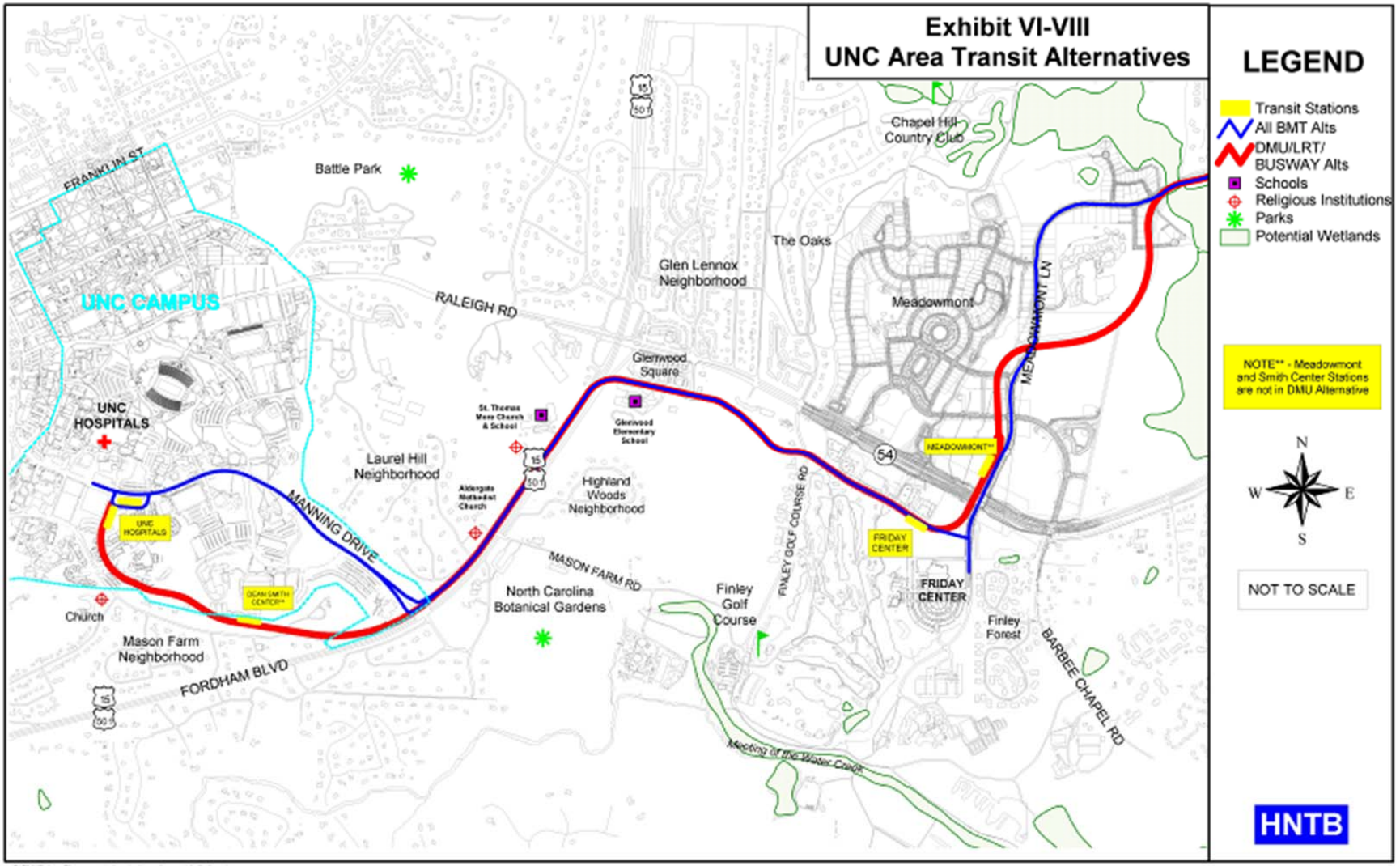
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N
W
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S
NOT TO SCALE
HNTB
UNC CAMPUS
UNC HOSPITALS
Battle Park
FRANKLIN ST
RALEIGH RD
Glen Lennox Neighborhood
Chapel Hill Country Club
The Oaks
Meadowmont
MEADOWMONT LN
Glenwood Square
Laurel Hill Neighborhood
Highland Woods Neighborhood
MANNING DRIVE
MASON FARM RD
North Carolina Botanical Gardens
Finley Golf Course
FINLEY GOLF COURSE RD
FRIDAY CENTER
Finley Forest
BARBEE CHAPEL RD
Mason Farm Neighborhood
FORDHAM BLVD
Church
Meeting of the Water Coach
54
15
501

Appendix B - Matrix of Evaluation Measures from the US 15-501 Phase II MIS

Table ES-2 MATRIX OF KEY EVALUATION MEASURES

Criteria	Measure of Effectiveness	DMU Technology	Light Rail (LRT)			Exclusive Busway				Busway/Mixed Traffic (BMT)	
		DMU Alternative 1[1]	LRT[2] Alternative 1	LRT[2] Alternative 2	LRT[2] Alternative 3	Bus Alternative 1	Bus Alternative 2	Bus Alternative 3	Bus Alternative 4	BMT Alternative 1	BMT Alternative 2
Transportation Services/ Mobility											
Transit Coverage (change from No-Build)	Passenger Miles (per day)	62,252	67,178	67,985	97,085	85,317	88,951	79,416	77,596	32,433	65,693
	% of pop served by transit	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%
Transit Effectiveness	% Change in Auto VMT (per day)	+0.15%	+0.13%	+0.08%	+0.07%	+0.08%	(-0.05%)	(-0.02%)	+0.04%	+0.09%	+0.01%
Relative Traffic/Pedestrian Potential Conflicts between Alternatives (Safety)	Qualitative	Less	More	More	Less	Same	More	Less	More	More	Less
Modeling Forecasts											
Increase in Transit Ridership From No-Build	# Trips (Avg Weekday Linked Trips)	400 (A) 310 (B)	1,250	1,210	2,120	2,340	2,700	2,230	2,500	570	2,120
New Service Rail / Busway System Boardings	# Boardings (Avg Weekday Unlinked Trips)	8,030 (A) 5,640 (B)	15,950	16,910	15,830	10,330	9,420	9,520	9,030	7,450	11,210
Community Impacts											
Residential and Business Displacements	# Businesses	10	7	7	10	10	7	10	10	4	5
	# Residences	83	78	78	83	86	86	83	83	1	77
Neighborhoods Affected	# of Neighborhoods	9	9	9	9	8	8	9	9	2	7
Community-Sensitive Land Uses Affected	# of Land Uses	9	7	7	9	8	8	9	9	6	6
Relative Visual/Aesthetic Impacts between Alternatives	Qualitative	Equal	Equal	Equal	Equal	Equal	Equal	Equal	More	Less	Less
Environmental Impacts											
Historic Sites / Structures	# Sites / Structures	None	None	None	None	None	None	None	None	None	None
Wetlands	Estimated Acres	4.89	4.89	4.89	4.89	4.52	4.52	4.52	4.52	1.27	4.52
New River and Creek Crossings	# of Crossings	3	4	4	3	4	4	3	3	2	3

1. DMU Alternative 1(A) assumes 15 minute peak / 30 minute off-peak headways; DMU Alternative 1(B) assumes 7.5 minute peak / 15 minute off-peak headways.

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Table ES-2 MATRIX OF KEY EVALUATION MEASURES (CONT'D)

Criteria	Measure of Effectiveness	DMU Technology	Light Rail (LRT)			Exclusive Busway				Busway/Mixed Traffic (BMT)	
		DMU Alternative 1[1]	LRT[2] Alternative 1	LRT[2] Alternative 2	LRT[2] Alternative 3	Bus Alternative 1	Bus Alternative 2	Bus Alternative 3	Bus Alternative 4	BMT Alternative 1	BMT Alternative 2
Financial Issues/Impacts											
Right-of-Way Cost	$ million	$82.6	$73.6	$73.6	$84.0	$80.0	$72.1	$85.6	$77.7	$11.5	$62.2
Utility Relocations Costs	$ million	$1.0	$1.4	$1.4	$1.1	$4.1	$4.2	$1.1	$1.1	$0.8	$4.3
Construction Cost	$ million	$187.3	$227.3 (E) $195.6 (D)	$220.8 (E) $189.1 (D)	$218.2 (E) $186.7 (D)	$133.5	$127.7	$149	$143	$54.9	$109.2
Vehicle Capital Costs	$ million	$35.9	$28.3 (E) $34.3 (D)	$28.3 (E) $34.3 (D)	$26.3 (E) $31.8 (D)	$12.1	$13.0	$11.3	$12.6	$14.5	$13.4
Total Capital Costs ROW, Utility Relocation, Construction and New Vehicle Costs (excludes new LRT / BMT Maintenance facility)	$ million	$306.8	$330.5 (E) $304.9 (D)	$324.1 (E) $298.4 (D)	$329.6 (E) $303.6 (D)	$229.7	$217	$247	$234.4	$81.7	$189.1
Transit Operating and Maintenance Costs	$ per year (FY 2000)	$52.3 (A) $56.0 (B)	$53.9	$53.6	$53.6	$54.1	$54.7	$53.5	$54.1	$54.7	$54.6
Transit Cost Effectiveness	Cost-Effectiveness Index (CEI)	$291.92 (A) $418.63 (B)	$103.26 (E) $104.71 (D)	$104.30 (E) $105.80 (D)	$60.07 (E) $60.85 (D)	$43.94	$37.73	$47.15	$41.73	$117.22	$44.45
	Cost/Transit User	$14.54 (A) $23.01 (B)	$8.09 (E) $8.21 (D)	$7.46 (E) $7.57 (D)	$8.04 (E) $8.15 (D)	$9.95	$10.81	$11.04	$11.55	$9.97	$8.41
Physical Data											
Miles of Improvements		14.0	13.9	14.1	14.1	13.9	14.1	14.0	14.0	15.0	14.9
Miles of Structures		2.5	2.5	2.4	2.5	2.1	1.85	2.5	2.4	0.4	1.6
At-Grade Intersections		24	37	37	26	27	43	26	32	62	47
Number of Stations		11	14	14	13	14	14	13	12	12	14

1. DMU Alternative 1(A) assumes 15 minute peak / 30 minute off-peak headways; DMU Alternative 1(B) assumes 7.5 minute peak / 15 minute off-peak headways.
2. LRT Alternatives provide cost information for (E) electric vehicles and (D) diesel vehicles.

Note: Capital Cost of No-Build assumed to be $0; all alternative cost information is relative to No-Build.

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Appendix C – Summary of Public Comments and Resolutions

1. Introduction

Public input was one of five important decision criteria used for selecting the best performing corridor, alignments, station locations, and the Locally Preferred Alternative. Public comments were recorded in a database, categorized by topics, and then analyzed for key trends. The comments below refer specifically to the alignment, technology, and stations proposed for the Durham-Orange corridor. In addition, comments for this corridor that do not refer to these three topics are documented in a brief section below. All comments are presented as actual excerpts of the comments as they appeared on the original comment forms.

Throughout the entire Alternatives Analysis (AA) process the public and interested parties have continued to provide valuable input. Over the past 16 months, during the AA process, residents, employees, students, organizations, government agencies, and elected officials in Durham and Orange counties have examined options and provided input on vehicle technologies, rail alignments, and station locations. Public input was received via the www.ourtransitfuture.com website, mail, e-mail, a phone hotline, from 19 public workshops (through Comment Cards, examples of which can be seen after Section 3), and via a number of smaller outreach opportunities.

More than 1100 people attended the 19 meetings hosted in various municipalities in the 3 corridors of interest. 519 comments were collected during the AA, pertaining to purpose and need for additional transit planning and the definition of the corridors. The comments are not specifically attributed to one corridor. Unique hits on the program's website for 3 corridors totaled to 3,755,192 from August 2010 to April 2012.

Spanish language interpreter services were available at every one of the 19 public workshops. Conversations in Spanish took place in two workshops, the Durham Library in June 2010, Cary Town Hall in July 2010 and the Durham Station Transportation Center in September 2010. Half a dozen comments were received in Spanish which were translated into English and included in our comments database (among the 519 received) about three corridors.

These methods of involvement will continue to be available to the public.

2. Background

The first series of public workshops consisted of six open-house style meetings held across the Triangle in June and July of 2010. The purpose of those meetings was to introduce the public to the project, describe which locations and technologies would be evaluated, and solicit input and comments regarding the long-term bus and rail improvements in the region.

The second series of public workshops again consisted of six open-house style meetings in September of 2010. The purpose of those meetings was to review the Alternatives Analysis process, provide additional details on transit technology, and present preliminary corridor and alignment alternatives.

The third and final round of public workshops consisted of seven open-house meetings held across the Triangle in March of 2011. Those meetings were held to remind the public about the purpose and need for the project, to explain the results of the conceptual screening, and to provide information about the upcoming detailed evaluation that would result in a recommendation for a locally preferred alternative.

In August of 2011, the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) conducted two public workshops to present the results of the detailed evaluation that was completed after March of 2011. The results of the detailed evaluation formed the basis for the recommendation of a Durham-Orange Light Rail Transit project traveling from UNC Hospitals to Alston Avenue.

On February 8, 2012, the DCHC MPO selected the Durham-Orange (D-O) Light Rail Transit (LRT) project as the preliminary Locally Preferred Alternative (LPA) – the project to be advanced for further study. The next step in the implementation process for projects that may be considered for federal funding is environmental scoping. Through the scoping process, the public, their elected and appointed officials, and interested government agencies define a range of issues that will be studied in the Environmental Impact Statement (EIS).

Throughout scoping and the subsequent EIS, Triangle Transit will continue its policy and practice of actively encouraging members of the public to participate in the project through the scoping process, public meetings, and meetings with neighborhood groups, community organizations, and major employers, as well as through the project website. In addition to the public, other project participants include elected and appointed officials and staff from local, state, and federal government.

The scoping process will drive the overall focus of the development of the D-O LRT project and public input is essential to making prudent decisions for this project and the region's future. Comments will focus on identifying specific social, economic, and/or environmental impacts to be evaluated and suggesting alternatives that could result in less environmental impact but still achieve the desired transportation objectives. Comments at this time will also focus on the issues and alternatives for analysis and not on a preference for a particular alternative.

3. Public Comments

Public comments from the three rounds of public involvement meetings were analyzed with key trends identified. Most comments were received from comment cards or through e-mail. Table 1, which appears at the end of Section 3.5, presents a concise list of comments and specifies the portion of the project to which the comment was directed. A full list of public comments, separated out by the round of public workshop or by miscellaneous, can be found on the attached DVD.

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

3.1. Trends

The comments related to the Durham-Orange corridor demonstrated the following trends:

- C1 and C2 are the most frequently discussed alignment alternatives, with C1 receiving the most support
- Ensure that the corridor offers connections to the airport and between universities
- Prefer LRT over bus rapid transit (BRT)
- Implement project in a timely manner
- Develop policies and tools to promote transit-oriented development (TOD)
- Address and minimize social and real estate impacts
- Provide more frequent service
- Provide bicycle accommodations to support rail service
- Support the project for economic development, mobility, and potential affordable housing benefits

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- Connect to other transit systems, including Durham Area Transit Authority (DATA), as feeder services

3.2. Alignments

Prior to the meetings, many alignments were screened and removed from further evaluation due to potential environmental impacts, impacts to communities, prohibitive costs, and other factors. The Durham-Orange Corridor had three pairs of alignment alternatives for different segments of the corridor presented to the public in the third round of public meetings: A1 vs. A3; C1 vs. C2; and D1 vs. D3. A fourth segment, Segment E, included one alignment (E1) as a former alignment alternative that had been converted to a BRT alternative. Of the three segments with alternatives, A1/A3 and D1/D3 received very little feedback (three or fewer comments). Alignments C1 and C2 received more feedback with C1 being preferred by most respondents who commented on alternatives. Comments that were against an alignment were classified as preferring the opposite alignment. Alignment C1 (21%) was the most commented upon alignment, while alignment C2 (8%) was the second most. Fifty-six percent of the feedback did not have a comment related to a specific alignment section.

3.3. Technology

Technology choices within the Durham-Orange corridor include LRT and BRT. Commenters who provided a preference were overwhelmingly in favor of LRT within the corridor. The LRT technology was preferred by 31 percent of the respondents, while BRT was preferred by only 4 percent.

3.4. Stations

Many comments on station locations were associated with the alignment C1 which would route through the Meadowmont neighborhood. Commenters preferred alignment C1 with supporters indicating that the density and design of the neighborhood would make it conducive to transit-supportive uses and that C2 would be more expensive to build. Comments also indicated a preference for stations close to downtown Chapel Hill and UNC-Hospitals to serve students and major employers.

3.5. Other Issues/Trends

Among non-specific comments, the following trends were evident. Public comments addressed a broad range of topics including the following:

<u>Corridors and Timing</u>

- Build the Durham-Orange corridor first, especially if Wake county counts on approving the 1/2c sales tax
- Focus on other corridors first (as D-O needs least improvement at this point)
- Focus on other corridors first (as D-O doesn't connect vital nodes in region)
- Best alternative: three universities, most available land for TOD & revitalization, high economic potential & diversity, hospital, existing public transit service/park n rides
- The sooner the better
- Priority one for the Triangle and the State is expansion of North Carolina Railroad (NCRR) and Amtrak Commuter Rail. Triangle Transit (TTA) should only invest in additional cars (schedule expansion) not tracks or stations yet

- Commuter rail needs fewer stops that are more evenly spaced, closed crossings, and straightening of tracks

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Service

- Request for 24-hour service
- Stop at highly popular places along the route
- The plan is very Durham-biased—too many stops

Bus Services

- Questions about bus fares
- Need connection to Durham bus system
- Current/existing bus system could serve as feeder to light rail
- If UNC hospital station is end point, need better bus service to rest of Chapel Hill
- More cost effective alternatives should be implemented over that which is being proposed by a handful of politicians and private developers who have an agenda of their own
- No more expanded and costly contracts with the Railroad; no need to engineer really expensive elevations. An on/off, bus/light rail system should occur to reduce the cost of the FIXED RAIL portion of the project

Bicycle Amenities

- Support of bike accommodations to support rail
- We would highly recommend installing "Rent-a-Bike" options within each urban center to ease movement within each center once you are there. We just discovered this option in Washington, D.C.
- Secure bike lockers at stations would be a great idea

Growth and Development

- Mandate to develop in accordance with 2025 Plan
- Enact TOD zoning
- Minimize real estate impacts
- Support of project for economic development and mobility benefits
- Support of project for potential to provide affordable housing for students and low-income residents
- Create more mixed use
- Fixed guideway investment success will depend on the ability to guide new development into station areas. Build upon the Land-Use/Community Infrastructure/Development (LUCID) initiative that Triangle Transit, the MPOs, and local communities are pursuing.
- There is no density for light rail and we should not lock in routes or stops until development has already occurred. Light rail shouldn't be built until bus demand is proven and becomes inefficient.

Outreach/Coordination

- Consultation regarding neighborhood impacts
- Need for communication to low-income populations
- Need better mechanisms for informing affected citizens
- Consideration of political will, funding, and cultural factors

Methodology/Analysis

- Triangle Transit, the MPOs, and the counties are especially commended for the quality and transparency of the cost estimates and revenue forecasts developed for both the AA documents and

county-level funding plans. The reports would benefit from greater clarity on the ability/timing to fund future extensions given the assumed revenue streams.

- The greatest concerns with the analysis are with the lack of clarity for the ridership estimates and the limited metrics for some benefits. The ridership estimates use an older model version, include some optimistic assumptions, and rely on growth forecasts that don't match current station assumptions.

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

- A list or table of key risks to implementation for each alternative should be included in each report, especially those risks related to state and federal funding and approval from other parties, such as railroad companies.
- Each report would benefit from a graphic depicting how the Alternatives Analysis relates to the other major steps in the process leading to service implementation and also from an accompanying table indicating potential implications associated with each step.

<u>Funding Potential</u>

- A light rail alternative between University of North Carolina – Chapel Hill (UNC-CH) and East Durham appears to have the most challenges for securing federal funding and being implemented, based on the following concerns:
    - Federal New Starts funding is required. This funding is very competitive.
    - No New Starts project nationwide is in a region as small as Durham-Orange.
    - Ridership estimates per mile appear lower and costs per rider higher than other New Starts projects.
    - An initial investment of a smaller 9-12 mile corridor would omit either UNC Hospitals or downtown Durham.
    - Ridership levels may depend on extensive development at the Leigh Village station; transit-supportive densities at this and other locations have generated opposition.
    - The Triangle will be advancing three projects at the same time; the AA suggests this may be the lowest performing of the three.

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Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Prefer alignment A3 over A1. Benefit - access to health care facilities.	For A3	X							
Population of Meadowmont is mixed in age 40-70 and high income… Residents do not want line coming into/down thru Meadowmont. They want George King Rd/Rt. 54 Option.	For C2		X						
I love the additional stations added… Keep the alignment through Meadowmont.	For C1		X						X
Strongly support the existing TTA route through Meadowmont. Meadowmont was up-zoned and planned in mid-90s partly based on future fixed guideway transit running through it. Just because current residents in Meadowmont don't want the TTA is not justification to move it elsewhere. Routes C1 & C2 both will need to cross Little Creek. C2 (Woodmont) will have more elevated length and will be more expensive to build. Woodmont has included future (private) shuttle service to the Friday Center and/or Meadowmont TTA Stations. If C2 is selected, there is no such provision to provide private shuttle Meadowmont residents.	For C1		X						X
Stop at Meadowmont.	For C1		X						X

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Prefer alignment C1 over C2. Benefit access to Meadowmont (incl. UNC Healthcare) and Friday Station is deeper into Friday Center. Also keeps rail off of George King Road, my neighbors and I would like to see George King used as a collector street rather than Crossland Dr. Don't think George King could accommodate both a collector and light rail.	For C1		X						
I believe the routing via Meadowmont is the best option, to allow maximum pedestrian/bike access.	For C1		X						X
I would be in favor of the C1 option for the Meadowmont Region. I believe there would be more usage of the station in this option b/c of the type of developments that exist in this area. The mixed use of Meadowmont Village and the number and type of residential units lends itself to high usage.	For C1		X						X
Given the capacity constraints of NC54, and the growth expected both residential and employment in Chapel Hill, I strongly support LRT over the BRT alternative. In addition, as a resident of the Meadowmont Community, I strongly support alignment C1, which places a station in the Meadowmont community. To succeed, LRT needs transit stations accessible by large numbers of potential riders. Meadowmont is a dense community which was designed with an LRT alignment in mind. The alternative alignment goes through a much less dense neighborhood and is an inefficient use of transit resources. Meadowmont residents' objections should be tempered by the fact that the LRT proposed alignment dates back to the neighborhood's design and creation and should surprise no one. As a resident, I look forward to taking the LRT to Chapel Hill, the South Square neighborhood, and Duke.	For C1, For LRT		X			X			X

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Strongly favor C2 alignment. C1, crossing Meadowmont would require a significant crossing of a SNHA and is contradictory to Goal 5, "to minimize adverse impact to the natural and built environment." In addition it would require 4 street crossings in Meadowmont. Currently there is already insufficient parking in Meadowmont Village.	For C2		X						
The C2 route alternative is infinitely preferable to the C1 route. Reasons include: 1. Bridge span, elevation of C1 is prohibitive. 2. Environmental impact of punching another hole across the Little Creek wetlands area and Army Corps land. 3. Social concerns: Meadowmont to the west and Edgewood to the east - these neighborhoods overwhelmingly support C2 alternate route. Move station to Woodmont station from Meadowmont. 4. Work location consolidation. A bike and pedestrian bridge will be built where NC54 crosses Little Creek. Hwy 54 will be widened here for the bridge span.	For C2, For movement of station to Woodmont from Meadowmont		X						X
Use Woodmont Station, not Meadowmont, avoid the natural heritage area.	For C2		X						X

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Alternative to route rail from Leigh Station along NC 54 should not be selected for the following reasons: 1. The original routing through Meadowmont has been planned for over a decade. The density and layout of Meadowmont was in fact approved by Chapel Hill with this routing being a significant factor of that approval. 2. Excess parking has already been provided at Meadowmont (behind shopping areas) for future park/ride associated with the rail station. 3. Since Meadowmont was planned to support transit/rail, there will be more ridership catchment at a Meadowmont Station of both office and residential riders (as a function of roadways, footpaths, and sidewalks existing in Meadowmont for this purpose). 4. Woodmont is required by its master land use plan to provide bus service to/from Meadowmont Village, which will support light rail. There is no mechanism to require Meadowmont to provide similar transfer if the station were to be at Woodmont. 5. Routing along the south side of NC54 would require grade-level crossings (or expensive flyovers/bridging) of existing driveway access to NC54 of Little John Rd. and Downing Creek Pkwy, and the future primary entrance to the Woodmont development containing 600,000 sq. feet of commercial and residential space.	Against C2		X			X			X
I have lived at this residence *[115 Pearl Lane in Chapel Hill]* all my life (60 years). I am the fourth generation that has lived at this location. It distresses me to no end to see the proposed route that will put a park & ride lot in my backyard. It will devalue my property and ruin my children's future. Consider somewhere else, please.	Against C2		X						
The corridor proposed going by NC54 and not through Meadowmont will put a park and ride adjoining my property *[114 Pearl Lane in Chapel Hill]*. I will be boxed in by Hillmont Development and the park and ride lot for the rail system. I will have no quality of life outside my home.	Against C2		X						

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Personally had a problem with this alignment as it crosses 147 to Duke then west along Erwin-15/501/South Square-CH. I thought the better route would stay along **** corridor west out of Durham along Hillsboro Rd. to Hillsboro then to 86, turning south to CH. But with recent construction / development along Erwin into South Square 15-501 I've changed my opinion to a positive one.	For D1			X					
I dislike the E2 alignment. It must go through the business districts downtown. Not south of the freeway. But I guess the E1 is preferred anyway.	For E1				X				
Alignment needs to be shifted to not cut thru Duke Forest / western Durham. Would recommend aligning near Hillsboro Rd. to H'boro then NC 86 to Chapel Hill.	New alignment								
I believe the corridor should connect to Woodcroft neighborhood. Also, is there opportunity to provide it as a parallel option to the American Tobacco Trail?	New alignment								
I would really like to see the proposed rail line extended to include Carrboro. Other than that, it looks pretty good.	Line extension								
Anticipating light rail between UNC and Duke is a probable scenario; however the route choices made so far are incomprehensible. People will demand and need straight routes. Opposition has already formed against 2 watershed crossing locations.	General								

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
We can save a ton of money by having Durham's portion stop at I-40 & 15-501 and have Chapel Hill's portion route along 15-501 instead of dropping down NC 54.	New Alignment								
Look at the density along Chapel Hill Road in Durham instead of the 15-501 bypass. Put light rail where the people are, not along the greenways.	New Alignment								
Some of these routes are pretty good to have. Even having a light rail out to the airport as well. Even having other bus routes going to the airport too.	General								
Would seem a secondary connection to the Durham-Wake route.	General								
Prefer South Square B to South Square A.	For D3 - South Square B			X					X
Remove MLK station.	Against MLK station								X
I would utilize the rail depending on proximity to Franklin St. CH. The bus serves me well at present and my commute is 30 mins. I travel from Durham to CH daily for work.	For a station in proximity to Franklin St. (CH)								X
As a student at UNC, I favor putting the LRT station as close to campus as possible especially given that most students will be walking.	For placing a station as close to UNC as possible								X

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Bring it as close to UNC hospital as possible.	For placing a station as close to UNC hospital as possible								X
Good station suggestions, especially in the South Square and Martin Luther King stations.	For South Square and MLK stations								X
Need a station closer to DPAC.	For a station closer to DPAC								X
I hope you will reconsider adding a station at Pickett Road. With University Tower, 2 retirement communities, a high school and quite a bit of housing within 1/2 mile, it has quite a good support area.	For a station at Pickett Road								X
The UNC end station should be located close to the A1 location. This is the logical place because it is closest to employment and student centers.	For placing UNC end station closer to A1 location	X							X
I prefer the D3 South Square station - any station which has the opportunity to serve future higher-density, pedestrian-oriented development.	For D3 - South Square station			X					X

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Like the Leigh Village and Meadowmont Station locations.	For placement of Leigh Village and Meadowmont stations								X
Streetcars should have more frequent stops in commercial areas than 1/4 mile.	For more frequent streetcar stops							X	
Start w/ BRT and build on dedicated lanes when funding & ridership warrant LRT.	For starting with BRT, then LRT					X	X		
Strongly support LRT over BRT. Very important to demonstrate that LRT stations are much better for TOD, and should result in lower net cost over long run if development benefits are captured.	For LRT					X	X		
BRT already very commendable in area but road wear and traffic issues suggest LRT would be "better" except for cost. Connecting universities to each other is important.	Pros and cons of LRT and BRT					X	X		
Alignments seem to make logical sense. Technologies - streetcars seem ideal for smaller distances and lend a nostalgic feel. Light rail would be advantageous in terms of increased number of stations (example - Tokyo) and increased choices.	For LRT For streetcars (for shorter distances)					X			
I still believe bus-rapid transit is the best mode for this option. I do not have particular comments on stations and routing.	For BRT						X		

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
Though LRT is a little more expensive, it makes sense to use it so it will link up better to the Wake section.	For LRT					X			
Encouraging to see cost is under $100M/mile for LRT! My vote is for LRT because it encourages more transit-oriented development than BRT. The line should go through Meadowmont rather than NC54. Hamilton Station should move to East 54 development.	For LRT					X	X		
LRT would be the best long-term solution. This is a corridor where we should focus on our transit-oriented development.	For LRT					X			
I can see light rail as being a vital piece to the entire network. I can see this as even a way to help Raleigh with the "Gateway" corridor projects.	For LRT					X			
Definitely favor LRT. I just don't think BRT would have the same impact and attract the same volume of ridership. We definitely need the permanence of LRT to affect development patterns in Durham.	For LRT					X	X		
Go with light rail!	For LRT					X			
If I understand the displays correctly, analysis shows either light rail or bus rapid transit to be the modes of choice for this corridor. For reasons cited above, I'd prefer light rail, despite the added cost.	For LRT					X	X		
Do a high-speed light rail/bus hybrid throughout the entire corridor/Triangle. Move forward without Wake if we have to for Orange & Durham Counties. Include an express option as well as a local option for service.	For LRT/bus hybrid					X	X		

Table 1 - Durham-Orange Corridor - Alignments, Technology and Stations

COMMENT	SUMMARY	Segment				Technology			Stations
		A	C	D	E	LRT	BRT	Streetcar	
I really like all the route/station plans I have seen. I would much prefer light rail to rapid but for many reasons - I understand it is a higher upfront cost, but from a maintenance, speed (which I think has a lot to do with general acceptance & ridership), and energy perspective.	For LRT					X	X		
For the Durham-Orange corridor, LRT is a much better option than BRT, to my mind. More people can be convinced to take a train than a bus - they have higher status/class associations, and they're perceived as more reliable than buses.	For LRT					X	X		

Triangle Regional Transit Program

Public Workshop Series #1: **COMMENT FORM**

Contact Information

Name: _____ Organization: _____

Street Address: _____ City, State, Zip: _____

Email Address: _____ Best way to keep you informed: ☐Email ☐Mail ☐None

# of years living in the Triangle: _____ Best description of you *(check below)*:

☐Resident ☐Elected Official ☐Government representative ☐Business Owner ☐Other: _____

What objectives do you hope the Triangle Regional Transit Program will achieve?

(expanded service, improved existing services, new technologies, reduced congestion, etc.)

What is one new thing you learned at today's workshop?

What do we need to explain more clearly? What other information are you seeking?

Please write any additional comments or questions regarding the Project.

(Need more room? Please request an additional form or email us at info@ourtransitfuture.com)

There are four ways to return your comments: 1) Leave this form with us. 2) Email comments to info@ourtransitfuture.com
3) Mail your form to: Triangle Regional Transit Program, P.O. Box 530, Morrisville, NC 27560 or 4) Call toll free the Program hotline, 800.816.7817.

Please visit our website for project updates and notification on upcoming community meetings at ***www.ourtransitfuture.com.***

Triangle Regional *Transit Program*
our transit future

Triangle Regional Transit Program

Public Workshop Series #2: **COMMENT FORM**

Contact Information

Name: _____ Organization: _____

Street Address: _____ City & State: _____

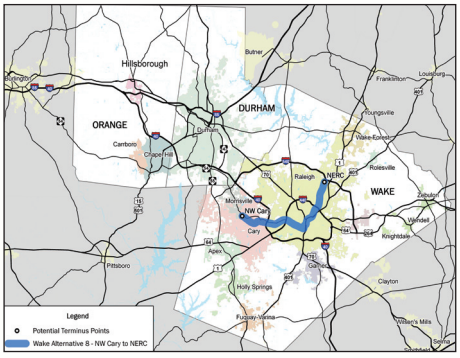
Email Address: _____ Best way to keep you informed: ☐Email ☐Mail ☐None

# of years living in the Triangle: _____ Zip code for where you work _____ Zip code for where you live _____

We want your input on which evaluation criterion is most important to you. *(Note: 5 is "Most Important" and 1 is "Not Important")*

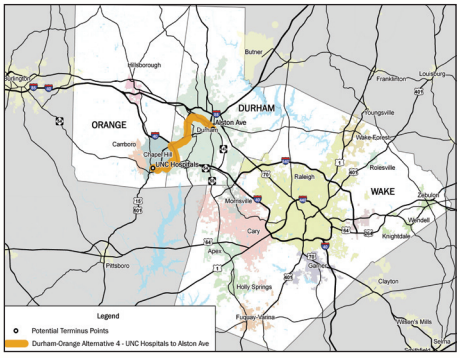
		Most Important	Very Important	Important	Less Important	Not Important
1. Mobility	*(rail trips per mile, i.e. "the more rides per mile, the better")*	5	4	3	2	1
2. Socioeconomic	*(population density, job density, low income, concentration of minority population)*	5	4	3	2	1
3. Land Use	*(activity centers, such as business districts, colleges and universities, employment centers, fairgrounds and arenas, hospitals, public/regulatory support, development potential within ½ mile of the corridor)*	5	4	3	2	1
4. Financial	*(total capital cost cost per rider and per rail trip, operations & maintenance costs)*	5	4	3	2	1

5. Based on what you have learned, do you consider Wake Corridor #8 to be the best performing corridor?



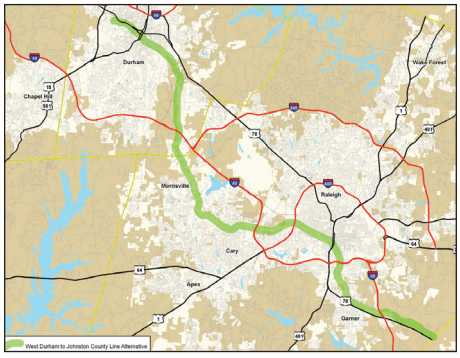
☐ YES ☐ NO

6. Based on what you have learned, do you consider Durham-Orange Corridor #4 to be the best performing corridor?



☐ YES ☐ NO

7. Would a Durham-to-Wake corridor be one of your top priorities?



☐ YES ☐ NO

(Note: There is space on the other side for your written comments.)

8. Please look at the 6 Alternative Conceptual Alignments & Stations maps. If you have comments, leave a sticky note with the #_____. The number helps us connect your posted comment back to this sheet. Thank you.

There are four ways to return your comments: 1) Leave this form with us, 2) Email comments to info@ourtransitfuture.com, 3) Mail your form to: Triangle Regional Transit Program, P.O. Box 530, Morrisville, NC 27560 or 4) Call toll free the Program hotline at 800 816-7817. Forms received at the workshop, by Mail, and by Email will be added to our comments database within five days of receipt.

Please visit our website for project updates and notification on upcoming events at ***www.OurTransitFuture.com*** *or call* ***800 816-7817.***

Triangle Regional *Transit Program*
our transit future

Triangle Regional Transit Program

Public Workshop Series #3: **COMMENT FORM**

Contact Information

Name: _____ Organization: _____

Street Address: _____ City & State: _____

Email Address: _____ Best way to keep you informed: ☐Email ☐Mail ☐None

# of years living in the Triangle: _____ Zip code for where you work _____ Zip code for where you live _____

Please share your thoughts on the alternatives (alignments, technologies and stations).

Wake Corridor *(Cary to Northeast Raleigh)*

Durham-Orange Corridor *(Durham to Chapel Hill)*

Durham-Wake Corridor *(Durham to Garner)*

There are four ways to return your comments: 1) Leave this form with us, 2) Email comments to info@ourtransitfuture.com, 3) Mail your form to: Triangle Regional Transit Program, P.O. Box 530, Morrisville, NC 27560 or 4) Call toll free the Program hotline at 800 816-7817. Forms received at the workshop, by mail, and by Email will be added to our comments database within five days of receipt.

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Triangle Regional *Transit Program*
ourtransitfuture.com

4. DCHC MPO Summary of Comments

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

The DCHC MPO received a set of comments until September 14th, 2011 in relation to the Regional Rail Alternatives Analysis. The following is a compilation of comments based on letters, e-mails, and completed comment forms from citizens and community groups.

1. C1 imposes less environmental impact on wetlands, less costly to construct if done with proposed Southwest Durham Drive, and Meadowmont was designed for transit.
2. C2 is less expensive, less wetland impacts, higher ridership, not a cut into a new wetland, will have dedicated parking, and won't impact the Rizzo Retreat Center.
3. Negative comments regarding the alignment between Patterson Place and MLK Jr. Parkway due to potential negative environmental and recreational impacts to New Hope Creek and Sandy Creek. An alignment that runs along US 15-501 is preferred.
4. Preference given to alternative D3 because of the proposed University Marketplace.
5. Preference given to alternative A3 at UNC hospital because there is better employment access to the hospital and extension to Carrboro is possible.
6. Preference given to Option A in front of Duke Medical Center and the Veteran's Hospital.
7. Futile to have a plan without a station at RDU airport. There should be a station at the airport or at least a discussion in the Alternatives Analysis as to why none is included.
8. Studying the east Durham Commuter Rail station is an excellent idea.
9. Concern that Alston Avenue must remain walkable until the transit station is constructed.
10. LRT especially effective in serving diverse populations and employment centers, as well as spawning economic growth.
11. Mason Farm station should be called Smith Center/Mason Farm to give it better place recognition.
12. More affordable alternative is on/off, bus/light rail system. Would cost one-half of proposed just light rail.
13. Respondent asked if Triangle Transit has compared LRT v. automobile energy consumption, including energy embedded in system construction.

The DCHC MPO received additional comments between September 14th, 2011 and January 11th, 2012 in relation to the Regional Rail Alternatives Analysis with a specific focus towards the Locally Preferred Alignment. Comments were received from citizens, community groups, neighborhood associations, and resource agencies. The following summary presents general findings and comments related to the project, however, a full list of comments can be found on the attached DVD.

4.1. Alternative C1

The following comments were made in support of alternative C1:

NC 54 Corridor [Prefer C1 (Meadowmont) alignment]

1. C2 would make it impossible to use George King Road as a future collector to connect a Leigh Village development with NC 54.
2. Woodmont can be connected to a Meadowmont station by shuttle service.
3. Wetland impacts can be mitigated if either C1 or C2 is constructed.
4. Marginal wetland impacts from constructing C1 might be much less if Southwest Durham Drive is built in the same corridor.
5. Hillmont is a concept – it is not yet built. Meadowmont already has mixed use development within walking distance of the proposed rail station.

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

4.2. Alternative C2

The following comments were made in support of alternative C2:

NC 54 Corridor [Prefer C2 (NC 54/Hillmont) alignment]

1. C2 is less expensive, less impact on wetlands, higher ridership, not a new cut into wetlands, will have dedicated parking, and will have more destination ridership (e.g., non-residential).
2. C2 will adversely impact Meadowmont, Rashkis Elementary School, UNC Wellness Center, and the Cedars retirement and care community, and access to the DuBose Health Center.
3. This natural area has been protected through community efforts and public funds, and a recent UNC-CH decision not to expand business school facilities toward the wetland.
4. Want information solicited from N.C. Natural Heritage Program, N.C. Wildlife Resources Commission, and U.S. Army Corps of Engineers.
5. Support study of both C1 and C2 as equal alternatives.
6. Advancing both C1 and C2 will be costly to taxpayers.

4.3. Other Comments/Trends

The following comments were made on other general issues:

Patterson Place-MLK Parkway Corridor

1. Do not support alignment between Patterson Place and MLK Jr. Parkway because of negative environmental and recreational impacts to New Hope Creek and Sandy Creek lands, and harm to long-term water quality.
2. This area has been protected through community efforts and public funds.
3. Want rail alignment along US 15-501 or Old Durham-Chapel Hill Rd.
4. Support the need to study the New Hope Corridor swath, not just the current alignment.
5. Want information solicited from N.C. Natural Heritage Program, N.C. Wildlife Resources Commission, and U.S. Army Corps of Engineers.

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

Patterson Place Station and Maintenance Facility

1. Patterson Place station and maintenance facility development will have a negative impact on the New Hope Creek floodplain. There are better areas for locating the station and facility that are away from the slopes adjacent to the floodplain.

Alston Avenue Station

1. Support Alston Avenue commuter rail station to serve transit dependent population and help economic development in east Durham.

Maintenance Facility – Cornwallis Road

1. Proposed operations and maintenance facility near Cornwallis Road will have extremely negative impact on growing campus of Judea Reform synagogue, Lerner Jewish Day School, and Lerner Jewish Community Center.

Extension in Orange County

1. Support a rail transit extension to downtown Chapel Hill and Carrboro. Ensure that UNC Hospital station [A3(d) in the report], University Square Redevelopment and the updated 2040 Long Range Transportation Plan support this extension, as well.

Process Related

1. More detailed environmental impact study is needed before the LPA is endorsed.
2. There is confusion with the term LPA. In the current process, the LPA is to identify a project for more detailed environmental study and public input in accordance with the National Environmental Policy Act (NEPA).
3. Concerns of U.S. Army Corps of Engineers (USACE), Durham City/County Planning and several resource and conservation agencies should be discussed in the Alternatives Analysis report.
4. The Federal Transit Administration (FTA) and USACE will be involved in the route selection process.

Other Issues

1. Respondents almost unanimously support mass transit and passenger rail.
2. Prefer D3 (i.e., alignment and station on Shannon Rd.) because of potential support to the proposed University Marketplace.
3. Prefer Option A -- station in front of Duke Medical Center and Veterans' Hospital because it is more centrally located for employees and patrons.
4. In implementation, make sure that park-and-ride facilities do not preclude opportunities to build transit oriented development.
5. Significant barriers exist to building operations and maintenance facilities at Patterson Place, Leigh Village, and Farrington Road. The Cornwallis maintenance and operations facility site is preferred.

6. Use MARTA (Atlanta) experience for guidance: provide station uses within ten minute walk of station; provide station parking; and, make rail transit time competitive.
7. Add direct rail transit route between Chapel Hill and RDU airport.

The statements included in this portion of the document are summaries of public comments and are not to be accepted as facts developed or endorsed by Triangle Transit.

5. Summary of Resolutions

On the 23rd of January, the Council of the Town of Chapel Hill recommended that the Transportation Advisory Committee approve the proposed LPA with several modifications:

- Alternative alignments C1 and C2 should be further analyzed as part of the anticipated Environmental Impact Statement. The Town expressed preference for C2.
- The Environmental Impact Statement should include a more detailed assessment of the location of the Hamilton Road Station and include options for grade separating the crossing of the C2 corridor with Barbee Chapel Road as included in the NC 54 Phase II Study.
- The Environmental Impact Statement should evaluate the impact of both alignments on the Little Creek floodplain and the proposed Little Creek trail.

The Town of Carrboro issued Resolution No. 191/2009-10 expressing its desire to be included for rail transit corridor in the Alternatives Analysis for the Triangle Regional Transit Program planning process, and its desire for at least one public meeting/workshop to be held in Carrboro. Such a workshop was scheduled conducted on September 16, 2010.

Appendix D - TRTP Durham to Chapel Hill Corridor Alignment West of I-40 White Paper

TRIANGLE REGIONAL TRANSIT PROGRAM

Durham to Chapel Hill Corridor

Alignment West of I-40

September 3, 2010

BACKGROUND

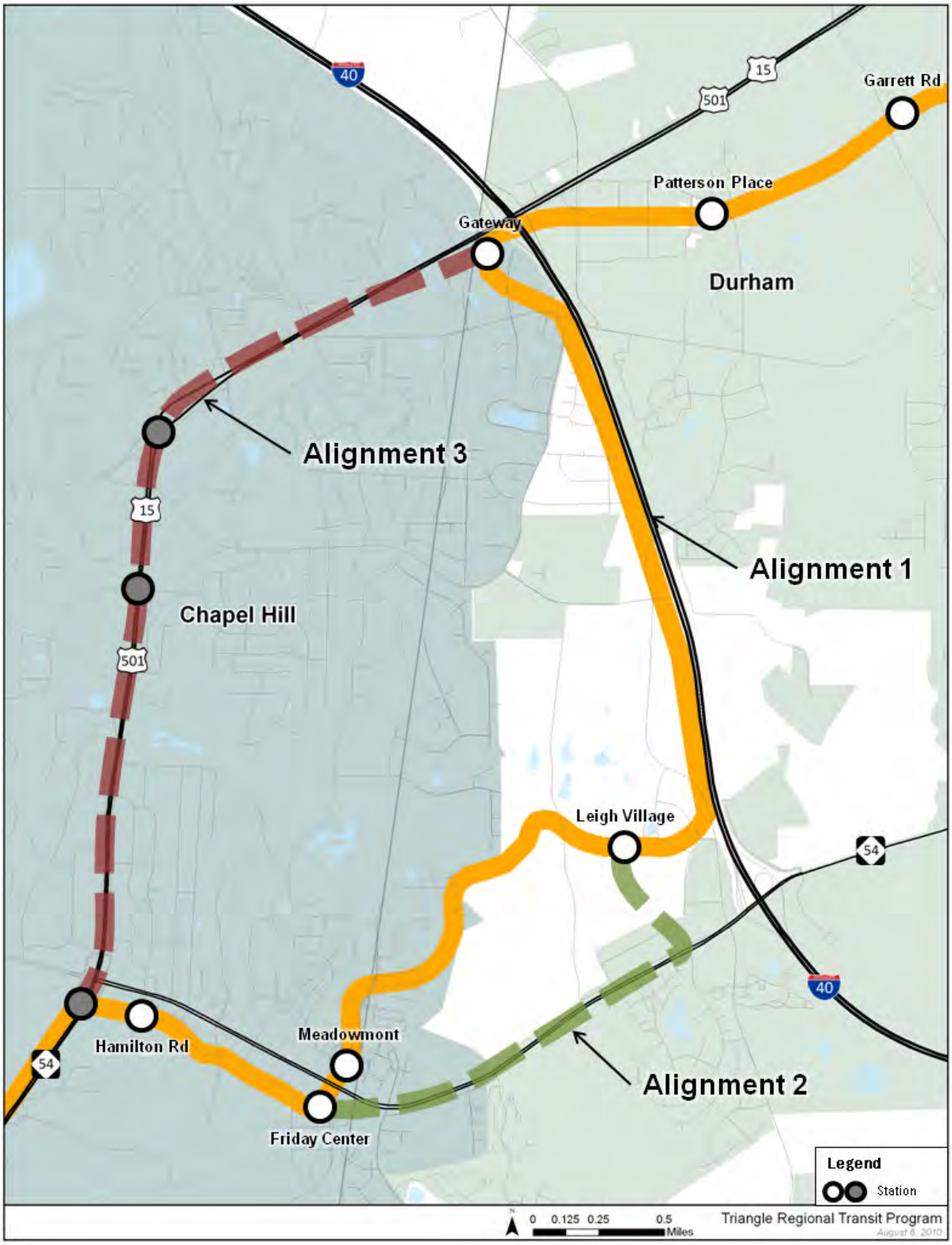
At a meeting with Town of Chapel Hill and University of North Carolina at Chapel Hill representatives on July 27, 2010, the Town requested that additional alignments be considered for the Durham to Chapel Hill fixed guideway transit corridor in the segment that is between the proposed Gateway station (in the southwestern quadrant of the interchange of I-40 and US 15-501) and the junction of NC 54 and US 15-501 (near the proposed Hamilton Road station), before continuing to the University of North Carolina at Chapel Hill main campus. The 2035 DCHC MPO Long-Range Transportation Plan (LRTP) shows the alignment that was adopted by the MPO following a Major Investment Study (MIS) completed for the corridor in 2001 (a Major Investment Study is now referred to as an Alternatives Analysis). The MPO plan proposes light rail transit (LRT) as the preferred vehicle technology for the corridor.

The adopted and alternative alignments are shown in Figure 1. Commencing at the Gateway station, the adopted alignment **(Alignment 1)** swings south roughly paralleling the west side of I-40, traverses the proposed Leigh Village development in southwest Durham, then swings west to cross the US Corps land (through a Natural Heritage Area), through Meadowmont, crosses NC 54 to serve the Friday Center, and then continues west to terminate at the UNC Hospitals.

In addition, an alignment that closely parallels the NC 54 roadway corridor (**Alignment 2**) was also proposed as an alternative to the adopted alignment to avoid the crossing of the Natural Heritage Area by Alignment 1. This alignment is considered to be broadly within the adopted corridor in the LRTP.

Alignment 3 remains on US 15-501/US 15-501 Bypass (Fordham Boulevard) between the Gateway and Hamilton Road stations and is outside of the adopted corridor. At its furthermost point, Alignment 3 is approximately 2 ½ miles from the adopted alignment. The Town requested that Alignment 3 be considered since (a) over 10 years has elapsed since the adopted alignment was initially selected, and (b) redevelopment along the US 15-501 corridor within Chapel Hill has become a higher priority for the Town.

Figure 1 – Alignment Options



ADOPTED ALIGNMENT

US 15-501 Major Investment Study

The 2001 US 15-501 MIS recommended the alignment (referred to as a corridor in that study) shown in Figure 2. The alignment was subsequently moved to the east (closer to I-40) which is now Alignment 1 in Figure 1.

Subsequent Transportation and Other Plans

The alignment recommended in the MIS was subsequently included and approved in the DCHC MPO Long-Range Transportation Plan, and subsequent updates to the LRTP, including the current Plan, have continued to include this alignment.

Several local government land use and transportation plans have been prepared and adopted assuming Alignment 1 as a major fixed guideway transit corridor that includes regionally adopted transit stations:

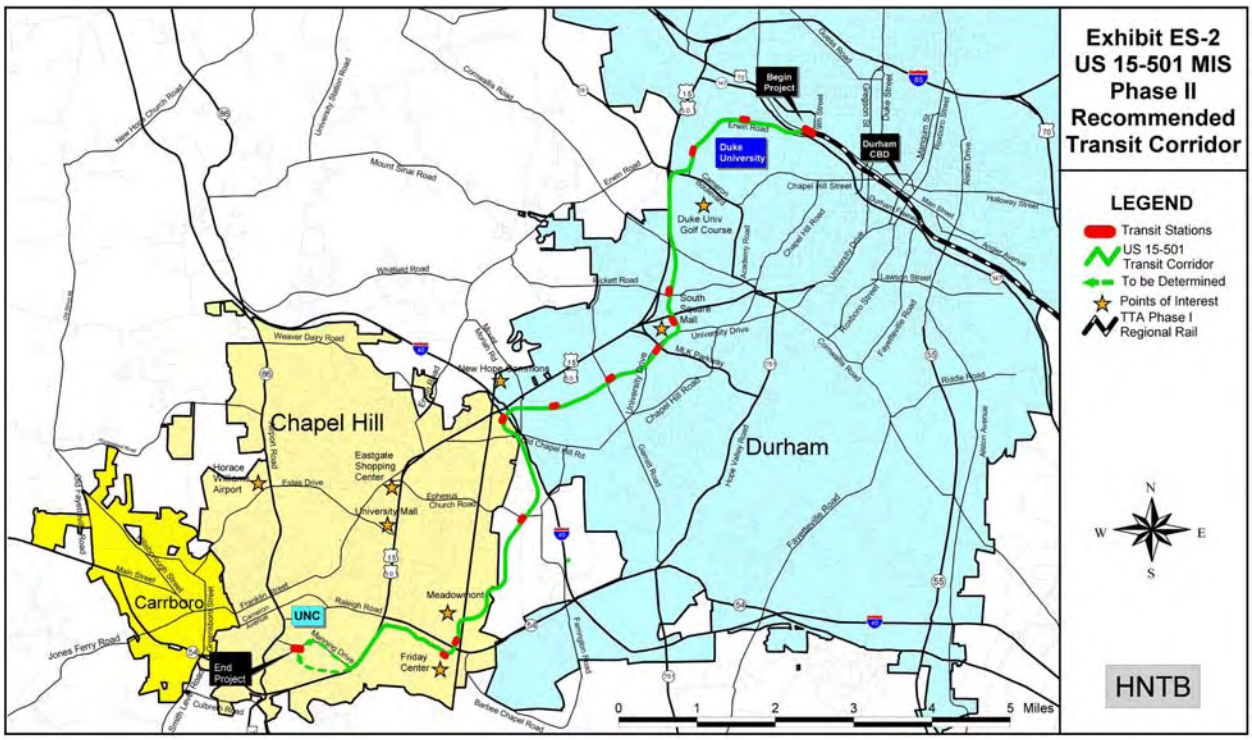
- The adopted alignment is referenced in the Durham City and County Comprehensive Plan. This Plan, adopted in February 2005 and amended in January 2009, states that the "City and County shall support planning for and protection of the transit corridors identified in the most recently adopted version of the Triangle Transit Authority's Regional Transit Plan". Furthermore, it mandates that the "City-County Planning Department and the City Public Works Department shall review development proposals in relation to the adopted Regional Transit Plan, and shall seek dedication or reservation of right-of-way along designated transit corridors in conformance with that Plan".
- The Comprehensive Plan also designates the Leigh Village area as a Suburban Transit Area, which allows for high densities associated with Compact Neighborhood development, and requires development to be transit, bicycle, and pedestrian oriented.
- The Transportation Advisory Committee (TAC) for the DCHC MPO adopted the Southwest Durham/Southeast Chapel Hill Collector Street Plan (CSP) in April 2007. Transit circulation and future transit facilities were a large component in the development of the recommended CSP. Better connectivity and accessibility to existing and future transit facilities was closely considered, with dense development expected near proposed transit stations.
- The current NC 54 corridor study, from US 15-501 to east of I-40, was commissioned by the City of Durham, Durham County, the Town of Chapel Hill, and the DCHC MPO in order to analyze land use and transportation issues in the corridor to better inform future land use and transportation strategies. While the final master plan resulting from this study has not been officially adopted, the study assumes the adopted alignment.

Development Plans

A number of land development projects have either been completed or are being planned based on the adopted alignment and local government land use and transportation plans that reference the alignment. These include:

- Meadowmont was required by the Town of Chapel Hill to preserve right-of-way for fixed guideway transit, and planned the development to concentrate the commercial and office components in the vicinity of the proposed Meadowmont station.

Figure 2 – MIS Recommended Alignment



- The design of the recent 54 East project was required to accommodate the adopted alignment.
- The design of Creekside Elementary School was also affected by and was required to preserve land for the adopted alignment.
- Planning for high density, mixed-use, transit-oriented development for the Leigh Village property has been ongoing for several years, on the assumption that the land must be preserved for the alignment and as a station that will be located there. The planning also assumes that the station will be a multi-modal hub that serves express buses from I-40 to the east, as well as a major park-and-ride center.
- The University has undertaken preliminary planning for the Friday Center property on the assumption that a station will be located there.

Conclusion

The regional rail plan, and its feasibility, hinges on high density, transit-oriented development occurring at many of the stations. Much of this development will be undertaken by the private sector, and in some cases appropriate development has commenced, has been planned, or is in the planning phases. In making financial commitments, developers and their financial backers need to be assured that an alignment formally adopted by local governments will not be retracted.

ADDITIONAL FACTORS

There are several additional factors that favor remaining in the NC 54 corridor, though these do not preclude the US 15-501 corridor as an option. It also should be noted, however, that Alignment 3 is approximately two miles shorter than the NC 54 options, thus potentially providing some cost savings, and Alignment 3 also may have the least impacts on the natural environment. Regardless, these

potential advantages must be weighed in comparison with the benefits of keeping the chosen alignment within the NC 54 corridor.

Employment, Population, and Activity Centers

Figure 3 shows the 2035 employment and population projections for the traffic analysis zones within the study area. These projections should generally cover all anticipated and desired development. Based on aerial photography and some knowledge of the proposed developments, an order of magnitude estimate of the number of employees and population within approximately ½ mile of the stations has been determined. While several of the traffic analysis zones are quite large, in many cases the development is focused in only a portion of the zone. For example, the proposed Leigh Village development is clustered around a station in the southern portion of the zone, and the Meadowmont and Friday Center employment is closer to NC 54, where stations are proposed.

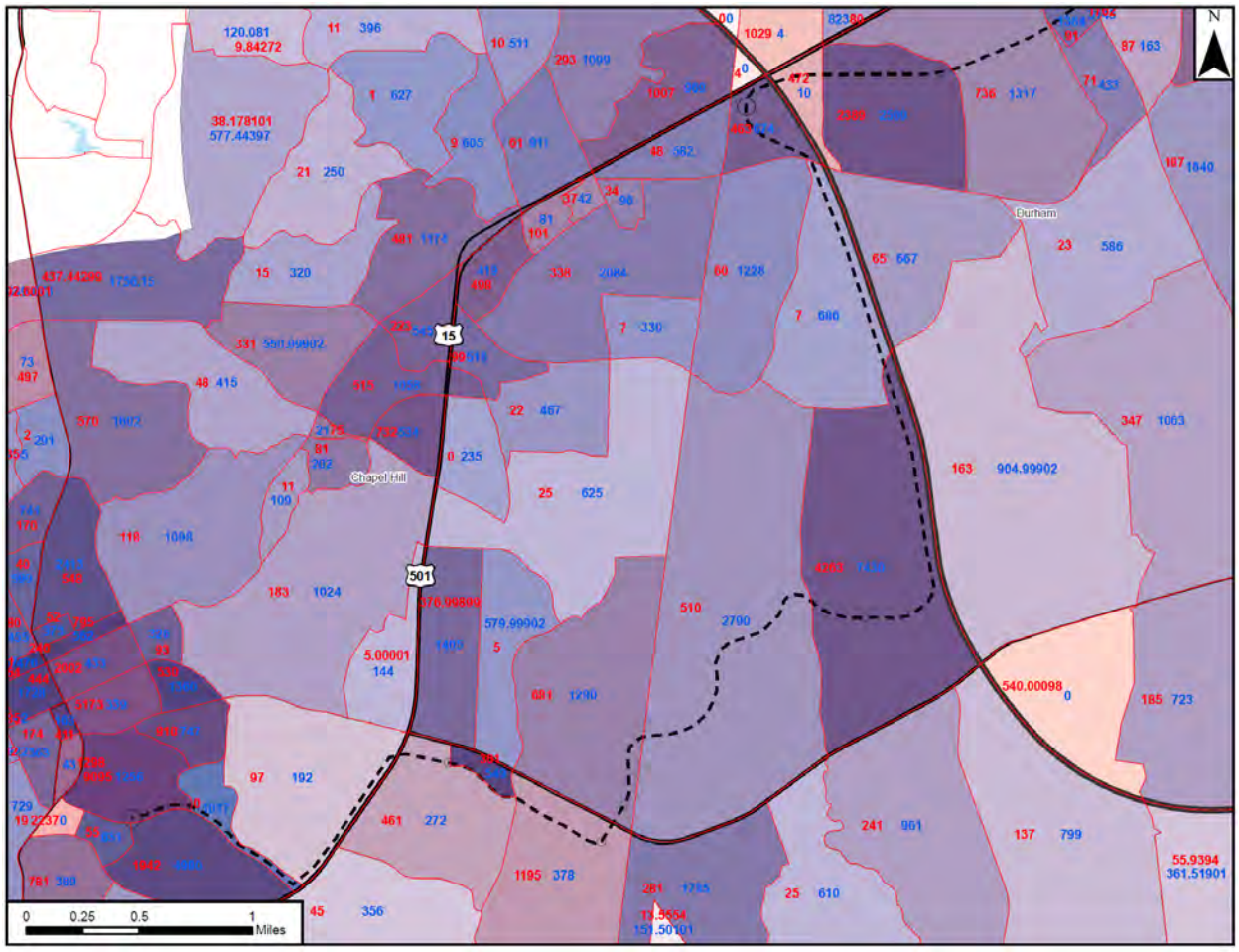
The 2035 population is significantly higher for the two NC 54 alignments than for Alignment 3, and the 2035 employment is more than double. Therefore the NC 54 alignments strengthen the feasibility of light rail transit in the Durham-Chapel Hill corridor, as this initial analysis suggests that ridership generated from development within the corridor would be higher for Alignments 1 and 2.

Park-and-Ride Demands and Ridership

Park-and-ride has the potential to significantly contribute to ridership on a rail line that connects park-and-ride facilities located near I-40 interchanges to UNC main campus and downtown. Currently there are 1,660 park-and-ride spaces at the Friday Center on NC 54, serving primarily commuters from east of Chapel Hill. These are filled to capacity on a typical weekday, and the University has identified a need for more spaces in this corridor. Over time, as the Friday Center property is redeveloped, it is anticipated that the current park-and-ride must be relocated closer to I-40. One site that has been studied for a large park-and-ride facility is Leigh Village where a rail station and major transfer hub would be located for Alternatives 1 and 2. Initial studies have indicated a long-term need (2035+) for a total of over 3,500 spaces in the NC 54 corridor. Previous analysis has determined that this could translate into about 8,000 daily transit riders in the corridor (both directions combined). While these would be short distance trips, they would represent a significant amount of the total ridership in the Durham to Chapel Hill corridor. Representatives of the planned Leigh Village development have indicated a willingness to accommodate park-and-ride.

Studies have also identified the need for a large amount of park-and-ride in the US 15-501 corridor to serve commuters from the Durham area. However, the University and Town have been unable to find sites suitable for a sizable facility in the corridor, a situation that is unlikely to change. Therefore, while some opportunities may arise for smaller or shared park-and-ride facilities, it is unlikely that they will match the potential for park-and-ride in the NC 54 corridor. Therefore, rail alignments in the NC 54 corridor, i.e. 1 and 2, will benefit to a much greater degree in terms of ridership than an alignment in the US 15-501 corridor, i.e. alignment 3.

Figure 3 – 2035 Employment and Population Projections



An alignment in the NC 54 corridor also can reduce Chapel Hill Transit (CHT) operating costs, or enable CHT service to be expanded at no cost. In the NC 54 corridor, CHT runs approximately 24 vehicles in rush hour service to serve the Friday Center and NC 54 park-and-ride lots, as well as buses serving the more neighborhood-oriented "G" and "V" routes. With the NC 54/I-40 interchange being the primary intercept point for east-of-Chapel Hill traffic (and much of southern Durham traffic), Alignments 1 or 2 have the potential to pick up the work (and cost) of perhaps 50% to 75% of these buses. Selecting Alignment 1 or Alignment 2 provides the Town of Chapel Hill with the choice of:

- Significantly re-deploying their vehicles for service in other corridors, such as the MLK corridor or East Franklin/15-501 corridor, which were envisioned for enhanced bus service in the Chapel Hill Transit Long Range Transit Plan study
- Creating feeder routes to link presently unserved or underserved neighborhoods in Chapel Hill to the rail line
- Reducing the number of buses operating at peak periods in Chapel Hill and lower the burden of the bus system on the Town budget
- A combination of all of the above

A choice of Alignment 3 would probably require most of those 24 buses in service in the NC 54 corridor to remain in operation in that location, reducing redeployment, feeder bus, and peak period operating cost reduction opportunities.

Right-of-Way Availability

As previously mentioned, right-of-way has been preserved for Alignment 1, possibly at no cost. Additional right-of-way may have to be purchased for Alignment 2, particularly if the NC 54 corridor study recommendations for road improvements are implemented. An initial review of property maps indicates that the right-of-way width along US 15-501 (Alignment 3), including the parallel service roads, is a minimum of 200 feet. It is possible that right-of-way may have to be purchased in places. It is assumed that the redevelopment of Ram's Plaza will donate right-of-way close to US 15-501 for transit.

CONCLUSIONS

As outlined above, there are strong arguments for the alignment to remain in the NC 54 corridor. A desktop environmental evaluation of the three alignments does not indicate any environmental fatal flaws associated with any of the alignments. A detail environmental study and coordination with the federal and state regulatory agencies is needed before a definitive recommendation can be made as to which of the two NC 54 alignments has the least overall environment impacts, particularly as to the preferred location for crossing the Corps land. No permits for crossing federally-owned lands or wetlands have been obtained for the adopted alignment.

Appendix E – Station Evaluation

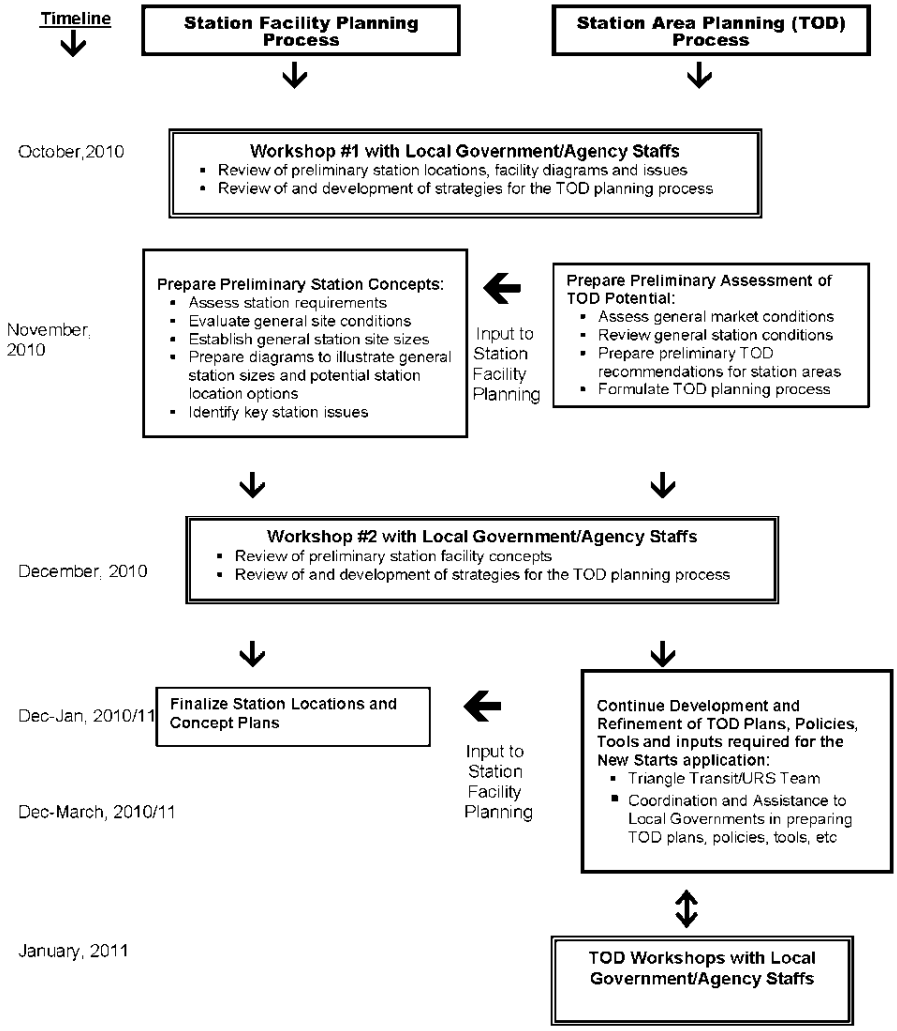
1. Introduction

This technical report presents the Durham-Orange Corridor transit station planning and preliminary concept design process and recommendations.

2. Station Planning Process

Station locations for the Durham-Orange Corridor were developed through a combination of stakeholder involvement and parallel engineering and planning studies. The Station Planning Process is shown in Figure 1.

Figure 1 Station Facility Planning and Station Area Planning Process



This report presents the stakeholder involvement process for the Station Facility Planning and Station Area Planning Process. It also presents the Station Facility Planning Process and recommendations in more detail. The Station Area Planning process is documented in the Transit Oriented Development (TOD) Assessment Report.

2.1. Stakeholder Involvement

Stakeholder involvement revolved around three sets of very productive workshops that were held in October 2010, December 2010, and January 2011. Workshop participants included planning and transportation staff from the municipal and county governments within the study area, as well as other agencies and organizations with an interest in or responsibility for planning in those areas.

The table on the right lists the organizations and agencies whose representatives were invited to and participated in most, if not all, of the workshops. Additional meetings were also held with a limited number of agencies to review individual station locations.

Station Planning Stakeholder Participants

- City of Durham
- Town of Chapel Hill
- Town of Carrboro
- Durham County
- Orange County
- Triangle J Council of Governments
- Research Triangle Foundation
- University of North Carolina at Chapel Hill/UNC Health Care System
- Duke University and Medical Center
- Durham-Chapel Hill-Carrboro Metropolitan Planning Organization
- Capital Area Metropolitan Planning Organization
- North Carolina Department of Transportation
- Durham Area Transit Authority
- Chapel Hill Transit
- Triangle Transit

Subsequent to the workshops and meetings, staff from the local governments and other organizations provided additional information and local knowledge to assist the consultant team in refining and advancing plans at each of the station locations. Participation by local governments and other agencies was extensive and has resulted in ongoing inter-jurisdictional collaboration. Summary notes from each of the larger meetings are appended to this document.

Following is an overview of the three sets of workshops:

- The October 2010 workshops focused on reviewing station locations that had been identified in previous studies or subsequently proposed by one or more of the agencies or the consultant team. In addition, the need for and amount of supporting facilities or infrastructure was discussed, including park-and-ride, feeder bus services, platform location and configuration, and vehicular, bus, and pedestrian access and circulation. An overview of TOD and the forthcoming assessments were also discussed at this meeting in preparation for more detailed planning and analysis at future meetings.
- At the December 2010 workshops station locations and concepts, which had been revised as a result of the October workshops, were presented for additional discussion and further refinement. TOD typologies reflecting the different types of stations were reviewed and the results of initial assessments of TOD potential were presented for many of the station locations.
- The January 2011 workshops focused on the results of more detailed assessments and the potential for TOD at each station location, ranking of station locations by applying multiple criteria, and initial station area development diagrams.

Following is a description of those station locations for which alternatives were selected for more detailed analysis, stations initially considered and subsequently eliminated, and/or new station locations. Stations for which there are no alternative locations or there are only minor adjustments in location are not discussed below:

- There are three potential station locations on the University of North Carolina (UNC) at Chapel Hill main campus (in the area of the UNC Hospitals). They are as follows:

- Alternative A is located south of Manning Drive adjacent to the Jackson Circle Deck. This location is shown on the University Master Plan adopted in 2006 and is based on the assumption that the Light Rail Transit (LRT)/Bus Rapid Transit (BRT) corridor and service would not be extended.
- Alternative C is located south of Manning Drive, west of Hibbard, and east of Alternative A; could permit the corridor to be extended north and west into downtown Chapel Hill and beyond to Carrboro as a future phase of the LRT/BRT project.
- Alternative D is located on a proposed realigned segment of Mason Farm Road between Daniels Road and East Drive; could also permit the corridor to be extended in the future.

- Alignment alternatives (C1 and C2) which occur east of the Friday Center Station have resulted in two different station location alternatives which are described below:
  - The Meadowmont Station would be located along the alignment which was originally adopted by the Durham-Chapel Hill-Carrboro (DCHC) Metropolitan Planning Organization (MPO), the Town of Chapel Hill and Durham in 2001, on Meadowmont Lane between Sprunt Street and Barbee Chapel Road
  - The Woodmont station would be located along the alignment alternative that follows NC 54 and serves the proposed mixed-use Hillmont development.
- A station at Garrett Road was eliminated because of limited developable land within the station area due to the surrounding wetlands and other undevelopable areas. This alternative was also eliminated due to constrained vehicular and pedestrian networks caused by Garrett Road being the only access between Chapel Hill Road and Durham Chapel Hill Blvd/US 15-501 in addition to the environmental constraints that limit the prospects for roadway expansion resulting in a limited potential for ridership.
- Two alternative alignments in the South Square area have resulted in two different station locations, both of which are located between Durham Chapel Hill Boulevard and University Drive. One alternative is located on Shannon Road and the other is located on Westgate Drive.
- A station considered near Pickett Road was eliminated based on its proximity to the South Square station alternative at Westgate Drive and because of the limitations created by the adjacent highway and the limited amount of developable land in the vicinity of the station. While there was initial support for retaining the Pickett Road station if the Shannon Road alternative at South Square were to be selected, constructability and cost issues as well as the limited development opportunities led to the determination that it would be difficult to justify this station's implementation cost.
- A station originally proposed on Erwin Road near the intersection of Towerview Drive (adjacent to the Duke University West Campus) was moved north to LaSalle Street where ridership potential was considered to be higher.
- The station serving Duke University Medical Center and the Durham VA Hospital is located on the west side of the intersection of Erwin Road and Fulton Street. At the University's request an alternative station location has been included on Erwin Road between Flowers Dr. and Trent Dr.

Final station locations are presented in Section 4.

2.2. Station Facility Planning Process

The initial and alternative station locations evaluated were based primarily on previous studies, including the Phase I Regional Rail Final Environmental Impact Statement (2002) and the US 15-501 Major Investment Study (2001), as well as changes, additions, or deletions made by local governments subsequent to those studies or in the early phases of the Alternatives Analysis prior to the October 2010 Station Planning Workshops.

For LRT and BRT system design, there are typically three key planning and design components that need to be considered in selecting the locations and configuration of transit stations, as depicted in Figure 2. These components were the basis of criteria used in the assessment of both previously identified and new station locations in order to identify the preferred locations.

Figure 2 Three Key Ingredients for Transit Station Development

Corridor Fit

The first component in transit station design is the fit of the transit stations into the community setting or fabric. Transit stations should be located where they can optimize service to the community while minimizing the amount of disruption or negative impacts on the surrounding land uses and facilities. Transit stations should be located to optimize the following:

- Service to the maximum number of users including major activity nodes, employment centers, and housing concentrations
- Available rights-of-way and transit station sites

- Compatibility with adjoining land uses and major existing or proposed developments
- Avoidance of sensitive land uses and facilities such as parks, open space, wetlands, and other natural environments, cultural, and historic resources
- Minimum disruption to existing major utilities

Transit Station Function

The second major component of transit station planning is the ability of the proposed transit station sites to meet the transit station facility functional requirements. Each proposed transit station site must be able to accommodate all the required transit functions identified for each particular location. The functional requirements for transit stations can include one or more of the following:

- Feeder bus circulation, feeder bus turnarounds, and feeder bus bays for inter-modal transfers
- Convenient vehicular, bicyclist, and pedestrian access to the transit station sites with minimum disruption to the area traffic circulation patterns
- Pedestrian and bicyclist access, paths, and bicycle storage
- Drop-off and pick-up areas
- At-grade park-and-ride lots or parking structures/ramps
- Ticketing, validating, and security equipment
- Transit shelters and site amenities, including landscaping
- Storm water retention areas

In addition, all transit facilities must meet the Americans with Disabilities Act (ADA) requirements and address special local or neighborhood needs and conditions.

Transit Station Area Development

The third component in locating transit stations is the potential to create TODs around the transit stations. Transit stations should be located where they maximize opportunities for creating new TODs that support and complement the transit facilities. Well-designed TODs can achieve the following:

- Increase the population base and thus the ridership for the transit system
- Attract new retail, service, office, and residential developments
- Further local planning and redevelopment goals and objectives

Therefore, some of the primary considerations in selecting potential transit station sites should include the following:

- Potential to develop undeveloped or underutilized parcels around or in the vicinity of the transit stations (the station area)
- Potential to increase densities in the surrounding new or infill (increasing the density of existing residential/commercial areas) developments
- Potential for mixed-use and multi-use developments that offer a variety of living, working, learning, shopping, and entertainment opportunities

3. Station Characteristics

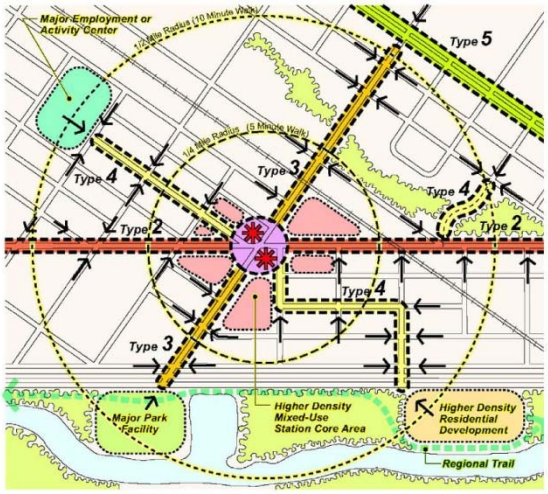
3.1. General Station Characteristics

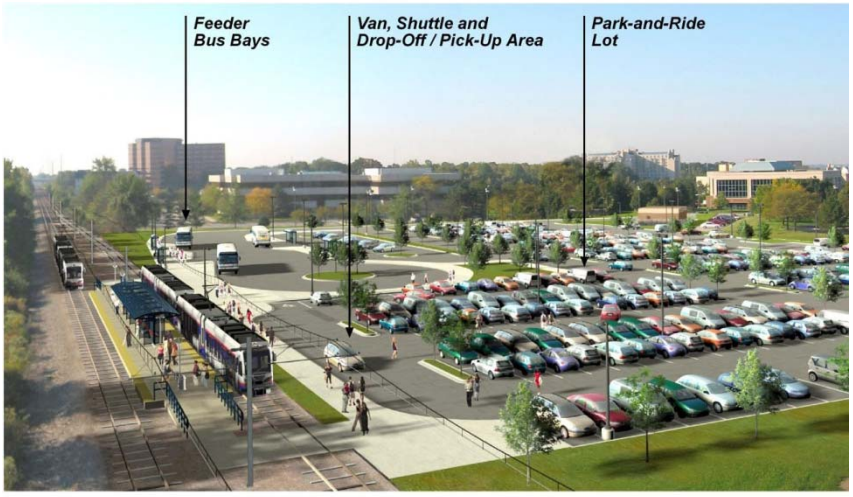
LRT and BRT stations can take many forms and shapes and can be configured in a number of ways. Each type may be designed to be relatively simple or quite elaborate and extensive. While the following discussion focuses on LRT many of the design features are also applicable to BRT. These general station characteristics were considered in the Station Facility Planning Process.

One of the most critical elements for successful transit stations is good station access. Figure 3 illustrates the various access modes that need to be considered in transit station design. For walk-up stations, a comprehensive pedestrian and bicyclist path system (Figure 3-a) is essential. The path systems need to extend beyond the station limits and link all major transit user generators within at least a ½ mile radius, which represents a 10-minute walking distance to the transit stations. For people arriving by other travel modes (Figure 3-b), feeder bus bays, van or shuttle service stops, pick-up and drop-off areas, and parking spaces for park-and-ride users need to be provided.

Figure 3 Transit Station Site Access

a. *Pedestrian and Bicyclist Access Path System*





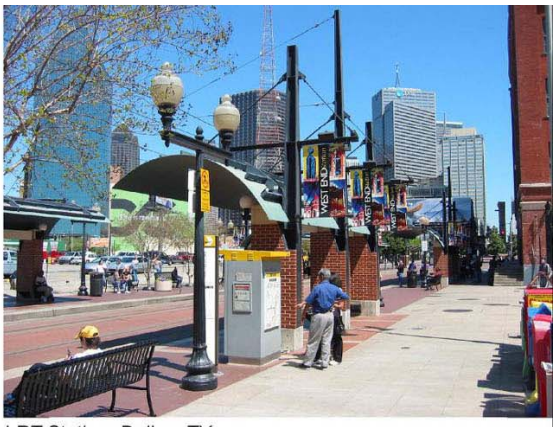
b. *Vehicular Access Modes to Transit Stations*

3.2. Station Examples

Stations are one of the key components of LRT and BRT systems because they are the contact points or gateways between the transit users and the transit facilities and also because they are one of the most highly visible elements of the transit system. Figure 4 provides examples of some typical LRT and BRT station designs from around the world.

Figure 4 Transit Station Examples

LRT Station, St. Louis, MO



LRT Station, Dallas, TX

BRT Station, Holland

LRT Station, Minneapolis, MN

BRT Station, Orlando, FL

LRT Station, Cleveland, OH

LRT Station, Portland, OR

3.2.1. Station Components

LRT and BRT stations include a number of key components that are either essential for the safety and security of the transit users or are amenities that make using the transit system more comfortable and enjoyable and thus encourage more ridership. Figure 5 illustrates some of the major components that make up LRT and BRT systems and stations.

Figure 5 Transit Station Components

a. Low-Floor LRT Train

b. Low-Boarding Station Platforms and Shelters

c. Station Furniture

d. Ticket Vending and Validating

e. Security Equipment

f. Schedules and Area Information

g. Bicycle Storage

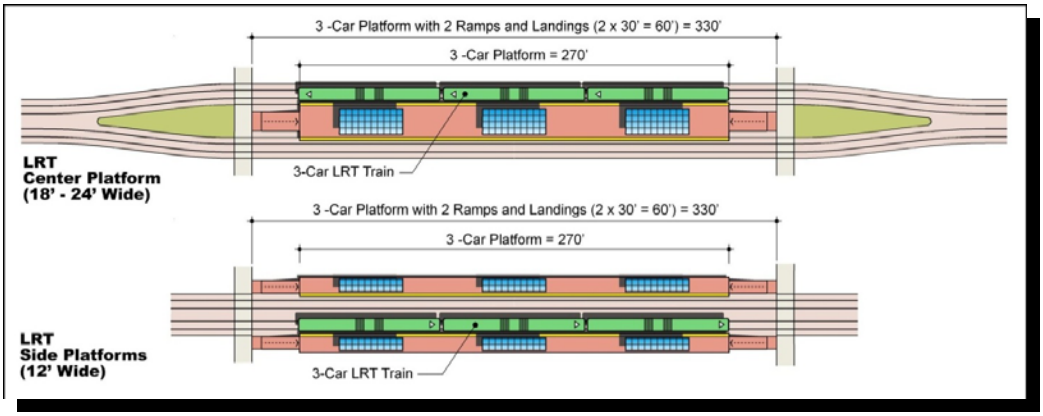
h. Lighting

Vehicles

Although not directly a part of the transit station, the design characteristics of the BRT and LRT vehicles dictate how the stations need to be configured. The type of LRT vehicle that might be used for the Durham-Orange Corridor is illustrated in Figure 5a. Since LRT and BRT vehicles are essentially moving advertisements for the system, a well-designed graphics scheme for the vehicles can help improve the overall image of the transit system.

Station Platforms

Station platforms are typically the largest physical components in the station areas. Their height, length, and width can vary considerably, depending upon the planned system characteristics, and they can be constructed of various materials with a wide range of finishes. Major features of station platforms are access ramps and tactile edge strips. The tactile edge strips, which serve to mark the loading edges of the platforms for transit patrons with disabilities, are usually two feet wide and have a textured surface. LRT platforms in the Durham-Orange Corridor are designed to accommodate 3-car (connected rail cars) "consists". The BRT platforms are 150 ft. long to accommodate two articulated buses.



Station Shelters

Station shelters, which can be designed in various themes and styles, frequently are the signature pieces of LRT and BRT systems. They protect waiting passengers from the elements and can include special features such as passenger information displays, sound systems, unique lighting, and heating elements. Some examples of typical shelter designs for transit stations are illustrated in Figure 4 above.

Station Furniture

Station furniture for LRT and BRT systems (see Figure 5-c) includes, in most cases, items such as light fixtures, benches, litter receptacles, information cases, and railings. Ideally, they are designed to be coordinated and to match the overall station design theme. Items such as benches need to be carefully designed to discourage vagrancy and loitering.

Ticket Vending and Validating Equipment

LRT and BRT systems typically operate on a pre-paid fare basis. In order to facilitate faster boarding and reduce dwell time at the stations, tickets need to be purchased before boarding vehicles. Station platforms are typically considered a "paid-fare zone", which means that patrons waiting on platforms

should have a valid ticket. Each platform should have access to at least one ticket vending and validating machine (Figure 5-d) and each station area should have a minimum of two machines in case one breaks down.

Generally, this means that for stations with two separate platforms, a ticket vending and validating machine is provided for each platform; for stations with a single platform, two ticket vending machines are provided on the same platform or adjacent to the platform. In some transit systems, the ticket vending and validating machines are located off the platforms, while in others they are all located on the platforms. Ideally, the ticket vending equipment should be placed under a canopy or other form of weather protection.

Security Equipment

Depending upon local circumstances and capital cost considerations, security equipment, such as speakers and video cameras (Figure 5-e); can be incorporated into the station designs.

Schedule and Area Information Cases

A schedule case should be provided that includes information about transit routes, the transit fare structure, and safety information (Figure 5-f). Some transit systems also incorporate display cases that provide information about area businesses and local attractions.

Bicycle Storage

If feasible, bicycle racks or loops (Figure 5-g) should be provided for bicycle users at transit stations. Bicycle lockers are another option that provide better safety and security and encourage more bicycle usage. Some transit systems, especially in Europe, include extensive bicycle storage facilities. An evaluation needs to be made for each of the proposed transit stations to establish what bicycle usage might be expected and how large the bicycle storage facilities need to be. Typically, bicycle storage facilities are located off station platforms in the immediate vicinity of the stations.

Lighting

Good lighting is essential for the comfort and security of the transit users. Lighting can include built-in light fixtures in the shelters (Figure 5-h) as well as bollards and free-standing light poles on the platforms (Figure 5-c).

Signs

Signs are essential for identifying the transit stations, providing safety information, and for posting regulatory guidelines for the station areas. Advertising signs can provide extra revenue for transit systems but should be used judiciously in order to minimize clutter and avoid obstructing views.

Vertical Circulation

For stations that are grade-separated from the surrounding street systems and neighborhoods, or where a grade-separated crossing of a roadway or railroad is needed, vertical circulation may be required. Unless the grade differences are not too great and there is sufficient room for pedestrian ramps, the vertical circulation components may need to include staircases and elevators. For some transit stations

with high volumes of pedestrian traffic, escalators may also be a desirable amenity. Figure 6 provides examples of various vertical circulation features, including an aerial station with staircases and elevators directly accessible from the station platform (Figure 6-a), a pedestrian overpass bridge (Figure 6-b), two examples of vertical circulation cores at the sides of transit corridors (Figure 6-c and Figure 6-d), a pedestrian overpass over a freight railroad corridor (Figure 6-e), and a pedestrian underpass under a freight railroad corridor (Figure 6-f).

Figure 6 Vertical Circulation Examples

a. Aerial LRT Station — Charlotte, NC

b. Pedestrian Overpass — Charlotte, NC

c. Proposed Vertical Circulation Core — Atlanta, GA

d. Vertical Circulation Core — Hiawatha LRT, Minneapolis, MN

e. Pedestrian Overpass for RR Corridor — Northstar Line, MN

f. Pedestrian Underpass for RR Corridor — Northstar Line, MN

Park-and-Ride Facilities

At some LRT and BRT stations, especially end-of-line stations or at stations in the middle of longer transit corridors, park-and-ride facilities are required to accommodate transit users arriving by car. Typically these stations also include feeder bus bays and bus turn-around areas, and drop-off and pick-up areas.

Some park-and-ride sites in the middle of the transit corridor can be relatively small, in the range of 50 to 200 parking spaces, while other large and very-large site at the end-of-line stations may have several thousand spaces. The actual number of park-and-ride spaces provided depends on ridership forecasts and available sites for the park-and-ride facilities. Where feasible, surface parking lots are the most cost effective way of providing park-and-ride facilities and they provide future development flexibility. However, where land assembly costs are at a premium, parking decks may need to be constructed. Figure 7 provides examples of a small and a very large park-and-ride and feeder bus facilities. Both include feeder bus bays and circulation and drop-off/pick-up areas.

Figure 7 Examples of Park-and-Ride Facilities

a. Small Park-and-Ride and Feeder Bus Facility — Charlotte, NC

b. Very Large Park-and-Ride and Feeder Bus Facility — Houston, TX

Drop-Off and Pick-Up Areas

Where feasible, all transit stations should include areas that are designated for dropping off and picking up passengers. These drop-off and pick-up areas can be located on-street along curbs or they can be integrated into park-and-ride facilities.

4. Proposed LRT/BRT Station Concepts

This section includes a description and conceptual plan illustrating the key features of the proposed LRT and BRT (High and Low) stations for the Durham-Orange County corridor. These conceptual station plans represent preliminary ideas for general location and overall site requirements. Station platforms are shown as red rectangles superimposed on the track alignment which is shown in yellow when the tracks are at-grade and blue when the tracks are on an aerial structure. For stations with park and ride spaces, the area required for parking is illustrated in a yellow box. These conceptual plans are only diagrammatic representations of the approximate area required for the LRT/BRT station sites and do not represent site specific recommendations.

4.1. UNC Station

For the UNC Station, which would be located on the UNC campus, there are three options. Two of the options would be located southwest of the Manning Drive and Hibbard Drive intersection and the third option would be located in a new alignment south of the Genetic Medicine Research facility. All three options are based on the assumption that, as indicated in the UNC Master Plan, the southwest area of the campus will be redeveloped and a number of existing buildings removed. The UNC Master Plan further indicates that a number of new buildings and new roadways will be built in the area.

4.1.1. UNC Station – Option A

The UNC Hospitals Station – Option A which would be developed according to the UNC Master Plan would be the western end-of-line station.

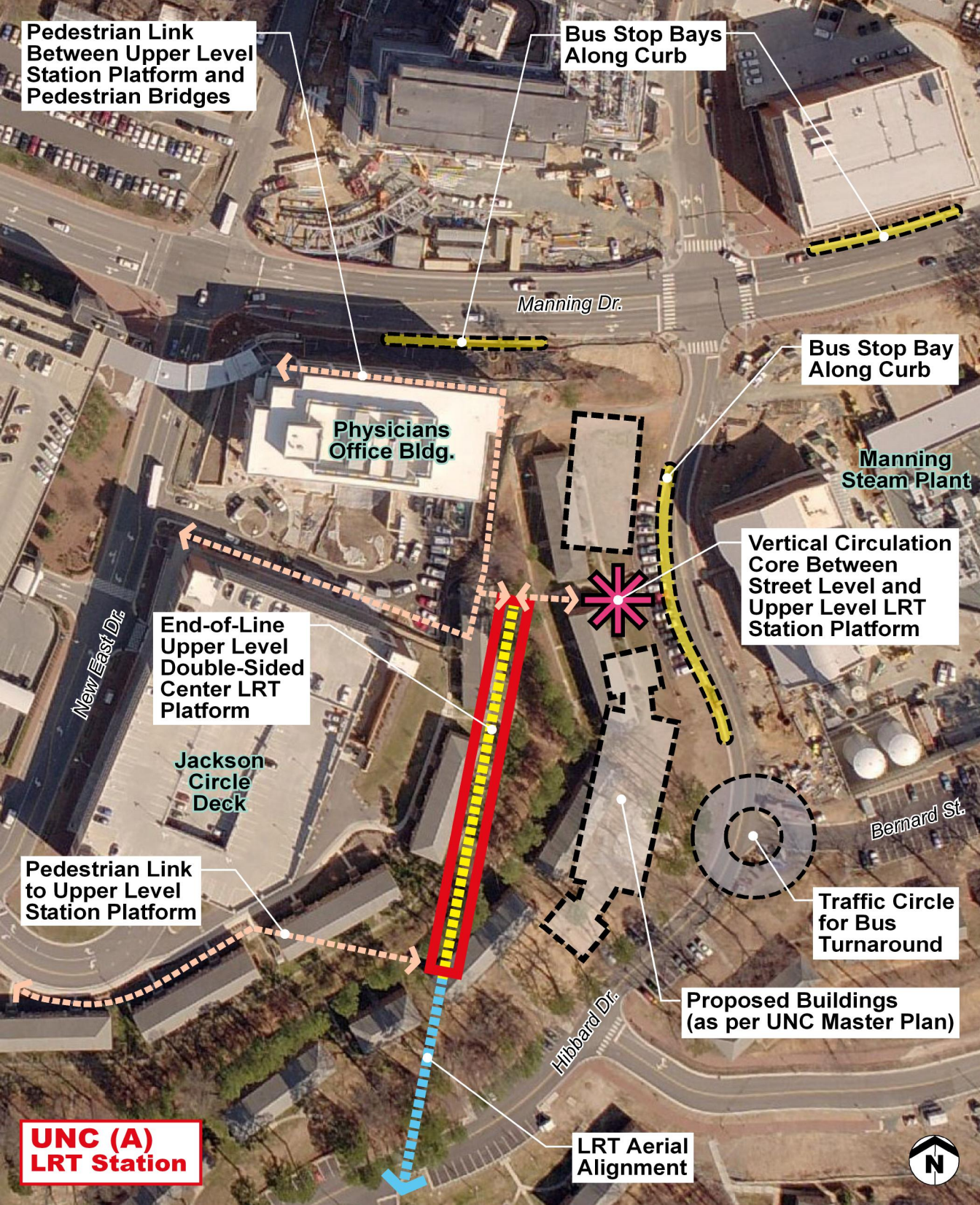
Location: Southwest of the Manning Drive and Hibbard Drive intersection, adjacent to the Jackson Circle Deck. It would require a vertical circulation core for access from Hibbard Drive. The tracks or guideway to the south would be on aerial structure.

Existing Conditions: Fully developed, however, the UNC Master Plan includes infill and redevelopment.

Service: UNC Hospital Complex and UNC South Campus, as well as UNC North Campus and the Towns of Chapel Hill and Carrboro via bus.

Key Features:

- Primarily a walk-up station with feeder bus service that would stop along the curbs of Manning Drive and Hibbard Drive. If the buses that stop along Hibbard Drive need to be turned around, a roundabout could be developed at the intersection of Hibbard Drive and Bernard Street.
- Elevated, at-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- Direct access from the station platform to the walkway that wraps around the north side of the Physicians Office Building and connects to the elevators that lead to the skyway overpasses over Manning Drive.
- Vertical circulation core with a staircase and at least one elevator between the station and Hibbard Drive. Since this may be a relatively heavily used station, a second elevator might be required.


Pedestrian Link Between Upper Level Station Platform and Pedestrian Bridges
Bus Stop Bays Along Curb
Manning Dr.
Bus Stop Bay Along Curb
Physicians Office Bldg.
Manning Steam Plant
Vertical Circulation Core Between Street Level and Upper Level LRT Station Platform
New East Dr.
End-of-Line Upper Level Double-Sided Center LRT Platform
Jackson Circle Deck
Bernard St.
Pedestrian Link to Upper Level Station Platform
Traffic Circle for Bus Turnaround
Proposed Buildings (as per UNC Master Plan)
Hibbard Dr.
LRT Aerial Alignment
UNC (A) LRT Station
N

4.1.2. UNC Station – Option C

The UNC Hospitals Station – Option C would be the westerly end-of-line station.

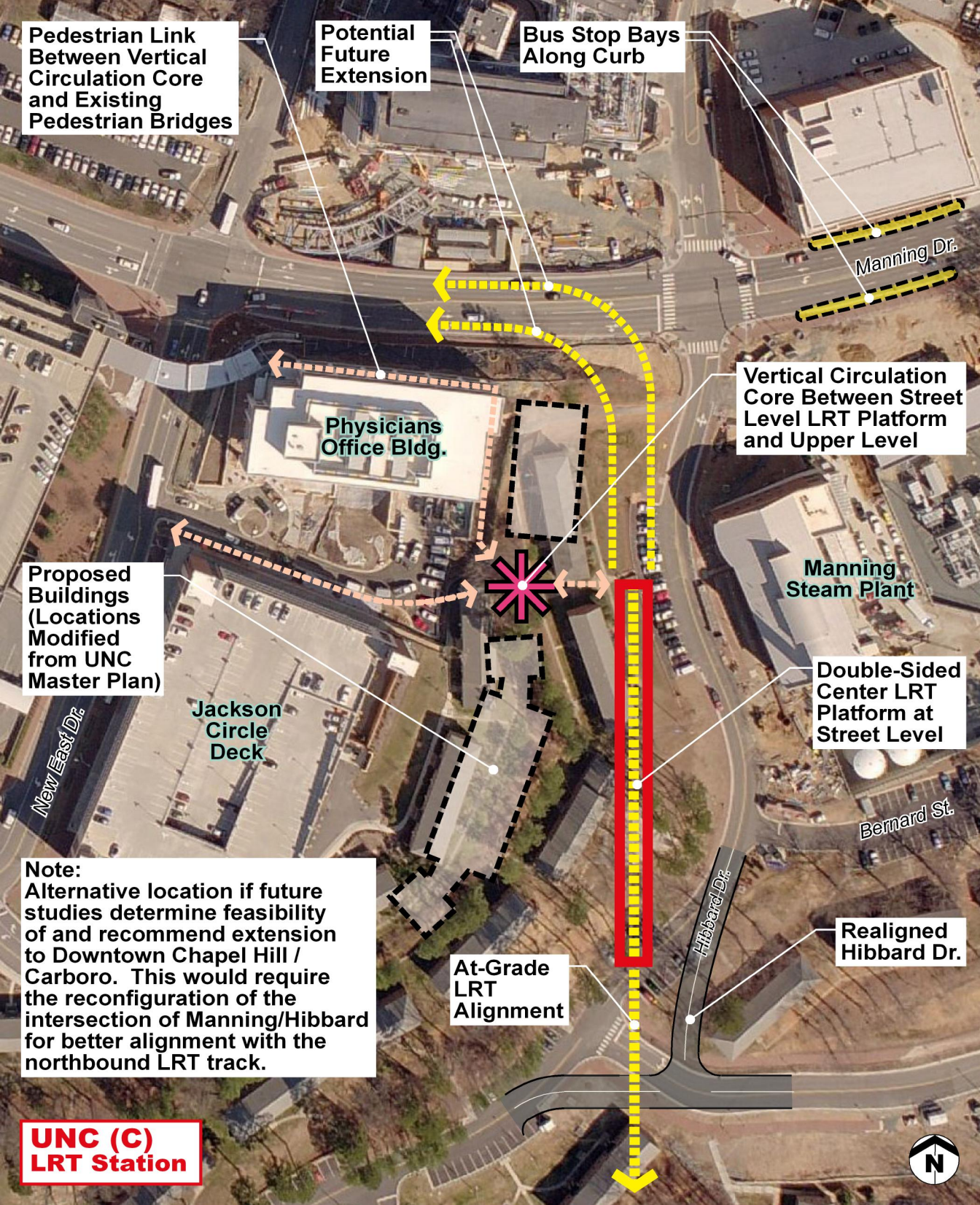
Location: Southwest of the Manning Drive and Hibbard Drive intersection, at street level, and just west of Hibbard Drive. This location could permit the corridor to be extended north and west into downtown Chapel Hill and beyond to Carrboro as a future phase of the project

Existing Conditions: Fully developed, the UNC Master Plan includes infill and redevelopment. New buildings that are proposed in the UNC Master Plan would need to be constructed west of the station.

Service: UNC Hospital Complex and UNC South Campus, as well as UNC North Campus and the Towns of Chapel Hill and Carrboro via bus.

Key Features:

- Primarily a walk-up station with feeder buses that would stop along the curbs of Manning Drive.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- Vertical circulation core with a staircase and at least one elevator west of the station platform to provide a direct connection to the upper level walkways and the skyway overpasses over Manning Drive. Since this may be a relatively heavily used station, a second elevator might be required.
- A portion of Hibbard Drive southeast of the station would need to be reconstructed.


Pedestrian Link Between Vertical Circulation Core and Existing Pedestrian Bridges
Potential Future Extension
Bus Stop Bays Along Curb
Manning Dr.
Vertical Circulation Core Between Street Level LRT Platform and Upper Level
Physicians Office Bldg.
Proposed Buildings (Locations Modified from UNC Master Plan)
Manning Steam Plant
Double-Sided Center LRT Platform at Street Level
Jackson Circle Deck
New East Dr.
Bernard St.
Hibbard Dr.
Realigned Hibbard Dr.
At-Grade LRT Alignment
Note:
Alternative location if future studies determine feasibility of and recommend extension to Downtown Chapel Hill / Carboro. This would require the reconfiguration of the intersection of Manning/Hibbard for better alignment with the northbound LRT track.
UNC (C)
LRT Station
N

4.1.3. UNC Station – Option D

The UNC Hospitals Station – Option D would be the westerly end-of-line station.

Location: At street level south of the Genetic Medicine Research facility on a proposed realigned segment of Mason Farm Road between Daniels Road and East Drive. This location could permit the corridor to be extended into downtown Chapel Hill and beyond as a future phase of the project.

Existing Conditions: Fully developed, however, according to the UNC Master Plan, the area will be redeveloped and a number of new buildings and roadways will be constructed in the area.

Service: UNC Hospital Complex and UNC South Campus, as well as UNC North Campus and the greater Chapel Hill area via bus.

Key Features:

- Primarily a walk-up station with feeder bus transfers from buses that would stop along the curbs of a new east-west roadway, which would be developed directly north of the alignment.
- The new roadway, which would be located directly south of the existing Genetic Medicine Research building loading docks, would permit the continuation of the existing loading dock operations.
- The feeder bus curb pull-outs, which would be located on both sides of the new roadway, would be designed to accommodate two 60-foot articulated buses each.
- At-grade station platform with two access ramps and an elevator and staircase for access to a pedestrian bridge.
- 24-foot wide, double-sided, center platform.
- A pedestrian bridge to provide a direct connection between the station platform and the elevated Mason Farm Road and Daniels Road intersection and the rest of the UNC campus.
- Signalized intersection at Mason Farm Road and Hibbard Drive.


Pedestrian Bridge
Existing Concrete Loading Area
Potential Future LRT Extension
West Dr.
Cardinal Deck
Dogwood Deck
New Roadways (Typ.)
Daniels Rd.
Mason Farm Rd.
Bio-Informatics
East Dr.
Genetic Medicine Research
Tomkins Ops. Center
LRT Alignment
Chiller
Hibbard Dr.
Mason Farm Rd.
New Access Road to Chiller Area
Signalized Intersection
Proposed New Buildings (as per UNC Master Plan)
End-of-Line Double-Sided Center LRT Platform at Street Level
Concrete Bus Bays for 2 Articulated Buses
Elevator and Staircase for Access to Pedestrian Bridge
UNC (D) LRT Station
N

4.2. Mason Farm Road Station

The Mason Farm Road Station would be developed in conjunction with the proposed UNC facilities that, according to the UNC Master Plan, are being planned for the triangular area between Mason Farm Road and Fordham Boulevard. The UNC Master Plan includes new buildings, a parking deck, and a new roadway connection along the west side of the site, which would link Mason Farm Road with Fordham Boulevard and which would have a new signalized intersection at Fordham Boulevard.

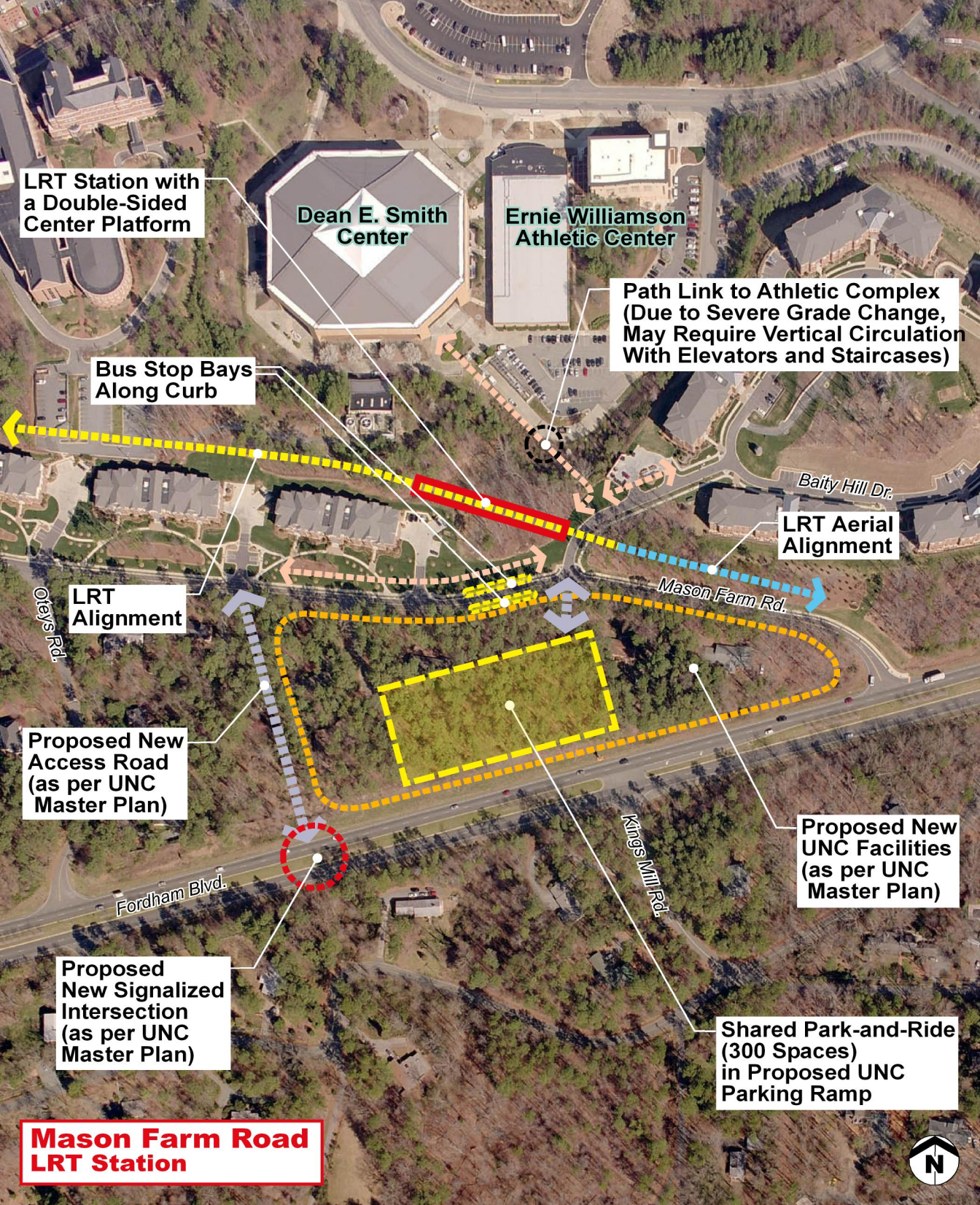
Location: At the southern end of the UNC campus, northwest of the Mason Farm Road and Baity Hill Drive intersection, at- grade.

Existing Conditions: Fully developed.

Service: UNC South Campus, including the Dean E. Smith Center, the Ernie Williamson Athletic Center, feeder bus transfers, park-and-ride users, UNC housing, and the residential neighborhood to the south.

Key Features:

- Medium park-and-ride and feeder bus station.
- At-grade station platform with one access ramp. Due to the steep grade conditions in the area, the station would have only one at-grade access from Baity Hill Drive.
- 18-foot wide, double-sided, center platform.
- 300 shared park-and-ride spaces would be developed in conjunction with the proposed UNC parking structure.
- Feeder bus bays along the curbs of Mason Farm Road, directly west of Baity Hill Drive.
- Path links to the residential developments in the vicinity and to the athletic complex to the north. Due to the extremely steep grade conditions, a vertical circulation core with elevators and staircases may need to be provided for the link to the athletic complex. In addition, since the athletic complex will have very high pedestrian traffic flows at event times, an escalator or multiple escalators may be required.


LRT Station with a Double-Sided Center Platform
Dean E. Smith Center
Ernie Williamson Athletic Center
Path Link to Athletic Complex (Due to Severe Grade Change, May Require Vertical Circulation With Elevators and Staircases)
Bus Stop Bays Along Curb
Baity Hill Dr.
LRT Aerial Alignment
LRT Alignment
Mason Farm Rd.
Oteys Rd.
Proposed New Access Road (as per UNC Master Plan)
Proposed New UNC Facilities (as per UNC Master Plan)
Kings Mill Rd.
Fordham Blvd.
Proposed New Signalized Intersection (as per UNC Master Plan)
Shared Park-and-Ride (300 Spaces) in Proposed UNC Parking Ramp
Mason Farm Road LRT Station
N

4.3. Hamilton Road Station

The Hamilton Road Station, which would be primarily a walk-up station, has two at-grade configuration options.

4.3.1. Hamilton Road Station – Option A

The Hamilton Road Station – Option A would be primarily a walk-up station.

Location: Southwest of the Hamilton Road and Prestwick Road intersections, at the northwest corner of the UNC Finley Golf Course.

Existing Conditions: Fully developed area.

Service: The commercial and office developments located along the south side of Raleigh Road and the medium-density residential neighborhood north of Raleigh Road.

Key Features:

- Walk-up station with primary access from the Hamilton Road and Prestwick Road intersection.
- At-grade station platform with one access ramp. Eighteen-foot wide, double-sided, center platform.
- A second access could be developed at the southwest end of the station, if needed.

4.3.2. Hamilton Road Station – Option B

The Hamilton Road Station – Option B would be primarily a walk-up station.

Location: Along Prestwick Road, southeast of the East 54 development.

Existing Conditions: Fully developed area.

Service: The commercial and office developments located along the south side of Raleigh Road and the residential neighborhood north of Raleigh Road.

Key Features:

- Walk-up station with primary access from Prestwick Road.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.

Hamilton Road (A and B) LRT Station

4.4. Friday Center Drive Station

The Friday Center Drive Station, which would be primarily a walk-up station, has two configuration options – an aerial station and an at-grade station.

4.4.1. Friday Center Drive Station – Option A

The Friday Center Drive Station - Option A would apply if the LRT alignment continues north, across Raleigh Road (NC 54), to the Meadowmont development. Since the alignment would need to be grade separated at Raleigh Road, this would need to be an aerial station.

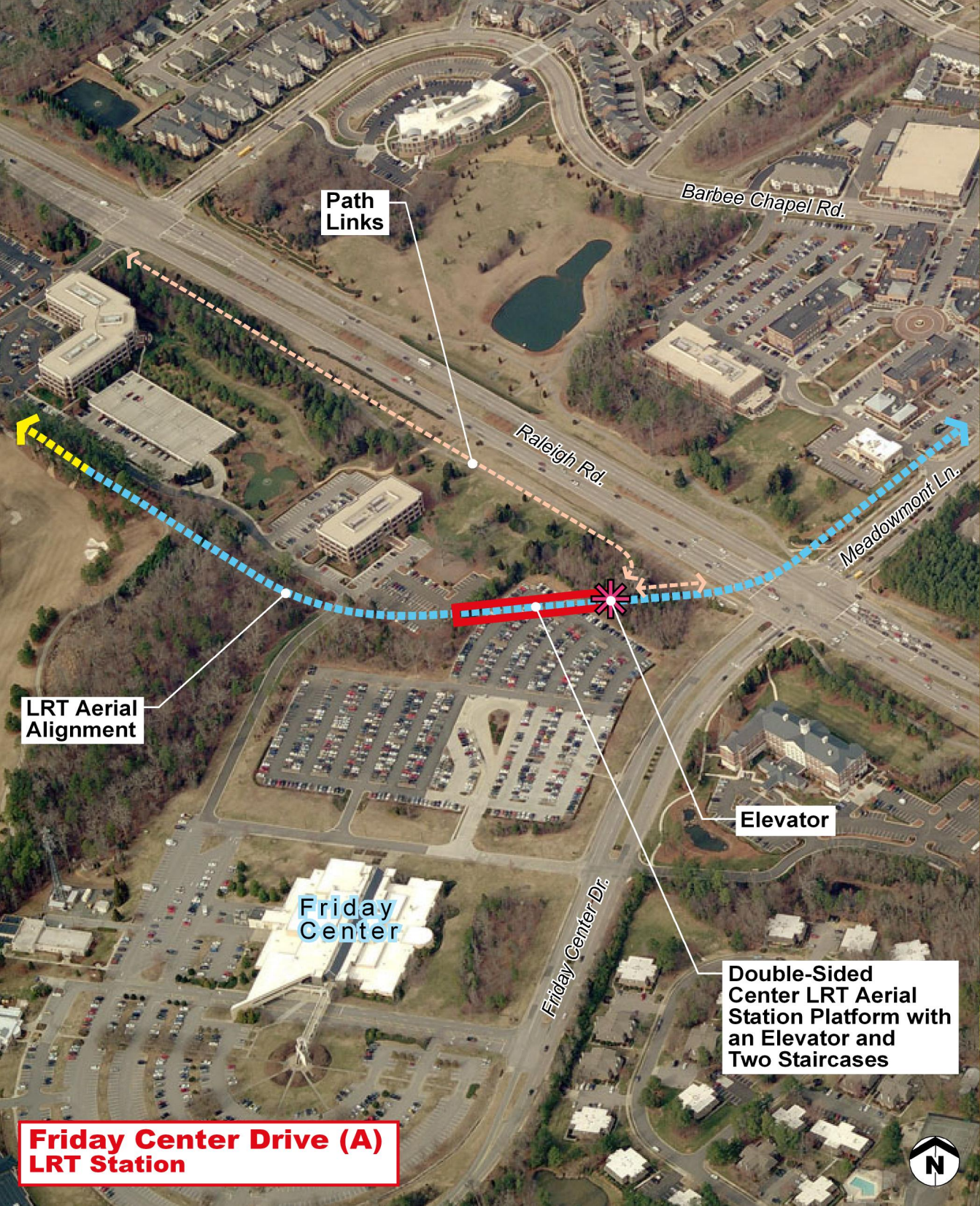
Location: Southwest of the Raleigh Road/NC 54 and Friday Center Drive intersection.

Existing Conditions: Fully developed

Service: Commercial and office developments located along the south side Raleigh Road, the UNC Friday Center building, and the low-/medium-density residential developments to the east.

Key Features:

- Walk-up station.
- Aerial station platform with an elevator at the northeast end of the platform and two staircases for a total station length of 280 feet.
- 24-foot wide, double-sided, center platform with two staircases.
- Path links to the Raleigh Road and Friday Center Drive intersection, the NC 54 pedestrian underpass, and to the surrounding developments.



Friday Center Drive (A) LRT Station

4.4.2. Friday Center Drive Station – Option B

The Friday Center Drive Station - Option B would apply if the LRT/BRT alignment continues southeast along the south side of Raleigh Road, to the Hillmont development. Since the alignment would be at-grade, this would be an at-grade station.

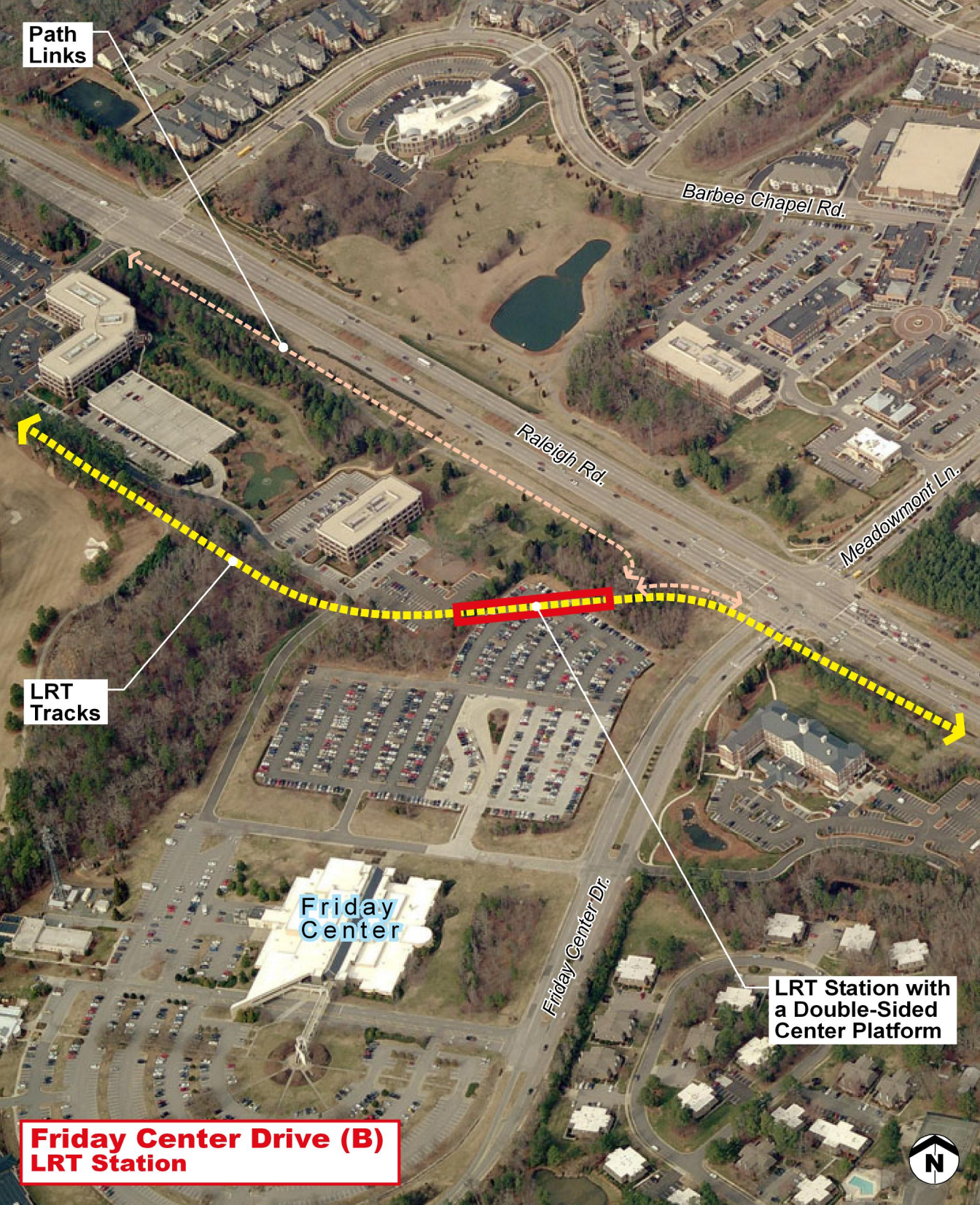
Location: Southwest of the Raleigh Road and Friday Center Drive intersection.

Existing Conditions: Fully developed.

Service: Commercial and office developments located along the south side Raleigh Road, the UNC Friday Center building, the Meadowmont development north of Raleigh Road, and the medium-density residential developments to the east.

Key Features:

- Walk-up station with primary access from the Raleigh Road and Friday Center Drive intersection.
- At-grade station platform with two access ramp.
- 18-foot wide, double-sided, center platform.
- Path links to the Raleigh Road and Friday Center Drive intersection, the NC 54 pedestrian underpass and to the surrounding developments.



Friday Center Drive (B) LRT Station

4.5. Meadowmont Lane Station

The Meadowmont Lane Station would be primarily a walk-up station.

Location: West side of Meadowmont Lane, between Barbee Chapel Road and Sprunt Street.

Existing Conditions: Fully developed mixed-use TOD with commercial, medical, educational and medium-density residential uses.

Service: Primarily the Meadowmont Village development area.

Key Features:

- Walk-up station with primary access from the Meadowmont Lane and Barbee Chapel Road intersection and a secondary walkway access from Sprunt Street.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- Linked to extensive pedestrian and interconnected roadway network.


Sprunt St.
Meadowmont Ln.
Platform Access Walk from Sprunt St. Between LRT Tracks
LRT Station with a Double-Sided Center Platform
Barbee Chapel Rd.
LRT Tracks
Meadowmont Lane (A)
LRT Station

4.6. Woodmont Station

The Woodmont Station would be a small park-and-ride station. A large, mixed-use development is planned for the area directly south of the station.

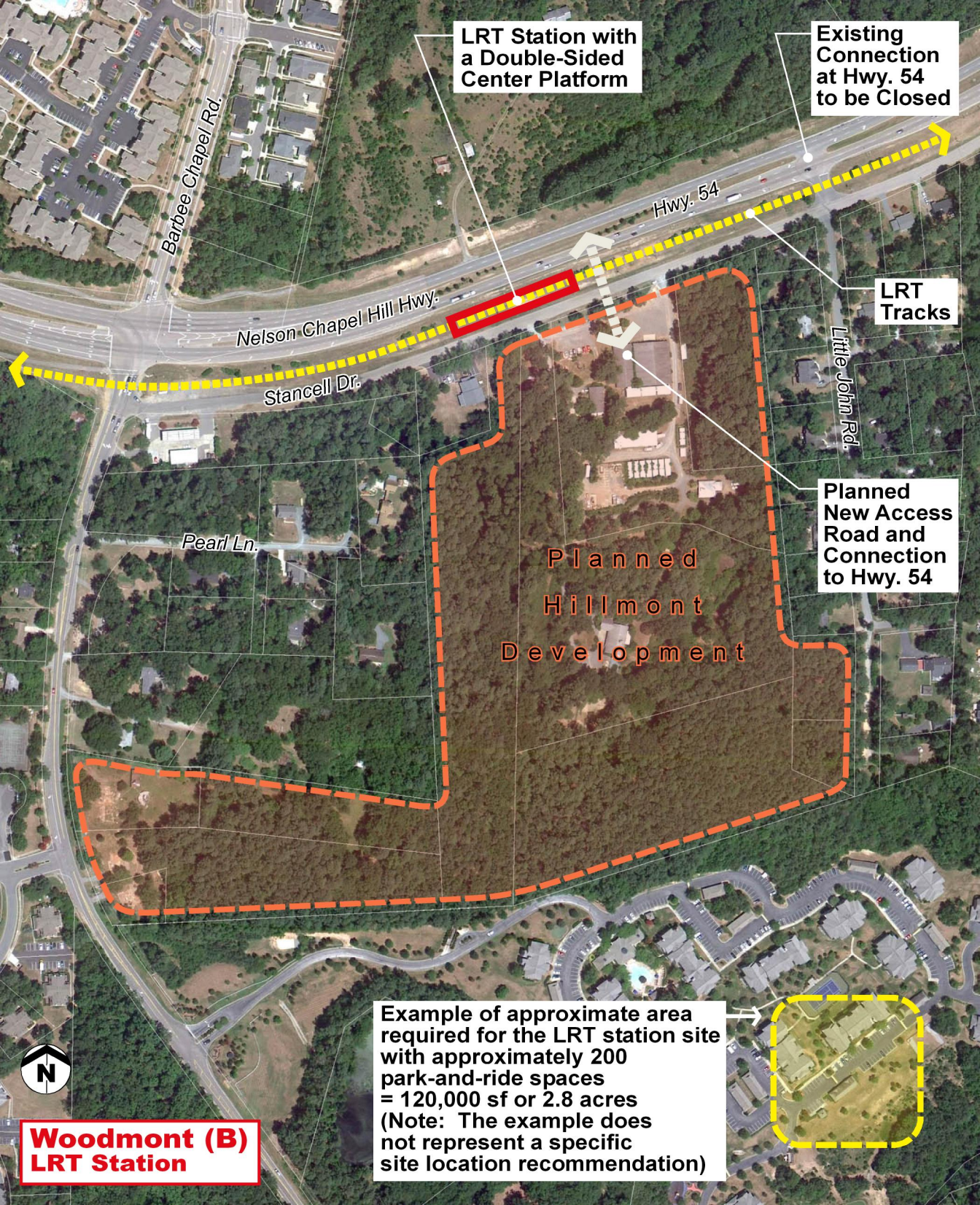
Location: Between Nelson Chapel Hill Highway and Stancel Drive, east of Barbee Chapel Road.

Existing Conditions: Low-density developments and undeveloped land.

Service: Park-and-ride and feeder bus users, the existing low- and limited medium-density residential developments in the vicinity of the station and the proposed Hillmont Development a mixed-use (primarily commercial and office) project proposed for the area directly south of the station.

Key Features:

- Small park-and-ride station.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- 200 park-and-ride spaces.
- Estimated station site size = 120,000 SF or 2.8 acres.


LRT Station with a Double-Sided Center Platform
Existing Connection at Hwy. 54 to be Closed
Barbee Chapel Rd.
Hwy. 54
LRT Tracks
Nelson Chapel Hill Hwy.
Stancell Dr.
Little John Rd.
Planned New Access Road and Connection to Hwy. 54
Pearl Ln.
Planned Hillmont Development
Example of approximate area required for the LRT station site with approximately 200 park-and-ride spaces = 120,000 sf or 2.8 acres (Note: The example does not represent a specific site location recommendation)
N
Woodmont (B) LRT Station

4.7. Leigh Village Station

The Leigh Village Station would be a very large park-and-ride and feeder bus station. A large, mixed-use project is planned for the area directly southwest of the station site.

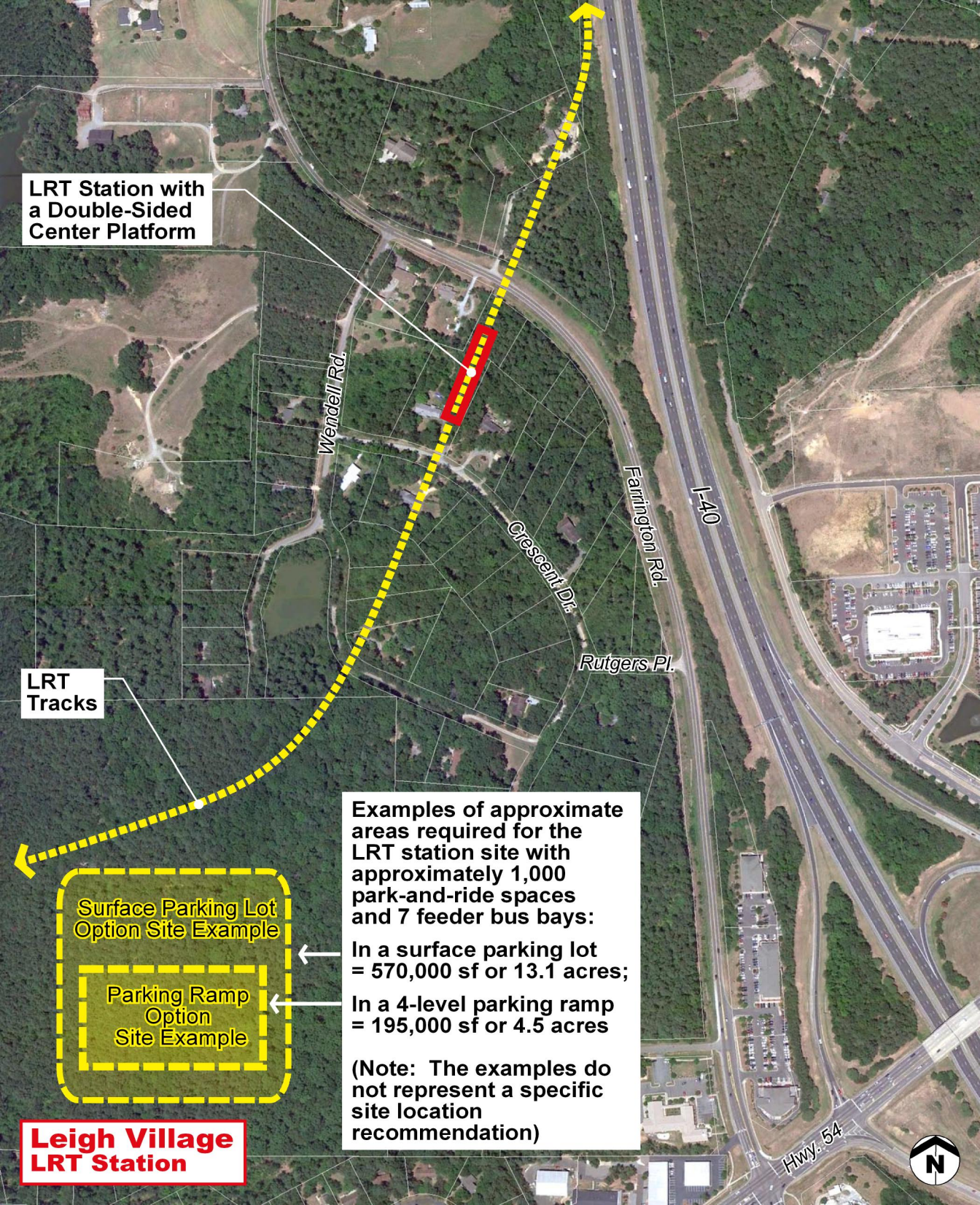
Location: Southeast of the Farrington Road and Wendell Road intersection, west of I-40.

Existing Conditions: Low-density residential uses and undeveloped land.

Service: Intermodal bus transfers, park-and-ride users, and the proposed large mixed-use project. This would be a very large park-and-ride and feeder bus station that has convenient access from I-40 and Highway 54, with potential future direct access from I-40.

Key Features:

- Very large park-and-ride and feeder bus station.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- 1,000 park-and-ride spaces.
- 7 feeder bus bays.
- Potential future direct access from I-40.
- Estimated station site size, if parking is in a surface lot = 570,000 SF or 13.1 acres.
- Estimated station site size, if parking is in a 4-level parking deck = 195,000 SF or 4.5 acres.


LRT Station with a Double-Sided Center Platform
Wendell Rd.
Crescent Dr.
Farrington Rd.
I-40
Rutgers Pl.
LRT Tracks
Surface Parking Lot Option Site Example
Parking Ramp Option Site Example
Examples of approximate areas required for the LRT station site with approximately 1,000 park-and-ride spaces and 7 feeder bus bays:
In a surface parking lot = 570,000 sf or 13.1 acres;
In a 4-level parking ramp = 195,000 sf or 4.5 acres
(Note: The examples do not represent a specific site location recommendation)
Hwy. 54
N
Leigh Village LRT Station

4.8. Gateway Station

The Gateway Station would be a large park-and-ride and feeder bus station. The intersection of Old Chapel Hill Road and Pope Road is planned to be reconstructed as a roundabout. Also, Danziger Road is proposed to be extended over I-40.

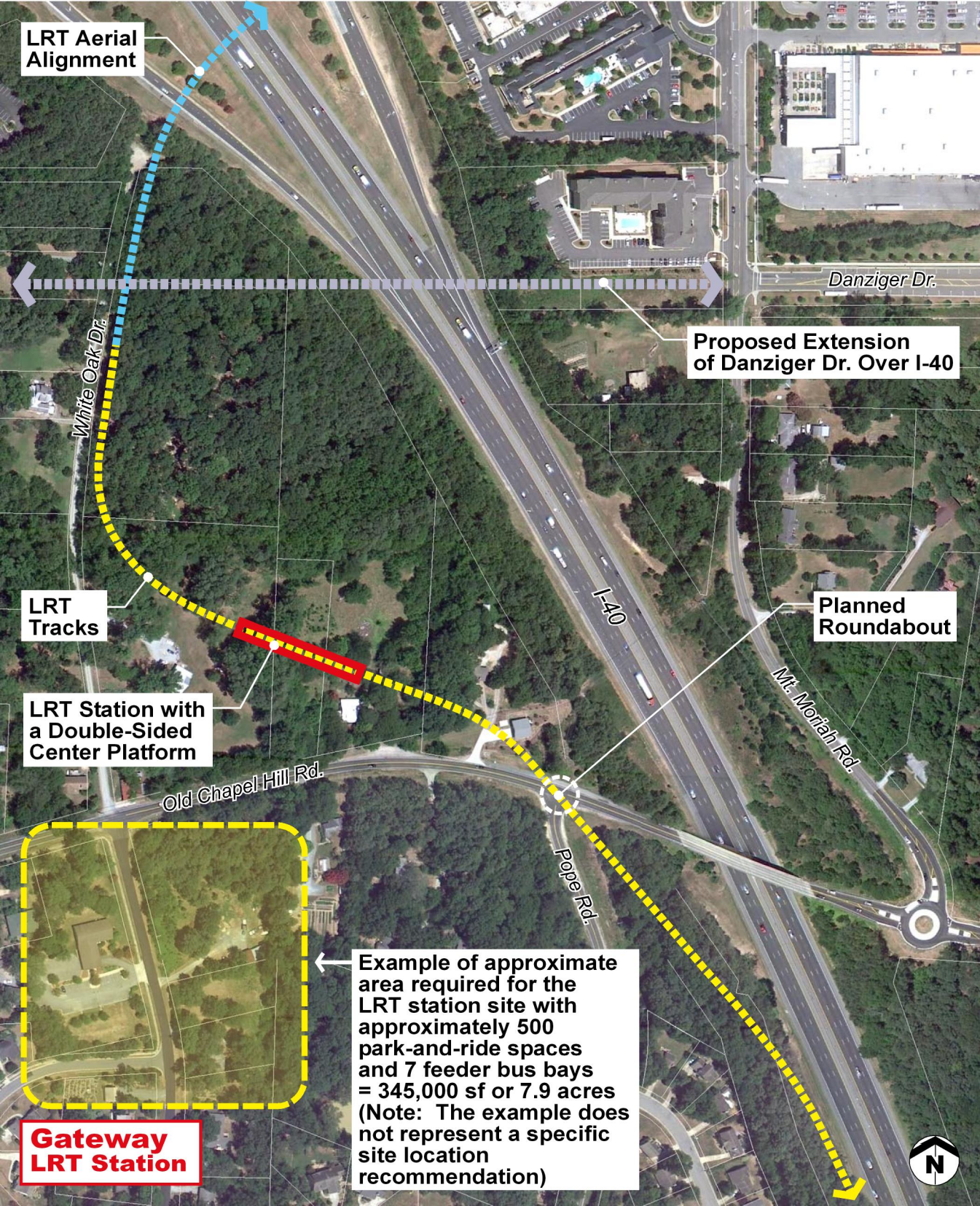
Location: Northeast of the Old Chapel Hill Road and White Oak Drive intersection.

Existing Conditions: Low-density residential uses and undeveloped land.

Service: Intermodal bus transfers, park-and-ride users, and potential TODs in the station vicinity.

Key Features:

- Large park-and-ride and feeder bus station.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- 500 park-and-ride spaces.
- 7 feeder bus bays.
- Estimated station site size = 345,000 SF or 7.9 acres.


LRT Aerial Alignment
Danziger Dr.
Proposed Extension of Danziger Dr. Over I-40
White Oak Dr.
LRT Tracks
I-40
Planned Roundabout
LRT Station with a Double-Sided Center Platform
Mt. Moriah Rd.
Old Chapel Hill Rd.
Pope Rd.
Example of approximate area required for the LRT station site with approximately 500 park-and-ride spaces and 7 feeder bus bays = 345,000 sf or 7.9 acres (Note: The example does not represent a specific site location recommendation)
Gateway LRT Station
N

4.9. Patterson Station

The Patterson Station would be primarily a walk-up station.

Location: East of the McFarland Road and Sayward Drive intersections.

Existing Conditions: Low-density residential and commercial uses and undeveloped land.

Service: The existing and future commercial and mixed use developments located to the west, various existing residential neighborhoods, and potential TODs in the vicinity of the station site.

Key Features:

- Walk-up station with primary access from the McFarland Road and Sayward Drive intersection.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- Path links to all the existing and potential developments in the vicinity of the station.


Durham Chapel Hill Blvd.
SW Durham Dr.
Witherspoon Blvd.
Sayward Dr.
McFarland Rd.
Danziger Dr.
LRT Tracks
LRT Station with a Double-Sided Center Platform
Patterson Place
LRT Station
N

4.10. MLK Jr. Parkway Station

The MLK Jr. Parkway Station would be a medium park-and-ride station.

Location: Along the north side of University Drive, between MLK Jr. and Lyckan Parkways.

Existing Conditions: Fully developed area with commercial and medium-density residential uses, though redevelopment opportunities may exist.

Service: Intermodal bus transfers, park-and-ride users, and the existing and potential future commercial, office, and residential developments in the vicinity of the station.

Key Features:

- Medium park-and-ride station.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- 300 park-and-ride spaces.
- 5 feeder bus bays.
- Estimated station site size = 215,000 SF or 4.9 acres.


Westgate Dr.
Lyckan Pkwy.
LRT Tracks
LRT Station with a Double-Sided Center Platform
University Dr.
MLK Jr. Pkwy.
Ivy Creek Blvd.
Example of approximate area required for the LRT station site with approximately 300 park-and-ride spaces and 5 feeder bus bays = 215,000 sf or 4.9 acres (Note: The example does not represent a specific site location recommendation)
N
MLK Jr. Parkway
LRT Station

4.11. South Square Station

For the South Square area there are two alignment and station location options.

4.11.1. South Square Station – Option A

The South Square Station – Option A would be a medium park-and-ride station. Since the alignment would need to be grade separated at Durham Chapel Hill Boulevard, this would need to be an aerial station. A large multi-use development is planned for the area directly southeast of the station.

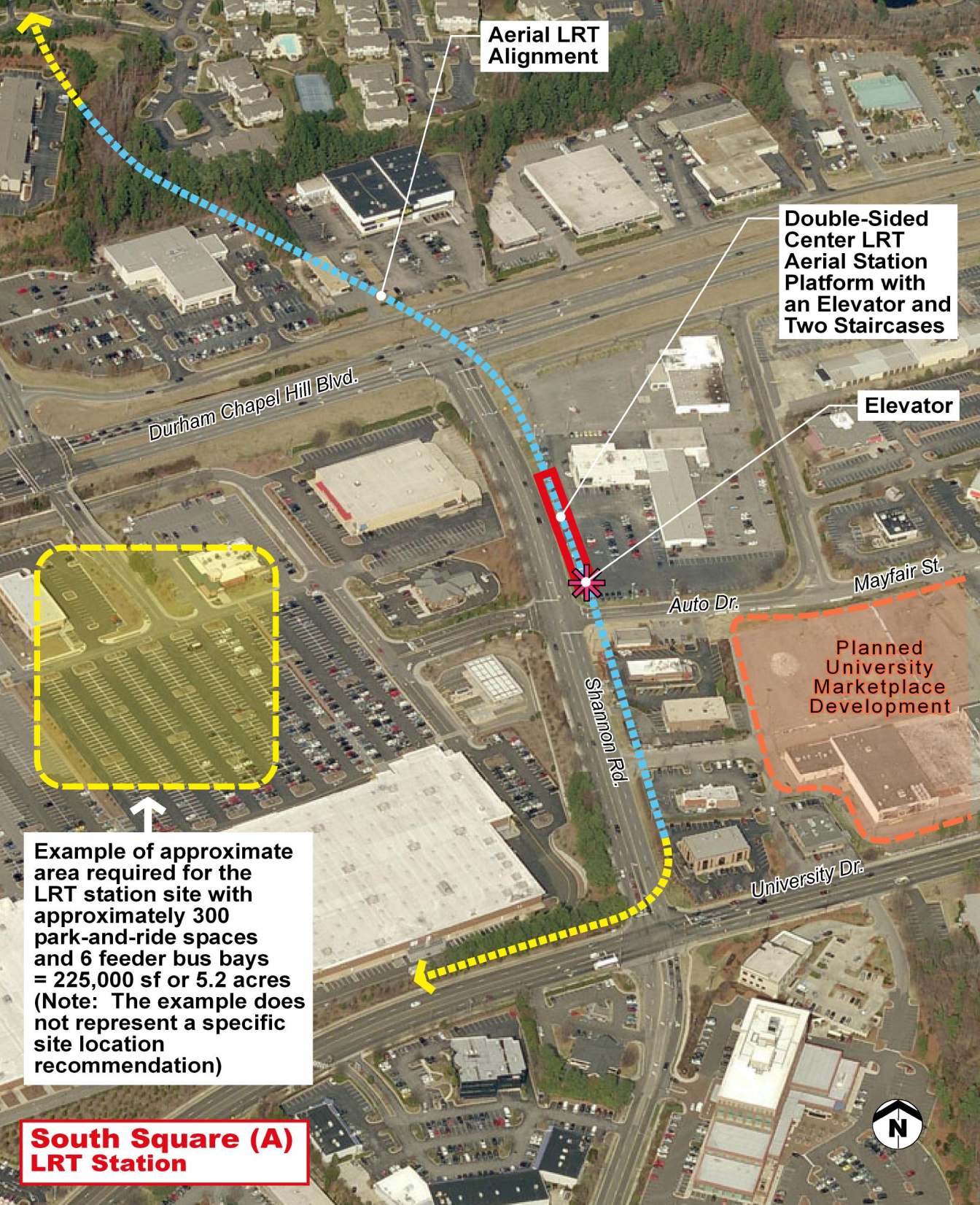
Location: Along the east side of Shannon Road, directly northeast of the Shannon Road and Auto Drive intersection.

Existing Conditions: Fully developed with commercial uses, though redevelopment opportunities may exist.

Service: Intermodal bus transfers, park-and-ride users, the commercial uses in the area, and the planned University Marketplace development southeast of the station.

Key Features:

- Medium park-and-ride and feeder bus station.
- Aerial station platform with an elevator at the south end of the platform and two staircases.
- 24-foot wide, double-sided, center platform.
- 300 park-and-ride spaces.
- 6 feeder bus bays.
- Estimated station site size = 225,000 SF or 5.2 acres.



South Square (A) LRT Station

4.11.2. South Square Station – Option B

The South Square Station – Option B would be a medium park-and-ride station. Since the alignment would need to be grade separated at Durham Chapel Hill Boulevard, this would need to be an aerial station.

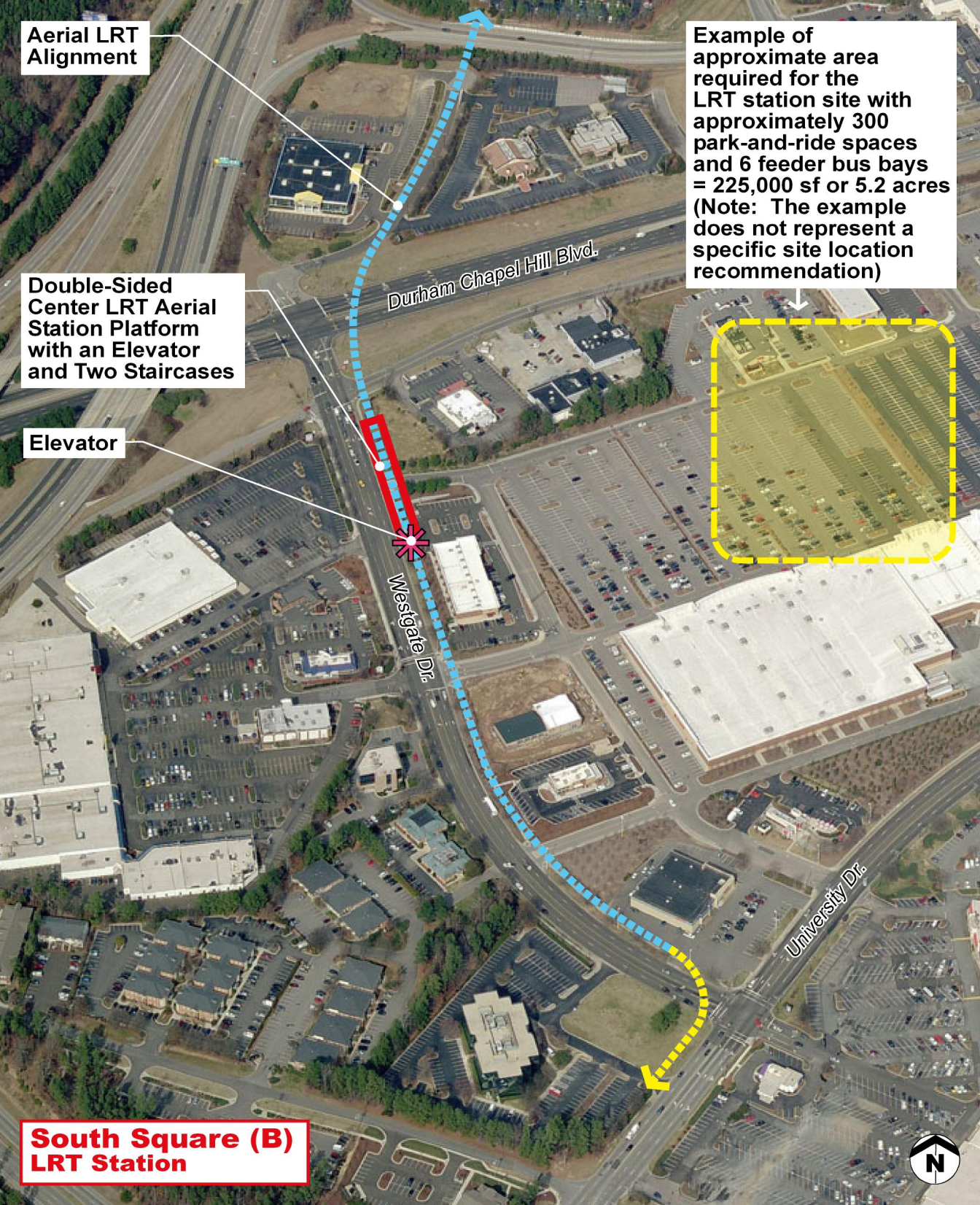
Location: Along the east side of Westgate Drive, south of Durham Chapel Hill Boulevard.

Existing Conditions: Fully developed with commercial uses, though redevelopment opportunities may exist.

Service: Intermodal bus transfers, park-and-ride users, and the existing commercial uses and potential future redevelopment in the area.

Key Features:

- Medium park-and-ride and feeder bus station.
- Aerial station platform with an elevator at the south end of the platform and two staircases.
- 24-foot wide, double-sided, center platform.
- 300 park-and-ride spaces.
- 6 feeder bus bays.
- Estimated station site size = 225,000 SF or 5.2 acres.


Aerial LRT Alignment
Example of approximate area required for the LRT station site with approximately 300 park-and-ride spaces and 6 feeder bus bays = 225,000 sf or 5.2 acres (Note: The example does not represent a specific site location recommendation)
Double-Sided Center LRT Aerial Station Platform with an Elevator and Two Staircases
Elevator
Durham Chapel Hill Blvd.
Westgate Dr.
University Dr.
South Square (B) LRT Station
N

4.12. LaSalle Street Station

The LaSalle Street Station would be primarily a walk-up station.

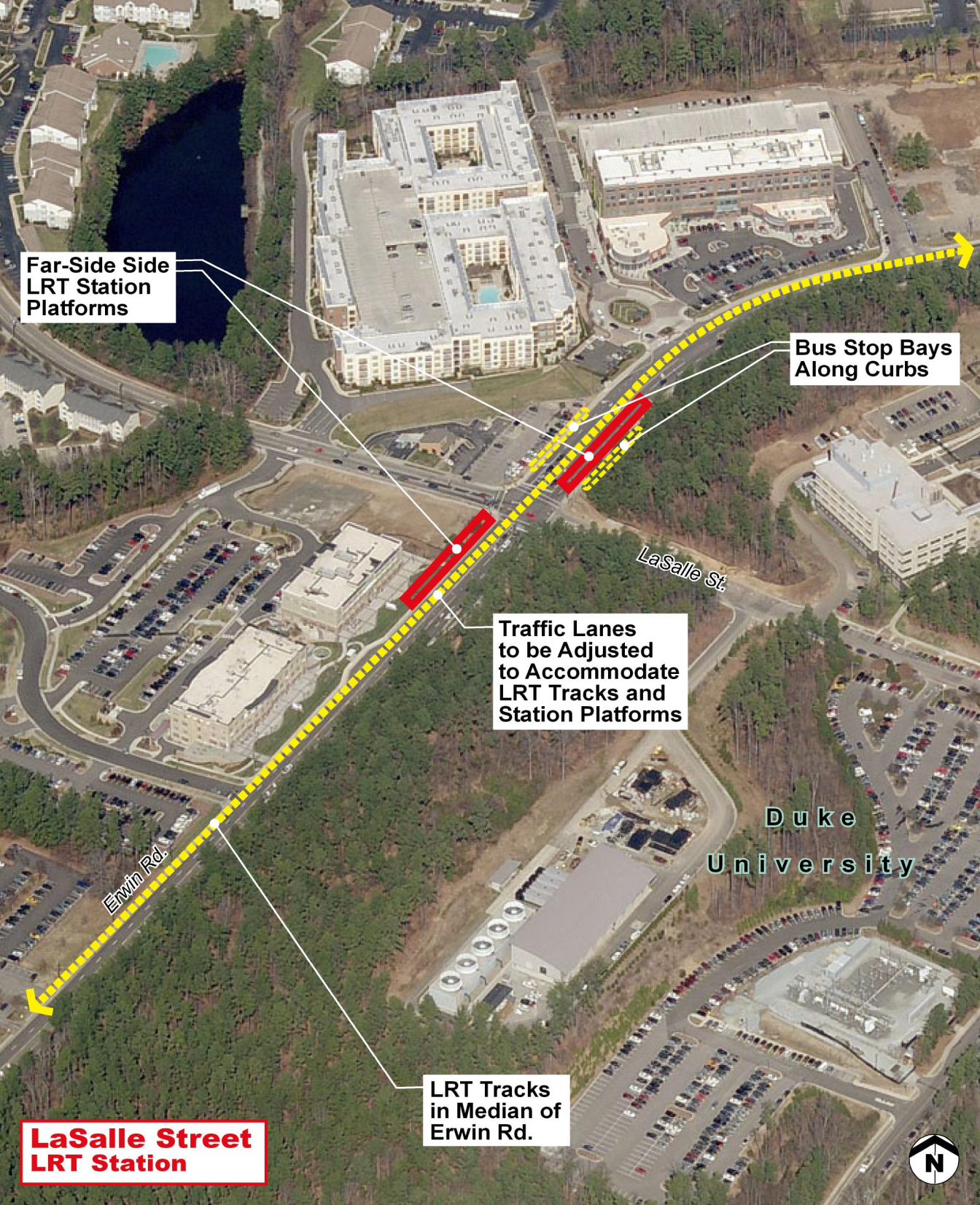
Location: In the median of Erwin Road at LaSalle Street.

Existing Conditions: Fully developed with commercial and institutional uses.

Service: Intermodal bus transfers, the west side of the Duke University campus, and the commercial and residential uses in the area.

Key Features:

- Feeder bus and walk-up station.
- Two at-grade, far-side, side station platforms in the median of Erwin Road. Access to both platforms would be from the LaSalle Street intersection with southbound passengers accessing the platform on the north side of the intersection and northbound passengers accessing the platform on the south side of the intersection. Each platform would have one access ramp.
- 12-foot wide side platforms.
- Feeder bus bays along the curbs of Erwin Road, east of LaSalle Street, for accommodating 5 buses.


Far-Side Side LRT Station Platforms
Bus Stop Bays Along Curbs
LaSalle St.
Traffic Lanes to be Adjusted to Accommodate LRT Tracks and Station Platforms
Duke University
Erwin Rd.
LRT Tracks in Median of Erwin Rd.
LaSalle Street LRT Station
N

4.13. Duke Medical Center Station

The Duke Medical Center Station, which would be primarily a walk-up station, has two configuration options. A key issue at this station is the need to accommodate the large volume of through and turning traffic movements for smooth traffic operations.

4.13.1. Duke Medical Center Station – Option A

The Duke Medical Center Station – Option A would have a single platform on the west side of Fulton Street with access from the Fulton Street intersection.

Location: In the median of Erwin Road on the west side of Fulton Street.

Existing Conditions: Fully developed with institutional and commercial uses.

Service: The Duke Medical Center, the Durham VA Medical Center, and the commercial and adjacent medical office uses in the area.

Key Features:

- Walk-up station.
- One at-grade, center station platform, in the median of Erwin Road on the west side of Fulton Street, with one access ramp from the Fulton Street.
- 18-foot wide, double-sided, center platform.

4.13.2. Duke Medical Center Station – Option B

The Duke Medical Center Station – Option B would have a single platform east of Trent Drive and west of Flowers Drive with access from these two intersections with Erwin Road.

Location: In the median of Erwin Road on the west side of Flowers Drive and east side of Trent Drive.

Existing Conditions: Fully developed with institutional and commercial uses.

Service: The Duke Medical Center and the commercial and adjacent medical office uses in the area.

Key Features:

- Walk-up station.
- One at-grade, center station platform, in the median of Erwin Road on the west side of Flowers Drive and east side of Trent Drive, with two access ramps from the Trent Drive and Flowers Drive intersections.
- 18-foot wide, double-sided, center platform.


End-of-Line West Durham Commuter Rail Station
Hwy. 147
Freight Rail Tracks
Commuter Rail Track
Hillsborough Rd.
Durham Fwy.
Main St.
Durham VA Medical Center
Fulton St.
Elba St.
Parking Deck
Erwin Rd.
Duke Medical Center
Trent Dr.
Flowers Dr.
Research Dr.
LRT Alignment in Median of Erwin Rd.
Option A: Double-Sided Center LRT Platform on West Side of Fulton St. with Platform Access from the Fulton St. Intersection
Option B: Double-Sided Center LRT Platform with Platform Access from the Trent Dr. and Flowers Dr. Intersections
Note: Traffic Lanes on Erwin Rd. to be Adjusted to Accommodate LRT Tracks and Station Platforms
N
Duke Medical Center (A and B)
LRT Station

4.14. Ninth Street Station

The Ninth Street Station would be a small park-and-ride station. The existing grade separation at Ninth Street and the railroad corridor would require a vertical circulation core for access between the LRT station and the underpass that links it to the developments and potential redevelopment on the north and east sides of the tracks.

Location: On new, separate, exclusive tracks in the North Carolina Railroad (NCRR) right-of-way, west of Ninth Street, directly south of the freight and commuter rail tracks.

Existing Conditions: Fully developed with mixed use commercial buildings and Duke University East Campus, except the large parcel in Erwin Square north of Main Street.

Service: Feeder bus transfers, park-and-ride users, and the neighborhoods and businesses located west of the Durham downtown area including proposed and potential new and infill development.

Key Features:

- Small park-and-ride and feeder bus station.
- Elevated station platform at the level of the railroad tracks with one access ramp at the east end of the platform.
- 18-foot wide, double-sided, center platform.
- Vertical circulation core at the east end of the station, south of the LRT tracks, with an elevator and a staircase.
- 200 park-and-ride spaces.
- 4 feeder bus bays.
- Estimated station site size = 160,000 SF or 3.7 acres.


LRT Station with a Double-Sided Center Platform
Existing Underpass Crossing
Freight and Commuter Rail Tracks
Swift Ave.
9th St.
Main St.
LRT Tracks
Erwin Rd.
Aerial LRT Alignment
Hwy. 147
Example of approximate area required for the LRT station site with approximately 200 park-and-ride spaces and 4 feeder bus bays = 160,000 sf or 3.7 acres (Note: The example does not represent a specific site location recommendation)
Vertical Circulation Core with Elevator and Staircase for Access Between LRT Station and Road Underpass
N
Ninth Street LRT Station

4.15. Buchanan Boulevard Station

The Buchanan Boulevard Station would be primarily a walk-up station. Buchanan Boulevard currently has an at-grade crossing at the railroad tracks. For the Buchanan Boulevard BRT High and Low Station see Section 4.19.

Location: On new, separate, exclusive tracks in the NCRR right-of-way, east of Buchanan Boulevard, directly south of the freight and commuter rail tracks.

Existing Conditions: Fully developed with commercial, institutional, and residential uses, though opportunities for infill redevelopment may exist.

Service: The west end of the Durham downtown area, the Duke University East Campus, and the businesses and neighborhoods in the station vicinity.

Key Features:

- Walk-up station with primary access from Buchanan Boulevard.
- At-grade station platform with one access ramp at the west end. If a second access is developed at the east end, the total station length would increase by about 30 feet.
- 18-foot wide, double-sided, center platform.
- A second access could be developed at the east end of the station, in order to provide a direct connection for potential future TODs southeast of the station.


Freight and Commuter Rail Tracks
Duke University East Campus
LRT Tracks
Existing At-Grade Crossing
Main St.
LRT Station with a Double-Sided Center Platform and Primary Access from Buchanan Blvd.
Smith Warehouse (Duke University)
Maxwell Ave.
Durham Fwy.
Peabody St.
Hwy. 147
Buchanan Blvd.
Potential Secondary Access to Platform if Area to the South is Redeveloped
Gregson St.
Chapel Hill St.
Buchanan Boulevard LRT Station
N

4.16. Durham Station

The Durham Station would be part of a multi-modal transit complex located adjacent to the Amtrak and Commuter Rail Stations and across the street from the Durham Station Transportation Center, which serves local, regional, and intercity bus service, as well as taxis. Duke Street, at the west end of the station, currently has an at-grade crossing at the railroad tracks. Chapel Hill Street, at the east end of the station, has an underpass at the railroad corridor. For the Downtown Durham BRT High and Low Station see Section 4.19

Location: On new, separate, exclusive tracks in the NCRR right-of-way, between Duke Street and Chapel Hill Street, directly south of the freight and commuter rail tracks.

Existing Conditions: Fully developed with commercial and institutional uses.

Service: Intermodal transfers, park-and-ride users, the Durham Performing Arts Center (DPAC), Durham Bulls Athletic Park, Judicial System facilities, and Downtown Durham which includes potential redevelopment and infill areas.

Key Features:

- Walk-up station with intermodal transfers from the feeder bus service in the Durham Station Transportation Center and the Amtrak and Commuter Rail stations.
- At-grade station platform with access ramps at both ends for a total station length of 330 feet. The station length may be longer if vertical circulation for a connection to an overpass is provided.
- 18-foot wide, double-sided, center platform. The platform may need to be 24 feet wide, or wider, if vertical circulation for a connection to an overpass is provided directly from the platform.
- Pedestrian overpass linking the LRT station, the Commuter Rail station, the Amtrak station, and the Durham Station Transportation Center.
- Triangle Transit currently has an agreement for 150 shared parking spaces in the City/County parking deck, and there is potential for an additional 150 spaces on-site.
- Potential park-and-ride site or TOD on the triangular site directly south of the LRT station.


Freight and Commuter Rail Tracks
LRT Station with a Double-Sided Center Platform
Existing At-Grade Crossing
Commuter Rail Station with a Double-Sided Center Platform
Main St.
LRT Tracks
Existing Amtrak Station
Gregson St.
Existing Underpass Crossing
Chapel Hill St.
Potential Park-and-Ride Site or TOD
Duke St.
New Bus Center
Jackson St.
Pedestrian Overpass to Link Commuter Rail, Amtrak, LRT Station, Bus Station, Parking, and Potential TOD
Willard St.
Parking Agreement for 150 Shared Parking Spaces in Parking Ramp
Durham Fwy.
Blackwell St.
Hwy. 147
Durham LRT Station
N

4.17. Dillard Street Station

The Dillard Street Station would be primarily a walk-up station. Dillard Street currently has an at-grade crossing at the railroad tracks. For the Dillard BRT High and Low Station see Section 4.19.

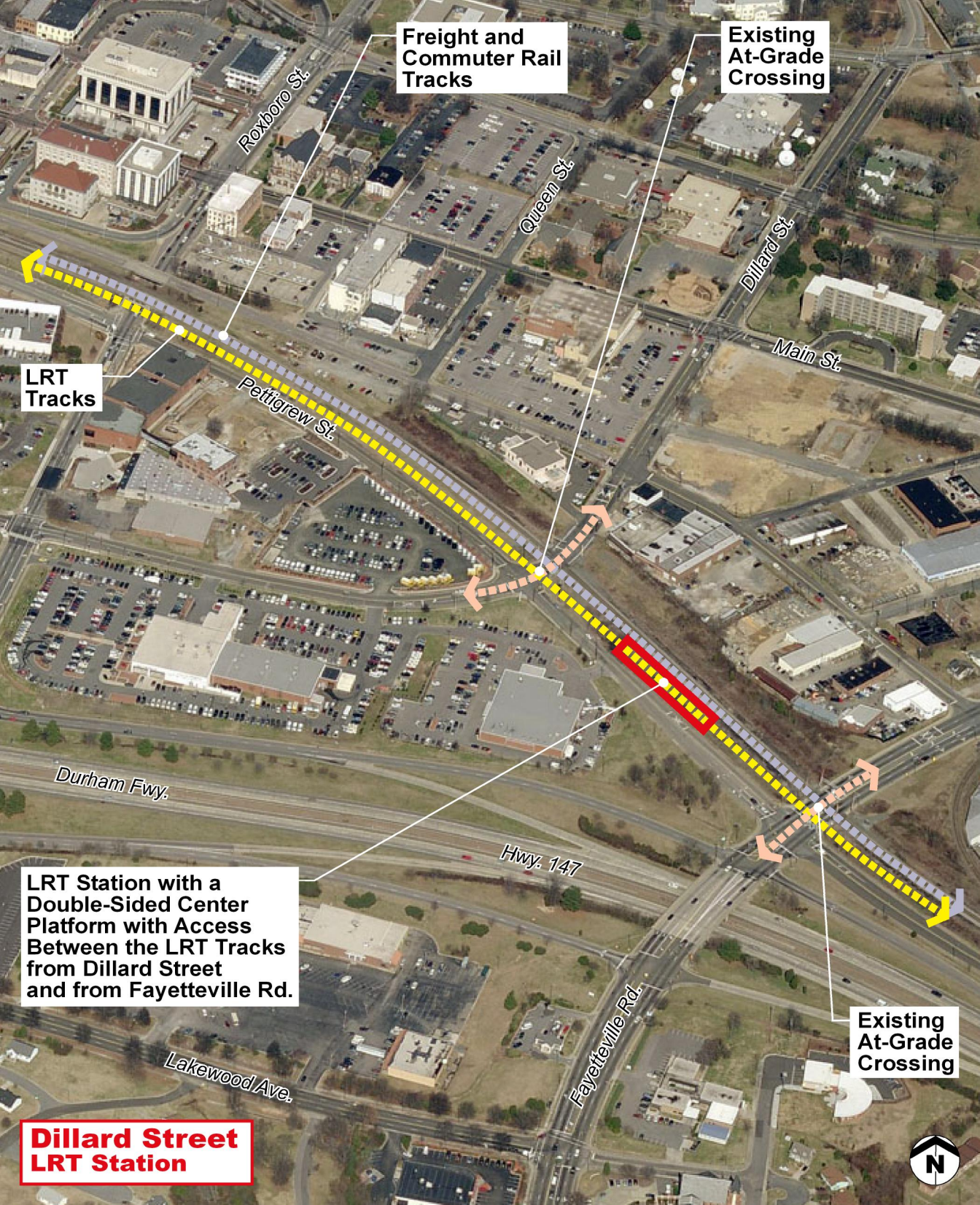
Location: On new, separate, exclusive tracks in the NCRR right-of-way, east of Dillard Street, directly south of the freight and commuter rail tracks.

Existing Conditions: Fully developed with commercial and industrial uses, though opportunities for redevelopment may exist.

Service: The east end of the Durham downtown area, the existing businesses and neighborhoods, and potential TODs in the station vicinity.

Key Features:

- Walk-up station with primary access from Dillard Street.
- At-grade station platform with two access ramps.
- 18-foot wide, double-sided, center platform.
- A path link to Fayetteville Road for access to the station from the south side of Highway 147, as well as potential future TODs in the station vicinity.


Freight and Commuter Rail Tracks
Existing At-Grade Crossing
Roxboro St.
Queen St.
Dillard St.
Main St.
LRT Tracks
Pettigrew St.
Durham Fwy.
Hwy. 147
LRT Station with a Double-Sided Center Platform with Access Between the LRT Tracks from Dillard Street and from Fayetteville Rd.
Existing At-Grade Crossing
Fayetteville Rd.
Lakewood Ave.
Dillard Street LRT Station
N

4.18. Alston Avenue/NCCU Station

The Alston Avenue Station would be a large park-and-ride and feeder bus station and the end-of line station at the east end of the LRT or BRT alignment. Alston Avenue currently has an underpass at the railroad corridor. A newly constructed pedestrian bridge over Highway 147 is located southeast of the station. For the Alston Avenue BRT High and Low Station see Section 4.19.

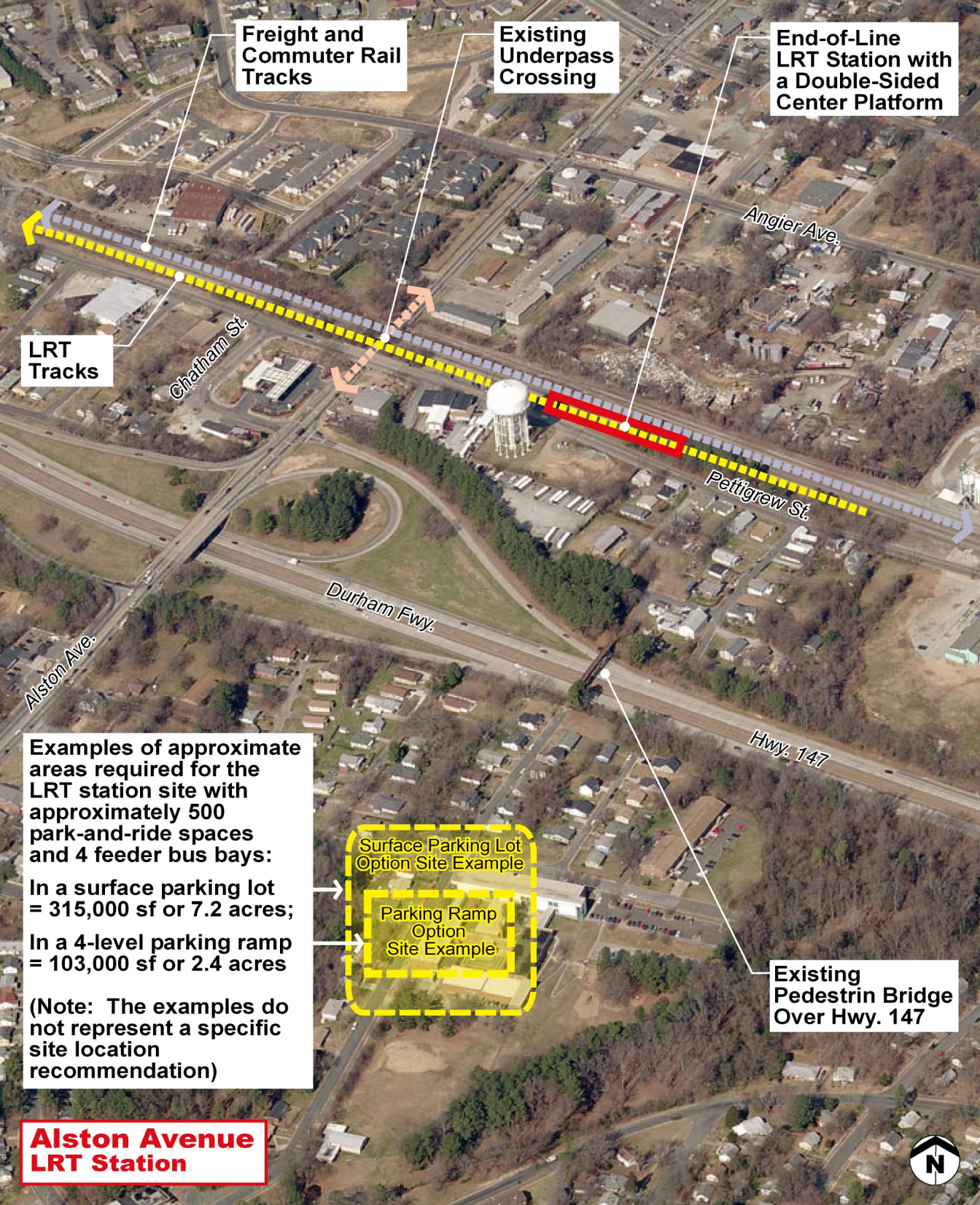
Location: On new, separate, exclusive tracks in the NCRR right-of-way, east of Alston Avenue, directly south of the freight and commuter rail tracks.

Existing Conditions: Fully developed with commercial, industrial, and institutional uses, with potential redevelopment areas.

Service: Intermodal bus transfers, park-and-ride users, North Carolina Central University (NCCU), Durham Technical Community College (by bus) and the businesses and neighborhoods east of the Durham downtown area which include potential infill and redevelopment areas.

Key Features:

- Medium park-and-ride and feeder bus station.
- At-grade station platform with access ramps at both ends.
- 18-foot wide, double-sided, center platform.
- 500 park-and-ride spaces.
- 4 feeder bus bays.
- Path link to the existing pedestrian bridge over Highway 147.
- Estimated station site size, if parking is in a surface lot = 315,000 SF or 7.2 acres.
- Estimated station site size, if parking is in a 4-level parking deck = 103,000 SF or 2.4 acres.


Freight and Commuter Rail Tracks
Existing Underpass Crossing
End-of-Line LRT Station with a Double-Sided Center Platform
Angier Ave.
LRT Tracks
Chatham St.
Pettigrew St.
Durham Fwy.
Alston Ave.
Hwy. 147
Examples of approximate areas required for the LRT station site with approximately 500 park-and-ride spaces and 4 feeder bus bays:
In a surface parking lot = 315,000 sf or 7.2 acres;
In a 4-level parking ramp = 103,000 sf or 2.4 acres
(Note: The examples do not represent a specific site location recommendation)
Surface Parking Lot Option Site Example
Parking Ramp Option Site Example
Existing Pedestrin Bridge Over Hwy. 147
Alston Avenue LRT Station
N

4.19. BRT "High" and BRT "Low" Stations

BRT "Low" Stations

Table 1 lists the BRT "Low" stations that are unique to the BRT "Low" alignment alternative. These stations reflect what differentiates the BRT "Low" from the BRT "High" alternative.

Table 1 BRT "Low" Station Summary

Station Name	Location	Features	Service Area
Friday Center Station	On the northeast and southwest sides of NC 54 (Raleigh Road) west of the intersection of NC 54/ Friday Center Drive/ Meadowmont Lane	▪ Walk-up station ▪ At-grade, side platform on each side of NC 54 ▪ Bus pullouts	▪ Commercial and office developments located along the south side of NC 54 ▪ UNC Friday Center ▪ Medium-density residential developments to the east ▪ Meadowmont Village to the north
Woodmont Station	On the north and south sides of NC 54 straddling the intersection of NC 54 and Downing Creek Parkway	▪ 200-space park-and-ride ▪ At-grade, side platform on either each side of NC 54	▪ Existing low- and limited medium-density residential developments in the vicinity ▪ Planned mixed-use Hillmont Development
Gateway Station	Northwest of the Old Chapel Hill Road and White Oak Drive intersection	▪ 500-space park-and-ride with 7 bus bays ▪ At-Grade platform	▪ Low-density residential uses and undeveloped land
Farrington Road Station	North and south sides of Old Chapel Hill Road straddling the intersection of Farrington Drive/Durham Drive and Old Chapel Hill Road	▪ Walk-up station ▪ At-grade, side platform on either each side of Old Chapel Hill Road ▪ Bus pullouts	▪ Multi-family residential north and south of Old Chapel Hill Rd ▪ Middle School on north side of Old Chapel Hill Rd east of SW Durham Rd
University Place Station	On the east and west sides of University Drive at the University Place intersection	▪ Walk-up station ▪ At-grade, side platform on either each side of University Drive ▪ Bus pullouts	▪ Multi-family residential west of University Drive ▪ Office buildings in University Place on east side of University Drive
South Square Station	*South Square near LRT(A) Alternative* Along the east and west sides of Shannon Road, north and south of the intersection of Shannon Road and Auto Drive.	▪ 300-space park-and-ride ▪ 6 feeder bus bays ▪ At-grade platform	▪ Area commercial uses ▪ Planned University Marketplace development SE of proposed station

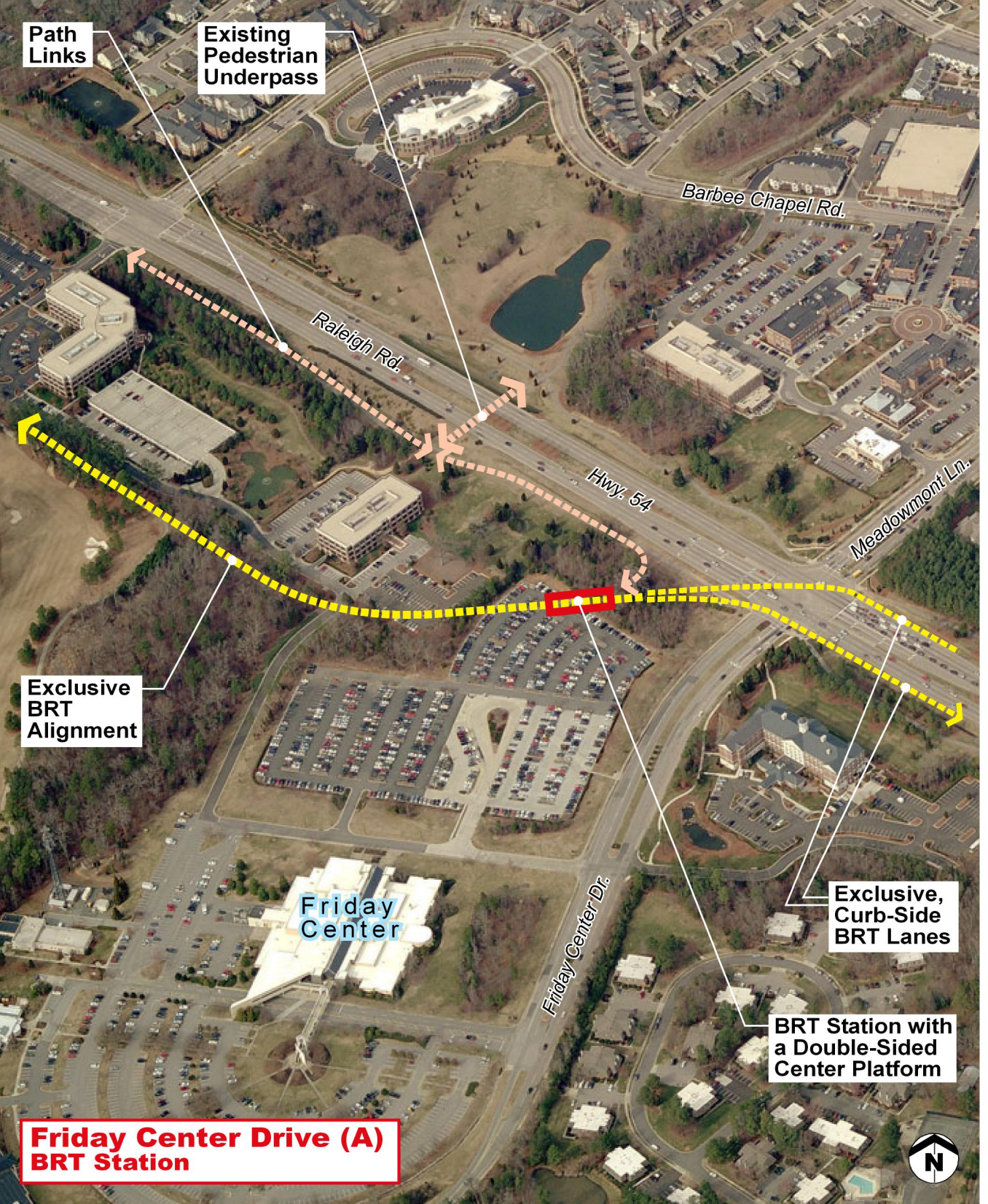
BRT "High" and BRT "Low" Stations

In general, the rest of the BRT-"High" and BRT-"Low" stations would be similar in layout and context as the LRT stations except along the railroad corridor in Durham where the LRT alignment and stations are adjacent to the existing tracks in the rail corridor. For both the BRT "High" and BRT "Low" options, the stations would be located along Pettigrew Street. These four stations are summarized in Table 2.

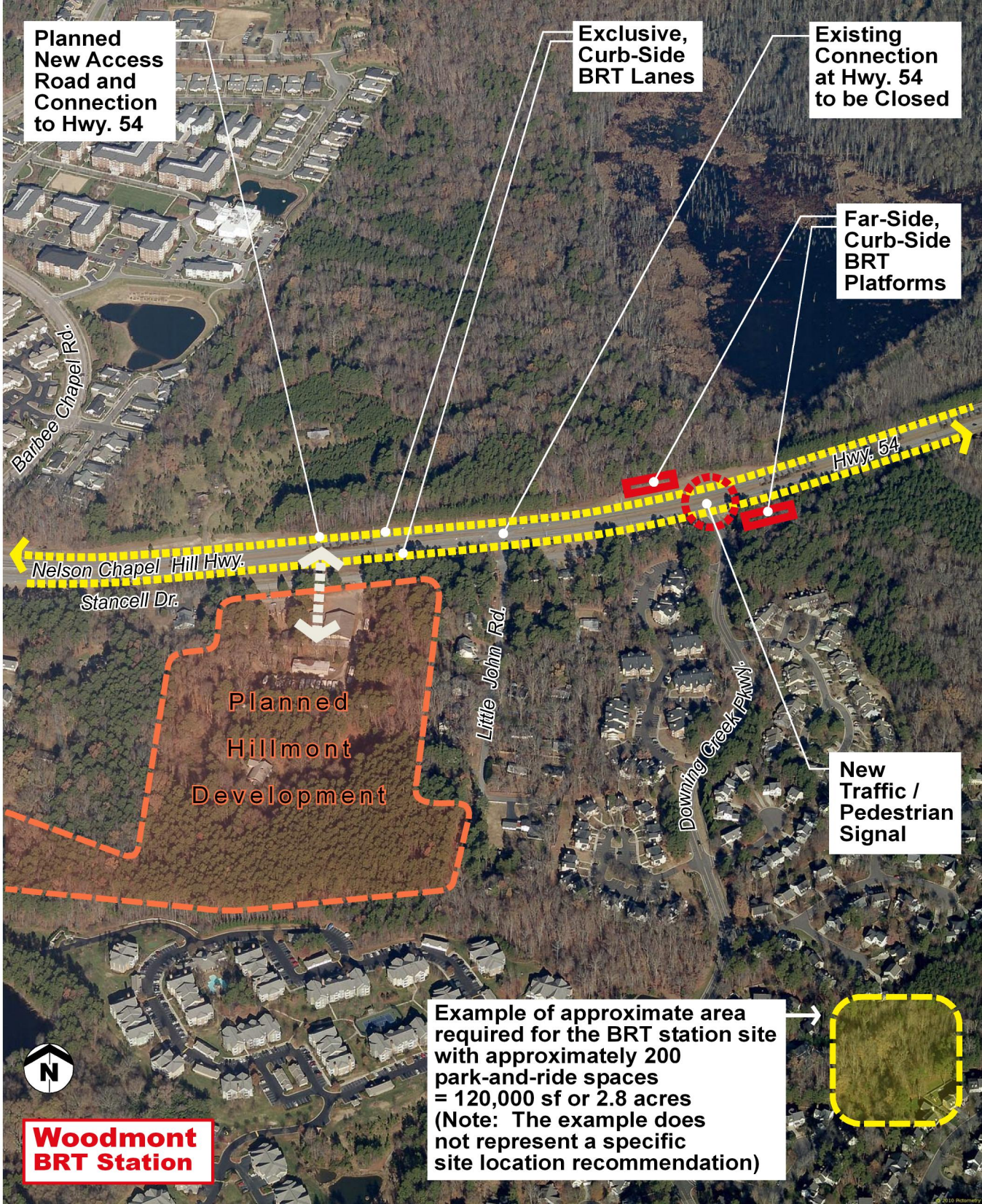
Table 2 BRT "High" and BRT "Low" Station Summary

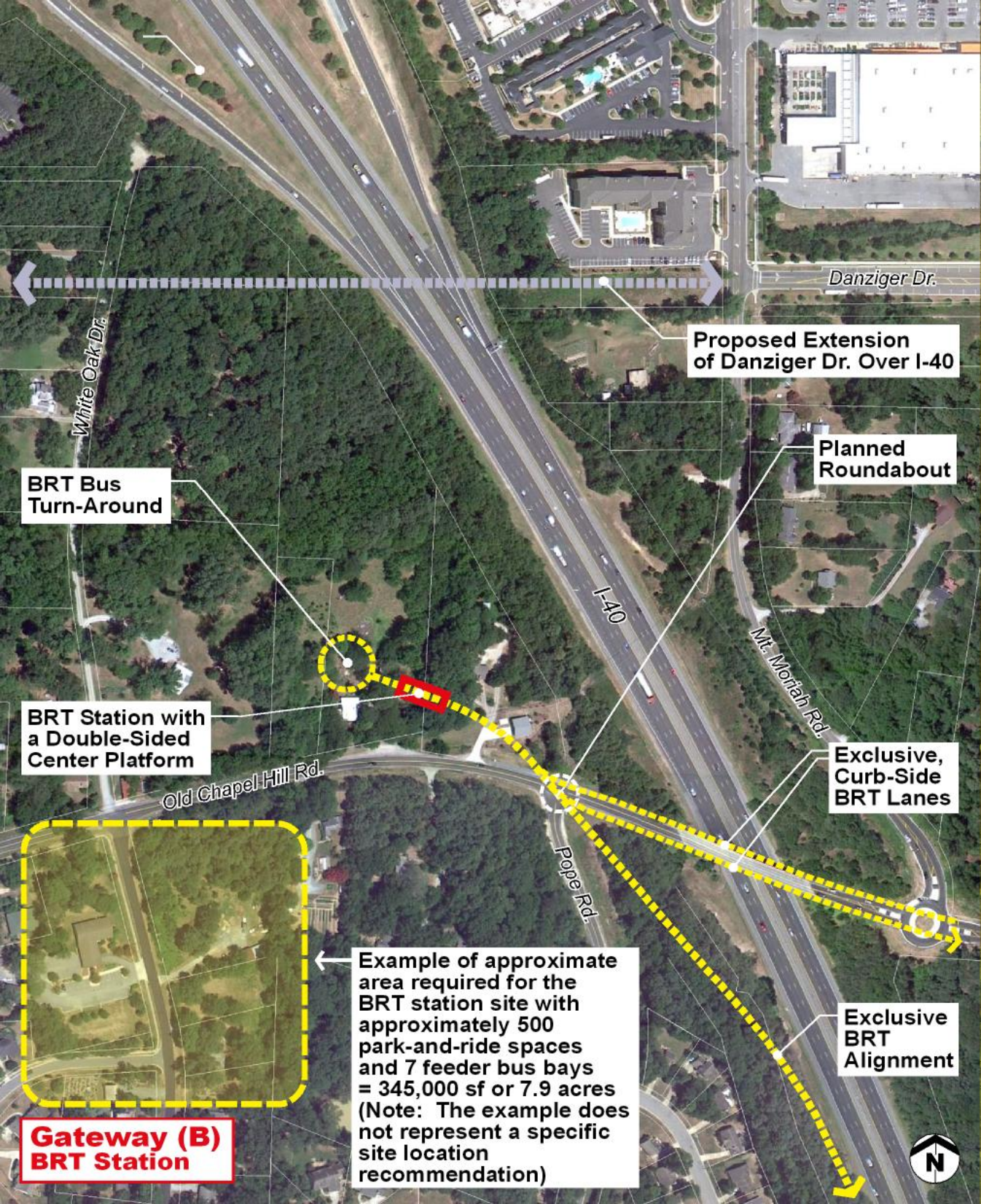
Station Name	Location	Features	Service Area
Buchanan Boulevard Station	Just southeast of and adjacent to Buchanan Boulevard on an extension of Pettigrew Street from Campus Drive to Duke Street which would make Pettigrew 'Street continuous from Ninth Street to Alston Avenue	▪ Walk up Station ▪ At-grade side platforms on each of the new Pettigrew Street extension ▪ Bus transfers making use of station area	▪ The west end of the Durham downtown area, the Duke University East Campus, and the businesses and neighborhoods in the station vicinity
Durham Station	Station would be located at the existing Durham Transportation Center either making use of the existing bus bays or separate bus bays or pull outs in the Transportation Center area.	▪ Shared parking with the existing Durham Transportation Center garage ▪ Bus Bay Transfer area	▪ Intermodal transfers with commuter rail and park-and-ride users, the Durham Performing Arts Center (DPAC), Durham Bulls Athletic Park, Judicial System facilities, and Downtown Durham which includes potential redevelopment and infill areas
Dillard Station	At Dillard Street along Pettigrew Street	▪ Walk up station ▪ Split far side platforms ▪ Bus transfers making use of station area	▪ The east end of the Durham downtown area, the existing businesses and neighborhoods, and potential TODs in the station vicinity.
Alston Avenue Station	South side of Pettigrew Street, east of Alston Avenue. Station includes a bus turnaround since this is the end station.	▪ 500 park and ride spaces ▪ 4 feeder bus says ▪ At-grade center platform station	▪ Intermodal bus transfers, park-and-ride users, NCCU, Durham Technical Community College (by bus) and the businesses and neighborhoods east of the Durham downtown area which include potential infill and redevelopment areas.

Conceptual Station layouts for the BRT "Low" and the BRT "Highhigh" and "Low" stations follow in the same order as presented in Tables 1 and 2.



Friday Center Drive (A)
BRT Station


Planned New Access Road and Connection to Hwy. 54
Exclusive, Curb-Side BRT Lanes
Existing Connection at Hwy. 54 to be Closed
Far-Side, Curb-Side BRT Platforms
Barbee Chapel Rd.
Hwy. 54
Nelson Chapel Hill Hwy.
Stancell Dr.
Little John Rd.
Downing Creek Pkwy.
Planned Hillmont Development
New Traffic / Pedestrian Signal
Example of approximate area required for the BRT station site with approximately 200 park-and-ride spaces = 120,000 sf or 2.8 acres (Note: The example does not represent a specific site location recommendation)
N
Woodmont BRT Station


Danziger Dr.
Proposed Extension of Danziger Dr. Over I-40
White Oak Dr.
Planned Roundabout
BRT Bus Turn-Around
I-40
Mt. Moriah Rd.
BRT Station with a Double-Sided Center Platform
Exclusive, Curb-Side BRT Lanes
Old Chapel Hill Rd.
Pope Rd.
Example of approximate area required for the BRT station site with approximately 500 park-and-ride spaces and 7 feeder bus bays = 345,000 sf or 7.9 acres (Note: The example does not represent a specific site location recommendation)
Exclusive BRT Alignment
Gateway (B) BRT Station
N

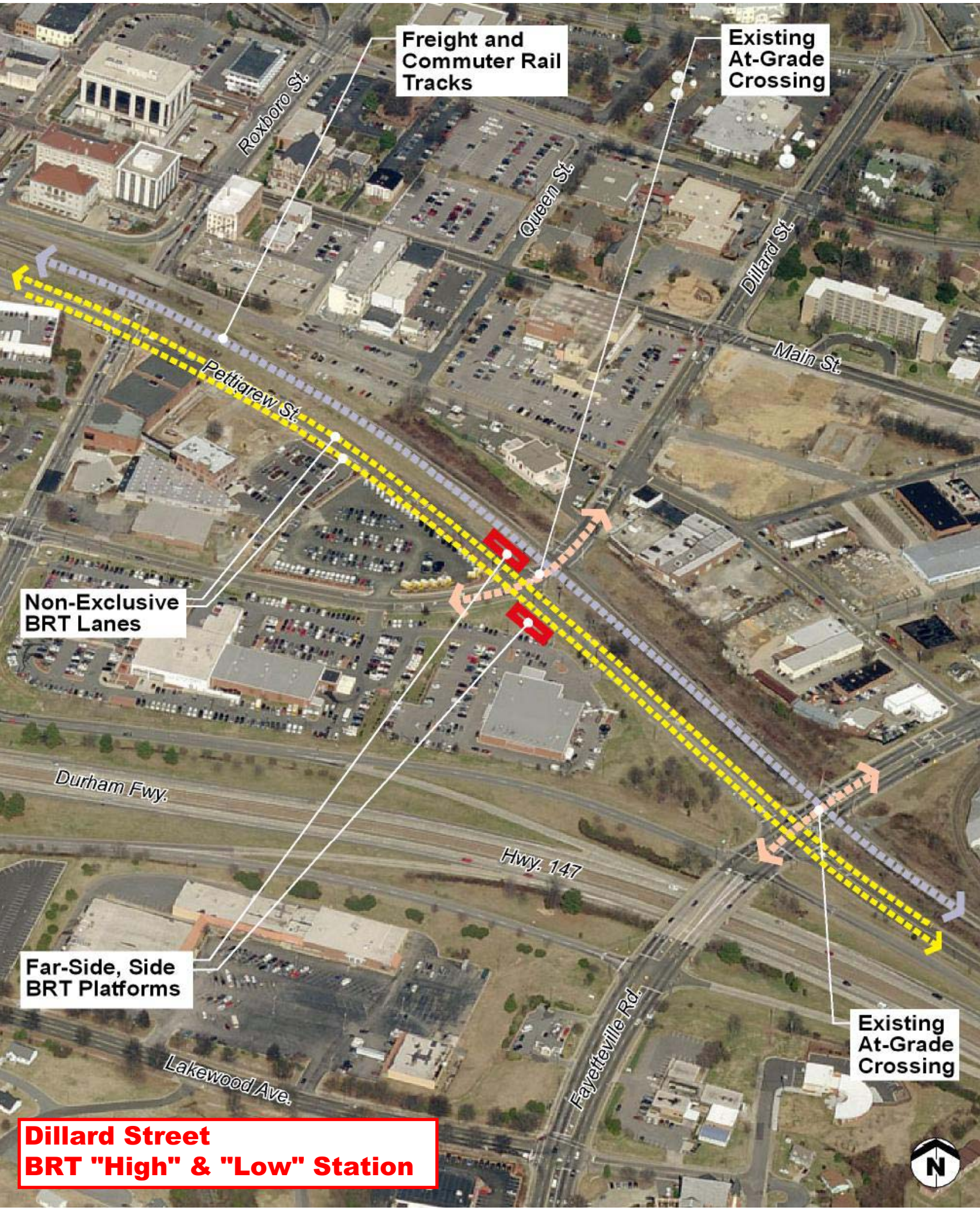

Far-Side, Curb-Side BRT Platforms
Durham Dr.
Garden Ln.
Sherwood Githens Middle School
Old Chapel Hill Rd.
Existing Traffic Signal
Farrington Rd.
Marvin Dr.
Buchanan Dr.
Exclusive, Curb-Side BRT Lanes
Butler St.
N
Farrington Road BRT Station


Ivy Creek Blvd.
Far-Side, Curb-Side BRT Platforms
University Pl.
Existing Traffic Signal
University Dr.
Exclusive, Curb-Side BRT Lanes
N
Old Chapel Hill Rd.
University Place BRT Station

South Square (At Grade)
BRT Station

Buchanan Boulevard
BRT "High" & "Low" Station

Durham Station
BRT "High" & "Low" Station



Dillard Street
BRT "High" & "Low" Station

Alston Avenue
BRT "High" and "Low" Station

Appendix F – Construction Impacts

CONSTRUCTION IMPACTS FOR DURHAM-ORANGE LINE BY ALTERNATIVE AND AREA SEGMENT

Introduction

This write up pertains to both the light rail transit (LRT) and the bus rapid transit (BRT) alternatives. The construction impacts for the BRT "High" option are the same for the LRT option since the guideway is defined as being the same plan and profile with minor differences in width. The write up for the alternative alignment options for the BRT "Low" option follow the LRT/BRT high write up.

For guideway construction, it is common to make use of the corridor in one area as a staging zone for construction in another and then progress in a linear fashion. A finished guideway zone is a good area for staging construction materials for the next zone thus minimizing the need for additional construction staging areas and for a consistent material delivery area for certain reaches of guideway construction. The materials are then distributed linearly along the guideway corridor as the work progresses. Future station park-and-ride lots and bus bay areas would also be used for the staging of construction.

It is common to dictate working hours and occasionally limit construction equipment noise levels depending on the sensitivity of the surrounding areas. Sometimes nighttime construction is required to minimize traffic impacts (such as an aerial crossing of an expressway). At other times nighttime construction is prohibited, for example, in a residential setting.

Erosion control and water run-off control during construction is common to all types of guideway construction and is typically mandated by the authority having jurisdiction.

Types of Construction and Typical Construction Impacts Associated with Each

***At-Grade Guideway Construction*:** Heavy equipment is used to clear and grub the guideway path and earth moving equipment is used either to distribute fill material or to excavate material. Suitable material excavated from one area can be used in another as fill material. Often suitable materials will be stockpiled in selected areas, typically along the alignment or in designated staging areas, for use later when construction activities advance to the area in need. Otherwise, the soil is redistributed locally as much as possible. Construction impacts include the hauling and redistribution of materials and also the delivery of new materials for guideway construction, namely, ballast (LRT), concrete or paving materials (BRT and LRT), rail (LRT), and overhead catenary poles and wiring (for LRT). Other construction materials include drainage pipes and graded materials for base and sub-base for pavements (BRT) and for drainage trenches. The heavy equipment used for these deliveries can cause noise and traffic impacts to the surrounding area.

Where the guideway crosses streets at-grade, local automobile traffic can be disrupted and it is customary to either close the street and detour the traffic away and around the construction site or to construct the grade crossing in stages without closing the street entirely by detouring traffic locally around the construction zone making use of one-half of the street being crossed. This process is then reversed to build the other half of the street. This necessitates the use of flagmen and traffic detour signs. It is a normal construction staging requirement that adjacent street crossings cannot be worked on simultaneously in order to minimize impacts to traffic. Construction detour plans would be prepared by the contractor and approved by the governing jurisdiction.

Aerial Guideway Construction

Substructure: Methods for constructing foundations for the columns of the aerial guideway include drilled caissons, auger cast piles, or driven piles, depending on the soil types and sensitivity of the surrounding area to the construction methods. Pile driving has the most impact due to noise and vibration and drilled caissons/auger cast piles have more impact for the hauling away of drilled soils and stormwater runoff. Large equipment is used for the construction all of these types of foundations.

Superstructure: The guideway superstructure can either be constructed with cast-in-place construction or by means of pre-cast elements such as box girders or concrete/steel beams. Box girders and beams can be anywhere from 60 feet to 130 feet in length and there is usually a box girder or set of I-beams for each track. The top deck is then poured in place, unifying the box girders or beams. Delivery of the pre-cast elements can impact the traffic since the specialized vehicles used for delivery sometimes need to make use of the entire street, especially for turning movements. From time to time these deliveries involve "wide-load" warnings.

Another method is to use segmented pre-cast concrete boxes which are typically delivered in 10-foot long segments. This method is common for longer spans of above 130 feet up to about 200 feet and in extreme cases can be used for even longer spans with more specialized elements in the design. These units are typically cast to accommodate both tracks due to their nature of construction. Hence, these 10-foot units can be 30 to 35 feet wide to accommodate the double lane or double track cross section.

For all superstructure installations, cranes are used to unload the pre-cast units and other guideway materials such as rebar, rail (LRT), and miscellaneous materials. The staging of construction is an important aspect for all aerial construction. A linear area parallel to the guideway is needed for the staging of the the aerial structure construction and for placement of the superstructure and delivery of materials after the basic superstructure is up. Specialized "top-down" construction, typical for construction in sensitive areas such as wetlands, is an exception to this linear area need for the staging of construction.

The following sections describe the types of construction in each segment. The construction impacts presented above are indicative to that type of construction and hence are not repeated in each individual section. Other items unique to the segment are itemized.

LIGHT RAIL TRANSIT (LRT)

Alignment Alternative A-1 from the University of North Carolina (UNC) Station (A) or (C) to Mason Farm Road Station

Starting from the UNC station, William Blythe Drive/Hibbard Drive will be crossed either at-grade or on an aerial structure depending on the station alternative chosen for alignment alternative A-1. South of William Blythe Drive, the ground drops off and then comes back up forming a valley necessitating an aerial structure no matter which option is chosen. Currently there is student housing in this area but the UNC Master Plan removes and replaces this housing elsewhere. Therefore, what is there now may be different from what will be there during guideway construction.

Near the Mason Farm station, there is married-student housing that will remain and, as such, will be considered a sensitive area requiring working restrictions during construction.

Alignment Alternative A-3 from the UNC Station (D) to Mason Farm Road Station

This alternative is all at-grade from the UNC Station to the Mason Farm Road Station with an at-grade crossing of Mason Farm Road. Near the Mason Farm Station, there is married-student housing that will remain and hence this area will be considered a sensitive area requiring working restrictions during construction.

Mason Farm Road Station to Hamilton Road Station (Segment B)

This segment transitions to an aerial structure and parallels Fordham Boulevard along the west side and crosses Fordham Boulevard at a skew at Old Mason Farm Road. Construction of this crossing will create traffic impacts on Fordham Boulevard which will necessitate some detouring during each half of the crossing construction. Barricades will be needed to separate the traffic from the construction zone along Fordham Boulevard. The aerial construction along Fordham Boulevard will most likely result in the creation of one-lane traffic with detours around.

The alignment curves to the east south of Prestwick Drive and goes around an area that from a previous project was dedicated as a wetland mitigation site. It will be important for construction activities to avoid any disruption of this site during construction.

Hamilton Road Station to Friday Center Station (Segment B)

The guideway alignment traverses along the northern boundary of the UNC Finley Golf Course. The guideway is behind the tee box of the 15th hole and thus it does not appear that netting will be needed for protection of wayward golf shots. However, there will be construction noise impacts.

Alignment Alternative C-1 from Friday Center Station to Leigh Village Station

For this alternative the Friday Center Station is elevated and the alignment crosses over NC 54 into the Meadowmont Village subdivision. Traffic on NC 54 will be impacted during construction. Construction of this crossing will create traffic impacts on NC 54 requiring some detouring during each half of the crossing construction.

The alignment crosses the entrance to Meadowmont Village Circle at-grade along with at-grade crossings of Barbee Chapel Road, Sprunt Street, and Meadowmont Lane. With the exception of Meadowmont Lane itself, there are alternate routes for traffic to use during the construction of the other three street crossings. Complete closures of these roads during construction speeds up the construction and lessens the time of impact versus a staged half and half street construction.

The alignment then traverses behind a dozen homes that would likely be impacted by construction noise, most likely necessitating restriction on the hours of construction.

From Meadowmont Village, the alignment traverses some wetlands (about 500 feet in length) and across federal property (the 500 feet of wetlands plus another 500 feet). Construction means and methods will need to be developed to minimize disruption to the wetlands. This is typically done by means of an elevated viaduct with top down construction so that the majority of the land beneath the guideway is not impacted except where columns are placed.

There is a potential route to lessen the amount of impact, but this route is very circuitous and would severely impact operating speeds, would significantly lengthen the alignment, and be built across difficult terrain. Additional impacts would be created to planned communities to the north. However, this circuitous route may have to be followed depending on the Corps of Engineers and their requirements for minimizing impacts to wetlands and to federal property.

Alignment Alternative C-2 from Friday Center Station to Leigh Village Station

This alignment parallels NC 54 and stays within the North Carolina Department of Transportation (NCDOT) right-of-way. The crossing of Friday Center Dr. will either be an at-grade crossing or an aerial crossing depending on results of additional traffic studies. Barbee Chapel Rd., Little John Road, and Downing Creek Road will be at-grade crossings and full closures are anticipated during construction with local detours provided along Stancel Drive, which is a frontage Road to NC 54. The crossing of Friday Center Drive will be a staged construction crossing.

The guideway transitions to an aerial structure as it crosses over the eastbound lanes of NC 54. The guideway runs down the median of NC 54 for about 800 feet before turning north to cross over the westbound lanes. The aerial crossings will impact traffic and will require detours during critical construction times. Construction of an aerial structure down a roadway median will require linear concrete barrier protection and some local detouring to allow sufficient space for construction activities in the median. The median running down the center of NC 54 offers the least impact to the wetlands zone in this area since NC 54 has already mitigated this with the construction of the roadway. The guideway is on an aerial structure as it crosses over Little Creek. Control of runoff from the construction activities will be an important aspect of the construction plan.

The alignment then runs parallel to George King Rd. within the roadway right-of-way. It then traverses open land on the way to the Leigh Village Station site. There are few homes in this area; one of them will be acquired for the project and others will need to be considered during construction to avoid adverse impacts.

Leigh Village Station to Gateway Station (Segment D)

From the Leigh Village station, the guideway heads north paralleling the south I-40. The guideway is within the I-40 right-of-way with few exceptions. The guideway is positioned to allow for a future lane widening of the freeway. The line is all at-grade and crosses the southern portion of Farrington Road and Old Chapel Hill Road at-grade before entering the Gateway Station site. There will be traffic impacts similar to those discussed earlier with regard to staged construction crossings. The line will pass under the northern portion of Farrington Road which is elevated as it passes over I-40. The undercrossing of Farrington Road will have traffic impacts during construction and full closure of this crossing is anticipated to lessen the time-of-construction impact.

Gateway Station to Patterson Place Station (Segment D)

From the Gateway Station, the line transitions to aerial to head in an easterly direction passing over the I-40/Durham Chapel Hill Boulevard interchange. Columns will be constructed in the freeway median and in the triangular area formed between the on- and off-ramps and the freeway. Staging of construction will be done in accordance with the requirements of NCDOT, taking into account safety and the

minimizing of traffic impacts during construction. Nighttime work is envisioned to accomplish this multi-span crossing.

The aerial structure transitions to grade as it runs along the north side of McFarland Drive. It then crosses Witherspoon Drive at-grade. It also crosses McFarland Drive at-grade as McFarland makes a ninety degree turn. Lastly, the guideway crosses Sayward Drive before entering the station site. All of these crossings will most likely be closed during the construction of the crossings itself since there are multiple by-pass routes. Some parking will be lost permanently along McFarland Drive once construction begins. There are large department type stores on the other side of McFarland but they are setback a good distance and disruption is not considered to be an issue.

Patterson Place Station to MLK Station (Segment D)

Heading east from Patterson Place Station, the guideway crosses SW Durham Drive at-grade and will then traverse about 1,800 feet of wetlands. The guideway will be on viaduct structure with top down construction mandated to minimize wetland impacts. The wetlands must be traversed since moving the route north or south does not alleviate the crossing of the wetland. New Hope Creek is located within the zone of the wetlands and special attention will have to be paid to the construction means and methods so as not to adversely affect the creek.

The guideway is at-grade after the wetland crossing and crosses Garrett Road, which will be a staged construction with local detouring around the construction zone as each half of the crossing is built. From there the guideway route is behind two separate residential subdivisions as the guideway turns and becomes parallel with University Drive running along the west side. This residential community will require restrictions on the hours of construction and on noise levels from the construction activities.

Snow Crest Trail, Larchmont Drive, and MLK Jr. Parkway will all be at-grade crossings. MLK Jr. Parkway will be a staged construction with local detouring as each half of the crossing is built. Given the alternative routes around the construction zone, the other two will most likely be full closures to minimize the total construction time.

Alignment Alternative D-1 from MLK Jr. Parkway Station to South Square (B) Station to Cornwallis Road

The guideway continues running parallel to University Drive on the west side heading north. The guideway crosses Lyckan Parkway, a local business access driveway, and Westgate Drive at-grade. Lyckan Parkway will need to be a staged construction since no other access exists to the businesses beyond. The other local business access driveway and Westgate Drive will be closed until the street crossing construction is complete. The local driveway has other access off of Westgate Drive. The Westgate Drive crossing is on a curve and will need to be constructed in a single stage with local traffic being detoured to other streets nearby.

The guideway transitions to an aerial structure with the South Square (B) station being an elevated station. A local road (Chapel Hill Boulevard service road) just west of Westgate Drive will be permanently closed since proper clearance will not be achieved with the guideway transitioning to an aerial structure. This closure is not considered to be a significant issue given the street grid pattern that exists. The guideway continues on an aerial structure along the north side, and parallel to Westgate Drive. An aerial structure is needed to cross over the South Square mall frontage road and Durham Chapel Hill Boulevard due to the volume of traffic on Durham Chapel Hill Boulevard.

The staging of the construction activities will be disruptive to the businesses along the north side of Westgate Drive given the limited amount of working area. Encroachment onto Westgate Drive is likely with construction activities making use of the northern lane (there are two lanes in each direction on

Westgate Drive). The crossing of Durham Chapel Hill Boulevard will be a clear span crossing with critical structural elements being erected at night with a possibility of limited complete road closures, depending on the type of structure used.

The alignment continues on an aerial structure passing over the US 15/501 on- and off-ramp roadway and the structure comes to ground level before it crosses Pickett Road at-grade. The structure over the on- and off-ramp roadway will also be a clear span structure with similar traffic impacts as the Durham Chapel Hill Boulevard crossing. The Pickett Road crossing will need to be staged to avoid a full closure since there are no practical detours. The alignment then runs along the east side of US 15/501 with a frontage road on the immediate west. The frontage road may have to be shifted and reconstructed, especially if provisions for future lane widening of US 15/501 need to be adapted on the west side of US 15/501. The alignment then crosses Cornwallis Road at-grade with the construction being staged to allow through-traffic at the crossing via local detouring.

Alignment Alternative D-3 from MLK Jr. Parkway Station to South Square (A) Station to Cornwallis Road

Upon leaving the MLK Jr. Parkway Station, this alternate alignment also crosses Lyckan Parkway, a local business access driveway and Westgate Drive at-grade with the same construction requirements and impacts as described in alignment alternative D-1. There is a fourth road crossing that provides additional access into South Square mall off of University Drive. This fourth crossing can be fully closed to expedite construction with an alternative detour route via Westgate Drive. After this crossing, University Drive increases in elevation and a sloped embankment is created between University and South Square mall. The guideway is on this sloped embankment. It is likely that the construction staging of this section of guideway will require the use of the adjacent lane of University Drive, leaving one lane of travel on the mall side of University Drive during construction of this 1,200 feet of guideway. This may or may not require nighttime construction and will have to be coordinated with the governing authority. During this stretch, University Drive turns to an easterly direction.

The guideway then crosses Shannon Road at-grade and curves to the north paralleling Shannon Drive along the east side. The guideway transitions to an aerial structure with the ground dropping off beneath it as Shannon Road slopes down to the north. The South Square (A) station is an elevated station along and adjacent to Shannon Drive and prior to Durham Chapel Hill Boulevard. Portions of the existing business parking lots along the east side of Shannon Drive may be used for construction staging of the elevated structure. The staging area would most likely be the parking lot for the transit station.

The guideway continues on the aerial structure for the crossing of Durham Chapel Hill Boulevard. As with alignment alternative D-1, the crossing of Durham Chapel Hill Boulevard will be a clear span crossing with critical structural elements being erected at night with a possibility of limited complete road closures, depending on the type of structure used. The elevated guideway does a slight “S-curve” making use of some of the parking lot corners of business properties (for column locations) as the alignment heads north toward Pickett Road and eventually parallel to US 15/501. The Pickett Road crossing is at-grade and will be built in stages. North of Pickett Road there are residential units and the construction activities along these units will most likely have restrictions on working hours.

The alignment then runs along the east side of US 15/501 crossing and then paralleling a frontage road on the immediate west. The frontage road may have to be shifted and reconstructed, especially if provisions for future lane widening of US 15/501 need to be accommodated for on the west side of US 15/501. The alignment then crosses Cornwallis Road at-grade with the construction being staged to allow through traffic at the crossing via local detouring.

Cornwallis Road to Ninth Street Station (Segment E)

The alignment continues along the west side of US 15/501 inside the NCDOT right-of-way with the Duke Golf Course further to the west. During construction barricades may be needed to separate construction crews from the traffic. There should be no loss of an existing lane on US 15/501 during the at-grade construction.

The guideway alignment traverses over to Erwin Road and enters the center of Erwin Road at the Erwin Road and Cameron Boulevard intersection. Erwin Road will be re-constructed entirely to accommodate the guideway with the curb lines being moved out on both sides. There will most likely be three stages of construction. The east/south side of the street would be rebuilt up to the demarcation point between the guideway and the traffic lanes with traffic being detoured to the other side of the street making use of three lanes. Then the other side of the street would be re-built with traffic detoured to the newly reconstructed street. Lastly, the guideway would be constructed with traffic now on the new portions.

However, all of Erwin Road would not be constructed simultaneously. The construction would be done in linear stages as well. For example, from Cameron Boulevard to Moreene Road, from Moreene Road to Lambeth Circle, from Lambeth Circle to Eye Care Drive, from Eye Care Drive to Emergency Drive, and from Emergency Drive to 15th Street. Construction through each intersection would be staged as well. The linear sections would be chosen based on construction time and efficiency of operations and on the ease of detouring from new sections to existing sections considering the goal of minimizing traffic and business impacts and maximizing safety. It will be important to work with Duke University, the hospitals, and other businesses along the route to take their operational needs and their overall concerns into account.

The guideway construction over Durham Freeway would need to be staged in accordance with the requirements of NCDOT taking into account safety and the minimizing of impacts during construction. Nighttime work is envisioned to accomplish this multi-span crossing. There would most likely be a column placed in the median of the freeway. Specific detour plans would be presented and approved in accordance with the method of constructed and jurisdictional requirements.

With the crossing of the Durham Freeway, the guideway enters the NCRR right-of-way. The Ninth Street station will be at-grade.

Ninth Street Station to Alston Avenue Station (Segment E)

The guideway follows the railroad corridor along the south side. The tracks will be on bridges over the cross streets wherever the existing freight tracks are on bridges so that new grade crossings are not created. These bridge locations include:

- Erwin Road
- Campus Drive
- Gregson Street
- Chapel Hill Street.
- Roxboro Street
- Alston Avenue

All other street crossings will be at-grade along with the freight tracks. Detour plans during construction will be coordinated for the entire corridor working with the City of Durham and with the operating railroads and with NCRR. Nighttime work may be warranted for the placement of superstructure beams or girders and/or to maximize efficiency and safety depending on the freight traffic.

Construction workers will be required to take railroad construction safety courses and meet all of the requirements of the NCRR. Railroad Flagmen will need to be on-site during construction to control and coordinate the construction activities with on-going operations.

BUS RAPID TRANSIT (BRT)

Introduction

The construction impacts for the BRT "High" option is the same for the LRT option since the guideway is defined as being the same plan and profile with minor differences in width. The BRT "Low" option deviates from the BRT "High" option in three locations. These are termed alignment options BRT—1, BRT—2 and BRT—3 and are described below. Alignment option BRT—4 parallels the NCRR corridor making use of Pettigrew Street since it is not feasible to have BRT run alongside freight tracks as expressed by the operating railroads. This alignment alternative is termed BRT—4 and this alternative is applicable to both the BRT "High" and BRT "Low" options and is the one exception where the BRT "High" option is not identical in plan and profile to the LRT option.

BRT Alignment Alternative BRT-1, Hamilton Station to Leigh Village Station

This alignment alternative is associated with the BRT "Low" option and would widen NC 54 one lane in each direction from Hamilton Street to George King Road. This recognizes the need that more capacity is needed on NC 54 and additional local and regional bus operations could make use of these added lanes, but normal automobile traffic would not be allowed by definition. It also reduces the amount of aerial structure as compared to the BRT "High" option. The guideway would leave Hamilton Station and join with Hamilton Street running in mixed traffic for this short block. The northbound lane would be built on the east side of NC 54 and the southbound lane on the east side. The southbound movement at the intersection of Hamilton Street and NC 54 would be a controlled at-grade movement through a modified signal control system.

Similar impacts on the south side of NC 54 would occur as described with the LRT alignment alternative C-2 and additional impacts would occur on the north side. For the southbound lane of the guideway, additional at-grade crossings would occur at Barbee Chapel Road, Friday Center Drive, and George King Road. The northbound lane of the guideway would transition to aerial structure for the crossing of NC 54 and come to grade on the north side of NC 54 where it would rejoin the southbound guideway and continue on to Leigh Village as with the LRT option. The aerial structure would be a single lane bridge and have similar impacts associated with the double track bridge described in alignment alternative C-2. The widening may produce additional impacts to wetlands for the 1,200 to 1,500 feet crossing of the wetlands on both sides.

There would be two side platforms on each side of NC 54. The Friday Center Drive Station would be aligned with the pedestrian underpass to allow for grade separated pedestrian movements across NC 54. The other station (replicating the Woodmont LRT stop) would be at the Downing Creek Parkway intersection. A new traffic signal would be introduced at Downing Creek Parkway to allow for pedestrian movements associated with the two split platforms.

Barricades may be needed during construction to separate construction crews from the traffic. There should be no loss of an existing lane during construction.

BRT Alignment Alternative BRT-2, Gateway Station to MLK Jr. Parkway Station

This alternate alignment is associated with the BRT "low" option and would follow Old Chapel Hill Road and University Drive for its entire length between the Gateway Station and MLK Jr. Parkway Station. Like NC 54, one lane would be built on each side of Old Chapel Hill Road and University Drive. Stations at

Farrington Drive and University Place would be side platforms on each side of the street with traffic signals controlling the pedestrian movements.

This alignment alternative avoids the elevated viaduct across the middle of the wetland area associated with the BRT "high" option and LRT option. There would likely be some wetland impacts, but until the full extent of the wetland boundary is defined, this impact is not determinable at this time.

The existing Old Chapel Hill Street Bridge over I-40 would be widened to accommodate the added lanes. Staging of construction will be done in accordance with the requirements of NCDOT taking into account safety and the minimizing of traffic impacts during construction.

There are numerous side street crossings along this stretch. All major street crossings would be signalized if currently not signalized. This includes Farrington Drive, Garrett Road, MLK Jr. Parkway, and at the station stop at University Place station. Preferably, all intersections would be signalized for efficient and safe operations but, depending on the volume of traffic for the local access streets and depending on the desires of the City of Durham and local communities, the method of proper vehicular control and control of train movements could change. The details of the grade crossings would be determined later. In addition, specific restrictions on construction e.g., hours of construction and construction noise) would be detailed later in order to properly mitigate impacts.

BRT Alignment Alternative BRT-3, Shannon Drive to Pickett Road

This alternate alignment is associated with the BRT "low" option and continues the guideway along the west side of University Drive to Shannon Drive. The option is to place a lane in each direction on Shannon Drive down to Durham Chapel Hill Boulevard running at-grade instead of elevated as is with the BRT "high" option. From Shannon Drive, the lanes would turn east along Durham Chapel Hill Boulevard again, with one lane on each side of the street. The alignment would then turn north entering Tower Road and would operate in mixed traffic for the short length of Tower Road. This option saves a significant amount of aerial structure with limited impact on operations.

The construction impacts for the alignment along Shannon Drive would occur mostly at the side street and driveway crossings and the crossings could be closed for the construction through the street given the multitude of access points for all businesses. The station would be side platforms on both sides of Shannon Drive at the Auto Drive intersection. The pedestrians would cross Shannon Drive at the Auto Drive intersection that is already signal controlled. There would be no impact to either Durham Chapel Hill Boulevard or to Tower Road.

BRT Alignment Alternative BRT-4, Ninth Street to Alston Avenue

This alignment alternative is associated with both the BRT "high" and BRT "low" options. In prior correspondence with Triangle Transit, the operating railroads would not allow a dedicated BRT guideway in the same location as the light rail guideway due to safety reasons. Thus, for this stretch of the corridor, the BRT options would follow the existing Pettigrew Street route. There is one location where Pettigrew Street does not currently exist and that is from Campus Drive to Duke Street. The BRT guideway would build a new Pettigrew Street connection between these intersections along the same route and similar location of the existing Pettigrew Street in relation to the existing freight tracks. Further investigation is needed concerning the City's platted street and whether the City has the right to make this connection. Otherwise, approval to connect Pettigrew Street from Campus Drive to Duke Street would need NCRR / NS approval, which is not guaranteed.

The BRT would run in mixed traffic along Pettigrew Street, but would be exclusive running in the new connection between Campus Drive and Duke Street. There would be stations at Ninth Street, Buchanan Boulevard, the Durham Transportation Center, Dillard Street, and at Alston Avenue. The route from

Pettigrew Street to the Durham Transportation Center would be via the one-way couplet of Duke Street and Gregson Street.

Since the construction is parallel to the rail corridor and is limited to the area between Campus Drive and Duke Street there would be very little construction impact in this section.

Appendix G - Supporting Technical Reports

Several supporting technical reports are appended to the Detailed Definition of Alternatives documented by reference. A list of these technical reports is provided below. A copy of these reports can be found on the attached DVD.

- *Durham-Orange Detailed Definition of Alternatives Volume 2: Detailed Definition of Alternatives - Conceptual Plan and Profile Drawings,* URS Team, May 2011.
- *Durham-Orange Detailed Definition of Alternatives Volume 3: Durham-Orange Corridor Capital Cost Estimates, Operations and Maintenance Costs Estimates, Travel Time and Distance Calculation, and Ridership Summaries and Station-to-Station Ridership*, URS Team, May 2011.
- *Durham-Orange Detailed Definition of Alternatives Volume 4: Transit Oriented Development (TOD) Assessment Report,* URS Team, April 2011.
- *Durham-Orange Detailed Definition of Alternatives Volume 5: Traffic Analysis Results Report*, URS Team, February 2011.