REPORT OF THE
VIRGINIA DEPARTMENT OF RAIL
AND PUBLIC TRANSPORTATION

Washington, DC to Richmond Third Track Feasibility Study

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 78

COMMONWEALTH OF VIRGINIA
RICHMOND
2006

COMMONWEALTH of VIRGINIA

MATTHEW O. TUCKER
DIRECTOR

DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION
1313 EAST MAIN STREET, SUITE 300
P.O. BOX 590
RICHMOND, VA 23218-0590

(804) 786-4440
FAX: (804) 786-7286
VIRGINIA RELAY CENTER
1-800-828-1120 (TDD)

December 4, 2006

Senator Martin E. Williams
Chairman, Senate Transportation Committee
General Assembly Building, Room 332
Richmond, Virginia 23219

Senator John H. Chichester
Chairman, Senate Finance Committee
General Assembly Building, Room 626
Richmond, Virginia 23219

Delegate Leo C. Wardrup, Jr.
Chairman, House Transportation Committee
General Assembly Building, Room 722
Richmond, Virginia 23219

Delegate Harry R. Purkey
Chairman, House Finance Committee
General Assembly Building, Room 415
Richmond, Virginia 23219

Delegate Vincent F. Callahan, Jr.
Chairman, House Appropriations Committee
General Assembly Building, Room
Richmond, Virginia 23219

Gentlemen:

Attached for your review is the "Washington D.C. to Richmond Third Track Feasibility Study" that was requested by the 2006 General Assembly session in HB 5012. In addition to an analysis of the feasibility of constructing a third track, this study responds to the General Assembly's direction to expand the scope to:

(i) Identify needed right-of-way parallel to existing tracks, including right-of-way owned by CSX or by other parties;
(ii) Identify major environmental issues;
(iii) Develop an implementation plan based on the most optimal options, including the schedules for each phase of the project as well as financing for the project;
(iv) Review legal and regulatory issues; and
(v) Estimate the cost of powering passenger trains by electricity for a Third Track from Washington, D.C. to Richmond.

The Department of Rail and Public Transportation (DRPT) is charged with ensuring that the Commonwealth of Virginia achieves the highest public benefit for the dollars invested in our rail programs. There is no doubt that this is a high priority freight and

passenger rail corridor that will require significant investment in order to maintain and improve mobility for people and goods. DRPT is taking a strategic approach in studying this high priority corridor. Our new approach is based on establishing public benefits, identifying public/private partnership opportunities, and providing realistic cost estimates based on a comprehensive plan that identifies all of the improvements and issues that need to be addressed in the provision of reliable, sustainable, expandable, and efficient freight and passenger rail operations.

Without conducting a formal environmental review and preliminary engineering, DRPT is not able to provide a realistic cost estimate for advancing passenger rail in this high priority corridor. Accordingly, this report does not address the basic question of feasibility of the third track from a cost perspective.

The report provides a minimum/partial cost estimate of $684 million in 2006 dollars for capital improvements for the construction of a nearly continuous third track along the entire length of the corridor and improvements to the connection between Richmond's Main Street Station and the Staples Mill Road Station in Henrico County. However, this minimum cost estimate omits key cost drivers such as the cost of right-of-way use or acquisition, utility relocation, escalation costs, and other important improvements such as the construction of a new bridge across the Potomac River between Arlington and Washington, D.C. to eliminate a critical bottleneck for fluid operations.

The $684 million minimum/partial estimate also does not include the cost of electrification of the corridor. This option was analyzed in the report and the cost of electrification was estimated to be at least $953 million in 2006 dollars, which is in addition to the cost of the third track. It should also be noted that heat restrictions are not eliminated as a result of the capital improvements reviewed in this study. Heat restrictions often lead to significant delays to passenger rail operations in the corridor due to CSX policy that limits train speeds during warm weather periods.

Significant investments have been made in the corridor with funds from the Virginia Transportation Act of 2000 (VTA 2000). Two new crossovers and major signal upgrades have been completed at Arkendale in Stafford County and Elmont in Hanover County. The new bridge across Quantico Creek will be completed by May 2007, and construction of approximately one mile of third track at L'Enfant Plaza is underway. Three additional sections of third track are in final design, and preliminary plans have been completed for track improvements in Richmond that will improve access to Main Street Station. Completion of these projects allows the operation of four new passenger train round trips, reduced travel time and improved reliability of all trains operating in the corridor. However, there is a funding shortfall of approximately $20 million to complete these important projects. This shortfall is the result of the lack of preliminary engineering when the initial cost estimates were prepared, cost escalations, and adjustments to the projects to optimize their effectiveness. It is highly recommended that additional funding be provided to complete these projects.

Previous funds provided by the Commonwealth for these projects were not matched by CSX and the Commonwealth did not obtain an agreement that would protect the public investment by specifically establishing performance standards such as on-time performance for passenger rail service. Moving forward, DRPT highly recommends that the Commonwealth fully explore all options in this corridor. As part of this approach, the Commonwealth should identify opportunities for sharing costs and benefits of improvements in this corridor through public/private partnerships.

DRPT recommends that the Commonwealth take the following actions to advance passenger rail service in the Washington, D.C. to Richmond corridor:

1) **Complete the VTA 2000 Program of Projects**. An additional $20 million is needed to complete all of the Washington, D.C. to Richmond corridor projects that are currently under final design.

2) **Complete a Comprehensive Alternatives Analysis**. This will include operational modeling, a review of alternate right-of-ways, and the analysis of public and private benefits that will lead to the identification of opportunities for cost sharing and leveraging of public and private resources. The Public Private Transportation Act (PPTA) may offer the opportunity to identify alternative right-of-ways. It is estimated that this effort will cost $1 million and take 12 months to complete.

3) **Conduct Environmental Review and Preliminary Engineering**. A minimum of 30% engineering must be completed in order to determine the specific design for proposed improvements and to develop an accurate estimate of total costs. This task will include the preparation of all necessary environmental documentation. The estimated total cost is $40 million and this will take 24 months to complete.

4) **Establish Agreements**. The Commonwealth has a long-term interest in this corridor and will need to assume a lead role if passenger rail is going to be successful in the corridor. Agreements must be executed between the Commonwealth and other stakeholders to establish the roles and responsibilities of each party in the construction, operations, management and governance of this rail corridor. These agreements must protect the Commonwealth's interests, allocate costs and benefits, and ensure long term access and performance for passenger rail service.

5) **Identify a dedicated source of funding for capital and operating costs in the corridor.** The Washington, D.C. to Richmond rail corridor represents an excellent opportunity for the Commonwealth to utilize rail to reduce traffic congestion and truck traffic in the I-95 corridor, where road expansion is very challenging due to cost and environmental concerns. Passenger rail, similar to highways, requires maintenance and incurs ongoing operating costs. Without funding and leadership from the Commonwealth, this corridor will never achieve

its potential in terms of providing a viable alternative to the automobile. A source of funding must be secured before a comprehensive program of improvements can be finalized and construction can commence.

I look forward to working with the members of the General Assembly to provide fast, frequent and reliable passenger rail service between Washington, D.C. and Richmond.

Sincerely,

Matthew O. Tucker

Cc: Honorable Pierce R. Homer

Attachment

WASHINGTON, D.C. TO RICHMOND
THIRD TRACK FEASIBILITY STUDY

PREFACE

This study was requested by the 2006 General Assembly session in HB 5012. In addition to an analysis of the feasibility of constructing a third track, this study responds to the General Assembly's direction to expand the scope to:

(i) Identify needed right-of-way parallel to existing tracks, including right-of-way owned by CSX or by other parties;
(ii) Identify major environmental issues;
(iii) Develop an implementation plan based on the most optimal options, including the schedules for each phase of the project as well as financing for the project;
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The Department of Rail and Public Transportation (DRPT) is charged with ensuring that the Commonwealth of Virginia achieves the highest public benefit for the dollars invested in our rail programs. There is no doubt that this is a high priority freight and passenger rail corridor that will require significant investment in order to maintain and improve mobility for people and goods. DRPT is taking a strategic approach in studying this high priority corridor. Our new approach is based on establishing public benefits, identifying public/private partnership opportunities, and providing realistic cost estimates based on a comprehensive plan that identifies all of the improvements and issues that need to be addressed in the provision of reliable, sustainable, expandable, and efficient freight and passenger rail operations.

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addition to the cost of the third track. It should also be noted that heat restrictions are not eliminated as a result of the capital improvements reviewed in this study. Heat restrictions often lead to significant delays to passenger rail operations in the corridor due to CSX policy that limits train speeds during warm weather periods.

Significant investments have been made in the corridor with funds from the Virginia Transportation Act of 2000 (VTA 2000). Two new crossovers and major signal upgrades have been completed at Arkendale in Stafford County and Elmont in Hanover County. The new bridge across Quantico Creek will be completed by May 2007, and construction of approximately one mile of third track at L'Enfant Plaza is underway. Three additional sections of third track are in final design, and preliminary plans have been completed for track improvements in Richmond that will improve access to Main Street Station. Completion of these projects allows the operation of four new passenger train round trips, reduced travel time and improved reliability of all trains operating in the corridor. However, there is a funding shortfall of approximately $20 million to complete these important projects. This shortfall is the result of the lack of preliminary engineering when the initial cost estimates were prepared, cost escalations, and adjustments to the projects to optimize their effectiveness. It is highly recommended that additional funding be provided to complete these projects.

Previous funds provided by the Commonwealth for these projects were not matched by CSX and the Commonwealth did not obtain an agreement that would protect the public investment by specifically establishing performance standards such as on-time performance for passenger rail service. Moving forward, DRPT highly recommends that the Commonwealth fully explore all options in this corridor. As part of this approach, the Commonwealth should identify opportunities for sharing costs and benefits of improvements in this corridor through public/private partnerships.

DRPT recommends that the Commonwealth take the following actions to advance passenger rail service in the Washington, D.C. to Richmond corridor:

1) **Complete the VTA 2000 Program of Projects**. An additional $20 million is needed to complete all of the Washington, D.C. to Richmond corridor projects that are currently under final design.

2) **Complete a Comprehensive Alternatives Analysis**. This will include operational modeling, a review of alternate right-of-ways, and the analysis of public and private benefits that will lead to the identification of opportunities for cost sharing and leveraging of public and private resources. The Public Private Transportation Act (PPTA) may offer the opportunity to identify alternative right-of-ways. It is estimated that this effort will cost $1 million and take 12 months to complete.

3) **Conduct Environmental Review and Preliminary Engineering**. A minimum of 30% engineering must be completed in order to determine the specific design for proposed improvements and to develop an accurate estimate of total costs. This task will include the preparation of all necessary environmental documentation. The estimated total cost is $40 million and this will take 24 months to complete.

4) **Establish Agreements**. The Commonwealth has a long-term interest in this corridor and will need to assume a lead role if passenger rail is going to be successful in the corridor. Agreements must be executed between the Commonwealth and other stakeholders to establish the roles and responsibilities of each party in the construction, operations, management and governance of this rail corridor. These agreements must protect the Commonwealth's interests, allocate costs and benefits, and ensure long term access and performance for passenger rail service.

5) **Identify a dedicated source of funding for capital and operating costs in the corridor.** The Washington, D.C. to Richmond rail corridor represents an excellent opportunity for the Commonwealth to utilize rail to reduce traffic congestion and truck traffic in the I-95 corridor, where road expansion is very challenging due to cost and environmental concerns. Passenger rail, similar to highways, requires maintenance and incurs ongoing operating costs. Without funding and leadership from the Commonwealth, this corridor will never achieve its potential in terms of providing a viable alternative to the automobile. A source of funding must be secured before a comprehensive program of improvements can be finalized and construction can commence.

EXECUTIVE SUMMARY

1. Overview

The goal of this report, prepared by HDR Engineering, Inc. for the Virginia Department of Rail and Public Transportation (DRPT) under a mandate of the Virginia General Assembly, is to review the feasibility of a third track in the Washington, D.C. to Richmond rail corridor owned by CSX Transportation (CSX). (See Figure 1) Consistent with the General Assembly mandate, this study only addresses the feasibility of building a third track adjacent to the existing CSX tracks. The Department believes, however, that a new approach to improving passenger rail service in this corridor may be appropriate. All potential options, including development of a new rail corridor should be considered before a final recommendation is made.

A preliminary minimum cost of $684 million, in 2006 dollars, has been estimated for the construction of the third track. This cost clearly underestimates the actual cost of improvements as it does not include several items with will add to the overall cost of the project. The following are some of the items that are not included in this cost estimate:

All cost estimates are provided in current 2006 dollars. Inflation will add significantly to the overall cost because the construction of improvements will be spread out over several years. For each year in which project construction is delayed, costs should be expected to increase by an average of 3.12% per year according to construction inflation forecasts provided by the Virginia Department of Taxation.

Right-of-way costs are not included. The study suggests that there may be sufficient room within the existing CSX right-of-way to construct a third track, with only a few parcels totaling less than an acre having to be obtained. However, final engineering must be completed before the actual amount of right-of-way requirements can be determined.

The estimated minimum cost also does not include costs associated with the relocation of utilities (principally fiber optic lines and petroleum pipelines) in the CSX right-of-way. Without detailed field surveys it is not possible to quantify the impacts on such utilities. Relocation of utilities could result in substantial costs and would have to be negotiated as part of the agreement to use the rail line.

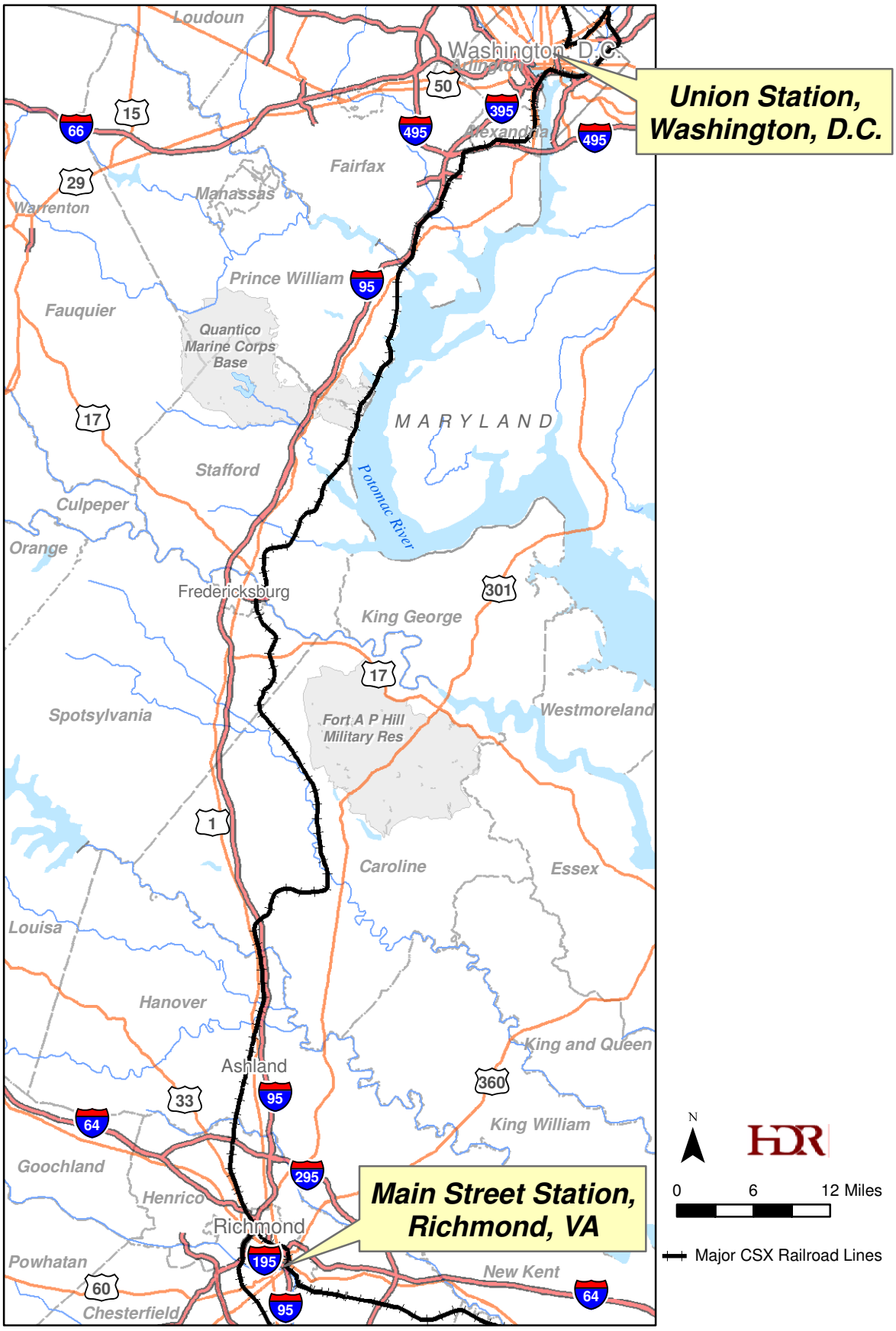
The cost of electrification was estimated to be at least $953 million in 2006 dollars, which is in addition to the cost of the third track.

The improvements included in this estimate also do not include the construction of a third track in several key areas, including Ashland, Fredericksburg and the Long Bridge across the Potomac River. These three sections will require very expensive solutions to provide additional rail capacity while minimizing the impact on the surrounding communities. Improved passenger rail service can be provided in this corridor without a third track in these three locations, but these areas will become bottlenecks that will limit reliability and the capacity for additional future service growth.

This study does not calculate the level of or existence of public benefits that may result from these improvements. The evaluation of public benefits must be completed before a final determination of feasibility can be made. The Commonwealth and CSX will need to come to an agreement that clearly identifies and provides for a public benefit which includes the capability to provide expanded and significantly improved commuter and intercity passenger rail operations. The Commonwealth and CSX would also have to determine a cost sharing agreement since the improvements will benefit both passenger and freight rail service.

The findings of this study presented here are largely based on previously prepared studies and conceptual plans. Before allocating any funding in this corridor, this study recommends a comprehensive review of all alternatives in this corridor and preparation of preliminary engineering plans and cost estimates.

Assuming that further analysis determines that the third track or new rail corridor is feasible from a cost and public benefit perspective, there is a need for negotiation and execution amongst the involved stakeholders of the necessary governance agreements addressing design, construction, implementation schedule, ownership, liability and indemnification issues, access, operation and maintenance of the third track. DRPT highly recommends that outcome-based performance standards be developed for each significant issue to be agreed upon and for each step in implementing the strategy. These standards must be driven by realistic costs, schedules, deliverables, and performance measures that can be independently monitored, reported and audited by the Commonwealth and other participating parties on a regular basis.



Third Track Feasibility Study
December 2006

DRPT

Figure 1
Washington-Richmond Corridor Map

Appropriate corridor development involving public funds must be justified by a direct public benefit and shared investment strategy where both the public and the private benefits are identified and these investments are shared accordingly. The current Operating Agreement between CSX and VRE for the operation of commuter trains from Fredericksburg to Washington stipulates that a third track must be built for the entire VRE service area before additional commuter train frequencies can be implemented. The Operating Agreement further states that these improvements will be made at no cost to CSX. The Commonwealth should seek a more balanced cost sharing arrangement with CSX.

Following is the scope of work of this study.

- Identification of rail services in the corridor.
- Documentation of the basis for the third track.
- Definition of the third track conceptual design and anticipated operation.
- Estimation of minimum construction cost.
- Evaluation of potential environmental effects and documentation requirements.
- Review of legal and financial issues.
- Assessment of operation of electric powered trains in the corridor.
- Evaluation of connections to possible enhanced passenger rail service to Hampton Roads.
- Presentation of preliminary implementation priorities and schedule.

DRPT was assisted by HDR Engineering, Inc. and the Virginia Transportation Research Council (VTRC) in the research and preparation of this report.

2. Rail Services in the Corridor

Four providers of rail service are operating in the 118-mile Washington to Richmond corridor. These operators and the average weekday train volumes that they operate are:

1. **CSX:** The owner of the corridor, CSX operates approximately 25 to 30 through and local freight trains per day, depending on location, along the entire length of the corridor. Additional local freight trains are also operated along the corridor.
2. **Amtrak:** operates an average of 18 intercity passenger trains per day between Washington and Richmond.
3. **Virginia Railway Express (VRE):** operates 14 daily commuter trains between Fredericksburg and Washington and an additional

16 trains per day on the corridor between Alexandria and Washington.

4. **Norfolk Southern Railroad:** has trackage rights on a 2.2-mile section of the CSX line for delivery of coal to a power plant in Alexandria, and access to the Northeast Corridor operates not more than one train per day.

Based on these train services, current maximum daily volumes of trains on various portions of the corridor are:

Washington to Alexandria:	**81 trains per day**
Alexandria to Fredericksburg:	**62 trains per day**
Fredericksburg to Richmond:	**48 trains per day**

Since the Alexandria to Washington portion of the corridor is largely triple track now, or programmed for the construction of a third track, this report focuses principally on the evaluation of a third track south of Alexandria to Richmond. Ultimately, however, the existing two-track CSX Long Bridge crossing the Potomac River from Virginia into Washington will need to be augmented with additional capacity in order to handle increased numbers of both passenger and freight trains serving Washington and destinations to the south assuming the construction of a third track.

3. Previous Evaluations of the Need for Additional Track Capacity

Three major studies of rail capacity improvements in the Washington to Richmond corridor have been conducted over the past 10 years, all of which address the capability of implementing fast, frequent and reliable passenger rail service. DRPT conducted an initial concept and feasibility study in 1996 which was followed by a more detailed operational analysis and preliminary engineering study conducted by the Federal Railroad Administration (FRA) and Amtrak in 1999. In 2002, DRPT and the North Carolina Department of Transportation (NCDOT) completed the Southeast High Speed Rail Tier I Environmental Impact Statement (EIS) which integrated the Washington to Richmond improvements into the longer bi-state corridor.

The approach followed in all of these studies was to establish goals for provision of quality service and to then identify a package of improvements, including construction of a third track, that would be sufficient to allow for those goals to be met. The term "third track" has come to be used to describe the full program of improvements that are being recommended in these studies and which form the basis for the third track program as addressed in this report.

Of the three studies conducted, the FRA/Amtrak report, which was submitted to Congress in May 1999, provides the most comprehensive

analysis of the proposed improvements. The stated purpose of that study was to specify that the infrastructure improvements that would enable the Washington to Richmond corridor to accommodate reliably the mix and volume of higher speed intercity passenger, commuter and freight services that the line's operators and public partners foresee for the year 2015. An assessment of then current facilities, services and operating conditions was conducted as part of that study.

All of the key parties in this corridor, including DRPT, FRA, Amtrak, CSX and VRE, worked together to characterize the service needs for the study planning year of 2015. An operational analysis was conducted to simulate the performance of future services over various configurations of infrastructure and from this analysis a set of infrastructure investments was developed that would allow operations that achieve the intended service quality and train volumes with satisfactory reliability. The report concludes that "Reliable high-speed passenger train service between Washington and Richmond is a feasible goal provided that requisite infrastructure improvements are constructed."

The most recent evaluation completed for continuing the third track program in the corridor was the Third Track Conceptual Location Study completed by DRPT in June 2004. That study identifies the conceptual location of a third mainline track in the 92.7-mile corridor between Richmond Staples Mill Road Station and the Ravensworth Interlocking, a crossover between mainline tracks which is located south of Franconia in the Northern Virginia suburbs of Washington. The objective of the study, which takes into account existing and planned rail infrastructure, is to help guide planners and engineers in identifying the location and design of individual future improvements and ultimately the location of the third track.

This report analyzes the 92.7-mile corridor as defined above in addition to the 8.1-mile section of the corridor connecting Richmond's Main Street Station with Staples Mill Road Station via Acca Yard.

4. Definition of the Third Track and Anticipated Operation

The third track between Washington and Richmond would not be constructed as a completely separate track and would not be solely dedicated to passenger service. Rather, the track would be designed and operated as a mainline track along with the other two mainline tracks as a complete integrated three-track system. In some areas the new track would be built on the east side of the existing two-track system and in other locations on the west side or, where space permits, between the two existing tracks. Crossovers between tracks would be located at key locations to assure maximum fluidity of train operations. Both passenger and freight trains would have access to the new third track throughout the

day depending on train dispatching requirements and negotiated priorities. Passenger trains would have access to all three mainline tracks.

The integrated three-track system would greatly facilitate train operations by permitting train movements in both directions while a train is stopped at a station or otherwise occupying one of the three tracks. For example, in the case of a train breakdown blocking one track it may be possible to move trains around it in both directions simultaneously with minimal delay. At present, when such an event occurs without the third track, major disruptions in train service occur in one or both directions on the railroad. These disruptions often lead to significant delays in VRE commuter and Amtrak intercity passenger train service. It should be noted that the construction of the third track will not result in the elimination of the CSX heat restriction policy that limits train speeds and that severely impacts reliable rail operations during warm weather periods.

5. Estimated Minimum Construction Costs

An estimate of probable minimum construction cost for the third track and related civil and signal improvements required for the track construction has been prepared as part of this report. This order of magnitude cost estimate is based on a number of assumptions and has been derived without the benefit of preliminary or detailed engineering plans, field surveys or analyses that would require substantially more effort and resources than allowed for in this phase of the study. The construction cost assumes construction of a nearly continuous third track along the entire length of the corridor under examination and substantial improvements to the connection between Main Street Station and Staples Mill Road Station in Richmond. The analysis does not consider unavoidable additional costs that may be incurred for construction of phased individual segments since such a phased process would most likely result in the construction of infrastructure (such as track crossovers) that would later be removed. No topographic or other field surveys were available or used in the compilation of the inventory of infrastructure required for the cost estimate.

The conceptual design and costing assumes that the third track and Richmond improvements can be largely fit within the existing CSX right-of-way except in those locations where narrow right-of-way or topographic restrictions, as could be best identified from aerial photography and videos, were determined. This best-fit approach has to be made without the benefit of detailed surveys or engineering and is subject to change as further detailed information becomes available during subsequent engineering and design phases of the program. Earth filling along elevated portions of right-of-way or cutting along hillsides to

accommodate the third track may require purchase of additional right-of-way.

It is important to note that HDR is not assuming at this time, and has not included in the estimated minimum cost, a cost of the use of the land owned by CSX upon which to build the third track. Agreement by CSX to allow the use of the land would obviously be essential, as well, as would agreements between the parties regarding access, liability, maintenance and other legal matters.

The estimated minimum cost also does not include costs associated with the relocation of utilities (principally fiber optic lines and petroleum pipelines) in the CSX right-of-way. Without detailed field surveys it is not possible to quantify the impacts on such utilities. Additionally, the various utility easements granted by CSX have varying stipulations as to which party would be financially responsible for relocating an affected utility line, the utility company, CSX or a third party, which in this case may be the Commonwealth of Virginia. A legal review of all affected utility easement agreements will need to be completed before an accurate estimate of relocation costs can be made. Relocation of utilities could result in substantial costs and would have to be negotiated as part of the agreement to use the rail line.

Although the estimated minimum cost does not include right-of-way or utility relocation costs it does include contingency allowances to cover unknown aspects of the other estimated construction items. This contingency is added to the overall cost and amounts to 30% of such costs. The contingency will be reduced as the program moves forward and additional information becomes available as a result of further analysis, design and field surveys.

The estimated minimum cost has been calculated in year 2006 dollars and does not include inflation adjustments for year of expenditure costs. An accurate estimate of inflated costs cannot be identified until a funding source is identified and a multi-year prioritized program of projects is developed.

The improvements identified in this study do not include the construction of a third track through Ashland, Fredericksburg or across the Potomac River between Arlington and Washington, DC. These three bottlenecks will require extremely expensive solutions that are likely to have significant impacts on the surrounding communities. Improved passenger rail service can be provided in this corridor without a third track in these three locations, but these areas will become bottlenecks that will limit reliability and the capacity for additional service growth.

Based on the concepts, assumptions and limitations noted above, HDR has calculated the estimated minimum cost of the third track excluding the cost of right of way and relocation of utilities in the 92.7 mile portion of the corridor and improvements in Richmond at $684 million, in 2006 dollars. Detailed engineering analysis may subsequently deem the

construction of the third track unfeasible due to either cost and or engineering issues.

It must be noted again that the investments in the construction of a third track discussed in this study will not necessarily result in the elimination of the heat restrictions on train speeds that CSX enforces during warm weather. These heat related speed restrictions are a matter of CSX corporate policy that is based on concerns about safety and liability. CSX has indicated that they will maintain this policy regardless of the level of investment in the rail infrastructure. This issue must be addressed in the agreements that will be developed for the construction and operation of the proposed improvements.

6. Potential Environmental Effects, Documentation and Permitting Requirements

A review of key resource features along the corridor was performed using various available mapping and photographic resources. Assumptions about the width of anticipated construction limits and other actions offered guidelines for the conceptual analysis. At this time, it appears that the third track can be constructed nearly entirely within existing CSX right-of-way. As part of the assessment process, each mile of the corridor was assigned one of three categories for environmental concern. The categories are: low, medium, or high. A cost percentage applied to each of these categories generally covers the added dollar cost to perform the documentation, permitting and mitigation activities.

Several locations within the corridor have the potential for considerable environmental impacts and associated mitigation. About 25 miles of the corridor present areas of high concern. Some locations have key issues of water bodies or wetlands; segments with known historic sites will require special consideration to satisfy the National Historic Preservation Act and requirements of the Virginia Department of Historic Resources. It is important to note that this is a concept-level review only; no field work or detailed research has been conducted for this effort.

Permitting requirements apply for all construction projects including, as appropriate, permits from the U.S. Army Corps of Engineers for wetlands, compliance with the Threatened and Endangered Species Act, compliance with numerous laws and regulations of the Commonwealth regarding erosion and sediment control, storm water management, coastal zone management, hazardous materials, and Chesapeake Bay Preservation Act. Terms of the permits may include mitigation activities on- or off-site.

A Tier I Environmental Impact Statement (EIS), prepared in compliance with the National Environmental Policy Act (NEPA), has been completed for this corridor as part of the Southeast High Speed Rail Corridor project.

Working under federal guidelines (FRA and/or Federal Transit Administration), DRPT anticipates one or more Environmental Assessments (EA) will need to be prepared, depending upon project phasing. The development of EAs (or possibly more rigorous EISs) would require scoping, agency coordination, detailed field reviews for numerous conditions and resources, research and preliminary engineering. For planning purposes, this study for the third track suggests that a single Tier II NEPA document for the whole corridor would likely not be developed for supplementing the existing infrastructure.[1]

7. Legal and Financial Issues

In meeting the Legislative mandate for this report, DRPT requested the assistance of the Virginia Transportation Research Council (VTRC) in identifying pertinent legal and funding issues. VTRC found that Chapter 49 U.S.C. § 10901 of the United States Code provides that construction of an extension or additional rail line may be undertaken only if the Surface Transportation Board (STB) issues a certificate authorizing such activity. DRPT has established a position, however, that the addition of the third track in the Washington to Richmond corridor does not constitute construction of a new rail line, but rather construction of additional capacity in an existing rail corridor and thus would not come under the authority of the STB.

VRTC also identified several funding mechanisms that may apply to state funding of the third track program. These include the first source of dedicated funding for freight and passenger rail improvements in Virginia history was established through the Rail Enhancement Fund (REF). The purpose of the fund is to provide monies for the acquisition, lease, or improvement of railways or railroad equipment, rolling stock, right-of-ways or facilities for freight and or passenger rail purposes. All projects receiving funds from the REF must result in a public benefit and include a minimum of 30% cash or in-kind matching contribution from a non-state source, which may include a railroad, a regional authority, a local government source, or a combination of such sources.[2]

Another potential source of funding is the Transportation Partnership Opportunity Fund, which is to be used by the Governor to encourage the development of transportation projects through design-build pursuant to the Public-Private Transportation Act and to provide funds to address the transportation aspects of economic development opportunities. Money

[1] From an environmental documentation standpoint, additional trackage either on existing alignment or on a rail bypass of either Ashland or Fredericksburg would likely involve significant impacts or be of considerable controversy, thus requiring an EIS. Improvements through both of those communities have not been considered in this study.

[2] http://www.drpt.virginia.gov/studies/files/REF-Policy-Goals-2005.pdf

from this fund can be awarded as grants, revolving loans, or other financing tools and equity contributions to an agency or political subdivision of the Commonwealth or to a private entity or operator which has submitted a proposal or signed a comprehensive agreement to develop a transportation facility. Loans from this fund are interest free, but are not to exceed $30 million. Grants are not to exceed $5 million.

The Virginia Public-Private Transportation Act of 1995 (PPTA) was intended to allow public entities to contract with private entities for transportation services. Along these lines, a third track could be funded by a private entity. The Act provides that any private entity seeking authorization under this chapter to develop and/or operate a transportation facility shall first obtain approval of the responsible public entity. Such private entity may then initiate the approval process by requesting approval from the agency or the responsible public entity may request proposals from other prospective private sources. There are several advantages and disadvantages in this instance to seeking a public-private agreement. The main advantage of a PPTA agreement would be to take the funding burden off of the state and place it on a private company. The private entity could also be charged with the numerous administrative tasks associated with gaining approval of new rail construction.

VTRC also identified state legislation and regulations pertaining to right-of-way and eminent domain powers of the state; liability and indemnification issues; and tax issues associated with railroads. Each of these issues is discussed in Section 6 of this report.

8. Operation of Electric Powered Trains

The General Assembly request directing advancement of the third track study also requested an estimation of the cost for powering passenger trains on the third track by electricity. At present, all train service, both passenger and freight in the Washington to Richmond corridor, is powered by diesel locomotives.

Amtrak passenger service is electrified north of Washington to New York City and beyond to Boston. Amtrak Northeast Corridor passenger trains now originating in Newport News and Richmond must switch engines in Washington, a time consuming process, in order to proceed northward on the corridor since diesel service is not permissible into and through New York City. This is due to the long tunnels and confined underground station spaces in New York that can not accommodate diesel powered engines and the exhaust they produce. Electric train propulsion also has substantial air quality benefits and an electrified rail corridor can also be used as a power line transmission corridor with certain co-locational benefits.

However, the installation of an electrical catenary system may raise serious concerns for CSX. The railroad would probably never utilize the electrical power for their freight trains, but they would be required to make substantial changes to the way they operate and maintain the rail line. The supports for the overhead power lines would impact the right-of-way and clearances for maintenance. There would be a new safety risk associated with the electrical power system with personnel entering the right-of-way.

The Southeast High Speed Rail Corridor (SEHSR) between Washington, DC and Charlotte, NC, which includes the Washington to Richmond Corridor, does not propose electrification. The Alternatives Analysis and Tier I Environmental Impact Statement that have been completed for SEHSR recommend the use of modern diesel locomotives which are capable of operating at speeds well in excess of the maximum 110 mph proposed in this study. Further, the level of service provided and the number of passengers served in this corridor did not justify the huge expense of installing an overhead catenary electric power system.

The approach to estimating the cost of an electrified third track from Washington to Richmond is based on a concept similar to other electrified rail operating systems such as the Amtrak Northeast Corridor (NEC), the Metro-North Railroad New Haven Line, and the French TGV electrified system. The developed concept provides realistic costs for the proposed system which has approximately 118 miles of operating trackage.

The viability of only electrifying the proposed third track with respect to operational issues and rolling stock compatibility was evaluated and HDR concluded that it would not be either practical or economically viable to electrify simply the third track and not the other two tracks. With only one track electrified, severe constraints on electric train operations would occur. For example, simultaneous movement of electric trains in opposite directions on a section of the corridor would not be possible without double-tracking the electrified portions which would then require an expensive four-track section. Likewise, electrified passenger service to stations would be restricted to one track and platform further restricting train dispatching flexibility.

By providing overhead catenary electrified service for all three tracks, the electric passenger service could be operated on any track in the corridor. Diesel powered freight service could also operate on any of the three tracks since diesel service can operate with few hindrances under an electrified catenary system. Therefore, in order to allow the greatest degree of operational flexibility and efficiencies in the corridor, the electrified system is assumed to be based on the electrification of all three tracks.

The developed concept includes the sizes and spacing of traction power substations, required electric utility supply feeders, the form, clearances and configuration of the overhead catenary contact wire system as well

as operating considerations for the electrified system including a storage yard in Richmond.

Based on the conceptual electrified rail system described above, HDR prepared an order of magnitude minimum cost estimate to construct the system between Washington Union Station and Richmond Main Street Station. The cost estimate represents the minimum total construction cost of the electrified rail system including six electric locomotives that would be required to provide at least minimal electric service between the two cities. Operational costs, or comparisons with conventional diesel train operating costs, are not included in the cost estimate. It is important to note that the derived costs are preliminary estimates only and were developed without benefit of engineering plans, topographic surveys or field investigations. The total minimum cost for electrifying the Washington to Richmond corridor as a three track railroad is estimated at $953 million, in 2006 dollars, or $7.8 million per mile over the 118-mile corridor length. This is in addition to the $684 million cost of the rail improvement. The total minimum cost, in 2006 dollars, of building a fully electrified three track rail line from Washington to Richmond is $1.6 billion.

9. Proposed Passenger Rail Service to Hampton Roads

DRPT has initiated a separate analysis of enhanced and new Richmond/ Hampton Roads Passenger Rail Project. As part of that initiative various rail routes and services are currently being examined in two corridors connecting to Richmond: one north of the James River on CSX to Newport News and one south of the James River on Norfolk Southern to Norfolk. The trains being proposed in this study would travel to Richmond Main Street Station then continue on to the Washington to Richmond corridor. .

The overview presented below is based, in part, on the work produced to date for the Tier I Draft Environmental Impact Statement (DEIS). DRPT anticipates the release of the DEIS in the spring of 2007. Following public hearings, DRPT will propose a preferred alternative to the Virginia Commonwealth Transportation Board (CTB).

The four alternatives examined in the DEIS are:

1) No Build: Conventional Speed Service – maximum achievable speed of 79 mph – continues existing service only from Main Street Station via CSX routing to Newport News.
2) Alternative 1: New Higher Speed Service – maximum achievable speed of 90 mph or 110 mph -- via Petersburg to Norfolk; Conventional Speed Service via existing CSX routing to Newport News.

3) Alternative 2A: Higher Speed Service via existing CSX routing to a new station in downtown Newport News; new Conventional Speed Service via Petersburg to Norfolk.
4) Alternative 2B: Higher Speed Service only over CSX routing to Newport News.

At this time (Fall 2006), no preferred alternative has been indicated by DRPT for enhanced Hampton Roads service.

The Richmond to Hampton Roads DEIS assumed that slots for nine round trip trains would be available for service to Hampton Roads based on the operations modeling conducted in the FRA Washington to Richmond study and that these trains would continue north of Richmond. However, modeling of corridor capacity and simulation of train operations and constraints of the affected lines would be necessary to arrive at a definitive answer as to any impact of these Hampton Roads trains on the capacity of the Washington to Richmond corridor.

10. Preliminary Implementation Schedule

The followings steps must be completed before actual construction of projects can begin:

- A clear and comprehensive alternatives analysis needs to be conducted. This analysis should include operational modeling, a review of alternative right-of-ways, and ridership projections to determine the public benefits of any proposed improvements.
- Evaluation of the public benefits of all alternatives and a detailed agreement that specifically provides safe, reliable and efficient passenger rail operations.
- Governance issues, such as how and by whom the capital projects are managed, and how the new service will be operated, must be addressed.
- Preliminary engineering must be completed for the proposed projects in order to develop an accurate estimate of total costs and to prepare the appropriate environmental documentation.
- Funding for operating and capital costs must be identified and allocated.

Long-term funding and scheduling commitments require much greater detail and certainty, especially when they become the basis for the governing agreements and the funding commitments that will be necessary amongst the involved parties. A funding plan must be developed and the funding secured before construction can commence. The cost for detailed alternatives analysis, environmental impact assessment and preliminary engineering sufficient to develop a funding plan is not unsubstantial at an estimated $40 million and will take an estimated 48 months.

Given the information evaluated in this study and the preliminary priorities noted above, the following preliminary implementation steps are recommended as a tool in initiating the implementation strategy.

Preliminary Implementation Schedule

1) Initiate a comprehensive analysis that includes:

   a. Review of alternative right-of-ways in the corridor.
   b. Completion of capacity and train operations modeling to determine the full array of needed third track infrastructure.
   c. Development of ridership projections.
   d. Development of a governance strategy.
   e. Identification of public and private benefits.
   f. Establishment of enforceable performance standards.
   g. Development of cost sharing arrangements, and
   h. Development of a funding plan.

   Estimated Duration: 12 months.

2) Develop project implementation priorities, an implementation schedule and cost estimates based on the findings in Number 1. Estimated Duration: 3 months.

3) Prepare agreements to address issues of governance, cost sharing, operations and performance. Estimated Duration: 18 months.

4) Conduct preliminary engineering and environmental documentation for corridor improvement projects. Estimated Duration: 24 months.

5) Secure funding and execute construction agreements among parties. Estimated Duration: 12 months.

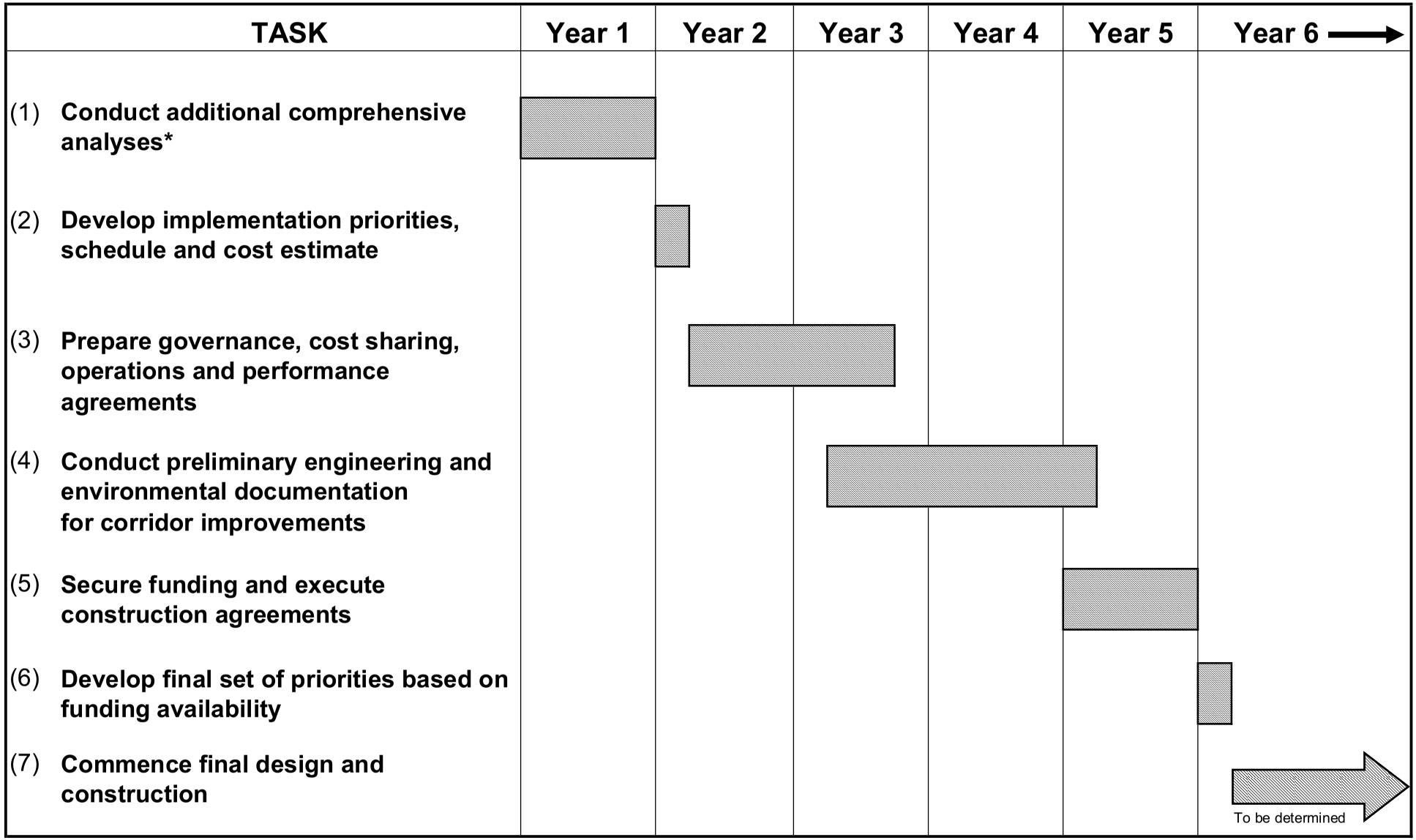
6) Develop final set of priorities based on funding availability. Estimation Duration: 2 months.

7) Commence final design and construction of highest priority projects. Estimated Duration: To be determined.

The implementation plan is illustrated on Figure 2, which follows.

* * *

Figure 2 - Preliminary Implementation Schedule



Includes capacity, operations, alternative right-of-ways, ridership and benefits analyses. Also, develop governance strategy, performance standards, cost sharing and funding plan arrangements.

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1. Introduction: Purpose, Objective and Overview

1.1 Legislative Mandate and Project Objective

In 2006, the General Assembly of Virginia requested that the Department of Rail and Public Transportation (DRPT) "advance the completion of the 'Third Track' study between Washington, D.C. and Richmond and continuation of high speed service between Richmond and Hampton Roads." This request was made in General Assembly H. 5012 (known as the "Caboose Bill").

"As part of this feasibility study the Department shall expand the study's scope to:

(i) identify needed right-of-way parallel to existing tracks, including right-of-way owned by CSX or by other parties;
(ii) identify major environmental issues;
(iii) develop an implementation plan based on the most optimal options, including the schedules for each phase of the project as well as financing for the project;
(iv) review legal and regulatory issues; and
(v) estimate the cost of powering passenger trains by electricity for a Third Track from Washington, D.C. to Richmond."

The objective of this study is to fulfill this legislative mandate and present to the General Assembly an estimate of the order of magnitude costs and other requirements, along with a schedule for implementation, for the addition of a third track in the 118-mile two-track rail corridor owned by CSX Transportation that connects Richmond Main Street Station with Washington Union Station in the District of Columbia.[1] (See Figure 1-1) Additionally, the other issues raised by H. 5012 regarding environmental needs, right-of-way, regulatory issues and powering trains with electricity are also addressed in this report. This report does not address governance, operations or public/private cost sharing. Rail operations modeling is currently being conducted on this corridor to refine the

[1] Amtrak owns one mile of trackage at the southern approach to Washington Union Station. That track traverses a tunnel under Capitol Hill. This study does not address widening the two-track tunnel to accommodate a third track.

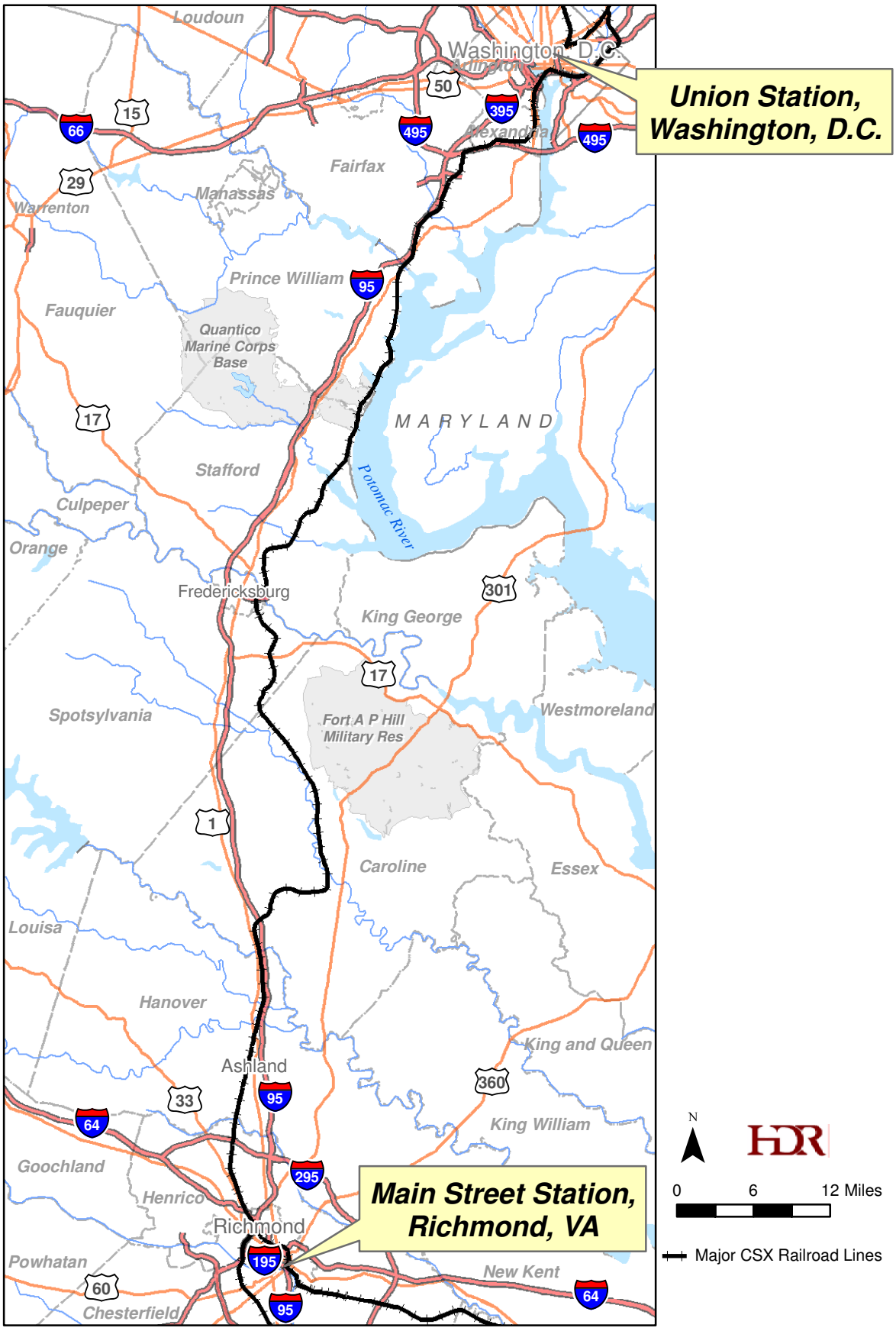

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Figure 1-1
Washington-Richmond Corridor Map

prioritization of projects. Additional engineering will be required to more accurately determine the cost of the proposed improvements.

1.2 Existing Rail Services in the Corridor

Four providers of rail service are operating in the 118-mile Washington to Richmond corridor. These operators and the average weekday train volumes that they operate are:

1. **CSX:** The owner of the corridor, CSX operates approximately 25 to 30 through freight trains per day, depending on location, along the entire length of the corridor. Other local freight trains are also operated along the corridor.

2. **Amtrak:** operates an average of 18 intercity passenger trains per day between Washington and Richmond.

3. **Virginia Railway Express (VRE):** operates 14 daily commuter trains between Fredericksburg and Washington and an additional 16 trains per day on the corridor between Alexandria and Washington.

4. **Norfolk Southern Railroad (NS):** has trackage rights on a 2.2-mile section of the CSX line for delivery of coal to a power plant in Alexandria, operates not more than one train per day. NS also has trackage rights across Long Bridge to connect to the Amtrak Northeast Corridor (NEC) and has recently exercised those rights for operation of intermodal trains.

Based on these train services, current maximum daily volumes of trains on various portions of the corridor are:

Washington to Alexandria:	**81 trains per day[2]**
Alexandria to Fredericksburg:	**62 trains per day**
Fredericksburg to Richmond:	**48 trains per day**

Since the Alexandria to Washington portion of the corridor is largely triple track now, or programmed for the construction of a third track, this report focuses principally on the evaluation of a third track south of Alexandria to Richmond. Ultimately, however, the existing two-track CSX Long Bridge crossing the Potomac River from Virginia into Washington will need to be augmented with additional capacity in order to handle increased numbers of both passenger and freight trains serving Washington and destinations to the south assuming the construction of a third track.

[2] CSX has noted recent seasonal peak volumes as high as 88 trains per day on the Washington to Alexandria segment.

1.3 Previous Corridor Studies

Previous Studies. Three major studies of rail improvements in the Washington, DC to Richmond corridor have been conducted over the past ten years, all of which address the feasibility of implementing fast, frequent and reliable passenger rail service. DRPT conducted an initial concept and feasibility study in 1996. This was followed up by a more detailed operational analysis and preliminary engineering study conducted by the Federal Railroad Administration (FRA) and Amtrak in 1999. In 2002, DRPT and the North Carolina Department of Transportation (NCDOT) completed the Southeast High Speed Rail (SEHSR) Tier I Environmental Impact Statement (EIS) which integrated the Washington, D.C. to Richmond improvements into the longer bi-state corridor extending to Raleigh, N.C.

The approach followed in all of these studies was to establish goals for provision of quality service and to then identify a package of improvements that would be sufficient to allow for those goals to be met. Over time, people have come to use the term "third track" to describe the improvements that are being recommended in these studies. However, the package of improvements identified in these reports includes much more than just a third track. A detailed list of track, signal and station improvements has been recommended which are designed to address the capacity and speed constraints of the existing infrastructure and to accommodate the service goals of reducing travel time, increasing frequency and increasing reliability of passenger trains.

Of the three studies conducted, the Amtrak/Federal Railroad Administration (FRA) report, which was submitted to Congress in May 1999, provides the most comprehensive analysis of the proposed improvements. The stated purpose of that study was to specify, "... the infrastructure improvements that would enable the Washington-Richmond Corridor to accommodate reliably the mix and volume of higher speed intercity passenger, commuter and freight services that the line's operators and public partners foresee for the year 2015." An assessment of then current facilities, services and operating conditions was conducted as part of that study.

Subsequent of the above studies, all of the key parties in this corridor, including DRPT, FRA, Amtrak, CSX and the Virginia Railway Express (VRE), the commuter railroad operating between the Northern Virginia suburbs and Washington, D.C., worked together to characterize the service needs for the study planning year of 2015. An operational analysis was conducted to simulate the performance of future services over various configurations of infrastructure.

From that analysis, a set of infrastructure investments was developed that would allow operations that achieve the intended service quality and train volumes with satisfactory reliability. The operational report concludes that

"Reliable high-speed passenger train service between Washington and Richmond is a feasible goal provided that requisite infrastructure improvements are constructed."

The most recent evaluation completed for continuing the third track program in the corridor was the *Third Track Conceptual Location Study* completed by DRPT in June 2004. That study identifies the conceptual location of a third mainline track in the corridor between Richmond Staples Mill Road Station and the Ravensworth Interlocking, a crossover which is located south of Franconia in the Northern Virginia suburbs of Washington, D.C. The corridor examined in that study is 92.7 miles in length and accounts for 78% of the total mileage between Richmond Main Street Station and Washington Union Station. The conceptual third track location identified in the study lies principally on the west side of the existing two-track corridor. The objective of that study, which took into account existing and planned rail infrastructure, is to help guide planners and engineers in formulating the location and design of individual future improvements and ultimately the location of the third track.

DRPT also prepared a *Richmond Area Master Plan* in 2003 that addresses needed improvements on CSX between the Amtrak Staples Mill Road Station, located north of the city, and Main Street Station in downtown Richmond. That study analyzed a number of Amtrak intercity passenger rail issues including better transit times, options to bypass the congested CSX freight switching operations at Acca Yard, and passenger train layover and turning locations necessary for increased service to Main Street Station. All of these improvements would are critical to providing enhanced intercity passenger service to downtown Richmond.

Implementation of Third Track Projects. With passage of the Virginia Transportation Act of 2000 (VTA2000), the Commonwealth began design and construction of several sections of third track in the corridor and a number of the improvements supportive of the third track program. These projects, carried out in accordance with a Memorandum of Understanding signed by the Commonwealth, VRE and CSX, include approximately 12.8 miles of mainline third track at:

- Crystal City in Arlington County (1.1 miles)
- L'Enfant Plaza in Washington, DC (1.0 mile)
- Franconia Hill in Fairfax County (7.6 miles)
- Fredericksburg in Stafford County (3.1 miles)

In addition, other infrastructure supportive of the third track was also implemented under VTA2000. Most notable is the construction by VRE of the second CSX bridge spanning Quantico Creek, which is scheduled for completion in 2007. This new bridge will eliminate the single largest bottleneck in the Washington to Richmond corridor by adding second and third track capacity to what is now a single-track crossing of the creek.

Other improvements that are completed, under design or in construction that provide immediate benefit to passenger and freight train movements, as well as support of three-track operations in the corridor, include:

- Train crossovers between mainline tracks at Elmont (Hanover County), Arkendale (Stafford County), Possum Point (Prince William County), and Slaters Lane (City of Alexandria).
- The new AF Interlocking[3] in Alexandria where CSX and Norfolk Southern tracks meet.
- 4.7 miles of third track between AF Interlocking and SRO Interlocking in Crystal City.
- New and upgraded signal and communication systems.
- A new railroad bridge and extension of Amtrak's Auto Train lead track at Lorton.
- Relocation and triple tracking of CSX tracks at Potomac Yard in Alexandria/Arlington.

The completed or currently programmed sections of third track (See Figure 1-2) account for 17.5 miles, or 15%, of the 118-mile Washington to Richmond corridor. This study does not include these completed or programmed miles in the total package of identified work required to finish the entire three track system. Likewise, costs for these completed or nearly completed projects are not included in the cost estimates presented in this report.

1.4 Definition of Third Track Concept and Intended Operation

The third track between Washington and Richmond would not be solely dedicated to passenger service. Rather, the track would be designed and operated as a mainline track along with the other two mainline tracks as a complete integrated three-track system. Crossovers between tracks would be located at key locations to assure maximum fluidity of train operations. Both passenger and freight trains would have access to the new third track throughout the day depending on train dispatching requirements and priorities. Passenger trains would also continue to have access to the other two mainline tracks as well.

The integrated three-track system would greatly facilitate train operations by permitting train movements in both directions while a train is stopped at a station or otherwise occupying one of the three tracks. For example, in the case of a minor train derailment or train breakdown blocking one track it may be possible to move trains around it in both directions simultaneously. At present, when such an event occurs without the third track, major disruptions in train service occur in one or both directions on the railroad. These disruptions often lead to significant delays in VRE

[3] An Interlocking is a point where one or more tracks or routes meet or cross and includes crossovers between two or more set of tracks along a mainline track system such as the Washington to Richmond CSX Corridor.

commuter and Amtrak intercity passenger train service. It should be noted that the construction of the third track will not result in the elimination of the CSX heat restriction policy which limits train speeds and which severely impacts reliable rail operations during warm weather periods.

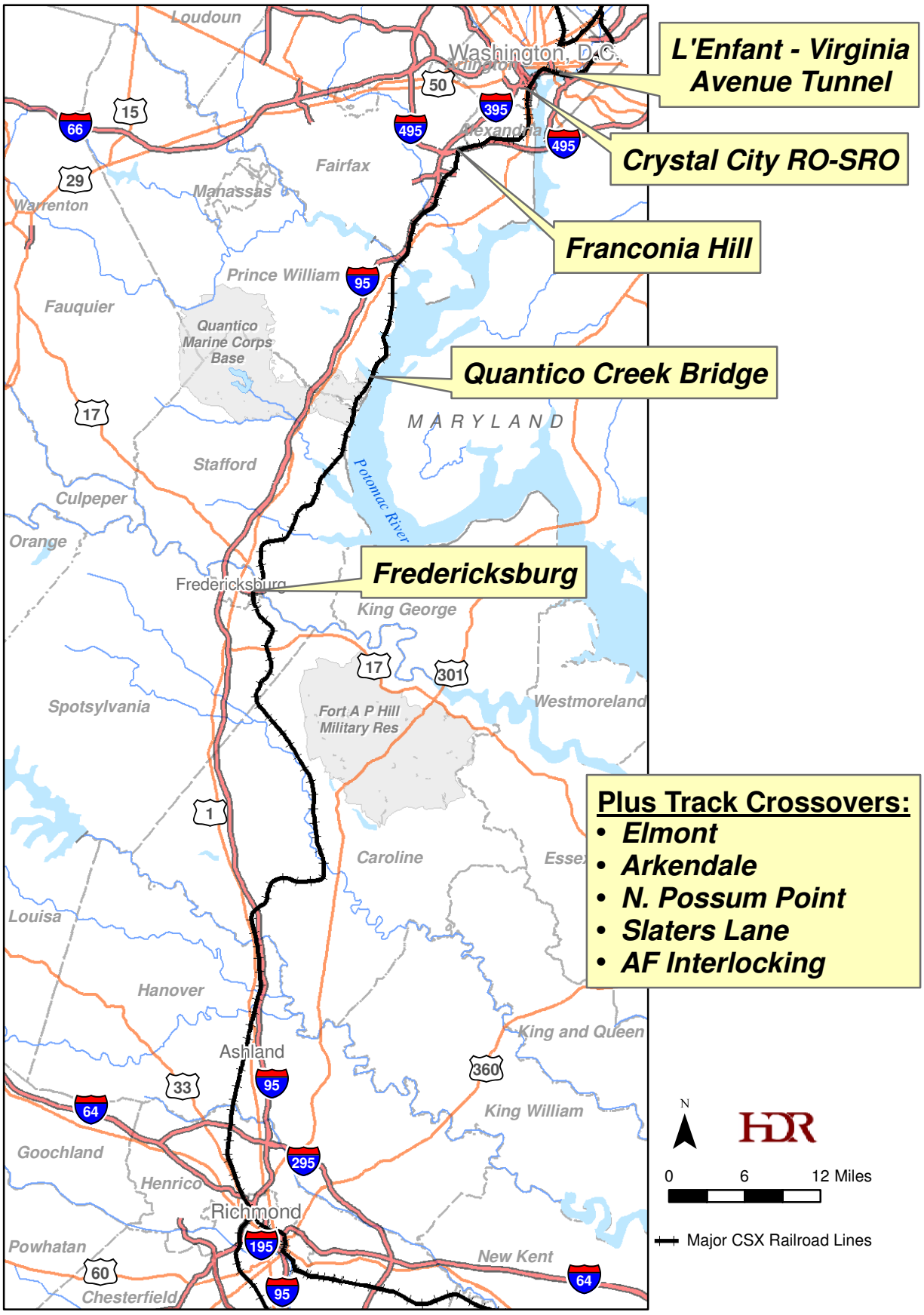

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Figure 1-2
Programmed or Completed Sections of Third Track

2. Description of Third Track Project Status and Limits

The third track study corridor begins at Main Street Station in Richmond and extends 118 miles north to Washington Union Station in the District of Columbia. This study, however, does not include every mile in that corridor for several reasons. These reasons are:

- Some sections of the corridor, as noted above, already have the third track installed or are scheduled and programmed to have the third track completed in the near future.
- Other short sections of the corridor are not anticipated to require a third track for optimal train operations.
- Three specific locations (Ashland, Fredericksburg and Long Bridge across the Potomac River in Washington, D.C.) have major constraints that would require substantially greater analysis and coordination with an expanded stakeholder base before a decision can be made as to if and when to proceed with a third track.

The sections of the Washington to Richmond corridor specifically addressed in this report are:

1) **Milepost (MP)[1] SRN 0.0 (Main Street Station) to MP 1.1 (RF&P Subdivision, South Acca Yard, total 5.1 miles)**
2) **MP 1.1 (South Acca Yard) to MP 4.5 (Staples Mill Road Station)**

Note: The above two sections comprise the Richmond terminal area. A distinct 3-track system connecting Main Street Station and Staples Mill Road Station is not foreseen at this time. Rather, an efficient passenger bypass of the CSX Acca Yard operating on two tracks is the preferred improvement in this area in addition to other track improvements, road crossing closures and passenger train storage and turning facilities. The costs for this Acca Yard "bypass" exceed those already programmed for the Richmond terminal area; however those costs are included in this report because the improvements are essential for operation of efficient three-track passenger service between Washington, D.C. and Richmond.

[1] MP is a railroad designation for Mile Post. This designation can be accompanied by a letter designation denoting the operating subdivision to which the particular section of track belongs.

3) MP 4.5 (Staples Mill Road Station) to MP 13.8 (South Ashland)
4) MP 15.9 (North Ashland) to MP 55.7 (South Fredericksburg)

Note: A 2.1-mile section of third track through the downtown area of the Town of Ashland (MP 13.8 to MP 15.9) is not addressed in this study. Constructing a third track through the city downtown area would result in substantial impacts and would be of such a potential magnitude to warrant a separate analysis including, perhaps, an evaluation of constructing a rail bypass route to the city and coordination with an expanded stakeholder base. Costs for this 2.1-mile section are not included in this report.

5) MP 61.1 (Dahlgren Junction) to MP 96.7 (Ravensworth)

Note: A 3.1-mile section of third track on the south side of Fredericksburg is now programmed for construction. A third track through the downtown Fredericksburg and across the Rappahannock River (MP 55.9 to MP 61.1) is not addressed in this study. Constructing a third track through the city given the existing narrow elevated alignment and right of way would result in substantial impacts to the downtown area and are of such a magnitude to warrant a separate analysis and coordination with an expanded stakeholder base. Without a third track through Fredericksburg, little benefit is gained by building a costly third track bridge across the Rappahannock on the immediate north side of downtown Fredericksburg. Consideration of building the rail bridge should be included in any study of the third track through downtown Fredericksburg. Costs for this 3.1-mile section through Fredericksburg are not included in this report.

6) MP 110.1 (Roslyn Jct., Arlington) to Amtrak Tunnel to Washington Union Station

Note: The third track is completed or programmed for completion between MP 96.7 and MP 110.1. The above section includes a new major two-track bridge across the Potomac River, which would parallel the existing two-track Long Bridge, and additional connecting track capacity to the Amtrak Tunnel leading to Union Station. However, given the magnitude of the costs, anticipated to exceed $500 million, for these particular major improvements they are listed as separate line items in the presentation of project costs for the entire corridor. Excluded from the cost in this section is the one mile of third track already funded and scheduled for construction in the vicinity of the VRE L'Enfant Plaza Station. Also excluded from consideration of additional third track capacity is the Amtrak-owned two-track tunnel leading from the CSX rail

line at Virginia Avenue Tower (MP 112.2), under Capitol Hill and into Union Station.

A summary of the on-going and completed projects in the third track program, evaluation of additional improvements as are addressed in this report, and the portions of the corridor that would need to be addressed separately in the future, as noted above, follows.

Status of 118-mile Third Track Program

1) Completed or currently programmed third track	17.4 miles
2) Third track sections analyzed in this study	87.0 miles
3) Richmond Terminal *(no third track proposed)*	8.1 miles
4) Third track sections recommended for separate future analysis *(Ashland, Fredericksburg and Long Bridge)*	5.5 miles
Total Miles:	118.0 miles

3. Third Track Design and Configuration

Layout for the third track along this corridor requires consideration of several factors. With the exception of a few locations, there is currently a two track mainline system that will have to be expanded to accommodate a third mainline track. At various points along the corridor, existing track realignment will be necessary to provide room for the third track on the right-of-way. In addition to track realignment, it may be necessary to purchase land in areas where the existing tracks cannot be realigned to accommodate the third track.

Construction of a third mainline track will require that existing track facilities be modified to allow for the new track. Modifications include, but are not limited to upgrading existing track sidings to mainline track, widening railroad bridges, and installing and upgrading communication and signal systems. Each of these facility modifications were accounted for in the conceptual design and preliminary cost estimate of the third mainline track in this study.

In addition to the physical track facility modifications, major earthwork will be necessary in certain areas along the right-of-way. Such earthwork would include clearing and grubbing and general grading with cut and fill areas. In order to construct a suitable subgrade, borrow material or geotechnical fabric may be needed to construct the subgrade in accordance with standard plans and specifications.

Lastly, clearances under overhead bridges, and adjacent to overhead utilities were identified and noted in the study. Clearance issues can affect the third track location and may be a precursor to major track shifts.

All of these factors affect the design and configuration of the third track and has been reflected in the cost estimate. A visual representation of the track configuration can be found in Figure 3-1 (MP 3 to MP 40), Figure 3-2 (MP 40 to MP 78) and Figure 3-3 (MP 78 to MP 114) at the end of this chapter.

The following is a description of the corridor by section with the addition of the third track.

3.1 Third Track Configuration – Description of Corridor

3.1.1 MP 4.5 (Staples Mill Road Station) to MP 13.8 (South Ashland)

Segment 1: Staples Mill Road Station to Ashland – MP 4.5 to MP 13.8

Third Track Location: West side of corridor.

Segment Highlights: This area is comprised of medium density industrial and commercial businesses. Beyond the industrial and commercial locations, the area becomes residential suburbs of Richmond. At Parham Road (MP 5.9), approximately one mile north of Staples Mill, the corridor traverses through sparsely populated areas up to the south edge of Ashland at MP 13.8. It appears that there would be minimal affect on non-railroad land or facilities.

3.1.2 MP 15.9 (North Ashland) to MP 55.7 (Hamilton Interlocking)

Segment 2: Ashland to Doswell – MP 15.9 to MP 23.4

Third Track Location: West side of corridor until MP 20, and east side of corridor until MP 23.4.

Segment Highlights: This segment begins at the northern boundary of Ashland and traverses north to Doswell Interlocking. The segment runs through open countryside and there would be minimal affect on non-railroad land or facilities. At Doswell, there is a crossing diamond (MP 21.8) where the CSXT RF&P Subdivision (Washington, DC – Richmond Corridor) crosses the Buckingham Branch Railroad (formerly CSX Piedmont Subdivision).

Segment 3: Doswell to Guinea– MP 23.4 to MP 47.0

Third Track Location: West side of corridor.

Segment Highlights: The segment runs through open countryside and there would be minimal affect on non-railroad land or facilities. There are numerous wet areas in this segment, as well as a bridge across the Mattaponi River (MP 34.7). In some locations, the corridor is surrounded by water on both sides.

Segment 4: Guinea to Hamilton Interlocking – MP 47.0 to MP 55.7

Third Track Location: Runs along the west side of the corridor until MP 52.0 and then shifts to the east.

Segment Highlights: The segment runs through open countryside and there would be minimal affect on non-railroad land or facilities. At the

north end of the segment, the track location shifts to the east in the curve prior to Olive (XR).

3.1.3 MP 55.7 (Hamilton Interlocking) to MP 96.7 (Ravensworth)

Segment 5: Hamilton Interlocking to Dahlgren Junction – MP 55.7 to MP 61.1

Third Track Location: East side of corridor.

Segment Highlights: The Fredericksburg third mainline track upgrade (HA to FB) is a currently planned and funded VTA2000 capital improvement project in this segment. A third track is not planned from MP 56 (North of Hamilton Interlocking) to MP 60.7 (South of Dahlgren Junction). The northern portion of this segment crosses over the Rappahannock River (MP 59.6), but a third mainline track is not planned for this bridge at this time nor for the downtown Fredericksburg section leading to the bridge.

Segment 6: Dahlgren Junction to Woodbridge – MP 61.1 to MP 88.7

Third Track Location: The conceptual track location alternates between the east and west sides of the corridor dependent on topography, adjacent land use, and existing passenger station platform facilities.

Segment Highlights: This segment traverses through a rural, sparsely populated area up to the U.S. Marine Corps Base at Quantico. Along the northern portion of the segment the tracks run adjacent to the Potomac River. There are four VRE passenger stations in this section of the corridor: Leeland Road (MP 63.4), Brooke (MP 67.9), Quantico (MP 78.8), and Rippon (MP 85.8). A new VRE station is planned at Cherry Hill (MP 83.0). The Rippon Station has an overhead pedestrian walkway structure that is necessary for access to the platform on the east side of the tracks due to the existing topography at that location. VRE train access is on the easternmost track, although Quantico has a platform and shelter on the west side that Amtrak serves. The third track locations in this segment are described on a sub-segment basis as follows:

1) Dahlgren Junction to MP 63 – third mainline track on the east:

2) MP 63 to Aquia Creek (MP 70.9) – third mainline track on the west: The VRE Leeland Road Station (MP 63.5) is on the east side of the corridor. In order to avoid relocating the passenger platform at this station, the third mainline track is shown on the west side of the corridor. The VRE Brooke Station (MP 67.9), approximately 4.4 miles north of Leeland Road, is on the east side as well.

3) Aquia Creek (MP 70.9) to Widewater (MP 74.5) – third mainline track on the east: The shift of the third mainline track occurs in the curve just north of the Aquia Creek Bridge (MP 70.9).

4) Widewater (MP 74.5) to Woodbridge (MP 88.7) – third mainline track on the west: There is currently a single track bridge over Quantico Creek. A second two-track bridge is under construction and scheduled for completion in 2007. The new bridge is being built to the west of the existing bridge and will accommodate second and third mainline tracks.

Segment 7: Woodbridge to Ravensworth – MP 88.7 to MP 96.7

Third Track Location: The conceptual track location alternates between the east and west sides of the corridor dependent on topography, adjacent land use, and existing passenger station platform facilities.

Segment Highlights: The segment begins in a rural, sparsely populated area and then runs adjacent to alternating areas of residential and light industrial developments. There are two VRE passenger stations in this segment: Woodbridge (MP 88.9) and Lorton (MP 93.4). These are all single platform stations with train access on the easternmost track.

1) Woodbridge (MP 88.7) to MP 90 - Third mainline track on the east. There is not sufficient land available between the corridor and US Route 1 to accommodate a second platform and third mainline track without major conflicts. Therefore, the track may need to shift to the east as it runs through the VRE Woodbridge Station resulting in reconstruction of the station platform.

2) MP 90 to Ravensworth (96.7) – Third mainline track on the west. At Lorton, the Amtrak Auto Train facility sits on the west side of the corridor. The lead track into the facility may need to be used as the third mainline. However, use of that track will complicate Amtrak Auto Train switching, train storage, and train make-up activities at the Lorton facility. Major revisions to the facility and operations would be required if the third mainline track is placed on the west side, although that would allow use of the 3-track bridge over Lorton Road. If the third track is placed on the east side at Lorton, right-of-way may need to be purchased and a new bridge or span across Lorton Road would also need to be built.

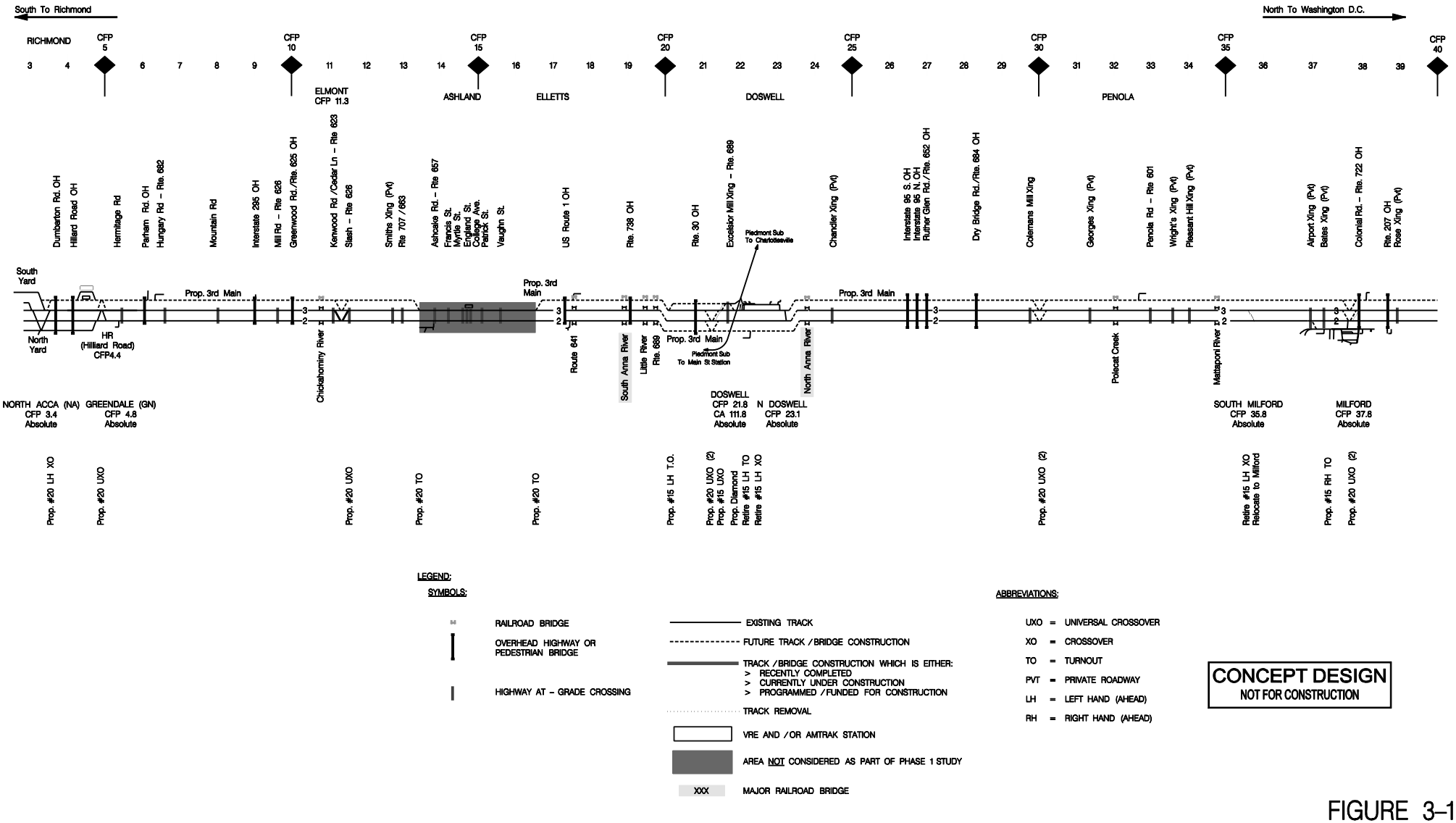

FIGURE 3–1

DESIGNED DRR 11-9-06	REVISIONS	PREPARED BY:	PROJECT:
DRAWN MAR 11-9-06	DATE / BY / DESCRIPTION	HDR	THIRD TRACK FEASIBILITY STUDY WASHINGTON, D.C. TO RICHMOND, VA.
CHECKED		1101 KING STREET–SUITE 400 ALEXANDRIA, VIRGINIA 22314–2944 WWW.HDRINC.COM	CSX CORRIDOR MP CFP 3 TO MP CFP 40
APPROVED		DRPT VIRGINIA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION 1313 EAST MAIN STREET, SUITE 300 RICHMOND, VIRGINIA 23218	SCALE: NONE · DRAWING NO.: SK – 1 · SHEET NO.: 1

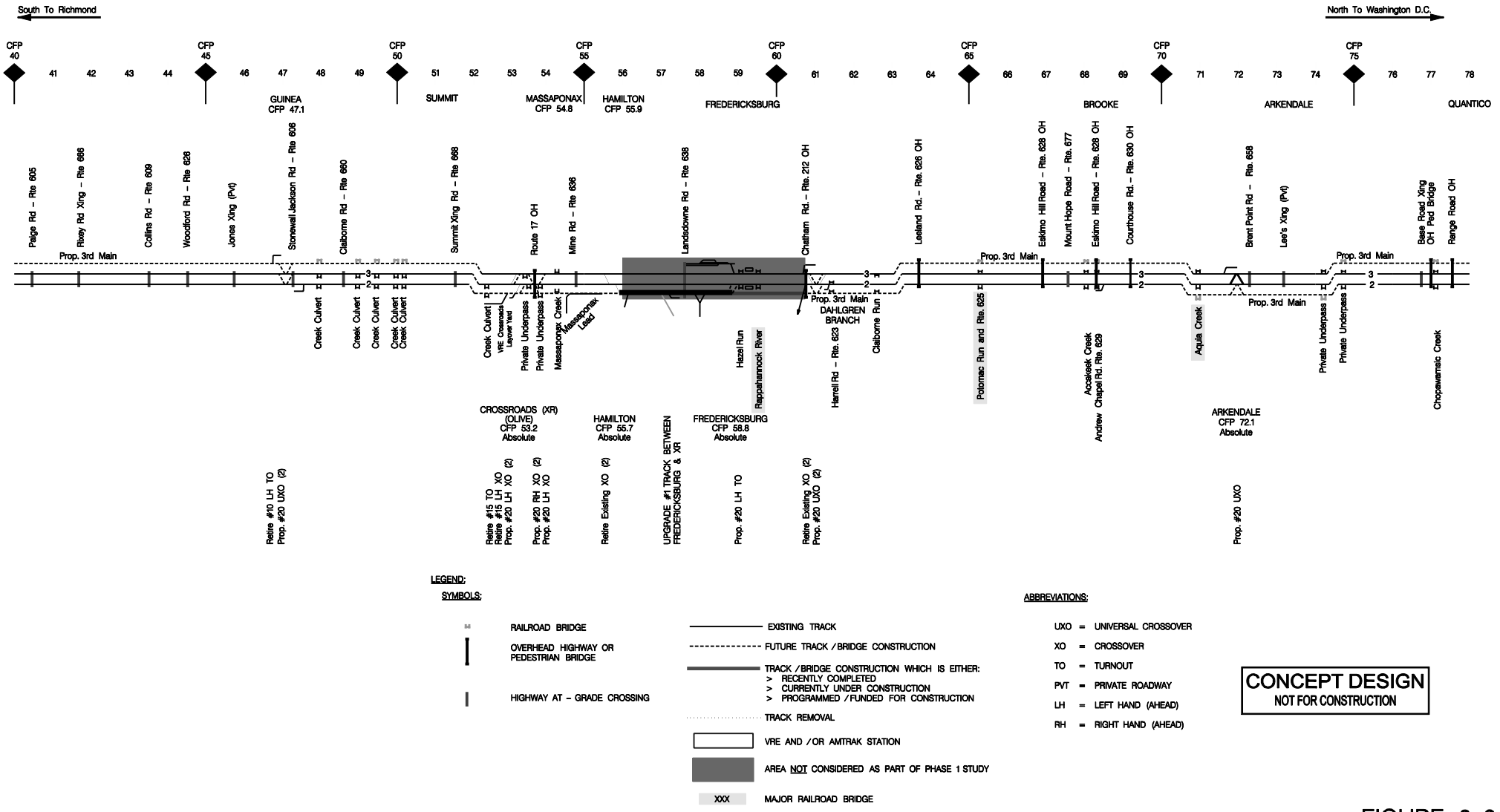

FIGURE 3–2

DESIGNED DRR 11-9-06	REVISIONS	DRPT	PREPARED BY:
DRAWN MAR 11-9-06	DATE / BY / DESCRIPTION	VIRGINIA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION 1313 EAST MAIN STREET, SUITE 300 RICHMOND, VIRGINIA 23218	HDR 1101 KING STREET–SUITE 400 ALEXANDRIA, VIRGINIA 22314–2944 WWW.HDRINC.COM
CHECKED DATE			
APPROVED DATE			

PROJECT:
THIRD TRACK FEASIBILITY STUDY
WASHINGTON, D.C. TO RICHMOND, VA.

CSX CORRIDOR MP CFP 40 TO MP CFP 78

SCALE	DRAWING NO.	SHEET NO.
NONE	SK – 2	2

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11/30/2006

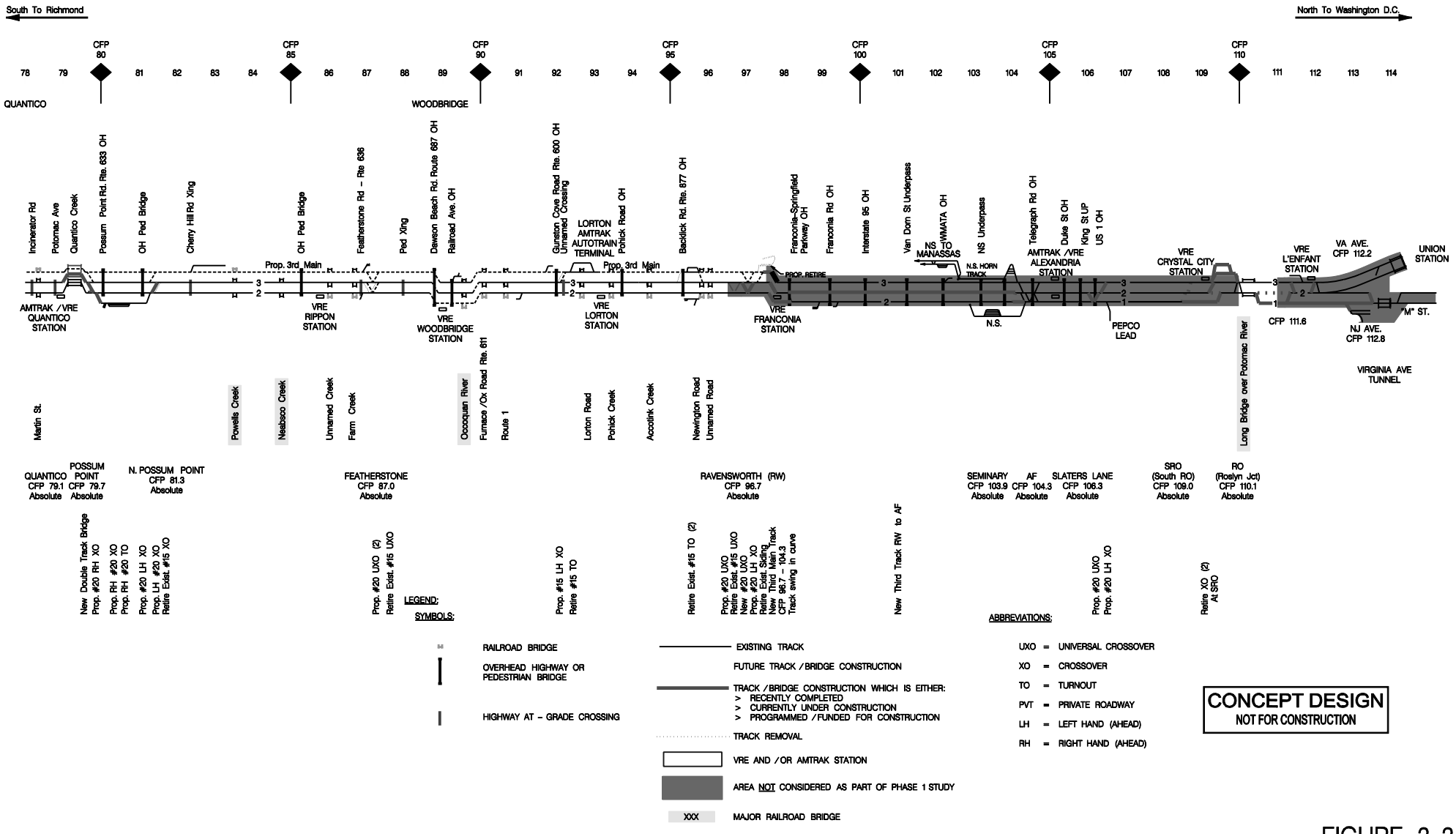

FIGURE 3–3

DESIGNED DRR 11-9-06	REVISIONS	DRPT	PREPARED BY:
DRAWN MAR 11-9-06	DATE / BY / DESCRIPTION	VIRGINIA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION 1313 EAST MAIN STREET, SUITE 300 RICHMOND, VIRGINIA 23218	HDR 1101 KING STREET - SUITE 400 ALEXANDRIA, VIRGINIA 22314-2944 WWW.HDRINC.COM
CHECKED DATE			
APPROVED DATE			

PROJECT:
THIRD TRACK FEASIBILITY STUDY
WASHINGTON, D.C. TO RICHMOND, VA.

CSX CORRIDOR MP CFP 78 TO MP CFP 114

SCALE	DRAWING NO.	SHEET NO.
NONE	SK - 3	3

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11/30/2006

4. Estimate of Minimum Construction Cost

4.1 Cost basis assumptions and limitations

An estimate of probable construction cost for the third track and related civil and signal improvements required for the track construction has been prepared as part of this study. This estimate of minimum construction cost is based on a number of assumptions and has been derived without the benefit of preliminary or detailed engineering plans, surveys or analyses that would require substantially more effort and resources than allowed for in this phase of the study. The construction cost offered here assumes construction of continuous third track along the entire corridor as defined for purposes of this study (i.e. not including Ashland or Fredericksburg). Analysis does not consider additional cost incurred for construction of phased individual segments. Phased implementation involves additional infrastructure (i.e. turnouts) for connection and operations.

4.1.1 General description and assumptions

Using available previous studies, corridor mapping, valuation maps, prior cost estimates, actual costs derived from recent improvement projects completed on the same corridor, aerial (Fli-Map) videos and other materials, HDR prepared a data base that captures railroad infrastructure in the Washington to Richmond corridor potentially affected by the construction of a third track. This inventory of affected infrastructure is compiled on a mile-by-mile basis and includes track, signals, bridges and other structures, sidings and other infrastructure supportive of railroad operations in the corridor. The major categories of construction are enumerated and described below in Section 4.2. A Summary of Cost Assumptions is provided in Section 4.3.

The analysis also assumes that the third track can be largely fit within the existing CSX right-of-way (ROW) except in those locations with narrow right-of-way or topographic restrictions, as could be best identified from mapping and aerial photography / video. The fitting of the third track into the corridor further assumes that shifting of the existing two tracks can be made to accommodate the new track to the greatest extent possible. Again, this best-fit approach has to be made without the benefit of detailed surveys or engineering and is especially subject to change as further detailed information becomes available during subsequent engineering and design phases of the program.

4.1.2 Construction unit costs

Current (2006) unit costs are utilized in estimating construction costs. The data base is designed, however, to permit projecting estimated construction costs for future year implementation of the project based on a phased construction schedule and anticipated rates of inflation. Note that this is an intended future application of the data base and that phased, inflated future costs are not included here. As part of this process, HDR has also designed the data base such that costs of the third track can be extracted on a mile-by-mile or larger segment basis for input into formulation of a preliminary implementation schedule. The estimated construction cost (unit and total) provided here represents HDR's best judgment by experienced and qualified professionals who are generally familiar with the construction industry. One particular source of cost information used for this study is estimates and actual costs from recently completed construction projects along the CSX corridor funded by the Commonwealth.

4.2 Construction categories

In an effort to divide the work into major construction categories the corridor construction cost data base uses 13 categories. Ten of these categories are considered "hard costs" or items requiring physical construction. The remaining three categories are considered "soft costs" which are real costs associated with the design and construction of the third track. Each major category is also divided into subcategories of construction where specific unit costs have been assigned. As an example, Category 2: Special Trackwork includes "Install No. 20 Universal Crossover" as subcategory 2F. A list of the categories, subcategories and respective estimated unit cost is shown in Table 4-1. A description and declaration of assumptions is shown below.

4.2.1 Category 1: Trackwork

This category of construction is included for every mile of the corridor considered as part of this study and includes general trackwork of two basic forms of track, mainline and sidings. HDR assumed that siding construction costs would be slightly less than mainline costs due to reduced material cost (e.g. less ballast and sub-ballast, smaller rail, wider tie spacing, etc.)

In addition to mainline and siding construction, there is also a subcategory for shifting the existing track alignment, where new track materials would not be required. Such track realignment would be required in locations where the proposed third track shifts from the east side of the existing two-track main to the west side (or vice versa), at certain overhead bridges with limited horizontal clearance, and at existing passenger stations. In order to capture the cost of track realignments not specifically accounted for, and for minor ROW acquisition, HDR added a

Table 4-1: Summary of Construction Categories

No.	Category	Unit Cost		Description
1	**Trackwork**	Construction and realignment of track which includes rail, ties, OTM, ballastsub-ballast, and 3" subgrade preparation.		
A	136# CWR Mainline	$240	TF	Mainline track construction
B	115# Relay Rail	$192	TF	Siding track construction (80% of Mainline construction)
C	Mainline Realignment	$108	TF	Relocation of existing mainline for the new alignment (45% of Mainline construction)
2	**Special Trackwork**	Construction or removal of turnouts and crossovers.		
A	No. 10 - 136# Turnout	$90,000	EA	No. 10 Hand-throw, Timber Turnout
B	No. 15 - 136# Turnout	$173,000	EA	No. 15 Pre-Paneled, Concrete Turnout
C	No. 20 - 136# Turnout	$188,000	EA	No. 20 Pre-Paneled, Concrete Turnout
D	No.15 - 136# Crossover	$338,000	EA	No. 15 Pre-Paneled, Concrete Crossover
E	No.20 - 136# Crossover	$374,000	EA	No. 20 Pre-Paneled, Concrete Crossover
F	No.15 - 136# Universal Crossover	$674,000	EA	No. 15 Concrete Universal Crossover
G	No.20 - 136# Universal Crossover	$749,000	EA	No. 20 Concrete Universal Crossover
H	Retire and Remove Turnout	$16,000	EA	Retire or remove an existing turnout
J	Retire and Remove Crossover	$31,000	EA	Retire or remove an existing crossover
K	Railroad At-Grade Crossing Diamond	$350,000	EA	At-grade railroad crossing diamond
3	**Bridges**	Includes overhead highway bridges, railroad bridges, and pedestrian bridges.		
A	**Railroad Bridges**			
A1	RR Bridge (small)	$5,000	TF	Spans < 20-ft; Bridge Length < 100'-ft; Height < 25-ft.
A2	RR Bridge (medium)	$11,000	TF	Spans 20-ft to 75-ft; Bridge Length 100-ft to 300-ft; Height 25-ft to 50-ft..
A3	RR Bridge (large)	$15,000	TF	Spans > 75-ft; Bridge Length > 300-ft; Height > 50-ft..
B	**Highway Bridges**			
B1	OH HWY Bridge (no conflict)	$10,000	LS	Width of existing bridge columns appears sufficient to accommodate third track construction
B2	OH HWY Bridge (minor conflict)	$100,000	LS	Existing horizontal clearance may not be sufficient to accommodate third track construction and may require modification.
B3	OH HWY Bridge (major conflict)	$2,000,000	LS	Existing horizontal clearance appears insufficient to accommodate third track construction and may require significant modification.
C	**Pedestrian Bridges**			
C1	OH PED Bridge (no conflict)	$10,000	LS	Width of existing bridge columns appears sufficient to accommodate third track construction
C2	OH PED Bridge (minor conflict)	$50,000	LS	Existing horizontal clearance may not be sufficient to accommodate third track construction and may require modification.
C3	OH PED Bridge (major conflict)	$500,000	LS	Existing horizontal clearance appears insufficient to accommodate third track construction and may require significant modification.
4	**Drainage**	Construction or extension of arches, culverts, and pipes necessary for stormwater management.		
A	**Arch**			
A1	3' to 11' Masonry Arch	$63,000	LS	Extension or replacement of existing masonry arch.
A2	12' - 26' Masonry Arch	$109,000	LS	Extension or replacement of existing masonry arch.
A3	3' to 11' Concrete Arch	$55,000	LS	Extension or replacement of existing concrete arch.
A4	12' - 26' Concrete Arch	$95,000	LS	Extension or replacement of existing concrete arch.
B	**Culvert**			
B1	Masonry Box Culvert < 4-ft Max. Dim.	$35,000	LS	Extension or replacement of existing masonry box culvert.
B2	Masonry Box Culvert > 4-ft Max. Dim.	$63,000	LS	Extension or replacement of existing masonry box culvert.
B3	Concrete Box Culvert < 4-ft Max. Dim.	$30,000	LS	Extension or replacement of existing concrete box culvert.
B4	Concrete Box Culvert > 4-ft Max. Dim.	$55,000	LS	Extension or replacement of existing concrete box culvert.
C	**Pipe**			
C1	8" to 16" CIP, CMP, TC, VC, & Conc. Pipe	$6,000	LS	Extension or replacement of pipe.
C2	18" to 36" CIP, CMP, TC, VC, & Conc. Pipe	$15,000	LS	Extension or replacement of pipe.
C3	> 36" CIP, CMP, TC, VC, & Conc. Pipe	$28,000	LS	Extension or replacement of pipe.
5	**At-Grade Crossings**	Construction or enlargement of existing crossing to accommodate third track.		
A	Public	$450	TF	Add third track to existing at-grade crossing.
B	Private	$250	TF	Add third track to existing at-grade crossing.
6	**Utilities**	Protection, replacement or relocation of overhead (OH) and underground (UG) utility crossings.		
A	Overhead Power Line	---	LS	Relocation of existing power line support (NOT CONSIDERED)
B	Overhead Utility	---	LS	Relocation of existing utility (NOT CONSIDERED)
C	Underground Utility	---	LS	Protection or relocation of existing underground utility (NO CONSIDERED)
7	**Communications and Signals**	Installation and relocation of signals and associated communication systems.		
A	Signal work at Interlockings (Exist. and Prop.)	$550,000	EA	Installation of signals for new interlockings or modification at existing interlockings
B	Modification of Existing Signals (other than interlockings)	$325,000	EA	Relocation of existing signals (i.e. intermediate signal columns)
C	Corridor Signal Improvements	$200,000	MI	Signal upgrades or improvements required along the entire corridor.
D	Grade-Crossing Signal Modifications	$250,000	EA	Signal modifications required for at-grade crossing construction.
8	**Right-of-Way**	The right of use of real property obtained through easements, and/or title ownership of property.		
A	Urban	---	SF	Costs associated with purchase of rigt-of-way or easements in urban areas. (NOT CONSIDERED)
B	Rural	---	SF	Costs associated with purchase of rigt-of-way or easements in rural areas. (NOT CONSIDERED)
9	**Stations & Buildings**	Construction of new stations and buildings, and relocation or modification of existing buildings.		
A	Existing Station Modifications	$250	SF	Demolition and reconstruction of station platform.
B	Existing Building Modifications	$10,000	EA	Demolition of existing buildings.
10	**Earthwork**	Grading for trackbed which includes unclassified excavation and compacted fill.		
A	Excavation/Embankment < 5-ft max. height	$75	TF	Cut and fill earthwork. Assume 3-CY per TF
B	Excavation/Embankment 5-ft to 10-ft. max. height	$150	TF	Cut and fill earthwork. Assume 6-CY per TF
C	Excavation/Embankment > 10-ft. max. height	$300	TF	Cut and fill earthwork. Assume 12-CY per TF
D	Unit Cost of Earthwork	$25	CY	Cubic yard of fill material used for calculations above.
11	**Environmental Permitting & Planning**	Planning, permitting, and mitigation activities required by Federal, State, and Local laws.		
A	LOW	2%		Percentage of construction subtotal cost allocated for minor environmental activities required by Local, State, and Federal government.
B	MODERATE	4%		Percentage of construction subtotal cost allocated for moderate environmental activities required by Local, State, and Federal government.
C	HIGH	6%		Percentage of construction subtotal cost allocated for substantial environmental activities required by Local, State, and Federal government.
12	**Engineering Services and Owner Review**	Conceptual, preliminary, and final design and Construction Management required for project completion.		
A	Eng. Design, Construction Management and Owner Review	20%		Percentage of subtotal construction cost allocated for engineering related activities.
13	**Construction Contingency**	Contingency for Construction Costs.		
A	Construction Contingency	30%		Percentage of subtotal construction cost allocated for related construction activities.

line item in each mile for shifting 1,000-trackfeet of both existing tracks. HDR is not suggesting realignment or acquiring ROW in each mile, but this item captures that potential cost. For instance, there may be five adjacent miles with no ROW acquisition or track shift, but the sixth mile may require major realignment to stay on the ROW. The monies previously allocated could be used for that construction (or in some rare instances ROW acquisition). See Section 4.2.8 for details concerning right-of-way acquisition.

In locations where the proposed third track transitions from the east side of the existing track to the west side of the existing track (or vice versa) a work item (1C) has been included for "Mainline Realignment" and assumes a relatively minor shift in horizontal location for 1000-trackfeet in both direction for both existing tracks (4,000-trackfeet total).

Mainline track construction includes (from top down):

- New 136 lb. Continuous Welded Rail (CWR).
- Other Track Materials (OTM) such as tie plates, spikes, and clips.
- Timber ties (unless noted otherwise).
- 12-inches of stone ballast.
- 6-inches of stone sub-ballast.
- 3-inches of subgrade preparation and compaction (i.e. minor earthwork).

For purposes of this study, HDR has calculated track construction for sidings and realignment as a percentage of the mainline construction, assuming that labor cost are nearly the same and material cost are slightly less than mainline construction.

4.2.2 Category 2: Special Trackwork

Special Trackwork includes all trackwork not included in Category 1. Such construction includes installation and removal of turnouts and crossovers of various sizes (i.e. No. 10, No. 15 or No. 20) as well as crossing diamonds. It is assumed that all mainline crossovers would be No. 20 crossovers with concrete ties.

In locations where there are existing turnouts for a siding, HDR assumed that those turnouts would be replaced in the proposed third mainline track.

Turnout / Crossover / Diamond construction includes:

- Rail and OTM.
- Power switches (unless noted otherwise e.g. hand thrown No. 10).
- Concrete ties and switch ties (unless noted otherwise).
- Pre-panelized components delivery (i.e. factory built).
- Field welds.

4.2.3 Category 3: Bridges

This category primarily includes three basic forms of bridges:

- Railroad bridges which carry railroad live load.
- Overhead highway bridges where existing tracks pass beneath a roadway.
- Overhead pedestrian bridges where existing tracks pass beneath a pedestrian walkway.

Given the number of railroad bridges along the corridor (approximately 40), this study simplifies the analysis by considering three basic subcategories of these bridges for the purposes of estimating the construction cost of adding a third track to each bridge. The bridges are described as small, medium and large; the criterion for each is declared below. HDR has made no distinction here as to the type of bridge materials in use on the individual structures (i.e. steel deck plate girders versus concrete beams) or the type of deck (open-deck versus ballasted-deck). A bridge must meet at least two of the three criteria to be considered in the particular subcategory.

Please see photographic examples of bridge subcategories below.

Photo 4-1: CSX Bridge at approximately MP 74.3 over a private road and un-named stream. This bridge is considered a **SMALL** railroad bridge for purposes of this study.

Railroad Bridge (**small**):

- Span length less than 20-feet long.
- Total bridge length less 100-feet.
- Height less than 25-feet above grade or water.

Photo 4-2: CSX Bridge at approximately MP 76.9 over Chopawamsic Creek which is considered a **MEDIUM** railroad bridge for purposes of this study.

Railroad Bridge (**medium**):

- Span length between 20 and 75-feet long.
- Total bridge length between 100 and 300-feet.
- Height between 25 and 50-feet above grade or water.

Photo 4-3: CSX Bridge at approximately MP 84.9 over Neabsco Creek which is considered a **LARGE** railroad bridge for purposes of this study.

Railroad Bridge (**large**):

- Spans length greater than 75-feet long.
- Total bridge length greater than 300-feet.
- Height greater than 50-feet above grade or water.

Overhead bridges (both highway and pedestrian) present a potentially significant challenge to construction of the third track. In an effort to account for the impacts HDR has first identified the overhead structures and then used video evidence to attempt to identify where major or minor construction conflicts definitely exist and those where conflicts are not likely to exist.

Overhead Bridge (without conflicts):

- Appears that construction of the third track is permitted within existing horizontal clearances between vertical obstructions (piers or abutments) without structural modifications.
- Relatively minor cost assigned for this subcategory in data base is due to uncertainty of review.

Photo 4-4: Pedestrian Bridge over CSX at approximately MP 76.8 which is considered **without conflict** for purposes of this study.

Overhead Bridge (with minor conflicts):

- Appears that construction of the third track is permitted within existing horizontal clearances between vertical obstructions (piers or abutments).
- Minor structural modifications may be required (i.e. crash walls).

Photo 4-5: Range Rd. over CSX at approximately MP 77.5 which is considered a **major conflict** for purposes of this study. The skewed piers may be as little as 16-feet from existing centerline of track.

Overhead Bridge (with major conflicts):

- Appears that construction of the third track is not permitted within existing horizontal clearances between vertical obstructions (piers or abutments).
- Major structural modifications must be performed to allow track construction (i.e. pier / span relocation or bridge replacement).

4.2.4 Category 4: Drainage

The importance of drainage on an operating railroad can not be overstated. Although the cost of individual drainage elements is relatively minor, the vast number of drainage structures creates a substantial cost for third track construction. The physical elements considered in the construction cost data base are drainage structures such as arches, culverts, and pipes of various sizes. The widely variable conditions and unknown topography make it extremely difficult to estimate construction costs. In light of these conditions, the cost assigned is for the horizontal extension or complete replacement of these elements. Unit cost provided in the data base is a lump sum cost based on new drainage structure constructed perpendicular to the track and related earthwork for installation. It may be necessary, in some cases, to replace the entire drainage element. The cost used here allows for such construction on a limited basis.

Photo 4-6: Drainage structure (obscured by vegetation) under track. Such structures will require extension or replacement as part of third track construction.

4.2.5 Category 5: Grade Crossings

Construction of the proposed third track will require track, signal and roadway construction at existing highway-railway at-grade crossing locations. Each existing two-track grade crossing will become a three-track grade crossing. The construction cost data base considers two basic types of grade crossings: public roadways and private roadways. HDR assigned construction cost per track foot of crossing. All of the public crossings and several of the private crossings also include flashing lights, bells and gates. The data base also assumes that this equipment will need to be relocated on at least one side of the existing tracks to allow construction of the third track. It is important to note that HDR did not consider the replacement of grade crossings with grade separations (bridges) at any location.

Photo 4-7: Existing two-track public roadway grade crossing (Potomac Avenue in Quantico) which will require signal relocation.

Public roadway grade crossings include:

- Full-depth grade crossing and track materials.
- Minor earthwork and asphalt paving for roadway construction.
- Relocation of crossing protection equipment (gates, lights).

Photo 4-8: Private roadway grade crossing over CSX tracks. Note there are no gates or flashing lights.

Private roadway grade crossings include:

- Typical track and grade crossing materials with timber flangeways and asphalt.
- Minor earthwork and asphalt paving for roadway construction.

4.2.6 Category 6: Utilities

There are numerous utilities that exist on the CSX right-of-way and they take many forms. For instance, there are overhead and underground power lines, underground petroleum pipeline, underground fiber optic cable, and even above-ground stream lines. These utilities may be either parallel or perpendicular to the existing track. The presence of these facilities could add complexities and cost to construction of the third track.

All existing utilities would need to be either protected during construction or relocated within the right-of-way. No cost for utilities is assigned in the data base. Further study of the exact location and condition of utilities as well as the easement agreement(s) between the railroad and the utility owner(s) is required as a part of subsequent work. The additional study must be completed before a determination can be made and reliable cost can be assigned.

Photo 4-9: View of track looking north near MP 83. Note both petroleum pipeline and fiber optic cable markers.

4.2.7 Category 7: Communication and Signals

Communications and signal systems for train control exist throughout the corridor. HDR assumed that construction of the proposed third track will require additional signal infrastructure as well as upgrades / improvements to the existing system.

One major aspect of both the track and signal construction is the addition of new interlockings with universal crossovers and signal control points. These new crossovers are located at existing interlocking locations (i.e. Arkendale) or completely new interlocking locations. Signals along the corridor have been categorized as either interlocking or intermediate. HDR assumes that all signal locations will have to be modified, but that this cost is greater at interlocking locations. For instance, work at interlocking must include connection to existing and proposed switches.

In addition to these specific locations the construction cost database assumes that general signal construction / upgrades will be required throughout the corridor. An example of such required general signal work is relocation of signal relay cases within the limits of construction (LOC). Such cost is allocated here on a “per mile” basis.

Photo 4-10: New concrete universal crossover and related signals at Arkendale Interlocking. Third track construction will require moving at least one signal column at both ends of the interlocking.

4.2.8 Category 8: Right-of-Way

Without the benefit of topographic survey HDR had to assume a certain minimum width of CSX right-of-way necessary to "fit" all three tracks. From review of valuation maps it is evident that three tracks can fit within as little as 60-feet of right-of-way. Given the number of other assumptions required to perform this estimate, HDR considered a minimum right-of-way width of 80-feet for construction.

Based on this assumed minimum it appears construction of the third track can generally be performed within the existing limits of the right-of-way. There were actually only four locations along the corridor where the right-of-way was identified as less than 80-feet wide. Those locations are:

- North of Occoquan River bridge in Fairfax County.
- South of Occoquan River bridge in Prince William County.
- At Quantico Station in Prince William County.
- South of Ashland in Hanover County.

Given the numerous assumptions and potential inaccuracies that may occur from a lack of topographic survey, HDR has not included cost for right-of-way acquisition for third track construction. It can be assumed that generally little right-of-way will be required until additional information has been collected and design has been completed.

It is important to note that all work on the corridor recently completed or programmed for construction has not or does not require acquisition of additional right-of-way.

4.2.9 Category 9: Stations and Buildings

This category includes an allowance for demolition and construction of existing stations and buildings directly affected by construction of the third track. One example of such construction is the Amtrak / VRE Quantico station. The proposed third track construction would require demolition of the existing west platform and building (passenger shelter) at the south end of the platform. Therefore it is necessary to demolish and reconstruct the existing west platform, which may also require acquiring additional right-of-way from an adjacent parking lot.

HDR has not considered the construction of new or proposed stations or platforms as part of this study. Such stations not considered include the proposed station at Cherry Hill or proposed VRE west platforms at each existing station north of Fredericksburg. Consideration of additional stations and platforms can be undertaken in subsequent phases of the Third Track Study.

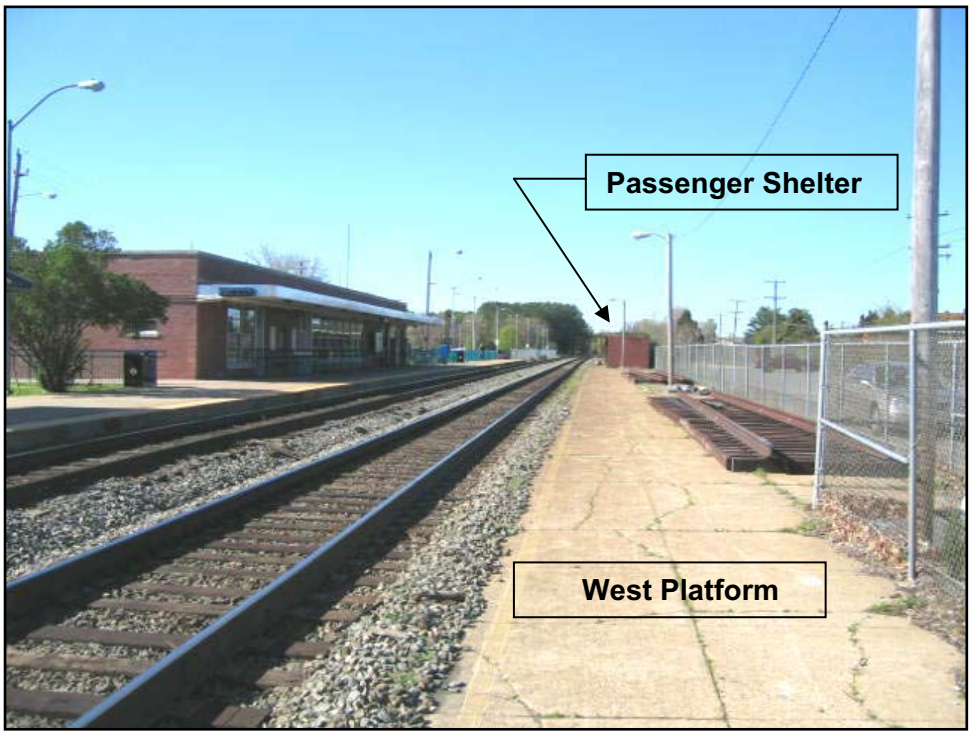


Photo 4-11: Station and platforms at Quantico Station. Third track construction will require demolition and reconstruction of the west platform and demolition of the passenger shelter.

4.2.10 Category 10: Earthwork

Due to time and budget constraints this study is limited to a two-dimensional analysis of the corridor and therefore estimating the amount of earthwork is difficult. HDR has assumed three subcategories of earthwork required for track construction. The three subcategories are: 1) minor to light grading 2) moderate fill or cut and 3) major fill or cut. Using photographic and video evidence each mile has been reviewed and assigned one of these three subcategories. A unit cost per cubic yard of fill material is translated into a cost per track-foot based on the estimated depth of fill material (minor, moderate or major). The assumed earthwork amounts and unit costs are shown in Table 4-1.

4.2.11 Category 11: Environmental and Permitting

Construction which uses federal monies requires review pursuant to the National Environmental Policy Act (NEPA) process, as well as other local, state, and federal permitting processes (see Section 5 for additional details).

HDR considered environmental and permitting issues by each mile of the corridor using the same photographic and video references and other mapping sources as previously cited. Each mile has been reviewed for its expected environmental and permitting effort. HDR assigned one of three categories (low, moderate, or high) as defined below, and as more specifically described in Section 5. HDR then applied a corresponding percentage of the construction cost at the respective rates of 4%, 6% and 8% per mile for the associated environmental and permitting efforts.

Low Environmental / Permitting Effort:

- Appears that there are no unusual environmental impediments within the limits of construction (LOC).
- Appears that there are no major physical impediments within the LOC.

Moderate Environmental / Permitting Effort:

- Appears one or two environmental factors likely within the LOC.
- Appears numerous, but minor structural improvements for existing stream or utility crossings.

High Environmental / Permitting Effort:

- Appears more than two environmental factors likely within the LOC.
- Appears wetlands are within the LOC.
- Requires construction of a new bridge over a waterbody.
- Requires relocation, rerouting or closing of a highway/rail at-grade crossing.

4.2.12 Category 12: Engineering Services and Owner Review

This category accounts for professional design and construction engineering services required for preparation of construction documents (i.e. plans and specifications) as well as construction engineering and management required for review of contractor submittals and construction inspection. HDR calculated engineering fees as a percentage of the estimated construction subtotal cost.

Engineering Fees assigned here include:

- 8% for Concept and Preliminary Design.
- 4% for Final Design.
- 6% for Construction Engineering / Management.
- 2% for Owner Review by CSX.

4.2.13 Category 13: Minimum Construction Contingency

As noted above, this study generally does not include engineering design or field investigation (e.g. surveying, geotechnical, etc.) typically included in engineering analyses. In an effort to account for typical, unforeseen construction cost related to this type of construction, a contingency has been included. Given the level of information and purposes of this study a minimum construction contingency of 30% has been applied to the estimated subtotal construction costs. Contingency values are usually reduced as more information is obtained and unknown conditions are reduced through subsequent design efforts. Contingency costs typically range from 5% to 12% of construction in final pre-bid estimates.

The construction contingency provided here is for currently unknown site conditions, unknown condition of existing elements such as bridge abutments and piers, and a premium of 5% for the need to conduct construction in a manner that does not impede current railroad traffic (i.e. night and weekend labor).

4.3 Summary of Minimum Cost Assumptions

GENERAL:

1. Limits of corridor considered are from Union Station, Washington, D.C. to Main Street Station, Richmond, VA excluding:
    a. Ashland (MP 13.8 to MP 15.8)
    b. Fredericksburg (MP 55.7 to MP 61.1)
    c. Ravensworth (MP 97.1) to RO (MP 110.1)
    d. Long Bridge / L'Enfant Station (MP 110.1 to Union Station)
2. Analysis performed without topographic survey or field investigation, but uses mapping, aerial photography and video evidence of existing conditions.
3. Maximum 90-mph train speeds.

4. 15-foot track centers; however, existing track centers (as little as 13'-6") may be used for third track in certain locations such as at overhead bridges.
5. Base costs provided in 2006 dollars considering recently completed projects. Implementation plans will show escalated costs for various phases.
6. Study assumes construction of continuous third track along the entire corridor. Analysis does not consider additional cost incurred for construction of phased individual segments.

CATEGORY 1: TRACKWORK

7. Mainline trackwork for each mile includes 5,280-trackfeet of 136 lb. CWR, OTM, timber ties, 12" of ballast, 6" of sub-ballast and 3" of subgrade preparation.
8. Siding construction and mainline realignment unit cost is calculated as 80% of mainline construction cost.
9. No deduction in trackwork quantity for other construction such as bridges, grade-crossings, or special trackwork.
10. In locations where proposed third track is built on the alignment of an existing siding, cost is not included to replace the siding but rather a turnout is provided from the third track.

CATEGORY 2: SPECIAL TRACKWORK

11. Includes turnouts, crossovers, universal crossovers, and diamonds.
12. Unless noted otherwise, features include pre-paneled elements, concrete ties, field welds, and power switches.

CATEGORY 3: BRIDGES

13. Railroad bridges considered as one of three:
    a. Small: Spans < 20-ft; Bridge Length < 100-ft; Ht. < 25-ft.
    b. Medium: Spans 20 to 75-ft; Length 100 to 300-ft; Ht. 25-50-ft.
    c. Large: Spans > 75-ft; Length > 300-ft; Ht. > 50-ft.
14. Categorization of highway and pedestrian bridges (i.e. no conflict, minor or major conflict) based on maintaining existing track centers, and will require track shift.
15. Where major conflict exists, cost allocated is for highway bridge replacement.

CATEGORY 4: DRAINAGE

16. Considers extension or replacement of individual drainage elements such as arches, pipes and culverts on a generic lump sum basis with respect to size.

CATEGORY 5: GRADE CROSSINGS

17. Includes all track and grade-crossing materials required to add a third track to each existing two track at-grade crossing.
18. Signal costs allocated for relocation of lights and gates where they exist.
19. Considers minor earthwork and asphalt paving for roadway construction.
20. Does not include grade separation of any existing at-grade crossings.

CATEGORY 6: UTILITIES

21. Data captures location of existing utilities, however, no cost assigned for utility relocation or protection since responsibility for such costs can not be determined at this time.

CATEGORY 7: COMMUNICATIONS AND SIGNALS

22. Signals considered as either interlocking or intermediate. Cost to install, relocate or modify interlocking signal is greater than intermediate signals.
23. Includes “cost-per-mile” for general signal improvements and minor relocations such as signal relay cases.

CATEGORY 8: RIGHT-OF-WAY

24. No cost included for right-of-way acquisition since determination of right-of-way needs can not made at this time.
25. Provides a general “cost-per-mile” that can be allocated for either track shift or ROW acquisition.

CATEGORY 9: STATIONS & BUILDINGS

26. Allowance for demolition and replacement of existing platforms and demolition of buildings within the limits of construction (e.g. Quantico)
27. Does not include construction of proposed stations (i.e. Cherry Hill or VRE west platforms).

CATEGORY 10: EARTHWORK

28. Assigns one of three categories of necessary earthwork (minor, moderate, or major) to each mile, which is then calculated on a trackfoot basis.

CATEGORY 11: ENVIRONMENTAL / PERMITTING

29. Assigns one of three categories of necessary environmental and permitting effort to each mile considering adjacent features. Cost is assigned as a percentage of estimated construction subtotal cost.
30. Anticipated NEPA involvement is noted elsewhere.

CATEGORY 12: ENGINEERING SERVICES AND OWNER REIVEW

31. Calculated as a percentage of estimated construction subtotal cost.
32. Concept and Preliminary Design (8%), Final Design (4%) and Construction Management. (6%) equals 18% total.
33. Includes 2% allowance for cost to CSX for review of proposed improvements.

CATEGORY 13: CONSTRUCTION CONTINGENCY

34. Cost assigned in addition to estimated construction cost due to limited information available as part of this study.
35. Calculated as 30% of estimated construction subtotal cost.
36. Includes 5% premium for night and weekend construction required to reduce conflicts to freight and passenger operations.

4.4 Estimate of Probable Minimum Construction Cost

Using the unit costs and category assumptions described above, HDR prepared a comprehensive corridor cost estimate in a manner that enumerates the cost per category, per mile and summarizes cost for each mile. Table 4-2 provides a summary of all estimated construction costs for each mile and the estimated minimum cost to construct the entire third track within the parts of the corridor considered here.

Figure 4-1 is a graphical representation of the corridor cost estimate that shows the estimated construction cost per mile. Large structures along the corridor are noted.

The estimated minimum construction cost of the entire third track in 2006 dollars is $684 million, or an estimated $7 million per mile with the cost of all major bridges spread over the entire corridor. This estimated cost consists of:

- $612.2_million for the construction of the necessary third track between Richmond's Staples Mill Road Station and Washington's Union Station, as is detailed in Table 4-2, and

- $71.8_million for construction of necessary improvements between Staples Mill Road Station and Richmond Main Street Station.

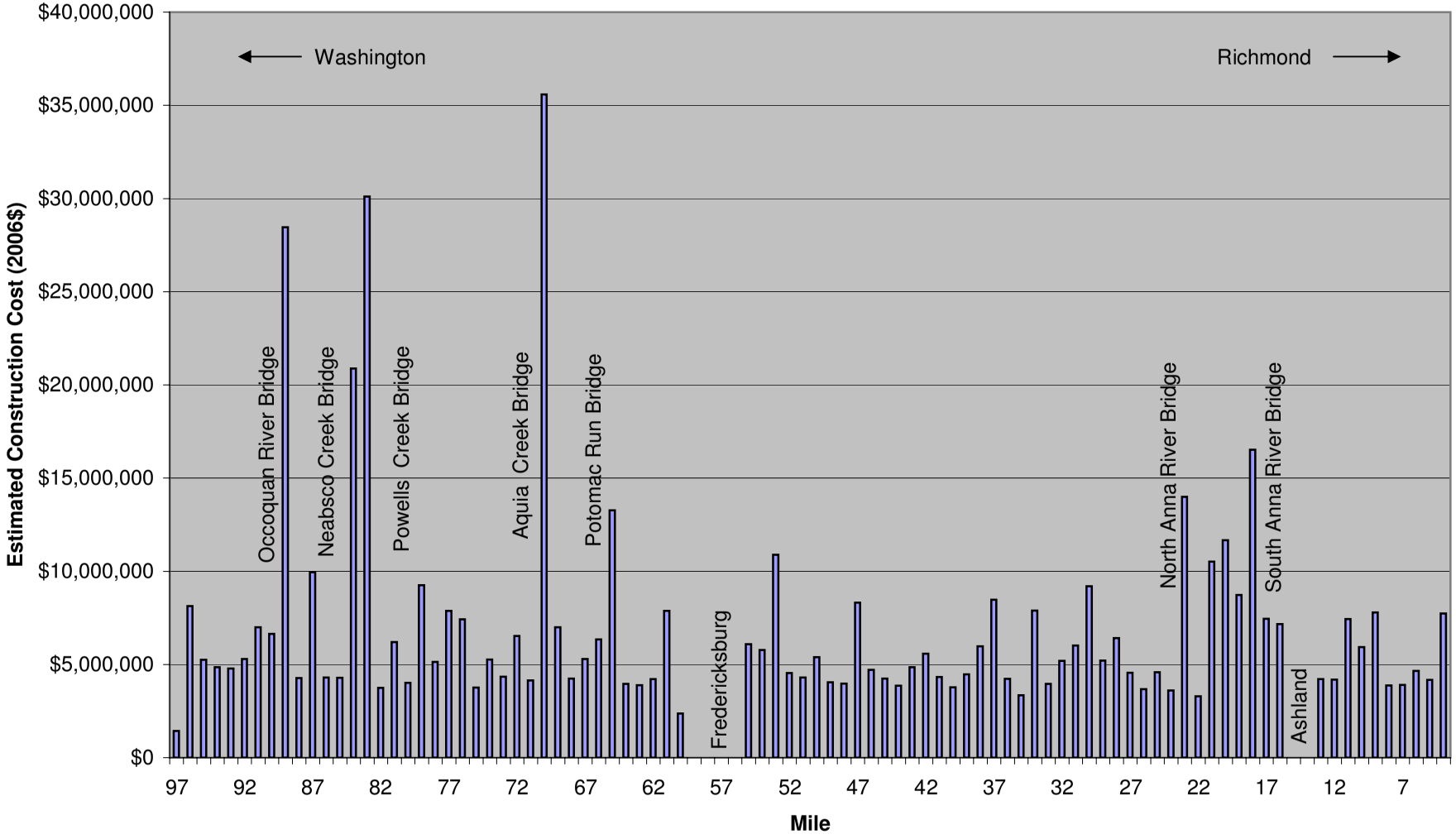
As a reminder, the third track costs do not include the cost of any right-of-way that may subsequently be needed, or the cost of relocating utilities.

Location	Construction Cost by Category										Subtotal	Related Direct Cost			Total
	1	2	3	4	5	6	7	8	9	10		11	12	13	
Mile	Trackwork	Special Trackwork	Bridges	Drainage	Grade Crossings	Utilities	C & S	Right-of-Way	Stations & Bldgs	Earthwork	Subtotal	Environmental & Permitting	Engineering Services	Construction Contingency	ESTIMATED TOTAL
97	$336,313	$374,000	$0	$0	$0	$0	$200,000	$0	$0	$37,500	$947,813	$18,956	$189,563	$284,344	$1,440,676
96	$1,484,582	$811,000	$90,000	$171,000	$0	$0	$2,400,000	$0	$0	$396,000	$5,352,582	$107,052	$1,070,516	$1,605,775	$8,135,925
95	$1,484,582	$394,000	$535,000	$75,000	$0	$0	$525,000	$0	$0	$396,000	$3,409,582	$136,383	$681,916	$1,022,875	$5,250,756
94	$1,484,582	$189,000	$405,000	$115,000	$0	$0	$525,000	$0	$0	$396,000	$3,114,582	$186,875	$622,916	$934,375	$4,858,748
93	$1,484,582	$0	$912,000	$70,000	$0	$0	$200,000	$0	$0	$396,000	$3,062,582	$183,755	$612,516	$918,775	$4,777,628
92	$1,484,582	$716,000	$264,000	$126,000	$5,000	$0	$450,000	$0	$0	$396,000	$3,441,582	$137,663	$688,316	$1,032,475	$5,300,036
91	$1,484,582	$16,000	$2,000,000	$186,000	$0	$0	$525,000	$0	$0	$396,000	$4,607,582	$92,152	$921,516	$1,382,275	$7,003,525
90	$1,916,984	$0	$1,225,000	$183,000	$0	$0	$200,000	$0	$0	$792,000	$4,316,984	$172,679	$863,397	$1,295,095	$6,648,156
89	$1,484,582	$0	$15,800,000	$36,000	$0	$0	$525,000	$0	$0	$396,000	$18,241,582	$1,094,495	$3,648,316	$5,472,475	$28,456,868
88	$1,916,984	$0	$10,000	$254,000	$0	$0	$200,000	$0	$0	$396,000	$2,776,984	$111,079	$555,397	$833,095	$4,276,556
87	$1,484,582	$1,560,000	$0	$141,000	$0	$0	$2,400,000	$0	$0	$792,000	$6,377,582	$382,655	$1,275,516	$1,913,275	$9,949,028
86	$1,484,582	$205,000	$250,000	$0	$11,250	$0	$450,000	$0	$0	$396,000	$2,796,832	$111,873	$559,366	$839,050	$4,307,121
85	$1,484,582	$0	$0	$15,000	$0	$0	$525,000	$0	$0	$792,000	$2,816,582	$56,332	$563,316	$844,975	$4,281,205
84	$1,484,582	$0	$10,875,000	$30,000	$0	$0	$200,000	$0	$0	$792,000	$13,381,582	$802,895	$2,676,316	$4,014,475	$20,875,268
83	$1,484,582	$0	$16,830,000	$60,000	$0	$0	$525,000	$0	$0	$396,000	$19,295,582	$1,157,735	$3,859,116	$5,788,675	$30,101,108
82	$1,484,582	$16,000	$0	$86,000	$5,000	$0	$450,000	$0	$0	$396,000	$2,437,582	$97,503	$487,516	$731,275	$3,753,876
81	$1,484,582	$374,000	$0	$75,000	$0	$0	$1,300,000	$0	$0	$792,000	$4,025,582	$161,023	$805,116	$1,207,675	$6,199,396
80	$1,484,582	$0	$10,000	$125,000	$0	$0	$200,000	$0	$0	$792,000	$2,611,582	$104,463	$522,316	$783,475	$4,021,836
79	$1,484,582	$374,000	$0	$180,000	$0	$0	$3,500,000	$0	$0	$396,000	$5,934,582	$356,075	$1,186,916	$1,780,375	$9,257,948
78	$1,484,582	$16,000	$0	$141,000	$34,500	$0	$700,000	$0	$520,000	$396,000	$3,292,082	$197,525	$658,416	$987,625	$5,135,648
77	$1,484,582	$378,000	$2,000,000	$264,000	$0	$0	$200,000	$0	$0	$792,000	$5,118,582	$204,743	$1,023,716	$1,535,575	$7,882,616
76	$1,484,582	$0	$1,786,400	$303,000	$12,500	$0	$775,000	$0	$0	$396,000	$4,757,482	$285,449	$951,496	$1,427,245	$7,421,672
75	$1,484,582	$0	$0	$359,000	$0	$0	$200,000	$0	$0	$396,000	$2,439,582	$97,583	$487,916	$731,875	$3,756,956
74	$1,916,984	$0	$325,000	$210,000	$0	$0	$525,000	$0	$0	$396,000	$3,372,984	$202,379	$674,597	$1,011,895	$5,261,856
73	$1,484,582	$0	$0	$201,000	$5,000	$0	$775,000	$0	$0	$396,000	$2,861,582	$57,232	$572,316	$858,475	$4,349,605
72	$1,484,582	$749,000	$0	$105,000	$15,750	$0	$1,550,000	$0	$0	$396,000	$4,300,332	$86,007	$860,066	$1,290,100	$6,536,505
71	$1,484,582	$0	$0	$251,000	$0	$0	$525,000	$0	$0	$396,000	$2,656,582	$159,395	$531,316	$796,975	$4,144,268
70	$1,916,984	$173,000	$19,815,000	$313,000	$0	$0	$200,000	$0	$0	$396,000	$22,813,984	$1,368,839	$4,562,797	$6,844,195	$35,589,816
69	$1,484,582	$0	$2,000,000	$140,000	$0	$0	$525,000	$0	$0	$396,000	$4,545,582	$181,823	$909,116	$1,363,675	$7,000,196
68	$1,484,582	$0	$125,000	$155,000	$0	$0	$200,000	$0	$0	$792,000	$2,756,582	$110,263	$551,316	$826,975	$4,245,136
67	$1,484,582	$0	$0	$331,000	$9,000	$0	$775,000	$0	$0	$792,000	$3,391,582	$203,495	$678,316	$1,017,475	$5,290,868
66	$1,484,582	$0	$2,000,000	$98,000	$0	$0	$200,000	$0	$0	$396,000	$4,178,582	$83,572	$835,716	$1,253,575	$6,351,445
65	$1,484,582	$0	$5,985,000	$119,000	$0	$0	$525,000	$0	$0	$396,000	$8,509,582	$510,575	$1,701,916	$2,552,875	$13,274,948
64	$1,484,582	$0	$0	$131,000	$0	$0	$200,000	$0	$0	$792,000	$2,607,582	$52,152	$521,516	$782,275	$3,963,525
63	$1,484,582	$0	$100,000	$51,000	$0	$0	$525,000	$0	$0	$396,000	$2,556,582	$51,132	$511,316	$766,975	$3,886,005
62	$1,916,984	$0	$75,000	$146,000	$0	$0	$200,000	$0	$0	$396,000	$2,733,984	$109,359	$546,797	$820,195	$4,210,336
61	$1,484,582	$1,687,000	$125,000	$126,000	$0	$0	$1,300,000	$0	$0	$396,000	$5,118,582	$204,743	$1,023,716	$1,535,575	$7,882,616
60	$348,324	$251,000	$10,000	$109,000	$0	$0	$750,000	$0	$0	$75,000	$1,543,324	$61,733	$308,665	$462,997	$2,376,719
59	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
58	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
57	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
56	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
55	$1,484,582	$62,000	$0	$166,000	$0	$0	$1,850,000	$0	$0	$396,000	$3,958,582	$158,343	$791,716	$1,187,575	$6,096,216
54	$1,484,582	$173,000	$825,000	$30,000	$18,000	$0	$775,000	$0	$0	$396,000	$3,701,582	$222,095	$740,316	$1,110,475	$5,774,468
53	$1,484,582	$2,106,000	$135,000	$156,000	$0	$0	$2,400,000	$0	$0	$792,000	$7,073,582	$282,943	$1,414,716	$2,122,075	$10,893,316
52	$1,916,984	$0	$0	$78,000	$0	$0	$200,000	$0	$0	$792,000	$2,986,984	$59,740	$597,397	$896,095	$4,540,216
51	$1,484,582	$0	$0	$154,000	$18,000	$0	$775,000	$0	$0	$396,000	$2,827,582	$56,552	$565,516	$848,275	$4,297,925
50	$1,484,582	$0	$90,000	$141,000	$0	$0	$200,000	$0	$0	$1,584,000	$3,499,582	$139,983	$699,916	$1,049,875	$5,389,356
49	$1,484,582	$0	$180,000	$42,000	$0	$0	$525,000	$0	$0	$396,000	$2,627,582	$105,103	$525,516	$788,275	$4,046,476
48	$1,484,582	$0	$90,000	$148,000	$9,000	$0	$450,000	$0	$0	$396,000	$2,577,582	$103,103	$515,516	$773,275	$3,969,476

Table 4-2 Summary Construction Cost Estimate

Location	Construction Cost by Category										Subtotal	Related Direct Cost			Total
	1	2	3	4	5	6	7	8	9	10		11	12	13	
Mile	Trackwork	Special Trackwork	Bridges	Drainage	Grade Crossings	Utilities	C & S	Right-of-Way	Stations & Bldgs	Earthwork	Subtotal	Environmental & Permitting	Engineering Services	Construction Contingency	ESTIMATED TOTAL
47	$1,484,582	$1,498,000	$60,000	$0	$18,000	$0	$1,875,000	$0	$0	$396,000	$5,331,582	$319,895	$1,066,316	$1,599,475	$8,317,268
46	$1,484,582	$189,000	$0	$359,000	$0	$0	$200,000	$0	$0	$792,000	$3,024,582	$181,475	$604,916	$907,375	$4,718,348
45	$1,484,582	$0	$0	$129,000	$7,500	$0	$775,000	$0	$0	$396,000	$2,792,082	$55,842	$558,416	$837,625	$4,243,965
44	$1,484,582	$0	$0	$187,000	$18,000	$0	$450,000	$0	$0	$396,000	$2,535,582	$50,712	$507,116	$760,675	$3,854,085
43	$1,484,582	$0	$0	$84,000	$15,750	$0	$775,000	$0	$0	$792,000	$3,151,332	$126,053	$630,266	$945,400	$4,853,051
42	$1,484,582	$0	$0	$310,000	$0	$0	$200,000	$0	$0	$1,584,000	$3,578,582	$214,715	$715,716	$1,073,575	$5,582,588
41	$1,484,582	$0	$0	$147,000	$5,000	$0	$775,000	$0	$0	$396,000	$2,807,582	$112,303	$561,516	$842,275	$4,323,676
40	$1,484,582	$0	$0	$108,000	$11,250	$0	$450,000	$0	$0	$396,000	$2,449,832	$97,993	$489,966	$734,950	$3,772,741
39	$1,484,582	$0	$0	$63,000	$0	$0	$525,000	$0	$0	$792,000	$2,864,582	$171,875	$572,916	$859,375	$4,468,748
38	$1,484,582	$0	$100,000	$211,000	$5,000	$0	$450,000	$0	$0	$1,584,000	$3,834,582	$230,075	$766,916	$1,150,375	$5,981,948
37	$1,484,582	$1,529,000	$10,000	$225,000	$0	$0	$1,850,000	$0	$10,000	$396,000	$5,504,582	$220,183	$1,100,916	$1,651,375	$8,477,056
36	$1,484,582	$0	$0	$153,000	$10,000	$0	$700,000	$0	$0	$396,000	$2,743,582	$109,743	$548,716	$823,075	$4,225,116
35	$1,484,582	$31,000	$0	$63,000	$0	$0	$200,000	$0	$0	$396,000	$2,174,582	$86,983	$434,916	$652,375	$3,348,856
34	$1,484,582	$0	$2,277,000	$126,000	$5,000	$0	$775,000	$0	$0	$396,000	$5,063,582	$303,815	$1,012,716	$1,519,075	$7,899,188
33	$1,484,582	$0	$0	$267,000	$7,500	$0	$450,000	$0	$0	$396,000	$2,605,082	$52,102	$521,016	$781,525	$3,959,725
32	$1,484,582	$16,000	$490,000	$126,000	$13,500	$0	$450,000	$0	$0	$792,000	$3,372,082	$134,883	$674,416	$1,011,625	$5,193,006
31	$1,484,582	$0	$0	$63,000	$5,000	$0	$775,000	$0	$0	$1,584,000	$3,911,582	$156,463	$782,316	$1,173,475	$6,023,836
30	$1,484,582	$1,498,000	$0	$189,000	$0	$0	$1,300,000	$0	$0	$1,584,000	$6,055,582	$121,112	$1,211,116	$1,816,675	$9,204,485
29	$1,484,582	$0	$0	$322,000	$13,500	$0	$775,000	$0	$0	$792,000	$3,387,082	$135,483	$677,416	$1,016,125	$5,216,106
28	$1,484,582	$0	$2,000,000	$139,000	$0	$0	$200,000	$0	$0	$396,000	$4,219,582	$84,392	$843,916	$1,265,875	$6,413,765
27	$1,484,582	$0	$0	$155,000	$0	$0	$525,000	$0	$0	$792,000	$2,956,582	$118,263	$591,316	$886,975	$4,553,136
26	$1,484,582	$0	$210,000	$93,000	$0	$0	$200,000	$0	$0	$396,000	$2,383,582	$95,343	$476,716	$715,075	$3,670,716
25	$1,484,582	$0	$0	$219,000	$0	$0	$525,000	$0	$0	$792,000	$3,020,582	$60,412	$604,116	$906,175	$4,591,285
24	$1,484,582	$0	$0	$27,000	$11,250	$0	$450,000	$0	$0	$396,000	$2,368,832	$47,377	$473,766	$710,650	$3,600,625
23	$1,916,984	$0	$4,965,000	$0	$0	$0	$1,300,000	$0	$0	$792,000	$8,973,984	$538,439	$1,794,797	$2,692,195	$13,999,416
22	$1,484,582	$0	$0	$84,000	$0	$0	$200,000	$0	$0	$396,000	$2,164,582	$43,292	$432,916	$649,375	$3,290,165
21	$1,484,582	$2,569,000	$0	$147,000	$16,250	$0	$2,125,000	$0	$0	$396,000	$6,737,832	$404,270	$1,347,566	$2,021,350	$10,511,018
20	$4,319,221	$173,000	$2,000,000	$65,000	$0	$0	$725,000	$0	$0	$396,000	$7,678,221	$153,564	$1,535,644	$2,303,466	$11,670,895
19	$1,484,582	$0	$2,847,000	$93,000	$0	$0	$525,000	$0	$0	$792,000	$5,741,582	$114,832	$1,148,316	$1,722,475	$8,727,205
18	$1,484,582	$0	$7,600,000	$0	$0	$0	$200,000	$0	$0	$1,584,000	$10,868,582	$217,372	$2,173,716	$3,260,575	$16,520,245
17	$1,484,582	$205,000	$2,125,000	$171,000	$0	$0	$525,000	$0	$0	$396,000	$4,906,582	$98,132	$981,316	$1,471,975	$7,458,005
16	$1,484,582	$188,000	$0	$99,000	$0	$0	$1,300,000	$0	$0	$1,584,000	$4,655,582	$186,223	$931,116	$1,396,675	$7,169,596
15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13	$1,484,582	$188,000	$0	$141,000	$0	$0	$525,000	$0	$0	$396,000	$2,734,582	$109,383	$546,916	$820,375	$4,211,256
12	$1,484,582	$0	$0	$123,000	$18,500	$0	$700,000	$0	$0	$396,000	$2,722,082	$108,883	$544,416	$816,625	$4,192,006
11	$1,484,582	$749,000	$0	$108,000	$33,750	$0	$2,125,000	$0	$0	$396,000	$4,896,332	$97,927	$979,266	$1,468,900	$7,442,425
10	$1,484,582	$0	$1,265,000	$63,000	$0	$0	$200,000	$0	$0	$792,000	$3,804,582	$228,275	$760,916	$1,141,375	$5,935,148
9	$1,484,582	$0	$2,000,000	$60,000	$18,000	$0	$775,000	$0	$0	$792,000	$5,129,582	$102,592	$1,025,916	$1,538,875	$7,796,965
8	$1,484,582	$0	$10,000	$189,000	$22,500	$0	$450,000	$0	$0	$396,000	$2,552,082	$51,042	$510,416	$765,625	$3,879,165
7	$1,484,582	$0	$0	$126,000	$0	$0	$525,000	$0	$0	$396,000	$2,531,582	$101,263	$506,316	$759,475	$3,898,636
6	$1,484,582	$189,000	$0	$132,000	$15,750	$0	$450,000	$0	$0	$792,000	$3,063,332	$61,267	$612,666	$919,000	$4,656,265
5	$1,484,582	$189,000	$10,000	$166,000	$11,250	$0	$450,000	$0	$0	$396,000	$2,706,832	$108,273	$541,366	$812,050	$4,168,521
4	$1,484,582	$797,000	$10,000	$0	$0	$0	$2,400,000	$0	$0	$396,000	$5,087,582	$101,752	$1,017,516	$1,526,275	$7,733,125
Total	**$134,220,138**	**$20,632,000**	**$112,851,400**	**$11,928,000**	**$425,250**	**$0**	**$64,275,000**	**$0**	**$530,000**	**$51,988,500**	**$396,850,288**	**$16,941,777**	**$79,370,058**	**$119,055,086**	**$612,217,209**

Figure 4-1: Estimated Cost Per Mile



5. Environmental Issues

This chapter presents several topics related to environmental analysis. First, the chapter explains compliance with federal environmental documentation, and offers a general explanation of the kinds of documentation. The chapter also summarizes the environmental documentation already performed for already programmed actions supporting the third track along portions of the corridor. The chapter also summarizes State and Federal permitting requirements for the corridor. Finally, the chapter summarizes the major environmental resources and issues along the corridor.

5.1 Potential Regulatory Involvement

The National Environmental Policy Act (NEPA) requires any federally funded action to consider environmental consequences. Although no Federal Railroad Administration (FRA) or Federal Transit Administration (FTA) or even Federal Highway Administration (FHWA) funding has been secured for any of the actions regarding the third track along this corridor, the possibility exists. Certainly, the potential for Federal funding should not be dismissed. Thus, this chapter has been prepared in anticipation of federal funding for the project(s).

5.1.1 Types of Environmental Documentation

Agencies have the initial and primary responsibility to determine the extent of the impact any federal action will have on the environment. There are three distinct levels of analysis:

A detailed **Environmental Impact Statement (EIS**) is required for "major federal actions significantly affecting the quality of the human environment" [42 USC 4332(2)(c)] such as a new rail corridor on a completely new alignment. The key word is "significantly," which applies both in terms of context and intensity. (FTA identifies these as Class III actions.)

An **Environmental Assessment (EA)** allows an agency to consider environmental consequences while reserving resources from preparing a full EIS. If a Finding of No Significant Impact (FONSI) is made after the EA analyzes potential impacts, then preparation of an EIS is unnecessary. [40 C.F.R. § 1501.4(a)] The key words are "no significant impact" meaning that either there were no such impacts or that if there were, then they have been

sufficiently reduced to a negligible effect through specific mitigation commitments.

A **Categorical Exclusion (CE)** (sometimes expanded to a "Documented CE") is issued for actions that do not individually or cumulatively have a significant effect on the environment. For the simplest category, CE, Federal lead agencies have certain types of projects which automatically are "categorically excluded". The FTA has implemented a Documented CE for some projects for which a review of available background conditions is required. Similarly, the FRA has a "Worksheet" which requires evaluation and consideration of a number of existing conditions in order to determine the relative (lack of) impacts. [1]

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For large corridors, sometimes EISs are performed at a program-level analysis, using a tiered approach.[2] The tiered approach allows planners to assess environmental impacts of various build alternatives which meet the project's purpose and need at the "macro level" for Tier I, but without looking at site-specific details. The Tier II analysis assesses project impacts at a more detailed level, i.e., it "will evaluate specific segments of the preferred study area alternative with additional research, coordination and field surveys"[3] As discussed below, the Southeast High Speed Rail Corridor (SEHSR) is a 500-mile long two-state corridor, making it a perfect example of the order of magnitude for which a tiered process applies.

5.1.2 NEPA Process

The Council on Environmental Quality (CEQ) regulations (40 CFR Part 1500) implementing NEPA require documentation describing the environment of the area(s) to be affected by the alternatives under consideration, as well as a discussion of the impacts in proportion to their significance. The affected environment includes land use, socioeconomic conditions, community facilities and services, physical, natural and cultural resources, air quality, and ambient noise levels, among others.

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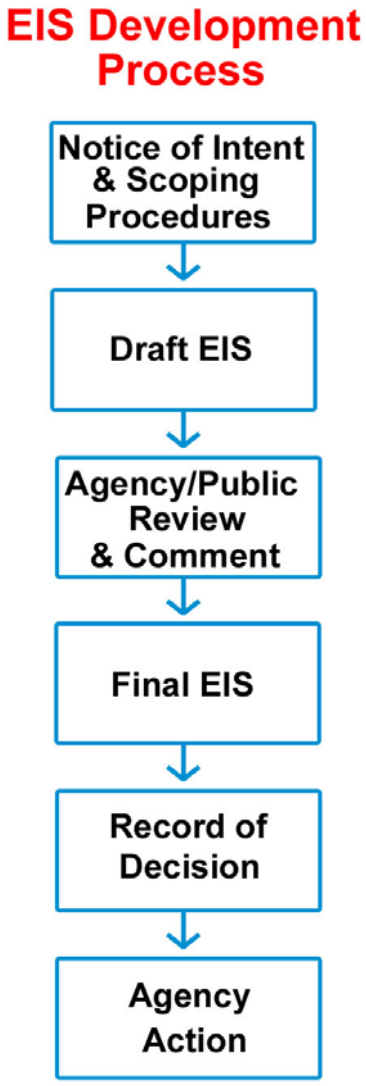
[1] "*Procedures for Considering Environmental Impacts*, Section 4 (c) states that certain classes of FRA actions are categorically excluded as they do not individually or cumulatively have a significant effect on the human environment. Examples are minor rail line additions including construction of side tracks, passing tracks, crossovers, short connections between existing rail lines, and new tracks within existing rail yards provided that such additions are not inconsistent with existing zoning, do not involve acquisition of significant amount of right-of-way, and do not significantly alter the traffic density characteristics of the existing rail lines or rail facilities. (64 FR 28545)

[2] As described in 23 CFR 771.111[g] and CEQ regulations 1502.20 & 1508.28.

[3] Virginia Department of Rail and Public Transportation and the North Carolina Department of Transportation, *Record of Decision for the Tier I Southeast High Speed Rail Corridor*, October 2002,pg. 2.

To improve early coordination, the CEQ regulations introduced the concept of "lead agency" and "cooperating agency." The lead agency is that Federal agency which is responsible for the Federal action. The cooperating agencies are those with special expertise (e.g., the Fish and Wildlife Service, the Department of the Interior) or jurisdiction by law (e.g., the U.S. Army Corps of Engineers (USACE) or the Coast Guard (USCG) when a permit is necessary). The CEQ also instituted a scoping process which was intended to get the lead and cooperating agencies and other interested groups together early in the project development process to determine the scope of the issues to be addressed, and identify any important issues related to the proposed action. By properly using the early coordination process, agencies could avoid conflicts later, and could assure the full input from the various interests. Early coordination continues to be emphasized in all transportation guidance and legislation.



Any USDOT project is required to have “logical termini” and “independent utility”. In other words, each project must have an independent purpose and need, and function without other projects being implemented. Aside from common sense, this protects environmentally sensitive areas which may become sandwiched between two proposed projects which require each other to make a complete improvement. Additionally, multiple seemingly potential minor projects must be considered for their cumulative effects, which could in fact be substantial when combined.

One key early decision for the federal lead agency is the type of document needed to satisfy the NEPA process and thus advance a project. As noted above, NEPA requires an EIS for major Federal actions significantly affecting the human environment. FRA has Procedures for Considering Environmental Impacts, (64 FR 28545, May 26, 1999), and FTA and FHWA jointly issued their environmental impact regulations (23 C.F.R 771). The point is to identify whether an action could trigger the need for a more detailed environmental review.

5.1.3 State and Federal Permitting Requirements

Part of the environmental review process for the Third Track corridor includes an evaluation of the kinds of permits which may to be required for construction. Specifically,

- Authorization by the USACE under Section 404 of the Clean Water Act for discharges of dredged or fill material into waters of the U.S., including wetlands. This requires jurisdictional confirmation of the wetland delineation. While CSXT enjoys a nationwide permit for maintaining its ditches, clearance of new areas or placement of infrastructure in or over **wetlands** or creeks involves additional coordination and permitting.
- Authorization by the Virginia Department of Environmental Quality (DEQ) of a Virginia **Water Protection Permit** (9 VAC 25-210-10) pursuant to Sections 401 and 402 of the Clean Water Act for activities affecting jurisdictional wetlands, streams, and other waters.
- Authorization by the Virginia Marine Resources Commission (VMRC) for applications to encroach in, on, or over subaqueous lands of the Commonwealth (4VAC20-120-10 et seq.) for activities affecting jurisdictional streams and tidal wetlands.
- Authorization under Virginia and applicable county **Erosion and Sediment Control** laws and **Storm Water Management** Criteria for water quality and quantity control, including the Virginia Stormwater Management Program (VSMP).
- Compliance with Virginia Coastal Resources Management Program (VCP)[4], which consists of a network of programs administered by several agencies. As an initial activity, preparation of a **Federal Consistency Determination** pursuant to the Coastal Zone Management Act (CZMA) of 1972 (16 USC § 1451, et seq., as amended) and VCP.[5]

Other laws and regulations for which projects will need to comply with include Section 106 of the National Historic Preservation Act, the Endangered Species Act, the Virginia Chesapeake Bay Preservation Act, and numerous additional water quality, air quality, stormwater management, and hazardous materials protection.

5.2 Previous Environmental Documentation for the Corridor

Several studies have been conducted in recent years along the Washington, D.C - Richmond. corridor. This section summarizes those previous environmental reviews.

[4] Code of Virginia S10.1-2100 – 10.1-2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; Virginia Administrative Code 9 VAC 10-2 et seq,.

[5] Section 307(c)(1) of the CZMA Reauthorization Amendment (CZMARA) stipulates that federal projects that affect land uses, water uses, or coastal resources of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of that state's federally-approved coastal management plan.

5.2.1 Southeast High Speed Rail Corridor

FRA and FHWA completed a Tier I EIS on the Southeast High Speed Rail Corridor (SEHSR) between Washington, D.C. and Charlotte, N.C.[6] The Record of Decision was signed in October 2002. A Tier II EIS is currently in preparation for the Richmond to Raleigh, N.C. component; and is scheduled for release in 2009.

Authorization for a program of high speed rail corridors was included in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and continued in the Surface Transportation Equity Act for the 21st Century (TEA-21). In 1992, USDOT designated the SEHSR Corridor as one of five national high speed rail corridors, allowing federal funds to be spent on the existing rail system.[7]

For the SEHSR Tier I EIS, all of the build alternatives[8] utilized the common alignment of what is the CSX RF&P subdivision. The RF&P subdivision includes the section of the corridor from MP 4 to MP 97 between Washington, DC and Richmond, VA, the same routing that is being evaluated in this report. The SEHSR Tier I EIS assumed a study area width of about 300 feet, centered on the existing trackage, with a few locations ranging to six miles wide.

The SEHSR Tier I EIS considered alternatives which reduce the travel time for rail passengers (end-to-end) from the current 10 hours to 6-7.5 hours. This is consistent with federal legislation which seeks to offer competitive transportation mode to air and highway travelers, promoting a nationwide intermodal network. As the travel time decreases, and as reliability increases, the total ridership along the entire corridor has been projected to increase from 1.3 million to 1.8 million passengers by 2025. The SEHSR Tier I EIS assumed a travel speed for intercity passenger trains of 110 mph. The current corridor has a maximum limit of 70 mph.

In general, the SEHSR recommended an incremental approach to accomplishing high speed rail while maximizing use of the existing infrastructure and right-of-way. It further noted that the Tier II EIS will analyze environmental impacts in more detail on such resources as: land requirements and acquisition; air quality (particularly in non-attainment and maintenance areas); historic and archeological resources; wetlands; water quality; natural heritage and wildlife resources; subaqueous

[6] The Notice of Intent to prepare the document was published in the Federal Register on August 5, 1999. A joint bi-state scoping meeting was among the numerous agency coordination activities. Over 225,000 people received direct mailings, and 26 public workshops were conducted. The Draft Tier 1 EIS was distributed to agencies and the public in August 2001, followed by a series of 18 public hearings. The Final Tier 1 EIS was available on June 29, 2002

[7] In 1996, USDOT designated an extension of the SEHSR from Richmond to Hampton Roads; in 1998, USDOT extended the corridor to South Carolina.

[8] Among the nine build alternatives ranked in the EIS, “Alternative A+” was selected as the preferred alternative. Alternative A+ is a variation of Alternatives A and B that offers passenger connectivity to Winston-Salem, NC.

vegetation beds; coastal zones and consistency with regional plans. Lastly, the Tier II analysis will include the Section 4(f) and Section 6(f) Evaluations.[9]

5.2.2 High-Priority Projects

DRPT has performed environmental documentation which satisfies NEPA for the majority of the already programmed and/or completed high-priority projects along the Washington to Richmond rail corridor.

Recent NEPA documents completed by DRPT satisfying FRA requirements include Documented CE's and FRA Categorical Exclusion Worksheets for:

- Arkendale Crossover (MP 72),
- Elmont Crossover (MP 17.5),
- RO-SRO (MP 109-110) Third Track,
- L'Enfant Plaza - Virginia Avenue Tunnel (MP 111-Union Station) Third Track (Washington, D.C.),
- Quantico (aka North Possum Point, MP 80-81) Interlocking,
- Slaters Lane (MP 106.4) Crossover.

Work is in progress for the EA on the Franconia Third Track (AF to Ravensworth, MP 96.7 to 104.3). Work is currently in abeyance for a Documented CE on Fredericksburg Third Track (FB to HA, MP 55.7 to 58.8).

Additionally, VRE completed an EA on the new Quantico Creek Railroad Bridge and approaches (MP 79-80) which culminated in a FONSI signed by FTA on December 11, 2001. The new bridge and track are nearing completion, with two-track operations scheduled to begin 2007.

5.3 Potential Major Environmental Issues, Resources and Impacts

This section provides a broad qualitative overview of significant environmental resources which exist in the corridor between MP 4 and MP 97.

HDR considered environmental and permitting issues along the corridor using the photographic and video references and other mapping sources,

[9] Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 USC 303) requires that no land from a publicly owned public park, recreation area, or wildlife or waterfowl refuge, be used for federal-aid highways unless there is no feasible and prudent alternative. Section 6(f) of the Land and Water Conservation Fund Act of 1965 as amended (LWCFA) (36 CFR 59.1) requires coordination with National Park Service and local park authorities if taking of certain parkland is proposed.

as noted. Key resource features were identified, and several assumptions offered fundamental guidelines for the conceptual analysis. Finally, for each mile, HDR assigned one of three categories regarding the preliminary level of environmental documentation and permitting effort that is expected for the third track project. The categories are: low, medium, or high. In turn, as noted in Section 4, Order of Magnitude Cost Estimate, HDR applied a cost percentage to each of these categories in order to approximate the added dollar cost for studies, permits and mitigation. *It is important to note that this is a concept-level review only; no field work or detailed research has been conducted for this effort.*

5.3.1 Environmental Review Methodology

Previous Studies. HDR reviewed the following previous studies:

- *Southeast High Speed Rail Corridor Tier I EIS* and the subsequent *Record of Decision* by FTA and FHWA.
- DRPT's completed and in-progress NEPA documentation for the high priority projects noted above.
- DRPT's June 2004, *Third Track Conceptual Location Study.*
- DRPT's June 2003, *Richmond Area Rail Master Plan Final Report – Phase I*.
- FTA's December 2000 FONSI and October 2000 EA on *Quantico Creek Railroad Bridge*
- VRE's March 2001 *Mitigation Alternatives Analysis,* and September 2003 *Joint Permit Application for Quantico Creek Railroad Bridge.*
- United States Geological Survey (USGS) quadrangle topographic mapping for the entire corridor.
- Low altitude helicopter fly-over videos (on CD's) performed by CSX Transportation in 2002.
- Valuation maps for the corridor.
- CSXT track maps (a.k.a. Beaver diagram maps) for RF&P Subdivision.
- ADC map books for Greater Richmond, Hanover County, Spotsylvania County, Stafford County, Prince William County and Northern Virginia.
- Mapquest aerial imaging and street mapping.

Key Resources. Key resources of environmental concern considered included:

- Wetlands
- Large stream (river) crossings
- Adjacent bodies of water
- Nearby community facilities
- Nearby residences
- Public access routes
- Noise sensitive receptors (schools, churches, etc.)

Environmental Assumptions. During the review, HDR planning staff applied the following environmental assumptions:

- Potential for federal funding in some capacity exists for the corridor.
- Adjacent wetlands, outside of the right-of-way, do not fall within the railroad's nationwide permit [i.e., additional permitting may be required].
- Discharge into or filling of wetlands is not exempt from Federal wetland permits.
- State water pollution and protection regulations apply for all construction activity.
- NEPA-related work already completed or in-progress along the corridor (for the high-priority projects) would not need to be redone.
- All existing highway/railroad at-grade crossings, either public or private, are not deficient and that similar railroad protection devices as currently exist would be suitable and replaced.
- NEPA-categorical exclusion projects do not obviate permitting requirements.
- Signal improvements and utility relocations are not considered an environmental issue.

Placement of the third track considered identical locations as the conceptual engineering component of this study, including the following basic assumptions:

- The tracks would be placed using 15-ft. track centers.
- The third track placement assumes 90 mph as the maximum train speed. (CSX has previously declared that 25' track centers are required for train speeds of 110 mph; 110 mph is the ultimate intent of the SESHR study.)
- Environmental impacts would be primarily within the estimated limits of construction (LOC), with some exceptions which could extend to include adjacent waterbodies, homes or other sensitive land uses.
- A third track for a major portion of the corridor could be placed within existing railroad right-of-way.
- Construction access and lay-down areas have not been considered in this analysis.
- Exclusion of three areas: Ashland (MP 13.8-15.8), Fredericksburg (MP 55.7-61.1), and Ravensworth – RO (MP 97.1-110.1).

As mentioned, no field visits were conducted as part of the preliminary environmental consideration at this stage. Similarly, no contacts were made with any outside agency, no reviews were made of the archives Virginia Department of Historic Resources, and no database reviews were made for hazardous materials or waste sites, National Wetland Inventory mapping, comprehensive land use or local planning documents. In short, the review was intended to provide a preliminary "fatal flaw" analysis of certain proposed railroad-related improvements. Information

gathered for the preparation of this report will serve as a foundation for subsequent scope development for environmental documentation and permit preparation.

There is a high volume of existing train traffic in this corridor, and the proposed concept is to add one track where needed. Portions of the corridor previously had accommodated three tracks. Nevertheless, there are certain resources in the study area which were determined to be impacted to a greater extent than others because of the likely location for the additional track. For example, impacts to existing at-grade crossings are assumed to be minimal. Road bridges and underpasses were qualitatively evaluated to determine if they could accommodate a third track with either minor or major modifications.

5.3.2 Areas of Environmental Concern

The landscape of the corridor is relatively flat for its entire length. This corridor straddles the boundary of the Piedmont and Coastal Plain physiographic provinces. The southernmost part of the corridor is in downtown Richmond, traversing largely industrial areas, including Acca Yard. The majority of the corridor borders land uses of rural or industrial character. Towns traversed by the corridor include Ashland and Fredericksburg (both of which are excluded from this study), Quantico, and smaller hamlets such as Featherstone. In the northern portion of the corridor (from MP 71), the suburban areas of Washington, D.C. begin and then from approximately Lorton (MP 92) the adjacent land presents a more highly developed urban environment.

Richmond Main Street Station to Staples Mill Road Station (MP 4).

DPRT has conducted a *Richmond Area Rail Operations Report* (December 2002) and a *Richmond Area Rail Master Plan – Phase I Final Report* (June 2003) for this section of the corridor. These studies describe related issues pertaining to Main Street Station and Acca yard, among others such as geometric curve velocities and highway/rail at-grade crossings. This third track corridor study does not address the environmental issues associated with this section.

Staples Mill Road Station (MP 4) to Fredericksburg (MP 55)

MP 4 to MP 33. From MP 4 to MP 9 (south of Interstate 295), this is largely a suburban corridor. Traveling northward becomes more rural with scattered population and occasional roadway and large stream crossings. South of Ashland the corridor crosses the Chickahominy River. The Town of Ashland (approximately MP 13.8 to 15.8) was not included in the analysis; a rail bypass has been suggested by CSXT, and the concept is under consideration by DRPT. North of Ashland to MP 33 is largely rural. Impacts to socioeconomics, community facilities, or from noise and vibration in these areas are likely minimal. New crossings of the South Anna and North Anna Rivers and wetlands exhibit perhaps the greatest environmental concern.

MP 33 to MP 55. The section of the corridor from MP 33 to MP 53 can be characterized as rural farmland and largely unpopulated in sections. Several important water features exist in this section of the corridor including the Mattaponi River which meanders adjacent to the track beginning at the Mattaponi River Bridge (MP 34) to MP 39. Tributaries to the Mattaponi and Poni Rivers and connected wetland areas lie in the areas between MP 42 and MP 43. At MP 47, the corridor routes through a significant cultural resource, Fredericksburg-Spotsylvania National Military Park, which includes the Stonewall Jackson Shrine. The corridor within the downtown limits of the City Fredericksburg was excluded from this evaluation. The existing two track bridge in Fredericksburg is the primary constraint to the third track expansion in this area. Given the historic character of the area and the potential right-of-way requirements, these few miles of track are not being considered for replacement at this time.

Dahlgren (MP 61) to Ravensworth (MP 97). This segment of the corridor begins north of Fredericksburg and ends in Franconia in southern Fairfax County. VRE offers passenger service in this section of the corridor. Stations include Quantico which also serves Amtrak (MP 76), Rippon (MP 85), the Woodbridge (MP 89), and Lorton (MP 93). Also, MP 92 is the location of the Amtrak Auto Train Station in Lorton.

This section crosses several bodies of water, each of which would require state and federal water quality permits. There are several locations with environmental sensitivity, particularly the crossings of the Potomac Run (MP 65), Accokeek (MP 67), Aquia (MP 71), Powells (MP 83), Neabsco (MP 84), and Pohick (MP 93) Creeks. From MP 70 to 75, the existing rail alignment is in close proximity (from about 100 to 500 feet) to the Potomac River, as well as several tributaries, other water bodies and potential wetland areas. It is expected that water, stream, and wetland resources will be principal concerns here in the environmental review process. Interface with the potential VRE station at Cherry Hill (MP 83) offers geotechnical challenges and potential right-of-way issues.

From MP 76 north, the area becomes more densely developed as the rail corridor travels through Quantico and the Marine Corps Base Facilities (from MP 77 to 79). At MP 82, the tracks are about 50 feet of the Potomac River to the east. As the corridor moves north towards from MP 85 to MP 97, densely settled suburban areas may make the environmental analysis more complex. There is a range of industrial and commercial activity in this section.

Ravensworth (MP 97) to Union Station, Washington, D.C.

Third track placement has been constructed or is in the environmental planning process the entire distance from MP 97 to Union Station, with the exception of the Long Bridge, between MP 110 and MP 111. A third track and interlocking are programmed immediately south of the Long Bridge, between RO-SRO near the Crystal City VRE station. However,

the addition of third track capacity to the existing double track bridge over the Potomac River has not been programmed. DRPT anticipates the need to prepare a comprehensive EIS if a new crossing of the Potomac River is proposed.

5.3.3 Summary of Environmental Review

In summary, HDR assigned a category of anticipated environmental level of concern for each mile of the corridor. The results revealed:

- **25 miles of anticipated high level of concern,**
- **39 miles of anticipated moderate levels, and**
- **27 miles of minimal environmental issues.**

The expected impacts or complexity of environmental permitting or mitigation do not infer decisions. Figure 5-1 illustrates the Areas of Highest Environmental Concern, which are noted in Table 5-1.

Given the limited expectations of right-of-way required, the general absence of nearby residences, the largely industrial use of suburban and urban areas, major NEPA environmental documentation (i.e. an EIS) may not be required for the proposed third track.

However, given the number of river crossings, DRPT should anticipate preparation of Environmental Assessments (EA), and possibly smaller EIS documents. The presumption of EA's is that the impacts will not be significant and/or they will be sufficiently minimized or mitigated so that the overall impact is not significant. The projects are not considered to be controvertial, but could be construed as a major action.

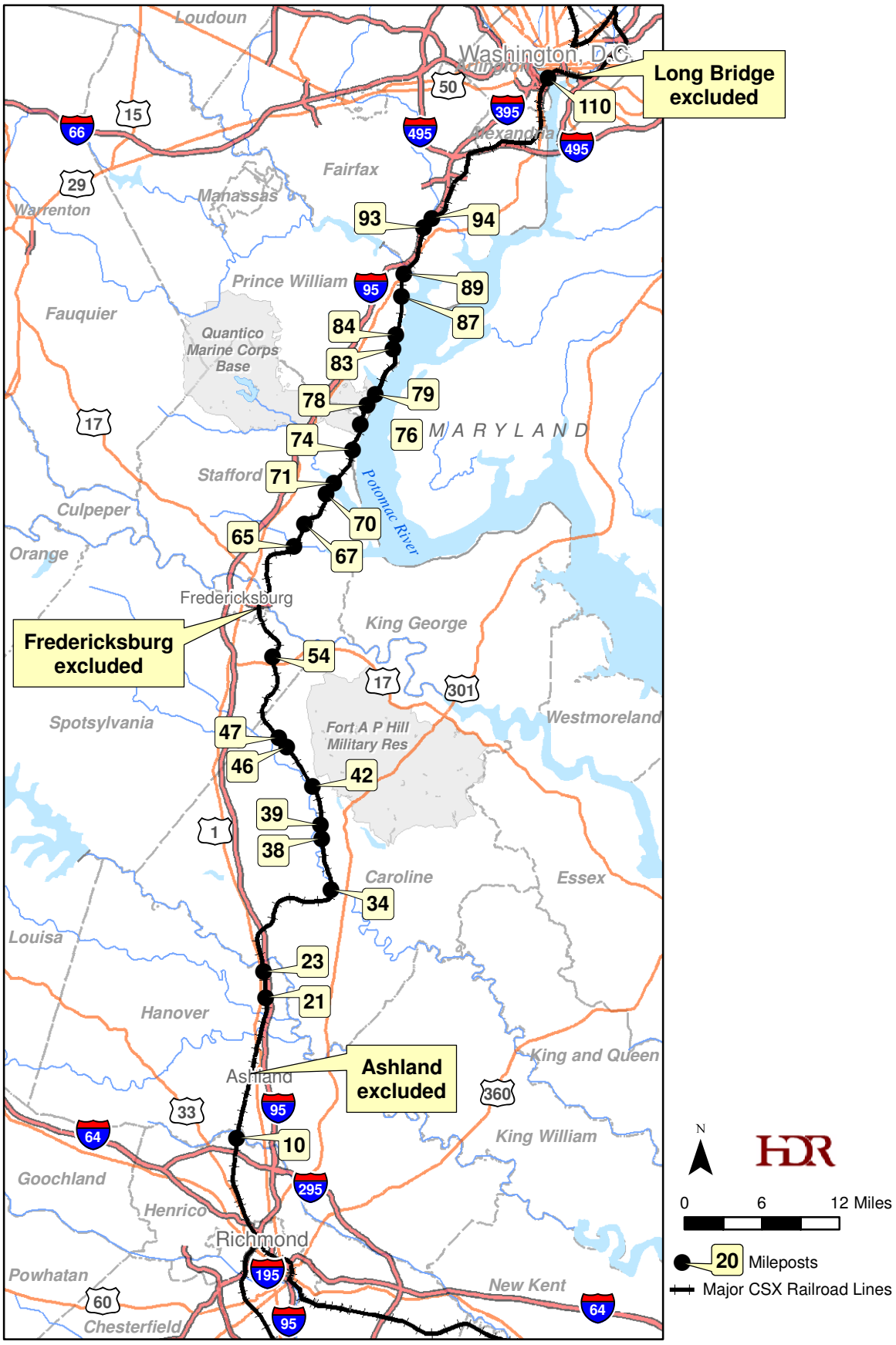
There will be costs associated with developing appropriate environmental documentation, obtaining approvals prior to design, performing necessary analysis, and developing permit applications — including permit application fees and public notices. Costs are also associated during construction for both construction-related requirements and potential off-site mitigation.

Some locations within the corridor have the potential for sensitive environmental resources. As noted previously, the route crosses waterways and passes through wetlands as well as near important historic properties. Further information will be developed during the preparation of the federal NEPA documents. Working with FRA and/or FTA, or FHWA, DRPT will help identify logical termini, independent utility, and the purpose and need for specific projects. Through the NEPA process, these projects will include scoping, agency coordination, field reviews, identification of human and environmental variables, strategies to mitigate and/or resolve unavoidable impacts to significant resources. Given the extent of the project, it is unlikely that a single environmental document would be produced for the third track project.

Table 5-1: Areas of Highest Environmental Concern

MP	County	Key Feature
10	Henrico	Chickahominy River
21	Hanover	Town of Doswell, Piedmont Sub
23	Hanover	North Anna River
34	Caroline	Mattaponi River
38	Caroline	Adjacent expanses of water
39	Caroline	Adjacent expanses of water
42	Caroline	Tributaries of Mattaponi River
46	Caroline	Adjacent expanses of water
47	Caroline	Stonewall Jackson Shrine
54	Spotsylvania	Massaponax Creek
65	Stafford	Potomac Run
67	Stafford	Accokeek Creek, VRE Brook Station
70	Stafford	Approach to Aquia Creek and wetlands
71	Stafford	Aquia Creek Bridge, Boars Creek crossing
74	Stafford	Proximity to Potomac River
76	Stafford	Chopawamsic Creek
78	Prince William	Town of Quantico
79	Prince William	Quantico
83	Prince William	Powells Creek
84	Prince William	Neabsco Creek
87	Prince William	Featherstone (residences)
89	Prince William	Occoquan River; proximity to U.S. Rte. 1
93	Fairfax	Pohick Creek
94	Fairfax	Accotink Creek
110	Washington, DC	Potomac River

Excludes: Richmond Main Street Station – Staples Mill Road (MP 4); Ashland (MP 13.8-15.7), Fredericksburg (MP 55.7-61.1); Ravensworth (MP 97.1-110.1); and, L'Enfant Station – Union Station (MP 111.6-Union Station).



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DRPT

Figure 5-1
Areas of High Environmental Concern

6. Legal, Regulatory and Funding Issues

6.1 Construction Authorization

In the absence of a federal program or earmark for such improvements, funding and construction of the third track, as foreseen by DRPT at this time, would be a wholly state and private undertaking even though federal entities such as the Federal Railroad Administration and the National Railroad Passenger Corporation (Amtrak) are involved as participating stakeholders. DRPT is proceeding with the program of service enhancements on the Washington to Richmond corridor, however, under the assumption that federal funding of the program may materialize in the future. By meeting federal regulatory requirements during planning, design and implementation of the various project elements, DRPT has established a framework for federal funding of projects, to be administered by DRPT[1] that would not be delayed or unduly encumbered. This is especially important in the area of environmental impact assessment and the need to meet the requirements of NEPA as discussed in detail in Chapter 5.

In meeting the Legislative mandate for this report, DRPT engaged the Virginia Transportation Research Council (VTRC) to assist in identifying pertinent legal and funding issues. VTRC found that Chapter 49 U.S.C. § 10901 of the United States Code provides that construction of an extension or additional rail line may be undertaken only if the Surface Transportation Board (STB) issues a certificate authorizing such activity. The party seeking to build a new rail line must apply to STB and a certificate will be issued unless the STB finds that the addition is inconsistent with the public convenience and necessity. STB can also set conditions on the construction of a new rail line which would most likely require preparation of environmental documentation in accordance with STB guidelines. Conditions for environmental mitigation could also be stipulated by STB as part of the approval process.

DRPT has established a position that the addition of the third track in the CSX right-of-way in the Washington to Richmond corridor does not constitute construction of a new rail line, but rather construction of additional capacity in an existing rail corridor. The third track would not result in any extension of existing rail lines nor result in new connections between rail carriers or elimination of existing rail access between carriers. No elimination of access to shippers is foreseen and, in fact,

[1] Va. Code Ann. § 33.1-391.5 (7) (2002).

shippers should enjoy enhanced service as a result of impr oved freight rail operations in the corridor with the third track in operation.

DRPT remains cognizant of the fact, however, that federal regulations applicable to rail line construction in a completely new corridor would require approval by the Surface Transportation Board.

6.2 Funding

6.2.1 State Funding

The mission of DRPT is "to acquire by any means whatsoever, lease, improve, and construct railway lines, passenger and freight rail,... determined to be for the common good of the Commonwealth or a region of the Commonwealth and to assist other appropriate entities in the implementation and improvement of passenger and freight rail,... and the retention of rail corridors for public purposes."[2] While DRPT has not undertaken actual construction, operation and maintenance of rail facilities, as VDOT does with state-owned highways, the agency does administer funding for such activities by other entities such as the Virginia Railway Express and has contracted with CSX to construct six improvements funded by the Virginia Transportation Act of 2000. The VTRC has identified several financing mechanisms that may apply to state funding of the third track program,

Rail Enhancement Fund[3]. In 2005, the first source of dedicated funding for freight and passenger rail improvements in Virginia history was established through the Rail Enhancement Fund (REF). The purpose of the fund is to provide monies for the acquisition, lease, or improvement of railways or railroad equipment, rolling stock, right-of-ways or facilities for freight and or passenger rail purposes. The Director of DRPT administers the REF, and shall consult with and obtain the advice and recommendations of the nine member Rail Advisory Board before submitting a proposal to the Commonwealth Transportation Board for approval.

The criteria for funding stipulate that the project result in public benefits to the Commonwealth, or to a region of the Commonwealth equal to or greater than the public investment. Finally, all projects receiving funds from the REF must include a minimum of 30% cash or in-kind matching contribution from a non-state source, which may include a railroad, a regional authority, a local government source, or a combination of such sources.[4]

[2] Va. Code Ann.§ 33.1-391.4 (2002)
[3] Va. Code Ann. § 33.1-221.1:1.1 (2005)
[4] http://www.drpt.virginia.gov/studies/files/REF-Policy-Goals-2005.pdf

When the CTB provides Rail Enhancement Funds for a project, the Director of DRPT will develop and negotiate an agreement with the applicant. This agreement will stipulate the time frame for implementation and completion of the project. Payment is made on a reimbursement basis, and after the completion of work, the grantee's records are subject to an audit. Grantees are required to report annually on the amount of public benefits obtained for the life of the project, which is generally for 15 years after project completion.

Transportation Partnership Opportunity Fund[5] Another potential source of funding is the Transportation Partnership Opportunity Fund (TPOF), which is "to be used by the Governor to encourage the development of transportation projects through design-build pursuant to § 33.1-12 (b), the Public-Private Transportation Act (§ 56-556 et seq.) and to provide funds to address the transportation aspects of economic development opportunities."

Money from this fund can be awarded as "grants, revolving loans, or other financing tools and equity contributions to (i) an agency or political subdivision of the Commonwealth or (ii) a private entity or operator which has submitted a proposal or signed a comprehensive agreement to develop a transportation facility". Grants received from this fund may be used:

> "for transportation capacity development on and off site; road, rail, mass transit, or other transportation access costs beyond the funding capability of existing programs; studies of transportation projects including but not limited to environmental analysis, geotechnical assessment, survey, design and engineering, advance right-of-way acquisition, traffic analysis, toll sensitivity studies, financial analysis, or anything else permitted by law. Funds may be used for any transportation project or any transportation facility. Any transportation infrastructure completed with moneys from the Fund shall not become private property, and the results of any studies or analysis completed as a result of a grant or loan from the Fund shall be property of the Commonwealth."

Loans from this fund are interest free, but are not to exceed $30 million. Grants are not to exceed $5 million. Applications for funding shall include a description of:

> "how the studies and analysis to be completed using moneys from the Fund will advance the development of a transportation facility, a process for the application for and review of grant and loan requests, a timeframe for completion of any work, the comparative benefit resulting from the development of a transportation project, assessment of the ability of the recipient to repay any loan funds, and other criteria as necessary to support the timely development

[5] Va. Code Ann. § 33.1-221.1:8 (2005)

> of transportation projects. The criteria shall also include incentives to encourage matching funds from any other local, federal, or private source."

Further evaluation of the enabling legislation may determine that TPOF cannot be used for construction on improvement of facilities located on private right-of-ways.

6.2.2 Public-Private Funding

The Public-Private Transportation Act of 1995 (PPTA) was intended to allow public entities to contract with private entities for transportation facilities and services. This Act could provide a mechanism for shared public and private investment in the construction of a third track. The Act provides that:

> "any private entity seeking authorization under this chapter to develop and/or operate a transportation facility shall first obtain approval of the responsible public entity. . .Such private entity may initiate the approval process by requesting approval or the responsible public entity may request proposals.[6]

In the case of a project that will span multiple jurisdictions, all affected jurisdictions are to convene in order to determine which is the "responsible public entity". This determination must be made within 60 days of receiving a proposal, and prior to requesting proposals.[7]

The responsible public entity is charged with distributing funds from government sources to the private entity. The Act further provides that:

> "Any financing of a qualifying transportation facility may be in such amounts and upon such terms and conditions as may be determined by the parties to the interim or comprehensive agreement. Without limiting the generality of the foregoing, the private entity and the responsible public entity may propose to utilize any and all revenues that may be available to them and may, to the fullest extent permitted by applicable law, issue debt, equity, or other securities or obligations, enter into leases, concessions, and grant and loan agreements, access any designated transportation trust funds, borrow or accept grants from any state infrastructure bank and secure any financing with a pledge of, security interest in, or lien on, any or all of its property, including all of its property interests in the qualifying transportation facility."

There are several advantages to seeking a public-private agreement for these corridor improvements. The main advantage of an agreement would be take the funding burden off of the state and place it on a private

[6] Va. Code Ann. §56-559 (1994)
[7] Va. Code Ann. §56-566.2 (1994)

company. The private entity could also be charged with the numerous administrative tasks associated with gaining approval of new rail construction. The railroad may also be able to design and construct improvements on its own right-of-way much more quickly than the state.

The scope of this project is quite large, however, and it could be difficult to find private entities willing to enter into such an agreement and willing to make a substantial investment in the improvements. In addition, if a private company were to enter into an agreement and then default or for some reason not finish construction, the state would presumably be required to cover the loss. Highway projects funded by lending institutions can be designed and operated as toll facilities in order to repay loans. There is a question as to whether the users of the railroad would be willing and able to pay the additional fees necessary to repay the cost of building the rail improvements.

6.3 Liability

In the event that an accident does occur for which a rail operator is liable, the potential liability is limited by federal and state law. Virginia law provides that "the aggregate liability of the authority and any applicable railroad, including the authority or railroad's governing board, directors, officers, employees, affiliates engaged in railroad operations, or an agent of an authority, for all claims of rail passengers arising from a single incident or accident of any kind involving passenger rail services or incidental services related thereto for property damage, personal injury, bodily injury, and death shall be limited to $250 million per single incident or accident.[8] This limit does not apply to accidents caused due to willful and wanton conduct, felonious criminal conduct, or gross negligence on the part of the railroad. Federal law establishes liability limits for services operated by Amtrak.

6.4 Right-of-Way

The Commonwealth can obtain property through eminent domain. State law provides that

> "any state institution may acquire by condemnation title to (i) land, (ii) any easement there over . . . for the purpose of opening, constructing, repairing or maintaining a road or for any other authorized public undertaking; however, such acquisition by condemnation shall only be commenced if the terms of purchase cannot be agreed upon or the owner (a) is unknown, (b) cannot with reasonable diligence be found within this Commonwealth or

[8] Va. Code Ann. § 56-446.1 (2006)

> (c) cannot negotiate an agreement or convey legal title to the property because the owner is a person under a disability."[9]

Permission to undertake eminent domain procedures must come from the General Assembly.[10] It is clear that without adequate land, as may be needed at specific locations to be determined in the design phases of the third track program, it will be difficult if not impossible to build a third track. However, eminent domain has become generally unpopular. With this in mind, all measures to obtain the land without eminent domain should be exhausted before such a proceeding is undertaken.

Railroad companies also have the right under Virginia law to acquire property through condemnation.

6.5 Taxes

Currently, rail companies are subject to a number of local taxes, such a property tax, levied by the localities through which the railroad passes. VTRC has pointed out that there are several ways through which the burden of taxes on a state-supported investment program into a private rail corporation could be minimized to the benefit of the traveling public. First, state law provides that "property owned directly or indirectly by the Commonwealth" is exempt from taxation.[11] State law further provides that:

> "Property indirectly owned by the Commonwealth or any political subdivision thereof or by the United States shall include, but not be limited to, a leasehold interest or other right pursuant to a concession, as defined in § 56-557 [Public-Private Agreement], in a transportation facility and real property acquired or constructed for the development and/or operation of the qualifying transportation facility when (i) the qualifying transportation facility is owned, or title to it is held, by the Commonwealth or any political subdivision thereof or by the United States and is being developed and/or operated pursuant to a concession under the Public-Private Transportation Act of 1995 (§ 56-556 et seq.) or similar federal law and (ii) the property or leasehold interest is required to be dedicated to the Commonwealth, its political subdivision, or the United States upon the termination of the concession."[12]

This section is designed to apply in instances where a Public-Private Agreement has been made between the state and a private entity. From the viewpoint of a private entity, this may not be an attractive option

[9] Va. Code Ann. §25.1-101 (2003)
[10] Va. Code Ann. §25.1-103 (2003)
[11] Va. Code Ann. §58.1-3606 (2005)
[12] Va. Code Ann. §58.1-3606.1 (2006)

because it requires the private entity to give its ownership interest in the land to the state. In the end, the state owns the property, but the private company may lease back the property.

VTRC has indicated that another method to minimize taxes would be for the General Assembly to exempt this type of rail operation from local taxation, a method likely to be more attractive to a rail company because it does not require the rail company to give up any ownership interests. For example, state law allows an exemption from taxation for "the sale, lease, use, storage, consumption, or distribution of an orbital or suborbital space facility, space propulsion system, space vehicle, satellite, or space station of any kind possessing space flight capability, including the components thereof, irrespective of whether such facility, system, vehicle, satellite, or station is returned to this Commonwealth for subsequent use, storage or consumption in any manner when used to conduct spaceport activities".[13] However, such an exemption from local taxes would have a major impact on those localities that would lose the revenues they are currently receiving from the railroads.

[13] Va. Code Ann. 58.1-609.3

7. Hampton Roads Passenger Service

7.1 Overview of Hampton Roads Service

DRPT has initiated a separate analysis of enhanced and new Richmond/ Hampton Roads Passenger Rail Project. As part of that initiative various rail routes and services are currently being examined in two corridors connecting to Richmond: one north of the James River on CSX to Newport News and one south of the James River on Norfolk Southern to Norfolk. The trains being proposed in this study would travel to Richmond Main Street Station then continue on to the Washington to Richmond corridor.

The overview presented below is based, in part, on the work produced to date for the Tier I Draft Environmental Impact Statement (DEIS). DRPT anticipates the release of the DEIS in the spring of 2007. Following public hearings, DRPT will propose a preferred alternative to the Virginia Commonwealth Transportation Board (CTB).

The four alternatives examined in the DEIS are:

1) No Build: Conventional Speed Service – maximum achievable speed of 79 mph – continues existing service only from Main Street Station via CSX routing to Newport News.
2) Alternative 1: New Higher Speed Service – maximum achievable speed of 90 mph or 110 mph -- via Petersburg to Norfolk; Conventional Speed Service via existing CSX routing to Newport News.
3) Alternative 2A: Higher Speed Service via existing CSX routing to a new station in downtown Newport News; new Conventional Speed Service via Petersburg to Norfolk.
4) Alternative 2B: Higher Speed Service only over CSX routing to Newport News.

The Richmond to Hampton Roads DEIS assumed that slots for nine round trip trains would be available for service to Hampton Roads based on the operations modeling conducted in the FRA Washington to Richmond study and that these trains would continue north of Richmond. However, modeling of corridor capacity and simulation of train operations and constraints of the affected lines would be necessary to arrive at a definitive answer as to any impact of these Hampton Roads trains on the capacity of the Washington to Richmond corridor.

In addition to the Hampton Roads services being examined by DRPT, numerous other rail service initiatives and plans converge at, terminate in, or pass through Richmond. These initiatives include:

- The Washington to Richmond Third Track Study for additional corridor capacity.
- The Southeast High Speed Rail Project.
- The Trans-Dominion Express Service Initiative for service between Richmond and Bristol.
- The proposed extension of Amtrak NEC Service to Main Street Station from Staples Mill Road Station.
- The proposed routing of Amtrak Florida and North Carolina Services through Main Street Station.
- Potential Richmond commuter rail service.

At this time (Fall 2006), no preferred alternative has been indicated by DRPT for enhanced Hampton Roads service.

These discussed or evaluated service or capacity enhancements all have implications for design and use of the Washington to Richmond third track either through added train services on the line or through physical connections and routing of trains that would affect service on the line. The Commonwealth may wish to consider conducting a comprehensive analysis, including capacity and simulation modeling, of all existing and proposed Central Virginia passenger rail services in order to capture their potential impact on rail system operations and capacity in the Richmond area. Such an analysis would assist in adequately evaluating all usage and impacts on the third track north of Richmond. The capacity modeling project currently underway by DRPT in cooperation with CSX, which is centered on Richmond and is scheduled to be completed in Summer 2007, will be an effective means with which to evaluate passenger service connectivity in the region.

7.2 Implications of Connecting Services on the Third Track

The DEIS assumed that nine round trip trains will operate between Hampton Roads and Richmond, and that all of these trains will continue north of Richmond and on to the Northeast Corridor. However, modeling of Washington to Richmond corridor capacity and train operations will be necessary to arrive at a definitive answer as to whether there is sufficient capacity to accommodate these Hampton Roads trains. The capacity modeling project currently underway by DRPT in cooperation with CSX, which is centered on Acca Yard in Richmond, will be an effective means with which to evaluate passenger service connectivity in the region.

8. Electrification of Washington, DC to Richmond Corridor

8.1 Description of Washington to Richmond Electrified Service

In H. 5012, the Virginia General Assembly also requested an estimation of the cost for powering passenger trains on the third track by electricity. At present, all train service, both passenger and freight, in the Washington to Richmond corridor is powered by diesel locomotives. While modern diesel locomotives can be energy efficient they are not the most optimal means of hauling passenger trains at high speeds. For truly efficient higher speed passenger service, electric propulsion is preferred due to the high rates of acceleration and top speeds that electric engines can provide, especially for passenger cars and trains that are substantially lighter than freight trains.

Amtrak passenger service is electrified north of Washington to New York City and beyond to Boston. Amtrak Northeast Corridor passenger trains now originating in Newport News and Richmond must switch engines in Washington, a time consuming process. Engine switching is necessary to proceed northward on the corridor, to those cities, because diesel service is not permitted into and through New York City. This is due to the long tunnels and confined underground station spaces in New York that can not accommodate diesel powered engines and the exhaust they produce.

However, the installation of an electrical catenary system would raise serious concerns for CSX. The railroad would probably never utilize the electrical power for their freight trains, but they would be required to make substantial changes to the way they operate and maintain the rail line. The supports for the overhead power lines would impact the right-of-way and clearances for maintenance. There would be a new safety risk associated with the electrical power system with personnel entering the right-of-way.

The Southeast High Speed Rail Corridor (SEHSR) between Washington, DC and Charlotte, NC, which includes the Washington to Richmond Corridor, does not propose electrification. The Alternatives Analysis and Tier I Environmental Impact Statement that have been completed for SEHSR recommend the use of modern diesel locomotives which are capable of operating at speeds well in excess of the maximum 110 mph

proposed in this study. Further, the level of service provided and the number of passengers served in this corridor did not justify the huge expense of installing an overhead catenary electric power system.

The approach to estimating the cost of an electrified third track from Washington to Richmond is based on a concept similar to other electrified rail operating systems such as the Amtrak Northeast Corridor (NEC), the Metro-North Railroad New Haven Line, and the French TGV electrified system. The developed concept provides realistic costs for the 118 mile Washington to Richmond corridor. Specific requirements and proposed throughput of electric service have also been considered and used in developing the electrified railroad concept for the corridor.

The viability of only electrifying the proposed third track with respect to operational issues and rolling stock compatibility was evaluated and HDR concluded that it would not be either practical or economically viable to electrify simply the third track and not the other two tracks. With only one track electrified, severe constraints on electric train operations would occur. For example, simultaneous movement of electric trains in opposite directions on a section of the corridor would not be possible without double tracking the electrified portions which would then require an expensive four-track section. Likewise, electrified passenger service to stations would be restricted to one track and platform. This concept would restrict rail capacity options for passenger rail service.

By providing overhead catenary electrified service for all three tracks, the electric passenger service could be operated on any track in the corridor.[1] Diesel powered freight service could also operate on any of the three tracks since diesel service can operate without hindrances under an electrified catenary system. Therefore, in order to allow the greatest degree of operational flexibility and efficiencies in the corridor, the electrified system is assumed to be based on the electrification of all three tracks.

An investigation was also conducted of the proposed right-of-way to determine access to the right-of-way for traction power substations and electrification infrastructure, as well as clearances for the overhead electrification distribution system, particularly at bridges and where overhead clearance is restricted. The developed concept includes the sizes and spacing of traction power substations, required electric utility supply feeders, the form and configuration of the overhead catenary contact wire system as well as operating considerations for the electrified system.

[1] The electrified concept examined in this study is based on an electric supply system of overhead catenary wires supported by poles alongside the rail line. Although reference is made to an “electrified track” it is not the track or rail itself that is electrified, nor is there a third electrified rail along the track supplying the electricity as there is with many subway systems such as the Washington, D.C. Metro.

The developed minimum construction cost estimates include the required railroad electrification infrastructure, electric services and necessary right-of-way, civil and structural modifications for electrification as well as required electric rolling stock (engines).

8.2 Proposed Electrification Concept

The proposed electrification concept is based on a technology developed to transmit power at a higher voltage than is being utilized by the locomotive. This concept is known as an Autotransformer (AT) feeding system and provides a higher feeding voltage from the supply substation than is used by the catenary to feed the locomotive. The higher feeder voltage is reduced to the required catenary line voltage by autotransformers installed approximately 4 to 6 miles apart along the track. This arrangement is frequently used for high speed systems and over recent years has become the system of choice for electrified commuter railroads because it provides greater system capacity and increased spacing of supply substations (approximately every 10-15 miles). Further, due to less feeder current from the supply substation compared with a single feeding system, voltage drops are reduced and the overall system operates with improved voltage regulation. Because the load current from the supply substation is less than that of the distribution voltage, the capacity of the system is increased which makes it particularly suitable for commuter, heavy and long haul rail applications as would be seen in the Washington to Richmond corridor. A further advantage of the lower load current from the source substation is that the inductive interference that affects communication lines is greatly reduced.

Given the proposed conceptual system as described above, the following has been assumed for the 118 mile electrified system:

- A total of seven supply substations will be installed and consist of a high voltage switchgear section, two 30 MVA supply transformer and 27.5 kV catenary and feeder switchgear.
- A total of 24 auto-transformer substations will be installed and consist of three 5 MVA, 55/27.5 kV autotransformers and associated catenary and feeder switchgear.
- A total of six sectionalizing switching stations will be installed along the right-of-way and be used to sectionalize the three track catenary system.
- An operations and control center and associated Supervisory Control and Data Acquisition (SCADA) and communications systems to remotely monitor and control the traction power system.
- Based on the proposed passenger train operations for the corridor, it is estimated that a total minimum fleet of six electric locomotives would be required to operate an electrified extended service south of Washington.

8.3 Construction Cost Estimate for Electrified Rail System

Based on the conceptual electrified rail system described above, HDR prepared an order of magnitude cost estimate to construct the system between Washington Union Station and Richmond Main Street Station. The cost estimate, in 2006 dollars, represents the total construction cost of the electrified rail system including six electric locomotives that would be required to provide at least minimal electric service between the two cities. Operational costs, or comparisons with conventional diesel train operating costs, are not included in the cost estimate. It is important to note that the derived costs are preliminary estimates only and were develop without benefit of engineering plans or field investigations.

The preliminary construction cost estimate is summarized in Table 8-1. The costs, which include contingency allowances, design and environmental costs are order of magnitude only at this preliminary stage of investigation. The total minimum cost for electrifying the Washington to Richmond corridor as a three track railroad is estimated at $953 million, in 2006 dollars, or $7.8 million per mile over the 118-mile corridor length. This is in addition to the $684 million cost of the rail improvement. The total minimum cost, in 2006 dollars, of building a fully electrified three track rail line from Washington to Richmond is $1.6 billion.

Table 8-1: Washington, D.C. to Richmond, VA Electrification Construction Cost Estimate (in 2006 $)

Item	Quantity	Unit	Electrical Unit Price	Civil/Struc. Unit Price	Total Cost
					2006 $
COMPLETE LINE ESTIMATE					
- 60 MVA Supply Substation	7	EA	$8,034,240	$1,794,800	$68,803,000
- Autotransformer SubStation	24	EA	$3,458,560	$1,595,300	$121,293,000
- Sectionalizing Switching Station	6	EA	$1,899,760	$904,000	$16,823,000
- Land Acquisition and Access Roads Temporary Constr.	1	LS		$5,000,000	$5,000,000
- Environmental Clean up / Mitigation	1	LS		$8,000,000	$8,000,000
- Install Wayside Sensing Equipment	1	LS	$7,500,000		$7,500,000
- Overhead Contact Wire System (OCS)	118	Mile	$1,948,075	$587,712	$299,223,000
- Utility and Utility Relocations	1	LS	$20,000,000		$20,000,000
- Traction Power SCADA and Operations Control	1	LS	$11,500,000		$11,500,000
- Communications Carrier Transmission System	118	Mile	$250,000		$29,500,000
- Security System	1	LS	$9,500,000		$9,500,000
- Vehicle Costs	6	EA	$3,500,000		$21,000,000
SUBTOTAL					**$618,142,000**
- Contingency (30 %)					$185,442,000
TOTAL					**$803,584,000**
- EIS Study at 1 % of $803,584,000					$8,036,000
- Design at 8 % of $803,584,000					$64,287,000
- Construction Management (5 % of $803,584,000)					$40,179,000
- Railroad Management (4% of $803,584,000)				$8,036,000	$32,143,000
- Commissioning Costs (Diesel Operation, Fault Testing)				$64,287,000	$5,000,000
GRAND TOTAL					**$953,229,000**
COST PER MILE					**$8.1 Million**

* This order of magnitude cost estimate is based on a conceptual electrified rail system only and has been prepared without the benefit of engineering plans or field investigations.

NOTE: This cost is for electrification only. The cost of the third track capacity improvements is estimated to be at least $683 million. The total minimum cost of an electrified three track corridor between Washington and Richmond is $1.6 billion in 2006 dollars.

9. Preliminary Implementation Schedule

The followings steps must be completed before actual construction of projects can begin:

- A clear and comprehensive alternatives analysis needs to be conducted. This analysis should include operational modeling, a review of alternative right-of-ways, and ridership projections to determine the public benefits of any proposed improvements.
- Evaluation of the public benefits of all alternatives and a detailed agreement that specifically provides safe, reliable and efficient passenger rail operations.
- Governance issues, such as how and by whom the capital projects are managed, and how the new service will be operated, must be addressed.
- Preliminary engineering must be completed for the proposed projects in order to develop an accurate estimate of total costs and to prepare the appropriate environmental documentation.
- Funding for operating and capital costs must be identified and allocated.

Long-term funding and scheduling commitments require much greater detail and certainty, especially when they become the basis for the governing agreements and the funding commitments that will be necessary amongst the involved parties. A funding plan must be developed and the funding secured before construction can commence. The cost for detailed alternatives analysis, environmental impact assessment and preliminary engineering sufficient to develop a funding plan is not unsubstantial at an estimated $40 million and will take an estimated 48 months.

Given the information evaluated in this study and the preliminary priorities noted above, the following preliminary implementation steps are recommended as a tool in initiating the implementation strategy.

Preliminary Implementation Schedule

1) Initiate a comprehensive analysis that includes:

   a. Review of alternative right-of-ways in the corridor.
   b. Completion of capacity and train operations modeling to determine the full array of needed third track infrastructure.

c. Development of ridership projections.
d. Development of a governance strategy.
e. Identification of public and private benefits.
f. Establishment of enforceable performance standards.
g. Development of cost sharing arrangements, and
h. Development of a funding plan.
Estimated Duration: 12 months.

2) Develop project implementation priorities, an implementation schedule and cost estimates based on the findings in Number 1. Estimated Duration: 3 months.

3) Prepare agreements to address issues of governance, cost sharing, operations and performance. Estimated Duration: 18 months.

4) Conduct preliminary engineering and environmental documentation for corridor improvement projects. Estimated Duration: 24 months.

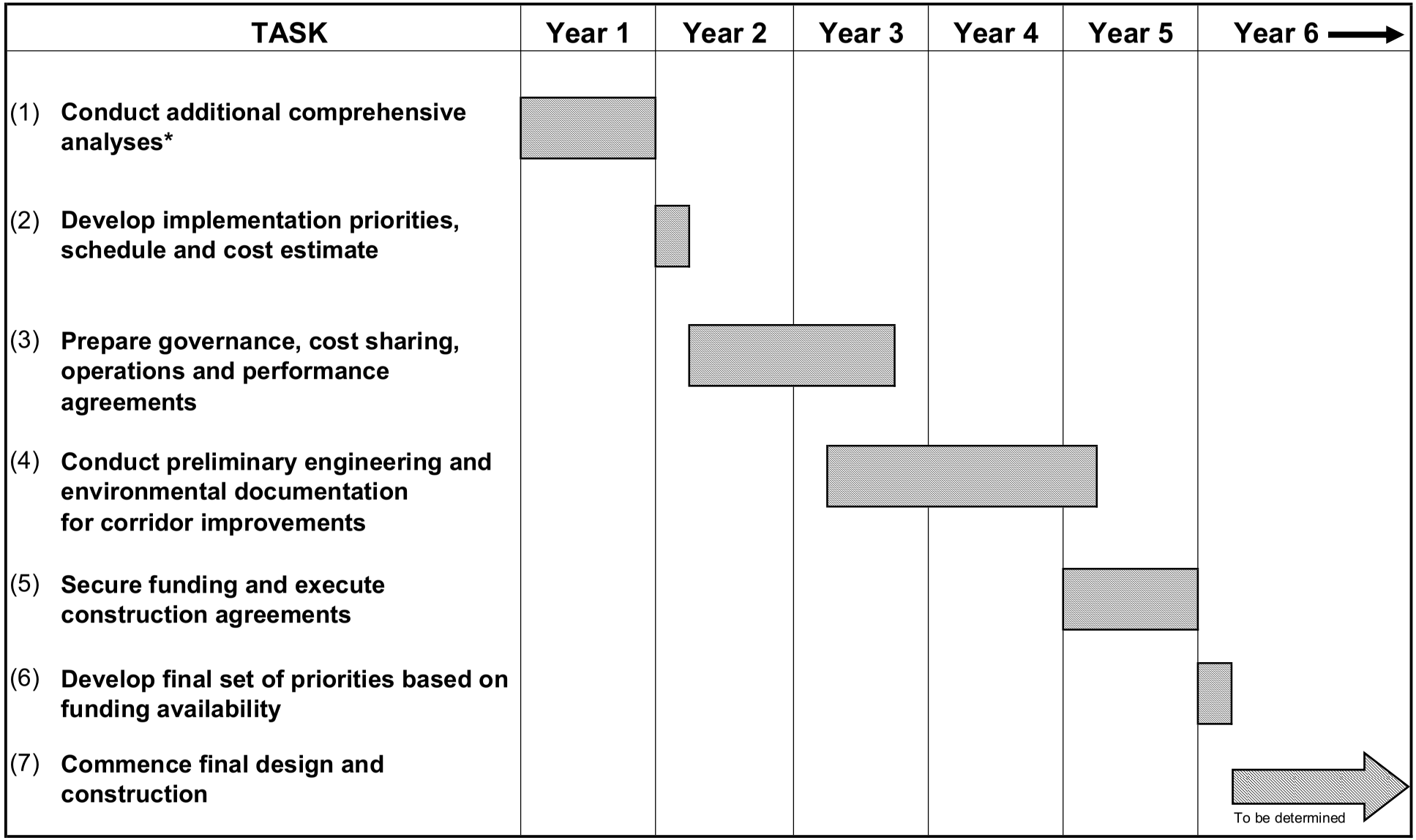
5) Secure funding and execute construction agreements among parties. Estimated Duration: 12 months.

6) Develop final set of priorities based on funding availability. Estimation Duration: 2 months.

7) Commence final design and construction of highest priority projects. Estimated Duration: To be determined.

The implementation plan is illustrated on Figure 9-1, which follows.

Figure 9-1 - Preliminary Implementation Schedule



Includes capacity, operations, alternative right-of-ways, ridership and benefits analyses. Also, develop governance strategy, performance standards, cost sharing and funding plan arrangements.