

APPENDIX B

SELECTION OF PREFERRED ALTERNATIVE ALIGNMENT

This Appendix describes the selection of alternatives for analysis in the SDEIS and the FEIS for the Norfolk Light Rail Transit (LRT) project. This Appendix represents a historical representation of the Norfolk LRT Project. As such, it documents the original alignments, stations and vehicle storage and maintenance facility sites, and describes the process through which HRT has developed the Preferred Alternative.

Section 1.0 includes the project history and background including the selection of Light Rail Transit as the recommended technology for the east-west corridor parallel to I-264. Section 2.0 describes the alignment options specific to the Norfolk LRT project, presented for public comment during the Scoping period, and lists the additional alignment options that were suggested during Scoping (as of November 2000). Section 3.0 describes the two-step screening process of the alignment options (April 2001). Section 4.0 discusses the combination of alignment options and selection of the LRT Build Alternative that was the subject of detailed analysis in the Supplemental Draft Environmental Impact Statement (October 2001). Section 5.0 documents the analysis of additional east end options identified to improve the project's cost effectiveness and reduce potential project impacts (June 2003). Section 6.0 lists the alternative sites identified for the Vehicle Storage and Maintenance Facility (VSMF) and provides a comparison of each alternative relative to the facility size, costs, displacements required and environmental impacts (April 2002).

B1.0 History/Background of the Norfolk LRT Project

Hampton Roads Transit (HRT) has completed several systems planning studies that examined the feasibility of providing additional transit service in several corridors throughout the greater Hampton Roads area. Specifically, the recommended transportation plan for South Hampton Roads, derived from the *Rail Systems Analysis and Fixed Guideway Plan*, 1991, was to provide substantially improved bus transit service for the short term and light rail transit (LRT) in the longer term.

As a result of the 1991 system planning studies, the *Norfolk-Virginia Beach Corridor Major Investment Study (MIS)*, June 1996, was conducted by Tidewater Regional Transit, the predecessor agency of HRT, to evaluate transit and transportation improvements in a 30-mile corridor extending from Virginia Beach to downtown Norfolk and Naval Station Norfolk. The MIS utilized and built upon results of past planning efforts in evaluating the feasibility of implementing various transportation alternatives and documented the selection of a Locally Preferred Alternative (LPA). The Locally Preferred Alternative, selected by HRT in May 1996, consisted of an 18-mile light rail transit system between downtown Norfolk and Virginia Beach. In May 1999, a Draft Environmental Impact Statement for the 18-mile Norfolk-Virginia Beach Light Rail Transit System East/West Corridor Project was published. This document analyzed an 18-mile LRT Build Alternative between downtown Norfolk and the Virginia Beach Pavilion Convention Center, generally following the Norfolk Southern Railroad right-of-way. The Build Alternative included a proposal for 13 stations, five of which were to be located within the City of Norfolk, an expanded bus feeder system, and a vehicle storage and maintenance facility located in Virginia Beach. Two public hearings were conducted in June 1999 to give members of the public the opportunity to comment on the document. The Final Environmental Impact Statement for the Norfolk-Virginia Beach Light Rail Transit System East/West Corridor Project was published in March 2000.

In response to a non-binding advisory referendum held in Virginia Beach in the fall of 1999, the City of Virginia Beach chose not to continue to participate in the development of the Norfolk-Virginia Beach LRT project within their city boundaries. As a result of the Virginia Beach decision to withdraw from the development of LRT, HRT was asked by the City of Norfolk to continue to consider the feasibility of the Norfolk portion of the Locally Preferred Alternative. In February 2000, the Transportation District Commission of Hampton Roads (TDCHR) endorsed HRT's request to proceed with the preparation of a Supplemental Draft Environmental Impact Statement (SDEIS).

The Supplemental DEIS (SDEIS), published in December 2002, evaluated an 8-mile LRT system that ran from the western terminus near Eastern Virginia Medical Center through Downtown Norfolk to an eastern terminus on Kempsville Road just north of I-264. The alignment proposed in this FEIS is a modification of the original alignment that was documented in the SDEIS. Upon completion of the Supplemental DEIS, refinements of the LRT alignment were needed to strengthen the project's cost effectiveness. The most significant revision to the alignment is the shortening of the track from the previous end-point at the Barry Robinson Center to the current end-point at Newtown Road and Kempsville Road. This revision would reduce the length of the LRT track by 0.6 miles while having no impact on ridership, reduce project costs and eliminate impacts to the Barry Robinson Center, a historic resource that provides adolescent mental health services to the region.

As a result, this FEIS documents the costs, benefits, and impacts associated with the 7.4-mile LRT system that lies entirely within the jurisdictional boundaries of the City of Norfolk.

B2.0 Scoping Alignment Options (November 2000)

As a result of the TDCHR endorsement to proceed with a "Norfolk only" project, HRT initiated the planning process for the Norfolk LRT Supplemental Draft Environmental Impact Statement (SDEIS) with a 30-day Scoping period between November 2, 2000 and December 1, 2000 in which comments from the public, stakeholders and agencies were solicited regarding the scope of the SDEIS and the alignment alternatives to be analyzed. The following describes the alignments and options presented at the SDEIS Scoping meetings and those suggested during the SDEIS Scoping process.

B2.1 Alternatives and Alignment Options Presented at Scoping

Three alternatives were identified for examination in the SDEIS: the No-Build Alternative, the Transportation Systems Management (TSM) Alternative and the Norfolk LRT Build Alternative.

The No-Build Alternative includes all highway and transit facilities and services of the existing transportation system plus highway and transit improvements from the Hampton Roads Planning District Commission's Transportation Improvement Program.

The Transportation System Management (TSM) Alternative represents a lower capital cost approach to transit services and facilities in the Norfolk LRT corridor. The TSM Alternative is included in the SDEIS to provide the baseline against which the cost effectiveness analysis of the Build Alternative can be evaluated. It assumes the implementation of the highway and transit improvements associated with the No-Build Alternative, including planned long-range transit service and capital improvements.

The Build Alternative would be the LRT alignment identified in the City of Norfolk section of the Norfolk-Virginia Beach Environmental Impact Statement with end-of-line options on the west and east ends, and in downtown Norfolk. The Norfolk LRT Project would provide an LRT system within the City of Norfolk utilizing the 5.8-mile alignment and stations as proposed in the Norfolk-Virginia Beach Environmental Impact Statement, with extensions on the west and east to provide logical termini and an operable segment with independent utility. The Build Alternative would include a separate investigation of vehicle storage and maintenance facility (VSMF) location options (the original project had the VSMF sited within Virginia Beach), a restructured feeder bus network to facilitate passenger transfers between bus, ferry and LRT, along with other elements of the No-Build and TSM Alternatives.

The approximately 8-mile LRT project and alignment options, shown on Figure B-1, would be comprised of a combination of railroad joint-use right-of-way and shared street/dedicated LRT right-of-way.

The proposed alignment would follow the Norfolk Southern freight railroad right-of-way paralleling I-264 from the area of Newtown Road to west of Norfolk State University (NSU). West of NSU, the LRT alignment would leave the freight right-of-way, pass by Harbor Park Stadium and enter downtown Norfolk via Main Street and Plume Street.

The majority of the LRT alignment, from Plume Street to Military Highway, would be the same as originally proposed. However, additional station locations may be considered in the SDEIS. All alignment options west of Plume Street would extend along the south side of Brambleton Avenue, cross Smith Creek, and continue to the vicinity of the Eastern Virginia Medical Center complex. Alignment options east of Military Highway would extend to the east towards Newtown Road, remaining within the Norfolk city limits. The central LRT alignment, common to all alignment options, is described below.

B2.1.1 Central Alignment

As stated above, the central alignment that is common to all alignment options is the City of Norfolk section of the Norfolk-Virginia Beach Environmental Impact Statement. The alignment would begin on Plume Street, in the vicinity of Bank Street, and proceed in an easterly direction across Court Street and St. Paul's Boulevard, to the Government Center Station located in the plaza between City Hall, the Circuit Courts and the Civic Center/Jail. From the Government Center Station, the alignment would proceed in

an easterly direction along Main Street, under Route 337 and I-264. After passing under I-264 eastbound, the alignment would cross Main Street and proceed east parallel to I-264 through the Harbor Park stadium parking lot to the Harbor Park Station.

From the Harbor Park Station, the alignment would continue easterly and turn to the north along Holt Street, passing under I-264. The alignment would then transition onto an elevated structure north of I-264 to pass over Norfolk-Southern Railroad's (NSRR) Lambert's Point Branch, transition back to grade, and turn to the east across Park Avenue and Brambleton Avenue. The Norfolk State University (NSU) Station would be located just east of Brambleton Avenue along the Norfolk-Southern Railroad tracks. From the NSU Station, the alignment would continue eastward, within the Norfolk Southern right-of-way, to the Military Highway Station, located just west of Military Highway.

B2.1.2 Alignment Options

HRT initiated the planning process for the Norfolk LRT Supplemental Draft Environmental Impact Statement (SDEIS) with a 30-day Scoping period between November 2, 2000 and December 1, 2000 in which comments from the public, stakeholders and agencies were solicited regarding the scope of the SDEIS and the alignment alternatives to be analyzed. The options presented at the Scoping meetings include the following;

- West End Options (Smith Creek on Brambleton Avenue to a western terminus);
- Downtown Norfolk Options (Main/Plume Street to Smith Creek on Brambleton Avenue); and
- East End Options (Military Highway to a new Eastern terminus).

The Vehicle Maintenance and Storage Facility Options are documented in Section B6.0.

A. West End Options

1. **Brambleton Avenue:** The alignment would cross Smith Creek on a new bridge parallel to the existing Brambleton Avenue bridge and end on Brambleton Avenue by the Eastern Virginia Medical Center complex.
2. **Children's Lane:** The alignment would cross Smith Creek on a new bridge parallel to the existing Brambleton Avenue bridge and run north from Brambleton Avenue onto the extension of Children's Lane and terminate by Raleigh Avenue.
3. **Woodruff Avenue:** The alignment would cross Smith Creek on a new bridge parallel to the existing Brambleton Avenue bridge and turn northward on Woodruff Avenue and terminate at Raleigh Avenue.

B. Downtown Options

4. **Monticello & Granby:** From Plume Street, two one-way tracks running along Monticello Avenue and Granby Street to Brambleton Avenue.
5. **Waterside & Boush:** From Main Street, the alignment would travel on double tracks along Waterside Drive and Boush Street, turning west onto Brambleton Avenue.

C. East End Options

6. **Military Circle Mall:** From the Norfolk Southern railroad right-of-way at Military Highway, the alignment would turn northward over I-264 and travel along the east side of Military Highway to the vicinity of Military Circle Mall in the northwest quadrant of the Mall ring road.
7. **Kempsville Road - Barry Robinson Center Terminus:** This alignment would leave the Norfolk Southern alignment just west of Newtown Road and follow Kempsville Road to the vicinity of the terminus station behind the Barry Robinson Center.
8. **Kempsville Road- 6161 Kempsville Road Terminus:** This alignment would leave the Norfolk Southern alignment just west of Newtown Road and follow Kempsville Road to a terminus station behind the office building at 6161 Kempsville Road.

B2.2 Alignment Options Developed during Scoping

The following additional alignment options were asked to be considered as a result of the two public Scoping meetings, the Steering Committee and Technical Advisory Committee meetings, the thirteen stakeholder meetings and other comments recorded during the Scoping period (February 2001). No additional West End Options were considered during Scoping.

A. Downtown Options

9. **Granby Double-Track:** From Plume Street, a two-way pair along Granby Street to Brambleton Avenue.
10. **Boush Double-Track:** From Plume Street, a two-way pair along Boush Street to Brambleton Avenue.
11. **Boush & Granby:** From Plume Street, one-way tracks along Boush and Granby streets to Brambleton Avenue.
12. **Monticello Double-Track:** From Plume Street, a two-way pair through the site of the Kirn Memorial Library on to Monticello Avenue to Brambleton Avenue.
13. **Monticello & Granby (Kirn Memorial Library):** From Plume Street, a one-way track through the site of the Kirn Memorial Library onto Monticello Avenue. The other track would turn north onto Granby Street. The two tracks would turn west onto Brambleton Avenue.
14. **Plume/Granby & Library/Monticello:** From Plume Street, a one-way track through the site of the Kirn Memorial Library onto Monticello Avenue. The other track would turn north onto Granby Street. The two tracks would turn west onto Charlotte Street, continue to Bute Street, and cut through a parking lot at Yarmouth Street onto Brambleton Avenue.
15. **Library & Monticello:** From Plume Street, a two-way pair through the site of the Kirn Memorial Library onto Monticello Avenue, turning west onto Charlotte Street. The alignment would continue onto Bute Street and cut through a parking lot at Yarmouth Street onto Brambleton Avenue.

16. **Boush - Monticello:** From Plume Street, two one-way tracks along Boush Street and Monticello Avenue to Brambleton Avenue.
17. **Library & City Hall Ave./Granby & Monticello:** From Plume Street, the alignment would travel through the site of the Kirn Memorial Library onto City Hall Avenue and split into two separate tracks. One track would cross City Hall Avenue onto Monticello Avenue to Charlotte Street. The other track would continue east on City Hall Avenue and turn onto Granby Street to Charlotte Street. The two tracks would turn west onto Charlotte Street, continue to Bute Street, and cut through a parking lot at Yarmouth Street onto Brambleton Avenue.

B. East End Options

18. **Poplar Hall Drive/Military Circle Center:** Under this option, the alignment would turn northward from the Military Highway station and elevate to cross over I-264. The alignment would continue on elevated structure, crossing onto the west side of Military Highway to a station near Poplar Hall Drive. From there, the alignment would cross back over Military Highway and then proceed northward, on elevated structure, along the east side of Military Highway to the vicinity of Military Circle Mall. This option would have two stations. One station would be located on the west side of Military Highway just south of Poplar Hall Drive. A second station would be on the east side of the Military Circle Mall, off of Glenrock Road.
19. **Poplar Hall Drive/Military Circle Center/Kempsville Road:** Under this option, the alignment would turn northward from the Military Highway station and elevate to cross over I-264. The alignment would continue on elevated structure, crossing onto the west side of Military Highway to a station near Poplar Hall Drive. From there, the alignment would cross back over Military Highway and then proceed northward, on elevated structure, along the east side of Military Highway to the west side of Military Circle Mall. The alignment would return to grade and traverse around the north side of the Mall to a station near Glenrock Road. The alignment would then travel south along Glenrock Road, across Poplar Hall Drive, and turn eastward, on elevated structure, over I-64 and end at a station in the vicinity of the Barry Robinson Center on Kempsville Road.
20. **Military Circle Center / Kempsville Road Loop:** From the Military Highway Station, a two-way pair of tracks traveling north over I-264 to the east side of Military Highway, around Military Circle Mall, and continuing eastward over I-64 (on structure) to Kempsville Road, in the vicinity of the Koger Office Park, the Barry Robinson Center and the Sentara Leigh Hospital. From there, it would turn southbound along Kempsville Road, proceed under I-264, and turn west using the Norfolk Southern rail line back to the Military Highway Station.
21. **Kempsville Road/Military Circle Center:** This alignment would leave the Norfolk/Southern alignment just west of Newtown Road and follow the west side of Kempsville Road to the vicinity of the Barry Robinson Center. From there, the alignment would turn westward and elevate to cross I-64, return to grade just south of Poplar Hall Drive, and follow Glenrock Road to the end-of-line Military Circle Center Station on the east side of Military Circle Mall.

In addition to the alignment options, the following two additional stations were requested along the central alignment to provide additional access to residential communities:

22. **Ballentine Boulevard Station:** The proposed station site would be located just west of Ballentine Boulevard, along the Norfolk Southern rail line

23. **Ingleside Station:** The proposed station site would be located just west of Ingleside Road, along the Norfolk Southern rail line.

B3.0 Screening of Alignment Options (April 2001)

The 23 alignment options that resulted from the Scoping period were evaluated through a two-step screening process in April 2001. The first phase of screening focused on compatibility with the goals and objectives of the project, constructability, and major environmental and transportation related impacts. Alignment options that were carried forward for further review from the first phase of screening were refined and then evaluated in terms of potential ridership and capital cost estimates.

B3.1 Phase One Screening Evaluation

In the first phase of screening, alignment options were analyzed for compatibility with the goals and objectives of the project, constructability, and major environmental and transportation related impacts.

Table B-1 lists all of the alignment options, which options have been set aside and for what reason, and which options will be carried forward for further review. The options carried forward are highlighted in the Table. The two additional station locations at Ballentine Boulevard and Ingleside Road were determined to be of minimal additional cost, while adding significant connectivity to the surrounding communities. As a result, the additional stations were added to the common segment and are no longer subject to screening.

**Table B-1
Phase One Screening of Alignment Options**

Location	Option #	Design Options	Status
West End Options	1	Brambleton Ave.	Carried Forward for Further Review
	2	Children's Lane	Set Aside – No available station site/parking
	3	Woodruff Avenue	Set Aside – No available station site/parking
Downtown Options	4	Monticello-Granby	Set Aside – Roadway geometrics at Monticello and Brambleton
	5	Waterside-Boush	Set Aside – Roadway geometrics, does not support economic development goals of downtown core
	9	Granby Double Track	Set Aside – Retail economic impacts
	10	Boush- Double Track	Set Aside – Roadway geometrics at Plume St. and Boush
	11	Boush & Granby	Set Aside – Roadway geometrics at Plume St. and Boush
	12	Monticello Double track	Set Aside – Roadway geometrics at Monticello and Brambleton
	13	Monticello-Granby (Kirn Memorial Library)	Set Aside – Roadway geometrics at Monticello and Brambleton

Location	Option #	Design Options	Status
Downtown Options	14	Plume/Granby & Library/Monticello	Carried Forward for Further Review
	15	Library & Monticello	Carried Forward for Further Review
	16	Boush-Monticello	Set Aside – Northbound and southbound station spacing presents passenger convenience issues
	17	Library & City Hall Ave./Granby & Monticello	Carried Forward for Further Review
East End Options	6	Military Circle Mall	Set Aside – No access to Poplar Halls Residential Community
	7	Kempsville Road at Barry Robinson Center	Carried Forward for Further Review
	8	Kempsville Road, 6161 Kempsville Road Terminus	Set Aside – Station would permanently displace all available parking on east side of office building
	18	Military Circle Mall – Kempsville Road Loop	Set Aside – Operational difficulties
	19	Poplar Hall Drive/Military Circle Center	Carried Forward for Further Review
	20	Poplar Halls Drive/Military Circle Center/Kempsville Road:	Carried Forward for Further Review
	21	Kempsville Road/Military Circle Center	Carried Forward for Further Review
Station Options	22	Ballentine Blvd. Station	Carried Forward for Further Review
	23	Ingleside Station	Carried Forward for Further Review

Source: URS Corp., Inc. July 2003

B3.2 Phase Two Screening Evaluation

The alignment options that were carried forward from the first phase of screening were refined to identify specific roadway geometries and station locations. These options are described below. Following the description of the alignment options that resulted from Phase One screening, the options are further evaluated based on potential ridership and capital cost estimates.

B3.2.1 Description of Options Carried Forward from Phase One to Phase Two Screening

A. West End Option (Figure B-2)

1. **Brambleton Avenue:** From Smith Creek, the alignment would continue along the south side of Brambleton Avenue to the vicinity of the Eastern Virginia Medical Center complex. A station would be located by the pedestrian bridge on the south side of Brambleton Avenue.

B. Downtown Options (Figure B-3)

1. **Library & Monticello:** The alignment would begin on Plume Street in downtown Norfolk, cut through the site of the Kirn Memorial Library, across City Hall Avenue, and onto Monticello Avenue. The alignment would then travel north up Monticello Avenue on two parallel tracks, turn west onto

Charlotte Street to Bute Street to Yarmouth Street. From Yarmouth and Bute Streets, the alignment would cut across a parking lot to the south side of Brambleton Avenue, and continue along Brambleton Avenue, across Smith Creek, to a termini station in the vicinity of the Eastern Virginia Medical Center complex. Three stations would be located at the site of the Kirn Memorial Library, Monticello Avenue at Freemason Street, and on Brambleton Avenue, between Dunmore and Botetourt Streets. (Figure B-3, Option 1)

2. **Plume/Granby & Library/Monticello:** This Option would begin on Plume Street, in downtown Norfolk, and would split into two separate tracks. One would cut through the site of the Kirn Memorial Library, across City Hall Avenue, and onto Monticello Avenue. The other track would turn northward on Granby Street. The two tracks would continue northward and turn west onto Charlotte Street. The two tracks would converge into a double-track alignment and follow Charlotte Street to Bute Street to Yarmouth Street. From Yarmouth and Bute Streets, the alignment would cut across a parking lot to the south side of Brambleton Avenue, and continue along Brambleton Avenue, across Smith Creek, to a termini station in the vicinity of Eastern Virginia Medical Center complex.

This option would include three stations. One set of one-way track stations would be located at the Kirn Memorial Library site (Monticello one-way track) and on Plume Street in front of the Monticello Arcade (Granby one-way track). The second set of one-way track stations would be located between Monticello Avenue and Freemason Street (Monticello one-way track), Granby Street and Freemason Street (Granby one-way track). The third station would be located on Brambleton Avenue, between Dunmore and Botetourt Streets. (Figure B-3, Option 2)

3. **Library & City Hall Ave./Granby & Monticello (Four Stations):** The alignment would begin on Plume Street in downtown Norfolk, cut through the site of the Kirn Memorial Library to City Hall Avenue, and would split into two separate tracks. One track would cross City Hall Avenue onto Monticello Avenue. The other track would continue east on City Hall Avenue and turn onto Granby Street. The two tracks would continue northward and turn west onto Charlotte Street. The two tracks would converge into a double-track alignment and follow Charlotte Street to Bute Street to Yarmouth Street. From Yarmouth and Bute Streets, the alignment would cut across a parking lot to the south side of Brambleton Avenue, and continue along Brambleton Avenue, across Smith Creek, to a termini station in the vicinity of Eastern Virginia Medical Center complex.

The four-station option would include a station on Plume Street, in front of the MacArthur Memorial, two sets of stations on Granby Street and Monticello Avenue, just north of City Hall Avenue and at Freemason Street; and one station on Brambleton Avenue, between Dunmore and Botetourt Streets. (Figure B-3, Option 3)

- 3a. **Library & City Hall Ave./Granby & Monticello (Three Stations)** The three-station option would have one station on the site of the Kirn Memorial Library, one set of stations on Granby Street and Monticello Avenue at Freemason Street, and one station on Brambleton Avenue, between Dunmore and Botetourt Streets. (Figure B-3, Option 3a)

C. East End Options (Figure B-4)

1. **Poplar Halls Drive/Military Circle Center:** Under this option, the alignment would turn northward from the Military Highway station and elevate to cross I-264. The alignment would continue on elevated structure, crossing onto the west side of Military Highway to a station near Poplar Halls Drive. From there, the alignment would cross back over Military Highway and then proceed northward, on elevated structure, along the east side of Military Highway to the vicinity of Military Circle Mall. This option would have two stations. One station would be located on the west side of

Military Highway just south of Poplar Halls Drive. A second station would be on the east side of the Military Circle Mall, off of Glenrock Road. (Figure B-4, Option 1)

2. **Poplar Halls Drive/Military Circle Center/Kempsville Road:** Under this option, the alignment would turn northward from the Military Highway station and elevate to cross I-264. The alignment would continue on elevated structure, crossing onto the west side of Military Highway to a station near Poplar Halls Drive. From there, the alignment would cross back over Military Highway and then proceed northward, on elevated structure, along the east-side of Military Highway to the west side of Military Circle Mall. The alignment would return to grade and traverse around the north side of the Mall to a station near Glenrock Road. The alignment would then travel south along Glenrock Road, across Poplar Halls Drive, and turn eastward, on elevated structure, over I-64 and end at a station in the vicinity of the Barry Robinson Center on Kempsville Road.

This option would have three station sites. One station would be located on the west side of Military Highway just south of Poplar Halls Drive. A second station would be on the east side of the Military Circle Mall, off of Glenrock Road. The third station would be located at the site of the Barry Robinson Center, by Kempsville Road. (Figure B-4, Option 2)

3. **Kempsville Road at Barry Robinson Center:** This option would leave the Norfolk/Southern alignment and swing northward just west of Newtown Road. The alignment would then follow Kempsville Road to the vicinity of the Barry Robinson Center. After the Military Highway Station, this option would have one station by the Barry Robinson Center on Kempsville Road. (Figure B-4, Option 3)

4. **Kempsville Road/Military Circle Center:** This option would leave the Norfolk/Southern alignment and swing northward just west of Newtown Road. The alignment would then follow Kempsville Road under I-264 to a station in the vicinity of the Barry Robinson Center. From there, the alignment would turn westward and elevate to cross I-64, return to grade just south of Poplar Halls Drive, and follow Glenrock Road to an end-of-line station by the west side of Military Circle Mall.

This option would have two stations. One would be located at the site of the Barry Robinson Center on Kempsville Road. The other station would be east side of the Military Circle Mall, off of Glenrock Road. (Figure B-4, Option 4)

Table B-2 lists all of the alignment options described above, which options have been set aside and for what reason, and which options will be carried forward for the final identification of the LRT Build Alternative. The options carried forward are highlighted in the Table.

**Table B-2
Phase Two Screening of Alignment Options**

Location	Design Options	Status
West End Option	Brambleton Ave.	Carried Forward for Further Review
Downtown Options	Plume/Granby & Library/Monticello Option	Set Aside: Severe impacts to traffic and economic conditions on Granby Street
	Library & Monticello	Carried Forward for Further Review
	Library & City Hall Ave./Granby & Monticello (3 Stations)	Set Aside: Severe impacts to traffic and economic conditions on Granby Street
	Library & City Hall Ave./Granby & Monticello (4 Stations)	Set Aside: Severe impacts to traffic and economic conditions on Granby Street

Location	Design Options	Status
East End Options	Kempsville Road	Carried Forward for Further Review
	Poplar Halls Drive/Military Circle Center	Set Aside: Very high capital costs
	Kempsville Road/Military Circle Center	Set Aside: Very high capital costs
	Poplar Halls Drive/Military Circle Center/Kempsville Road:	Set Aside: Very high capital costs

Source: URS Corp. July 2003

B4.0 Selection of Norfolk LRT Build Alternative (October 2001)

Phase Two screening resulted in the selection of one downtown option, one west end option, and two east end options. The selection of the LRT alignment to be carried forward in the SDEIS was based on the most cost-effective relationship between ridership and capital cost.

B4.1 Development of Norfolk LRT Alignment Scenarios

For the purpose of identifying a lower cost project alignments, an additional downtown option (Plume Street to the Freemason District Station) and an additional east-end option (stopping at the Military Highway Station) were investigated. The alignment options that resulted from the phase two screening process, plus the two lower cost downtown and east end options were combined with the common middle segment to portray entire alignment scenarios. The resulting six LRT complete alignment scenarios are described below.

Scenario One: Freemason District to Military Highway (Figure B-5)

Under this scenario, the alignment would originate at the Freemason District Station in downtown Norfolk on Monticello Avenue, and head south on Monticello Avenue, cross City Hall Avenue, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and terminating on the east-side at the Military Highway Station. An additional 1100 (340 meters) feet of non-revenue track would run from the Military Highway Station to the Vehicle Storage and Maintenance facility.

Scenario Two: Freemason District to Kempsville Road (Figure B-6)

Under this scenario, the alignment would originate at the Freemason District Station in downtown Norfolk on Monticello Avenue, head south on the west side of Monticello Avenue, cross City Hall Avenue, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government

Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and the Military Highway Station. East of the Military Highway Station, just west of Newtown Road, the alignment would leave the Norfolk/Southern alignment and swing northward, following the west side of Kempsville Road under I-264 to the eastern terminus at the Kempsville Road Station in the vicinity of the Barry Robinson Center.

Scenario Three: Freemason District to Military Circle Center (Figure B-7)

Under this scenario, the alignment would originate at the Freemason District Station in downtown Norfolk on Monticello Avenue, head south on the west side of Monticello Avenue, cross City Hall Avenue, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and the Military Highway Station. East of the Military Highway Station, just west of Newtown Road, the alignment would leave the Norfolk/Southern alignment and swing northward, following the west side of Kempsville Road under I-264 to the Kempsville Road Station in the vicinity of the Barry Robinson Center. From there, the alignment would turn westward and elevate over I-64, return to grade just south of Poplar Halls Drive, and follow Glenrock Road to an end-of-line station by the west side of Military Circle Mall.

Scenario Four: EVMC to Military Highway (Figure B-8)

Under this scenario, the alignment would originate at the Medical Center Station, run on the south side of Brambleton Avenue in a easterly direction, over Smith Creek on a new bridge parallel and south of the existing roadway bridge, and stop at the Hague Station. From there, the alignment would continue eastward to Yarmouth Street, where the alignment would turn to the south through the YMCA parking lot onto Bute Street. The alignment would follow Bute Street and Charlotte Street in a easterly direction, and then turn south onto Monticello Avenue, stopping at the Freemason District Station. From the Freemason District Station, the alignment would continue south on Monticello Avenue, cross City Hall Avenue on a diagonal, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and terminating on the south side of the Norfolk Southern rail right of way at the Military Highway Station. An additional 1100 (340 meters) feet of non-revenue track would run from the Military Highway Station to the Vehicle Storage and Maintenance facility.

Scenario Five: EVMC to Kempsville Road (Figure B-9)

Under this scenario, the alignment would originate at the Medical Center Station, run on the south side of Brambleton Avenue in a easterly direction, over Smith Creek on a new bridge parallel to the existing roadway bridge, and stop at the Hague Station. From there, the alignment would continue eastward to Yarmouth Street, where the alignment would turn to the south through the YMCA parking lot onto Bute Street. The alignment would follow Bute Street and Charlotte Street in a easterly direction, and then turn south onto Monticello Avenue, stopping at the Freemason District Station. From the Freemason District Station, the alignment would continue south on Monticello Avenue, cross City Hall Avenue, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and the Military Highway Station. East of the Military Highway Station, just west of Newtown Road, the alignment would leave the Norfolk/Southern alignment and swing northward, following the west side of

Kempsville Road under I-264 to the eastern terminus at the Kempsville Road Station in the vicinity of the Barry Robinson Center.

Scenario Six: EVMC to Military Circle Center (Figure B-10)

Under this scenario, the alignment would originate at the Medical Center Station, run on the south side of Brambleton Avenue in a easterly direction, over Smith Creek on a new bridge parallel to the existing roadway bridge, and stop at the Hague Station. From there, the alignment would continue eastward to Yarmouth Street, where the alignment would turn to the south through the YMCA parking lot onto Bute Street. The alignment would follow Bute Street and Charlotte Street in a easterly direction, and then turn south onto Monticello Avenue, stopping at the Freemason District Station. From the Freemason District Station, the alignment would continue south on Monticello Avenue, cross City Hall Avenue, and stop at the Plume Street Station on the site of the Kirn Memorial Library. From the Plume Street Station, the alignment would follow the central LRT alignment, making stops at Government Center Station, Harbor Park Station, NSU Station, the newly proposed Ballentine Boulevard Station and Ingleside Station, and the Military Highway Station. East of the Military Highway Station, just west of Newtown Road, the alignment would leave the Norfolk/Southern alignment and swing northward, following the west side of Kempsville Road under I-264 to the Kempsville Road Station in the vicinity of the Barry Robinson Center. From there, the alignment would turn westward and elevate over I-64, return to grade just south of Poplar Halls Drive, and follow Glenrock Road to an end-of-line station by the west side of Military Circle Mall.

B4.2 Selection of LRT Build Alternative (October 2001 – April 2002)

Based on this evaluation, **Scenario Five, EVMC to Kempsville Road** was determined to have the highest estimated ridership, relative to the cost of construction. As a result, Scenario Five was selected as the LRT Build Alternative. Scenario Six, EVMC to Military Circle Center provided a greater number of riders than Scenario Five, EVMC to Kempsville Road, however, the additional capital costs associated with crossing I-64 on an elevated structure was determined to be in excess of the current affordability of the project. Nevertheless, Scenario Six was carried forward for review in potential future alignment extensions, if additional funds can be obtained.

The design and estimated capital costs associated with the Scenario Five LRT alignment is subject to change as a result of several alignment options, however the end of line locations will remain constant. Design options being investigated for Scenario Five include:

- Three west end of line Medical Center Station options at Brambleton Avenue, Southampton Road, and Children's Lane within the EVMC complex.
- Movement of the Hague Station approximately 650 feet (200 meters) eastward to the YMCA parking lot between York and Bute streets and Duke and Yarmouth streets. The new station would be called York Street Station.
- Reconfiguration of Harbor Park Station area track alignment; changing old alignment parallel to I-264 between Main Street and Lambert's Point rail line, to new alignment along Main Street onto grassy median adjacent to Park Avenue.
- Two NSU Station options: One running at-grade across Brambleton Avenue with a station east of Brambleton Avenue; the other option would cross Park and Brambleton avenues on elevated

structures with an NSU Station elevated over Brambleton Avenue. Under this option, the alignment would transition to grade east of the station.

- Two Ballentine Boulevard Station Options: one would follow the Norfolk Southern railroad tracks at grade to the station, located just west of Ballentine Boulevard; the other option would run at-grade to a station approximately 1000 feet west of Ballentine Boulevard and then transition onto elevated structure over Ballentine Boulevard. East of Ballentine Boulevard, the alignment would transition back to grade.
- Reconfiguration of the LRT alignment where the tracks transition from the Norfolk Southern Railroad tracks onto Kempsville Road via Bangor Avenue. The new alignment would leave the Norfolk Southern Railroad tracks approximately 325 feet (100 meters) west of Bangor Avenue at Houston Avenue, turning to the north, and continuing to Kempsville Road.

B4.2.1 Modification of LRT Build Alternative (2001 – April 2002)

As noted above, subsequent to the selection of Scenario Five, the design and initial capital cost estimates associated with Scenario Five were subject to revisions as better design information became available. Between 2001 and April 2002, several design features were modified, while leaving the project limits/stations the same, so as to reduce the project's total capital costs. Some of the modifications that helped to reduce the project costs to \$278.5 million include the following:

- The relocation of the Vehicle Storage and Maintenance facility at Military Highway. The facility site has been relocated to the before mentioned Norfolk State University (NSU) site, bounded by NSU, I-264, and Brambleton Avenue.
- Replacement of gauntlet tracks at Ingleside and Military Highway Stations with retractable edge platforms
- Elimination of the NSRR interchange track
- Elimination of the pocket track at Harbor Park Station
- Funding of the proposed parking garage at York Street Station through private redevelopment and providing surface parking instead.

Additional cost reduction measures were designed into the LRT Alternative to further reduce project costs to \$221.9 million, as suggested through FTA review. These modifications include the following:

- Vehicle storage capacity at the Vehicle Storage & Maintenance facility (VSMF) reduced to maximum of 15 vehicles
- Signaling at VSMF eliminated
- Operation Control Center at VSMF eliminated
- Portland Light Rail vehicle replaced with San Diego Siemens Avanta S70 Light Rail vehicle
- Most elements of the communications system eliminated
- Gauntlet tracks removed
- Automated Train Control system eliminated, except at select locations
- All stations except one (2-car train) would be built for one-car trains
- Prefabricated station canopies will be used at stations
- Trackway lighting is eliminated
- Hours of operations are reduced, and
- Guaranteed Ride Home no longer part of Operating Plan.

B5.0 Analysis of Additional East End Options (January - August 2003)

Upon completion of the Supplemental DEIS, further refinements of the LRT alignment were needed to strengthen the project's cost effectiveness. As a result, additional east end-of-line options were considered that focused on the further reduction of capital costs, while following the general alignment within the Kempsville Road to Barry Robinson Center corridor. Although the additional alignments did not go through the complete evaluation and screening process described above, they were developed with sufficient detail to make sound planning and engineering decisions. Following are brief descriptions and assessments of the additional alignments studied.

A. I-64 /I-264 Ramp to Kempsville Road Option (Figure B-11)

This east end-of-line option would head eastbound from the Military Highway Station and turn northbound on the east side of I-64. The alignment would run parallel to the I-64 to I-264 ramp and, at Kempsville Road, the alignment would turn northbound under I-264, following the west side of Kempsville Road to the terminus station at the edge of the Barry Robinson Center.

B. Kempsville Road, East Side Alignment Options (Figure B-12)

The Kempsville Road, east side alignment options would head eastbound from the Military Highway Station, turning north from the Norfolk/Southern alignment just west of Newtown Road and Bangor Avenue onto Kempsville Road. At this point, the alignment would cross over Kempsville Road at grade onto the east side and run parallel the east side of Kempsville Road in an exclusive right-of-way. From Kempsville Road and I-264, two alignment options were considered.

Center Drive Terminus

The Center Drive Terminus would continue northward on the east side of Kempsville Road, turn right onto the north side of Center Drive and continue approximately eight hundred feet to a terminal station.

Sentara Leigh Terminus

The Sentara Leigh Terminus would continue northward on the east side of Kempsville Road to a terminal station at Sentara Leigh Hospital.

C. Kempsville Road, Center/Median Alignment Option

The Center Median alignment option would head eastbound from the Military Highway Station, turning north from the Norfolk/Southern alignment just west of Newtown Road and Bangor Avenue onto Kempsville Road. At this point, the alignment would cross, at grade, over the southbound lanes of Kempsville Road onto an exclusive right-of-way in the center median, and continue northward to Kempsville Circle. The alignment would then turn right onto the north side of Kempsville Road and continue north to a terminal station at Sentara Leigh Hospital (Same as Figure B-12, Sentara Leigh Terminus, but in center of Kempsville Road).

D. West side of Kempsville Road at Church Parking Lot Option (Figure B-13)

This alignment would head eastbound from the Military Highway Station, leaving the Norfolk/Southern alignment just west of Newtown Road and Bangor Avenue, in the same configuration as the Kempsville Road – west side alignment. After turning northbound, the alignment would run along the west side of Kempsville Road, passed the Children’s Hospital of the King’s Daughters, and terminate at a station in the overflow parking lot for the First Baptist Church between Blackstone Street and I-264.

E. Newtown Road at Kempsville Road Option, FEIS Final Alignment (Figure B-14)

This east end-of-line option would head eastbound from the Military Highway Station, crossing under I-64 and terminate with a station on the existing railroad right-of-way at Newtown and Kempsville Road

Table B-3 lists each of the additional east end-of-line options, identifies the significant impacts and specific issues associated with each option and whether or not the options were set aside from further consideration. One option, the Newtown Road at Kempsville Road, was carried forward. Figure B-14 shows the selected Newtown Road at Kempsville Road Option along with the entire LRT alignment documented in the Final Environmental Impact Statement.

**Table B-3
Additional East End-of-Line Options, Impacts & Issues**

Option	Impacts and Issues	Status
I-64 /I-264 Ramp to Kempsville Road	<ul style="list-style-type: none"> • Displacement of residential apartment complex at Foresttown Drive east of I-64. • Significant wetland impacts along the major drainageways of I-64/264 (ACOE issue with avoidable impacts). 	Set Aside
Kempsville Road, East Side Alignment	<ul style="list-style-type: none"> • Displacement of existing cemetery on Kempsville Road on the south side of the I-264 overpass (NRHP Section 106 issue). • Not enough horizontal clearance between existing church building and/or the Interstate Commerce center buildings north of Center Drive and Kempsville Road. • The alignment would require the displacement of 2 office buildings in the Interstate Office Park and a significant portion of a parking lot from a third building. • Traffic impacts associated with new grade crossings where tracks cross east side of Kempsville Road at Center Drive, North Center Drive, and the main driveway for the First Baptist Church, south of I-264. • Significant impacts to wetlands and forested areas at the Center Drive terminal station for Scenario One. • Not enough space to replace surface parking lot at terminal station for decked parking. • Significantly higher capital costs than the west side Kempsville Road option. 	Set Aside

Option	Impacts and Issues	Status
Kempsville Road, Center/Median Alignment	<ul style="list-style-type: none"> • The widening of Kempsville Road would be required, including the reconstruction of slope abutments on the west side of the I-264 overpass. This would require the acquisition of a 30-foot wide strip of land along Kempsville Road, currently owned by the Barry Robinson Center. • The reconstruction of approximately half a mile of Kempsville Road, southbound lanes would result in significantly higher capital costs than the west side Kempsville Road Option. 	Set Aside
Newtown Road at Kempsville Road	<ul style="list-style-type: none"> • Additional property displacements would be required along Curlew Drive, and the area bounded by Newtown/Kempsville/Bangor to construct a 350-space park and ride lot. • Reconfiguration of existing traffic patterns and access to adjacent communities. • Requires shuttle from the station to Sentara Leigh Hospital • Better direct access to I-264/64 • Reduced construction costs • Eliminates need for displacement of 8 residential buildings and 2 businesses 	Carried Forward for Further Review
West side of Kempsville Road at Church Parking Lot	<ul style="list-style-type: none"> • End-of-line station not near activity centers • Number of displacements • Eliminates First Baptist Church overflow park lot on west side of Kempsville Road • Poor access to proposed Park & Ride lot. • Introduces signalized intersection at Kempsville Rd/Blackstone St. intersection • Requires shuttle from the station to Sentara Leigh Hospital • No advantage over stopping at Newtown Road (Option 11) 	Set Aside

Source: URS Corp, April 2003

The Newtown Road at Kempsville Road option was selected for further evaluation in the FEIS. This option would reduce the length of the LRT system by 0.6 miles while having no impact on ridership, reduce project costs and eliminate impacts to the Barry Robinson Center, a historic resource that provides adolescent mental health services to the region.

B6.0. Vehicle Storage and Maintenance Facility (VSMF) Site Selection (Figure B-15)

The following three sites were investigated between November 2000 and April 2002 for the LRT vehicle storage and maintenance facility for the Norfolk LRT Project.

1. **Norfolk State University:** The VSMF would be located in a vacant site bounded by Brambleton Avenue on the west, Norfolk State University on the north, Ballentine Boulevard on the east, and I-264 on the south. The site is approximately 7.0 acres in size. The VSMF would be designed to be constructed as a light repair facility with a control room and a vehicle car wash. Heavy repairs would be performed off-site. The facility would provide open storage for the opening day fleet size of 9 light rail vehicles, and storage for 6 additional vehicles, not including storage within the shop. The site is currently owned by Norfolk Southern Railroad and Virginia DOT. (Figure B-15, Option 1))
2. **Barry Robinson Center:** The VSMF would be located at the northern edge of the Barry Robinson Center, between Kempsville Road and I-64, next to the existing baseball field. The VSMF would be designed to be constructed as a full service facility for light and heavy repairs, with a control room and a vehicle car wash. The overall site would have a 70-car capacity, with sufficient capacity for the Norfolk LRT system and future additions of LRT service. The site is currently owned by the Barry Robinson Center. (Figure B-15, Option 2)
3. **Military Highway:** The proposed VSMF would be located in a currently industrialized site in the southeastern corner of the LRT alignment and the Military Highway Service Road. The site is approximately 15.5 acres in size and is bounded by Curlew Drive to the north and Military Highway to the west. On the east side, the facility would be bounded by the western property lines of the houses on the west side of Inez Avenue. The south side boundary would be located approximately 325 feet north of Sellger Drive, requiring the use of part of the lawn of the Riverside Baptist Church. The VSMF would be designed to be constructed in two phases. The first phase would include a light repair facility with a control room and a vehicle car wash. The facility would provide open storage for the opening day fleet size of 9 light rail vehicles, and storage for 8 additional vehicles, not including storage within the shop. The second phase would enlarge the shop facility to add heavy repair pits and components for 3 car consists. (Figure B-15, Option 3)

Table B-4 evaluates the three VSMF site options based on size of facility (LRT vehicle capacity), capital cost in Year 2006 dollars, required displacements, and environmental impacts as a result of construction.

Table B-4
Evaluation of VSMF Site Options

VSMF Site	Size	Cost (millions of dollars)	Displacements	Environmental Impacts
Norfolk State University	15 vehicles	\$18.0 (2006 \$)	none	Woodland Wetlands
Barry Robinson Center	70 vehicles	Not Available	Barry Robinson Center	
Military Highway	35 vehicles	\$29.3 (2005 \$)	8 businesses	Hazardous materials Noise impacts

Source: URS Corp. September 2003

In August, 2000, the Military Highway VSMF site was selected for review in the Supplemental DEIS. However, based on the significant impacts associated with the high capital costs, the required business displacements and the noise impacts, the NSU vehicle storage and maintenance site was selected as the preferred site (April 2002). The location of the maintenance facility has been carefully reviewed and was chosen based on location within the project corridor, configuration of the site, availability of the property,

and overall usability of the site. Of all the locations reviewed for the maintenance facility, the NSU site is the only one under public or railroad ownership. The site is currently on idle land that has been previously used as a railroad spur line. Development of the site would not require the relocation of any businesses or residences. This site is wedged between the interstate highway and existing rail line, and has a long narrow configuration that is most suitable for the facility.