

CHAPER VI

DEVELOPMENT OF ALTERNATIVE CONCEPTS

A. Background

Phase I of the US 15-501 MIS Corridor Study was completed at the end of 1998 in which a series of feasible alternatives to improve mobility within the US 15-501 corridor in Durham and Orange Counties of North Carolina was recommended. These alternatives included bus transit service improvements, fixed guideway transit, a highway expansion alternative and several Transportation Demand Management (TDM) and Transportation Systems Management (TSM) measures.

The core group of the US 15-501 Phase I Steering Committee of the project recommended that the next steps toward implementation of the highway and transit alternatives occur on separate tracks. It was further recommended that the transit alternatives required better definition and more evaluation to reduce the number of transit technologies and feasible corridors under consideration. The Phase II MIS focused on selecting a preferred transit technology and corridor for protection prior to initiating Phase III: the Environmental Impact Statement/Preliminary Engineering process (EIS/PE).

B. Study Area Description

In general, the study area examined in Phase I of the MIS is also the study area for Phase II. Presented in Exhibit VI-I, the study area is predominately parallel to US 15-501 between UNC Hospitals and Duke University Medical Center. Due to the development of related studies, the Phase II MIS study area was expanded to include Triangle Transit Authority's Phase I Regional Rail Station at 9th Street in Durham and the NC 147 corridor between 9th Street and US 15-501. Early in the Phase II MIS, the study area included the area from the UNC Hospitals to UNC's Horace Williams property for a qualitative assessment of all transit technologies under consideration, but was later determined to be the subject of further study and excluded from the Phase II MIS.

C. Study Purpose

This chapter describes the further study of the Phase I MIS Corridor transit alignment concepts for the purpose of defining a transit corridor, which can be protected through development review process. Also described is the information collected and the process used in Phase II MIS to select a transit technology to be carried forward into the next phase.

D. Approach

Phase II MIS rail and busway alignments were developed based on transit technology applications and upon refinement of the Phase I MIS Corridor "A" alignment. Transit technology applications were assessed in more detail at the following critical locations:

- Cornwallis Road to 9th Street Station, including assessment of a feasible Duke Station and stations proximate to the Duke property (i.e. Morreene Road Station);
- South Square Mall Area; and
- UNC-Hospitals to Fordham Boulevard (US 15-501 Bypass).

Viable Phase II MIS alignments and alternatives were screened for their benefits, disadvantages and potential “fatal flaws” by the project’s Technical Committee before approval by the Policy Oversight Committee. Through an increased public involvement effort and station area planning workshops, comments were solicited from the public, universities, and hospital representatives during the development of the Phase II MIS alternatives. Based on the resulting alignment, conceptual cost estimates and ridership/revenue estimates were developed and compared for each of the four basic technologies in order to determine a preferred technology for the entire corridor.

E. Station Area Planning Workshops

Reconnaissance meetings were held with representatives from both universities and their respective hospitals to collect data. Based on this information, preliminary station planning concepts for Duke and UNC area stations were developed and refined with the assistance of the Technical Committee and approval of the Policy Oversight Committees. A series of workshops were held at Duke University and UNC. Preliminary station concepts for university/hospital stations were presented to the respective representatives for review and comment. The resulting station area concepts are shown in Appendix C. The remaining station locations were developed in detail similar to what was done in the Phase I MIS.

F. Identification of Alternative Corridors

This section represents the identification and screening of the initial alignments identified through coordination with the involved agencies and the project’s Technical and Policy Oversight Committees. These concepts are presented in Exhibits VI-II through VI-IV.

1. Duke Area

It was assumed that TTA’s 9th Street Station would be the connection point between Phase I TTA Regional Rail and the Phase II MIS study. Seven initial alternative concepts along three corridors were developed in preparation for the Duke Station Area Planning Workshops in November 2000. Three of the Bus and Busway / Mixed Traffic (BMT) concepts, which followed alignment east of Duke along Campus Drive/Anderson Street to University Road, were eliminated as they were considered non-viable in comparison with alternatives on the Erwin Road or NC 147 / Durham Freeway corridors. Based on the discussion and consensus reached at the workshop, the remaining four alternative concepts were combined into the three Duke area station concepts and are depicted in Exhibits VI-V and VI-VI.

2. South Square to Meadowmont

Due to the potential conflicts with proposed US 15-501 road improvements and the desire to refine the Phase I MIS Corridor “A” alignment to attract future transit oriented development, four additional corridors in the area between South Square Mall and the future Gateway Development were studied and screened. The alignments, presented in Exhibit VI-III, were screened based on environmental and community impacts, consistency with future land use plans, existing land use, and ridership potential. These alignments were refined into one corridor, SSGW1, then compared to the Phase I MIS Corridor “A” alignment. The analysis is summarized and presented in Table VI-I. Although SSGW2 / Phase I MIS Corridor “A” had more potential residential relocations, the study team felt that the more southerly alignment of SSGW1 presented better opportunity for future transit-orientated development.

Table VI-I. Gateway to South Square Alternative Alignment Comparison

Evaluation Criteria	Alignment SSGW1	Alignment SSGW2 Corridor “A” Phase I MIS
Residential Relocations* (# Single Family Residences)	Watkins Road Area – 2	Sayward Drive – 2
Residential Relocations* (# Apartment Buildings)	Wellington Place – 5 Springfield – 2 Summit Square – 3	Springfield – 4
Business Relocations*	7	4
Wetlands Impact (Linear Feet)	2,200	2,400
Stream Crossings	4	1
Street Crossings (At-grade or Structure)	8	7
Existing Development Impact		
Mount Moriah Area	Same	Same
Garrett Road Area	More	Less
University Place Area	Higher R/W Impact Lower Wetland Impact	Lower R/W Impact Higher Wetland Impact
Southwest Durham 2020 Future Land Use Plan		
Mount Moriah Area	Office and Mixed Use	Mixed Use and High Density Residential
Garrett Road Area	High Density Residential and Commercial	Mostly Open Space, Recreational, And Floodplain
University Place Area	High Density Residential and Commercial	High Density Residential and Commercial
Station Ridership Potential – Distance in Feet to TAZ Centroid		
Mt. Moriah / Watkins Road Station TAZ 2238	1150	900
Garrett Road Station TAZ 2235	1500	1250
University Place Station TAZ 2234	800	800

* Based on field observations, February 2001

3. Meadowmont to Gateway

Three alignment corridors were studied in the Ephesus Church Road / George King Road area and are shown in Exhibits VI-VII and VI-VIII. Phase I MIS Corridor “A”, the future Southwest Durham Drive, is identified on the Durham-Chapel Hill Thoroughfare map. A western alignment, (MMGW2) and an eastern alignment (MMGW3) were also analyzed and compared to each other for environmental and community impacts, consistency with future land use plans, and ridership potential. The following table summarizes the results of the analysis. Although the three alternatives had relatively equal environmental and community impacts, the study team felt that the Phase I MIS Corridor “A” had better potential for ridership in addition to following a previously established transportation corridor.

Table VI-II. Meadowmont to Gateway Alternative Alignment Comparison

Evaluation Criteria	Alignment MMGW1 (Corridor “A” Phase I MIS / SW Durham Drive)	Alignment MMGW2 (Western Alignment)	Alignment MMGW3 (Eastern Alignment)
Residential Relocations (# Single Family Residences)	2	1	4
Business Relocations	1	0	0
Wetlands Impact (Linear Feet)	250	0	700
Stream Crossings	0	1	1
Street Crossings (At-grade or Structure)	3	2	3
Existing Development Impact	Medium	Lowest	Highest
Southwest Durham 2020 Future Land Use Plan	Low Density Residential	Low Density Residential	Low Density Residential
Ephesus Church Station Ridership Potential			
Distance To TAZ Centroid (feet)	3,800 (TAZ 2261)	2,400 (TAZ 2260)	3,800 (TAZ 2261)
TAZ Households	1,034	164	1,034
TAZ Employment	205	0	205
Future Transportation Plan Consistency			
SW Durham Drive	Consistent	Inconsistent	Inconsistent

* Based on field observations, February 2001

4. *Friday Center to US 15-501 / Fordham Boulevard*

Since the Phase I MIS study was completed, development has occurred within the Corridor “A” alignment, and any construction of fixed guideway will result in impacts to an existing parking structure, parking lots, and accessibility to office buildings. An alternative transit corridor alignment was considered and qualitatively compared the Phase I MIS Corridor “A” alignment to see whether it was feasible to run within or adjacent to the NC 54 right-of-way. In this analysis, the following issues arose concerning an alignment within or adjacent to NC 54:

- NC 54 has insufficient median width to accommodate a transit corridor within the median of NC 54; widening to the north or the south would be required resulting in additional right of way costs and environmental impacts to natural meadowland areas;
- Potential conflicts with left turn movements at Burning Tree/Golf Course Road and Meadowmont Development driveway;
- Structure requirements with median alignment may have negative visual aesthetic issues, require geometrically restrictive radius, and have potential conflicts with the Burning Tree/Golf Course intersection; and
- Difficulties in siting the Friday Center.

Based on this analysis, the study team determined that the Phase I MIS alignment was the preferred transit corridor for this phase of the study.

5. *UNC Area*

Six initial alternative concepts along two main corridors, Raleigh Road and US 15-501/Fordham Boulevard, were developed in preparation for the UNC Station Area Planning Workshops in November 2000. Three concepts with alignments along Raleigh Road were considered, but rejected by the workshop attendees due to 1) the orientation of the UNC station location for future rail expansion, 2) poor circulation at the station due to vehicular congestion at the hospital, and 3) the alternative corridor alignment along Fordham Boulevard better served the expanding south end of campus. The remaining four alternative concepts were combined into the three UNC area station concepts and are depicted in Appendix C. Consensus was reached at the workshop that, in the future, if bus “diamond lanes” were implemented on Manning Drive, and general use lanes were restricted to two lanes, traffic relief must occur by the proposed southern access road (as per UNC master plan).

A qualitative comparison analysis was also performed to determine the optimum busway/mixed traffic (BMT) corridor on the UNC campus. This analysis assumed no capital improvements on Manning Drive (i.e., operating within the existing 5-lane roadway section) and assumes that Mason Farm Road at Fordham Boulevard access will be available for traffic relief. Due to better operating speed and less potential for

pedestrian conflicts (due to the shorter length of roadway segment), the Manning Drive alignment was selected as the preferred corridor for BMT.

G. Description of Alternative Concepts

This section describes the No-Build and Build Alternatives to be evaluated in more detail. For clarity, the Build Alternatives are also presented graphically in Exhibits VI-V through VI-IX. All rail and exclusive busway Build Alternatives follow the same refined Phase I Corridor “A” alignment south of Cameron Boulevard and north of Manning Drive. The only variation in alignments of the alternative concepts occurs in the Duke University and UNC areas.

1. No-Build Alternative

The No-Build Alternative will be the basis of comparison for other alternatives in the Phase II MIS. Although it will be unlikely that the No Build will compare favorably against the build alternatives in terms of mobility and operating deficiencies, it will benefit in comparison by having no capital costs or right of way impacts. The 2025 “background” highway network provided by the Durham-Chapel Hill-Carrboro Metropolitan Planning Department was developed using the existing plus committed (full funded) bus service. This includes TTA’s Phase I Regional Rail System, extending from North Raleigh to Downtown Durham and the feeder bus system associated with TTA’s Phase I Rail.

2. DMU Alternative

Phase II MIS’s only Diesel Multiple Unit Alternative, DMU Alternative No. 1, is the extension of TTA’s Phase I system from the 9th Street Station to UNC using Federal Rail Administration (FRA) compliant vehicles capable of operating in a railroad environment. This extension would follow a “Western” alignment adjacent to the North Carolina Railroad corridor along the refined Phase I MIS Corridor “A” alignment adjacent to US 15-501, ultimately entering UNC with a southern alignment consistent with the UNC Masterplan. The right of way of the DMU corridor varies from 40 feet (adjacent to existing roads) to 65 feet on new alignment. DMU Alternative 1A assumes headways consistent with the TTA’s Phase I DEIS (15 minutes peak / 30 minutes off-peak). For comparison with other rail and busway alternatives with lesser headways, a DMU Alternative 1B was also considered for 7.5 minute / 15 minutes off-peak headways.

Stations for DMU Alternative No. 1 were assumed at the following locations:

- 9th Street Station, consistent with TTA’s Phase I DEIS conceptual plans;
- Hillsborough Road Station with a park and ride facility and a shuttle transit connection to Duke University;

- An at-grade walking station at Cameron Boulevard;
- Elevated station and park an ride facilities at South Square Mall;
- At-grade station locations with parking at Mt. Moriah Road, the future Gateway Development, Ephesus Church Road and Friday Center;
- Walking station at the Smith Center (special events only); and
- Walking Station at UNC Hospitals.

3. “Lighter Rail” Technology Alternatives

Three alternative concepts for electric or diesel light rail or “lighter” DMU were evaluated in this phase of the MIS study. “Lighter Rail” Technology (LRT) Alternative 1 assumes a technology transfer between TTA’s Phase I and the Phase II MIS technology to occur at the 9th Street Station for Chapel Hill to Durham riders. This alternative also assumes an exclusive TTA Phase I DMU connection to Duke Medical Station using the existing coal spur right of way. LRT Alternative No. 1 alignment continues down Erwin Road, where transit is located at-grade within the median of Erwin Road to an exclusive guideway segment leading to the refined Phase I MIS Corridor “A” alignment adjacent to US 15-501 and ultimately to the UNC Hospitals using the southern alignment consistent with the UNC Masterplan. Headways were assumed to be 7.5 minutes peak / 15 minutes off-peak with stations assumed to be at the following locations:

- 9th Street Station consistent with TTA’s Phase I DEIS conceptual plans;
- At-grade walking stations at Duke Medical Center, Morreene Road, Pickett Road;
- Elevated station and park and ride facilities at South Square Mall;
- At-grade walking station at University Road;
- At-grade stations with parking at Mount Moriah, future Gateway development, and Ephesus Church and Friday Center;
- At-grade walking station at Meadowmont and UNC Hospitals; and
- Walking station at the Smith Center for special events only.

LRT Alternative 2 is identical to LRT Alternative No. 1 with the exclusion of the TTA Phase I Coal Spur Station. It was intended to use this alternative as a baseline for a future TTA technology in which allows for a “lighter” DMU vehicle with the same vehicle size and operating performance of the current “lighter rail” technology.

LRT Alternative 3 assumes the identical corridor alignment of the DMU Alternative No. 1 with a technology transfer between TTA Phase I and the Phase II MIS to occur at the Hillsborough Station. Headways are assumed to be 7.5 minutes peak / 15 minutes off-peak with the following station locations:

- 9th Street Station, consistent with TTA’s Phase I DEIS conceptual plans;
- Hillsborough Road Station with a park and ride facility and a shuttle transit connection to Duke University;
- An at-grade walking station at Cameron Boulevard and Pickett Road;

- Elevated station and park an ride facilities at South Square Mall;
- At-grade walking station at University Road;
- At-grade station locations with parking at Garrett Road, Mt. Moriah Road, the future Gateway Development, Ephesus Church Road and Friday Center;
- Walking stations at Meadowmont and the Smith Center (special events only); and
- Walking Station at UNC Hospitals.

4. Exclusive Busway Alternatives

Four alternative concepts for exclusive busway (busses with their own dedicated guideway) were evaluated in this phase of the MIS study. Bus Alternative Nos. 1 & 3 are identical in alignment and station locations to LRT Alternative Nos. 1 & 3, respectively.

Bus Alternative 2 assumes a technology transfer at the 9th Street Station; busses access an at-grade exclusive transit corridor within the median of Erwin Road to connection of exclusive guideway south of Cameron Boulevard the refined Phase I MIS Corridor “A”, and ultimately entering the UNC campus using “diamond lanes” (i.e., exclusive outside dedicated lanes to busses) on Manning Drive. Bus Alternative 2 assumes a grade-separated flyover for the busses accessing the exclusive busway from Manning Drive to northbound US 15-501 / Fordham Boulevard. Southbound busses exiting the busway to Manning Drive (opposing flyover movement) benefit only from signal pre-emption at the intersection of Manning Drive and Fordham Boulevard. Station location assumption for Bus Alternative 2 is the same as of LRT Alternative 2.

Bus Alternative 4 is similar to Bus Alternative 3, following the “Western” alignment in the Duke area. However, it shares the same “diamond lane” / BMT concept for Manning Drive as Bus Alternative 2. Station location assumptions are the same as for Bus Alternative 3. All Bus Alternatives assume signal pre-emption for cross traffic.

5. Busway / Mixed Traffic Alternatives

A Busway / Mixed Traffic (BMT) workshop was held in June 2001 with members of the Technical Committee to solicit input in developing the BMT alternatives. Workshop attendees made the following assumptions:

- The Busway / Mixed Traffic (BMT) alternatives were developed by developing lower cost alternatives to segments of the exclusive busway alignments with high right-of-way or capital cost in an effort to construct a future exclusive busway alternative in phases;
- The BMT corridors were to have as direct of a connection from origin to destination as possible;
- The BMT alternatives were intended to service the same stations as the exclusive busway alternatives;

- The V/C ratios (traffic volume per road capacity) from the 2025 No Build road network would be used in identifying less congested potential BMT corridors; and
 - The TSM network was assumed to be the alternative, which represents bus in mixed traffic alternative (no segments of exclusive busway) from Durham to Chapel Hill.
- The two busway / mixed traffic (BMT) alternatives developed during Phase II described in the following section and are presented graphically in Exhibit VI-IX.

Busway / Mixed Traffic (BMT) Alternative 1 has fewer segments of exclusive busway than the other BMT alternative, and therefore has less right of way and capital costs associated with it. BMT Alternative 1 assumes:

- Transfer to busses from TTA Phase I rail system will occur at the 9th Street Station;
- Busses travel along Erwin Road mixed in general use lanes of traffic; signal pre-emption occurs at Anderson Street, Trent Drive / Hospital Drive, Fulton Street, Douglas Street / Research Drive, LaSalle St, Morreene Road / Towerview Road, and Cameron Boulevard;
- 4-lane section on Cameron Boulevard, busses mixed in general use lanes of traffic, and signal pre-emption at Duke University Road;
- 2-lane section on Academy Road, busses mixed in general use lanes, with signal pre-emption at Woodburn Road, Cornwallis Road, Pickett Road, US 15-501 bypass / Chapel Hill Road;
- 4-lane section with median turning lane on University Road, busses mixed in general use lanes, signal pre-emption at Chapel Hill Road, Shannon Road / Cosmos Street, Westgate Drive, Martin Luther King Boulevard and Larchmont Drive. A new signal will be required at Snowcrest Trail;
- A 4-lane section with proposed designated bus lanes between Garrett Road and Watkins Road / Farrington Road. This alternative will have some capital costs associated with proposed widening (2 lanes); signal pre-emption at Garrett Road and Watkins Road;
- 4-lane section on Farrington Road with busses mixed in general use lanes;
- 4-lane section on SW Durham Drive with proposed outside designated bus lanes between I-40 and Ephesus Church Road; 2-lane section with busses mixed in general use traffic between Ephesus Church Road and connection to Meadowmont Lane. Signal pre-emption at Ephesus Church Road will require new signal;
- Transit to share general use lanes of 4-lane Meadowmont Lane; signal pre-emption at NC 54 before entering exclusive busway segment at Friday Center;
- Transit leaves exclusive busway segment at Fordham Boulevard and enters Manning Drive as a 4-lane section with median turning lane and designated bus lanes for transit and hospital vehicles; signal pre-emption is assumed at Fordham Boulevard. This alternative also assumes the Manning Drive flyover for northbound movement only.

Station locations are assumed at 9th Street Station (transfer), Duke Medical Center, Morreene Road, Pickett Road, South Square, University Drive at MLK Parkway, Garrett Road, Farrington Road, Ephesus Church Road, Meadowmont, Friday Center, Smith Center (special events only) and UNC hospitals. A time penalty is associated

with the BMT segment on Farrington Road due to 2025 No-Build projected congestion (V/C >1.32). Roads with V/C ratios greater than 1.0 indicate that the volume of traffic exceeds the capacity of the road. This study also assumed that the capital and right of way costs for constructing designated bus lanes on SW Durham Drive between I-40 and Ephesus Church would be associated the proposed I-40 interchange.

BMT Alternative No. 2 has more segments of fixed guideway, and higher right of way and construction costs. BMT Alternative No. 2 assumes:

- Transfer to busses from TTA Phase I rail system will occur at the 9th Street Station;
- Busses travel along Erwin Road in proposed 7-lane section with two designated outside bus lanes and median turning lane; signal pre-emption assumed at Anderson Street, Trent Drive / Hospital Drive, Fulton Street, Douglas Street / Research Drive, LaSalle Street, Morreeene Drive / Towerview Road, and Cameron Boulevard;
- 4-lane section of busses mixed in general use lanes on Cameron Boulevard; signal pre-emption at US 15-501;
- 4-lane urban freeway of busses mixed in general use lanes of US 15-501 between Cameron Boulevard and Cornwallis Road;
- 2-lane section on Cornwallis Road; busses mixed in general use lanes until entering exclusive busway segment east of US 15-501/Cornwallis Road interchange; pre-emption and new signal assumed at entrance to busway;
- Busses exit exclusive busway on south side of South Square Mall; busses mixed in general use lanes on 4-lane section of University Road. Signal pre-emption is assumed at Shannon Road / Cosmos Street, Westgate Drive, Martin Luther King Boulevard, and Larchmont Drive. A new signal is required where busses enter/exit busway segment just west of Snowcrest Trail;
- Busses exit guideway at I-40 and SW Durham Drive. The remaining southern alignment to UNC (and assumptions) are identical to BMT Alternative 1.

BMT Alternative 2 assumes a time penalty associated with the mixed traffic segment on US 15-501 between Cameron Boulevard and Cornwallis Road (V/C = 1.07). Station locations are assumed at 9th Street Station (transfer), Duke Medical Center, Morreeene Road, Pickett Road, South Square, University Drive at MLK Parkway, Garrett Road, Mt. Moriah Rd., Gateway, Ephesus Church Road, Meadowmont, Friday Center, Smith Center (special events only) and UNC hospitals.

H. Bus and Rail Operating Plans

This section describes the development of bus and rail operating plans for each of the alternatives being considered in the Durham to Chapel Hill / US 15/501 corridor. Section 1 describes the operating plans for rail alternatives; including the extension of TTA's Phase I Regional Rail system (DMU Alternative 1), and three "Lighter Rail" (LRT) alternatives. The operating plans also include proposed changes to bus service to feed the new rail lines. Section 2 describes the operating plans for the bus-based alternatives, including four exclusive busway alternatives and two busway / mixed traffic (BMT) alternatives. The following descriptions cover the most important features of the plans. Detailed listings of individual bus and rail route changes have been prepared for each operator for each alternative for use in network coding. In the interest of space the lists are not included here, but are available on request.

The No-Build and TSM Alternatives have been provided by Durham-Chapel Hill –Carrboro Metropolitan Planning Organization (DCHC MPO). Both alternatives include significant expansion of bus service by all of the transit operators in the study corridor: Durham Area Transit Authority (DATA), Chapel Hill Transit (CHT), Triangle Transit Authority (TTA), and Duke University. Both TSM and No-Build alternatives include Phase I of TTA's Regional Rail System. TTA's Phase I system will use self-propelled diesel trains (DMUs) operating on separate tracks along existing railroad rights-of-way. The initial assumption concerning service levels is that peak service will have 15-minute headways, and offpeak service will operate every 30 minutes.

1. Rail Alternatives

The operating plans for the rail alternatives include several elements: estimation of station-to-station run times; development of rail service levels; and modifications to bus service to feed the rail system and reduce overlapping service.

Rail run times for Alternative 1 (DMU) were prepared using train performance data supplied by TTA. Rail run times for the three LRT alternatives were prepared by Manuel Padron and Associates (MPA), using a run time model developed by MPA based on observed run times for electric light rail vehicles on the Blue Line in Los Angeles. The light rail acceleration and deceleration are generally faster than the DMU. However, the DMU alternative has fewer stations, which saves times compared to LRT. (Run times and station quantities cited below do not include a proposed event-only station at Smith Center.)

The four rail build alternatives are as follows:

- DMU Alternative 1 includes a 13.9-mile extension of the TTA regional rail system from Hillsborough Road Station to UNC Hospitals Station in Chapel Hill; in the Duke area the line follows the western alignment along the NC 147/ Durham Freeway and US 15/501. There would be seven new stations. The travel time from Hillsborough Road to UNC Hospitals would be 27.5 minutes.

- LRT Alternative 1 assumes the regional rail system would end at Duke Medical Center at TTA's Phase I Coal Spur Station. Light rail transit would operate from the 9th Street regional rail station to Chapel Hill, following the Erwin Road alignment in the Duke area. The light rail line would be 14.1 miles long with 13 stations; the run time would be 30.3 minutes.
- LRT Alternative 2 would be similar, except the regional rail system would end at TTA's Phase I 9th Street Station.
- LRT Alternative 3 would have light rail from Hillsborough Road Station to Chapel Hill (via "Western" alignment, as in DMU Alternative 1); the regional rail system would end at Hillsborough Road Station. The light rail line would be 13.9 miles long with 12 stations; the run time would be 28.7 minutes.

Changes in bus service are proposed for each of the transit operators in the corridor. The changes are designed to connect bus routes with the rail system at convenient locations. The changes would also eliminate or reroute service that currently runs parallel to the rail line. The changes are intended to improve mobility and travel time. Some of the changes will require some passengers to make a transfer that they do not currently make, and this could increase travel time for a few passengers. However, such changes are only recommended if it is felt that a majority of the users of the route would benefit from the proposed change, or if there are significant potential cost savings.

The proposed bus changes are summarized below for each operator. Table VI-III provides a listing of all the stations along the rail alignments, with the bus routes that are proposed connect to each station. Figure 1, located in Appendix E, is a schematic map of the feeder bus service in the corridor. The map is for LRT Alternative 2; however, the feeder system for the other rail alternatives is very similar.

a) TTA

TTA currently operates route 401 connecting RTP, Chapel Hill, and Durham. The portion between Chapel Hill and Durham generally parallels the proposed rail service. Therefore it would be eliminated in all of the rail alternatives. Several CHT and DATA routes would be extended to cover some of the street segments that are currently served only by route 401, and to create connecting points between CHT and DATA service.

Several proposed new TTA routes would be rerouted slightly to connect with a nearby rail station. A proposed TSM route between UNC and Duke would be eliminated, since the rail line would serve it.

b) DATA

Seven DATA routes would be extended or rerouted to connect with rail stations. Two routes would be extended southwest to the Gateway Station, which would be a major transfer point between DATA, CHT, and TTA bus routes. Southpoint

Mall is connected to the rail line by a route feeding the Garrett Road Station (South Square Station in DMU Alternative 1). Other routes would connect to the following stations: University Road, South Square, Pickett Road, Morreene Road / Cameron Boulevard, and Duke Medical Center.

c) CHT

Nine CHT routes would be extended or rerouted to connect with rail stations. Two routes extend northwest to the Gateway Station, which would be a major transfer point between DATA, CHT, and TTA bus routes. Other routes connect to the following stations: Mt. Moriah, Gateway, Ephesus Church, Meadowmont, and Friday Center. Since most of the CHT routes serve the UNC campus and hospital area, they would connect with the UNC Hospitals Station. Several routes which run parallel to the rail line or to other feeder routes were eliminated.

d) Duke University

Several of Duke's shuttle routes were rerouted or extended to connect with one of the rail stations. A route serving the campus connects to the Morreene or Cameron Station; a route serving the Medical Center connects to the Hillsborough Road Station in DMU Alternative 1 and LRT Alternative 3.

Table VI-III. 2025 Feeder Busses at Stations

Station Location	Routes	Peak Headways (min.)	Off-Peak Headways (min.)	Terminate at Station
Duke Medical Center	Duke Univ. & Hospitals	15	30	Through
Hillsborough Rd.	Hillsborough Rd.	15	30	Through
	Medical Center Shuttles	various	various	Through/Term
	Hillsborough – Duke	30	60	Through
Morreene or Cameron	Duke Univ. & Hospitals	15	30	Through
	East-West Shuttles	10	10	Through
Pickett Road	Square-Southpoint	15	30	Through
South Square	Fayetteville Street	15	30	Through
	Chapel Hill Rd., University Rd	15	30	Through
	University Dr. – RTP	15	30	Term
	Durham Crosstown	15	30	Term
University Road	Fayetteville St.	15	30	Through
	University Dr. – RTP	15	30	Through
	Durham Crosstown	15	30	Through
Garrett Road	Square – Southpoint	15	30	Through
Mt. Moriah	Laurel Hill/Ephesus - S. Columbia	15	30	Through
Gateway	Fayetteville St.	15	30	Term
	Chapel Hill Rd., University Rd.	15	30	Term
	Franklin St, Legion Rd.	15	30	Term
	Franklin St, Sage Rd, Eastowne	30	60	Term
	15/501 – 54, Pope Rd.	15	30	Term
	Chapel Hill – RTP	30	x	Through
Ephesus Church	Forest Park Circulator	15	30	Term
	Hampton	15	30	Term
	Laurel Hill/Ephesus - S. Columbia	15	30	Through
	15/501 - 54, Pope Rd.	15	30	Through
Meadowmont	Laurel Hill/Ephesus - S. Ccolumbia	15	30	Through
Friday Center	NC 54 P/R lot	15	20	Through
	Farton/Barbee Chapel Loop	15	30	Term
	15/501 - 54, Pope Rd.	15	30	Term
UNC Hospitals	RTP-Chapel Hill	15	30	Through
	Hillsborough-Chapel Hill	60	60	Term

2. Exclusive Busway Alternatives

The busway alternatives include exclusive guideway along the same general alignment as the rail alternatives, with relatively minor alignment variations. At the

Duke end of the corridor, Busway Alternatives 1 and 2 follow the Erwin Road alignment, while Busway Alternatives 3 and 4 follow the “Western” alignment (NC 147 / Durham Freeway and US 15/501 corridors). At the Chapel Hill end, Alternatives 1 and 3 have exclusive busway all the way to UNC Hospitals, while Alternatives 2 and 4 use “diamond lanes” (lanes reserved for exclusive use of busses and emergency vehicles) along Manning Drive. The busways have stations in the same locations as the corresponding rail alternatives. The end-to-end running times for the all-busway alternatives are very similar to the times for the corresponding rail alignments; Alternative 1 would take 30.8 minutes, while Alternative 3 would take 29.2 minutes.

The same basic operating plan is assumed for all four busway alternatives. There would be five regional bus routes (assumed to part of the TTA system) that would operate along significant portions of the busway. However, they would not all run end-to-end; some would enter or exit at intermediate stations so they can provide no-transfer service to major destinations or potential concentrations of riders. In addition to the regional routes, three CHT routes would use the busway between Friday Center and UNC in order to improve travel time. In addition to the routes which use the busway itself, other CHT and DATA routes would be rerouted to feed busway stations, very similar to the feeder bus plan for the rail alternatives. The busway operating plan is shown in Figure 2 located in Appendix E. The plan for Busway Alternative 1 is shown; however, the basic plan is very similar for all four alternatives.

The five regional routes using the busway are as follows:

a) *UNC – Durham*

Busses would start in a loop of the UNC campus and then operate the full length of busway to a junction with the regional rail system (Hillsborough Road or 9th Street Station)

b) *UNC – Duke*

Same as Busway Alternative 1 to vicinity of Duke, where busses would exit busway and make loop of campus and hospital area.

c) *Carrboro – Chapel Hill – Durham*

Starting in Carrboro, busses would operate through downtown Chapel Hill, to US-15-501 via Franklin Street, and then enter the busway at Gateway Station, and continue on busway to terminus at regional rail system.

d) North Chapel Hill – Durham

Route would start at Eubanks Park and Ride (P/R) then follows Weaver Dairy and 15/501 to Gateway Station, then via busway to TTA Phase I Regional Rail Station.

e) UNC – downtown Durham

Route would start in loop of UNC campus, then follow busway to South Square Station, and then continue via Durham-Chapel Hill Blvd. and University Drive to downtown Durham.

Each of the five routes would operate every 15-30 minutes during peak period, and the combined headway of all of the routes along the busway would range from 3 to 6 minutes, depending on the segment.

3. Busway / Mixed Traffic Alternatives

The operating plans for the two BMT alternatives are somewhat similar to the busway operating plans.

- BMT Alternative 2, which uses busway for most of the alignment, has the same operating plan as the busway, except that speeds would be somewhat slower in the mixed traffic segments.
- BMT Alternative 1 has greater lengths of mixed traffic operations, which will further reduce the speed of busses. In addition, the absence of the central busway segment (Gateway to South Square) means that busway routes 3 and 4 would not enter the BMT alignment until South Square instead of Gateway. In addition, the absence or shifting of several of the busway stations requires adjustments in some of the feeder route connections.

I. Non TTA Phase I Rail Technology Maintenance and Storage Facility

The function of a maintenance and storage facility is to provide a storage area for transit vehicles when they are not in service and to serve as a location to maintain and service the vehicles. Included in the requirements of such a facility are:

- A secure storage location for revenue transit vehicles and support vehicles;
- A location to clean the interior of the vehicles and wash the exterior;
- Inspection and service building;
- Material storage;
- Fueling facility;
- Employee welfare functions (lunch rooms, locker rooms etc.); and
- Administration offices.

The vehicles for the BMT and Busway technologies are expected to be rubber tire, combustion engine busses that are substantially similar to the busses currently in use by transit agencies in the Triangle region. It may be possible to service and maintain the BMT and Busway vehicles using maintenance practices and equipment that is presently in use at existing facilities.

For both the BMT and Busway alternatives, the assumption is that the vehicles would be stored and maintained at an existing facility. This may be one facility (such as a TTA bus facility) or a combination of several (TTA, DATA, CHT, etc.). This study assumes that the existing facilities could accommodate the additional busses.

An extension of the TTA's Phase I rail technology would enable the vehicles to be stored and maintained at the facility selected by TTA for Phase I. The Phase I DEIS has identified potential locations as Wrenn Road and Ellis Road in Durham County and Morrisville in Wake County. Depending upon the design of the Phase I maintenance and storage facility (number of storage tracks and capacity) and the number of vehicles operated in Phase I, it may be necessary to expand the storage capacity at that site and to increase the capacity of the facility to service and maintain vehicles.

The use of light rail technology would most likely require a new storage and maintenance facility along the new right-of-way between Durham and Chapel Hill. The land use in this area is primarily residential and commercial. The proposed location for a storage and maintenance facility is along the rail line to the north of Pickett Road, which is the only sizeable location along the right-of-way that is industrial. This is identified as a potential location for this facility. However, no detailed analysis was performed to determine the configuration and capacity of the facility. No investigation was performed to determine if the current uses of that site could be relocated.