COMMONWEALTH CORRIDOR FEASIBILITY STUDY: APPENDIX C

Virginia Department of Rail and Public Transportation

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C. Appendix C: Infrastructure Capital Cost Estimate

C.1. Overview & Methodology

The cost estimates were divided into four different sub-segments of work, with nearly all the work falling within the Charlottesville-Doswell corridor segment that currently only supports limited passenger service. Estimated costs considered the infrastructure needs required to support new passenger service at a speed of 79 MPH using only assumptions on potential project scope based on the feasibility study. Segments planned to host future passenger service under other projects were assumed to have their infrastructure costs already accounted for by those projects. The estimate was made without the benefit of site visits, inspection, or survey. Table C.1 depicts a summary of infrastructure work required by corridor segment.

TABLE C.1: SUMMARY INFRASTRUCTURE WORK REQUIRED

Commonwealth Corridor Segment	Infrastructure Work Required
New River Valley-Roanoke	Layover Facility Improvements
Roanoke-Lynchburg	None
Lynchburg-Charlottesville*	None
Charlottesville-Doswell	Significant Upgrades/Reconstruction
Doswell-Richmond*	None
Richmond-Newport News	Layover Facility Improvements

*Work at the Charlottesville-Doswell segment boundary will be required

A summary of major project elements is below:

- Layover Facility Improvements consisting of 2 new tracks at both the New River Valley and Newport News layover facilities
- Reconfiguration of Norfolk Southern/Buckingham Branch Connection at Charlottesville
- Significant Upgrades/Reconstruction of the Charlottesville-Doswell Segment
    - Charlottesville-Gordonsville Upgrades
        - 5 miles of curve surfacing for superelevation changes
        - 2 existing passing sidings lengthened
        - Crossing warning modifications
        - Installation of Positive Train Control on entire segment
    - Gordonsville-Doswell Reconstruction
        - 49 miles of fully rebuilt track
        - 2 new passing sidings
        - Crossing warning modifications
        - Installation of new signal system on entire segment
        - Installation of Positive Train Control on entire segment

Elements considered in developing costs include:

- Track & Roadbed elements
- Layover Facility improvements
- Sitework on existing right-of-way/alignment

- Signal Systems and Positive Train Control (PTC)
- Professional Services and Agency Costs
- Contingency

Elements not considered in developing costs include:

- Environmental impacts or mitigation
- Real-estate or land acquisition (work assumed within existing property)
- Third party utilities
- Geotechnical considerations
- Structural work (bridges/culverts)

Capacity needs on existing freight lines due to increased passenger service are partially considered and are expanded upon later in this cost estimate.

C.1.1. Base Year

For the purposes of the estimate the base year was set to 2021. An escalation of 3% compounded annually to the year 2030 is also included for costs projected to a future construction start date.

C.1.2. Contingency

Due to the very high-level concept of this estimate at the feasibility stage of project development and the entire scope of work not able to be defined a full maximum contingency of 50% has been applied. This additionally considers that some potentially significant cost elements such as bridge structures or environmental mitigation were not included as part of developing the cost estimate.

C.1.3. Anomalies Due to COVID-19 Impacts

Construction impacts due to COVID-19 have varied widely. Sufficient data has neither been collected nor analyzed to fully determine the impacts of the COVID-19 pandemic on capital costs or construction activities related to this potential project. These impacts, along with government recovery efforts to offset them, will also need to be evaluated in future stages of this project.

C.2. Layover Facility Improvements

Initial projected service plans have indicated the need for additional layover capacity beyond what has already been planned at both ends of the corridor at New River Valley and Newport News for other services. Each facility would need to have two new layover tracks added to accommodate the train sets needed for Commonwealth Corridor service. Costs considered were the construction of new tracks with paved access roads on either side running the entire length within existing property limits. The estimate was constructed for a single facility and then doubled. Table C.2 depicts the estimate layover facility improvement costs.

Exact locations of these added tracks were not determined, and future operational considerations may significantly differ from the assumptions requiring further modifications to the layover facilities. These may require additional real estate and environmental review which has not been considered as a part of this estimate. Furthermore, since the New River Valley layover is not yet in construction, there are likely costs savings available in constructing a larger layover that can accommodate future service increases,

rather than constructing a smaller layover for the New River Valley service only, then expanding its capacity for Commonwealth Corridor service.

TABLE C.2: LAYOVER FACILITY IMPROVEMENT COSTS

Layover Improvements	Cost Estimate (1 Facility)	Cost Estimate (2 Facilities)
Trackwork	$900,000	$1,800,000
Civil Site work	$150,000	$300,000
Paving	$431,600	$863,200
Subtotal Construction	$1,481,600	$2,963,200
Professional Services	$148,160	$296,320
Agency Costs	$74,080	$148,160
Subtotal Other Costs	$222,240	$444,480
Contingency	$851,920	$1,703,840
Total Layover Improvements 2021	$2,555,760	**$5,111,520**
Escalation to 2030	$778,927	$1,557,854
Total Layover Improvements 2030	$3,334,687	**$6,669,374**

C.3. Norfolk Southern/Buckingham Branch Connection at Charlottesville Reconfiguration

The current connection between NS and BBRR is not suitable for passenger operations and requires reconfiguration. Two potential options have been considered for the purposes of the estimate; however, these concepts were created without the benefit of detailed operational discussions with NS and BBRR. Both options are possible approaches that could serve as a starting point for discussion with the freight railroads and then further refined with their input. The costs associated with both options are relatively close and should be comparable with several other configuration options. These costs are depicted in Table C.3. Option A was utilized for overall project estimation purposes.

The two options both include reconfiguration of CP-Charlottesville to include a crossover from the BB "middle track" to the BB mainline to access the existing Charlottesville station platform. The remaining details of the options are:

A. Reconfiguration of the hand-throw turnouts and crossovers on the NS immediately south of CP-Charlottesville to allow a move from the NS mainline to reach Charlottesville station at this location. This will also include turning some of the turnouts into signalized power turnouts either by further modification of CP-Charlottesville or installation of a new interlocking. A conceptual drawing of this option is depicted in Figure C.1
B. Utilization of the existing North Pass uncontrolled side-track that starts at Shamrock Road on the NS as the passenger connection. This requires signalization of the North Pass track along with associated track improvements and a new interlocking at Shamrock Road. A conceptual drawing of this option is depicted in Figure C.2

TABLE C.3: NS/BBRR CHARLOTTESVILLE CONNECTION RECONFIGURATION COSTS

NS/BBRR Charlottesville Connection	Cost Estimate "A"	Cost Estimate "B"
Trackwork	$1,500,000	$2,430,000
Signal System	$7,200,000	$7,300,000
Civil Site Work	$400,000	$400,000
Subtotal Construction	$9,100,000	$10,130,000
Professional Services	$910,000	$1,013,000
Agency Costs	$455,000	$506,500
Subtotal Other Costs	$1,365,000	$1,519,500
Contingency	$5,232,500	$5,824,750
Total Charlottesville Connection 2021	**$15,697,500**	**$17,474,250**
Escalation to 2030	$4,784,177	$5,325,683
Total Charlottesville Connection 2030	**$20,481,677**	**$22,799,933**

Considering the scope of the NS/BBRR Charlottesville connection reconfiguration is potentially significant and is at the boundary of the Lynchburg-Charlottesville and Charlottesville-Doswell line segments it will require a large amount of coordination among and work by both freight carriers. Therefore, it has been identified as a separate work item spanning both segments.

FIGURE C.1: CHARLOTTESVILLE RECONFIGURATION OPTION A

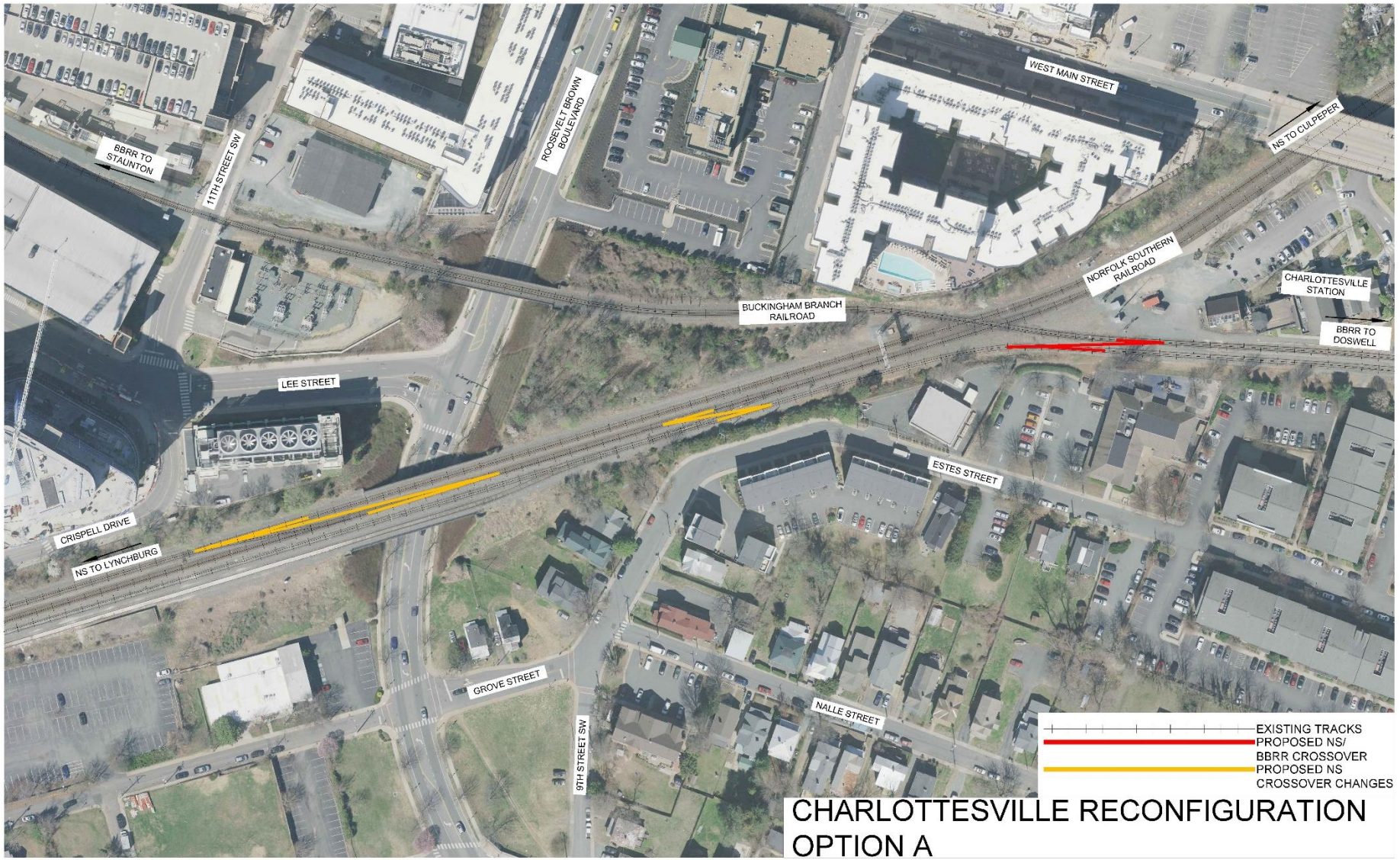
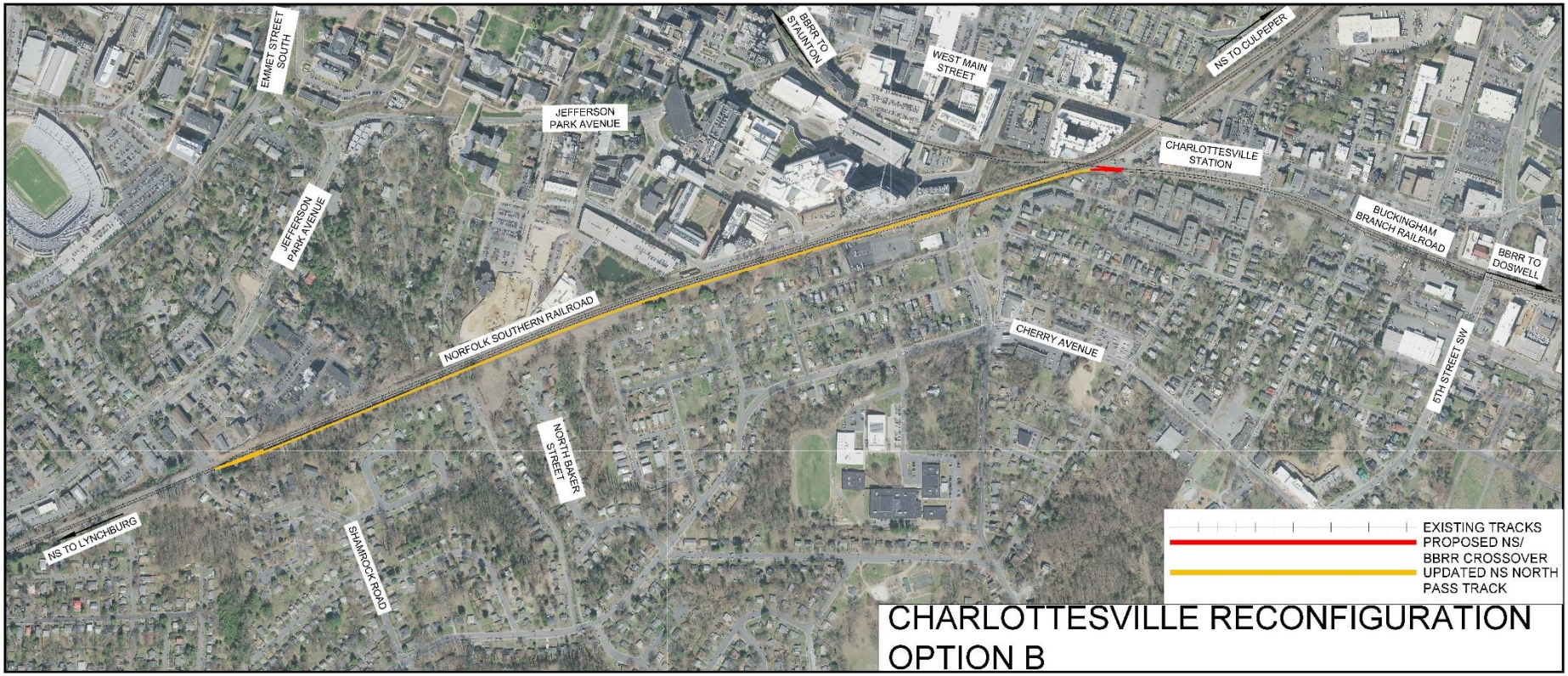


FIGURE C.2: CHARLOTTESVILLE RECONFIGURATION OPTION B



C.4. Charlottesville – Gordonsville Upgrades (Charlottesville-Doswell Segment)

This sub-segment of the project currently hosts passenger service, thus improvement needs identified in this study are not as extensive. Installation of Positive Train Control and track upgrades to support higher speeds are assumed to be needed. Two siding extensions are also assumed to be required so there is capacity to add additional passenger frequency to the existing train volume. Charlottesville – Gordonsville upgrades costs are depicted in Table C.4.

Assumptions:

- Approximately 5 miles of curve superelevation adjustment/surfacing is required
- Curve surfacing is done on existing alignment (no track shifts)
- Need to extend 2 existing passing sidings to be capable of supporting 10,000' freight trains
- No track infrastructure upgrades are required to support desired speed
- No signal system upgrades are required to support desired speed
- Existing grade crossings do not need upgrades, only modifications to allow increased speed
- Positive Train Control needs to be installed
- Charlottesville Station does require any upgrades for initiation of service

TABLE C.4: CHARLOTTESVILLE - GORDONSVILLE UPGRADES COSTS

Charlottesville-Gordonsville	Cost Estimate
Trackwork	$7,852,000
Signal System	$8,400,000
Positive Train Control	$10,000,000
Civil Site Work	$1,750,000
Subtotal Construction	$28,002,000
Professional Services	$2,800,200
Agency Costs	$1,400,100
Subtotal Other Costs	$4,200,300
Contingency	$16,101,150
Total Charlottesville-Gordonsville 2021	**$48,303,450**
Escalation to 2030	$14,721,596
Total Charlottesville-Gordonsville 2030	**$63,025,046**

C.5. Gordonville-Doswell Reconstruction (Charlottesville-Doswell Segment)

As the only part of the segment not currently hosting or otherwise planned to host passenger service this sub-segment requires a near-total rebuild resulting in the largest capital investment. This results in all new track infrastructure and a new signal system with Positive Train Control. Two new sidings are also assumed to be required so there is capacity to add additional passenger frequency to the existing train volume. Gordonsville – Doswell reconstruction costs are depicted in Table C.5.

Assumptions:

- Track over the entire sub-segment needs full reconstruction (appx 49 miles) including all mainline turnouts
- Track remains on existing alignment (no track shifts)
- Need to add 2 new passing sidings capable of supporting 10,000' freight trains
- Existing grade crossings do not need upgrades, only modifications to allow increased speed
- New ABS signal system needs to be installed with Positive Train Control

TABLE C.5: GORDONSVILLE - DOSWELL RECONSTRUCTION COSTS

Gordonsville-Doswell	Cost Estimate
Trackwork	$87,852,000
Signal System	$28,100,000
Positive Train Control	$25,000,000
Civil Site Work	$4,000,000
Subtotal Construction	$144,952,000
Professional Services	$14,495,200
Agency Costs	$7,247,600
Subtotal Other Costs	$21,742,800
Contingency	$83,347,400
Total Gordonsville-Doswell 2021	**$250,042,200**
Escalation to 2030	$76,206,157
Total Gordonsville-Doswell 2030	**$326,248,357**

The scope of this sub-segment estimate includes modifications required at the boundary of the Charlottesville-Doswell and Doswell-Richmond line segments due to the limited scope of work at Doswell on the CSX side. The work would consist of signal configuration changes to account for the new signal system on the BBRR and potentially minor trackwork on the existing connecting track.

C.6. Passenger/Freight Interoperability and Line Capacity Considerations

Proposed Commonwealth Corridor passenger schedules have proposed passenger trains meet existing and future planned passenger trains on existing infrastructure. At this stage in the development of the project there has been limited high-level discussion with the BBRR and no specific discussion with the NS or CSX regarding potential capacity improvements required to support Commonwealth Corridor service in relation to freight operations and line segment capacity.

BBRR has indicated that siding needs over the Charlottesville-Doswell segment would need to be closely evaluated due to current limitations and lack of effective passing sidings. Taking this into consideration, for estimation purposes the entire segment of 70 miles is effectively single-track. Utilizing an approximate spacing of 15 miles between sidings results in a need of 4 passing sidings capable of

supporting full-length (10,000-foot) freight trains. Costs for sidings of this size have been included in the Charlottesville-Gordonsville and Gordonsville-Doswell estimates. Specific siding locations were not determined, and further discussion with BBRR is required to finalize capacity needs.

Without input from NS and CSX it is impossible to estimate a cost of capacity needs on their respective lines. As part of this estimate, the cost of a new 10,000-foot passing siding/second track has been developed as a point of reference that could be iterated across needed improvements. This cost is not included in the overall project estimate. Table C.6 depicts the estimated cost of a new 10,000-foot passing siding.

TABLE C.6: PASSING SIDING COSTS

10,000-foot Passing Siding	Cost Estimate
Trackwork	$3,768,000
Signal System Modifications	$7,500,000
Civil Site Work	$500,000
Subtotal Construction	$11,768,000
Professional Services	$1,176,800
Agency Costs	$588,400
Subtotal Other Costs	$1,765,200
Contingency	$6,766,600
Total Passing Siding 2021	**$20,299,800**
Escalation to 2030	$6,186,835
Total Passing Siding 2030	**$26,486,635**

C.7. Results

The order-of-magnitude estimate of infrastructure costs required to initiate passenger service on the Commonwealth Corridor is approximately $319M in 2021 dollars, including costs for construction, contingency, professional services, and other agency costs. Escalated to 2030 the cost is approximately $416M. A summary of these capital costs are depicted in Table C.7.

TABLE C.7: SUMMARY OF KNOWN CAPITAL COSTS BY SEGMENT

Commonwealth Corridor Segment	2021 Cost ($M)	2030 Cost ($M)
New River Valley-Roanoke	$2,555,760	$3,334,687
Roanoke-Lynchburg	$0	$0
Lynchburg-Charlottesville*	$0	$0
Charlottesville-Doswell	$314,043,150	$409,755,081
Doswell-Richmond*	$0	$0
Richmond-Newport News	$2,555,760	$3,334,687
Total Corridor	**$319,154,670**	**$416,424,455**

*Boundary costs included in the Charlottesville-Doswell segment