CHAPTER 5
ENVIRONMENTAL CONSEQUENCES

D.C. TO RICHMOND SOUTHEAST HIGH SPEED RAIL

5 ENVIRONMENTAL CONSEQUENCES

The discussion on environmental consequences documents the potential effects on the human, physical, and natural environments that may result from construction and operation of the Preferred Alternative for the Washington, D.C. to Richmond Southeast High Speed Rail (DC2RVA) Project, as evaluated in the Final Environmental Impact Statement (EIS). The potential effects presented in this chapter are estimated directly from the conceptual engineering design of the Preferred Alternative in each of the six areas defined for the Project, which are described in detail in Chapter 4 and summarized below in Table 5.0-1.

Table 5.0-1: Summary of Preferred Alternative

Alternative Area	Preferred Alternative	Description
Area 1: Arlington (Long Bridge Approach)	1B	Add Two Main Tracks on the West
Area 2: Northern Virginia (Long Bridge Approach to Dahlgren Spur)	2A	Add a Third or Fourth Main Track
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3B	Add a Third Main Track Through the City, Add a Third Main Track North and South of the City
Area 4: Central Virginia (Crossroads to Doswell)	4A	Add a Third Main Track
Area 5: Ashland (Doswell to I-295)	5A	Maintain Two Tracks Through Town (No Station Improvements), Add a Third Main Track North and South of Town
Area 6: Richmond (I-295 to Centralia)	6F	Staples Mill Road and Main Street Stations Full Service with S-Line Improvements

Comparison to Draft EIS[1] Chapter Structure. In the Draft EIS, environmental consequences were presented in Chapter 4. This Final EIS Chapter 5 maintains the same structure as the Draft EIS chapter, and the environmental resources are described in the same order; however, each of the 23 numbered sections begins with a 5 rather than a 4. For example, Water Resources were described within Section 4.1 in the Draft EIS but are enumerated as Section 5.1 in this Final EIS. Any exceptions to this are noted within the text of this chapter.

[1] The Draft EIS for the DC2RVA Project was published on September 8, 2017, and is available on the Project website: http://dc2rvarail.com/draft/

Within the 23 sections, some subsections were not carried over if information has not changed from the Draft EIS as consistent with the intent of the condensed format of this Final EIS; for example, the impact criteria and methodologies under Noise and Vibration, Section 5.7, are not provided herein but can be reviewed in their entirety in Section 4.7 of the Draft EIS and have not changed since that time. References to Draft EIS subsections, tables, or figures and/or technical reports have been included in this Chapter 5 where necessary to support the discussions of the Preferred Alternative.

Definition of Limits of Disturbance. The potential environmental impacts for the Project are estimated directly from the conceptual design of the Preferred Alternative. Physical impacts to environmental resources are estimated within the Project's limits of disturbance (LOD), which are defined as the boundary within which all construction, materials storage, grading, landscaping, and related activities will occur.

- Permanent effects (identified with a "P" in the tables where impacts are quantified) include all areas where Project infrastructure will physically replace existing conditions, and will not be restored after completion of construction.
- Temporary effects (identified by a "T" in the tables where impacts are quantified) are areas required for construction of the Preferred Alternative, such as for construction access or staging and storage of equipment, that will temporarily modify the existing conditions, but will be restored after completion of construction. For restoration, the property will be regraded and seeded with an approved seed mixture by the contractor and allowed to renaturalize after completion of the Project.

While natural resources are generally affected by direct encroachments or physical effects of the built improvements as described by the permanent and temporary LOD above, the area of potential impact for the human environment, noise, and air quality are typically larger to account for factors such as viewsheds, community sizes, geographical and political boundaries, and census boundaries, which have not changed since the Draft EIS evaluations.

In general for the Preferred Alternative, permanent LOD are 0 to 40 feet outside of existing CSX Transportation (CSXT) railroad right-of-way, with a maximum offset of 650 feet for station improvements. Temporary LOD are generally 10 to 15 feet outside of the permanent LOD, with a maximum offset of 50 feet.

Changes since the Draft EIS. The permanent and temporary LOD for the Preferred Alternative are based on conceptual engineering, which is an approximately a 10 percent level of design. Refinements to the conceptual engineering resulted in design changes—and therefore changes to the LOD and associated environmental impacts—between the Draft and Final EIS. In many cases, these changes in LOD resulted in a reduction in potential impacts from what the Virginia Department of Rail and Public Transportation (DRPT) initially determined in the Draft EIS. For example, retaining walls were added to maintain the permanent LOD within the existing CSXT right-of-way wherever practicable, which reduced impacts to property and resources such as parks immediately adjacent the right-of-way, and the elimination of a parking deck at Richmond's Main Street Station in response to City comments resulted in reduced property and cultural resource impacts in Shockoe Valley. There are also certain areas of increased impact since the Draft EIS, such as just north of Ashland, where additional data led to the determination that the existing Washington Highway (Route 1) overpass over the rail corridor would need to be replaced due to insufficient horizontal clearance for an additional track and crash wall. These

changes are fully detailed in Chapter 4 of this Final EIS and are a result of either responses to public and/or agency comments or from new data or changes to the data that were used in refining the conceptual designs.

The changes in the conceptual engineering LOD and/or impacts since the Draft EIS are presented in this chapter in the following ways:

- Text within each resource section provides a description of any changes in the conceptual engineering LOD that resulted in changes to reported impacts to that resource since the Draft EIS evaluation.
- The tables present the range of impacts associated with the Draft EIS Build Alternatives for comparison to impacts for the Preferred Alternative, as shown in a "Draft EIS Impacts" row in each quantitative table. This gray-shaded row is located below the Preferred Alternative row for each associated Alternative Area.
  - For Alternative Areas in which the Draft EIS evaluated more than one Build Alternative (i.e., Areas 1, 3, 5, and 6), the "Draft EIS Impacts" row shows the range of impacts for all Build Alternatives that were evaluated in the Draft EIS.
  - For Alternative Areas in which the Draft EIS evaluated a single Build Alternative (i.e., Areas 2 and 4), the "Draft EIS Impacts" row shows a single value.
- Table values in this chapter are color coded to show the relative change in impacts since the Draft EIS. Reductions in impacts for the Preferred Alternative since the Draft EIS are indicated by green font and increases by red font.
  - For Alternative Areas in which the Draft EIS evaluated more than one Build Alternative (i.e., Areas 1, 3, 5, and 6), the color coding reflects the increase or decrease from the impacts reported in the Draft EIS for the corresponding Build Alternative, not the range of impacts for all Build Alternatives that were evaluated in the Draft EIS.

The LOD, which is based on conceptual design, may be further reduced or eliminated during future phases of design. If the Project's final design or impacts exceed the National Environmental Policy Act (NEPA) commitments established in this Final EIS and the Record of Decision (ROD), then DRPT will re-evaluate the design and/or the NEPA documentation.

Environmental Resource Mapping. Appendix M of this Final EIS presents updated environmental resource mapping that was previously published throughout the chapters and appendices of the Draft EIS. The majority of the mapping provided in the Draft EIS and its associated technical appendices has not changed, did not show the Project LOD, and/or was presented at a scale where the minor changes in LOD since the publication of the Draft EIS are not discernible; therefore, consistent with the intent of the condensed document format of this Final EIS, those maps are not reproduced, and Appendix M of this Final EIS instead provides the location in the Draft EIS where the reader can find the original mapping that remains up-to-date.

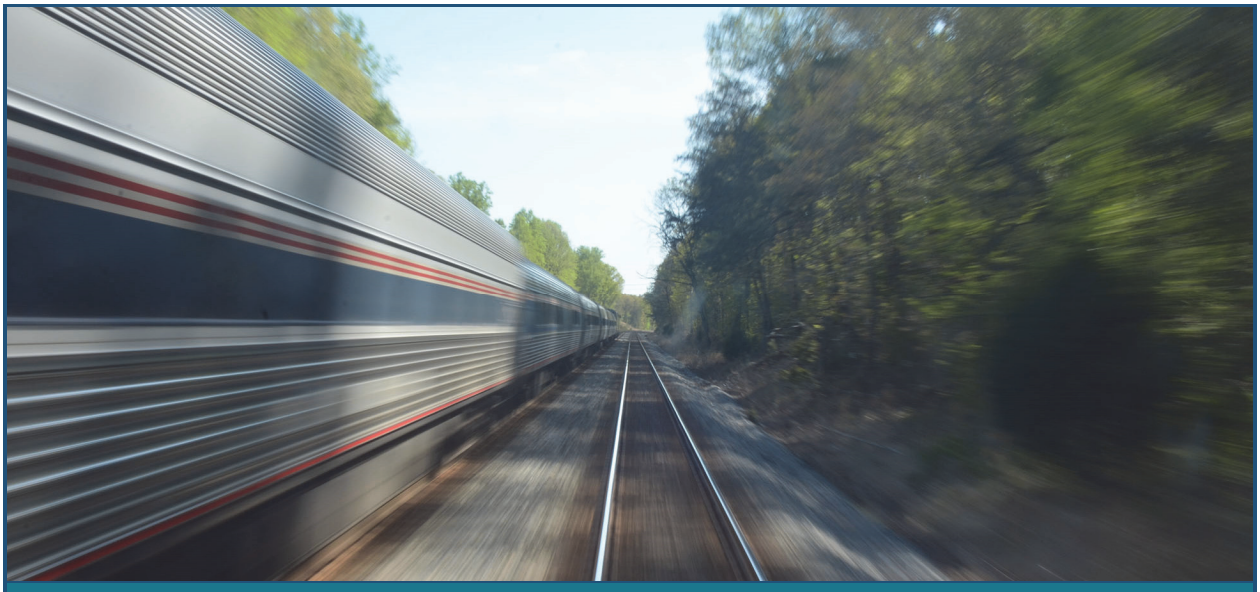
Appendix L of this Final EIS provides detailed a mapbook that shows the Preferred Alternative permanent and temporary LOD for the 123-mile Project corridor. The reader can use these maps in a side-by-side comparison with the resource mapping from the Draft EIS to view the Preferred Alternative LOD and the locations of existing environmental resources; the text in each of the following environmental resource section states how impacts to environmental resources have changed since the publication of the Draft EIS. Potential impacts to environmental resources as

identified in this Final EIS (which are based on a 10 percent level of design) will be reconfirmed as part of future phases of final design and permitting.

Analysis Dates. As indicated in Section 1.3.6 of this Final EIS and consistent with the Draft EIS evaluations, the year 2025 is the Federal Railroad Administration (FRA) and DRPT's build year estimate for the Project, and the planning horizon date is 2045, reflecting a 20-year lifetime for the improvements after the projected implementation of the new intercity passenger rail service in 2025. Accordingly, FRA and DRPT used 2025 as the date when the physical impacts to environmental resources associated with DC2RVA Project construction will take place. DRPT used the 2045 planning horizon date to estimate the longer-term effects of the proposed service, such as ridership, energy use, and effects on air quality, as well as indirect and cumulative effects as described within this chapter.

Mitigation for Environmental Impacts. Proposed mitigation is identified throughout this chapter as measures to avoid, minimize, reduce, or eliminate potential effects of the Project. As part of the identified mitigation, applicable best management practices, known as BMPs,[2] are also identified. BMPs are existing practices and measures required by law, regulation, or policy that reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing, or reducing/eliminating impacts, BMPs are distinguished from mitigation measures because BMPs are inherently part of the Project and are not additional mitigation measures proposed because of this environmental review process. Examples of typical BMPs include permanent seeding, use of native vegetation, sediment and erosion control, silt fences, check dams, and sediment basins. DRPT will refine the mitigation measures during final design and ensure that they are incorporated into the DC2RVA Project.

For a detailed listing of these mitigation measures and other activities that will be completed during final design and construction, refer to the Project Commitments for this Final EIS.



Intercity Passenger Rail Service in the Existing DC2RVA Corridor

[2] *BMP Design Manual of Practice*, Virginia Department of Transportation, April 2013; Virginia Erosion & Sediment Control Handbook; Virginia Stormwater Management Handbook; Virginia Stormwater Management Program; VDOT Drainage Manual. https://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications.aspx

5.1 WATER RESOURCES

Due to the linear nature and extent of the DC2RVA corridor and proximity to the Potomac River and other major tributaries within the Chesapeake Bay Watershed, the Preferred Alternative will include unavoidable effects to water resources. Detailed discussions of the water resources affected by the Build Alternatives evaluated in the Draft EIS were presented in the Natural Resources Technical Report (Appendix M of the Draft EIS).

The analyses summarized in this section assume the design changes associated with the Preferred Alternative, as described in Chapter 4 of this Final EIS. Notable changes in impacts to water resources as compared to the impacts reported in the Draft EIS for the Build Alternatives are identified within the individual subsections below.

5.1.1 Surface Waters, Rivers, Streams, and Floodplains

Table 5.1-1 presents the permanent and temporary impacts (physical encroachments) on water resources by the Preferred Alternative. An updated mapbook of water resources (major river crossings, streams, wetlands, impaired waters, floodplains, and resource protection areas) in relation to the Preferred Alternative LOD is provided in Appendix M of this Final EIS. Potential impacts to each of the water resources is discussed in detail after Table 5.1-1.

The Preferred Alternative will parallel the existing CSXT railroad through the full extent of the DC2RVA corridor and permanently span or encroach upon 163 rivers, streams, and other surface waters that fall within or adjacent to the existing railroad corridor. DRPT estimates permanent linear and parallel encroachments to these watercourses at 29,957 linear feet. In the Draft EIS, depending on the combination of Build Alternatives, DRPT determined that between 152 and 191 streams would be permanently affected by the proposed improvements and that linear and parallel encroachments to these streams would be between 26,377 and 35,422 linear feet. There are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to water resources; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS. Although the total number of steams and watercourses spanned by the Project remained the same, DRPT determined that, as a result of the minor design modifications since the Draft EIS, the Preferred Alternative will result in fewer total permanent impacts (physical encroachments) as compared to impacts originally reported in the Draft EIS.

Rail Bridge over Powells Creek (Area 2, Northern Virginia)

Table 5.1-1: Stream Resource/Floodplain Effects of the Preferred Alternative

Alternative Area	Preferred Alternative	Number of Streams	Stream Length (Linear Feet)	Navigable Waters (Linear Feet)	State Scenic Rivers (Linear Feet)	Nationwide Rivers Inventory (Linear Feet)	Chesapeake Bay RPA (Acres)	100-Year Floodplain (Acres)
Area 1: Arlington	1B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 5.0 T: 1.3	P: 0.1 T: 0.3
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 4.0-6.0 T: 0.6-1.5	P: 0.1-0.3 T: 0.3-1.0
Area 2: Northern Virginia	2A	P: 52 T: 68	P: 8,031 T: 3,396	P: 201.4 T: 236.9	P: 45.9 T: 50.2	P: 0 T: 0	P: 76.1 T: 41.6	P: 16.1 T: 17.1
Draft EIS Impacts		P: 52 T: 68	P: 7,198 T: 4,022	P: 205.7 T: 232.9	P: 44.4 T: 50.2	P: 0 T: 0	P: 67.9 T: 50.2	P: 15.1 T: 18.1
Area 3: Fredericksburg	3B	P: 20 T: 26	P: 1,271 T: 1,958	P: 45.0 T: 50.1	P: 45.0 T: 50.1	P: 0 T: 0	P: 46.0 T: 17.9	P: 9.9 T: 7.4
Draft EIS Impacts		P: 16-43 T: 21-45	P: 1,101-4,597 T: 1,693-1,894	P: 44.5-45.0 T: 50.1-102.7	P: 44.5-45.0 T: 50.1-102.7	P: 0 T: 0	P: 36.9-57.9 T: 17.7-18.6	P: 7.7-10.5 T: 3.8-6.4
Area 4: Central Virginia	4A	P: 32 T: 43	P: 3,616 T: 2,768	P: 22.8 T: 292.0	P: 21.8 T: 39.6	P: 21.8 T: 39.6	P: 69.2 T: 28.8	P: 17.2 T: 16.6
Draft EIS Impacts		P: 32 T: 43	P: 3,627 T: 2,798	P: 64.8 T: 265.9	P: 40.5 T: 20.8	P: 40.5 T: 20.8	P: 69.7 T: 31.9	P:17.2 T: 17.3
Area 5: Ashland	5A	P: 23 T: 25	P: 6,978 T: 1,741	P: 0 T: 0	P: 19.3 T: 36.9	P: 19.3 T: 36.9	P: 18.0 T: 13.5	P: 6.6 T: 3.3
Draft EIS Impacts		P: 22-28 T: 25-31	P: 6,928-9,114 T: 1,623-2,958	P: 0 T: 0	P: 40.1 T: 15.7	P: 40.1 T: 15.7	P: 16.6-32.6 T: 12.8-15.4	P: 5.9-11.5 T: 2.4-4.0
Area 6: Richmond	6F	P: 36 T: 31	P: 10,061 T: 1,140	P: 30.2 T: 99.9	P: 30.2 T: 99.9	P: 0 T: 0	P: 64.8 T: 9.3	P: 44.1 T: 17.5
Draft EIS Impacts		P: 30-36 T: 29-34	P: 7,523-10,886 T: 2,288-3,609	P: 29.2-31.7 T: 49.5-51.9	P: 29.2-31.7 T: 49.5-51.9	P: 0 T: 0	P: 53.5-63.3 T: 11.1-17.4	P: 8.1-51.9 T: 3.5-20.2
Total for the Preferred Alternative:		**P: 163 T: 193**	**P: 29,957 T: 11,003**	**P: 299.4 T: 678.9**	**P: 162.2 T: 276.7**	**P: 41.1 T: 76.5**	**P: 279.1 T: 112.4**	**P: 94.0 T: 62.2**

Notes: P = Permanent Effect; T=Temporary Effect

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.1.1.1 Designated Waters

Navigable Waters

The Preferred Alternative crosses seven Coast Guard regulated navigable waters, as listed below and shown in the updated environmental resource mapbooks in Appendix M of this Final EIS. There are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to navigable waters; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS. In general, permanent impacts to navigable waters are lower and temporary impacts are higher than reported in the Draft EIS. The Project will not affect or reduce the navigable channels within these waterways because all navigable waterways are already crossed by existing bridges and any new bridges required by the Project will be designed with horizontal openings that are equal to or greater than existing spans.

- Occoquan River
- Neabsco Creek
- Powells Creek
- Aquia Creek
- Rappahannock River
- Mattaponi River
- James River

State Scenic Rivers and Nationwide Rivers Inventory

The Project crosses the following five state scenic rivers: Occoquan River, Rappahannock River, North Anna River, South Anna River, and James River. The North Anna River and South Anna River are also listed on the Nationwide Rivers Inventory. As with the navigable waters, permanent impacts to these rivers are generally lower than reported in the Draft EIS and temporary impacts are higher. There are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to state scenic rivers and nationwide rivers inventory; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS. The Preferred Alternative will not affect river designations because the Project does not propose any new crossing locations of rivers, and any new rail structures will be designed to generally reflect the horizontal and vertical nature of existing structures.

Chesapeake Bay Preservation Act (Bay Act)[3]

The DC2RVA Project corridor falls within several designated Chesapeake Bay Preservation Areas. Permanent impacts to Resource Protection Areas (RPA) within the six alternative areas, as shown in Table 5.1-1 and the updated mapbook in Appendix M of this Final EIS, have slightly increased for the Preferred Alternative, and temporary impacts have decreased. In the Richmond area, the increased permanent LOD since the Draft EIS is a result of track extensions from Staples Mill Road Station for operations in and out of Acca Yard. Otherwise, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to RPAs; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

[3] The Bay Act and its implementing regulations are included in Va. Admin. Code § 62.1-44.15:74, et seq.

The Project will be consistent with the Bay Act and its implementing regulations in that improvements will be designed and constructed in accordance with: the Virginia Erosion and Sediment Control Law[4]; the Stormwater Management Act[5]; the terms and conditions of water quality permits required by the U.S. Army Corps of Engineers (USACE), Virginia Department of Environmental Quality (DEQ), and Virginia Marines Resources Commission (VMRC); and an erosion and sediment control plan and a stormwater management plan for Virginia DEQ.

Virginia Coastal Zone Management Program (CZMP)[6]

Virginia's Coastal Zone was shown in Figure 3-3 of the Appendix M of the Draft EIS (Natural Resources Technical Report). The Preferred Alternative, consisting of the six alternative area segments, will be consistent with the established Virginia Coastal Zone Enforceable Policies as related to fisheries management, subaqueous lands management, wetlands management, dunes management, nonpoint source pollution control, point source pollution control, shoreline sanitation, air pollution control, and coastal lands management.

As part of final design, DRPT (or the sponsoring agency at the time of application) will submit a Federal Consistency Determination for the Preferred Alternative that analyzes the coastal effects of the Project in light of the enforceable policies of the Virginia CZMP and provides commitment to comply with those policies. As indicated above, the Preferred Alternative will be designed and constructed in accordance with the Virginia Erosion and Sediment Control Law and the terms and conditions of water quality permits required by USACE, Virginia DEQ, and VMRC, and an erosion and sediment control plan and a stormwater management plan approved by Virginia DEQ. Implementation of proposed mitigation measures and any required permits will ensure consistency with the enforceable policies of the Virginia CZMP.

5.1.1.2 Floodplains and Floodways

As indicated in Table 5.1-1, the Preferred Alternative will permanently affect 94.0 acres of Federal Emergency Management Agency (FEMA)-designated 100-year floodplains (which were shown in Draft EIS Figure 3.1-3). There was considerable variation in the acres of encroachments (both longitudinal and parallel) among the various combinations of the Build Alternatives in the Draft EIS—ranging from 62.4 to 124.8 acres. Within the individual areas, there are minor increases and decreases in Preferred Alternative impacts from those reported in the Draft EIS. However, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to floodplains and floodways; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

None of the floodplain encroachments associated with the Preferred Alternative represent a "significant encroachment"[7] because of the following reasons:

- It would pose no significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation

[4] Va. Code Ann. §62.1-44.15:51—§62.1-44.15:66

[5] Va. Code Ann. §62.1-44.15:24—§62.1-44.15:50

[6] The Virginia Coastal Zone Management Program was established by Virginia Executive Order 35 (2014): Continuation of the Virginia Coastal Zone Management Program.

[7] See 23 Code of Federal Regulations (CFR) 650.105(q).

route. These rail lines are not considered the only emergency evacuation route, nor do they support emergency vehicles.

- It would not pose a significant flooding risk. The Preferred Alternative will be consistent with procedures for the location and hydraulic design on floodplains contained in 23 CFR 650 *Subpart A – Location and Hydraulic Design of Encroachments on Flood Plains*. Accordingly, DRPT does not expect that the Preferred Alternative will increase flood height elevations, the probability of flooding, or the potential for property loss and hazard to life.
- It would not have significant adverse effects on natural and beneficial floodplain values. Avoidance and minimization efforts, including spanning floodplains where practicable and minimizing wetland impacts, will be incorporated during design to avoid or minimize impacts on natural and beneficial floodplain values.

5.1.1.3 Stormwater/Drainage

Increased stormwater runoff from construction of the Project improvements can impact receiving streams and associated land surfaces in two forms: long-term impacts caused by runoff from increased impervious surfaces and short-term impacts caused by land disturbance during construction. As previously indicated, the Preferred Alternative will be designed and constructed in accordance with the Virginia Erosion and Sediment Control Law, the Stormwater Management Act, and the terms and conditions of water quality permits required by USACE, Virginia DEQ, and VMRC. By upgrading older stormwater facilities in the DC2RVA corridor, the Project will improve drainage, representing an overall beneficial effect of the Project.

5.1.2 Wetlands

Table 5.1-2 presents the temporary and permanent impacts by wetland type, and an updated mapbook showing wetlands in relation to the Preferred Alternative LOD is provided in Appendix M of this Final EIS. DRPT estimates permanent impacts resulting from the Preferred Alternative will be 24.19 acres (compared to the Draft EIS Build Alternative impacts that ranged from 22.14 to 49.64 acres), and temporary impacts during construction will be approximately 24.91 acres (similar to the Draft EIS Build Alternatives that ranged from 25.25 to 30.86 acres).The Preferred Alternative generally has fewer permanent and temporary impacts from those presented in the Draft EIS. However, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to wetlands; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Additionally, a small portion of the wetlands within the permanent and temporary LOD in the Project corridor occur along tidal waterways and are tidally-influenced:

- Permanent LOD: 0.85 acres occurring in Areas 2 and 4
- Temporary LOD: 0.50 acres occurring in Areas 1, 2, and 4

Tidal wetlands offer important habitat to migratory waterfowl, provide nurseries for aquatic species of the Chesapeake Bay, are important for shoreline stabilization, and serve as a filter removing excess nutrients and pollutants from connected waters. Impacts to these waters will be minimized by designing water crossings to span waterways, placing as little infrastructure in the waters as practicable.

Table 5.1-2: Wetland Effects (acres) of the Preferred Alternative

Alternative Area	Preferred Alternative	PEM[1]	PEM/ PSS	PEM/ PFO	PEM/ PSS/ PFO	PSS[2]	PSS/ PFO	PFO[3]	Total
Area 1: Arlington	1B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0.01	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0.01
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0.0-0.02 T: 0.01-0.67	P: 0 T: 0	P: 0 T: 0	P: 0.0-0.02 T: 0.01-0.67
Area 2: Northern Virginia	2A	P: 1.51 T: 0.59	P: 0.21 T: 0.17	P: 2.24 T: 1.19	P: 0.67 T: 0.37	P: 0 T: 0	P: 0 T: 0	P: 1.31 T: 0.82	P: 5.94 T: 3.14
Draft EIS Impacts		P: 1.36 T: 0.62	P: 0.15 T: 0.19	P: 1.71 T: 1.53	P: 0.67 T: 0.37	P: 0 T: 0	P: 0 T: 0	P: 1.31 T: 0.83	P: 5.19 T: 3.54
Area 3: Fredericksburg	3B	P: 1.63 T: 1.06	P: 0.29 T: 0.32	P: 1.48 T: 2.10	P: 0 T: 0	P: 0.03 T: 0.29	P: 0.04 T: 0	P: 0.73 T: 1.46	P: 4.20 T: 5.23
Draft EIS Impacts		P: 1.57-1.92 T: 0.92-1.16	P: 0.42-0.54 T:0.10-0.21	P: 2.39-3.92 T: 0.90-1.30	P: 0 T: 0	P: 0.13-0.42 T: 0.34-0.36	P: 0-0.04 T: 0	P: 0.70-17.03 T: 1.49-4.24	P: 5.24-23.82 T: 4.45-6.53
Area 4: Central Virginia	4A	P: 2.68 T: 1.43	P: 0.76 T: 0.19	P: 3.03 T: 7.08	P: 0.93 T: 0.94	P: 0.04 T: 0	P: 0.20 T: 0.94	P: 1.16 T: 3.55	P: 8.80 T: 14.13
Draft EIS Impacts		P: 2.51 T: 1.66	P: 0.78 T: 0.17	P: 2.67 T: 7.55	P: 0.71 T: 1.15	P: 0.04 T: 0	P: 0.25 T: 0.90	P: 1.43 T: 3.31	P: 8.39 T: 14.74
Area 5: Ashland	5A	P: 0.71 T: 0.13	P: 0 T: 0	P: 0.22 T: 0.45	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0.08	P: 0.05 T: 0.86	P: 0.98 T: 1.52
Draft EIS Impacts		P: 0.16-2.70 T: 0.05-0.78	P: 0 T: 0	P: 0.21-2.10 T: 0.46-0.92	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0.08	P: 0.04-3.69 T: 0.86-1.70	P: 0.41-8.48 T: 1.48-3.47
Area 6: Richmond	6F	P: 2.82 T: 0.51	P: 0.20 T: 0.01	P: 0.22 T: 0.03	P: 0.07 T: 0.03	P: 0.57 T: 0.05	P: 0 T: 0	P: 0.39 T: 0.25	P: 4.27 T: 0.88
Draft EIS Impacts		P: 1.30-2.75 T: 0.29-0.64	P: 0-0.20 T: 0-0.01	P: 0.28-1.07 T: 0.05-0.33	P: 0.13-0.36 T: 0.06-0.10	P: 0.01-0.08 T: 0.05-0.40	P: 0 T: 0	P: 0.18-0.30 T: 0.22-0.77	P: 2.91-3.74 T: 1.03-1.91
Total for the Preferred Alternative:		**P: 9.35 T: 3.72**	**P: 1.46 T: 0.69**	**P: 7.19 T: 10.85**	**P: 1.67 T: 1.34**	**P: 0.64 T: 0.35**	**P: 0.24 T: 1.02**	**P: 3.64 T: 6.94**	**P: 24.19 T: 24.91**

Notes: 1. PEM=Palustrine Emergent (freshwater emergent wetland)

2. PSS=Palustrine Scrub-Shrub (freshwater shrub wetland)

3. PFO = Palustrine Forested (freshwater forested wetland)

P = Permanent Effect, T=Temporary Effect

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.1.3 Water Quality

5.1.3.1 Temporary Effects

Despite protective measures, the Project could potentially result in short-term effects to water quality, such as increased sedimentation; increase in turbidity from in-stream work; increased likelihood of potential spills; and non-point source pollutants entering groundwater or surface water from stormwater runoff.

Construction activities that could affect stormwater runoff include excavation to widen "cut" sections and to remove unsuitable (organic) material from "fill" sections; filling and placing ballast to support new track; relocating access roads; relocating or creating new trackside swales; and any substructure work required for the signal and communication equipment foundations, grade-crossings, bridge or culvert installation, or station improvements. Construction-phased staging areas and haul roads, if needed, could also disturb the ground, potentially causing erosion and sedimentation.

5.1.3.2 Long-Term Effects

Minor long-term water quality impacts could occur as a result of increases in impervious surfaces and consequent increases in pollutants washed from the railroad surface into receiving water bodies; leaking fluids from trains; and an increase in non-point source pollutants from infrastructure, grease, oil, metals, maintenance chemicals, vegetation management chemicals, and suspended solids and other elements associated with railways.

The Preferred Alternative will be located adjacent to existing railroad and roadway facilities, and construction of the Preferred Alternative will incorporate BMPs and improved stormwater facilities, which will mitigate the potential impacts caused by the new facilities constructed by the Project and may result in improved water quality conditions.

5.1.3.3 Impaired Waters

The DC2RVA corridor includes 51 water crossings that have been assessed and found to have more contamination than allowed to support one or more of its designated uses. The Natural Resources Technical Report (Appendix M of the Draft EIS) provided a list of impairments, probable causes, and the potential for the DC2RVA Project to add to these impairments; impaired waters in relation to the Preferred Alternative LOD are provided in Appendix M of this Final EIS.

The potential for additional contaminants is similar for all waters, and waters that are already impaired may have additional restrictions in the form of Total Maximum Daily Load (TMDL) limits in an effort to restore designated uses.

The Project will not remediate existing sources of contaminants unless practical or required by federal, state, or local regulations; however, as indicated above, construction of the Preferred Alternative will incorporate BMPs and improved stormwater facilities, which will mitigate potential impacts and minimize further impairment of the water bodies.

5.1.4 Drinking Water/Aquifers/Water Supply

Table 5.1-3 presents the areas of potential influence associated with the Preferred Alternative LOD within drinking water protection zones. The permanent and temporary LOD for the Preferred Alternative were assessed in relation to the following prescribed protection zones:

- Public Surface Water Supply Intakes, Zone 1 (bounded by a 5-mile radius):
  - Eight Zone 1 public surface water supply intakes: Fairfax County Water Authority, Quantico Marine Base Mainside, Stafford County Utilities, Spotsylvania County Utilities (two intakes), Lake Caroline, Hanover Suburban Water System, and City of Richmond. The Draft EIS identified three intakes. This number was increased to eight, as listed above, based on new information provided by the Virginia Department of Health (VDH) since publication of the Draft EIS.
  - With the exception of the Hanover Suburban Water System, all of the intakes are located upstream of the existing tracks. In addition, only the surface water supply intake watershed of the Hanover Suburban Water System falls within the permanent or temporary LOD of the Preferred Alternative, as shown in the table below.
- Public Groundwater Sources:
  - Zone 1 (1,000-foot radius, potential to contaminate water supplies): 2 public groundwater sources, reduced from 3 reported in the Draft EIS.
  - Zone 2 (1-mile wellhead protection zone): 10 public groundwater sources, reduced from 14 reported in the Draft EIS.
- Private Wells:
  - Within 100 feet of 7 private wells, reduced from 14 reported in the Draft EIS. There are an additional 12 private wells that occur within 200 feet of the Preferred Alternative.

In Table 5.1-3, the increases shown in permanent impacts within the 100- and 200-foot radius of private wells in Areas 2 and 3 are associated with changes in the LOD that have occurred since the Draft EIS: specifically, at Dawson Beach Road in Prince William County to account for extended centerlines, lane widening, and associated changes to intersections, and directly south of Lansdowne Road in Spotsylvania County to account for the addition of a rail siding on the west side of the existing tracks and associated changes to intersections and entrances. In contrast, reduction in impacts in Area 4 since the Draft EIS resulted from the elimination of temporary LOD at the Doswell Road intersection in Hanover County and narrowing of LOD along Railroad Lane just north of the Ruther Glen Road intersection in Carolina County, both of which were due to wall modifications to reduce impacts.

Although the existing railroad facilities that fall within the wellhead protection zones are exempt, work required for the DC2RVA Project will include permanent and temporary impacts within the wellhead protection zones for public and private wells. Construction of the new facilities and subsequent operation within these protection zones have the potential to introduce contamination to existing wells. Before construction, DRPT (or the sponsoring agency at time of application) will evaluate the potential for contamination. The Project will not remediate existing sources of contaminants unless practical or required by federal, state, or local regulations; however, as indicated above, construction of the Preferred Alternative will incorporate BMPs and improved stormwater facilities, which will mitigate potential impacts and minimize further impairment of the water bodies.

Table 5.1-3: Estimated Area within Drinking Water Protection Zones

Alternative Area	Preferred Alternative	Public Surface Water Zone 1[1] (acres)	Public Groundwater Sources (acres)		Private Wells (square feet)	
		Hanover Suburban Water System	Zone 1[2]	Zone 2[3]	100-foot radius	200-foot radius
Area 1: Arlington	1B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Area 2: Northern Virginia	2A	P: 0 T: 0	P: 0 T: 0.10	P: 33.82 T: 12.85	P: 8,266 T: 9,796	P: 94,857 T: 27,516
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 26.37 T: 15.94	P: 7,822 T: 8,726	P: 72,243 T: 23,146
Area 3: Fredericksburg	3B	P: 0 T: 0	P: 0 T: 0	P: 22.00 T: 7.93	P: 19,294 T: 8,680	P: 120,001 T: 22,545
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 13.98-16.91 T: 6.39-9.72	P: 279-16,365 T: 414-8,397	P: 41,238-105,610 T: 3,762-16,996
Area 4: Central Virginia	4A	P: 25.36 T: 11.44	P: 0.81 T: 0	P: 36.88 T: 22.19	P: 4,115 T: 5,012	P: 17,512 T: 23,615
Draft EIS Impacts		P: 25.53 T: 12.47	P: 0.81 T: 1.07	P: 37.55 T: 27.73	P: 4,117 T: 25,446	P: 18,088 T: 45,750
Area 5: Ashland	5A	P: 0 T: 0	P: 0 T: 0	P: 9.25 T: 6.16	P: 0 T: 0	P: 0 T: 0
Draft EIS Impacts		P: 8.36 T: 6.08	P: 0-4.70 T: 0-1.51	P 9.25-46.53: T: 5.32-11.24	P: 0-4,205 T: 0-1,693	P: 0-26,018 T: 0-2,727
Area 6: Richmond	6F	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 33,712 T: 9,116
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0-23,773 T: 0-1,938	P; 16,364-55,761 T: 2,932-13,595
Total for the Preferred Alternative:		**P: 25.36 T: 11.44**	**P: 0.81 T: 0.1**	**P: 101.95 T: 49.13**	**P: 31,675 T: 23,488**	**P: 266,082 T: 82,792**

Source: VDOT-CEDAR, 2016; DMME, 2016.

Notes: 1. Surface water supply intake watershed bounded by a 5-mile radius.

2. Zone 1 includes a 1,000-foot radius (~72 acres) in which land use activities should be assessed for their potential to contaminate water supplies.

3. Zone 2 Virginia adopted a 1-mile wellhead protection zone around all groundwater public sources.

P = Permanent Effect, T=Temporary Effect

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.1.5 Permits

Chapter 7 of this Final EIS provides details on the final design, permitting, construction, and implementation of the Project, which DRPT anticipates will be implemented incrementally. Wetland and water quality permits will be required for construction of the Preferred Alternative. The controlling regulations and permits required at the local, state, and federal level were described in Section 4.1.5 of the Draft EIS and include the following:

- Section 401 of the Clean Water Act—Water Quality Certification
- Section 402 of the Clean Water Act—National Pollution Discharge Elimination System
- Section 404 of the Clean Water Act—Dredge and Fill Materials
- Section 408 of the Clean Water Act—USACE permission to alter or occupy civil works projects previously constructed by the Corps such as dams, levees, or flood channels
- Code of Virginia Chapter 2, Title 62.1 Subaqueous Stream Bed Bottom—VMRC
- Section 9 of the Rivers and Harbors Act—United States Coast Guard
- Section 10 of the Rivers and Harbors Act—USACE
- MS4 Permit–Small Municipal Separate Storm Sewer Systems

A Joint Permit Application (JPA) to apply for permits from USACE, VMRC, Virginia DEQ, and the Local Wetlands Boards could incorporate several of the above permits. DRPT, in consultation with the regulatory agencies, will determine the potential use of Nationwide and/or Regional permits, which will occur during final design (see Chapter 7).

5.1.6 Avoidance, Minimization, and Mitigation Evaluation – Water Resources

5.1.6.1 Wetlands, Streams, and Water Resources

Efforts have been made throughout the planning and conceptual design process, and will continue to be made during final design, to further avoid and minimize impacts to the extent practicable. General minimization measures incorporated into the Preferred Alternative include:

- Minor alignment shifts to avoid or minimize impacts
- Reduction of construction footprint to the extent practicable in areas with water resources
- Construction of bridges over wetland areas, substantially reducing impacts in comparison to causeways with culverts
- Use of bridges/open bottom culverts designed to the proper hydraulic opening to maintain stream morphology/integrity and that are wide enough without altering stream depth, facilitate passage of wildlife and aquatic species, and decrease erosion
- The use of stabilized side slopes and retaining walls to minimize encroachment
- Implementation of temporary and permanent stormwater management measures
- Use of natural stream design for unavoidable stream relocations, which means that the channel would mimic the characteristics of an appropriate reference stream
- Prompt revegetation of disturbed area, in particular stream banks, immediately after construction to stabilize soil and reduce erosion

Impacts to water resources will require submittal of a JPA to USACE, Virginia DEQ, and VMRC. Mitigation for unavoidable impacts will be developed in coordination with these agencies during the permitting process and incorporated into final design for both temporary and permanent impacts. Permanent impacts to wetlands and streams from construction activities will require compensatory mitigation. Guidance for compensatory mitigation from the regulatory agencies can be found in the July 2004 Joint USACE and Virginia DEQ *Recommendations for Wetland Compensatory Mitigation: Including Site Design, Permit Conditions, Performance Criteria, and Monitoring Criteria and associated Mitigation Checklist*; the March 2008 *Off-Site Mitigation Location Guidelines*; and the USACE and U.S. Environmental Protection Agency (EPA) jointly issued *Compensatory Mitigation for Losses of Aquatic Resources, Final Rule* from June 2008. The mitigation rule indicates the agencies' preferred hierarchy for mitigation options as follows:

1. Purchase of compensatory mitigation bank credits
2. Purchase of an approved in-lieu fee fund's credits
3. Watershed approach-based mitigation by the permittee
4. Onsite mitigation/in-kind mitigation by the permittee
5. Offsite mitigation/out-of-kind mitigation by the permittee

Virginia DEQ has also adopted this preferred sequence. Factors to be considered in deviating from the preference for banks include the likelihood for ecological success and sustainability, the location of the compensation site(s) relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project. DRPT recognizes the importance of early identification of the amount and type of available bank credits for wetlands and streams. DRPT will undertake more detailed investigation of the availability of mitigation bank credits and prepare a more detailed compensatory mitigation plan during final design. If there are insufficient bank or in-lieu fee credits, DRPT is prepared to develop a permittee-responsible mitigation proposal in coordination with USACE early in the permitting process.

The final compensatory mitigation plan will be determined during the permitting process, in coordination with the regulatory agencies, and will likely include a combination of types of mitigation. Wetland mitigation requirements vary by wetland type. Typical replacement ratios of area disturbed are Palustrine Emergent Wetlands (PEM) (1:1), Palustrine Scrub-Shrub Wetlands (PSS) (1.5:1), and Palustrine Forested Wetlands (PFO) (2:1). Compensation is approved on a case-by-case basis, and requirements may vary. Estimates of potential compensation requirements are based upon the impact estimates presented previously in Table 5.1-2.

Compensatory mitigation for unavoidable stream impacts will be based on the Unified Stream Methodology (USM) form. Impacts greater than 300 linear feet typically require compensation; however, for projects with multiple stream impacts, compensation for all impacts is often required regardless of the length of individual crossings. Although compensatory mitigation is generally not required for impacts to jurisdictional ditches or open waters, impacts will be reviewed on a case-by-case basis, and compensation will be determined during the permitting process. USACE is a cooperating agency for the Project and provided comments on the Draft EIS; their comments are summarized in Section 2.4.1.1 of this Final EIS.

5.1.6.2 Floodplains and Stormwater/Drainage

The design of this Project will include the use of stormwater management practices to address issues such as post-development storm flows and downstream channel capacity. Extreme weather events could include unusual heat or cold, prolonged or intense rainfall, and flooding, and resiliency to such events will also be addressed during the design phase. The Project will be designed and constructed in accordance with Executive Order (EO) 11988-*Floodplain Management*; 23 CFR 650 *Subpart A – Location and Hydraulic Design of Encroachments on Flood Plains*; the Virginia Erosion and Sediment Control Regulations; and the Virginia Stormwater Management Law and regulations. The Project will include an erosion and sediment control plan and a stormwater management plan approved by the Virginia DEQ, or local water quality protection criteria at least as stringent as the above state requirements. Accordingly, DRPT does not anticipate that the Project will increase flood height elevations, the probability of flooding, or the potential for property loss and hazard to life.

Opportunities for green infrastructure, such as rain gardens, vegetative swales, green roofs, porous pavements, and low impact development (LID) systems and practices will be considered during final design. Existing stormwater facilities will be upgraded and new stormwater facilities will be implemented to capture and treat run-off. Stormwater management measures, including detention basins, will be installed to reduce or detain discharge volumes and compensate for increased impervious surfaces. Major bridge crossings built to accommodate the additional rail line will be designed to be compatible with clearances of existing bridges and to minimize hydraulic alterations, and storm surge protection measures will be taken in areas along the Potomac River where practicable. A detailed hydraulic survey and study will be conducted during final design (after funding becomes available and incremental improvements are scheduled) to ensure that no substantial increases to risk of flooding will occur. Potential for expansion and contraction of rails in response to extreme heat and cold also will be considered in the design and specifications for the rails. Additional design, operational, and maintenance elements will also be considered as appropriate during further project development as federal and state guidance continues to evolve.

With the implementation of the above practices, the Project will improve drainage, representing an overall beneficial effect of the Project.

5.1.6.3 Water Quality

Minor long-term water quality impacts could occur as a result of increases in impervious surfaces, increases in train traffic, and consequent increases in pollutants washed from the railroad and bridges into receiving water bodies. Stormwater management measures, including detention basins, vegetative controls, and other measures described in the section above, will be implemented to minimize water quality impacts. These measures will reduce or detain discharge volumes and remove pollutants, thus avoiding substantial further degradation of impaired water bodies in the Project corridor.

Appropriate erosion and sediment control practices will be implemented in accordance with the Virginia Erosion and Sediment Control Regulations and the Virginia Stormwater Management Law and regulations. Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion during and after construction. Implementation of BMPs will minimize increases in turbidity of waters downstream of construction activities. Preconstruction sediment quality assessments and water quality monitoring during construction

may be conducted to address potential resuspension of contaminants and nutrients into overlying water. Further efforts to avoid and/or minimize water quality impacts will be made during final design. Such efforts to prevent impacts could include:

- Designing the project to minimize the LOD and subsequent impacts to water resources
- Installation of silt fencing and measures to prevent soil erosion from earthwork entering water bodies
- Implementation of temporary and permanent stormwater management measures
- Conducting stream work in the dry
- Native revegetation of disturbed areas
- Taking practicable measures to prevent spills of fuels, lubricants, or other pollutants into water bodies
- Elimination of weep hole devices that allow runoff to drip directly into waterways from bridges
- Use of vegetated buffers and vegetated swales to intercept runoff
- Use of holding basins to reduce pollution content, temperature, and intensity of runoff entering the water supply

The Virginia Erosion and Sediment Control Regulations and the Virginia Stormwater Management Law and regulations also prohibit contractors from discharging any contaminant that may impact water quality. If accidental spills occur, the contractor is required to immediately notify all appropriate local, state, and federal agencies and to take immediate action to contain and remove the contaminant.

Additionally, the requirements and special conditions of any required permits for work in and around surface waters will be incorporated into construction contract documents so that the contractor will be required to comply with such conditions. The number, locations, and abatement capacities of stormwater management facilities will be determined during later phases of Project design. Pollutant removal efficiencies will be used as a factor in determining the location and design of stormwater management facilities.

Impaired Waters

As indicated in Section 5.1.3.3 above, the DC2RVA corridor crosses 51 impaired waters and the Natural Resources Technical Report (Appendix M of the Draft EIS) provides a list of impairments, probable causes, and the potential for the DC2RVA Project to add to these impairments. The Project will not remediate existing sources of contaminants unless practical or required by federal, state or local regulations; however, DRPT will ensure that BMPs and other stormwater techniques will be employed to minimize further impacts on impaired waters. Construction techniques designed to reduce water quality impacts will be employed. Clearing practices will be limited to the greatest extent practicable around impaired waters to limit further degradation. The DC2RVA Project will adhere to additional restrictions in accordance with any TMDLs developed for impaired waters.

5.1.6.4 Drinking Water/Aquifers/Water Supply

By upgrading older stormwater facilities along the DC2RVA corridor, the Project will improve drainage, representing an overall beneficial effect of the Project. In addition, efforts will be made throughout the final design process to avoid and minimize impacts to drinking waters to the extent practicable. Minimization measures could involve modifications, such as further alignment shifts to avoid or minimize impacts; the use of BMPs; the use of retaining walls; and temporary and permanent stormwater management measures to reduce transportation of chemicals by stormwater, including limited or avoidance of snow removal and vegetation maintenance chemicals near source water protection areas and well locations.

5.2 TOPOGRAPHY, GEOLOGY, AND SOILS

Most of the proposed improvements associated with the Preferred Alternative are located adjacent to existing railroad tracks in areas where the land has already been disturbed, and DRPT does not anticipate any impacts to local topography or geology. The physiographic provinces in the Project corridor were presented in Figure 3.2-1 of the Draft EIS, and the presence and/or types of soils with construction-limiting qualities within the LOD of the Preferred Alternative have not changed from what was reported in Section 4.2.3 of the Draft EIS.

5.2.1 Avoidance, Minimization, and Mitigation Evaluation—Topography, Geology, and Soils

Before the acquisition of right-of-way and construction associated with the Preferred Alternative within newly acquired or existing railroad right-of-way, thorough site investigations will be conducted to determine if mitigation will be required for limiting soil characteristics. A geologic hazard assessment will be made to establish potential impacts of soil characteristics to bridges, walls, trackbed, and roadway subgrades, and geotechnical engineering parameters will be developed for soil conditions along the corridor. Bridge, wall, trackbed, and roadway recommendations will be developed according to the specific conditions of each site. Geotechnical engineering parameters, foundation and subgrade design recommendations, and other geotechnical engineering recommendations will be developed from a detailed analysis of the site investigations during final design.

Final designs will include standard means and methods to be included in construction packages to compensate for soil, geologic, and topographic limitations, including:

- The use of cut or fill to compensate for topographic changes
- The use of retaining walls to stabilize soils
- Removal or encapsulation of unsuitable soils
- Blending neutralizing material into acidic soils
- Engineering structures to compensate for limiting conditions adjustment of slope ratios, design heights, and depth of embedment
- Use of stabilizing materials

5.3 AGRICULTURAL LANDS

5.3.1 Farmland Soils

The Preferred Alternative requires permanent right-of-way acquisition that contains prime farmland and statewide and locally important soils. The transition of these soils to transportation use is a direct effect of the Project. No unique farmland soils occur within the LOD of the Preferred Alternative. Figure N-2 of Appendix N of the Draft EIS presented farmland classifications (prime farmland and farmland of statewide importance) in the Project Corridor.

Table 5.3-1 lists the acres of impacts and Corridor Assessment Scores for each segment of the Preferred Alternative as well as comparisons to the Build Alternatives evaluated in the Draft EIS. Selection of Alternative 5A as part of the Preferred Alternative minimized potential impacts to farmland soils as compared to the bypass alternatives as evaluated in the Draft EIS in this area. Impacts to farmland soils have also been reduced substantially for the Preferred Alternative due to refinements in reporting methodology for soil classifications and permanent/temporary LOD. There are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to farmland soils; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Table 5.3-1: Farmland Soils Converted within Preferred Alternative and Farmland Corridor Assessment Score

Alternative Area	Preferred Alternative	Prime Farmland Soils (Acres)	Statewide and Locally Important Soils (Acres)	Total (Acres)	Corridor Assessment Score[1]
Area 1: Arlington	1B	0	0	0	0
	Draft EIS Impacts	0	0	0	0
Area 2: Northern Virginia	2A	27.65	26.14	52.79	66
	Draft EIS Impacts	53.56	52.37	105.93	66
Area 3: Fredericksburg	3B	24.62	12.65	37.27	80
	Draft EIS Impacts	26.84-69.05	17.83-84.17	44.67-153.22	80-118
Area 4: Central Virginia	4A	56.93	36.54	93.47	93
	Draft EIS Impacts	99.17	49.91	149.08	93
Area 5: Ashland	5A	15.80	21.33	37.13	51
	Draft EIS Impacts	27.18-90.88	23.57-35.10	51.61-124.93	46-171
Area 6: Richmond	6F	25.40	4.63	30.03	19
	Draft EIS Impacts	30.79-49.93	4.59-14.22	35.38-60.55	19-29
Total for the Preferred Alternative:		**150.40**	**101.29**	**250.69**	**–**

Source: VDOT; Natural Resources Conservation Service (NRCS)-CPA-106 Forms.

1. NRCS treated each alternative area separately; therefore, there is no "cumulative" corridor assessment score.

Note that no Unique Farmland Soils occur within the Preferred Alternative. Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.3.2 Agricultural and Forestal Districts

The Preferred Alternative has no direct effects to agricultural and forestal districts.

There is one agricultural/forestal district, the Stanley District in Hanover County as shown in Figure 3.3-1 of the Draft EIS, within two of the Build Alternatives presented in the Draft EIS (5C and 5C–Ashcake) that included construction of a two-track west bypass of the Town of Ashland. Either of these alternatives would have converted 73.7 acres of this agricultural/forestal district to a transportation use; however, these bypass alternatives are not part of the Preferred Alternative.

5.4 MINERAL RESOURCES

DRPT has determined that no mines will be affected by the Preferred Alternative.

One known mineral resource is crossed by the Fredericksburg Bypass (Build Alternative 3C as evaluated in the Draft EIS). This site—Massaponax S. & G. (VA DMM permit 08288AA), as shown in Figure 3.4-1 of the Draft EIS—is a former sand and gravel pit. The bypass alternative is not part of the Preferred Alternative and therefore no conversion of this resource is required.

5.5 SOLID WASTES AND HAZARDOUS MATERIAL

5.5.1 Effects

Table 5.5-1 presents the number of known and potential hazardous material sites that are potentially affected by the Preferred Alternative. The estimated number of sites affected is based on the number of sites mapped within the Preferred Alternative's LOD (permanent and temporary) that may contain hazardous materials or wastes. The Draft EIS identified four hazardous materials sites[8] along the corridor that could require costly mitigation or potentially cause construction schedule delays; however, the Preferred Alternative no longer impacts one of these locations (the Loving's Produce site near Main Street Station in Richmond), and an updated mapbook of the other three sites in relation to the Preferred Alternative LOD is provided in Appendix M of this Final EIS.

Otherwise, design modifications to the Preferred Alternative have reduced the overall number of affected hazardous material sites shown in Table 5.5-1. However, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to the remainder of these hazardous materials sites; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS. All hazardous materials sites were shown in Figure O-1 of Appendix O of the Draft EIS. Locations of all identified sites have been recorded for consideration in future phases of final design.

[8] Hazardous materials sites were defined as the following: Superfund/Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)/Standardized Emergency Management System (SEMS)/National Priorities List (NPL) sites, and known HAZMAT release sites, per 42 USC 103.

Table 5.5-1: Hazardous Materials Sites within Preferred Alternative LOD

Alternative Area	Preferred Alternative	Superfund/ CERCLA/ SEMS/NPL[1]	Known HAZMAT Release[2]	Potential HAZMAT Contamination[3]	Petroleum Release[4]	HAZMAT Facility[5]	Petroleum Storage Tanks[6]
Area 1: Arlington	1B	0	0	0	0	0	0
	Draft EIS Impacts	0	0	0	0-2	0	0
Area 2: Northern Virginia	2A	0	0	4	1	5	1
	Draft EIS Impacts	0	0	8	4	2	1
Area 3: Fredericksburg	3B	0	0	1	2	4	3
	Draft EIS Impacts	0-1	0	5-8	2-3	0-4	0-3
Area 4: Central Virginia	4A	0	0	0	0	0	0
	Draft EIS Impacts	1	0	0	0	0	0
Area 5: Ashland	5A	0	0	0	2	0	3
	Draft EIS Impacts	0	0	1-2	3-7	0-1	1-5
Area 6: Richmond	6F	0	1	10	14	6	7
	Draft EIS Impacts	0-1	0-1	5-16	8-23	4-7	5-16
Total for the Preferred Alternative:		**0**	**1**	**15**	**19**	**15**	**14**

Source: VDOT-CEDAR, 2016.

Notes: 1. Sites proposed or already on the NPL. Sites in the United States eligible for long-term remedial action (cleanup) financed under the federal Superfund program.

2. Area known to be contaminated by HAZMAT or has had a toxic release of unlisted chemical.

3. Area with history of use for HAZMAT or has had a release that has been closed or remediated. These areas may be sufficient in their current use; however, there could be potential for uncovering contamination through construction.

4. Area where a petroleum product is known to have been released. The case may be closed; however, there is the potential for uncovering contaminated soil through construction.

5. Facilities that generate, transport, treat, store, and/or dispose of hazardous waste.

6. Facilities with above ground and underground storage tanks that store petroleum or hazardous substances.

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.5.2 Avoidance, Minimization, and Mitigation Evaluation—Solid Wastes and Hazardous Materials

Before the acquisition of right-of-way and construction of the Preferred Alternative within newly acquired or existing railroad right-of-way, thorough site investigations will be conducted to determine whether any of the sites are actually contaminated, and, if so, the nature and extent of that contamination. All solid waste material resulting from clearing and grubbing, demolition, or other construction operations will be removed and disposed of according to regulations. Any additional hazardous materials discovered during construction of the Preferred Alternative or demolition of existing structures will be removed and disposed of in compliance with all applicable federal, state, and local regulations. All necessary remediation will be conducted in

compliance with applicable federal, state, and local environmental laws and will be coordinated with EPA, Virginia DEQ, and other federal or state agencies as necessary. The Project will remediate existing sources of contaminants where disturbed by construction activities; however, the Project will not remediate existing sources of contaminants not affected by construction activities unless required by federal, state, or local regulations.

Types of remediation could include:

- **Excavation or dredging.** Removal of contamination generally to a regulated landfill, but also to be treated (commonly used for petroleum contamination, which is the most likely form of contamination to be found in a project such as this).
- **Thermal desorption.** Use of a chemical to vaporize contamination, which is then collected or destroyed in an off-gas treatment system.
- **Surfactant enhanced aquifer remediation (SEAR).** Use of chemicals to decrease water surface tension to allow the contamination to de-absorb and be removed from the medium.
- **Pump and treat.** Pumping out contaminated groundwater and passing it through a filtration system designed to absorb contamination from the groundwater.
- **Solidification and stabilization.** Using a binder and soil to stop, prevent, or reduce the mobility of contaminants that are left in place.
- **In situ oxidation.** Injection of oxygen or air to promote the growth of aerobic bacteria and accelerate natural destruction of organic contaminants.
- **Soil vapor extraction.** Treatment of the off-gas volatile organic compounds (VOCs) generated after vacuum removal of air and vapors (and VOCs) from the subsurface.
- **Nanoremediation.** Use of nano-sized reactive agents to degrade or immobilize contaminants.
- **Bioremediation.** Use of biological methods, such as seeding the site with specific plants, fungus (mycelia), or bacteria, to remove contamination.

5.6 AIR QUALITY

This section analyzes criteria pollutant air emissions associated with the Project. Additionally, while mobile source air toxics (MSAT) and greenhouse gases (GHG) are not criteria pollutants nor subject to conformity requirements, they are also considered in this section in accordance with EPA guidance. Potential air quality effects of the proposed DC2RVA Project include:

- Changes in rail-related emissions due to an increase in daily train operations and a change in equipment.
- Changes in the overall regional emissions due to travelers shifting from one mode of transportation to another.
- Changes in local (microscale) emissions, including changes at various crossings that could handle additional traffic due to nearby highway-railroad crossing closures, experience additional delay due to an increase in train operations, and undergo changes in vehicular delay around stations due to increased traffic resulting from increased ridership.

While direct physical impacts to other environmental resources have changed as a result of design refinements and modifications to the LOD of the Preferred Alternative, the general findings from the air quality analysis have not changed from the Draft EIS as rail operations for the Preferred Alternative within the DC2RVA Project corridor have not changed from that which was analyzed in the Draft EIS.

5.6.1 Locomotive Operations—NO_x, VOC, and PM

EPA established a comprehensive program[9] to reduce emissions from locomotives, including line-haul, switch, and passenger engines. The program establishes emission standards with applicability dependent on the date a locomotive is first manufactured. For switch engine locomotives, the first set of standards (Tier 0) applies to most locomotives originally manufactured before 2001. The most stringent set of standards (Tier 4) applies to locomotives manufactured in 2015 and later. Additional intercity passenger locomotives operating under the DC2RVA Project will, at a minimum, meet the emissions standards set by EPA.[10]

The DC2RVA Project is subject to federal air quality general conformity regulations[11] that require an evaluation of Project-generated emissions within nonattainment and maintenance areas be conducted to assess potential air quality effects. DRPT calculated annual pollutant emissions for the one marginal nonattainment area along the Project corridor (i.e., the Washington, D.C.-Maryland-Virginia ozone marginal nonattainment area, which was shown in Figure 3.6-1 of the Draft EIS). The emissions were calculated using the expected EPA emission rates and projected locomotive fuel consumption, which was developed as part of the rail operations modeling conducted for this Project.

Table 5.6-1 presents the emissions inventory of expected Project-generated emissions under the Preferred Alternative (i.e., emissions generated from the additional intercity passenger trains from this Project), which have not changed since the evaluation in the Draft EIS.

Table 5.6-1: Predicted Preferred Alternative Project-Generated Locomotive Emissions

Metropolitan Planning Organization	Annual Emissions (tons/year)	
	NO_x	VOC
Washington, D.C.-Maryland-Virginia[1]	13.7	0.3
De minimis (allowable) levels in the nonattainment/maintenance areas according to the rates listed in 40 CFR 93.153 for "other ozone NAA's inside an ozone transport region"	100	50

Notes: There are no changes to the values reported in this table since the Draft EIS.

1. Predicted emissions listed are for those generated from the additional intercity passenger trains from this Project.

Table 5.6-1 shows that Project-generated predicted annual pollutant emissions, from the 9 new daily intercity passenger round trips (18 total trains per day) added by this Project, in nonattainment and maintenance areas, are all below general conformity *de minimis* threshold values. Pursuant to the General Conformity Rule, EPA considers project-generated emissions

9 40 CFR Part 1033

10 EPA has published expected fleet average pollutant emission rates in their *Technical Highlights: Emission Factors for Locomotives USEPA-420-F-09-025.*

11 40 CFR Part 93, Subpart B

below these *de minimis* values to be minimal. Such projects do not require formal conformity determinations. These numbers are considered conservatively high because they do not account for any reduction in automobile emissions related to travelers diverting from auto to rail travel.

5.6.2 Mobile Source Air Toxics

DRPT qualitatively assessed regional MSAT effects associated with the Project based on the Federal Highway Administration's (FHWA) *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents,* released October 18, 2016, and in part from a study conducted by FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives*, as applicable to this Project. DRPT utilized FHWA's guidance as neither FRA nor EPA have guidelines related to MSAT analysis, including hot-spot[12] analyses.

5.6.2.1 Regional MSAT Effects

In 2045, DRPT projects that the Preferred Alternative will result in 1.12 million more rail passenger trips annually to/from/within the DC2RVA corridor (compared to the No Build Alternative). By shifting this travel to rail, DRPT expects that up to 2,700 vehicles per day and 322,000 vehicle miles per day will be removed from the parallel roads of I-95 and U.S. Route 1 in the 123-mile Project corridor in the year 2045. Assuming an average fuel efficiency of 22 miles per gallon and a typical passenger rail trip traveling the full length of the DC2RVA corridor, this equates to a reduction of approximately 5.3 million gallons of fuel per year. In comparison, the additional intercity passenger trains that will operate as a result of this Project are estimated to consume approximately 2.3 million gallons of fuel per year. Therefore, overall fuel consumption will be reduced in the DC2RVA corridor. The Preferred Alternative will also result in a reduction in the rate of growth of passenger miles of travel by air and bus, which could ultimately lead to a reduction in vehicle miles from these two modes.

Beginning in 2025, through 2045, the Preferred Alternative will decrease the total regional vehicle miles traveled (VMT) and MSAT emissions compared to the No Build Alternative. Under the No Build Alternative, the approximately 1.08 million annual intercity passenger rail trips from the Preferred Alternative could otherwise occur by other transportation modes; therefore, the availability of improved intercity passenger rail service will reduce the number of vehicle trips on a regional basis. Because the Preferred Alternative will not substantially change the regional traffic mix, the amount of MSAT emissions emitted from highways and other roadways along the Project corridor would be proportional to the VMT. Because the regional VMT estimated for the Preferred Alternative will be less than the No Build Alternative in 2045, MSAT emissions from regional vehicle traffic will also be less for the Preferred Alternative compared to the No Build Alternative in 2045. Emissions for the Preferred Alternative will also likely be lower than present levels in 2045 because of EPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent from 2010 to 2050.

Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures; however, the EPA-projected reductions are so great (even after accounting for VMT growth) that MSAT emissions in the Project corridor are likely to be lower in the future as well.

[12] A hot-spot analysis is known as a "microscale" analysis as it focuses on a relatively small geographic area.

5.6.2.2 Local MSAT Effects

The potential MSAT emission sources directly related to Project operation will be from trains operating along the DC2RVA corridor, vehicles used at maintenance facilities, passenger vehicles traveling to and from the train stations, and passenger vehicles delayed at grade crossings. Localized increases in MSAT emissions will occur as a result of all of these activities.

The localized increases in MSAT emissions will likely be most pronounced at maintenance facilities, where in-yard diesel-fueled switch locomotives will be used to pull in or pull out the trainsets for maintenance. The only maintenance facility along the DC2RVA corridor proposed as part of the Preferred Alternative is at the Bellwood Wye Yard, as detailed in Section 4.3.6.3 of this Final EIS; maintenance facilities located outside of the DC2RVA Project corridor are reviewed under separate environmental documents. Local MSAT emissions around this maintenance facility will increase with additional DC2RVA trains. There is no residential development or other sensitive land uses directly adjacent to the proposed maintenance facility. Therefore, DRPT expects any local MSAT effects to be minor.

Localized Project-related emissions will be substantially reduced due to implementation of EPA's vehicle and fuel regulations. The Preferred Alternative will decrease regional MSAT emissions compared to the No Build Alternative.

5.6.3 Highway Vehicle Operations—CO

Carbon monoxide (CO) emissions are associated with large volumes of slow-moving traffic, such as highly congested intersections. Areas experiencing high levels of CO are referred to as CO "hot spots." The purpose of a CO hot-spot analysis is to determine if CO emissions generated by a proposed project would cause or contribute to an exceedance of the air quality standard for CO as promulgated by EPA.

The Preferred Alternative will result in an increase in vehicular delay at grade crossings because more trains will be operating over these crossings; however, given the relatively short length and rapid passages of the 9 new daily intercity passenger round trips (18 total trains per day)implemented under the DC2RVA Project and modest predicted increases in the rates of train service, it is unlikely that these delays will result in any substantial effect on air quality levels. Additionally, at the locations where highway-rail grade separations are constructed, vehicles will no longer have to stop to wait for trains to pass and CO emissions will be reduced. Proposed grade separation locations are identified in Section 5.15.2.

Additionally, DRPT anticipates that the Preferred Alternative will increase vehicular traffic near station locations. While the Project will enhance passenger train travel speeds over an extended route and approximately double the frequency of intercity passenger rail service offered at each station, the increases in service will be distributed throughout the day and vehicular traffic increases near stations will be relatively modest. Many stations also have direct connections to local and regional transit. Particularly, all intercity passenger rail stations in Northern Virginia share service with Virginia Railway Express (VRE). Other stations in Northern Virginia have convenient or direct connection to the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system, including Franconia-Springfield, Alexandria, Crystal City, L'Enfant Plaza, and Washington Union Station. In Richmond, Main Street Station serves multiple local and regional bus services, and the Greater Richmond Transit Company (GRTC) completed a 7.6-mile bus rapid transit (BRT) system along Broad Street and Main Street in 2018. These multimodal connections can help offset vehicular traffic at these stations.

The National Ambient Air Quality Standards (NAAQS)[13] for CO are 35 parts per million (ppm) (1-hour standard) and 9 ppm (8-hour standard).

DRPT ran a computer model to determine the CO concentrations at the worst-case grade crossings along the DC2RVA corridor. DRPT selected these locations because the locations have the highest projected amount of traffic and/or the greatest amount of delay. The following worst-case traffic locations within the Preferred Alternative were selected:

- **England Street/Thompson Street in Ashland.** A two-track at-grade railroad crossing where all intercity passenger and freight train traffic will continue to operate through town, which will contribute to the worst-case traffic conditions in Ashland (Preferred Alternative 5A).
- **Hermitage Road in Richmond.** A three-track at-grade railroad crossing where most intercity passenger train traffic will use all or a portion of the CSXT S-Line between Main Street Station and Centralia, which will contribute to the worst-case traffic conditions on the S-Line in Richmond (Preferred Alternative 6F).

The CO hot-spot analysis compared the 2015 Existing, 2025 Build and No Build, and 2045 Build and No Build scenarios. DRPT used CAL3QHC, which is a standard EPA dispersion model, to estimate CO concentrations. Model input parameters included MOVES2014 emissions factors, CO background levels, persistence factors, peak-hour volumes, free-flow speeds, and estimated gate down time. Simulated meteorological conditions designed to yield worst-case concentrations were used in the analysis.

As shown in Table 5.6-2, the results of the analyses indicated that the 1-hour and 8-hour concentrations at the locations analyzed in any scenario were well below the NAAQS, and the evaluation has not changed since the Draft EIS. Based on these results, no mitigation is required, and no additional analysis is recommended.

Table 5.6-2: Predicted CO Concentrations for the Preferred Alternative

Worst-Case Intersection/Crossing	Analysis Scenario									
	2015 Existing		2025 No Build		2025 Build		2045 No Build		2045 Build	
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour
England Street/Thompson Street (Town of Ashland)	4.2	2.9	3.4	2.4	3.6	2.5	3.1	2.2	3.2	2.2
Hermitage Road (S-Line, City of Richmond)	3.6	2.5	2.9	2.0	2.9	2.0	2.4	1.7	2.4	1.7

Note: Predicted CO Concentrations are in ppm, including background. NAAQS for CO: 35 ppm (1-hour) and 9 ppm (8-hour). There are no changes to the values reported in this table since the Draft EIS.

[13] 42 USC 7401 et seq.

5.6.4 Greenhouse Gas Emissions

The projected change in 2045 carbon dioxide (CO_2) emissions for the Preferred Alternative relative to the No Build Alternative is shown in Table 5.6-3 by mode of passenger travel. These emission values were derived from mass emission rates per passenger mile published in a report prepared for the American Bus Association and projected changes in annual passenger miles of travel (as shown in Table 4.8-1 of the Draft EIS).

Increases in CO_2 emissions associated with additional intercity passenger rail service are expected to be more than offset by reductions in CO_2 emissions due to reduced use of other transportation modes, as shown in Table 5.6-3. DRPT derived the CO_2 emissions from the passenger ridership estimates for the entire DC2RVA corridor.

The ridership forecasts for the Preferred Alternative are based on the full service station option used in Richmond; other options considered are reflected in the range presented by the Draft EIS Alternatives. Accordingly, the results in Table 5.6-3 reflect the projected changes through the entire DC2RVA corridor.

Table 5.6-3: Change in Projected CO_2 Emissions in the DC2RVA Corridor by Mode Compared to the No Build Alternative (tons per year)–Year 2045

Preferred Alternative[1]	Rail	Automobile	Bus	Air	Total
6F (Full Service, Staples Mill Road/ Main Street Stations)	60,155	-41,187	-9,854	-15,632	-6,518
Draft EIS Impacts	*56,711-64,552*	*-37,568--43,206*	*-9,310--10,527*	*-15,493--17,516*	*-5,663--6,869*

Note: 1. Results in this table are for the entire DC2RVA corridor, which are based on the Richmond station option (i.e., 6F: Full Service to Staples Mill Road Station and Main Street Station) that was selected as the Preferred Alternative.
There are no changes to the values reported in this table since the Draft EIS.

5.6.5 Construction Effects

Demolition and construction activities can result in short-term increases in fugitive dust and equipment-related particulate emissions in and around the Project corridor. Equipment-related particulate emissions can be minimized if the equipment is well maintained.

The potential air quality effects of the Preferred Alternative will be short-term, occurring only while demolition and construction work is in progress and local conditions are conducive. The potential for fugitive dust emissions typically is associated with building demolition, ground clearing, site preparation, grading, stockpiling of materials, onsite movement of equipment, and transportation of materials. The potential is greatest during dry periods, periods of intense construction activity, and high wind conditions. Where required, DRPT will perform this analysis during final design to demonstrate general conformity. DRPT will also identify the appropriate BMPs to minimize air quality effects during construction.

GHG emissions will also be generated during construction of the Project. Using the FHWA Infrastructure Carbon Estimator[14], DRPT calculated GHG emissions from construction for the proposed action to estimate its contribution to the DC2RVA corridor. Based on this analysis, DRPT estimates that 11,467 tons per year of CO2 will be generated from construction activities

[14] The FHWA Infrastructure Carbon Estimator is available at: https://www.fhwa.dot.gov/environment/sustainability/energy/tools/carbon_estimator/

over a 25-year period. Comparatively, EPA oversees a GHG reporting program. As part of this program, EPA maintains an inventory of GHG emissions from large facilities. In 2016, CO2 emissions from large facilities in counties along the DC2RVA corridor were 13,754,158 tons.[15] Therefore, CO2 emissions from DC2RVA construction will be less than 0.1 percent of the total CO2 emissions from large facilities in the DC2RVA corridor. Given this relatively small contribution, DRPT concludes that construction of this Project will have a negligible impact on climate change due to GHG emissions.

5.6.6 Conclusion

The Project-generated net increases in predicted annual pollutant emissions from the 9 new daily intercity passenger round trips (18 total trains per day) in nonattainment areas will all be below general conformity *de minimis* threshold values. Pursuant to the General Conformity Rule, EPA considers project-generated emissions below these *de minimis* values to be minimal. Such projects do not require formal conformity determinations.

With regard to GHG emissions, the Preferred Alternative will contribute less than 0.1 percent of the CO_2 emissions from large facilities along the DC2RVA corridor. As a result, DRPT anticipates that the DC2RVA Project will not result in significant adverse effects to public health related to air pollutants and air toxics or contributions to GHG emissions.

5.6.7 Avoidance, Minimization, and Mitigation Evaluation—Air Quality

DRPT will identify the appropriate BMPs to minimize air quality effects during construction. Air quality mitigation is discussed in Section 5.19.2.3 in the Construction Impacts section.

5.7 NOISE AND VIBRATION

This section describes potential Project-related noise and vibration effects of the Preferred Alternative and identifies mitigation measures to offset Project-related impacts. These analyses only evaluated noise and vibration from the 9 new daily intercity passenger round trips (18 total trains per day) proposed as part of the Preferred Alternative, except where noted.

As described below, noise impacts have decreased from what was reported in the Draft EIS as a result of revised restrictions on horn use in the DC2RVA corridor, and vibration impacts are the same as reported for the Build Alternatives in the Draft EIS. Detailed descriptions of noise and vibration impact criteria and methodologies, as well as construction impacts, were reported in Section 4.7 of the Draft EIS. As detailed in the following subsections, there are minor changes noise impacts since the publication of the Draft EIS (see Section 5.7.1) and no change in vibration impacts (see Section 5.7.2).

5.7.1 Noise

5.7.1.1 Predicted Noise Levels

DRPT performed a General Noise Assessment and a General Vibration Assessment for the Project in keeping with FTA methods and the Project's conceptual level of design (see Section 4.7 of the

[15] http://ghgdata.epa.gov/ghgp

Draft EIS for a summary description of the noise and vibration assessment methods, with additional detail in Appendix P of the Draft EIS).

Train noise level calculations accounted for Project-related wayside noise (locomotive and wheel-rail noise) and locomotive horn use at public at-grade crossings.[16] Analysis results were used to determine the distance from the tracks at which train noise levels equal the noise impact thresholds for moderate and severe noise impacts at Category 1, 2, and 3 land uses (as defined in the table in Section 5.7.1.2, below). Noise impacts are identified at the noise-sensitive land uses within those distances to the track.

5.7.1.2 Operational Noise Impacts

This section presents the results of the assessment of Project-related noise during operation, which includes locomotive horn noise, stationary horn noise (if applicable), and wayside noise.

The noise impact assessment followed FRA and FTA guidelines for corridor-level projects; the guidelines require identification of moderate and severe noise impacts based on project noise levels and types of land use. Noise levels are projected by combining horn noise and wheel rail noise, and do not distinguish between noise impacts dominated by noise from horns versus noise impacts dominated by wayside noise. Figures in the Noise and Vibration Technical Report (Appendix P of the Draft EIS) showed the noise impact contours for the Build Alternatives evaluated in the Draft EIS, which have not changed for the Preferred Alternative other than in two locations in the Project corridor (these locations are updated in Appendix M of this Final EIS).

- In the Draft EIS, the noise impact contour at VRE's Crystal City Station did not properly account for CSXT's restrictions on horn noise at the station; additional details are described in the text below.
- In Area 6 near Richmond, a grade separated crossing proposed for Hermitage Road was changed to an at-grade intersection between the Draft EIS and Final EIS, resulting in an increase in train horn noise near the road intersection. However, while overall train noise would increase, there are no noise-sensitive land uses affected by the increase in noise, and no change to noise impacts occurred in this area.

The noise impact assessment results are presented in Table 5.7-1 and includes noise impacts due to both locomotive horn and wayside horn noise. The values shown in the table represent the number of noise-sensitive land use receptors projected to experience noise impacts under the Preferred Alternative. Category 1, Category 2, and Category 3 refer to land use categories evaluated in the noise assessment, as defined in the notes at the bottom of the table. The noise analysis did not account for terrain or buildings that block train noise from reaching noise-sensitive parcels; therefore, the results are considered to be conservatively high.

[16] A locomotive horn's primary purpose is to provide a safety warning of an approaching train to people and animals. Federal regulation (FRA's Final Rule on the Use of Locomotive Horns at Highway/Rail Grade Crossings, 49 CFR Part 222) requires locomotive horns be sounded for 15 to 20 seconds before entering all public grade crossings, but not more than one-quarter mile in advance. FRA locomotive horn use regulations and CSXT operating rules do not require locomotive horn use at private at-grade crossings. Further, CSXT has a rule on train horn use such that trains should not sound horns at any passenger and commuter station on the corridor between the hours of 11:30 pm and 4:30 am unless people are present. Horns are not sounded along sections of track between public grade crossings unless the locomotive operator determines a safety warning is warranted; such incidences of horn use are rare and therefore, horn noise between public crossings was not evaluated in this analysis. Existing locomotive horn use at public grade crossings is incorporated into the noise analysis via the existing noise measurements.

Table 5.7-1: Operational Noise Impact Summary for the Preferred Alternative

Alternative Area	Preferred Alternative	Operational Noise Impacts, By Category[1]						
		Category 1		Category 2		Category 3		
		Moderate	Severe	Moderate	Severe	Moderate	Severe	Total
Area 1: Arlington	1B	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0	0	0
Area 2: Northern Virginia	2A	0	0	548	99	6	0	653[2]
Draft EIS Impacts		0	0	670	99	6	0	775
Area 3: Fredericksburg	3B	0	0	67	8	1	0	76
Draft EIS Impacts		0-2	0-1	66-2,392	8-1,524	1-8	0-5	75-3,932
Area 4: Central Virginia	4A	0	0	51	18	1	0	70
Draft EIS Impacts		0	0	51	18	1	0	70
Area 5: Ashland	5A	0	0	135	14	1	4[3]	154
Draft EIS Impacts		0-1	0	133-272	14-51	1-2	4	154-329
Area 6: Richmond	6F	1	0	416	15	7	0	439
Draft EIS Impacts		0-1	0	298-416	8-15	4-7	0	313-439
Total for the Preferred Alternative:		**1**	**0**	**1,217**	**154**	**16**	**4**	**1,392**

Notes: The noise impact locations were shown in the Noise and Vibration Technical Report (Appendix P of Draft EIS), with two updated locations shown in Appendix M of this Final EIS. Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

1. Category Descriptions:

Category 1: Land where quiet is an essential element (e.g., amphitheaters and concert pavilions). This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks (NHLs) with significant outdoor use.

Category 2: Residences and buildings where people sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

2. The Category 2 severe impacts generally occur at residences located immediately adjacent to the DC2RVA corridor, including a trailer park just south of Woodbridge Station and several other residential neighborhoods in Prince William County.

3. One of the severe Category 3 impacts is at the Ashland Library, located adjacent to the tracks; however, the proximity of the nearby station means that intercity passenger and freight trains will actually be traveling slower than modeled. The impacts identified within Ashland assume that passenger trains will operate at 90 mph through the Town of Ashland. However, trains will slow down through town to the CSXT's 35 mph speed order for the Town of Ashland, even if they are not stopping at the station. Any reduction in speed will reduce the noise impacts shown for the Project. As a result, the noise analysis results are conservative.

The design of the Preferred Alternative includes the realignment of curves of existing mainline tracks along the CSXT right-of-way, as detailed in Chapter 4 of this Final EIS. Therefore, the Preferred Alternative has the potential to reduce existing train noise along the tracks because straightening track curves, which is a main design element of the Project, can reduce or eliminate the potential for wheel flange squeal. Additionally, the proposed curve realignments physically move the tracks closer to or farther away from noise receptors, which in some cases can cause noise impacts to increase (closer to) or decrease (farther away) as a result of the Project. Also, the Preferred Alternative has the potential to reduce existing horn noise through the seven new grade separations and seven crossing closures proposed for existing at-grade crossings in the corridor (refer to Section 5.15.2 for specific locations of at-grade crossing treatments for the Preferred Alternative).

Increases in intercity passenger service with 9 new daily intercity passenger round trips (18 total trains per day) each day, as proposed by this Project, will result in a corresponding increase in locomotive horn use in most portions of the Project corridor; however, the noise impacts presented in this Final EIS have decreased from those shown in the Draft EIS. The number of locations where the sounding of locomotive horns is required in Alternative Area 2 were reduced since the Draft EIS, which did not account for existing horn restrictions through Crystal City that were negotiated with CSXT separate from, and several years prior to, this Project. CSXT has an additional rule in place for Crystal City, stating that trains approaching the Crystal City station shall only sound their horns between 5:30 am and 8:00 pm on weekdays only, but not at any other times unless people are present. Incorporating this existing CSXT rule on train horn use at Crystal City Station into the noise model resulted in a reduction in noise impacts in this area. Train horn noise impacts are distinguishable from wayside noise impacts on the noise impact contour figures that were shown in the Noise and Vibration Technical Report, Appendix P of the Draft EIS.

5.7.1.3 Avoidance, Minimization, and Mitigation Evaluation—Noise

Potential noise mitigation measures are broadly categorized as applied at the source, in the pathway (the path that sound travels), or at the receiver. Other than locomotive horn and wayside horn use, the source of most train noise is the interaction of steel wheels and the steel rail; this is called wayside noise. In addition, railcars (particularly freight cars) sometimes rattle and produce noticeable amounts of noise. Locomotives also emit noise from the engine casing and from the cooling and exhaust vents. Use of continuously welded rail (CWR), which is or rail with no joints, minimizes wayside noise as joints in the rail produce noise when trains roll over them. As part of the Preferred Alternative, DRPT assumes that all new and existing mainline track will be CWR.

Locomotive horns are another loud source of train noise; however, their use is mostly limited to at-grade crossings and other areas required by CSXT operating rules where they are used to warn people that trains are approaching. Locomotive horn use at public at-grade crossings is required under FRA safety regulations. FRA regulations and CSXT operating rules do not require locomotive horn use at private at-grade crossings. CSXT operating rules do require all trains to sound their horn when approaching, passing, or departing a passenger station along the mainline. Grade crossing closure, grade separations, and installation of wayside horns (which are stationary horns located at at-grade crossings, which eliminates the use of locomotive horns) are potential measures to mitigate locomotive horn use. These have been evaluated and are incorporated into the Project to the extent deemed reasonable and appropriate within the design, operating, and financial constraints of the Project. Although wayside horn applications were considered as a potential mitigation measure, they were not included as part of conceptual

design, but will be considered in the future diagnostic process as part of final design. FRA regulations also allow the creation of quiet zones (where locomotive horn use at public at-grade crossings is not required due to the installation of supplemental safety measures), which would be separate from this Project. Under those regulations, municipalities can coordinate the design and development of quiet zones with the community, CSXT, and FRA. Section 5.15.2.2 of this Final EIS provides additional information on potential Project effects on quiet zones.

Noise barriers, while not commonly used on rail projects, can block train noise and reduce noise levels in areas behind them. To be effective, noise barriers must block the line of sight between the noise source and the receiver. Raising the height of the noise barrier above that line of sight increases the amount of noise reduction the noise barrier provides, but the cost of a noise barrier is directly related to the size of the noise barrier. Cost effectiveness is sometimes used to evaluate whether the noise reduction provided by a noise barrier justifies the expense of designing, constructing, and maintaining the barrier. This type of evaluation also considers the number of noise-sensitive land uses expected to experience a noise reduction due to the noise barrier. FRA does not have criteria for evaluating cost effectiveness of noise barriers. The Virginia Department of Transportation (VDOT) does, however, and their criteria could be useful for evaluating the cost effectiveness and feasibility of noise barriers on this Project. Several comments on the Draft EIS requested noise barriers be constructed in the Crystal City area; however, the proximity of the multi-story buildings prohibit effective barrier construction at this particular location. Specific details on noise mitigation measures will be developed for the Preferred Alternative during final design, which will occur after funding is available and incremental improvements are scheduled. Receiver-based mitigation is rarely implemented on rail projects because it is not cost effective to treat multiple individual locations across large areas. Noise mitigation during construction is discussed in Section 5.19.2.4 in the Construction Impacts section.

5.7.2 Vibration

This section describes potential Project-related vibration effects for the Preferred Alternative and identifies mitigation measures to offset projected impacts. Impact criteria and methodologies, as well as construction impacts, were reported in Section 4.7.2 of the Draft EIS.

The vibration impacts presented here are related to the implementation of the intercity passenger rail service improvements proposed under the DC2RVA Project, or where the existing railroad alignment was physically shifted closer to a receptor accounting for a potential increase in impacts due to freight and passenger operations.

5.7.2.1 Predicted Vibration Levels

Estimates of Project-related, train-induced ground-borne vibration (GBV) levels were used to develop distance-to-vibration-impact contours. Vibration impact contour lines were then overlaid upon digital aerial photographs to delineate the areas projected to experience vibration impacts (see the Noise and Vibration Technical Report, Appendix P of Draft EIS).

5.7.2.2 Operational Vibration Impacts

DRPT conducted the vibration assessment by calculating the distance from the rail line at which proposed intercity passenger train-induced vibration levels equal the FRA ground-borne vibration impact thresholds. Vibration-sensitive land uses inside the vibration contours are therefore projected to experience vibration impacts as defined by FRA.

Table 5.7-2 shows the number of receptors DRPT anticipates will experience vibration impacts associated with the Preferred Alternative; category descriptions are provided in the notes at the end of the table. There are no changes in the estimated number of impacts as presented in the Draft EIS.

The source of vibration impacts shown in Table 5.7.-2 is a result of both increased DC2RVA intercity passenger rail frequencies and due to physical shifting of tracks or construction of new tracks closer to receptors due to both freight and passenger operations; the analysis does not distinguish between the two, though the Federal Transit Administration (FTA)/FRA vibration assessment guidelines indicate that freight trains generally produce more ground-borne vibration than passenger trains. Additionally, while vibration is assessed on a peak basis and not a cumulative one, the frequency of vibration events is factored in when selecting the vibration impact threshold.

There are no changes to the vibration impacts and impact contour mapping as presented in the Draft EIS; refer to the Noise and Vibration Technical Report (Appendix P of Draft EIS) for figures showing the locations of these impacts for the Build Alternatives evaluated in the Draft EIS.

Details of the vibration impact summary results within each area in the Project corridor are presented after the table below.

Table 5.7-2: Vibration Impact Summary for the Preferred Alternative

Alternative Area	Preferred Alternative	Vibration Impacts, by Category[1]			
		Category 1	Category 2	Category 3	Total
Area 1: Arlington	1B	0	0	0	0
Draft EIS Impacts		0	0	0	0
Area 2: Northern Virginia	2A	0	15	0	15
Draft EIS Impacts		0	15	0	15
Area 3: Fredericksburg	3B	0	0	0	0
Draft EIS Impacts		0	0-43	0	0-43
Area 4: Central Virginia	4A	0	2	0	2
Draft EIS Impacts		0	2	0	2
Area 5: Ashland	5A	0	25	1	26
Draft EIS Impacts		0	25-35	1	26-36
Area 6: Richmond	6F	0	8	0	8
Draft EIS Impacts		0	8	0	8
Total for the Preferred Alternative:		**0**	**50**	**1**	**51**

Notes: There are no changes to the values reported in this table since the Draft EIS.

1. Category Descriptions:

Category 1: Buildings where vibration would interfere with interior operations.

Category 2: Residences and buildings where people normally sleep.

Category 3: Institutional land uses with primarily daytime use.

Area 1 (Arlington). There are no vibration-sensitive receptors within 500 feet of the Preferred Alternative in the Arlington area; therefore, vibration impact contours were not calculated, and no receptors will experience vibration impacts under the Preferred Alternative.

Area 2 (Northern Virginia). The Preferred Alternative will result in 15 receptors experiencing vibration impacts in the Northern Virginia area. There is a building in the National Register of Historic Places (NRHP)—the historic Alexandria Union Station—which is within all vibration impact contours; however, this building was designed to stand next to rail transportation. Furthermore, the vibration levels are being compared to human-comfort criteria, which is much lower than vibration levels necessary to cause damage to even old structures. Therefore, while this building is within the vibration impact contours, it is not considered an impact[17] and is not included in Table 5.7-2.

Area 3 (Fredericksburg). No receptors will experience vibration impacts under the Preferred Alternative that passes through the City of Fredericksburg.

Area 4 (Central Virginia). The Preferred Alternative will result in two residential receptors experiencing vibration impacts in the Central Virginia area.

Area 5 (Ashland). The Preferred Alternative will result in 26 receptors experiencing vibration impacts in the Ashland area. These impacts, including the Category 3 impact at the Ashland Library, are based on the assumption that passenger trains are operating at 90 mph through Ashland; however, trains will slow down to CSXT's 35 mph speed order for the Town of Ashland, even if they are not stopping at the station. Any reduction in speed will reduce the noise and vibration impacts shown for the Project; therefore, the tabulation of vibration impacts is considered a conservative overestimate.

Area 6 (Richmond). The Preferred Alternative will result in eight receptors experiencing vibration impacts in the Richmond area.

5.7.2.3 Avoidance, Minimization, and Mitigation Evaluation—Vibration

Vibration impacts are projected to occur due to the proposed intercity passenger trains, and also in cases where freight trains are proposed to be relocated onto new tracks located closer to a receptor. Passenger and freight trains will share the rail corridor, and have the ability to operate on all tracks throughout the existing corridor. Vibration mitigation options are limited due to the presence of freight trains on tracks also used by the proposed intercity passenger trains in in the DC2RVA corridor. Mitigation strategies, such as floating slabs, are not feasible options for tracks that also carry freight. Where freight trains operate on realigned or new tracks and vibration impacts were projected to occur, the only feasible options for mitigation of the trains are track and wheel maintenance measures, strategic location of special trackwork, and buffer zones between the tracks and the receptors. DRPT will coordinate with CSXT to mitigate vibration impacts related to freight trains on realigned or new tracks.

Passenger train maintenance can also be implemented to reduce ground-borne vibration; modification of the passenger rail vehicle suspension is also a potential mitigation option.

[17] Extensive coordination on Alexandria Union Station has been completed with the Virginia Department of Historic Resources (DHR), City of Alexandria, and Alexandria Archaeology, including discussions on the resource's continued NRHP eligibility and Project effect (design, noise, vibration, and other potential impacts). Due to the existing and continued use of the station in its historic capacity, known information on historic noise and vibration at the station, and the minimal increase in noise and vibration from the current status, the DHR stated that the Project will have no adverse effect on this resource.

Mitigation measures are described below, and DRPT will identify vibration mitigation measures during the final design process should they be necessary.

- **Track and wheel maintenance.** Maintenance procedures, such as regularly scheduled rail grinding, wheel truing programs, vehicle reconditioning programs, and implementation of flat-wheel detectors, minimize the vibration sources before they can impact vibration-sensitive receptors.
- **Location of special trackwork.** Effects of special trackwork have not been evaluated because the locations are likely to change as Project design progresses. It is crucial that vibration effects on sensitive receptors are evaluated when locating special trackwork.
- **Vehicle suspension.** Changing the vehicle suspension of passenger trains is normally an option when creating a new fleet of passenger trains. It is not feasible for freight train traffic, and it is unlikely that existing passenger trains will modify their suspension.

Construction-related vibration mitigation measures include BMPs such as equipment selection, finding alternatives to traditional impact pile driving, and limiting the hours of operation and locations where sources of construction-related vibration will occur. For the purposes of NEPA, the Preferred Alternative is based on a conceptual level of design (approximately a 10% design level), which precludes detailed identification of BMP applicability and use; therefore, DRPT will develop the details of these BMPs during the final design process as additional information becomes available.

5.8 ENERGY

5.8.1 Energy Consumption during Operation

In the Draft EIS, DRPT evaluated the Build Alternatives in terms of their potential to realize savings in energy consumed by all major modes of transportation in the DC2RVA corridor compared to the No Build Alternative. Travel by rail is more energy-efficient than travel by automobile or air.[18] As a result, the increases in rail ridership associated with the Preferred Alternative will shift ridership from other less-efficient modes of transportation (automobile and air) to rail, and result in conservation of overall travel-related energy. The estimated change in annual energy consumption of the Preferred Alternative is shown in Table 5.8-1. There are no changes since the Draft EIS.

Table 5.8-1: Change in Annual Energy Consumption Compared to the No Build –Year 2045

Preferred Alternative	Rail	Automobile	Bus	Air	Total
DC2RVA Preferred Alternative (*Based on Richmond Alternative: 6F - Full Service, Staples Mill Road/Main Street Stations*)	478	-606	-24	-141	-293
Draft EIS Impacts	*451-513*	*-553--636*	*-23--26*	*-140--158*	*-265--307*

Notes: Values are shown in billions of BTUs (British Thermal Units, a traditional measure of heat). Results represent all passenger travel to, from, and within the DC2RVA corridor. There are no changes to the values reported in this table since the Draft EIS.

[18] Based on energy consumption rates from the Office of the Assistant Secretary for Research and Technology, Bureau of Transportation Statistics, National Transportation Statistics (2016) website.

5.8.2 Energy Consumption during Construction

During construction of the Preferred Alternative, additional energy will be expended beyond what would be used for normal rail operations. This additional energy will be consumed on a short-term basis by construction of the Project and by potential construction-related delays to existing rail service in the DC2RVA corridor; however, once the Project is complete and additional improved passenger rail service is provided, long-term energy savings will be realized.

5.9 AESTHETIC AND VISUAL ENVIRONMENT

5.9.1 Effects

Methodology. In accordance with FRA's *Procedures for Considering Environmental Impacts*, DRPT identified major changes likely to occur in the natural landscape and in the developed environment as a result of this Project. The assessment considers the visual changes associated with the Preferred Alternative, such as track improvements, bridges, grade crossings/separations, roadway improvements, stations and maintenance facilities, and other permanent improvements associated with the Project.

As described in Section 4.9 of the Draft EIS, the Project corridor was divided into a series of visual assessment units (VAU). Each visual assessment unit has its own visual character and visual quality. A High, Moderate, or Low Visual Impacts rating (as defined below) was assigned for each VAU.

- **Low Visual Impacts:** The Project elements are consistent with the existing visual elements in the landscape, such as line, form, texture, and color, and the alternative blends with the existing visual character. Viewers are generally not very sensitive to these changes.
- **Moderate Visual Impacts:** The Project elements are notably visible in the landscape but does not dominate or detract from the existing visual features. Viewers may notice these changes, but the changes are generally not seen as negative.
- **High Visual Impacts:** The Project elements are obvious and dominate the landscape, detracting from the existing landscape characteristics or scenic qualities. Viewers are sensitive to these changes and may perceive them negatively.

Visual effects within each VAU were described in detail in the Draft EIS Section 3.9, and included mapping and photos related to the visual environment.

Visual Environs of Agricultural Lands in VAU 4-1 (Area 4, Central Virginia)

Results. Table 5.9-1 summarizes the visual impacts related to the Preferred Alternative. With the exception of the visual impact rating being reduced from moderate to low in Ashland, as the Preferred Alternative does not include improvements within town limits, the remainder of the ratings are the same as reported in the Draft EIS.

Table 5.9-1: Visual Impact Rating by Visual Assessment Unit for the Preferred Alternative

Visual Assessment Unit	Visual Impact Rating		
Area 1: Arlington / Preferred Alternative 1B			
VAU 1-1 - CFP 110 to CFP 109.3	LOW		
Area 2: Northern Virginia / Preferred Alternative 2A			
VAU 2-1 - CFP 109.3 to CFP 100	LOW		
VAU 2-2 - CFP 100 to CFP 92	LOW		
VAU 2-3 - CFP 92 to CFP 85	MODERATE		
VAU 2-4 - CFP 85 to CFP 62	MODERATE		
Area 3: Fredericksburg / Preferred Alternative 3B			
VAU 3-1 - CFP 62 to CFP 48	HIGH		
Area 4: Central Virginia / Preferred Alternative 4A			
VAU 4-1 - CFP 48 to CFP 19	LOW		
Area 5: Ashland / Preferred Alternative 5A			
VAU 5-1 - CFP 19 to CFP 9	LOW		
Draft EIS Impacts[1]	MODERATE		
Area 6: Richmond / Preferred Alternative 6F			
VAU 6-1 - CFP 9 to CFP 2	MODERATE		
VAU 6-2 - CFP 2 to SRN 0	HIGH		
VAU 6-3 - SRN 0 to A 11 (via S-Line)	HIGH		
VAU 6-4 - CFP 2 to A 11 (via A-Line)	LOW		
VAU 6-5 - SRN 0 to CA 87	LOW		
VAU 6-6 - SRN 0 to CA 80	LOW		
Total for the Preferred Alternative:	**LOW: 8**	**MODERATE: 3**	**HIGH: 3**

Note: 1. With the exception of the one rating in this Alternative Area, there are no other changes from what was reported in the Draft EIS along the length of the Preferred Alternative, so the range of impacts is not repeated in this table. VAU 3-2 (Bypass) and VAU 5-2 (Bypass) are not included in this table as the Preferred Alternative is not located within it. Reductions in impacts since the Draft EIS are indicated by green font.

Three VAUs along the Preferred Alternative are identified as having a high visual impact:

- In Area 3, the Preferred Alternative has a high impact rating for VAU 3-1 (CFP 62 to CFP 48) through Fredericksburg. There will be a new raised station platform, parking deck, and station building. These facilities will generally reflect the horizontal and vertical profiles of the existing facilities to minimize the visual impacts. The Preferred Alternative adds one additional track to the east and an additional bridge over the Rappahannock River. The new bridge will be constructed with one additional track and include width for two tracks. The new bridge will generally reflect the horizontal and vertical profiles of the existing bridge to minimize the visual impacts.

- In Area 6, the Preferred Alternative has a high visual impact rating in two VAUs:
  - In VAU 6-2 (CFP 2 to SRN 0) due to extensive trackwork coupled with sensitive visual resources
  - In VAU 6-3 (SRN 0 to A 11 via S-Line) due to the additional bridge across the James River

Sensitive resources and the aesthetics of the surrounding area will be considered during the final design of these features.

5.9.2 Avoidance, Minimization, and Mitigation Evaluation—Aesthetics and Visual Environment

DRPT will continue to work with affected communities during the final design process on the nature and style of design for visually-significant structures, such as the major waterway crossings of the Occoquan River, Neabsco Creek, Rappahannock River, and James River. In the case of historic properties, additional coordination will be completed with consulting and other interested parties, as discussed in Section 6.7, Appendix E, and Appendix K of this Final EIS. DRPT anticipates that new bridges and buildings will generally reflect the horizontal and vertical profiles of existing bridges and building in their environs to minimize the visual impact.

The full length of the Preferred Alternative constructs tracks adjacent to the existing tracks, which will minimize visual impacts. DRPT has determined that most of the Preferred Alternative will have low to moderate visual impact ratings. Visual impact mitigation strategies that DRPT will consider during the final design process include:

- Incorporating landscaping to screen undesirable features
- Using other screening techniques for undesirable features
- Adding architectural design features in character with existing visual environs
- Minimizing tree and shrub removal
- Enhancing or creating visually pleasing designs

Visual Environs of Triple Crossing in VAU 6-3 (Area 6, Richmond)

5.10 BIOLOGICAL RESOURCES

All practicable measures will be taken to avoid and minimize impacts with the implementation of the Preferred Alternative; however, due to the extent and linear nature of the DC2RVA Project, impacts to some biological habitats will be unavoidable.

For this Final EIS, DRPT calculated estimated impacts to habitats and natural communities using a conservative assumption and categorized all impacts as permanent or temporary.

The analyses summarized in this section assume the design changes associated with the Preferred Alternative, as presented in Chapter 4 of this Final EIS. Notable changes in impacts to biological resources as compared to the impacts reported in the Draft EIS for the Build Alternatives are identified within the individual subsections below.

5.10.1 Habitat and Natural Communities

The Preferred Alternative will affect terrestrial natural communities and associated wildlife habitat through conversion of existing land coverage to railroad or roadway structures and maintained right-of-way.

As shown in Table 5.10-1, depending on the combination of Build Alternatives in the Draft EIS, DRPT estimated that between 132 and 453 acres of habitat would be permanently converted by the proposed improvements. The Preferred Alternative presented in this Final EIS will convert approximately 191 acres, which is within the approximate mid-range reported in the Draft EIS.

The increased impact to urban/developed lands in Alternative Area 2 can be attributed to the Potomac Yard area. In the Draft EIS, it was identified as CSXT right-of-way and was excluded from the calculations; however, since then it has been determined that the property is not owned by CSXT but rather by the Potomac Yards Development, and therefore is now included as an impact. Otherwise, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the remainder of the habitat and natural communities; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Station upgrades will occur in urban areas. Although the LOD are wider in these locations than the rest of the Project corridor, only small additional amounts of urban tree canopy will be affected. The largest amounts of habitat conversion reported in the Draft EIS were associated with the bypass alignments considered in Area 3 (Fredericksburg) and Area 5 (Ashland). Neither bypass alternative is part of the Preferred Alternative.

Both permanent (converted to transportation use by the Project) and temporary (able to renaturalize after construction completion) impacts to general habitat types within the LOD of the Preferred Alternative are summarized in Table 5.10-1.

Table 5.10-1: Habitat Impacts (acres) of the Preferred Alternative

Alternative Area	Preferred Alternative	Agriculture (pasture/row crop/ grassland)	Aqueous Habitat (wetlands/streams/ open water)	Upland Forest	Crosses Internal Forest Habitat[1]	Shrub Area/Old Field	Riparian/Bottomland Forest/PFO	Urban/Developed Lands	Total
Area 1: Arlington	1B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	No	P: 0 T: 0	P: 0 T: 0	P: 0.0 T: 0.6	P: 0.0 T: 0.6
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	No	P: 0 T: 0	P: 0 T: 0	P: 0.0-1.5 T: 0.6-0.9	P: 0.0-1.5 T: 0.6-0.9
Area 2: Northern Virginia	2A	P: 2.3 T: 1.7	P: 1.1 T: 2.1	P: 13.1 T: 6.4	No	P: 0.2 T: 0.1	P: 1.5 T: 1.0	P: 39.9 T: 39.0	P: 58.1 T: 50.3
Draft EIS Impacts		P: 2.1 T: 1.6	P: 1.1 T: 2.0	P: 15.0 T: 7.2	No	P: 0.2 T: 0.1	P: 1.3 T: 0.9	P: 13.2 T: 11.8	P: 32.9 T: 23.6
Area 3: Fredericksburg	3B	P: 1.8 T: 1.4	P: 1.7 T: 0.9	P: 1.4 T: 3.5	No	P: 0 T: 0	P: 0.2 T: 1.6	P: 10.1 T: 5.5	P: 15.2 T: 12.9
Draft EIS Impacts		P: 0.1-32.7 T: 1.1-8.2	P: 0.1-8.5 T: 0.4-3.1	P; 0.4-66.9 T: 3.2-17.4	Yes and No	P: 0 T: 0	P: 0.1-13.2 T: 1.4-4.0	P: 1.5-19.3 T: 3.4-5.4	P: 2.2-140.6 T: 9.5-38.1
Area 4: Central Virginia	4A	P: 0.8 T: 7.4	P: 0.3 T: 4.9	P: 0.6 T: 8.9	No	P: 0.0 T: 0.8	P: 0.0 T: 9.0	P: 0.6 T: 7.5	P: 2.3 T: 38.5
Draft EIS Impacts		P: 0.9 T: 7.4	P: 0.3 T: 5.1	P: 0.5 T:10.1	No	P: 0.1 T: 1.0	P: 0.1 T: 9.4	P: 0.7 T: 7.6	P: 2.6 T: 40.6
Area 5: Ashland	5A	P: 1.8 T: 0.5	P: 0.0 T: 0.2	P: 2.6 T: 1.5	No	P: 0.0 T: 0.2	P: 0.6 T: 0.7	P: 25.3 T: 8.5	P: 30.3 T: 11.6
Draft EIS Impacts		P: 1.2-29.3 T: 0.5-5.7	P: 0-2.3 T: 0.2-0.3	P: 2.4-64.0 T: 4.7-20.7	No	P: 0-11.0 T: 0.2-2.4	P: 0.2-4.7 T: 0.6-0.9	P: 16.4-36.5 T: 6.7-9.1	P: 20.2-147.8 T: 12.9-38.9
Area 6: Richmond	6F	P: 0.0 T: 0.1	P: 0.6 T: 1.1	P: 4.9 T: 2.1	No	P: 0.1 T: 0.0	P: 3.0 T: 0.6	P: 74.5 T: 19.4	P: 85.4 T: 23.4
Draft EIS Impacts		P: 0 T: 0	P: 0-0.7 T: 0-0.7	P: 3.7-6.7 T: 2.7-3.5	No	P: 0 T: 0	P: 1.5-2.5 T: 0.6-0.7	P: 63.9-122.1 T: 17.6-57.1	P: 73.6-128.0 T: 22.2-61.4
Total for the Preferred Alternative:		**P: 6.7 T: 11.1**	**P:3.7 T: 9.2**	**P: 22.6 T: 22.4**	**P: 0 T: 0**	**P: 0.3 T: 1.1**	**P: 5.3 T: 12.9**	**P: 150.4 T: 80.5**	**P: 191.3 T: 137.3**

Note: 1. Areas of internal forest that are a minimum of 300 feet from the edge of the forested area.

P = Permanent Impact, T=Temporary Impact

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.10.1.1 Conservation Areas

Due to the linear nature of the Project and the location of the existing tracks through rural areas, DRPT determined some of the habitat areas adjacent to the DC2RVA corridor worthy of conservation for a variety of qualities. Unavoidable impacts to these areas are outlined in Table 5.10-2. As previously mentioned, impacts listed are the total area of predicted temporary and permanent impacts within the LOD of the Preferred Alternative. There are no impacts to County and Private Wildlife Lands in the Preferred Alternative, the impacts to State Wildlife Lands have not changed since the Draft EIS, and Priority Conservation Areas have increased slightly in several locations due to refinements of the LOD for the Preferred Alternative in areas of wildlife corridors, as described further below. The values fall within the range of impacts reported in the Draft EIS for the various Build Alternatives. A more detailed discussion of conservation area impacts can be found in the Natural Resources Technical Report (Appendix M of the Draft EIS).

State Wildlife Lands

DRPT anticipates that the Preferred Alternative in the Central Virginia area (Alternative 4A) will result in unavoidable temporary impacts to Mattaponi Wildlife Management Area. This resource is located to the west of the CSXT railroad corridor from mileposts CFP 39 and 42. The Preferred Alternative includes the construction of a third mainline track through this area on the west side of the CSXT mainline, but within the existing railroad right-of-way. Consistent with the findings presented in the Draft EIS, approximately 2.54 acres adjacent to existing railroad right-of-way will be disturbed for construction and then replanted and encouraged to renaturalize. Coordination with the Virginia Department of Game and Inland Fisheries (VDGIF) will be necessary.

County Wildlife Lands

The Pohick Seeps Conservation Area crosses the CSXT railroad corridor with Pohick Creek near milepost CFP 93 in Lorton, VA. As part of a separate project and included in the No Build Alternative, DRPT and VRE plan to construct a third mainline track through this area (Franconia to Occoquan) on the east side of the CSXT mainline, but within the existing right-of-way. DRPT therefore anticipates that there are no permanent or temporary impacts to Pohick Seeps Conservation Area as part of the Preferred Alternative, which is no change to impacts estimated for Build Alternative 2A as presented in the Draft EIS.[19]

Priority Conservation Areas including Wildlife Corridors

The 123-mile DC2RVA rail corridor traverses several conservation areas and wildlife corridors. These have developed over time in the presence of the railroad infrastructure. Details about unavoidable impacts to Priority Conservation Areas for the Build Alternatives evaluated in the Draft EIS were described in the Natural Resources Technical Report (Appendix M of the Draft EIS). Priority Conservation Areas, as defined by Virginia Department of Game and Inland Fisheries, are open spaces that provide agricultural, natural resource, scenic, recreational, and/or ecological values and ecosystem functions. As noted in the technical report, temporary impacts may end up becoming permanent depending on the type of impact and the potential to disrupt sensitive resources that may not have the ability to recover (e.g., clearing and grubbing of an area with a rare plant community).

[19] The original Draft EIS documented 0.55 acres of temporary impact to Pohick Seeps Conservation Area; however, DRPT determined that Build Alternative 2A would not result in any permanent or temporary impacts to this resource and corrected the impact to zero acres, as shown in the errata for the Draft EIS (Appendix A of this Final EIS).

Table 5.10-2 presents the potential temporary and permanent impacts to conservation areas associated with the Preferred Alternative. Impacts associated with the Preferred Alternative are considerably less than other Draft EIS Build Alternatives that included the bypass alignments in Area 3 (Fredericksburg) and Area 5 (Ashland). However, there have been increases in impacts to priority conservations areas including wildlife corridors since the Draft EIS, notably in Area 5 as the Preferred Alternative requires the replacement of the existing rail overpass at Washington Highway (Route 1) north of Ashland, which was not part of any of the original Build Alternatives. Otherwise, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the remainder of the priority conservation areas; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Table 5.10-2: Conservation Area Impacts (acres) of the Preferred Alternative

Alternative Area	Preferred Alternative	USFWS National Wildlife Refuges	State Wildlife Lands	County Wildlife Lands	Private Wildlife Lands	Priority Conservation Areas, including Wildlife Corridors
Area 1: Arlington	1B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Area 2: Northern Virginia	2A	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0.01 T: 0.81
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0.00 T: 0.00	P: 0 T: 0	P: 0.01 T: 0.78
Area 3: Fredericksburg	3B	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0.11 T: 1.75
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0-22.31 T: 0-5.69	P: 0.03-83.36 T: 1.52-18.63
Area 4: Central Virginia	4A	P: 0 T: 0	P: 0.00 T: 2.54	P: 0 T: 0	P: 0 T: 0	P: 0.00 T: 2.52
Draft EIS Impacts		P: 0 T: 0	P: 0.00 T: 2.54	P: 0 T: 0	P: 0 T: 0	P: 0.00 T: 2.48
Area 5: Ashland	5A	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 5.45 T: 1.27
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Area 6: Richmond	6F	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0.15 T: 0.05
Draft EIS Impacts		P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0	P: 0 T: 0
Total for the Preferred Alternative:		**P: 0 T: 0**	**P: 0.00 T: 2.54**	**P: 0 T: 0**	**P: 0 T: 0**	**P: 5.72 T: 6.40**

Source: VDOT-CEDAR, 2016.

P = Permanent Impact, T=Temporary Impact

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

Potential impacts to existing wildlife corridors, many of which terminate at one side or the other of the 100-year old railbed, will result from widening the existing rail corridor. In some areas, wildlife is able to travel under bridges that span waterways and through culverts. Wildlife passage across (through) the railbed can potentially be improved with proposed rail improvements by the Project, including increased clearances at bridges and more and/or larger culverts. EPA suggested inclusion of natural bottom culverts as an example of a mitigation measure to improve wildlife passage, which will be determined during final design. Countersinking of culvert extensions will be designed in accordance with specifications contained in USACE's nationwide permit. Larger animals should continue to be able to successfully cross existing tracks since no fencing or other additional barriers are proposed along the corridor by the Project; however, an increased track area and increased and faster train traffic could result in a decreased ability for wildlife crossing. Although DRPT does not anticipate any substantial interruption to wildlife movements under the Preferred Alternative, DRPT will continue to consider special design features to improve wildlife corridors during final design.

5.10.1.2 Invasive Species

There is potential for the Preferred Alternative to inadvertently introduce additional invasive species into the corridor during construction; however, with implementation of the mitigation measures identified in Section 5.10.1.4, including prompt seeding of disturbed areas with seeds that are tested in accordance with the Virginia Seed Law and implementation of appropriate BMPs, DRPT does not anticipate temporary and/or permanent impacts from invasive species.

Biological Habitat adjacent to the DC2RVA Corridor (Area 2, Northern Virginia)

5.10.1.3 Submerged Aquatic Vegetation

Due to the need to expand existing bridge crossings of major waterways where beds of submerged aquatic vegetation (SAV) exists, the Preferred Alternative will have unavoidable impacts on these plant communities. Permanent impacts will include bed or bottom areas converted for the use of piers or infrastructure, while temporary impacts will include disturbed areas that regain the ability to support SAV again after construction completion.

Table 5.10-3 presents the estimated acres of temporary and permanent impacts to SAV for the Preferred Alternative; updated locations of SAV in relation to the Preferred Alternative LOD are shown in Appendix M of this Final EIS. In general, permanent impacts to SAV have minimally decreased (less than 1 percent change) and temporary impacts have minimally increased (less than 3 percent change) since the Draft EIS in Area 2 only.

DRPT anticipates permanent impacts to SAV to only occur with Alternative 2A (Northern Virginia) in the Preferred Alternative. No SAV beds occur in the DC2RVA corridor south of Aquia Creek, and the proposed improvements included with Alternative 1B (Arlington) as part of the Preferred Alternative will only require work along the fringe of waters containing SAV beds, resulting in minimal temporary impacts.

During final design, DRPT will submit a request to remove SAV from, or plant SAV on, state-administered benthic surfaces as part of a JPA to the VMRC. In determining whether to grant approval for SAV removal or planting, VMRC shall be guided by §28.2-1205 of the Code of Virginia and the SAV Transplantation Guidelines, or any new and improved methodologies as approved by VMRC.

Table 5.10-3: Submerged Aquatic Vegetation Impacts (acres) of the Preferred Alternative

Alternative Area	Preferred Alternative	Existing	Historic	Total
Area 1: Arlington	1B	P: 0.00 T: 0.01	P: 0 T: 0	P: 0.00 T: 0.01
	Draft EIS Impacts	P: 0.00 T: 0.01-0.03	P: 0 T: 0	P: 0.00 T: 0.01-0.03
Area 2: Northern Virginia	2A	P: 1.31 T: 1.92	P: 0.37 T: 0.36	P: 1.68 T: 2.28
	Draft EIS Impacts	P: 1.33 T: 1.91	P: 0.37 T: 0.35	P: 1.70 T: 2.26
Total for the Preferred Alternative:		**P: 1.31 T: 1.93**	**P: 0.37 T: 0.36**	**P: 1.68 T: 2.29**

P = Permanent Impact, T=Temporary Impact.

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives. However, there is no SAV south of Aquia Creek; therefore, there are no impacts listed for the Preferred Alternative in Areas 3, 4, 5, and 6.

5.10.1.4 Avoidance, Minimization, and Mitigation Evaluation—Habitat and Natural Communities

Minimization measures to protect habitat and natural communities could involve modifications to future designs such as:

- Minor alignment shifts to avoid or minimize impacts
- Minimizing clearing and grubbing, in particular in riparian areas
- Development of a mitigation plan that includes landscaping and planting detail for onsite replacement of any trees removed
- Native revegetation, including native shrub plantings and native reseeding of disturbed areas, to prevent the spread of invasive species and additional erosion during storm events due to exposed soil
- Using bridges or open/natural bottom culverts in streams to minimize the disruption of natural stream bottoms

Invasive Species

To avoid the introduction of new invasive species and prevent the spread of existing populations, appropriate BMPs will be followed, including washing machinery before it enters the area to prevent the spread of seeds and minimizing ground disturbance. Prompt seeding of disturbed areas with native seeds or seeds that are tested in accordance with the Virginia Seed Law to ensure that seed mixes are free of noxious species will decrease the ability for invasive species to take root and outcompete native species.

Submerged Aquatic Vegetation

Mitigation for areas of temporary disturbance to SAV will be coordinated with the VMRC. The following SAV area protection procedures are suggested by the Chesapeake Bay Program:

- Protect existing, historic, and potential SAV areas from physical disruption
- Avoid or minimize dredging within SAV areas
- Avoid nearby construction activities that create additional turbidity
- Avoid reduction in Secchi depths (water clarity) compared to predisturbance levels
- Establish an undisturbed buffer around SAV beds
- If construction must occur near or in beds, avoid activities during the growing season (April–October for most species)
- Preserve natural shorelines through stabilization with marsh plantings

Further efforts to avoid and/or minimize disturbance and removal of SAV will be made during final design as part of obtaining the VMRC permit. Erosion and sediment control measures will minimize potential impacts to water quality within adjacent SAV areas. Construction within or adjacent to SAV areas will avoid the prescribed Time-of-Year growing season restrictions for representative plant species to the extent practicable, as required by the VMRC permit. Mitigation for SAV loss will be developed in coordination with VMRC and may include enhancement (increase aerial coverage of SAV beds or improvement in habitat quality) or restoration (return SAV to unvegetated bottom that historically supported SAV) of SAV beds.

5.10.2 Wildlife

Impacts to migratory birds and terrestrial and aquatic wildlife habitat are quantified in the sections below. Construction activities associated with the Preferred Alternative may result in the disturbance of local wildlife species such as birds, reptiles and amphibians, deer, foxes, squirrels, rabbits, raccoons, groundhogs, and other common mammals. Mobile species, such as adult birds, mammals, and some reptiles, may be displaced, and loss of less mobile animals may also result from construction. These species would return and repopulate the area after construction and the process of regrowth of plants and brush offers habitat favorable to the wildlife.[20]

5.10.2.1 Migratory Birds

The migratory birds of primary concern in the Project area are migratory songbirds, commonly referred to as Neotropical migrants. Short-term adverse impacts from construction noise and disturbance may mask territorial vocalizations of birds and breeding calls, and they may temporarily disturb breeding pairs. Important stopover habitat for migratory songbirds includes forested areas with dense undergrowth that provides cover from predators. Migratory birds may be affected through habitat degradation and loss associated with this Project. Most of the lost habitat associated with this Project will be directly adjacent to the existing rail line and consists of lower quality edge habitat already impacted by local activities. Nearby conservation areas, such as federal, state, and private wildlife lands, are more likely to provide optimal habitat for these species.

5.10.2.2 Aquatic and Marine Life

Due to the number and type of water crossings involved, direct disturbance of aquatic communities will be unavoidable. In-stream work and use of wetland areas will result in the elimination of some aqueous habitat and species that may be unable to relocate.

Fisheries, Anadromous Fish, and Trout Waters

Permanent and temporary impacts to waters with reported anadromous fish movements for the Preferred Alternative are detailed in Table 5.10-4. Anticipated impacts to waters containing anadromous fish movements are dependent on the size of the water body and the type of crossing required; anadromous fish waters were shown in Figure 3-8 of Appendix M of the Draft EIS. Depending on the combination of Build Alternatives, DRPT estimated in the Draft EIS that there would be between 3.26 and 4.76 acres[21] of permanent impacts to the anadromous fish waters. The Preferred Alternative will permanently impact 4.51 acres of surface area of anadromous fish waters (i.e., shadow effect), with slightly higher or lower impacts within individual waters based on refinements to the LOD since the Draft EIS. However, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified these impacts; rather, narrow changes in the width or length of bridge structures resulted in minor increases and decreases in the permanent and temporary LOD.

[20] *Virginia Wildlife*, November/December 2017, "Nature's Way," pages 25, 28., VDGIF.

[21] The Draft EIS table originally reported anticipated impacts in linear feet, and has been updated to reflect anticipated impacts in acreage to better account for both physical impediments as well as shadowing effects which could potentially interrupt anadromous/migratory movements. Refer to the errata table for the Draft EIS (Appendix A of this Final EIS).

Table 5.10-4: Impacts to Anadromous Fish Use Waters of the Preferred Alternative

Water	Preferred Alternative	Confirmed Species	Anticipated Impacts (Acres)	
			Permanent	Temporary
Four Mile Run	2A	Striped Bass, Yellow Perch	P: 0.03	T: 0.29
		Draft EIS Impacts	*P: 0.03*	*T: 0.29*
Occoquan River	2A	Alewife, American Shad, Blueback Herring, Hickory Shad, Striped Bass, Yellow Perch	P: 0.56	T: 0.66
		Draft EIS Impacts	*P: 0.54*	*T: 0.66*
Neabsco Creek	2A	Striped Bass	P: 0.54	T: 0.74
		Draft EIS Impacts	*P: 0.55*	*T: 0.70*
Powells Creek	2A	Striped Bass, Yellow Perch	P: 0.75	T: 0.96
		Draft EIS Impacts	*P: 0.75*	*T: 0.97*
Aquia Creek	2A	American Shad, Blueback Herring, Striped Bass, Yellow Perch	P: 0.96	T: 1.24
		Draft EIS Impacts	*P: 1.03*	*T: 1.23*
Claiborne Run	3B	Potential anadromous fish use waters	P: 0.32	T: 0.08
		Draft EIS Impacts (in this Water)	*P: 0.06 – 0.28*	*T: 0.03 – 0.08*
Hazel Run	3B	Alewife, Blueback Herring	P: 0.02	T: 0.01
		New since Draft EIS	–	–
Rappahannock River	3B	Alewife, American Shad, Blueback Herring, Hickory Shad, Striped Bass, Yellow Perch	P: 0.42	T: 0.47
		Draft EIS Impacts (in this Water)	*P: 0 – 0.48*	*T: 0 – 1.09*
Mattaponi River	4A	American Shad, Blueback Herring, Striped Bass, Yellow Perch	P: 0.06	T: 0.30
		Draft EIS Impacts	*P: 0.11*	*T: 0.26*
North Anna River	4A	American Shad, Blueback Herring, Hickory Shad, Striped Bass, Yellow Perch	P: 0.04	T: 0.08
		Draft EIS Impacts	*P: 0.08*	*T: 0.04*
Little River	4A	Yellow Perch	P: 0.04	T: 0.02
		Draft EIS Impacts	*P: 0.04*	*T: 0.02*
South Anna River	5A	Alewife, American Shad, Blueback Herring, Hickory Shad, Striped Bass	P: 0.03	T: 0.06
		Draft EIS Impacts (in this Water)	*P: 0.07*	*T: 0.03*
James River	6F	Alewife, American Shad, Blueback Herring, Hickory Shad, Striped Bass, Yellow Perch	P: 0.74	T: 1.74
		Draft EIS Impacts (in this Water)	*P: 0 – 0.80*	*T: 0 – 1.31*
		Total for the Preferred Alternative:	**P: 4.51**	**T: 6.65**

P = Permanent Impact, T=Temporary Impact.

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.10.2.3 Avoidance, Minimization, and Mitigation Evaluation—Wildlife

Terrestrial Wildlife

DRPT will evaluate further minimization of impacts to wildlife during the final design process by decreasing LOD in habitat areas. This will include considering conservative use of staging areas and limiting access roads to reduce habitat loss. Wildlife passage can be facilitated through wildlife crossings. Wildlife crossings are man-made structures that allow animals to safely cross barriers. These crossings allow the connection or reconnection between habitats mitigating the impacts of habitat fragmentation, allow greater access to resources, and avoid wildlife/train collisions. DRPT will evaluate providing oversized culverts and extended bridges in areas where habitat fragmentation would occur. If pipes are used, they should be countersunk a minimum of three inches for pipes under 24 inches and a minimum of six inches for pipes 24 inches or greater to allow natural bottoms to be created in the pipes.

Migratory Birds

General time of year (TOY) restrictions on construction activities to avoid impacts on migratory and resident songbirds in Virginia are from mid-March through mid-August and for migrant passerines and non-passerines from the beginning of May through the end of July. To the maximum extent practicable, DRPT will avoid grading and construction during the breeding season. If construction is necessary during the breeding season, DRPT will conduct nest surveys, if necessary, and will avoid activities within 100 feet of active nests, where possible. DRPT will not plant food sources within the right-of-way, which will make the right-of-way less attractive to birds and decrease the likelihood of collisions with trains.

Aquatic and Marine Life

DRPT will work with VDGIF, National Marine Fisheries Service (NMFS), and United States Fish and Wildlife Service (USFWS) during the design process to develop specific measures for avoidance, minimization, and mitigation of impacts to aquatic wildlife. DRPT will implement BMPs, including use of silt curtains and limiting overflow from dredging equipment, which will minimize increases in turbidity of waters downstream of in-water activities. Erosion and sediment control measures will minimize potential impacts to water quality during construction.

Bottomless culverts and single-span bridges will be considered at smaller streams to maintain fish passage and channel morphology and to avoid instream work to the extent practicable. If pipes are used, they should be countersunk a minimum of three inches for pipes under 24 inches and a minimum of six inches for pipes 24 inches or greater. Preconstruction sediment quality assessments and water quality monitoring during construction will be considered to address potential resuspension of contaminants and nutrients into overlying waters.

TOY restrictions will be considered to avoid or minimize impacts on fish during early life stages. VDGIF typically recommends restrictions on all in-stream work within Anadromous Fish Use Areas and their tributaries between February 15 and June 30. Exact restrictions will vary depending on the species, type of work, and location and will be developed with VDGIF and NMFS. Stormwater management measures, including detention basins, vegetative controls, and other measures, will be implemented to minimize water quality impacts, if necessary. These measures will reduce or detain discharge volumes and remove pollutants, thus avoiding substantial further degradation of impaired water bodies in and downstream of the Project corridor. With implementation of these BMPs, DRPT anticipates the Preferred Alternative will not adversely affect downstream species.

5.10.3 Threatened and Endangered Species

Potential impacts to federal- or state-listed threatened or endangered species could occur for the Preferred Alternative where planned improvements affect areas where species or their habitat may be found.

Based on updated research through regulatory agency online databases, agency input regarding threatened and endangered species that may be present along the Project corridor, and field surveys of potentially suitable habitat, DRPT determined that the Preferred Alternative could potentially impact eight federally endangered and/or threatened species, one proposed federally threatened species, and eight state-listed endangered and/or threatened species, as shown in Tables 5.10-5 and 5.10-6, respectively. One federally endangered and one proposed federally threatened species have been added since the preparation of the Draft EIS: the rusty patched bumble bee (*Bombus affinis*) was listed as endangered on January 11, 2017, and the yellow lance (*Elliptio lanceolata*) was proposed for listing as threatened on April 5, 2017.

Potential impacts depend on the species and range, including, but not limited to, elimination of the species from the area, removal or alteration of habitat, elimination of access to important life stage areas, disruption of breeding season, or disturbance resulting in a species leaving the area. Impacts to threatened and endangered species habitats are expected to be minimal as the Preferred Alternative includes mostly urban or already disturbed, although in some cases naturalized, areas adjacent to the existing tracks.

Coordination with USFWS, VDGIF, and NMFS pursuant to Section 7 of the Endangered Species Act of 1973 (ESA),[22] as amended, for potential impacts to federally listed species will be conducted if required during final design and permitting. Preliminary coordination with USFWS has consisted of obtaining the current list of federally listed threatened and endangered species that could potentially be found in the Project corridor. DRPT anticipates that future coordination will cover the need for additional field surveys and discussion regarding the potential Project effects.

Roaches Run Waterfowl Sanctuary (Area 2, Northern Virginia)

[22] 16 USC §1531 et seq.

Table 5.10-5: Potential Preferred Alternative Effect on Federally Listed Species

Species/ Resource Name	Status[1]	Conclusion	Notes
Alternative 1B: Add Two Main Tracks on the West			
No species indicated; however, the tidal wetland in the Roaches Run Waterfowl Sanctuary may provide suitable habitat for sensitive joint-vetch and is recommended for future surveys, if impacted.			
Alternative 2A: Add a Third or Fourth Main Track			
Dwarf Wedgemussel *(Alasmidonta heterodon)*	FE	Potential habitat present, and no current survey conducted; may affect.	Known or likely to occur within the Lower Aquia Creek subwatershed (VDGIF, 2018).
Harperella *(Ptilimnium nodosum)*	FE	Potential habitat does not appear to be present, and no suitable habitat was identified during field surveys; not likely to adversely affect.	Known or likely to occur only in Stafford County (USFWS-ECOS, 2018) in the Lower Potomac (02070011) watershed (NatureServe, 2016).
Indiana bat *(Myotis sodalis)*	FE	Potential habitat present, and no current survey conducted; may affect.	No known occurrences in Fairfax, Prince William, or Stafford Counties (USFWS-ECOS, 2018).
Northern Long-eared Bat *(Myotis septentrionalis)*	FT	Potential habitat present, and no current survey conducted; may affect.	It is generally agreed by the regulatory agencies that this species can be found throughout Virginia.
Rusty Patched Bumble Bee (*Bombus affinis*)	FE	Species unlikely to be present within the Project corridor.	Historically documented in Annandale, within 2.0 miles of the Project area (VDCR, 2017). Within Virginia, not currently known outside of Bath, Clarke, Fauquier, and Loudoun Counties (USFWS-ECOS, 2018).
Sensitive Joint-vetch *(Aeschynome virginica)*	FT	Habitat present, and no current survey conducted; may affect.	Habitat recorded during field surveys. There are historic records of this species occurring in the Potomac River-Tank Creek and Lower Aquia Creek-Austin Run subwatersheds (VDCR, 2018), which are crossed by this area.
Small Whorled Pogonia *(Isotria medeoloides)*	FT	Habitat present, and no current survey conducted; may affect.	Habitat recorded during field surveys. There are historic records of this species occurring in the Accotink Creek-Gunston Cove and Accokeek Creek subwatersheds (VDCR, 2018), which are crossed by this area.
Yellow Lance (*Elliptio lanceolata*)	FT	Species unlikely to be present within the Project area.	Not listed as occurring within the watersheds crossed by this area (USFWS, 2017).
Alternative 3B: Add a Third Main Track Through City			
Dwarf Wedgemussel *(Alasmidonta heterodon)*	FE	Potential habitat present, and no current survey conducted; may affect.	Existing populations in the Lower Rappahannock (02080104) watershed (NatureServe, 2016).
Harperella *(Ptilimnium nodosum)*	FE	Species not known to be present, and no suitable habitat was identified during field surveys; not likely to adversely affect.	Not listed as occurring in the watershed crossed by this area (NatureServe, 2016).

▶ *Continued – see end of table for notes.*

Table 5.10-5: Potential Preferred Alternative Effect on Federally Listed Species

Species/ Resource Name	Status[1]	Conclusion	Notes
Indiana bat *(Myotis sodalis)*	FE	Potential habitat present, and no current survey conducted; may affect.	Known or likely to occur in Caroline County (USFWS-ECOS, 2018).
Northern Long-eared Bat *(Myotis septentrionalis)*	FT	Potential habitat present, and no current survey conducted; may affect.	It is generally agreed by the regulatory agencies that this species can be found throughout Virginia.
Rusty Patched Bumble Bee (*Bombus affinis*)	FE	Species unlikely to be present within the Project corridor.	In Virginia, not currently known outside of Bath, Clarke, Fauquier, and Loudoun Counties (USFWS-ECOS, 2018).
Small Whorled Pogonia *(Isotria medeoloides)*	FT	Habitat present, and no current survey conducted; may affect.	Habitat recorded during field surveys. There are historic records of this species within the Massaponax Creek subwatershed (VDCR, 2018).
Swamp-pink *(Helonias bullata)*	FT	Potential habitat present, and no current survey conducted; may affect.	There are historic records of this species in the Poni River subwatershed (VDCR, 2018), which is crossed by this area.
Yellow Lance (*Elliptio lanceolata*)	FT	Species unlikely to be present within the Project corridor.	This species has not been observed within the watersheds crossed by this area in over 22 years (USFWS, 2017).
Alternative 4A: Add a Third Main Track			
Dwarf Wedgemussel *(Alasmidonta heterodon)*	FE	Species present; may affect.	Existing populations in the Mattaponi (02080105) and Pamunkey (02080106) watersheds (NatureServe, 2016); Po River, upstream of this Project, listed by VDGIF as endangered waters for the dwarf wedgemussel; this species is known or likely to occur within the Poni River subwatershed (VDGIF, 2018) and within the South Anna River–Cedar Creek subwatershed (VDGIF, 2018 and VDCR, 2018).
Indiana bat *(Myotis sodalis)*	FE	Species potentially present, and no current survey conducted; may affect.	Known or likely to occur in Caroline County (USFWS-ECOS, 2018).
Northern Long-eared Bat *(Myotis septentrionalis)*	FT	Potential bat habitat present, and no current survey conducted; may affect.	It is generally agreed by the regulatory agencies that this species can be found throughout Virginia.
Rusty Patched Bumble Bee (*Bombus affinis*)	FE	Species unlikely to be present within the Project corridor.	In Virginia, not currently known outside Bath, Clarke, Fauquier, and Loudoun Counties (USFWS-ECOS, 2018).
Swamp-pink *(Helonias bullata)*	FT	Potential habitat present, and no current survey conducted; may affect.	There are historic records of this species occurring in the Poni River, Campbell Creek-Mattaponi River, and Polecat Creek subwatersheds (VDCR, 2018) crossed by this alternative area.

▶ *Continued – see end of table for notes.*

Table 5.10-5: Potential Preferred Alternative Effect on Federally Listed Species

Species/ Resource Name	Status[1]	Conclusion	Notes
Yellow Lance (*Elliptio lanceolata*)	FT	Species unlikely to be present within the Project corridor.	This species has not been observed within the watersheds crossed by this area in over 13 years (USFWS, 2017).
Alternatives 5A: Maintain Two Tracks Through Town (No Station Improvements)			
Dwarf Wedgemussel *(Alasmidonta heterodon)*	FE	Species present; may affect.	South Anna River has been listed by VDGIF as endangered waters for the dwarf wedgemussel; this species is known or likely to occur within the South Anna River–Cedar Creek subwatershed (VDGIF, 2018 and VDCR, 2018).
Northern Long-eared Bat *(Myotis septentrionalis)*	FT	Potential bat habitat present, and no current survey conducted; may affect.	Bat habitat was noted during field surveys in Carter Park; it is generally agreed by the regulatory agencies that this species can be found throughout Virginia.
Rusty Patched Bumble Bee (*Bombus affinis*)	FE	Species unlikely to be present within the Project corridor.	Within Virginia, not currently known outside of Bath, Clarke, Fauquier, and Loudoun Counties (USFWS-ECOS, 2018)
Yellow Lance (*Elliptio lanceolata*)	FT	Species unlikely to be present within the Project corridor.	This species has not been observed within the watersheds crossed by this area in over 22 years (USFWS, 2017).
Alternatives 6F: Full Service, Staples Mill Road / Main Street Stations			
Northern Long-eared Bat *(Myotis septentrionalis)*	FT	Species potentially present, and no current survey conducted; may affect.	It is generally agreed by the regulatory agencies that this species can be found throughout Virginia.
Rusty Patched Bumble Bee (*Bombus affinis*)	FE	Species unlikely to be present within the Project corridor.	Within Virginia, not currently known outside of Bath, Clarke, Fauquier, and Loudoun Counties (USFWS-ECOS, 2018).
Sensitive Joint-vetch *(Aeschynome virginica)*	FT	Species unlikely to be present in the Project corridor.	It is generally agreed by the regulatory agencies that this species can be found throughout Virginia, but no habitat in in the Richmond area will be affected.

Notes: 1. FE – Federal Endangered; FT – Federal Threatened

Table 5.10-6: Potential Preferred Alternative Effect on State Listed Species

Species/ Resource Name	Status[1]	Conclusion	Notes
Alternative 1B: Add Two Main Tracks on the West			
No species indicated; however, the tidal wetland in the waterfowl sanctuary may provide suitable habitat for sensitive joint-vetch and is recommended for future surveys, if impacted.			
Alternative 2A: Add a Third or Fourth Main Track			
Peregrine Falcon *(Falco peregrinus)*	ST	Species potentially present; and no current survey conducted; may affect.	This species has been recorded in Huntly Meadows Park (CEDAR-VDGIF); the Project is separated from Huntly Meadows Park by more than 1.5 miles of urban development.
Sensitive Joint-vetch *(Aeschynome virginica)*	ST	Habitat present, and no current survey conducted; may affect.	There are historic records of this species occurring in the Potomac River-Tank Creek and Lower Aquia Creek-Austin Run subwatersheds (VDCR, 2018), crossed by this area. Four wetlands recommended for further sensitive joint-vetch survey.
Small Whorled Pogonia *(Isotria medeoloides)*	SE	Habitat present, and no current survey conducted; may affect.	Habitat recorded during field surveys. There are historic records of this species occurring in the Accotink Creek-Gunston Cove and Accokeek Creek subwatersheds (VDCR, 2018), which is crossed by this area.
Wood Turtle *(Glyptemys insculpta)*	ST	Species potentially present, and no current survey conducted; may affect.	Known or likely to occur in the Cameron Run, Accotink Creek-Gunston Cove, Pohick Creek, Occoquan Bay-Potomac River, Lower Occoquan River-Belmont Bay, and Neabsco Creek subwatersheds (VDGIF, 2018 and VDCR, 2018).
Alternative 3B: Add a Third Main Track Through City			
Green Floater *(Lasmigona subviridis)*	ST	Species present; may affect; coordination with VDGIF required.	The Rappahannock River has been listed by VDGIF as endangered waters for the green floater; coordination with VDGIF is required.
New Jersey Rush *(Juncus caesariensis)*	ST	Potential habitat present, and no current survey conducted; may affect.	There are historic records of the potential of this species occurring in the Poni River subwatershed (VDCR, 2018) in Caroline County (USFWS-ECOS, 2018 and NatureServe, 2016) and the Lower Rappahannock (02080104) and Mattaponi (02080105) watersheds (NatureServe, 2016).
Small Whorled Pogonia (*Isotria medeoloides*)	SE	Habitat present, and no current survey conducted; may affect.	Habitat recorded during field surveys. There are historic records of this species within the Massaponax Creek subwatershed (VDCR, 2018).
Alternative 4A: Add a Third Main Track			
New Jersey Rush *(Juncus caesariensis)*	ST	Potential habitat present, and no current survey conducted; may affect.	There are historic records of the potential of this species occurring in the Poni River and Campbell Creek-Mattaponi River, Reedy Creek, and Polecat Creek subwatersheds (VDCR, 2018) in Caroline County (USFWS-ECOS, 2018 and NatureServe, 2016) within the Mattaponi (02080105) watershed and the Lower Rappahannock (02080104) watershed (NatureServe, 2016).
Swamp-pink *(Helonias bullata)*	ST	Potential habitat present, and no current survey conducted; may affect.	There are historic records of this species occurring in the Poni River, Campbell Creek-Mattaponi River, and Polecat Creek subwatersheds (VDCR, 2018) crossed by this alternative area.
Alternatives 5A: Maintain Two Tracks Through Town (No Station Improvements)			
No species indicated.			

▶ *Continued – see end of table for notes.*

Table 5.10-6: Potential Preferred Alternative Effect on State Listed Species

Species/ Resource Name	Status[1]	Conclusion	Notes
Alternatives 6F: Full Service, Staples Mill Road / Main Street Stations			
Barking Treefrog *(Hyla gratiosa)*	ST	Potential habitat present, and no current survey conducted; may affect.	This species is known or likely to occur in the Falling Creek (VDCR, 2018 and VDGIF, 2018) and Proctors Creek-James River (VDGIF, 2018) subwatersheds in Chesterfield County (NatureServe, 2016).
Peregrine Falcon *(Falco peregrinus)*	ST	Species present; may affect; coordination with VDGIF required.	Several active nests were recorded in 2009 within three miles of this alternative area near River Front Plaza in Richmond.
Sensitive Joint-vetch *(Aeschynome virginica)*	ST	Species unlikely to be present in the Project corridor.	It is generally agreed by the different regulatory agencies that this species can be found throughout Virginia, but no habitat in in the Richmond area will be affected.

Notes: 1. SE – State Endangered; ST – State Threatened

5.10.3.1 Bald Eagle and Golden Eagle Protection Act[23]

The bald eagle (*Haliaeetus leucocephalus*) is listed under Tier II of the Virginia Wildlife Action Plan for "Very High Conservation Need." While the bald eagle is no longer federally-listed as threatened, it is still protected under some laws, including the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act.

Table 5.10-7 lists bald eagle nests that will have their buffer zones encroached on by the permanent LOD of the Preferred Alternative. Since the publication of the Draft EIS, there are fewer nests within all buffer zones in Alternative Area 2 (Northern Virginia). Updated mapping of these locations in relation to the Preferred Alternative LOD is provided in Appendix M of this Final EIS. There are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to these buffer zones; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts within the corridor in the Northern Virginia area compared to those reported in the Draft EIS.

Table 5.10-7: Number of Bald Eagle Nests within Buffer Zones of the Preferred Alternative

Alternative Area	Preferred Alternative	Between 0.5 mile and 1 mile in open areas[1]	Within 660 feet[2]	Within 330 feet[3]
Area 2: Northern Virginia	2A	12	1	1
Draft EIS Impacts		**18**	**8**	**4**

Source: CCB, 2016.

Notes: 1. For projects that have blasting or other loud noise components.

2. Clearing, external construction, and landscaping between 330 and 660 feet should be done outside breeding season. 3. 330 feet, or as close as existing tolerated activity of similar scope.

This table reports the resource for the entire Preferred Alternative. There are no bald eagle nests within the buffer zones in Alternative Areas 1, 3, 4, 5, or 6, so they are not reported in this table. Reductions in impacts since the Draft EIS are indicated by green font.

[23] 16 U.S.C. § 668 et seq.

5.10.3.2 Avoidance, Minimization, and Mitigation Evaluation – Threatened and Endangered Species

DRPT will coordinate with USFWS, EPA, VDGIF, Virginia Department of Conservation and Recreation (VDCR), and other regulatory agencies regarding rare, threatened, and endangered species to ensure impacts are avoided to the extent practicable through the final design process and appropriate mitigation is developed where impacts are unavoidable. DRPT will reduce the likelihood of adverse effects through use of these measures:

- Further minimizing the LOD through final design
- Following appropriate BMPs for sediment and erosion control during construction
- Using infiltration stormwater management
- Minimizing clearing and grubbing
- Prompt reseeding of disturbed areas with native vegetation
- TOY restrictions, which are summarized in Table 5.10-8

Table 5.10-8: Listed Time of Year Restrictions for Threatened and Endangered Species with Potential to Occur in the DC2RVA Corridor

Species	Status[1]	Recommended Time-of-Year Restrictions
Dwarf Wedgemussel (*Alasmidonta heterodon*)	FE	March 15–May 31; August 15–October 15
Indiana bat (*Myotis sodalis*)	FE	The standard TOY restrictions are June 1–July 31 for the "pup season," April 15–September 15 outside of the 5.5-mile-radius buffer for hibernacula, and April 1–November 15 within a hibernaculum buffer
Northern Long-eared Bat (*Myotis septentrionalis*)	FT	Compliance with the USFWS ESA 4(d) rule. VDGIF's standard recommendations are to prohibit tree removal within 150 feet of a documented maternity roost from June 1–July 31 and to prohibit tree removal within 0.25 mile of a documented hibernaculum
Bald Eagle (*Haliaeetus leucocephalus*)	ST	Nest Sites: December 15–July 15; Concentration Areas and Roost Sites: Summer: May 15–August 31; Winter: December 15–March 15
Barking Treefrog (*Hyla gratiosa*)	ST	None listed
Green Floater (*Lasmigona subviridis*)	ST	April 15–June 15 (release of glochidia); August 15–September 30 (spawning)
Peregrine Falcon (*Falco peregrinus*)	ST	February 15–July 15 for activities within 600 feet of nest
Wood Turtle (*Glyptemys insculpta*)	ST	For instream work: October 1–March 31; For work within 900 feet of stream (zone of concern): April 1–September 30. Maintain undisturbed naturally vegetated buffer of at least 300 feet (preferably larger) on stream

Source: VDGIF, 2016.

Notes: 1. FE – Federal Endangered; FT – Federal Threatened; SE – State Endangered; ST – State Threatened

Bald Eagle. Disturbance of nesting bald eagles is unlikely to occur if the following general guidelines per VDGIF are followed:

- Clearing, grubbing, and construction activities within 660 feet, but outside 330 feet, is restricted to outside of the breeding season (December 15th through July 15th), even if these activities are occurring within railroad right-of-way.

- A buffer of at least 660 feet is maintained between all activities and the nest (including active and alternate nests). If a similar activity is closer than 660 feet, then a distance buffer as close to the nest as the existing tolerated activity would be maintained.
- A buffer of at least 0.5 mile, or one mile in open areas, is maintained for blasting and other activities that produce extremely loud noises or restricted to outside the breeding season.

These are general guidelines that will be further refined through coordination with VDGIF through the permitting process, including VDGIF's concern that the eagle's attraction to carrion present along the tracks and its effect on fledging eagles. During the final design stage of this Project, detailed maps depicting the location of new structures, including areas of pile driving and detailed descriptions of the proposed work, will be provided to VDGIF for review and comment. Proposed TOY restrictions will be incorporated in the Virginia DEQ and/or VMRC permit conditions.

Construction activities in Bald Eagle Concentration Areas, shoreline areas that are used by bald eagles during both the summer and winter periods as shown in the updated mapping in Appendix M of this Final EIS, may also negatively affect bald eagles. Bald eagles congregate in these locations for feeding and sheltering (roosting) because of their proximity to food sources. Construction activities may prevent bald eagles from foraging and roosting in these locations, resulting in disturbance that may stress or relocate the species to less optimal habitat. Permanent alterations at these sites can eliminate or reduce essential feeding and sheltering habitat.

According to the USFWS National Bald Eagle Management Guidelines, to minimize disturbance, activities should be conducted outside of the breeding season, if possible, and kept as far away from nests as possible. Loud and disruptive activities should be limited to periods when eagles are not nesting, and activity between the nest and nearest foraging area should be avoided. General guidance for Category A activities, such as constructing roads and other linear facilities, and Category H, such as blasting and other loud, intermittent noises, is outlined in Table 5.10-9. It may be necessary to also obtain a permit issued under the Bald and Golden Eagle Act (16 United States Code [U.S.C.] 668-668c, 54 Stat. 250), as amended, for activities located in Bald Eagle Concentration Areas. The need for this permit will be determined during the final design phase. Specific avoidance, minimization, and mitigation will be developed in coordination with USFWS and VDGIF and may require development of an eagle conservation plan.

Table 5.10-9: Bald Eagle Management Guidelines

Guideline Category		If there is no similar activity within 1 mile of the nest	If there is similar activity closer than 1 mile from the nest
Category A activities, such as constructing roads and other linear facilities	If the activity will be visible from the nest	660 feet. Landscape buffers are recommended.	660 feet, or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
	If the activity will not be visible from the nest	330 feet. Clearing, external construction, and landscaping between 330 and 660 feet should be done outside breeding season.	330 feet, or as close as existing tolerated activity of similar scope. Clearing, external construction, and landscaping within 660 feet should be done outside breeding season.
Category H, such as blasting and other loud, intermittent noises	Avoid blasting and other activities that produce extremely loud noises within 0.5 mile of active nests (or within 1 mile in open areas), unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area.		

Source: USFWS, 2007.

5.11 COMMUNITY RESOURCES[24]

DRPT assessed relocations and associated impacts based on potential right-of-way acquisition or partial acquisition, as summarized in Section 5.11.1. These were evaluated separately for commercial facilities, residential properties, and community facilities, as presented in Sections 5.11.2, 5.11.3, and 5.11.4, respectively, as well as compatibility with land use planning, which is presented in Section 5.11.5.

As previously discussed in the introduction to this chapter, the impacts are assessed based on conceptual engineering (approximately 10 percent level of design) and are subject to future decisions that could further minimize the property impacts presented in this section. As indicated in the sections below, total and partial acquisition of parcels will take place throughout the corridor as a result of the Project. The right-of-way acquisition process, including property owner notification, appraisal, acquisition, and relocation, would be conducted by VDOT in accordance with Federal and state regulations and would occur during future design stages of the Project (see Chapter 7 of this Final EIS for an overview of future steps, including property acquisition).

5.11.1 Right-of-Way and Relocation Policy and Procedures

The acquisition of right-of-way and the relocation of displacees will take place in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601). Potential relocations were determined based on overlaying the LOD of the Preferred Alternative on county/city tax parcel digital data through the use of Geographic Information System (GIS) mapping. The individual parcel data were then compiled, and the area that may be acquired with implementation of the Preferred Alternative was computed.

Potential relocations were identified as commercial (see Section 5.11.2), residential (individuals/families) (see Section 5.11.3), and community facilities (see Section 5.11.4). The relocations can be classified as total acquisitions or partial acquisitions:

- **Total Acquisition.** This occurs when the primary improvement (house, business, nonprofit, or farm) is within the right-of-way or access to the parcel is removed and cannot be restored. The owner is compensated for the fair market value of the entire parcel and provided relocation assistance.
- **Partial Acquisition.** This occurs when a portion of a parcel is acquired, and that portion does not include a primary improvement. The owner is compensated for the fair market value of the portion of their parcel and minor improvements that would be acquired.

Right-of-way impacts of the Preferred Alternative are summarized in Table 5.11-1 and may be further minimized as design progresses in the future. Easements may be used in lieu of acquiring new right-of-way for some properties. Temporary easements may also be needed on adjacent property to gain access to the existing rail line and right-of-way during construction activities and for construction staging. If necessary, these temporary easements could be obtained for a short duration, and the land would be returned to its original condition before easement lease termination. The number of parcels for each Alternative Area in Table 5.11-1 does not equate to the number of relocations; rather, it is the total number of parcels affected.

[24] To improve readability of this section, the order and names of the subsections 5.11.1 through 5.11.4 has been switched slightly since the publication of the Draft EIS; however, no sections have been removed or added.

Table 5.11-1: Right-of-Way Impacts[1] of Preferred Alternative

Alternative Area	Preferred Alternative	Number of Parcels	Total Acreage
Area 1: Arlington	1B	P: 2 T: 5	P: 0.03 T: 0.68
Area 2: Northern Virginia	2A	P: 98 T: 248	P: 53.77 T: 47.50
Area 3: Fredericksburg	3B	P: 38 T: 107	P: 14.02 T: 11.46
Area 4: Central Virginia	4A	P: 31 T: 143	P: 1.27 T: 41.88
Area 5: Ashland	5A	P: 85 T: 145	P: 23.45 T: 14.79
Area 6: Richmond	6F	P: 281 T: 337	P: 56.58 T: 19.87
Total for the Preferred Alternative:		**P: 535 T: 985**	**P: 149.12 T: 136.18**

Note: P=Permanent; T=Temporary. This a new table provided since the Draft EIS, so it does not include any comparison color-coding or rows.

1. Parcel and acreage data developed from GIS data for property boundaries and conceptual designs for improvements. Actual numbers will vary when boundary surveys and detailed engineering are developed in the future. The number of parcels is the total number of parcels affected as either total or partial acquisitions.

DRPT has the ability and, if necessary, is willing to provide housing of last resort, including the purchase of land or dwellings; repair of existing dwellings to meet decent, safe, and sanitary conditions; relocation or remodeling of dwellings purchased by DRPT; or construction of new dwellings. DRPT assures that all displaced families and individuals will be relocated to suitable replacement housing, and that all replacement housing will be fair housing available to all persons without regard to race, color, religion, sex, or national origin and will be within the financial means of the displacees. Each person will be given enough time to negotiate for and obtain possession of replacement housing. No residential occupants will be required to move from property needed for the Preferred Alternative until comparable decent, safe, and sanitary replacement dwellings have been made available to them.

5.11.2 Commercial Relocations

Direct effects of the Preferred Alternative on economic activity through business/commercial relocations are shown in Table 5.11-2, and on the maps in Appendix L of this Final EIS (parcel boundaries are shown; buildings and/or property access shown within the limits of disturbance lines on the maps could indicate a right-of-way impact or relocation).

Some relocations have been eliminated and additional relocations have been identified since the publication of the Draft EIS, as described further below. Otherwise, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to community relocations; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Table 5.11-2: Commercial Relocations for the Preferred Alternative

Alternative Area	Preferred Alternative	City of Fredericksburg	Stafford County		Hanover County	Henrico County		City of Richmond				Total
		S/W	O	GC	GC	GC	M/A	GC	S/W	M/A	O	
Area 3: Fredericksburg	3B	1	0	0	0	0	0	0	0	0	0	1
	Draft EIS Impacts	0	0-1	0-1	0	0	0	0	0	0	0	0-1
Area 5: Ashland	5A	0	0	0	2	0	0	0	0	0	0	2
	Draft EIS Impacts	0	0	0	1	0	0	0	0	0	0	1
Area 6: Richmond	6F	0	0	0	0	5	1	0	2	2	1	11
	Draft EIS Impacts	0	0	0	0	5	0	0-2	0-4	2-7	0-3	10-18
Total for the Preferred Alternative:		**1**	**0**	**0**	**2**	**5**	**1**	**0**	**2**	**2**	**1**	**14**

S/W=Storage/Warehousing; O=Other; GC=General Commercial; M/A=Manufacturing/Auto Repair

The warehousing and storage facilities include food and container storage. The category "Other" includes government property within the City of Richmond, that is a City of Richmond Department of Public Works property. The manufacturing facilities include auto service/repair and electrical manufacturing/repair.

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives. There are no commercial relocations in Areas 1, 2, or 4.

In **Area 1 (Arlington)**, **Area 2 (Northern Virginia)**, and **Area 4 (Central Virginia)**, there are no commercial relocations associated with the Preferred Alternative.

In **Area 3 (Fredericksburg)**, a Stafford County pumping station will no longer be affected by the Preferred Alternative; however, a storage facility in the City of Fredericksburg will be relocated by the Preferred Alternative improvements.

In **Area 5 (Ashland)**, an entertainment company and a hotel north of Ashland (which is a new impact since the Draft EIS) will be relocated by the Preferred Alternative improvements.

In **Area 6 (Richmond)**, among the 11 relocations required by the Preferred Alternative improvements are the Transflo facility and CSXT yard offices in the Acca Yard that will be relocated as a result of the construction of a two-track passenger bypass on the east side of Acca Yard from milepost CFP 1.7 to 3.4. The yard is located on the border of Henrico County and the City of Richmond. Most of the facility is in Henrico County. The impact to the Transflo facility is new information since the publication of the Draft EIS, and will require either acquisition of right-of-way or an easement on CSXT-owned property for the construction of the bypass. FRA considers the impact to the Transflo facility as a right-of-way action under this Final EIS; however, if any potential environmental review associated with the relocation or construction of a replacement Transflo facility is required, it will be the responsibility of CSXT as the facility owner.

Based on the number and type of commercial relocations, adequate replacement properties will be available for relocation purposes. The acquisition of right-of-way and the relocation of displaced persons and businesses will be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601), and

24 Virginia Administrative Code (VAC) 30– 41. DRPT assures that relocation resources will be available to all displaced businesses and nonprofit entities without discrimination. Relocation costs and property acquisition costs are included in the revised capital cost estimates for the Preferred Alternative (presented in Section 4.5 of this Final EIS).

5.11.3 Neighborhood and Community Effects

5.11.3.1 Residential Relocations and Associated Effects

The potential relocations are summarized in Table 5.11-3 and are shown on the maps in Appendix L of this Final EIS (parcel boundaries are shown; buildings and/or property access shown within the limits of disturbance lines on the maps could indicate a right-of-way impact or relocation). Total right-of-way impacts were previously quantified in Section 5.11.1. The number of residential relocations for the Preferred Alternative have decreased since the Draft EIS and are limited to Alternative 2A (Northern Virginia) and Alternative 6F (Richmond). However, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the impacts to residential relocations; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

Table 5.11-3: Residential Relocations by the Preferred Alternative

Alternative Area	Preferred Alternative	City/County												
		Arlington County	City of Alexandria	Fairfax County	Prince William County	Stafford County	City of Fredericksburg	Spotsylvania County	Caroline County	Hanover County	Henrico County	City of Richmond	Chesterfield County	Total
Area 1: Arlington	1B	0	0	0	0	0	0	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0	0	0	0	0	0	0	0	0
Area 2: Northern	2A	0	0	0	2	0	0	0	0	0	0	0	0	2
Draft EIS Impacts		0	0	0	2	0	0	0	0	0	0	0	0	2
Area 3: Fredericksburg	3B	0	0	0	0	0	0	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0-1	0	0-18	0	0	0	0	0	0-19
Area 4: Central Virginia	4A	0	0	0	0	0	0	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0	0	0	0	0	0	0	0	0
Area 5: Ashland	5A	0	0	0	0	0	0	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0	0	0	0	0-21	0	0	0	0-21
Area 6: Richmond	6F	0	0	0	0	0	0	0	0	0	3	0	0	3
Draft EIS Impacts		0	0	0	0	0	0	0	0	0	7	0-105	0	7-112
Total for the Preferred Alternative:		**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**5**

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

The direct effects as a result of the residential relocations for each area are detailed below; discussions include impacts to communities based on potential right-of-way acquisition of residences and community facilities, partial acquisitions of parcels, potential changes in community cohesion, changes in access to community facilities, and changes in access for emergency services

In **Area 1 (Arlington)**, DRPT does not expect direct effects to communities from relocations and right-of-way acquisition. There are no residential relocations, and none of the partial acquisition of individual parcels that are required for the Preferred Alternative in Alternative Area 1 (as shown in Table 5.11-1) are residential properties. There are no adverse effects to community facilities, access to these facilities, or access for emergency services.

In **Area 2 (Northern Virginia)**, the Preferred Alternative will require two residential relocations in part of the Belmont Bay community along Railroad Avenue (Prince William County), which will be relocated with no adverse effects to the remaining residences. Access to this community is currently through the condominiums at Belmont Bay and will not change under the Preferred Alternative. DRPT has determined that there will be no adverse effects to community facilities, access to these facilities, or access for emergency services.

The community of Brooke (Stafford County) will be affected by the Preferred Alternative. Partial acquisition of residential property will occur due to an additional roadway connection north of and parallel to the CSXT line to continue to provide access to the street network for residents via Brooke Road and Andrew Chapel Road. DRPT has determined that access to and from the area for emergency services, school transportation, and religious facilities on Andrew Chapel Road will not be adversely affected by the Preferred Alternative. Additional effects to this community include partial acquisition of residential property around the Eskimo Hill Road crossing of the CSXT line.

In **Area 3 (Fredericksburg)**, the Preferred Alternative will not require any residential relocations; only partial acquisition of primarily residential parcels, which will not impact the function of the remaining property, will be required in communities in this area.

In **Area 4 (Central Virginia)**, to the east and south of Carmel Church and Patersons Corner, access to the residential development along Railroad Lane (Caroline County) will not be affected by the Preferred Alternative. DRPT has determined that there will be no adverse effects to community facilities, access to these facilities, or access for emergency services. There are adequate alternate routes that will provide access.

In **Area 5 (Ashland)**, within the Town of Ashland, the proximity of the community to the existing CSXT rail line makes adverse effects to the community difficult to avoid. However, there will be no residential relocations in Area 5 required as part of the Preferred Alternative (refer to Section 5.11.1.2 for commercial relocations, which include an entertainment company and a motel).

Within **Area 6 (Richmond)**, direct effects to communities from three residential relocations (reduced from seven in the Draft EIS) will occur in Laurel Park in Henrico County. No other adverse effects to community facilities, access to these facilities, or access for emergency services are expected.

More detailed information on community effects can be found in the Community Impact Assessment Technical Report (Appendix Q of the Draft EIS).

5.11.3.2 Community Effects from Changes to the Transportation Network

The effects of the Preferred Alternative on communities from changes to the transportation network have been assessed based on physical changes to the roadway network and increased intercity passenger rail service in the DC2RVA corridor. Section 5.15.2 of this Final EIS presents the crossing improvements that are proposed at each at-grade highway-rail crossing in the corridor to improve safety and road and rail traffic flow for the Preferred Alternative, which includes seven grade separations and seven at-grade crossing closures, as well as details on all traffic-related impacts of the Preferred Alternative. DRPT proposes to maintain most existing public at-grade crossings with the addition of four-quadrant gates or gates with center median treatment.

This purpose of this section on community effects is to analyze the potential effects of proposed changes on the community, including community cohesion, emergency services access, and community facility access. DRPT and VDOT are committed to coordinating with emergency service providers, schools, and other local entities, as appropriate, to ensure that no service interruptions will occur under the Preferred Alternative. During construction, there is the potential for temporary impacts to the operation of local roads and streets crossed by the rail line. DRPT and VDOT will work with the localities and communities to minimize these temporary impacts.

In **Area 1 (Arlington)**, DRPT does not expect direct effects to the community as a result of construction of the Preferred Alternative because there are no at-grade crossings.

In **Area 2 (Northern Virginia)**, the Preferred Alternative will not change access to the communities of Harbor View and Colchester (Fairfax County) via Furnace Road and will therefore not adversely affect these communities. The community of Brooke (Stafford County) will be affected by the Preferred Alternative. Mount Hope Church Road will be closed at the CSXT rail line, and an additional roadway connection will be added north of and parallel to the CSXT line to provide access to the street network for residents via Brooke Road and Andrew Chapel Road. More detail appears in the Transportation Technical Report (Appendix S of the Draft EIS). DRPT has determined that access to and from the area for emergency services, school transportation, and the religious facilities in Brooke will not be adversely affected by the Preferred Alternative in Area 2.

In **Area 3 (Fredericksburg)**, DRPT expects that the Preferred Alternative will result in some direct effects to the community in Area 3 as a result of proposed changes to the transportation network. The improved station at Fredericksburg will provide better access to the transportation network with a larger station building, additional parking, and improved handicapped parking, which are all positive effects. An additional positive effect for the community is the change of the existing at-grade intersection at Lansdowne Road to a grade-separated crossing under the Preferred Alternative.

In **Area 4 (Central Virginia)**, the Colemans Mill Road (Caroline County) crossing of the CSXT rail line will be closed under the Preferred Alternative. DRPT does not expect adverse effects to access for emergency response, school transportation, or the roadway network as a result of this road closure. The north side of Colemans Mill Road will continue to be accessed by Rogers Clark Boulevard. The south side will maintain access through Dry Bridge Road to Colemans Mill Road. Access to the eastern section of Railroad Lane (Caroline County) will remain in place under the Preferred Alternative in Area 4.

In **Area 5 (Ashland)**, no changes are proposed to the existing at-grade crossings in the Town of Ashland between Vaughan Road (Archie Cannon Drive) and Ashcake Road, both of which are proposed to be grade separated as part of the Preferred Alternative. Grade-separating these two locations will improve access across town for police and emergency medical service vehicles.

In **Area 6 (Richmond)**, DRPT expects that the Preferred Alternative will result in direct effects to the community as a result of proposed changes to the transportation network. The station improvements at Staples Mill Road and Main Street Stations will increase mobility and provide better access to the transportation network with an expanded building, additional parking, and a designated pick-up and drop-off area, which will all be positive effects of the Project. In Area 6, under the Preferred Alternative, four public at-grade crossings will be grade-separated: Hungary Road, Hermitage Road (RF&P, Henrico County), Hospital Street/North Seventh Street, and East Commerce Road (see Section 5.15 for details). In general, these grade separations will have a positive effect on safety within the individual communities. Five public at-grade roadway crossings will also be closed under the Preferred Alternative in the Richmond area: St. James Street; North Second Street/Valley Road; Dale Avenue/Trenton Avenue; Brinkley Road; and Old Lane. More specific community effects of these closings are summarized in the following paragraphs.

Between Main Street Station and Centralia, the Preferred Alternative will close the St. James Street and North Second Street/Valley Road at-grade crossings between the communities of Gilpin and Southern Barton Heights. Based on the proximity and connections to the existing roadway network via North First Street and North Fifth Street, access to and from the communities for emergency services and school transportation will not be adversely affected by the Preferred Alternative. The Preferred Alternative also includes the closure of the at-grade crossing at Dale Avenue/Trenton Avenue in the community of Ampthill Heights; however, this crossing primarily provides back-gate access to the DuPont plant and alternate access is available. Brinkley Road in Chimney Corner will be closed as part of the Preferred Alternative; however, access will still be available via Dorsey Road and Thurston Road via Hopkins Road.

Old Lane in the community of Centralia will be closed under the Preferred Alternative in this area. Access to and from the community for school transportation will not be adversely affected by the closure. An increase in response time for emergency services could occur if the response were from Fire Station 17 in Centralia, but it will be less than a five-minute increase. If the response were from Fire Station 1, there will be no difference in response time.

5.11.4 Community Facilities and Services

Community facilities were shown in Figure 3-1 of Appendix Q of the Draft EIS. The Preferred Alternative will have no direct effects on community facilities in Areas 1, 2, 3, 4, and 6, and will directly impact one community facility in Area 5:

- The Preferred Alternative in **Area 5 (Ashland)** will require a minor temporary easement of two parcels from the Gwathmey Baptist Church. The temporary easement will not affect activities at the church, and DRPT does not expect the temporary easement to have adverse effects to the church. The Preferred Alternative in Area 5 will also require a temporary easement from the Patrick Henry Branch of the YMCA in Ashland due to alignment changes along Ashcake Road. DRPT does not expect that the temporary easement will adversely affect access to the facility or the facility itself.

While the Preferred Alternative in Area 2 (Northern Virginia) will require the removal of a marina dock on Neabsco Creek, the dock is not a public community facility and currently encroaches into CSXT right-of-way (based on GIS property data). The dock is located on the west side of the bridge and will be removed to construct the new bridge as part of the Project. The remainder of the docks at the marina will be undisturbed, and navigation through the bridge to the Potomac River will also be maintained during construction.

5.11.5 Land Use Planning

5.11.5.1 Changes in Land Use

The Preferred Alternative requires right-of-way acquisition, and the associated land use transitions are summarized in Table 5.11-4.

Table 5.11-4: Land Use Transition for the Preferred Alternative (acres)

Alternative Area	Preferred Alternative	Agricultural	Commercial/Office	Industrial	Institutional	Transportation	Preserved Open Space	Residential	Vacant
Area 1: Arlington	1B	0	0	0	0	0	0	0	0
Draft EIS Impacts		0	0	0	0	0	0	0	0-1.5
Area 2: Northern Virginia	2A	5.0	5.0	16.2	2.0	0.6	10.9	14.8	6.9
Draft EIS Impacts		4.3	1.9	0.63	1.96	0	10.2	12.1	0.1
Area 3: Fredericksburg	3B	0.1	6.8	0	1.3	2.1	1.7	2.9	0
Draft EIS Impacts		0.2-66.4	0.3-22.0	0	1.9-2.0	0	0.05-5.6	0.4-75.2	0
Area 4: Central Virginia	4A	1.0	0	0	0	0.2	0	0.1	0
Draft EIS Impacts		0.9	0.1	0	0.1	0.3	0	0.1	0
Area 5: Ashland	5A	9.0	0	6.2	0	17.7	0	4.6	0
Draft EIS Impacts		4.2-150.8	0.1-0.5	2.7-7.6	0.5-2.2	9.7-37.3	0	0.5-6.3	0
Area 6: Richmond	6F	0	10.4	23.0	0.2	0	0	5.8	14.9
Draft EIS Impacts		0	8.5-38.6	17.1-25.7	0.2-7.1	0	0.01-0.4	4.6-21.3	6.8-14.1
Total for the Preferred Alternative:		**15.1**	**22.2**	**45.4**	**3.5**	**20.6**	**12.6**	**28.2**	**21.8**

Source: City and County Land Use GIS databases.
Notes: Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

The transition of these land uses to transportation use is a direct effect, but it is an extension of the existing adjacent transportation land use and generally is not out of character with the area. Major changes in land use reported in the Draft EIS were primarily associated with the bypass alignments in Alternative Area 3 (Fredericksburg) and Area 5 (Ashland). The Preferred Alternative does not include the bypass alignments and the land use changes are generally

consistent with the values reported in the Draft EIS, with the exception of Alternative Area 2. In this area, land that was originally identified as CSXT right-of-way and excluded from the calculations has since been determined to be property not owned by CSXT, but rather by the Potomac Yards development. It is therefore now identified as a change in land use, thereby resulting in larger increases in the industrial and vacant categories. Otherwise, there are no noteworthy changes to the conceptual engineering made in response to public and agency comments since the Draft EIS that modified the remaining impacts to land use transitions; rather, narrow linear refinements with increases and decreases in the permanent and temporary LOD resulted in incremental changes in impacts over the length of the 123-mile corridor compared to those reported in the Draft EIS.

In **Area 1 (Arlington)**, the only land use in transition to a transportation use as part of the Preferred Alternative is currently designated as vacant land use. The transition of this vacant land use to a transportation use will be compatible with the current use.

In **Area 2 (Northern Virginia)**, in addition to the change from the Draft EIS identified above, the greatest amount of land use transitioning to a transportation use as part of the Preferred Alternative is from industrial and residential uses. The transition of industrial use to a transportation use is compatible with regional and local comprehensive plans and land use planning. The transition of residential use to a transportation use is not compatible; however, it is an extension of the existing adjacent transportation land use and is not out of character with the area.

In **Area 3 (Fredericksburg)**, the Preferred Alternative passes through downtown and involves transition from commercial/office and residential uses to a transportation land use. This conversion is compatible with the current land use because it is an extension of the existing adjacent transportation land use.

In **Area 4 (Central Virginia)**, the greatest amount of land use transitioning to transportation use as part of the Preferred Alternative is currently in agricultural use. The transition of this land to a transportation use will be incompatible with regional and local comprehensive plans and land use planning; however, it is an extension of the existing adjacent transportation land use and is not out of character with the area.

In **Area 5 (Ashland)**, land required for the Preferred Alternative is already in transportation use, which mainly occurs at the proposed grade separations of Vaughan Road (Archie Cannon Drive) and Ashcake Road. The transition of this land to a transportation use will be compatible with the current use.

In **Area 6 (Richmond)**, the greatest amount of land use transitioning to transportation use for most of the Preferred Alternative is currently in commercial and industrial use. The transition of this land to a transportation use will be compatible with the current use.

5.11.5.2 Compatibility with Future Land Use

Many of the local jurisdictions within the Project corridor have directly addressed the importance of rail service, and in some cases this particular Project, to local and regional mobility in their respective comprehensive planning processes.

In **Area 1 (Arlington)**, future land use adjacent to the Preferred Alternative is expected to remain in a similar use to current uses.

In **Area 2 (Northern Virginia)**, in Prince William County, future land use is projected to intensify within the Development Area (where development has already occurred) and remain similar to existing land uses within the Rural Area. The Preferred Alternative lies within the Development Area, where development will intensify, and will therefore be compatible with these future land uses. Within Stafford County, future land use is expected to stay similar to existing land use, with development intensifying in the Urban Service Areas.

In **Area 3 (Fredericksburg)**, the Preferred Alternative, which passes through Fredericksburg, is compatible with future land uses. In the City of Fredericksburg, future land use is expected to remain similar to existing land use due to the city's developed nature. The Preferred Alternative is compatible with these land uses. In Spotsylvania and Caroline Counties, future land use within the Preferred Alternative is expected to remain similar to the existing rural residential and agricultural/forested uses. In both counties, I-95 and the CSXT rail line are acknowledged as important transportation corridors.

In **Area 4 (Central Virginia)**, future land use in Caroline County is discussed in Alternative Area 3 above. In Hanover County, future land use as part of the Preferred Alternative is projected to remain similar to existing land uses, while providing "orderly growth" prescribed in the Hanover County Comprehensive Plan.

In **Area 5 (Ashland)**, the Preferred Alternative is compatible with future land uses.

In **Area 6 (Richmond)**, existing land uses surrounding the Preferred Alternative are expected to remain similar; thus, the Preferred Alternative is compatible with these uses.

5.11.5.3 Compatibility with Multimodal Transportation Planning

Many of the intercity passenger stations along the DC2RVA corridor have direct connections to local and regional transit, and all intercity passenger rail stations in Northern Virginia share service with VRE. Other stations in Northern Virginia have convenient or direct connection to WMATA Metrorail stations, including Franconia-Springfield, Alexandria, Crystal City, L'Enfant Plaza, and Washington Union Station. In Richmond, Main Street Station serves multiple local and regional bus services and the recently constructed GRTC Pulse BRT system. These multimodal connections can help offset vehicular traffic at these stations.

Many of the local jurisdictions within the Project corridor have recognized the importance of rail and multimodal transportation options within their transportation networks to residents, local businesses, regional connections, and economic vitality. In several of the jurisdictions, improved passenger rail is specifically mentioned in planning documents (Fairfax County, Prince William County, Stafford County, the City of Fredericksburg, Spotsylvania County, Caroline County, the Town of Ashland, the City of Richmond, and Chesterfield County). Localities that have existing rail stations are prioritizing new development in these areas, with a focus on transit-oriented development.

5.12 TITLE VI AND ENVIRONMENTAL JUSTICE

The environmental justice analysis performed for this Final EIS is based on whether the percentage of minority or low-income populations within a census tract impacted by the Preferred Alternative is greater than the percentage of minority or low-income populations within that census tract's county. Details of the EPA-approved methodologies were presented in Section 4.12 of the Draft EIS.

5.12.1 Corridor-Wide Impacts

Under the Preferred Alternative, more frequent and reliable intercity passenger rail service in the DC2RVA corridor will provide better access and mobility to all communities and populations, including environmental justice populations. Access to a wider geographic area for educational, medical, and employment opportunities will be improved as well.

5.12.2 Community-Level Impacts

U.S. Census information and preliminary relocation data was supplemented with information from public involvement activities for this Project, from federal education statistical information, and from regional and local agency planning information to assess impacts on communities for environmental justice effects.

5.12.2.1 Relocations and Displacements

Implementation of the Preferred Alternative will not result in acquisition or displacement impacts to communities with environmental justice populations. The acquisition of right-of-way and the displacement of residences is shown in Table 5.12-1. In Area 6, the number of relocations has decreased since the Draft EIS due to design refinements of the LOD for the Preferred Alternative; an updated mapbook showing environmental justice census tracts in relation to the Preferred Alternative LOD are provided in Appendix M of this Final EIS.

Table 5.12-1: Residential Relocations within Environmental Justice Census Tracts

Alternative Area	Preferred Alternative	City/County										
		Prince William County	Stafford County	Spotsylvania County	Hanover County		Henrico County		City of Richmond			Total
		Tract 9001	Tract 105.04	Tract 202.05	Tract 3205	Tract 3204	Tract 2005.03	Tract 2009.06	Tract 402	Tract 706.02	Tract 710.02	
Area 2: Northern Virginia	2A	2	–	–	–	–	–	–	–	–	–	2
Draft EIS Impacts		2	–	–	–	–	–	–	–	–	–	2
Area 6: Richmond	6F	–	–	–	–	–	3	0	0	0	0	3
Draft EIS Impacts		–	–	–	–	–	3	4	0-100[1]	0-4	0-1	7-112
% Minorities in City/County		52	33	28	15		44		61			–
% Minorities in Census Tract		42	9	36	7	17	20	25	50	84	83	–
% Low-Income in City/County		6	5	8	5		11		26			–
% Low-Income in Census Tract		5	10	9	2	10	10	6	46	14	21	–

Notes: Above 50%; Greater than respective jurisdiction.

1. This is an apartment building with 100 units.

Reductions in impacts since the Draft EIS are indicated by green font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives. Alternative Areas 1, 3, 4, and 5 have no residential relocations; therefore, they do not appear in this table.

5.12.2.2 Noise and Vibration

DRPT analyzed the Preferred Alternative to determine whether the Project will result in any disproportionate and adverse noise and vibration effects to environmental justice populations. The noise receptors that were assessed for this analysis were residential receptors and other places for sleeping (Category 2) that could experience moderate or severe impacts due to the Preferred Alternative. A full discussion of noise impacts appears in Section 5.7, Noise and Vibration.

Additional information on the environmental justice analysis can be found in the Community Impact Assessment Technical Report (Appendix Q of the Draft EIS). The suitability of the methodology and analysis of environmental justice was reviewed and discussed with EPA during both the Draft EIS review process and prior to publication of this Final EIS. EPA agreed that the methodology and analysis were appropriate for the DC2RVA Project as presented.

Area 1 (Arlington). There are no affected noise receptors, environmental justice or otherwise, associated with the Preferred Alternative in Area 1.

Area 2 (Northern Virginia). There are approximately 650 affected noise receptors in Area 2. Many of these noise receptors occur in census tracts with a high proportion of minority and low-income populations in the communities of Springfield Forest, Lorton, Colchester, Marumsco Acres, Marumsco Woods, and Leeland. As evaluated in the Draft EIS, Build Alternative 2A will not have a disproportionately high and adverse effect on potential environmental justice populations in these communities as compared to the noise receptors affected in census tracts with a low proportion of minority and low-income populations. These effects are not predominately borne by a minority population and/or a low-income population and are not appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population or non-low-income population. The Preferred Alternative has further reduced impacts in Area 2 in comparison to those reported in the Draft EIS, which did not account for the horn restrictions through Crystal City that reduced the number of locations where the sounding of locomotive horns is required (see Section 5.7.1.2 for details).

Alexandria Station (Area 2, Northern Virginia)

Area 3 (Fredericksburg). There are less than 100 affected noise receptors by the Preferred Alternative in Area 3; however, 88 percent of these occur in census tracts with a high proportion of minority and low-income populations. These occur in the communities of Mayfield, Hazel Hill, Patriot Lane, Summit, and Claiborne Crossing, and result in a disproportionately high and adverse effect on potential environmental justice populations in these communities. However, these cannot be avoided as the other Build Alternatives as evaluated in the Draft EIS would have equivalent or worse effects:

- Build Alternative 3A as evaluated in the Draft EIS, which had the same amount of noise impacts as the Preferred Alternative, retained the existing two-track railroad alignment through Fredericksburg and would not provide sufficient operating capacity to meet the Purpose and Need of the Project; and
- Build Alternative 3C as evaluated in the Draft EIS would avoid these 100 noise impacts but would cause almost 4,000 noise impacts in total.

Mitigation for the above effects of the Preferred Alternative in Area 3 could include noise barriers for affected receptors. Additional information regarding noise mitigation is provided in Section 5.7.1.3, Noise Mitigation Measures. Detailed recommendations for noise mitigation will be developed during final design.

Area 4 (Central Virginia). There are less than 100 affected noise receptors in Area 4. Seventy-nine percent of these occur in census tracts with a high proportion of minority and low-income populations in the communities of Claiborne, Woodford, Milford, Penola, and Doswell. This represents a disproportionately high and adverse effect on potential environmental justice populations in these communities. All of the Build Alternatives considered in Area 4 in the Draft EIS included equivalent noise impacts, which could not be avoided.

Area 5 (Ashland). There are almost 160 affected noise receptors in Area 5; however, 80 percent of these occur in census tracts with a high proportion of minority and low-income populations. These occur in the communities of downtown Ashland, Gwathmey, and Elmont. Build Alternative 5A as evaluated in the Draft EIS will have a disproportionately high and adverse effect on potential environmental justice populations in these communities. Build Alternatives 5B, 5B–Ashcake, and 5D–Ashcake in the Draft EIS had similar noise impacts as the Preferred Alternative. Build Alternatives 5C and 5C–Ashcake would avoid these 160 noise impacts, but would cause more than 300 noise impacts along the proposed bypass alignment.

Based on the information and analyses of the seven Build Alternatives presented for Area 5 in the Draft EIS, public comments on the Draft EIS, information and comments developed through the Ashland/Hanover Area Community Advisory Committee (CAC) process, and subsequent refined rail operations analyses, Build Alternative 5A was selected by FRA and DRPT as the Preferred Alternative for Area 5.

Area 6 (Richmond). There are approximately 440 affected noise receptors on the S-line in Area 6; 54 percent of these occur in census tracts with a high proportion of minority and low-income populations in the communities of Newtowne West, Chamberlayne, Gilpin, Davee Gardens, and Bellwood. The Preferred Alternative will not have a disproportionately high and adverse effect on potential environmental justice populations in these communities.

5.13 ARCHAEOLOGICAL AND ABOVE GROUND CULTURAL AND HISTORIC RESOURCES[25]

5.13.1 Summary of the Section 106 Process and Determinations of Effect

Background. Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (54 U.S.C. 306108), and implementing regulations (36 CFR Part 800), require federal agencies to consider the effects of their actions on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment if the action would result in an adverse effect on any property listed in or eligible for the NRHP. Effects are defined as:

- **Adverse Effect**. The Project would diminish the characteristics that render a property eligible for the NRHP. This could be a direct impact, such as physically disturbing an archaeological site or physically modifying a historic building, structure, or district; or an indirect impact, where the modifications would not physically touch a resource, but the Project would result in a negative impact to a resource's integrity (defined as its location, design, setting, materials, workmanship, feeling or association).
- **No Adverse Effect**. The Project may alter an aspect of the resource's integrity but the character-defining features that rendered it eligible for the NRHP would remain intact, such as the limits of disturbance being within the general viewshed of a historic property but the primary view would not be negatively altered and result in diminished NRHP eligibility; or the APE including the boundaries of a resource but the historic property is eligible for the NRHP under a criterion other than C (architectural merit), such as a railroad or battlefield.
- **No Effect**. The Project does not have the potential to alter or diminish aspects of the historic property that render it eligible for the NRHP, such as a building being located within the APE, but the Project area is not visible from the resource.

The Section 106 process informs the separate Final Section 4(f) Evaluation, which is Chapter 6 of this Final EIS.

Summary of Section 106 Process for the Project. FRA and DRPT initiated the Section 106 process in the Fall of 2014 and invited consulting parties, such as the ACHP, National Park Service (NPS), local historical societies, and localities, to participate. All federally recognized tribes in Virginia and tribes outside of Virginia but who have a stated vested interest in cultural properties in the state were also invited. Appendix E of this Final EIS contains additional data on invited consulting parties and communication that has occurred since the publication of the Draft EIS.

FRA defined an Area of Potential Effects (APE)[26] after the Section 106 process was initiated. The Virginia Department of Historic Resources—i.e., the State Historic Preservation Office (SHPO) for the Commonwealth of Virginia—concurred on the APE in an email dated February 2, 2015. Cultural resource studies to identify and evaluate all buildings, structures, objects, districts, and

[25] Since the Draft EIS, a new summary subsection was added to the beginning of Section 5.13 for readability, requiring the renumbering of the subsequent subsections.

[26] The APE is defined before the identification of historic properties for areas where the Project could impact character-defining features, directly or indirectly. While the Project Limits of Disturbance are the physical boundary of Project-related construction and construction-related activities, the APE considers all locations where a project may result in ground disturbances, visible or audible disturbances, or changes in public access, traffic patterns, or land use.

sites in the APE that are 48 years in age or greater have been ongoing since that time (48 years was selected to allow two years for the environmental process to reach the 50-year NRHP threshold). Appendix R of the Draft EIS and Appendix D of this Final EIS consist of the Cultural Resources Reports, which includes additional details on the cultural resource studies and mapping of the historic properties.

Within the APE for the Preferred Alternative, DRPT identified 120 historic properties,[27] defined as any resource that is eligible for, assumed eligible for, or listed on the NRHP:

- 13 archaeological sites
- 96 above ground resources
- 1 resource with an above ground and below ground component
- 10 battlefields

A detailed summary of the 120 historic properties is presented in Appendix D1 of this Final EIS.

DHR has reviewed and commented on the technical reports, and they have concurred with resource eligibility determinations. DHR letters corresponding to the 23 technical reports can be found in Appendix U of the Draft EIS and Appendix E of this Final EIS. Following their concurrence of resource eligibility, the DHR reviewed and commented on Project effect.

FRA made determinations of effect for each of the 120 historic properties, as summarized in each of the sections within this chapter. In letters dated June 28, 2018, July 18, 2018, and January 4, 2019, the DHR concurred with FRA's determinations of effect. Copies of these letters are provided in Appendix E of this Final EIS.

The Section 106 Draft Memorandum of Agreement (MOA), which is Appendix K of the Final EIS, has been developed based on feedback from consulting parties, property owners, and involved agencies and includes a roster of tasks to be completed on all adversely affected resources, such as public interpretation, additional research, National Register documentation, archaeological data recovery, and more, to mitigate any adverse effects caused by the undertaking. Acquiring a signed Section 106 MOA is the final step in the Section 106 process; a final, signed Section 106 MOA will be part of the Project ROD.

Historic Battlefield: Pierson/Slaughter Pen Farm (Area 3, Fredericksburg)

[27] The Draft EIS reported 158 historic properties within the APE. Since the publication of the Draft EIS, cultural resource studies and engineering refinements to minimize impacts have resulted in the removal of 53 properties and the addition of 15, resulting in the new total of 120. In this Final EIS: Appendix D1 provides details of the resources that were removed and/or added since the publication of the Draft EIS; and Appendix D2 through D7 provide the updated cultural resource reports that include locations of the 120 properties in the APE of the Preferred Alternative.

Summary of Determinations of Effect. In sum and as shown in Table 5.13-1, FRA determined that the Preferred Alternative for the DC2RVA Project will have:

- No adverse effect on 69 historic properties
- No effect on 30 properties
- An adverse effect on 21 historic properties (maps showing the 13 non-archaeological[28] historic properties in relation to the Project are provided in Chapter 6)

Refer to Appendix D1 of this Final EIS for the details of the effect determinations on each individual resource, including the NRHP eligibility criterion.

Table 5.13-1: Summary[1] of Section 106 Project Effect Determinations

Historic Property	Effect Determination (Number of Resources)		
	Adverse	No Adverse	No Effect
Archaeological Resources	8	6	0
Architectural Resources	13	54	30
Battlefields	0	10	0
Total for the Preferred Alternative:	**21**	**69[2]**	**30**

Notes: 1. Comparison to Draft EIS findings are provided in the individual tables in this section for each of the three historic property types.

2. Fredericksburg & Spotsylvania Co. Battlefields National Military Park & Cemetery, Lee Drive (111-0147) is both an above and below ground resource, and it is counted in the table twice in the "No Adverse Effect" column, as both an Archaeological Resource and a Historic Resource. Therefore, while the numbers in the three historic property categories under "No Adverse Effect" add to 70, the total for the Preferred Alternative is 69 individual resources.

The adverse effects were further categorized as direct impacts or indirect/cumulative impacts. A direct impact is a modification to the physical fabric of a resource. An indirect or cumulative impact is when a resource will not be physically modified but the viewshed or other character-defining feature is notably diminished in integrity.

For the 21 historic properties that will be adversely affected, the Project will have:

- A direct impact on 8 resources (all archaeological resources);
- Both a direct and indirect impact on 12 historic properties (all architectural resources); and
- An indirect/cumulative impact on 1 resource (an architectural resource).

The following sections summarize the determinations of effect for archaeological, architectural, and battlefields separately. The 20 properties that will experience direct impacts are described further in this section, and the 1 that will experience only an indirect or cumulative impact is described in Section 5.20.1.3.

[28] Locations for archaeological resources are not provided in public documents per guidelines set forth in the Archeological Resources Protection Act of 1979 and other applicable legislation; contact DRPT for details.

5.13.2 Archaeological Resources

In accordance with 36 CFR 800.4(b)(2), DRPT implemented a phased approach for archaeological studies. A Phase IA archaeological reconnaissance and predictive model was first done of the corridor and all alternatives. A Phase IB survey was then completed on the primary alignments and ensuing Preferred Alternative. All sites that were determined to be potentially eligible for the NRHP assumed to be eligible for the purposes of the DC2RVA Project; no Phase II eligibility testing has been conducted. DHR agreed with this approach for this Project in a meeting on August 10, 2016.

Within the APE, there are 3 NRHP-listed and 11 NRHP-eligible or potentially eligible archaeological sites, including 13 archaeological sites and 1 resource that has both an archaeological and an architectural component. FRA's determinations of effect for archaeological resources in Virginia are summarized in Table 5.13-2. None are National Historic Landmarks (NHL).

Table 5.13-2: Summary of Project Effect Determinations on Archaeological Sites

Alternative Area	Preferred Alternative	Effect Determination (Number of Resources)		
		Adverse	No Adverse	No Effect
Area 2: Northern Virginia	2A	1	0	0
	Draft EIS Impacts	0	0	0
Area 3: Fredericksburg	3B	4	2	0
	Draft EIS Impacts	0-1	0-1	0-3
Area 6: Richmond	6F	3	3	0
	Draft EIS Impacts	0-3	4-7	2-4
Total[1] for the Preferred Alternative:		**8**	**5**	**0**

Notes: 1. Fredericksburg & Spotsylvania Co. Battlefields National Military Park & Cemetery, Lee Drive (111-0147) is both an above and below ground resource and is included in the above totals as "No Adverse Effect."

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives. There are no archaeological sites within the APE in Alternative Areas 1, 4, and 5; therefore, they do not appear in this table.

Details on each individual property can be found in Appendix D of this Final EIS and the eight sites with a determination of adverse effect that will experience a direct impact are described below (from north to south).

The DHR has concurred on these recommendations in letters dated June 28, 2018, July 18, 2018, and January 4, 2019. Data recovery excavations will be completed on any segment of these sites that will be impacted by the Project. Details on the data recovery are included as stipulations in the Section 106 Memorandum of Agreement, which is produced as part of the Section 106 process and a draft of which is Appendix K of this Final EIS.

Civil War Campsite (44ST1223). This resource was recorded in the Spring of 2018 based on revised Project plans after the publication of the Draft EIS. The rail corridor was an extremely important component of transportation logistics associated with the Civil War, and war-related resources were often located near the tracks. This site represents one of many Union army winter encampments in the area, occupied during the winter of 1862–1863. The addition of new track as part of the Preferred Alternative will require disturbances to the subsurface matrix within the site, thus potentially destroying data-bearing strata that contribute to the site's eligibility.

Marye's Mill Site (44SP1087). The site represents the remains of a large mill, located on the banks of the Rappahannock River, which was in operation during the second half of the nineteenth and first decades of the twentieth centuries. It is a prominent visual element in many Civil War-era representations of Fredericksburg. Construction of the Preferred Alternative, including rail modifications and a new bridge spanning the river, will result in subsurface disturbances throughout the majority of the site, thus adversely affecting the data potential of this resource.

Block 49/Train Station (44SP0688) and Block 48/Train Station (44SP0687). These resources were recorded in the Spring of 2018 based on revised Project plans after the publication of the Draft EIS. These two archaeological sites comprise two city blocks in Fredericksburg, stretching from Sophia Street on the east to Princess Anne Street on the west and bounded by Lafayette Street on the north and Frederick Street on the south. Archaeological work has uncovered numerous foundations and other extant features below the ground surface. Construction of the new parking deck and new station, platform modifications, and other structural changes as proposed as part of the Preferred Alternative will result in subsurface disturbances throughout both blocks, which have the potential to damage intact archaeological remains.

Earthwork/Jackson's Earthwork (44SP0468). This archaeological site includes the remains of a large series of earthworks constructed during the First Battle of Fredericksburg (1862) and reused during other periods of the Civil War. They are located predominantly west of the rail tracks and have a notable connection to military actions during the war. The addition of a third rail as part of the Preferred Alternative may result in the destruction of small segments of these earthworks.

Sites 44HE1098, 44HE1097, and 44HE1094. All three of these archaeological sites are located in downtown Richmond. They were recorded based on map projections showing the locations of post-Civil War warehouses and other rail-related buildings that have been demolished; their exact composition and integrity is unknown as no archaeological studies have been conducted. Modifications to the structural support system for rail infrastructure of the Preferred Alternative, as well as the proposed parking deck in this area, will result in minor subsurface disturbances within the recorded boundaries of these sites. Should these sites contain significant deposits, this work will negatively impact data-bearing strata.

Earthwork/Jackson's Earthwork (Area 3, Fredericksburg)

5.13.3 Architectural Resources

There are 97 eligible or listed buildings, districts, structures, and objects located within the APE of the DC2RVA Project—96 above ground resources and 1 that has an above ground and below ground component. The resources range from single-family rural dwellings to significant historic districts along the rail corridor. Main Street Station (127-0172) in Richmond is also an NHL. FRA's determinations of effect for architectural resources in the Project APE are listed in Table 5.13-3; details on all resources can be found in Appendix D of this Final EIS.

Table 5.13-3: Summary of Project Effect Determinations on Architectural Resources

Alternative Area	Preferred Alternative	Effect Determination (Number of Resources)		
		Adverse	No Adverse	No Effect
Corridor Wide[1]	All	1	0	0
Area 1: Arlington	1B	0	2	0
	Draft EIS Impacts	1[1]	2	0
Area 2: Northern Virginia	2A	2	5	3
	Draft EIS Impacts	1	10	4
Area 3: Fredericksburg	3B	2	8	4
	Draft EIS Impacts	1-4	0-11	0-15
Area 4: Central Virginia	4A	2	8	3
	Draft EIS Impacts	3	12	4
Area 5: Ashland	5A	3	2	11
	Draft EIS Impacts	0-7	0-10	0-16
Area 6: Richmond	6F	3	29	9
	Draft EIS Impacts	7-16	42-60	2-11
Total for the Preferred Alternative:[2]		**13**	**54**	**30**

Notes: 1. The historic RF&P Railroad (500-0001) traverses the Project corridor from the Potomac River on the north to Main Street Station in Richmond on the south. In the Draft EIS, this resource was reported under Alternative Area 1; for clarity based on comments on the Draft EIS, it has been moved to a separate corridor-wide category here.

2. Fredericksburg & Spotsylvania Co. Battlefields National Military Park & Cemetery, Lee Drive (111-0147) is both an above and below ground resource and is included in the above totals as "No Adverse Effect."

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

Of the 13 resources with a determination of adverse effect, the 12 resources that will experience a direct impact are described below, north to south; the remaining 1 resource will experience indirect or cumulative impacts and it is discussed separately in Section 5.20.1.3. DHR has

concurred with these determinations in letters dated June 28, 2018, July 18, 2018, and January 4, 2019. Discussions of the coordination of these determinations with DHR and relevant consulting parties is provided in Appendix E of this Final EIS.

Richmond, Fredericksburg, and Potomac Railroad (RF&P) (500-0001). The historic rail corridor traverses the majority of all six alternative areas, from the Potomac River on the north to Main Street Station on the south. The resource includes the main rail line, spurs, and associated elements such as station houses, bridges, and other structures. The Preferred Alternative will require the replacement of several contributing elements to this rail district (such as the bridge over Naomi Road [089-0080] and numerous culverts) and construction of new bridges adjacent to extant contributing resources (such as the Bridge over the Occoquan River [500-0001-0022]). The physical removal of these contributing elements to the linear district will diminish the characteristics that render this resource eligible for the NRHP. As such, the Project will have a direct effect on this resource.

RF&P Bridge over Occoquan River (500-0001-0022): This resource is a through-truss, camelback railroad bridge constructed in 1915. It is both individually eligible for the NRHP and a contributing element to the RF&P Railroad. The Preferred Alternative includes constructing a second bridge directly east of the existing span, thus introducing a new element adjacent to the current bridge. It also includes physical modifications to the approach to the bridge, which are included in the NRHP boundaries and are a character-defining feature to this resource. The Project has the potential to diminish the property's integrity of design, workmanship, setting, materials, feeling, and association through the introduction of this large new element and physical changes to the approach, resulting in a direct effect to this resource.

Rappahannock River Railroad Bridge and Associated Structures/Platform (111-0132-0025). This 1927 multiple-span, open-spandrel, concrete arch bridge was built across the Rappahannock River in 1927 when the rail tracks in Fredericksburg were elevated to allow for vehicular traffic below. The system also includes a series of rail structural supports and the passenger platform to the west, built at the same time. This structure is both individually eligible and a contributing element to both the RF&P Railroad (500-0001) and the Fredericksburg Historic District (111-0132). The Preferred Alternative includes the construction of a new bridge immediately south of the existing span and physical changes to the structural supports and rail platform. These alterations will diminish the resource's integrity of design, setting, materials, workmanship, feeling, and association, resulting in a direct effect.

Rappahannock River Railroad Bridge (Area 3, Fredericksburg)

Fredericksburg Historic District (111-0132). This 200-acre district comprises the city's historic core and includes hundreds of residential, commercial, educational, ecclesiastic, and industrial buildings. The Preferred Alternative includes the construction of a multi-story parking deck to the south of the extant rail tracks, construction of a new rail station to the north of the tracks, and minor roadway modifications. Contributing elements to the district, such as the Rappahannock River Bridge and rail structural system, will be physically modified during the work. The work will introduce new large-scale elements to the district, and the physical changes will diminish character-defining features of this resource. The work will be a direct effect to the district.

Doswell Historic District (042-5448) and Doswell Depot and Tower (042-0093). The Doswell district encompasses a rural community that was once a center of major activity along the nearby road and rail networks. The Doswell Depot is located at the center of this district on the west side of the RF&P tracks, and the associated tower is just south of the district on the east side of the tracks. While similar depots and towers were once located throughout this stretch of the RF&P corridor, most have been destroyed or notably altered. The Doswell Depot and Tower are in excellent condition. The Preferred Alternative includes the installation of a third track through this area to the east of the current track. This action will not alter the depot, as it is on the west side of the tracks, but it will require moving the tower from its original site to a new location, likely to the east of the tracks. Moving the tower has the potential to cause physical damage to the tower's structural system. In addition, the Project requires physical alterations to area roads. These activities will diminish character-defining features of both resources and will diminish their integrity of location, design, setting, materials, workmanship, feeling, and association, resulting in a direct effect.

Berkleytown Historic District (166-5073). This early-twentieth century development was created when segregated planning doctrines in nearby Ashland pushed African-American residents outside of the town's boundaries. The Preferred Alternative includes raising Archie Cannon Road (i.e., a grade separation of the existing at-grade condition), which comprises the northern boundary of the district. Associated changes also include physically altering the original road plan within the district and construction of new roads and landscape elements. The construction of the new grade-separated roadway structure will introduce a new visual element and the road and landscape changes will physically modify character-defining features, thus diminishing critical elements of the district. This work will result in a direct effect to the district.

Laurel Industrial School Historic District (043-0292) and Main Building/Robert Stiles Building of the Laurel Industrial School (043-0292-0001). The Laurel Industrial School, founded in 1892, was one of several reform campuses built in Virginia by the Prison Association of Virginia. The Preferred Alternative includes grade-separating (i.e., raising) Hungary Road over the rail corridor. This action will result in the construction of a new road overpass structure within the footprint and viewshed of both resources, physical modifications of the road system within the district boundaries and surrounding the main building, and introduction of new landscape elements. Together, these physical changes will diminish the integrity of character-defining features of both resources and be direct effects to both properties.

Shockoe Valley & Tobacco Row Historic District (127-0344), Main Street Station and Trainshed (127-0172), and Seaboard Air Line Railroad (127-6271). These three resources are all located in Richmond's Shockoe Bottom. This area was the site of Richmond's earliest residential, commercial, and industrial activities, commencing in the eighteenth century. Due to its location near notable transportation hubs, it was also the location of numerous holding pens and markets

specializing in the sale of enslaved individuals in the years prior to the Civil War. In 1900, the area was selected as the northern terminus of the Seaboard Air Line Railroad, a new rail route between Richmond and Florida, and Main Street Station and the Railroad Y.M.C.A. were built to cater to rail travelers and train crews. The Preferred Alternative includes several physical changes to the existing rail infrastructure, including: elongating the passenger platforms at the station, creating new structural elements (piers) to support the platforms, and the construction of a new platform for train repairs. These changes will modify the existing viewshed from all three of these resources and physical alter character-defining features of all three resources. The work will result in a direct effect.

5.13.4 Battlefields

There are 10 battlefields located in the APE, all of which are associated with Civil War activities located in areas that were sites of numerous troop engagements during the war, notably the localities from Stafford County to the southern terminus of the Project. The resources were defined and mapped based on the American Battlefield Protection Program (ABPP)-defined Potential National Register (PotNR) boundaries, as determined in 2009. If PotNR boundaries were not available, DHR boundaries were used. In February 2016, DHR agreed to use these boundaries in the current analysis.

FRA's determinations of effect for battlefield resources in Virginia are listed in Table 5.13-4.

Table 5.13-4: Summary of Project Effect Determinations on Battlefields

Alternative Area	Preferred Alternative	Effect (Number of Resources)		
		Adverse	No Adverse	No Effect
Area 3: Fredericksburg	3B	0	4	0
	Draft EIS Impacts	0	0-3	0-3
Area 4: Central Virginia	4A	0	1	0
	Draft EIS Impacts	0	1	0
Area 6: Richmond	6F	0	5	0
	Draft EIS Impacts	0	4-6	0-2
Total for the Preferred Alternative:		**0**	**10**	**0**

Notes: Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives. There are no battlefields within the APE in Alternative Areas 1, 2, and 5; therefore, they do not appear in this table.

Details on each battlefield are presented in Appendix D of this Final EIS. The DHR concurred with these determinations in letters dated June 28, 2018, July 18, 2018, and January 4, 2019. Based on dialogues with DHR, the Project will have no adverse effect on any of the 10 battlefields within the APE.

5.13.5 Avoidance, Minimization, and Mitigation Evaluation—Archaeological and Aboveground Cultural and Historic Resources

In summary, FRA's determination is that 21 historic properties will be adversely affected by the Preferred Alternative: 8 of these impacts will be direct, 1 indirect/cumulative, and 12 both direct and indirect. Another 69 properties will have no adverse effect resulting from the Preferred Alternative and the remaining 30 historic properties in the APE will have no effect resulting from the Preferred Alternative. Where FRA has determined that the Preferred Alternative will have an adverse effect on historic resources, and DHR has concurred with that determination, efforts have been undertaken to avoid, minimize, or mitigate the adverse effects. Efforts have been made by DRPT to identify a Preferred Alternative that avoids adverse effects to Section 106 resources identified in this section. Where avoidance is not possible, through the Section 106 consultation process, FRA, DRPT, DHR, ACHP, and the consulting parties have identified measures to minimize and mitigate for impacts. All mitigation measures are noted in the Section 106 Draft MOA, which is Appendix K of this Final EIS.

5.14 PARKLANDS, RECREATIONAL AREAS, AND WILDLIFE REFUGES

5.14.1 Permanent and Temporary Impacts

This section presents the effects to public and private parklands, recreational areas (including trails), and wildlife and waterfowl refuges, which are collectively referred to as parkland resources. These effects were determined through overlay of the parkland boundaries with the permanent and temporary LOD of the Preferred Alternative; DRPT assumed that the proposed right-of-way will match the permanent LOD, and these areas will be permanently removed from use as a park, recreational area, or wildlife and waterfowl refuge.

Table 5.14-1 identifies the permanent and temporary impacts to parkland resources for the Preferred Alternative, and includes both public and private facilities. As shown in the table, 16 parkland and recreational trail resources will be impacted by the Preferred Alternative. Maps of these resources in relation to the Project can be found in Chapter 6. Only 1 of the 16 facilities will have permanent impacts while the remainder will have temporary impacts. In Alternative Area 6 (Richmond), permanent impacts to one parkland resource are minimal but unavoidable: a 0.21-acre permanent encroachment on Walker's Creek Retention Basin Park.

There have been changes to the number of park resources since the publication of the Draft EIS:

- Two of the parks (Potomac Yard Landbay N and Rail Park) were added subsequent to the Draft EIS based on comments from the City of Alexandria that identified new parks.
- The boundaries of Potomac Yard Park were expanded since the Draft EIS based on comments from the City of Alexandria; Potomac Yard Park was not previously impacted but the expanded park boundaries result in unavoidable temporary impacts.
- Revisions to the temporary LOD since the Draft EIS resulted in temporary impacts to Laurel Recreation Area and Four Mile Run Trail, both of which were previously unimpacted, and avoidance of Maggie Walker Governor's School Fields, which was previously impacted. These changes were narrow linear refinements with increases and decreases in the permanent and temporary LOD made in response to public and agency comments on the Draft EIS.

Table 5.14-1: Permanent and Temporary Impacts to Parklands for the Preferred Alternative

Park Name	Impacts (Parks in acres; Trails in feet)		Draft EIS Impacts	
	Permanent	Temporary	Permanent	Temporary
Alternative 1B: Add Two Main Tracks on the West				
Long Bridge Park	0.00	0.67	0.00-1.45	0.51-0.88
Alternative 2A: Add a Third or Fourth Main Track				
Crystal City Water Park[1]	0.00	0.11	0.00	0.11
Old Town Greens Homeowners Association[1]	0.00	0.06	0.00	0.08
Dog Run Park at Carlyle	0.00	0.18	0.04	0.14
George Washington Memorial Parkway	0.00	1.20	0.00	1.04
Mount Vernon Trail	0.00 feet	20 feet	0.00 feet	20 feet
Potomac Yard Park	0.00	0.48	0.00	0.00
Four Mile Run Trail	0.00 feet	43 feet	0.00 feet	0.00 feet
Potomac Yard Landbay N	0.00	1.41	New since Draft EIS	
Rail Park	0.00	0.60	New since Draft EIS	
Veterans Memorial Park	0.00	0.07	0.00	0.05
Alternative 3B: Add a Third Main Track Through City				
Pierson/Slaughter Pen Farm[1]	0.00	0.18	0.00	0.17
Fredericksburg and Spotsylvania National Military Park (Prospect Hill Area)	0.00	0.19	0.00	0.02
Alternative 4A: Add a Third Main Track				
Fredericksburg and Spotsylvania National Military Park (Stonewall Jackson Shrine Area)	0.00	1.10	0.00	1.09
Mattaponi Wildlife Management Area	0.00	2.54	0.00	2.54
Alternative 5A: Maintain Two Tracks Through Town (No Station Improvements)				
North Ashland Park	0	0	0	0
Railside Park	0	0	0	0
Carter Park	0	0	0	0
Ashland Trolley Line	0	0	0	0
Alternative 6F: Full Service, Staples Mill Road / Main Street Stations				
Laurel Recreation Area	0.00	0.01	0.00	0.00
Maggie Walker Governor's School Fields	0.00	0.00	0.00	0-0.01
Walker's Creek Retention Basin Park	0.21	0.27	0-0.17	0-0.23
Total for the Preferred Alternative:	**0.21**	**9.07 / 63 feet**	**–**	

Notes: 1. Crystal City Water Park, Old Town Greens Homeowners Association, and Pierson/Slaughter Pen Farm are private facilities.

P: Permanent Impacts in Acres; T: Temporary Impacts in Acres

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

In addition to the direct effects shown in the table above, Section 4(f) and Section 6(f) designations apply to some of the public parks, recreation areas, and wildlife and waterfowl refuges along the Project corridor and afford additional protection to these resources; Section 4(f) and Section 6(f) do not apply to private facilities that do not allow public access. Parks and recreational trails must be on publicly owned lands to qualify as a Section 4(f) resource. The resources in Table 5.14.1 above are all located on publicly owned lands and have protection under Section 4(f) with the exception of Crystal City Water Park, Old Town Greens Homeowners Association, and Pierson/Slaughter Pen Farm. These are privately owned and as such do not qualify for additional protection under Section 4(f). See Chapter 6 for the Section 4(f) Evaluation and discussion of Section 4(f) uses and mitigations.

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act prohibits the conversion of property acquired or developed with LWCF to a nonrecreational purpose without approval of the U.S. Department of the Interior's (DOI) NPS. State and local governments often obtain grants to acquire or make improvements to parks and recreation areas through this Act. Section 6(f) directs the DOI to assure that replacement lands of equal value, location, and usefulness are provided as conditions to such conversions. Consequently, where conversions of Section 6(f) lands are proposed for transportation projects, replacement lands would be necessary. The Preferred Alternative does not have any permanent impacts to Section 6(f) resources.

5.14.2 Avoidance, Minimization, and Mitigation Evaluation—Parklands, Recreational Areas, and Wildlife Refuges

Impacts to parklands, recreational areas, and wildlife and waterfowl refuges were avoided and minimized to the maximum extent possible. Only one park resource has permanent impacts, and these impacts are unavoidable and have been minimized to the greatest extent feasible. Temporary impacts to 16 parkland and trail resources were also minimized to the greatest extent feasible. The connectivity of the Mount Vernon and Four Mile Run Trails will be maintained throughout construction. DRPT will return temporary easements back to pre-construction conditions and to avoid impacting the essential park functions during construction.

5.15 TRANSPORTATION FACILITIES

This section summarizes the anticipated effects of the Preferred Alternative on the transportation network at two scales: the Regional Scale, which includes rail stations and highways (namely I-95 and U.S. 1) that connect Washington, D.C. and Richmond, and the Corridor Scale, which includes the roadway-rail crossings in the Project corridor. Refer to the Transportation Technical Report (Appendix S of the Draft EIS) for a full inventory of the methodologies, data, and analyses.

All analyses summarized in this section incorporate the design changes to the conceptual engineering for the Preferred Alternative as presented in Chapter 4 of this Final EIS, which include the following changes in improvements at at-grade crossings (presented in Section 5.15.2.1 below), listed north to south:

- DRPT revised the proposed at-grade crossings treatments to align with decisions made as part of the separate Powells Creek to Arkendale project (see Section 4.3.2 for details). There are now no proposed crossing treatments (i.e., no action) as part of the DC2RVA Project at one public at-grade crossing (Potomac Avenue) and at four private at-grade crossings (Cherry Hill Road, Henderson Road/Epperson Avenue, Flemming Street, and Lees Private Crossing).

- DRPT re-evaluated the proposed closure of the College Avenue crossing as part of Draft EIS Build Alternative 5A (Ashland). The previously proposed closure will not occur, and the crossing will remain open as part of Preferred Alternative 5A in this Final EIS.
- DRPT revised the proposed treatment for all public at-grade crossings within the Town of Ashland between Vaughan Road (Archie Cannon Drive) and Ashcake Road to no action (i.e., retain existing) as part of Preferred Alternative 5A. In the Draft EIS, for all Build Alternatives, DRPT proposed four-quadrant gate treatments for these crossings.
- DRPT revised the four-quadrant gate treatment at the Hermitage Road (RF&P Line, Henrico County) crossing proposed as part of the Draft EIS Build Alternative 6F (Richmond) to be a grade separation as part of Preferred Alternative 6F in this Final EIS.

The proposed crossing improvements at both public and private at-grade crossings are shown in the Preferred Alternative mapbook, which is Appendix L of this Final EIS. DRPT anticipates that the above changes in crossing improvements will have no effect on the Regional Scale analyses (presented in Section 5.15.1 below) and a minimal effect on the Corridor Scale analyses (presented in Section 5.15.2 below) in comparison to the Draft EIS. The analyses in these sections has been revised accordingly and include notes as to what results have changed since the Draft EIS.

Additionally, changes in parking facilities that are included as part of the Preferred Alternative as they relate to the parking demand analysis are summarized in Section 5.15.1.4.

5.15.1 Regional Scale

This section presents how the annual ridership associated with the Preferred Alternative train service are anticipated to affect the greater roadway network.

5.15.1.1 DC2RVA Train Service and Ridership

The Preferred Alternative will add 9 new daily intercity passenger round trips (18 total trains per day) to the Project corridor (refer to Chapter 4 of this Final EIS). Table 5.15-1 presents the annual ridership at each station, represented as a total number of boardings and alightings (i.e., total number of train passengers getting on and off of the train). This year 2025 data was used to estimate the effects of DC2RVA ridership on regional roadways (see Section 5.15.1.2 below).

Table 5.15-1: Annual DC2RVA Ridership[1] at Stations for the Preferred Alternative (2025)

Alexandria	Woodbridge	Quantico	Fredericksburg	Ashland	Staples Mill Road	Main Street	Total
230,840	83,057	45,257	303,303	44,165	417,774	370,238	1,951,631

Note: 1. The annual ridership represents the DC2RVA Project intercity passenger trains in year 2025. It excludes passengers on VRE, the Auto Train, and the long-distance trains to Georgia/Florida. These values are presented as boardings and alightings, which represent train passengers getting on and off of the train, respectively, and have not changed since the Draft EIS.

5.15.1.2 Ridership Effects on Regional Roadways

DRPT expects that the Preferred Alternative improvements will result in an increase of up to 854,000 annual rail passenger trips to, from, and through the study corridor in 2025, as compared to if the Project was not implemented (i.e., the No Build). By shifting this travel to rail, DRPT anticipates that up to 2,050 vehicles per day and 250,000 daily vehicle miles will be removed from the parallel roads of I-95 and U.S. Route 1 in the 123-mile Project corridor in 2025; annually, this equates to removing 656,000 vehicles per year and 80 million annual vehicle miles from the system.

5.15.1.3 Ridership Effects on Roadway Network at Stations

The annual DC2RVA passenger train ridership for the Preferred Alternative, as presented in Table 5.15-1, was used to estimate daily vehicle trips by mode to determine the percent change in traffic due to increases in DC2RVA ridership, which is shown in Table 5.15-2.

Increases in train ridership do not directly correlate to the same increases in vehicle traffic at train stations, as not every rider arrives and/or departs by single occupant vehicle. The DC2RVA Project will approximately double the frequency of intercity passenger rail service offered at each station; however, the increases in service will be distributed throughout the day and vehicular traffic increases on most adjacent roadways to stations will experience nominal increases in traffic (under one percent increase in total daily traffic) as part of the Preferred Alternative. DRPT anticipates that the adjacent roadways at stations have sufficient carrying capacity that could accommodate increases in vehicular trips due to the DC2RVA Project. The highest increases in daily traffic on adjacent roadways due to the DC2RVA ridership are anticipated at the Fredericksburg Station where traffic is projected to increase approximately seven to eight percent across the span of a day on Princess Anne Street and Caroline Street, both of which carry some of the lowest daily volumes on roadways adjacent to stations within the Project corridor. The Preferred Alternative equates to approximately 2,000 new daily motor vehicle trips to the Staples Mill Road and Main Street Stations; near Main Street Station, traffic is projected to increase one to two percent across the span of a day on the adjacent roadways of East Main Street and East Broad Street. Likewise, traffic on Staples Mill Road is projected to increase less than one percent across the span of a day under the Preferred Alternative.

Table 5.15-2: Effect on Adjacent Roadways[1] at Stations for the Preferred Alternative

Alexandria	Woodbridge	Quantico	Fredericksburg	Ashland	Staples Mill Road	Main Street
0.1%	0.4%	0.8%	7.3%	0.1%	0.1%	1.8%

Notes: The % changes shown in this table represent the increases in traffic for the Preferred Alternative in the year 2025 as compared to the condition where the Project was not implemented (i.e., the No Build), and have not changed since the Draft EIS.

1. Adjacent roadway(s) at stations were defined as those that vehicles (including personal motor vehicle, transit, or drop-off service such as taxis) could use to access the station.

5.15.1.4 Ridership Effects on Parking Needs at Stations

As detailed in Section 4.5.2 of the Transportation Technical Report (Appendix S of the Draft EIS), DRPT used an Amtrak-provided method to determine parking demand that utilized as inputs the station size (based on ridership) and type of location (development density) at each station:

- **Station size.** Large (fully staffed, multiple transit services and amenities, multiple tracks and platforms); Medium (lower levels of staff, supporting transit services); and Caretaker (enclosed waiting areas, limited amenities, not fully staffed).
- **Type of location.** Stations to be served by the Preferred Alternative are designated as Suburban, based on density and multimodal accessibility of the areas surrounding each station.

During the alternatives development process, DRPT calculated a range of daily parking space demand (a high and low range) based on projected DC2RVA ridership, as shown in Table 5.13-3, for stations to be served the by Project.

Table 5.15-3: Daily Parking Space Demand by Station for the Preferred Alternative

Station[1]	Station Size / Type	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
Alexandria	Medium / Suburban	140	190
Woodbridge	Caretaker / Suburban	35	47
Fredericksburg	Medium / Suburban	142	191
Ashland	Caretaker / Suburban	29	39
Staples Mill Road	Large / Suburban	301	406
Main Street	Large / Suburban	199	269

Notes: 1. While it is proposed to be served by DC2RVA intercity passenger trains and VRE is pursuing expanded parking facilities separate from this Project, there are no station modifications at Quantico Station as part of the Preferred Alternative. Ridership analyses indicate that many riders currently using the Quantico Station would choose the Woodbridge Station in the future due to its receiving increased service levels in the Preferred Alternative, and its more convenient access to the roadway network.

There are no changes to the daily parking space demand since the Draft EIS.

However, the conceptual layouts for each station site shown in the station figures in Chapter 4 of this Final EIS are also based on the physical characteristics of the station site, the DC2RVA Basis of Design, the functional requirements of Amtrak, and/or Project refinements to the Preferred Alternative that have occurred since the alternatives development process and the publication of the Draft EIS. The conceptual layouts include the following additional considerations:

- At Alexandria Station, the conceptual layout reflects the existing property constraints and not the calculated parking space demand shown above. Due to available transit service at the adjacent Metro station and several public parking decks in the vicinity, DRPT is not recommending additional parking infrastructure improvements outside of the existing lot.
- At Woodbridge Station, free parking is provided through a combination of surface parking and a parking deck, with a combined capacity of 730 spaces shared by Amtrak and VRE. The parking lot is at approximately 65 percent capacity per day, with ample capacity to absorb the DC2RVA daily parking space demand as projected above. Accordingly, DRPT is not recommending additional parking infrastructure improvements as part of the Project.
- At Ashland Station, free parking is available on the street and town lots, with ample capacity to absorb the DC2RVA daily parking space demand as projected above. Since the publication of the Draft EIS, DRPT is not recommending additional parking infrastructure improvements as part of the Project. In addition, there was no local support for additional parking infrastructure dedicated to intercity passenger rail customers during review of Project Build Alternatives (see Appendix G of this Final EIS for details on the CAC).
- At Richmond's Staples Mill Road Station, DRPT, in coordination with Amtrak and VDOT, completed an expansion of the existing surface parking lot in June 2018 (i.e., since the publication of the Draft EIS). The completed project more than doubles the amount of available parking from 288 to 600 parking spaces. The entire existing lot was repaved, with improved taxi and ride share parking, pedestrian access and bus loading. Along with these improvements, a second entrance off of Bremner Boulevard was added to improve parking lot access. This expanded parking lot meets the projected parking demand estimated for the DC2RVA Project, and no further parking improvements are recommended as part of the Project. Refer to Section 4.3.6 for full improvement details of the Preferred Alternative at Staples Mill Station.

- At Richmond's Main Street Station, a conceptual parking deck layout was shown in the Draft EIS to address future parking demand; however, this conceptual parking deck was removed from consideration in this Final EIS to reduce impacts on cultural resources and property (refer to Section 4.3.6 for full details). Future parking needs for intercity passenger rail service at Main Street Station will be addressed by a parking plan to be developed by the City of Richmond for the multi-purpose Main Street Station complex.

5.15.2 Corridor Scale

This section presents the potential effects of the Preferred Alternative on the highway-rail crossings and roadways that connect adjacent crossings. It describes the improvements proposed at each crossing as well as analysis of the effects on: vehicles using the crossings and overall roadway connectivity. Changes since the Draft EIS are a result of the modifications to the proposed at-grade crossing improvements that are described at the beginning of this Section 5.15.

At-Grade Crossing in the DC2RVA Corridor

5.15.2.1 Preferred Alternative Crossing Improvements

Existing at-grade crossings and existing grade-separated crossings for the Preferred Alternative are discussed separately in the sections below.

Types of Crossing Treatments Considered for Existing At-Grade Crossings

Recommendation of whether an existing at-grade roadway crossing should be eliminated (grade-separated or closed) or improved (through installation of new or additional crossing treatments) was based on FRA and FHWA guidance and site-specific conditions, including rail operations, geometry of parallel/intersecting crossing roadway, safety and accessibility, environmental resources, and engineering feasibility. The complete methodology of the at-grade crossing evaluation process was provided in the Transportation Technical Report (Appendix S of the Draft EIS). The following types of crossing treatments are proposed for existing at-grade crossings and are quantified in Table 5.15-4 and Table 5.15-5 in the next sections, and are shown in the Preferred Alternative mapbook, which is Appendix L of this Final EIS.

Grade Separation. A highway-rail crossing that occurs at two different vertical levels (i.e., the roadway would pass over or under the rail corridor). The Preferred Alternative includes the

construction of new grade separations[29] at a total of seven existing public at-grade crossings. No private at-grade crossings will be grade-separated as part of the Project.

Four-Quadrant Gates. A system of gates (entrance and exit gates on all roadway approaches) designed to provide full closure of the crossing when a train is approaching or occupying the crossing, thus eliminating the ability of vehicles to navigate into the crossing while the gates are lowered. The Preferred Alternative includes the installation of four-quadrant gates at a total of 13 public at-grade crossings and 2 private at-grade crossings.

Gates with Center Median Treatment. A system of physical improvements designed to impede approaching vehicles from traveling into the opposing traffic lane and around a lowered gate. Typical treatments include two-quadrant gates with non-traversable median treatment, such as wide raised medians or mountable raised curb systems with vertical median separators. The Preferred Alternative includes installation of gates with center median treatment at eight public at-grade crossings. No private at-grade crossings will have gates with center median treatment.

Closure. Removal of an existing at-grade roadway crossing from the rail corridor. The DC2RVA Project includes the closure of seven public at-grade crossings. No private at-grade crossings will be closed as part of the Project.

Locking Gate. A moveable barrier gate that is engaged (i.e., closed) and only opens on demand, either manually or in a more automated fashion (e.g., key card access to open and close the gate). The Preferred Alternative includes the installation of locking gates at 12 private at-grade crossings (in lieu of closure). Note that no public at-grade crossings will receive locking gates as part of the Project.

No Action. Considered at crossings where the existing crossing treatment is sufficient to accommodate the DC2RVA Project, or per direction of the Commonwealth Transportation Board (CTB) as part of its resolution for the Preferred Alternative (Appendix H of this Final EIS).

The Preferred Alternative does not propose any new at-grade crossings, the creation of which are restricted by Virginia state code.[30] Dynamic crossing safety technology to control exit gates (such as embedded loops or radar) will be determined during final design of the Project and is subject to FRA Office of Railroad Safety approval at the time of that design. Other site improvements to improve overall roadway and/or railroad safety, as part of or in addition to these treatments, are not precluded from the final design of any of these treatments.

Improvements at Existing Public At-Grade Crossings

The proposed public at-grade crossing improvements for the Preferred Alternative are summarized in Table 5.15-4, and shown in the maps in Appendix L of this Final EIS. DRPT proposes that most of the existing at-grade public roadways remain at grade with the addition of four-quadrant gates or gates with center median treatment to enhance safety in the DC2RVA Project corridor. Changes to public at-grade crossing improvements since the Draft EIS are summarized at the beginning of Section 5.15, and include changes in downtown Ashland as well as one less four-quadrant gate in the Northern Virginia area and one additional grade separation in the Richmond area.

[29] Note that the construction of new grade separations are separate from modifications to existing grade-separated crossings that may be widened/replaced as part of the Project, which are discussed later in this section.

[30] The applicable state law can be found at: https://vacode.org/56-363/

Table 5.15-4: Public At-Grade Crossing Improvements for the Preferred Alternative

Grade Separation[1]	Crossing Closure	Four-Quadrant Gates	Gates with Center Median Treatment	No Action[2]
Alternative 2A: Add a Third or Fourth Main Track				
0	1	1	0	2
	Mount Hope Church Road[3]	Brent Point Road		Featherstone Road; Potomac Avenue
Alternative 3B: Add a Third Main Track Through City				
1	0	2	1	0
Lansdowne Road		Mine Road; Summit Crossing Road	Claiborne Crossing Road	
Alternative 4A: Add a Third Main Track				
0	1	4	2	0
	Colemans Mill Road	Stonewall Jackson Road; Woodford Road; Penola Road; Doswell Road	Woodslane Road; Paige Road	
Alternative 5A: Maintain Two Tracks Through Town (No Station Improvements)				
2	0	3	1	5
Vaughan Road (Archie Cannon Drive); Ashcake Road		Gwathmey Church Road; Elmont Road; Cedar Lane	Mill Road	W Patrick Street; College Avenue / Henry Clay Street; England Street / Thompson Street; Myrtle Street; E Francis Street
Alternative 6F: Full Service, Staples Mill Road / Main Street Stations				
4	5	3	4	1
Hungary Road; Hermitage Road (RF&P, Henrico County); Hospital Street / N 7th Street; E Commerce Road	St James Street[4]; N 2nd Street / Valley Road; Dale Avenue / Trenton Avenue; Brinkley Road; Old Lane	Maury Street; Goodes Street; Kingsland Road	Hermitage Road (S-Line, Richmond); Brook Road; Ruffin Road; Bells Road	Mountain Road
Total for the Preferred Alternative:				
7	**7**	**13**	**8**	**8**

Notes: 1. Some existing grade-separated crossings will be widened/replaced as part of the Project; these crossings are separate from the proposed new grade separations of existing at-grade crossings that are quantified in this table.

2. "No Action" in this table includes replacing the existing crossing improvement in-kind or no additional crossing improvement.

3. The closure of Mount Hope Church Road will include a new parallel access road.

4. St James Street will be closed for roadway traffic, but a new shared-use path will be grade-separated over the former at-grade crossing.

There are no public at-grade crossings for Alternative 1B in Area 1 (Arlington, Long Bridge Approach). Changes to public at-grade crossing improvements since the Draft EIS are summarized at the beginning of Section 5.15.

Improvements at Existing At-Grade Private Crossings

The Preferred Alternative maintains access to existing private crossings, albeit with additional safety measures, as shown in Table 5.15-5 and in the maps in Appendix L of this Final EIS. Changes to private at-grade crossing improvements since the Draft EIS are summarized at the beginning of Section 5.15, and include removal of previously proposed treatments in the Northern Virginia area (i.e., no action as part of the DC2RVA Project) to align with the separate Powells Creek to Arkendale project.

DRPT proposes that most of the existing private at-grade crossings will be equipped with locking gates in the Preferred Alternative; however, DRPT proposes four-quadrant gates at two private crossing locations where site-specific safety, geometric, and/or operating conditions were determined to preclude use of locking gates. Locking gates will not remove owner's access to the private crossing, but will provide an additional measure of safety for both vehicles and trains at the crossing. DRPT anticipates that locking gates will be tied to train control, and private property owners will need to "request" that their crossing gate be opened. However, details of technology used and design of the track circuit interlock will be determined as part of the final design of the Project and is subject to FRA and CSXT approval at the time of that design. DRPT will coordinate with property owners to determine means of access to each property during final design.

Table 5.15-5: Private At-Grade Crossing Improvements for the Preferred Alternative

Alternative Area	Preferred Alternative	# / Type of Private Crossing Treatment				Total
		Crossing Closure	Four-Quadrant Gates	Locking Gate	No Action Required	
Area 1: Arlington	1B	0	0	0	0	0
Area 2: Northern Virginia	2A	0	0	0	5	5
Area 3: Fredericksburg	3B	0	0	0	0	0
Area 4: Central Virginia	4A	0	0	10	0	10
Area 5: Ashland	5A	0	0	0	0	0
Area 6: Richmond	6F	0	2	2	0	4
Total for the Preferred Alternative:		**0**	**2**	**12**	**5**	**19**

Improvements at Existing Grade-Separated Crossings

All existing grade-separated crossings (both public and private) in the rail corridor will be maintained as part of the Preferred Alternative, as shown in the maps in Appendix L of this Final EIS. The proposed crossing improvements at the existing grade-separated crossings consist of one of the following:

- No action required (i.e., the existing structure is sufficient to accommodate the DC2RVA Project)
- For roadway overpasses, widen/replace the existing roadway structure over the railroad to meet the vertical and/or horizontal clearances required to construct and operate on the additional track, at seven crossings: Dawson Beach Road (Prince William County), Eskimo Hill Road (Stafford County), Leeland Road (Stafford County), Primmer House Road

(Stafford County), Kings Highway (Stafford County), Dumbarton Road (Henrico County), and Elliham Avenue (Chesterfield County)

- For roadway underpasses, build a new railroad bridge over the roadway so as to construct and operate on the additional track at 10 crossings: Furnace Road (Fairfax County), Private road (Prince William County), Andrew Chapel Road (Stafford County), Harrell Road (Stafford County), Sophia Street (Fredericksburg), Caroline Street (Fredericksburg), Princess Anne Street (Fredericksburg), Charles Street (Fredericksburg), Taylorsville Road (Hanover County), and Elletts Crossing Road (Hanover County)

These modifications do not represent a change to the existing crossing type, and are separate from the proposed grade separations of existing at-grade crossings that are quantified in the at-grade crossing tables above. The above crossing improvements are functionally equivalent because the existing operations of the crossing roadway (i.e., the number and type of lanes) are not modified as part of the Preferred Alternative.

At the existing grade-separated crossings where DRPT proposes that the Preferred Alternative extend the existing structure or build a new structure to accommodate the additional rail infrastructure through the crossing, DRPT will coordinate with VDOT and/or the responsible municipality during future phases of design and construction to ensure that the new structure will accommodate projected traffic volumes. The Project, however, does not increase traffic volumes to a level that will require additional travel lanes at any crossing and therefore DRPT has not included additional travel lanes in its compilation of impacts or Project costs.

5.15.2.2 Preferred Alternative Effects on Roadway Connectivity and Accessibility

The purpose of this section is to qualitatively identify locations where accessibility and connectivity of the roadway network may be affected by the Preferred Alternative and establish those locations where further quantitative analysis is required.

Roadway Effects of Public At-Grade Crossing Improvements

The Preferred Alternative crossing improvements that DRPT anticipates will have the greatest effect on existing accessibility and connectivity of the public network are the seven proposed closures of existing public at-grade highway–rail crossings (as previously described in Section 5.15.2.1):

- Mount Hope Church Road crossing, Stafford County (Preferred Alternative 2A)
- Colemans Mill Road crossing, Caroline County (Preferred Alternative 4A)
- St James Street crossing, City of Richmond (Preferred Alternative 6F)
- N 2nd Street/Valley Road crossing, City of Richmond (Preferred Alternative 6F)
- Dale Avenue/Trenton Avenue crossing, City of Richmond (Preferred Alternative 6F)
- Brinkley Road crossing, Chesterfield County (Preferred Alternative 6F)
- Old Lane crossing, Chesterfield County (Preferred Alternative 6F)

These closures require a permanent detour of vehicular traffic, which not only affects the vehicles that are making the detour, but also the traffic operations and vehicles along the alternate route, and therefore warrant further analysis of the proposed closure and associated diversion, which is presented in Section 5.15.2.3 of this Final EIS.

For all proposed grade separations, four-quadrant gates, and gates with center median treatment, the Preferred Alternative maintains the existing functional characteristics of the crossing roadway. Characteristics to be maintained during construction and in the final configuration include the existing number and type of roadway lanes as well as the existing type of pedestrian access. The primary intent to modify existing at-grade crossings with four-quadrant gates or center median treatment is to reduce the probability of hazards due to interaction between roadway and railroad traffic at certain crossings. Therefore, DRPT expects that these proposed crossing improvements will have minimal effect on existing accessibility and connectivity as part of the Preferred Alternative and do not warrant further detailed operations analysis.

The DC2RVA Project will approximately double the frequency of intercity passenger rail service operating along the corridor; while these increases in service will be distributed throughout the day, thus minimizing the impact to vehicles using at-grade crossings, DRPT evaluated the potential change in total daily vehicle delay, which is presented in Section 5.15.2.4.

Roadway Effects of Private At-Grade Crossing Improvements

The Preferred Alternative was designed to maintain existing accessibility and connectivity to private land parcels, except where full property acquisitions are required by Project design. DRPT does not anticipate that any of the Preferred Alternative private crossing improvements will have an effect on the overall connectivity and accessibility of the public transportation network; therefore, further detailed traffic operations analysis is not warranted.

Roadway Effects of Grade-Separated Crossing Improvements

The crossing improvements at existing grade-separated crossings (both public and private) include: extension of the existing crossing structure, construction of a new separate parallel grade-separated crossing structure, or no change required (i.e., the existing structure is sufficient to accommodate the Preferred Alternative). The Preferred Alternative includes modifications to grade-separated crossings where either the horizontal envelope below an existing overhead roadway bridge was insufficient to allow for the installation of a new track or curve alignment or an existing undergrade railroad bridge required structural remediation or realignment. The Preferred Alternative maintains the existing functional characteristics of the crossing roadway, including number and type of roadway lanes. Therefore, DRPT does not anticipate that any of the proposed modifications to existing grade-separated crossings of the Preferred Alternative will have an effect on the overall connectivity and accessibility of the transportation network. Further detailed traffic operations analysis of these crossings is not warranted.

Relevance of Preferred Alternative to Quiet Zones

FRA regulations (49 CFR Part 222) require locomotive horn use at public at-grade crossings, but the regulations also include the procedures by which a local authority could establish a new quiet zone where locomotive horn use at public at-grade crossings is not necessarily required because supplemental and alternatives safety measures (SSMs) are installed. SSMs include the following:

- Closure of a highway-rail at-grade crossing (i.e., closure of the at-grade condition, which could include grade separation of the crossing or permanently closing the crossing to vehicular traffic)
- Four-quadrant gates
- Gates with traffic channelization arrangements (i.e., non-mountable curb or mountable curb with delineators)

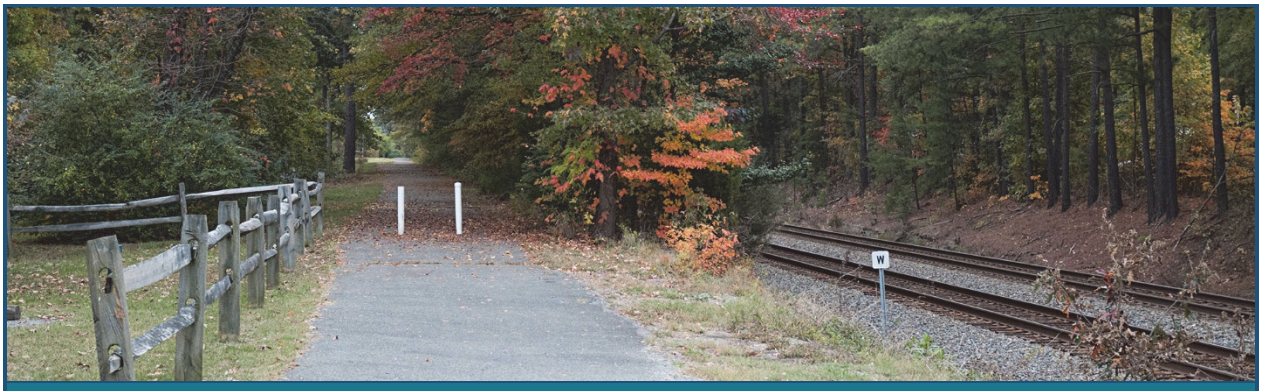
Under the regulations, local jurisdictions/municipalities initiate and manage the process for implementing the creation of new quiet zones. Therefore, the requirement for trains to routinely sound horns is dependent on the locality's actions, in accordance with FRA standards and approved by FRA. Localities would also fund all improvements, equipment, and signage, and they would provide ongoing maintenance for all quiet zones within their jurisdictions. The FRA Office of Safety authorizes quiet zones on a site-specific basis, and observance of quiet zones by the operating railroad is voluntary. Train horns may be sounded in emergency situations or to comply with other operating railroad rules or conditions, even within a quiet zone, and use of wayside horns (i.e., those installed as part of a crossing treatment) may be used within quiet zones.[31] Also, CSXT operating rules require all trains to sound their horn when approaching, passing, or departing a passenger (intercity or commuter) station along the mainline.

DRPT does not anticipate that the Project will affect existing or future quiet zone designations, as Project improvements that qualify as SSMs are proposed at most public at-grade crossings.

Effects on Bicycle and Pedestrian Connectivity

The Preferred Alternative will maintain existing bicycle and pedestrian facilities at crossings (i.e., to the same level of existing treatment). If the Preferred Alternative impacts (i.e., crosses) an existing pedestrian and/or bicycle crossing, DRPT has designed that crossing to current safety standards in keeping with the Project's Basis of Design and applicable FRA, Amtrak, CSXT, and VDOT safety standards and in compliance with the Americans with Disabilities Act (ADA). Any crossings for which DRPT proposes no changes to the tracks as part of the Preferred Alternative will result in no changes to existing bicycle and/or pedestrian facilities. It is important to note that crossing the railroad tracks at locations other than designated crossings is unsafe and is a violation of §18.2-159 of the Code of Virginia.

Opportunities for additional bicycle and pedestrian accessibility improvements, including new and/or additional ADA-compliant facilities beyond existing levels, will be incorporated during final design, in coordination with FRA and CSXT. As part of the CTB's resolution recommending Alternative 5A as the Preferred Alternative for the Ashland/Hanover area, the CTB directed DRPT to explore the need for other safety improvements to pedestrian and vehicle at-grade crossings within the Town of Ashland. DRPT will continue to work with the FRA, VDOT, Town of Ashland, Randolph-Macon College, and CSXT to identify safety improvements for all users crossing the at-grade tracks in Ashland, separate from the DC2RVA Project.



Trail through Railside Park (Area 5, Ashland)

[31] From FRA's Quiet Zone Brochure, available at: https://www.fra.dot.gov/eLib/Details/L04781

5.15.2.3 Crossing Closure Diversion Analysis (Traffic Operations)

Closing an existing traffic movement requires vehicles to permanently use a different route, which not only affects the vehicles that are diverting, but also the traffic operations and vehicles along the diversion route. Diversion routes, consisting of multiple roadways and intersections along each side of the rail corridor, were identified for each crossing closure location; refer to the Transportation Technical Report (Appendix S of the Draft EIS) for the complete methodology, including graphics of the proposed detour routes at each crossing closure location.

The closure diversion analysis included two evaluations for each closure location of the Preferred Alternative:

1. Effects on the roadway traffic along the diversion route(s), including projected daily volumes and associated facility level of service (LOS).[32]
2. Effects on intersection capacity and operations along the diversion route(s). DRPT considered three threshold criteria: under capacity, near capacity, and over capacity, where intersections may be approaching but not yet exceeding capacity. The intersection capacity analyses are intended to generally correspond to LOS as follows:
   - Under capacity represents LOS A/B conditions
   - Near capacity represents LOS C/D conditions
   - Over capacity represents LOS E/F conditions

The results of the closure diversion analysis for the seven public at-grade crossing closures that are part of the Preferred Alternative for the Project are presented in Table 5.15-6.

Table 5.15-6: Closure Diversion Analysis Results for the Preferred Alternative

Preferred Alternative	Crossing Closure(s)	Operations along the Diversion Route	
		Roadway Traffic Volumes and Associated LOS	Intersection Capacity
2A	Mount Hope Church Road	Minimal Effect	Minimal Effect
4A	Colemans Mill Road	Minimal Effect	Minimal Effect
6F	St James Street; N 2nd Street/Valley Road; Dale Avenue/Trenton Avenue; Brinkley Road; Old Lane	Centralia Road: *16,300 daily vehicles / LOS E (LOS B in No Build)* Hopkins Road: *8,000 daily vehicles / LOS C (LOS B in No Build)* Kingsland Road: *4,200 daily vehicles / LOS B (LOS A in No Build)* All other locations minimal effect.	Centralia Road at Chester Road: *Near Capacity* All other locations minimal effect.

Notes: Preferred Alternatives 1B, 3B, and 5A do not have crossing closures that are part of the closure diversion analysis, so are not included in this table. There have been no changes to the closure diversion analysis for the alternatives shown since the Draft EIS; Preferred Alternative 5A is no longer included in this table as the College Avenue crossing remains open as part of the Preferred Alternative.

Refer to Section 5.4 of the Transportation Technical Report (Appendix S of the Draft EIS) for details of diversion analysis for each closure.

[32] Level of service (LOS) is a measure of traffic operating conditions based generally on a comparison of traffic volumes to available capacity. LOS is described in terms of letter grades from A to F; LOS A represents free-flowing traffic conditions, while LOS F represents a breakdown in traffic flows, with stop-and-go conditions. Generally for roadway design standards, LOS C is considered acceptable in rural areas, and LOS D is considered acceptable in urban areas.

DRPT anticipates that most of the crossing closures of the Preferred Alternative will have minimal effect on both roadway and intersection operations; "minimal" is defined as the LOS on all roadway segments and through all intersections along the diversion route as being equivalent to the condition where the Preferred Alternative was not implemented (i.e., the No Build condition). Additionally, the LOS at these locations is considered acceptable by roadway design standards (at least LOS C in rural areas/LOS D in urban areas). There are no changes to the closure diversion analysis shown in Table 5.15-6 since the Draft EIS with the exception of the College Avenue crossing in the Town of Ashland, which is no longer included and will remain open as part of the Preferred Alternative.

There are three roadway locations and one intersection identified in Table 5.15-6 in Area 6 (Richmond) as locations where DRPT anticipates that the Preferred Alternative will reduce traffic operations along the diversion route (compared to the condition where the Project was not implemented, i.e., the No Build condition): Centralia Road, Hopkins Road, and Kingsland Road and the intersection of Centralia Road at Chester Road. However, the operations along Hopkins Road and Kingsland Road have LOS that are generally considered acceptable by roadway design standards (at least LOS C in rural areas/LOS D in urban areas). Centralia Road is located south of the Project limits and has a crossing of the rail corridor that is proposed to be grade-separated as a part of the separate Southeast High Speed Rail (SEHSR) Richmond to Raleigh Project (SEHSR R2R project), and therefore, Centralia Road in proximity to the diversion route is assumed to be redesigned and reconstructed (including the grade separation) to accommodate future volumes as part of the DC2RVA Project No Build condition.

Vaughan Road Existing At-Grade Crossing (Area 5, Ashland)

5.15.2.4 Preferred Alternative Effects on Total Daily Vehicle Delay

The total vehicle delay per day is the amount of time that vehicles spend queuing at an at-grade crossing over a 24-hour period, based on the number of trains that are expected to pass through the crossing. Any combination of more trains, slower trains, or more motor vehicles can increase estimated total daily vehicle delay. Eliminating an at-grade crossing, which is defined as either a proposed grade separation or crossing closure, can reduce total daily vehicle delay at that crossing by physically separating or removing train traffic from roadway vehicle traffic. However, for crossing closures, those vehicles would then detour to use an adjacent existing crossing, the total daily delay of which would increase. Refer to Section 5.5 of the Transportation Technical Report (Appendix S of the Draft EIS) for details on the total daily vehicle methodology.

Total daily vehicle delay results are presented in vehicle-hours, which represents the cumulative delay of all motor vehicles queuing at an at-grade crossing as a total for all train crossing events in a single average day. The summary of total daily vehicle delay for the Preferred Alternative is presented in Table 5.15-7, and results by individual crossing are presented in Table 5.15-8. The majority of the total daily vehicle delay experienced by motor vehicles at at-grade crossings in the Project corridor will result from freight trains that will operate in both the No Build and Preferred Alternatives. Freight train traffic represents between 80 to 90 percent of the total daily vehicle delay of the Preferred Alternative. Intercity passenger trains represent 10 to 13 percent of the total daily vehicle delay experienced at at-grade crossings in the Preferred Alternative. Changes in impacts to total daily vehicle delay since the Draft EIS are a result of the changes to the crossing improvements that are described at the beginning of this Section 5.15, and resulted in a slight change in total daily delay at specific crossings in Alternative Area 5 and 6, though these changes did not affect the total percent increase in total daily delay for all crossings due to the Project in either area.

Table 5.15-7: Summary of Total Daily Vehicle Delay for the Preferred Alternative

Alternative Area	Preferred Alternative	At-Grade Crossings Removed as part of the Project[1]	Total Daily Vehicle Delay[2] (Vehicle Hours)	% of Total Daily Vehicle Daily		
				Intercity Passenger Trains	VRE Trains	Freight Trains
Area 1: Arlington	1B	*There are no at-grade crossings in this area.*				
Area 2: Northern Virginia	2A	1	23.01	13%	5%	82%
	Draft EIS Impacts	1	23.01	13%	5%	82%
Area 3: Fredericksburg	3B	1	6.59	13%	5%	82%
	Draft EIS Impacts	1	6.59-32.79	9-13%	0-5%	81-91%
Area 4: Central Virginia	4A	1	3.35	13%	0%	87%
	Draft EIS Impacts	1	3.35	13%	0%	87%
Area 5: Ashland	5A	2	56.33	11%	0%	89%
	Draft EIS Impacts	1-3	9.76-56.33	11-42%	0%	58-89%
Area 6: Richmond	6F	9	64.22	10%	0%	90%
	Draft EIS Impacts	7-9	26.48-68.55	8-24%	0%	76-92%
Total for the Preferred Alternative:		**14**	**153.50**	**11%**	**1%**	**88%**

Notes: 1. "At-Grade Crossings Removed" includes proposed grade separations and crossing closures as part of the Preferred Alternative.

2. Total Daily Vehicle Delay represents the cumulative delay for all at-grade crossings within each area. Refer to Table 5.15-8 for details on delays at individual crossings.

Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

Total daily vehicle delay is one of FHWA's 11 conditions[33] for which grade separation of at-grade crossings should be considered (but is not required); the criteria threshold set by FHWA is 40 total vehicle hours of delay per day at a single crossing, which is the cumulative time all motor vehicles are delayed at a single crossing per day. As shown in Table 5.15-8, the 40-hour FHWA threshold for total daily vehicle delay is not exceeded by any single at-grade crossing as part of the Preferred Alternative.

Table 5.15-8: Total Daily Vehicle Delay Results for the Preferred Alternative, By Crossing

Crossing Roadway (At-Grade Public Crossings)	Crossing Treatment as part of Preferred Alterntaive[1]	Total Daily Vehicle Delay (Vehicle Hours and % of Total)			Total Daily Vehicle Delay (Vehicle Hours)
		Intercity Trains	VRE Trains	Freight Trains	
Alternative 2A: Add a Third or Fourth Main Track					
Featherstone Road	Existing Treatment	1.69 / 13%	0.71 / 5%	10.99 / 82%	13.39
Potomac Avenue	Existing Treatment	1.22 / 13%	0.49 / 5%	7.4 / 81%	9.11
Brent Point Road	Four Quadrant Gates	0.07 / 13%	0.03 / 5%	0.43 / 82%	0.52
Mount Hope Church Road	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Total		**2.98 / 13%**	**1.22 / 5%**	**18.81 / 82%**	**23.01**
Alternative 3B: Add a Third Main Track Through City					
Lansdowne Road	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Mine Road	Four Quadrant Gates	0.77 / 13%	0.31 / 5%	4.7 / 81%	5.78
Summit Crossing Road	Four Quadrant Gates	0.05 / 14%	0 / 0%	0.32 / 86%	0.37
Claiborne Crossing Road	Median Treatment	0.06 / 13%	0 / 0%	0.38 / 87%	0.44
Total		**0.88 / 13%**	**0.31 / 5%**	**5.39 / 82%**	**6.59**
Alternative 4A: Add a Third Main Track					
Stonewall Jackson Road	Four Quadrant Gates	0.24 / 13%	0 / 0%	1.58 / 87%	1.83
Woodford Road	Four Quadrant Gates	0.04 / 12%	0 / 0%	0.3 / 88%	0.34
Woodslane Road	Median Treatment	0.01 / 12%	0 / 0%	0.08 / 88%	0.09
Paige Road	Median Treatment	0.05 / 12%	0 / 0%	0.38 / 88%	0.43
Penola Road	Four Quadrant Gates	0.05 / 13%	0 / 0%	0.34 / 87%	0.38
Colemans Mill Road	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Doswell Road	Four Quadrant Gates	0.03 / 12%	0 / 0%	0.25 / 88%	0.28
Total		**0.43 / 13%**	**0 / 0%**	**2.92 / 87%**	**3.35**
Alternative 5A: Maintain Two Tracks Through Town (No Station Improvements)					
Vaughan Road (Archie Cannon Drive)	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
W Patrick Street	Existing Treatment	0.07 / 11%	0 / 0%	0.56 / 89%	0.63
Draft EIS Impacts[2]	Four Quadrant Gates	0.09 / 11%	0 / 0%	0.64 / 89%	0.72

▶ *Continued – see end of table for notes.*

[33] FHWA's *Railroad-Highway Grade Crossing Handbook – Revised Second Edition* (Handbook) provides guidance criteria for physical/operational improvements for highway-rail at-grade crossings to enhance safety and operation. The Handbook outlines analysis methodologies and sets forth 11 conditions for which public at-grade crossings "should be considered for grade separation or otherwise eliminated" if any one or more of the set thresholds are met or exceeded. FHWA's handbook recommends the application of certain types of improvements relative to the calculated threshold; however, the guidelines are not explicit and are subject to evaluation and feasibility for implementation at the individual crossing. http://safety.fhwa.dot.gov/xings/com_roaduser/07010/07010.pdf

Table 5.15-8: Total Daily Vehicle Delay Results for the Preferred Alternative, By Crossing

Crossing Roadway (At-Grade Public Crossings)	Crossing Treatment as part of Preferred Alterntaive[1]	Total Daily Vehicle Delay (Vehicle Hours and % of Total)			Total Daily Vehicle Delay (Vehicle Hours)
		Intercity Trains	VRE Trains	Freight Trains	
College Avenue / Henry Clay Street	Existing Treatment	0.31 / 11%	0 / 0%	2.51 / 89%	2.82
Draft EIS Impacts[2]	Crossing Closure	0 / 0%	0 / 0%	0 / 0%	0.00
England Street / Thompson Street	Existing Treatment	4.30 / 11%	0 / 0%	34.88 / 89%	39.18
Draft EIS Impacts[2]	Four Quadrant Gates	4.59 / 11%	0 / 0%	37.62 / 89%	41.85
Myrtle Street	Existing Treatment	0.43 / 11%	0 / 0%	3.52 / 89%	3.96
Draft EIS Impacts[2]	Four Quadrant Gates	0.43 / 11%	0 / 0%	3.52 / 89%	3.96
E Francis Street	Existing Treatment	0.43 / 11%	0 / 0%	3.52 / 89%	3.96
Draft EIS Impacts[2]	Four Quadrant Gates	0.43 / 11%	0 / 0%	3.52 / 89%	3.96
Ashcake Road	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Gwathmey Church Road	Four Quadrant Gates	0.02 / 13%	0 / 0%	0.13 / 87%	0.15
Elmont Road	Four Quadrant Gates	0.27 / 13%	0 / 0%	1.76 / 87%	2.03
Cedar Lane	Four Quadrant Gates	0.24 / 13%	0 / 0%	1.58 / 87%	1.83
Mill Road	Median Treatment	0.36 / 13%	0 / 0%	2.3 / 87%	2.66
Total		**6.34 / 11%**	**0 / 0%**	**49.99 / 89%**	**56.33**
Alternative 6F: Full Service, Staples Mill Road / Main Street Stations					
Mountain Road	Existing Treatment	0.7 / 13%	0 / 0%	4.53 / 87%	5.22
Hungary Road	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Hermitage Road (RF&P, Henrico County)	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Draft EIS Impacts[2]	Four Quadrant Gates	0.57 / 13%	0 / 0%	3.76 / 85%	4.34
Hermitage Road (S-Line, Richmond)	Median Treatment	2.17 / 8%	0 / 0%	26.01 / 92%	28.18
Brook Road	Median Treatment	1.72 / 8%	0 / 0%	20.68 / 92%	22.40
St James Street	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
N 2nd Street / Valley Road	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Hospital Street / N 7th Street	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Maury Street	Four Quadrant Gates	0.23 / 18%	0 / 0%	1.02 / 82%	1.25
Goodes Street	Four Quadrant Gates	0.02 / 18%	0 / 0%	0.07 / 82%	0.09
E Commerce Road	Grade Separate	0 / 0%	0 / 0%	0 / 0%	0.00
Ruffin Road	Median Treatment	0.16 / 18%	0 / 0%	0.69 / 82%	0.85
Bells Road	Median Treatment	0.79 / 18%	0 / 0%	3.5 / 82%	4.29
Dale Avenue / Trenton Avenue	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Kingsland Road	Four Quadrant Gates	0.37 / 19%	0 / 0%	1.56 / 81%	1.93
Brinkley Road	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Old Lane	Closure	0 / 0%	0 / 0%	0 / 0%	0.00
Total		**6.15 / 10%**	**0 / 0%**	**58.06 / 90%**	**64.22**
Total for the Preferred Alternative:		**16.78 / 11%**	**1.53 / 1%**	**135.18 / 88%**	**153.50**

Notes: 1. Crossing treatments of grade separation and closure result in a total daily vehicle delay of "0" by physically separating or removing train traffic from roadway vehicle traffic. Crossing treatments of "existing treatment" are existing four quadrant gates at Featherstone Road and Mountain Road, existing gates at Potomac Avenue (subject to the separate Powells Creek to Arkendale project), and existing gates in Ashland.
2. With the exception of the four locations noted, there are no other changes in total daily vehicle delay results from what was reported in the Draft EIS along the length of the Preferred Alternative, so the range of impacts is not repeated in this table.
Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. For Alternative Areas 1, 3, 5, and 6, the color coding reflects the increase or decrease from the corresponding Build Alternative evaluated in the Draft EIS, not the range of impacts shown for all Build Alternatives.

5.16 UTILITIES

Utility impacts for the Preferred Alternative vary widely throughout the length of the Project corridor. Table 5.16-1 summarizes the estimated utility impacts and costs for the Preferred Alternative.

Table 5.16-1: Estimated Utility Relocations and Costs for the Preferred Alternative

Alternative Area	Preferred Alternative	Relocations (in feet, except Major Facility)							Cost ($2017)
		Fiber	Water	Sanitary Sewer	Electric Dist.	Electric Trans.	Gas	Major Facility	
Area 1: Arlington	1B	235	115	165	170	–	50	–	$194,300
Area 2: Northern Virginia	2A	162,286	860	2,300	520	–	81,891	–	$70,333,100
Area 3: Fredericksburg	3B	24,729	90	110	80	–	19,269	1	$15,954,800
Area 4: Central Virginia	4A	389,160	1,300	–	2,105	–	8,155	–	$25,371,300
Area 5: Ashland	5A	61,776	–	–	400	–	600	–	$3,472,300
Area 6: Richmond	6F	147,255	5,280	1,215	21,320	17	6,125	–	$36,704,800
Total for the Preferred Alternative:		**785,441**	**7,645**	**3,790**	**24,595**	**17**	**116,090**	**1**	**$152,030,600**

Note: Cost estimates do not include engineering costs or contingency. Electric transmission relocations are provided by number of towers, not feet of transmission line. Major utility facility relocations are defined as pump houses, electrical substations, or other individual utility facilities, and are provided by number of facilities, not feet. Note that this table is new since the Draft EIS based on the selection of the Preferred Alternative, so no comparison rows are shown.

5.17 SAFETY AND SECURITY

FRA's Track Safety Standards (49 CFR 213) are based on classifications of track that determine maximum operating speed limits, inspection frequencies, and standards of maintenance, among other factors. Higher track classes require more-stringent maintenance standards to support higher allowable maximum operating speed. The proposed maximum speed for intercity passenger trains in the Project corridor is 90 mph, or FRA Class 5. The proposed maximum authorized speed is variable by segment, with increased speeds of 80 to 90 mph in some sections where practicable. Maximum authorized speeds are based on curve and track geometry. Actual operating speeds will be refined during future phases of design and future modeling of train operations. The existing maximum speed for intercity passenger trains is 79 mph, or FRA Class 4. The corresponding maximum operating speed for freight trains is 60 mph and 80 mph on Class 4 and Class 5 track, respectively; however, the maximum operating speed for freight trains is planned to remain at 60 mph throughout the DC2RVA corridor. The proposed improvements described in Chapter 4 will bring rail infrastructure in the selected corridor into compliance with the appropriate FRA standards. FRA will require the preparation of a System Safety Plan upon the completion of this Final EIS and prior to authorization to implement the infrastructure and

service improvements proposed under the DC2RVA Project. Refer to the Basis of Design (Appendix B of the Draft EIS).

As detailed in Section 5.15 above, DRPT analyzed each at-grade highway-rail crossing to determine which safety mechanisms or treatments will be proposed as part of the Preferred Alternative. These treatments include grade separation, closure/consolidation, four-quadrant gates, median treatment, other treatment, or no action. The Project will improve safety of the private at-grade crossings with either locking gates or signalized four-quadrant gates and will improve safety at the pedestrian at-grade crossings.

Safety of the existing public at-grade crossings in the DC2RVA corridor will be improved as part of the Preferred Alternative and is discussed in Section 5.15 of this Final EIS (also see Transportation Technical Report, Appendix S of the Draft EIS).

5.18 PUBLIC HEALTH AND SAFETY

Most of the rail lines in the United States, including the DC2RVA corridor, are used for transportation of various freight, including hazardous materials. FRA and the United States Department of Homeland Security (DHS) regulate the transportation of hazardous materials on railroads. Part of that regulation requires all Class I railroads to maintain a safety plan for transporting such materials. Spills of hazardous materials that may occur during operation would be handled in accordance with the emergency management and response plans of CSXT, Amtrak, and VRE in coordination with local, state, and federal emergency response agencies as appropriate, depending on the situation and location.

The Transportation Security Administration (TSA) of DHS determines the routes for shipment of certain hazardous materials. For security reasons, TSA does not share this information outside specific agencies and freight rail carriers; however, freight rail carriers regularly communicate with emergency management agencies and DHS about materials of concern.

The Preferred Alternative will add 9 new daily intercity passenger round trips (18 total trains per day) on the DC2RVA corridor. The Preferred Alternative will not add any hazardous materials trains on the DC2RVA corridor; however, under both the No Build and Preferred Alternatives, CSXT freight traffic is forecasted to nearly double the volume in operation in 2025. The types of freight trains in operation through the DC2RVA corridor is at the discretion of CSXT and the organic increase may include any type of train. The Preferred Alternative is designed in accordance with FRA regulations, industry standards, and CSXT requirements. DRPT expects that the proposed upgrades to facilities and added rail capacity associated with the Preferred Alternative will increase safety of all train traffic through the DC2RVA corridor by decreasing congestion, maintaining the rail line to current standards in locations where work is being conducted, and replacing older infrastructure. The modern infrastructure and new technologies that will be applied will provide a greater level of safety for all rail traffic, including transportation of hazardous materials.

The DC2RVA Project will also address bike/pedestrian safety at public at-grade crossings along the DC2RVA rail corridor, in keeping with the Project's Basis of Design and applicable FRA, Amtrak, CSXT, and VDOT safety standards. DRPT proposes to maintain existing bicycle and pedestrian facilities (provided in-kind, i.e., to the same level of existing treatment) as part of the Preferred Alternative. Accessibility across the tracks is addressed based on the improvements that are proposed at each crossing. If a Preferred Alternative alignment impacts (i.e., crosses) an

existing pedestrian and/or bicycle crossing, the Project will be required to design that crossing to current safety standards and in compliance with the ADA; this compliance will be required for the entire crossing (and not just the side of the crossing closest to the Project track work). Alternatives that propose no changes to the tracks will result in no changes to the existing bicycle and pedestrian facilities. Bike/pedestrian safety is discussed in Section 5.15 of this Final EIS.

As part of the CTB resolution recommending Alternative 5A as the Preferred Alternative for the Ashland/Hanover area, the CTB directed DRPT to explore the need for other safety improvements to pedestrian and vehicle at-grade crossings within the Town of Ashland, separate from the DCRVA Project. DRPT will continue to work with FRA, VDOT, Town of Ashland, Randolph-Macon College, and CSXT to identify safety improvements for pedestrians, bicycles, and vehicles crossing the tracks in Ashland. Opportunities for additional bicycle and pedestrian accessibility improvements, including new and/or additional ADA-compliant facilities beyond existing levels, could be incorporated during final design, in coordination with FRA, which will occur after funding is obtained.

5.18.1 Children's Health and Safety

Comments on the Draft EIS from EPA suggested inclusion of information regarding potential effects of the Project on children's health pursuant to Federal EO 13045,[34] which directs Federal agencies to make a "high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children" and "ensure that policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." Environmental health risks and safety risks are defined as those risks to health or safety that are "attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)."

The primary activities of the Task Force on Environmental Health Risks and Safety Risks to Children, which is the governing body of the EO, are asthma disparities among children, chemical exposures, climate change, healthy settings (primarily housing), and childhood lead exposure. These topics fall under impacts addressed in Sections 5.1 Water Resources; 5.2 Topography, Geology, and Soils; 5.4 Mineral Resources; 5.5 Solid Wastes and Hazardous Materials; 5.6 Air Quality; 5.11 Community Resources; and 5.14 Parklands, Recreational Areas, and Refuges. The primary action of the Project is to add 9 new daily intercity passenger round trips (18 total trains per day) to the DC2RVA corridor, which will not have an undue impact on children under the risk categories listed above. Notwithstanding, the relationship of these topics to EO 13045 is detailed below.

Environmental health risks due to impacts to Water Resources are not expected under the Preferred Alternative. Surface waters (such as streams), wetlands, floodplains, and stormwater, all have temporary and permanent impacts, but the Preferred Alternative will incorporate BMPs and improved stormwater facilities, which will mitigate new conditions and may improve existing conditions in water quality. Avoidance and minimization of effects to drinking water will continue to occur through the final design process to the extent practicable.

[34] https://www.epa.gov/children/executive-order-13045-protection-children-environmental-health-risks-and-safety-risks

Environmental health risks due to topography, geology and soils are not expected; the Preferred Alternative is not anticipated to affect local topography, geology, and soils.

Environmental health risks due to solid wastes and hazardous materials are limited. Sites potentially containing these substances have been identified throughout the LOD and site investigations will occur before the acquisition of right-of-way and construction. Remediation of any sites will be conducted in compliance with applicable federal, state, and local environmental laws and will be coordinated with EPA, Virginia DEQ, and other federal or state agencies as necessary. All waste material from construction and any additional hazardous materials sites discovered during construction will be disposed of in compliance with applicable federal, state, and local regulations.

DRPT does not environmental health risks due to changes in air quality. Annual pollutant emissions generated by the trains added by this Project (NO_x, VOCs, particulate matter) are all below general conformity minimal threshold values. Localized increases in MSAT emissions by vehicles other than trains could occur at maintenance facilities; the only maintenance facility along the DC2RVA corridor is proposed at the Bellwood Wye Yard, as detailed in Section 4.3.6.3 of this Final EIS. Other maintenance facilities associated with increases in intercity passenger rail service extending from Hampton Roads or North Carolina and to destinations in Washington, D.C. or the Northeast Corridor (NEC) will be evaluated under separate environmental review documents, as required. However, no residential development or other sensitive land uses are directly adjacent to the proposed maintenance facilities. A hot-spot analysis of CO from highway vehicles operations resulted in concentrations well below the NAAQS. Carbon dioxide emissions under the Preferred Alternative are projected to be lower than the No Build Alternative.

Community resources that could be affected by environmental health risks to children include schools, community facilities, and access to emergency services. There are no adverse effects to any of these resources under the Preferred Alternative. Parks and parklands are also resources that are used by children. Impacts to parkland and recreational facilities were avoided and minimized to the maximum extent possible. With the exception of one park, all potential impacts are temporary and will not affect park functions.

Another potential concern may be traffic safety as it relates to pedestrian and bicycle travel by children, which for this Project would be at-grade roadway crossings of the railroad corridor. As described above, DRPT proposed that existing bicycle and pedestrian facilities be maintained as part of the Preferred Alternative, with safety improvements as needed.

Based on the above, DRPT does not anticipate that the Project will pose an environmental health or safety risk that disproportionately affects children.

5.19 CONSTRUCTION IMPACTS

Construction impacts associated with a transportation project are those impacts that are temporary or short term and that occur only during construction. They can involve temporary changes in land use and access, air quality, noise levels, water quality, and wildlife habitat. The following provides an overview of the types and extent of potential construction impacts that may occur with the implementation of the Preferred Alternative. BMPs and other measures that can be used as appropriate to mitigate any temporary construction impacts are also presented. Refer to the Constructability Technical Report (Appendix L of the Draft EIS) for additional information regarding the construction of the Project.

5.19.1 Impacts

5.19.1.1 Rail

Track closures and shifts can have major effects on rail operations. New stations and station alterations can also have effects on transit users. Construction of the additional track, infrastructure additions and modification to control points, station infrastructure with additional platforms, and speed increases require a phased construction approach.

5.19.1.2 Land Use and Access

Construction activities for the Preferred Alternative could result in temporary and localized detours, modifications to access, and increases in truck traffic. Access to businesses and homes could be temporarily disrupted due to temporary detours that are necessary to allow ample space for equipment staging and construction. Additional information can be found in Section 5.11 Community Resources.

5.19.1.3 Air Quality

Demolition and construction activities can result in short-term increases in fugitive dust and equipment-related particulate emissions in and around the Project corridor. Reasonable precautions will be taken during project construction to limit the emissions of VOC and NO_x. The potential air quality effects will be short term, occurring only while demolition and construction work is in progress and local conditions are appropriate. The potential for fugitive dust emissions typically is associated with building demolition, ground clearing, site preparation, grading, stockpiling of materials, onsite movement of equipment, and transportation of materials. The potential is greatest during dry periods, periods of intense construction activity, and during high wind conditions.

GHG emissions will also be generated during construction; however, as documented in Section 5.6.5, these emissions will be relatively minor given the nature and size of the Project and the limited duration of construction activities. Additional information on air quality impacts can be found in Section 5.6.

5.19.1.4 Noise

Noise levels will not be substantially altered by construction, which includes noise generated by heavy equipment during construction activities. The potential for noise impacts during construction is correlated to the proximity of sensitive noise receptors to the proposed construction activity. The potential for noise impacts during construction typically increases in urban and suburban areas because of the higher population densities found in those areas; however, noise in urban areas might be less noticeable than in rural areas because ambient noise levels are higher in urban areas. Construction noise impacts are temporary and, typically, progress linearly along transportation corridor construction projects. As construction approaches an area, noise impacts to receptors in that area would begin to increase over a period of time, reach a peak, and then dissipate as construction moves past the area. Additional information on noise impacts can be found in Section 5.7.

5.19.1.5 Water Resources

Construction could potentially result in short-term effects such as increased sedimentation, increase in turbidity from in-stream work, and possible spills, or non-point source pollutants

entering groundwater or surface water from stormwater runoff. Construction activities that could affect stormwater runoff include excavation to widen "cut" sections and to remove unsuitable (organic) material from "fill" sections; filling and placing ballast to support new track; relocating access roads; relocating or creating new trackside swales; and any substructure work required for bridge or culvert installation, or station improvements. Construction staging areas and haul roads, if needed, could also disturb the ground, potentially causing erosion and sedimentation. Additionally, culvert installation may require pump-around methods, resulting in a temporary cessation of flow through stream sections. Additional information on water resource impacts can be found in Section 5.1.

5.19.1.6 Wildlife and Habitat

Human presence during construction and the associated construction noise, such as from passing equipment, piling emplacement, and blasting of bedrock, may temporarily displace some species of wildlife. The noises associated with construction may also mask territorial vocalizations of birds, interfering temporarily with breeding. Amphibians, which breed more commonly at dusk or night, are less likely to be affected. Construction in forested areas may result in mortality of amphibians, reptiles, and small mammals within the work zone and the loss of nesting birds if construction is initiated during nesting season. The clearing of terrestrial and aquatic vegetated cover within the construction footprint will temporarily displace certain habitat areas, and the mechanical removal of cover will cause animal migration away from the disturbance, resulting in a temporary decrease in available habitat and increased competition for remaining habitat. Water quality and therefore aquatic species may be affected temporarily by runoff from construction areas and permanently through runoff from increased impervious surfaces. Anadromous fish movements could be interrupted during construction. Opportunistic or invasive plant species may have a competitive advantage in colonizing disturbed areas during early construction activities. Many of these effects can be offset through application of BMPs. Additional information on wildlife and habitat impacts can be found in Section 5.10.

5.19.2 Avoidance, Minimization, and Mitigation Evaluation—Construction Impacts

5.19.2.1 Rail

During construction, the goal will be to maintain two mainline tracks in operation wherever possible; however, there will likely be some track outages and service disruptions during construction. The Project's Corridor Service Development Plan (SDP) defines the phased implementation of improvements relative to the incremental expansion of service, and the preliminary engineering includes a construction staging plan to minimize track outages during construction; refer to Chapter 7 for full details on the SDP and preliminary and final design. Station improvements for platform additions and pedestrian access will be constructed early to support the new track when placed in operation.

5.19.2.2 Land Use and Access

Temporary disruptions to driving patterns and access are often unavoidable but will be minimized to the extent possible by carefully planning for maintenance of traffic during the construction process. The Corridor SDP will define the phased implementation of improvements relative to the incremental expansion of service. Preliminary engineering and final design plans will include a construction staging plan to minimize roadway outages during construction. Safety concerns due to the presence of heavy construction equipment during Project construction will

be mitigated using appropriate signage and fencing to separate pedestrians and vehicles from construction areas and equipment. All land use temporarily affected by construction activities will be returned to its original use after construction is complete. All temporary access for construction vehicles will be removed and returned to its original land use.

5.19.2.3 Air Quality

DRPT will identify the appropriate BMPs to minimize air quality effects during construction, including methods outlined in 9 VAC 5-50-60 et seq. of the Regulations for the Control and Abatement of Air Pollution (Air Regulations). The VDOT *Road and Bridge Specifications* also include provisions on fugitive dust control. Under these provisions, dust and airborne dirt generated by construction activities will be controlled through dust control procedures or a specific dust control plan, when warranted. The contractor and DRPT will meet to review the nature and extent of dust-generating activities and will cooperatively develop specific types of control techniques appropriate to the specific situation. Techniques that may warrant consideration include measures such as minimizing track-out of soil onto nearby publicly traveled roads, reducing speed on unpaved roads, covering haul vehicles, and applying chemical dust suppressants or water to exposed surfaces, particularly those on which construction vehicles travel. With the application of appropriate measures to limit dust emissions during construction, this Project will not cause any significant, short-term particulate matter air quality impacts.

If open burning or use of incineration devices are to be used during construction, DRPT will comply with 9 VAC 5-130 et seq. of the Air Regulations for open burning and coordinate with VDEQ and local officials to determine whether permits or other requirements are applicable. DRPT will adhere to requirements of 9 VAC 5-80, Article 6, Permits for New and Modified Sources, for the installation of fuel-burning equipment or other air pollution generating equipment during construction. Finally, DRPT will adhere to limitations on the use of "cut-back" during construction consistent with 9 VAC 5-45-780 et seq.

5.19.2.4 Noise

Practices to minimize the effects of construction noise will be in accordance with Section 107.16(b)(3) of VDOT's 2016 *Road and Bridge Specification*s.

While construction noise is unavoidable in most cases, steps can be taken to minimize the impact, such as the following:

- Keep all equipment well maintained, tuned, and properly lubricated to minimize at-source noise production
- Use sound attenuation devices on exhaust ports
- Substitute the use of flag persons to control construction vehicle movements, instead of using audible back-up alarms for vehicles
- Minimize unnecessary idling of heavy equipment and machinery, especially diesel engines and generators, when not actively in use
- Prohibit construction during sensitive nighttime, early evening, and early morning hours

DRPT will evaluate construction noise mitigation measures in more detail when an analysis of construction noise based on an actual construction plan can be completed and will ensure that all

appropriate mitigation measures are employed, including the above measures, in construction contracts.

5.19.2.5 Water Resources

All temporary and permanent impacts to wetlands and water resources associated with construction activities are regulated by USACE and Virginia DEQ through Sections 404 and 401 of the Clean Water Act, as well as by the Virginia Water Protection Program. DRPT will be responsible for ensuring that all Section 404 and 401 permit requirements are met by the Project contractors.

Stormwater discharges to jurisdictional wetlands and waterways, such as discharges from construction sites, are regulated through the National Pollutant Discharge Elimination System (NPDES) [35] permit program. An NPDES construction permit would be required for any construction site that disturbs more than one acre (including sites that are smaller than one acre but are included as part of a larger project or development). Through issuance of an NPDES stormwater permit, the regulating agency would ensure that enough erosion and sediment control measures are specified for the activity and that impacts are further reduced by using construction BMPs.

Erosion and sedimentation control plans for highway and rail improvements, including staging areas, will be required for work that will include ground disturbance, and they will describe the measures to be employed as erosion control, sedimentation control, temporary stormwater management measures, and dust control. Erosion control plans will also address in-water work at stream crossing locations. These plans must be approved before site construction can proceed and will be developed in accordance with regulations set forth by VDCR. Implementation of the Project-specific plan will be expected to minimize impacts of erosion and sedimentation during construction. Erosion and sediment control measures will be implemented throughout the construction period to minimize water quality impacts from increased levels of sedimentation and turbidity. Control measures may include berms, dikes, sediment basins, fiber mats, straw silt barriers, netting, mulch, temporary and permanent seeding, and other methods. Construction impacts to in-stream aquatic habitats will be minimized to the extent practicable by avoiding stream relocations and by crossing streams at right angles where possible. To the extent possible, construction equipment will be restricted from fording and otherwise disrupting in-stream habitats. Staging areas for heavy equipment, material storage, and short-term field offices will be chosen carefully and situated away from sensitive areas.

5.19.2.6 Wildlife and Habitat

DRPT anticipates that construction will be monitored to adhere to a strict schedule with possible time of year restrictions to avoid disrupting the critical life cycles of both aquatic and terrestrial wildlife, in particular, threatened and endangered species. In addition, DRPT will coordinate with the USFWS if necessary as the Project progresses. The spread of invasive plant species will be minimized during construction through cleaning of equipment and machinery between sites to reduce transport of undesirable plant species and prompt revegetation of disturbed areas. Temporary and permanent revegetation establishment, in accordance with VDOT's *Road and Bridge Specifications*, will minimize the extent and duration of undesirable plant growth and

[35] The NPDES was made possible by the passage of the Federal Water Pollution Control Act Amendments of 1972 (also referred to as the Clean Water Act, 33 USC 23 §§ 1251–1387).

reduce sediment runoff. Work in streams and wetlands will also be minimized to the extent practicable, and necessary in-stream work will be done in the dry or with the use of sediment curtains and other measures to minimize impacts to aquatic species. Aquatic and terrestrial habitat will be restored in temporary construction areas as the native vegetation reestablishes over time.

5.20 INDIRECT AND CUMULATIVE EFFECTS

The following section describes the potential indirect and cumulative effects associated with the Preferred Alternative. A number of comments regarding these topics were received on the Draft EIS and therefore the following discussion is more detailed than other sections of this condensed chapter.

5.20.1 Indirect Effects

Indirect effects are those that are caused by an action and are later in time or farther removed in distance, but still are reasonably foreseeable. Indirect effects may include:

- **Encroachment-alteration impacts:** Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomic) on the environment
- **Induced growth impacts:** Project-influenced development effects (land use)
- **Impacts related to induced growth:** effects related to Project-influenced development effects (impacts of changed land uses on the human and natural environment)

As described more fully in Section 4.20.1 of the Draft EIS, DRPT identified the specific issues and resources to be considered in the indirect effects analysis based on collaboration with stakeholders, review of Project direction and goals, and inventory of notable environmental features that might be affected by the Project directly or indirectly. DRPT determined that the following impact areas could potentially experience indirect effects from the Preferred Alternative.

5.20.1.1 Socioeconomics and Land Use

Section 5.11.5 of this Final EIS describes direct effects on land uses. All existing rail stations are in urban and suburban locations where considerable development already exists. Under the Preferred Alternative, further intensification of development densities could occur at these locations in response to demand for residential space and commercial services in areas convenient to the stations, generally within a 0.5-mile radius from the station. Government agencies and other entities often prepare planning documents to anticipate and guide the form and density of such development. For example, Amtrak prepared a Master Plan for Washington, D.C.'s Union Station (Amtrak, 2012). The Master Plan provides for relieving existing and future passenger rail congestion and accommodating triple the current number of passengers and double the current number of trains (including the new intercity passenger trains proposed by the Project) within the existing station footprint. This would be accomplished by improving existing facilities and constructing new facilities under and above the existing facilities, including air rights development of retail, hotel, commercial, and residential spaces. Construction of the elements proposed in the Master Plan would be phased over a 15- to 20-year period. Phase 4 of the Master Plan provides further expanded tracks and platforms on a lower level and creation of a new Amtrak lower-level concourse, which would accommodate increased intercity passenger rail

service south to Virginia and the Southeastern United States. Aside from the facilities that would specifically be built to serve increased intercity passenger rail services, it is difficult to determine specific increments of other types of development that could be attributed to actual implementation of the services. The variety of other passenger rail services at the station (e.g., NEC, VRE, Metrorail), as well as the dense and dynamic existing and planned residential and commercial activities, also contribute to the overall development status of the station area and surrounding lands.

The City of Alexandria's Master Plan sets goals of encouraging quality, high-density mixed-use development near the King Street Metro Station, which is adjacent to the Alexandria Union Station served by Amtrak and VRE. The City of Richmond's Downtown Master Plan (2009) calls for Main Street Station to be a multimodal transportation hub for downtown Richmond. Recent and ongoing construction at the Main Street Station is aimed at rehabilitating the condition of the facilities, furthering the multimodal functions of the station, and promoting retail and social activities within and around the station.

Other stations in the DC2RVA corridor that will be served by the additional intercity passenger trains may also experience some increment of increased development to take advantage of the transportation benefits provided; however, such development will be consistent with the urban or suburban patterns already existing and will be consistent with local land use planning and goals. Moreover, such development will only enhance the utilization and effectiveness of the passenger rail services.

The Preferred Alternative involves improvements along an existing rail facility. As such, the Preferred Alternative will not divide or segment existing communities or interfere with community cohesion. Existing communities adjacent to the rail corridor are accustomed to the presence of the rail facility, the train traffic on it, and the noise and visual effects associated with it. However, in sections where parallel track will be added, the rail facility will be in incrementally closer proximity to residences and businesses, which may increase noise levels and/or remove visual buffers. It is possible that some residents or businesses may leave the area because of such increased proximity effects. It is also possible, however, that some people may be attracted to communities adjacent to the rail stations because of the improved travel times and access. While the increases in population and development could occur as a result of improved access to intercity passenger rail transportation along the DC2RVA corridor, local officials generally perceive such development as positive in that it helps promote more robust use of mass transit, as opposed to personal vehicles.

The Preferred Alternative could contribute positively to economic activity along the DC2RVA corridor in the short term by providing jobs during Project design and construction and in the long term by reducing congestion, improving intercity travel time and reliability, and improving accessibility to employment at other location within the region by rail.

5.20.1.2 Parks and Recreation Areas

Section 5.14.1 of this Final EIS describes direct effects of the Project on parks and recreation areas. Many publicly owned parks and recreation areas exist immediately adjacent to the rail corridor. None of these properties are at station locations where new or modified access will be provided to accommodate intercity passenger rail services. Accordingly, the Preferred Alternative will not result in induced growth effects on parks or recreation areas; however, these properties could potentially experience encroachment-alteration indirect effects due to ongoing proximity effects

over time, such as air quality, noise, and visual impacts from the railroad and trains operating on it. DRPT expects that any impacts will be minor and will not differ substantially from the No Build Alternative.

5.20.1.3 Historic Properties

As described in Section 5.13, the Preferred Alternative will adversely affect 21 historic properties (8 archaeological sites and 13 above-ground resources); however, only 1 is an indirect/cumulative effect on a historic resource, as described below. There are no adverse effects to battlefields.

Rippon Lodge (076-0023): One of the oldest houses in Prince William County, the vista from Rippon Lodge looking down Neabsco Creek (and current site of the railroad and associated bridge) was documented by Benjamin Latrobe in the late-eighteenth century. The waterway viewshed is a character-defining feature of this significant resource. A new railroad bridge across Neabsco Creek will be built as part of this Project. The new bridge will be west of the existing span and will be a new primary element within the viewshed from Rippon Lodge, thus impacting a character-defining element of the property. Because the Project will alter the viewshed but will not physically modify the resource, the Project will have an indirect effect on this historic property.

Refer to Section 5.13 for discussion of the historic resources that are the subject of a direct effect due to physical modifications of the Preferred Alternative. Refer to Appendix D of this Final EIS for additional information on historic resources and the Section 106 determination of effect. Chapter 3 of this Final EIS includes additional information regarding the cultural resources in Fredericksburg, Ashland, and Richmond. These expanded discussions are intended to provide the reader with a better understanding of the historic context of these areas and avoidance measures taken to mitigate potential impacts.

5.20.1.4 Water Resources

Section 5.1 of this Final EIS describes the direct effects of the Project on water resources. The Preferred Alternative may also have incremental induced development effects on water resources near station areas; however, given the urban and suburban locations of these stations, land cover is relatively impervious, and the potential for increased runoff and diminished water quality is less than it would be if the induced development were to occur in more naturalized land cover types (e.g., forest).

The Preferred Alternative involves direct losses of streams and wetlands as a result of track additions and modifications. Potential temporary indirect impacts of the Preferred Alternative during Project construction include increased downstream sedimentation and turbidity from in-stream work, and possible spills or non-point source pollutants entering groundwater or surface water from storm runoff. The Preferred Alternative will incrementally increase the amount of impervious surface, resulting in increased stormwater runoff flows from affected surfaces. If untreated, increased flows will incrementally increase the transport of sediments and roadway contaminants to streams crossed by or adjacent to the rail corridor. These pollutants can then be transported farther downstream and into wetland areas. Pollutant levels in runoff and the extent of downstream impacts are difficult to quantify because there are many variables surrounding land use and stream dynamics.

5.20.1.5 Floodplains

Section 5.1.1.2 of this Final EIS describes the direct effects of the Project on floodplains. The Preferred Alternative could have induced development effects on the 100-year floodplains in the vicinity of three stations: Alexandria Station, Fredericksburg Station, and Richmond's Main Street Station. However, development already exists within each of these floodplain areas. Furthermore, any new development or redevelopment in designated floodplains within all three potential impact areas will be subject to restrictions and conditions imposed under local floodplain ordinances and floodplain overlay districts. These ordinances and district designations are aimed at maintaining community safety from floods; protecting against loss of life, health, and property from floods; preserving and protecting floodplains; and requiring appropriate construction practices to minimize flood damage. With respect to encroachment-alteration indirect effects, the existing rail tracks displaced 100-year floodplains by placing bridges and culverts at stream crossings within the floodplains. The Preferred Alternative will require new or modified bridges and extensions of culverts, which could potentially cause indirect effects with respect to changes in flood flow elevations and changes in floodplain configurations. While floodplain encroachments are likely, Project design will be consistent with federal policies and procedures for the location and hydraulic design of encroachments on floodplains. Therefore, DRPT does not expect that the Preferred Alternative will cause notable increases in flood levels, increase the probability of flooding, or increase the potential for property loss and hazard to life. Furthermore, the Preferred Alternative is not expected to have substantial indirect effects on natural and beneficial floodplain values.

5.20.1.6 Wildlife and Habitat

Section 5.10 of this Final EIS describes the direct effects of the Project on wildlife and habitat, including threatened and endangered species. DRPT does not expect the Preferred Alternative to have notable induced development impacts on wildlife and habitat because all locations of potential induced development are in urban and suburban areas where available natural habitat is very limited. With respect to encroachment-alteration indirect effects of the Preferred Alternative, wildlife habitat along the rail corridor is highly variable.

In some areas, development has entirely displaced or at least fragmented forested habitat. In other areas, sizable blocks of forested habitat remain, though in many cases it is fragmented by agricultural activities. The Preferred Alternative may incrementally increase ongoing habitat impacts due to expansion of the rail facilities. Adjacent habitats will be further fragmented by removal of habitat for construction of the proposed improvements. Such habitat disturbances and losses could incrementally increase competition for resources in diminished habitats by displaced populations.

The indirect impacts to water quality discussed earlier will potentially affect habitat quality for aquatic species living in streams and wetlands downstream of the rail corridor. Sediments and pollutants in runoff may contribute to changes in macrobenthic community structure and composition, affecting fish and amphibian populations that rely on them as a food source, as well as birds and mammals higher on the food chain.

5.20.1.7 Summary of Indirect Effects and Mitigation

DRPT expects that the consequences of the indirect effects of the Preferred Alternative will be limited because:

- The proposed improvements will modify an existing rail facility within which the locations of potential induced development are limited to station areas where development already is prevalent.
- Any induced development that may occur will be largely compatible with existing development and will actually be desirable in the context of promoting more compact development patterns consistent with rail mass transit, multimodal transportation hubs, and facilitation of intercity travel that does not rely on the automobile.
- Any induced development will be consistent with local planning goals and land use plans.
- The narrow linear nature of the Preferred Alternative presents a limited footprint of direct impacts and, therefore, a limited potential for expansive indirect impacts attributable to encroachment and alteration.
- Impacts of the Preferred Alternative can be minimized and mitigated in many ways, including:
  - Implementation of temporary and permanent stormwater management features and erosion and sediment controls.
  - Compensation for unavoidable stream and wetland impacts.
  - Resolution of adverse effects on historic properties through design changes and other measures developed in consultation with DHR and other Section 106 consulting parties.

5.20.2 Cumulative Effects

Cumulative effects are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. FRA and DRPT consider reasonably foreseeable as planned and funded projects. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. The cumulative effects analysis used a five-part evaluation process based on FHWA guidance:

- What is the geographic area affected by the Project?
- What are the resources affected by the Project?
- What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
- What were those impacts?
- What is the overall impact on these various resources from the accumulation of the actions?

Using this process, the following cumulative effects of the Preferred Alternative were identified.

5.20.2.1 Socioeconomics and Land Use

Impact from Preferred Alternative. The land use and relocations impacts of the Preferred Alternative are relatively modest compared to the length of the Project, as described in Section

5.11 of this Final EIS. The total number of residential relocations will be five. Acquisition of properties and relocations of families, businesses, farms, and nonprofit organizations will occur in accordance with standards of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601). Any individual displaced as a result of the acquisition of real property, in whole or in part, will be eligible to receive reimbursement for the fair market value of the property acquired, as well as moving costs. Displaced property owners will be provided relocation assistance and advisory services together with the assurance of the availability of decent, safe, and sanitary housing. Relocation resources will be made available to all relocatees without discrimination.

Noise and vibration caused by trains currently operating on the corridor were considered as part of the existing noise environment. As discussed in Section 4.2 of this Final EIS, DRPT anticipates that there will be continued growth in freight volumes, and that this growth will result in a commensurate increase in number of freight trains as well as the effects of the freight trains on delay, energy use, air emissions, and noise. These effects will happen in response to regional and national economic activity independent of the DC2RVA Project, but will contribute to the cumulative effect.

The Preferred Alternative will reduce congestion and improve reliability within the rail corridor. These improvements to mobility will generally contribute positively to the quality of life for local communities and support the anticipated continued economic growth. The Preferred Alternative could induce more or denser development at station locations as a result of the improved transportation services; however, such development generally will be desirable to enhance the effectiveness of passenger rail services. Furthermore, because the station locations are in already urbanized areas, such development will be consistent with local plans, policies, and goals.

Impacts from Past and Present Actions. Past and present actions have changed the landscape dramatically and have resulted in the conversion of forest land to agricultural lands to residential, commercial, and industrial land uses as the populations and economies of localities along the DC2RVA corridor grew. It is presumed that in prehistoric times, forests once covered the entirety of the area surrounding the rail corridor. Those forests were displaced by agriculture and development long before modern times. Therefore, tree cover that exists today is due to multiple regenerations of tree growth. Agriculture, particularly tobacco farming, depleted the soil, and much of the soil that was not depleted washed away due to erosion of unprotected soil surfaces. Livestock waste contributed to water pollution. By the mid-1950s, development accelerated sharply in Northern Virginia, largely as a result of a growing federal government sector and post-World War II prosperity. Housing booms in counties bordering Washington, D.C. were fed by postwar affluence and the desire of people to own their own homes and land. The Interstate Highway Act authorized construction of high speed roads that made living farther from work a possibility. By the time I-95 was completed between Richmond and Washington, D.C., several residential subdivisions had already been built in jurisdictions along the DC2RVA corridor. More recently, the City of Fredericksburg and portions of the surrounding Stafford and Spotsylvania Counties have become bedroom communities to the metropolitan Washington region, as well as becoming economic activity centers themselves. The City of Richmond and surrounding counties collectively have become the third largest metropolitan area in Virginia ranked by population. The urbanization of these areas has created neighborhoods, facilitated social interaction, provided business and employment opportunities, facilitated economies of scale in community services such as education and public safety, and provided connectivity through robust multimodal transportation systems.

Potential Impact on Resources from Potential Future Actions. Foreseeable future projects may have various socioeconomic and land use impacts throughout the Project corridor; however, there is not enough information to reasonably quantify them. The foreseeable transportation projects are all along existing transportation facilities. As such, disruptive socioeconomic and land use effects could be largely limited by containing construction within existing rights-of-way to the extent possible. The rail corridor parallels I-95, Route 1, and Route 60 along the primary north-south transportation corridor along the eastern seaboard. Roads and highways along this corridor are constantly undergoing improvements, repairs, and expansions, such as the I-95 Express Lanes extension to Fredericksburg,[36] and these projects are independent of the DC2RVA Project. VDOT also has a series of I-95 improvement projects underway in Richmond to improve safety and traffic movement and to modernize existing assets and information technology infrastructure.[37] DRPT has coordinated with VDOT and the City of Richmond throughout the Project and will continue to do so through future phases of design. Note that these roadway projects also would be subject to NEPA (if federal actions are involved) and other regulatory processes that are designed to help avoid substantial impacts to communities. Future projects also would be guided by local comprehensive plans, which identify areas for compatible planned growth while accommodating future planned transportation improvements. Noise impacts associated with this future development are anticipated to occur mostly within existing urban and suburban environments, consistent with local community comprehensive plans.

Another example of a reasonably foreseeable future project is the proposed Potomac Yard Metrorail Station to be served by the Yellow and Blue Metrorail lines. The FTA and the NPS issued their Records of Decision for the Potomac Yard Metrorail Station in Fall 2016; this being the last step in the review process under the NEPA. WMATA has let a contract for construction of the station, with completion projected as early 2022.

Cumulative Effect. The nature and magnitude of the direct and indirect effects of the Preferred Alternative local land uses and socioeconomic elements are small in the context of the effects of past, present, and reasonably foreseeable future actions.

5.20.2.2 Parks and Recreational Areas

Impact from Preferred Alternative. There will be direct effects of the Preferred Alternative on publicly owned parks and recreational areas. As discussed in Section 5.14 of this Final EIS, land at 16 parks/trails will be directly used either permanently or temporarily by the Preferred Alternative. None of these impacts will affect park activities. Noise levels under the Preferred Alternative will be higher than existing noise levels or No Build Alternative noise levels; however, such noise levels will not rise to a level as to render the parklands unsuitable for their designated public recreational uses.

Impacts from Past and Present Actions. Past actions have preserved notable acreages of land throughout the Project corridor for conservation and recreational uses. At the same time, some past actions may have had direct physical encroachment impacts on some parks and recreation areas. Population increases and associated traffic increases may have caused higher levels of traffic noise within parks and placed greater wear and tear on park facilities due to greater use.

[36] http://www.virginiadot.org/projects/fredericksburg/i-95_express_lanes_fredericksburg_extension.asp

[37] http://www.virginiadot.org/projects/richmond/i-95_corridor_improvements.asp and http://www.virginiadot.org/projects/richmond/i-95-64_overlap_study.asp

Development adjacent to parks may have contributed to visual impacts to parks and increased volumes of stormwater flow to streams running through parks.

Potential Impact on Resources from Potential Future Actions. Foreseeable future projects may have various park and recreational area impacts throughout the Project corridor; however, there is not enough information to reasonably quantify them. Notwithstanding, the projects that would be subject to federal transportation agency approvals also would be subject to Section 4(f) provisions that require avoidance and minimization of uses of land from publicly owned public parks and recreation areas.

Cumulative Effect. As discussed in Section 5.14 of this Final EIS, the Preferred Alternative will have only minor impacts to parks and recreation areas. Additionally, the legal protections afforded parks and recreation areas by Section 4(f) for federal-aid transportation projects and the plan review processes by local jurisdictions for other projects greatly limit the potential for impacts by future projects. Accordingly, no substantial adverse cumulative impacts to parks and recreation areas by the Preferred Alternative are anticipated.

5.20.2.3 Historic Properties

Impact from Preferred Alternative. The Preferred Alternative will adversely affect 21 historic properties; refer to Section 5.13 for discussion of direct effects to historic properties and Section 5.20.1.3 for discussion of indirect effects to historic properties. A formal effects determination has been coordinated with DHR. Where FRA has determined and DHR has confirmed that the Preferred Alternative will have an adverse effect on historic properties, Section 106 efforts have been undertaken to avoid, minimize, or mitigate the adverse effects. As part of this process, FRA and DRPT have conducted ongoing consultation with DHR, ACHP and other consulting parties, such as the NPS, local historical societies, and localities Since a Programmatic Agreement was executed for the larger 2002 Tier 1 EIS, a Section 106 Draft MOA has been developed to outline tasks that will be undertaken to mitigate adverse effects (see Appendix K of this Final EIS); it will be finalized as part of the ROD.

Impacts from Past and Present Actions. Damage to or loss of historic properties was far more prevalent from past actions that occurred before the NHPA. The NHPA and the establishment of historic resource protection objectives at the local planning level have reduced the rate of impacts to historic resources.

Potential Impact on Historic Properties from Potential Future Actions. Notwithstanding the protections now afforded, conflicts between protection of historic properties and development and transportation projects are expected to continue from potential future actions, primarily because non-federal actions, such as private developments, are not subject to the NHPA. Potential effects include permanent loss and proximity effects (noise and visual impacts) from present and planned future development and transportation projects. If federal or state actions are involved, however, the NHPA may be applicable and afford considerations.

For example, DRPT and FRA fully understand the sensitivity and significance of the Shockoe Bottom area and potential effects of this Project as well as the I-95 improvement projects underway in Richmond, including the I-95/Broad Street interchange improvements. Studies to record and evaluate archaeological and architectural properties in this area have been ongoing since 2006. Above and below ground cultural resources in the Shockoe Bottom area of Richmond are referenced in the Draft EIS, Final EIS, and associated technical reports in a manner consistent with DHR guidelines on cultural resource studies and per the process set forth in Section 106 of

the NHPA, ensuring that all effects of the proposed undertaking on historic properties were taken into consideration. This includes the Burial Ground for Negros, Lumpkins Jail/Devil's Half Acre, and Grave Yard for Free People of Color and Slaves. Although a Richmond Slave District with associated boundaries has not been recorded at DHR, one of the mitigations for the adverse effects to the Shockoe Valley and Tobacco Row Historic District completed as part of this Project is the development of a roster of potential resources and a boundary for the district to be coordinated with the DHR (see the Section 106 Draft MOA, which is Appendix K of this Final EIS). Thorough development of such a district and potential NRHP nomination building from this data may be an appropriate future study to be completed by the City or another entity as described in Final EIS Chapter 3. In addition, a series of commitments have been made for the Grave Yard for Free People of Color and Slaves (44HE1203) near Hospital Street. Although the Project will have no adverse effect on this resource based on current designs, DRPT has committed to completing a thorough landscape study and boundary evaluation, additional archaeological testing, and archaeological monitoring during Project construction to assure that no human remains are impacted by the work. These approaches, as well as a robust dialogue on historic properties in the Shockoe Bottom area, has taken place during numerous meetings, telephone calls, and emails as a result of comments provided by several consulting parties, most notably the National Trust for Historic Preservation. Close coordination was conducted with DHR as well as other local stakeholders including the City of Richmond, Historic Richmond Foundation, Preservation Virginia, National Trust for Historic Preservation, NPS, Richmond Archaeology, Rivanna Archaeology, VCU, and the ACHP.

Cumulative Effect. The Preferred Alternative will adversely affect historic properties; however, feasible and prudent avoidance alternatives and measures to minimize harm to historic properties have been incorporated into the Preferred Alternative.

5.20.2.4 Water Resources

Impact from Preferred Alternative. The Preferred Alternative crosses 163 rivers and streams, 51 of which are characterized as impaired on Virginia's Section 303(d) list. Details on the impacts of the Preferred Alternative upon these waterbodies are provided in Section 5.1 of this Final EIS. Unavoidable impacts to streams and wetlands will be mitigated, as outlined in Section 5.1.6.

As shown in Figure 3.1-1 of the Draft EIS, the following boundaries of watersheds are crossed by the Preferred Alternative:

- The Middle Potomac-Anacostia-Occoquan Watershed encompasses approximately 831,483 acres, with roughly 45 percent of the watershed forested.
- The Lower Potomac River Watershed encompasses approximately 1,160,160 acres, most of which is forested.
- The Pamunkey Watershed encompasses approximately 941,032 acres, most of which is forested.
- The Lower Rappahannock Watershed encompasses approximately 738,446 acres. Half of the area is forested, with the remainder consisting largely of agricultural and developed land.
- The Mattaponi Watershed encompasses approximately 582,426 acres of which approximately 70 percent is forested.
- The Middle James-Willis Watershed encompasses approximately 615,449 acres.

- The Lower James Watershed encompasses approximately 1,135,000 acres, approximately 48 percent of which is in urban and suburban uses.

Impacts from Past and Present Actions. Human occupation of lands along and near the Project corridor dates to the Paleo-Indian period, which is thought to have begun by around 12,000 B.C. Since that time, progressively more intense human uses of the land have occurred. This progression can be summarized as follows:

- Earliest occupations—the population density was very low, and people lived in small, highly mobile bands, subsisting on wild foods and hunting animals. Over time, occupants began to develop a more sedentary lifestyle, resulting in clearing of woodlands, implementation of rudimentary agriculture, and establishment of villages.
- European settlers conquered the indigenous tribes and opened the region to new settlement. However, the settlers learned from the Native Americans how to farm and where and how to catch fish and game. Ancient transportation arteries were adopted by the Europeans. The majority of residents were planters, and large areas of woodland were cleared for agriculture.
- The population grew to form an affluent colonial society. Slave labor was an important economic and demographic factor and with that labor, more forests were cleared, removing wildlife habitat and causing erosion that contributed to deterioration of water quality. Overland transportation improved dramatically during the late eighteenth and early nineteenth centuries.
- During the Civil War (1861–1865), considerable military activity occurred throughout the corridor, as evidenced by the battlefields discussed earlier in this document. The war wreaked havoc on local markets and livelihoods, as well as the land.
- During the reconstruction and growth (1865–1917) period following the Civil War, residents returned to a primarily agricultural way of life. The severely depressed local economies relied on dairying, stock and poultry farming, flour milling, and the cultivation of fruit, vegetables, and flowers. During the first two decades of the twentieth century, the economy began to grow. The construction of better roads and rail services enhanced business connections and social interactions throughout the corridor. The ongoing expansion of population and associated construction of roads, railroads, homes, businesses, and industrial facilities resulted in further impacts to land cover and water quality.
- Since World War I, urban centers along the corridor expanded dramatically. Improvements in agricultural methods (mechanization and chemical fertilizers and pest controls) vastly increased productivity relative to labor. Family farms were disappearing, and commercial farming and urban lifestyles were becoming more popular. Jurisdictions in northern Virginia were transformed into suburbs of Washington, D.C., serving the growth of the federal government. New residential subdivisions rose up, and the demand for paved streets, schools, libraries, sewer systems, and other amenities increased. Similar growth occurred around the cities of Fredericksburg and Richmond. Such developments continued to increase the amount of impervious surfaces, contributing to further increases in stormwater runoff and degradation of water quality. However, since implementation of the Clean Water Act and ordinances passed by localities, water quality improvements have been realized.

- Ongoing efforts to improve water quality include federal and state permitting programs, establishment of TMDLs for impaired waterbodies, and establishment of resource protection areas that control development adjacent to streams.

Past and present actions within the affected watersheds have impacted an unknown quantity of streams and wetlands; however, the water quality effects of these actions are reflected in impairment designations and establishment of TMDLs of pollutants in certain waters, including the Chesapeake Bay, into which most of the affected watersheds drain.

Potential Impact on Resources from Potential Future Actions. Foreseeable future projects would have incremental effects on water resources. Before implementation, these projects would be required to undergo analysis of alternatives that avoid and minimize water resources impacts to the extent practicable, and Project proponents would have to obtain any required permits. Compensatory mitigation of unavoidable impacts also would be required.

Cumulative Effect. While the impacts of the Preferred Alternative and the multiple other reasonably foreseeable transportation projects and other likely development would be additive, these impacts would not all be occurring simultaneously due to the phasing of construction over a period of years. Additionally, the impacts would be largely distributed over many streams and multiple watersheds. Furthermore, the direct impact of the Preferred Alternative at each stream will be localized and the reach of the indirect impacts is not expected to be extensive. Stormwater generated through new impervious surfaces will be treated through improved or new stormwater management facilities. Implementation of compensatory mitigation, both for the Preferred Alternative and other foreseeable actions, will offset the adverse direct and indirect impacts. Moreover, local jurisdictions have established preservation and conservation programs that serve to improve water quality by protecting streams and controlling development. For example, Fairfax County's Environmental Quality Corridor (EQC) system protects the county's stream valleys by incorporating them into a system of connected parklands and trail systems. The EQC system provides buffer lands that separate streams from land uses and development activities that have the potential to degrade the ecological quality of streams. Prince William County's Comprehensive Plan limits development within the designated "Rural Area" and includes various rural preservation goals and policies that serve to protect water quality through careful land use planning. Both counties also prepare watershed management plans or studies that assess, monitor, and evaluate water quality and identify priorities and BMPs for improving water quality. Other counties and cities encompassed by the watersheds have similar policies and programs in place to protect water resources.

5.20.2.5 Floodplains

Impact from Preferred Alternative. As described in Section 5.1.1.2 of this Final EIS, none of the floodplain encroachments by the Preferred Alternative represent a significant encroachment. The Preferred Alternative will be designed to not encourage, induce, allow, serve, support, or otherwise facilitate incompatible base floodplain development.

Impacts from Past and Present Actions. The cumulative extent of impacts to floodplains from past and present actions is not known; however, DRPT assumes that the degree of impacts was greater before federal initiatives to avoid and minimize floodplain impacts (e.g., EO 11988 in 1977). State and local initiatives also now protect floodplains and reduce floodplain encroachments by development (Virginia's Chesapeake Bay Preservation Act enabled localities to establish resource protection areas along streams draining to the Chesapeake Bay).

Potential Impact on Resources from Potential Future Actions. Foreseeable future public or private actions could potentially impact floodplains; however, these actions would also be subject to federal and local floodplain protections that would minimize potential impacts.

Cumulative Effect. Because the floodplain encroachments by the Preferred Alternative do not represent significant encroachments, and because federal and local initiatives would continue to exert floodplain protections, DRPT expects that adverse cumulative effects of the Preferred Alternative to floodplains will be negligible.

5.20.2.6 Wildlife and Habitat

Impact from Preferred Alternative. As indicated in Section 5.10.1 of this Final EIS, the estimated limits of disturbance for the Preferred Alternative encompass approximately 191 acres of wildlife habitat. Habitats that will be impacted are directly adjacent to the existing rail line and are already altered by local activities, including operation of the railroad.

Impacts from Past and Present Actions. Past and present actions have changed the landscape dramatically and converted natural habitats to human uses. These changes have resulted in considerable fragmentation and loss of habitat throughout the Project corridor.

Potential Impact on Resources from Potential Future Actions. Foreseeable future actions would be expected to contribute to further fragmentation and losses of habitat over time.

Cumulative Effect. Adverse effects on wildlife habitats are expected to continue to accrue with anticipated population growth in the DC2RVA corridor, even in the absence of the Project. The relative contribution of the Preferred Alternative to the effects of terrestrial and aquatic habitat losses is small, given the existing fragmented condition of affected habitat areas along the existing rail corridor and the location of the majority of the improvements in the DC2RVA Project are generally within or adjacent to the existing CSXT railroad corridor. The contribution of the Preferred Alternative to degradation of water quality within aquatic habitats is also minimal given that the proposed improvements are being made to an existing rail facility and are already altered by local activities, including operation of the railroad, and stormwater management measures will be implemented in accordance with federal, state, and local regulations to minimize onsite and downstream water quality impacts. Project proponents will be responsible for coordination with applicable federal and state agencies.

5.20.2.7 Overall Cumulative Effects

While providing transportation benefits, the Preferred Alternative will incrementally increase environmental effects. These effects will occur along the existing rail corridor and will be relatively small in the context of the entire corridor as well as the localized impact sites.

Overall, considerable adverse impacts to sensitive and vulnerable resources have occurred over time, first due to agricultural uses of the land and then to residential, commercial, industrial, institutional, and public infrastructure development; however, current regulatory requirements and planning practices are helping avoid or minimize the contribution of present and future actions to adverse cumulative effects. When considered in the context of the Project setting, the magnitude and intensity of the impacts of the Preferred Alternative generally will not have substantial cumulative effects, particularly considering the efforts to minimize adverse impacts of the Preferred Alternative and other mitigation measures to be implemented.

5.21 RELATIONSHIP BETWEEN SHORT-TERM IMPACTS AND LONG-TERM BENEFITS

This section addresses in general terms the proposed Project's relationship between local short-term impacts/use of resources and the maintenance and enhancement of long-term productivity. The Preferred Alternative was developed based on sound planning for local, regional, and statewide transportation needs within the context of present and possible future traffic requirements and land use patterns. Coupled with the environmentally sensitive design of the proposed Project and BMPs, this helps to ensure that the short-term use of resources related to construction will be outweighed by the long-term benefits of implementing the proposed Project.

The most disruptive local short-term impacts associated with the Preferred Alternative will occur during land acquisition and Project construction. The short-term use of the environment and of human, socioeconomic, cultural, and natural resources contributes to the long-term productivity of the DC2RVA corridor. Most short-term, construction-related impacts will occur within or near the proposed right-of-way.

Some existing homes, farms, and businesses will be displaced under the Preferred Alternative; however, adequate replacement housing, land, and space are available for homeowners, tenants, and business owners. With the Preferred Alternative, 5 residential and 14 commercial displacements will occur over the entire DC2RVA corridor. The majority of these will occur in the heavily developed areas immediately adjacent to the existing rail corridor in Richmond (Alternative 6F).

Construction activities will create short-term air quality impacts, such as dust due to earthwork, road and rail improvements, and exhaust from construction vehicles. Short-term noise impacts will be unavoidable due to use of heavy equipment. Air and noise abatement measures, discussed in Sections 5.6 and 5.7, will be used to minimize these short-term impacts during construction. Short-term visual impacts will occur near the construction corridor. Mitigation measures, such as reducing slope cuts outside necessary road widths, reducing vegetation removal, leaving native vegetation screens in place, and minimizing the alteration of scenic viewsheds, will be used to reduce long-term visual resource impacts.

Implementation of BMPs for protection of surface waters will minimize potential water quality impacts. A short-term impact from construction will be removal of biotic communities and wildlife within the proposed right-of-way and construction staging areas. Overall, the Preferred Alternative will have minimal short-term impacts relative to the long-term benefits of increased intercity passenger rail service in the DC2RVA corridor, and the ultimate extension of higher-speed intercity passenger rail service along the East Coast. Elimination of some of the existing at-grade rail crossings and construction of grade-separated crossings will also improve the safety of rail crossings and reduce roadway delay. Construction-related activities will be localized and temporary. Short-term gains to the local economy should be recognized as a result of hiring local firms and labor, as well as purchasing local services and supplies to construct the proposed Project. Once completed, the benefits of long-term productivity in terms of improved mobility and safety will be realized. Implementation of the Project will enhance the existing transportation network between Washington, D.C. and Richmond, VA, and provide a viable travel alternative for residents and users. This is consistent with the purpose of the proposed Project. Based on the significant contribution to the long-term objectives of regional and local plans for development, the proposed Project is consistent with the maintenance and enhancement of the long-term productivity at the local, regional, state, and national levels. The benefits of the Project are described in more detail in Chapter 1 of the Draft EIS.

5.22 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction of the Preferred Alternative will require certain irreversible and irretrievable commitments of natural resources, energy (which includes fossil fuels), manpower, materials, and fiscal resources. Because most of the Project will be constructed within existing railroad right-of-way, land acquisition for construction of the proposed Project will be minimized; however, there will be an irreversible conversion of land to a transportation use in areas of new alignment and in areas where the existing road network will be modified to accommodate rail crossing closures and consolidations and to avoid historic resources. If a greater need for the use of the land were to arise or if the transportation facility were no longer needed, it could be converted to another use. There is no reason to believe such a conversion will be necessary or desirable.

The acquisition of new right-of-way and new construction within the existing right-of-way may result in short-term and long-term losses and alterations to the natural resources in the area. Limited upland and aquatic biotic communities, as well as agricultural land, may be committed to rail service where new right-of-way is required. The most apparent impact may be loss of aquatic or terrestrial habitat productivity and connectivity; therefore, wildlife abundance may decline in the area as a result of habitat destruction. Increased noise associated with the Project may be intolerable to some wildlife species. Forested areas may be cleared in some locations, and wetlands and other surface waters may be filled to accommodate new bridges and underpasses. Riprap may be placed along stream banks at bridge crossings, reducing habitat within riparian zone. After construction, some habitat types may be restored within the construction limits, although their value to wildlife is unlikely to equate to that which was lost. If wetlands are filled for new construction, mitigation of impacts will likely involve restoration of degraded wetlands within the same watershed. In the long term, this will offset the loss of wetland habitats within the Project construction limits. The commitment of natural resources within existing and new right-of-way is a permanent loss of productive wildlife habitat.

On a local scale, trains may affect wildlife habitats through the introduction of exotic plant species (e.g., seeds), emission of toxic contaminants (e.g., heavy metals), or right-of-way management (e.g., herbicide application). Section-specific habitat fragmentation effects are discussed in Section 5.10. Fossil fuels, labor, and construction materials will be expended in the fabrication and preparation of construction materials, as well as during construction of the Project. While these materials are generally not retrievable, they are not in short supply, and their use will not have an adverse effect on the continued availability of these resources. The steel rails required for the Project could be recycled should an alternate use of the property be selected. Any construction will also require a substantial, one-time expenditure of state and federal funds, which are not retrievable and could be used instead on other projects within the local community or in other parts of the country.

Specific natural resource impacts for the Preferred Alternative have been previously detailed in this chapter. When reviewed in the overall context of the Project and taken in total, the impacts are small in proportion to the benefits of the Project.

5.23 SUMMARY OF IMPACTS

Table 5.23-1 provides a summary of the potential impacts of the Preferred Alternative upon the built and natural environments. All impacts shown are permanent impacts (i.e., not temporary disturbances due to construction activities).

As noted earlier in this chapter, DRPT uses two future planning years for analysis of the DC2RVA Project. Year 2025 is the current best estimate of when construction of the DC2RVA infrastructure could be completed and the new DC2RVA service would be placed in operation. All the physical impact analyses within this Draft EIS on human and natural resources are estimated for 2025. Year 2045 is used by DRPT to demonstrate that the proposed Project is sufficient to deliver the proposed passenger rail benefits and an efficient and reliable multimodal rail corridor over a 20-year time horizon following the completion of the passenger Project. DRPT also used the 2045 planning horizon date to estimate some of the longer-term effects of the proposed service such as ridership, energy use, and effects on air quality, as well as indirect and cumulative effects.

Existing DC2RVA Rail Corridor

Table 5.23-1: Summary of Impacts

Environmental Resource			Preferred Alternative						Total for the Preferred Alternative
			1B	2A	3B	4A	5A	6F	
Additional ROW (Acres)			0.03	53.77	14.02	1.27	23.45	56.58	149.12
Natural Resources	Wetlands (Acres)		0	5.94	4.2	8.8	0.98	4.27	24.19
	100-Year Floodplains (Acres)		0.1	16.1	9.9	17.2	6.6	44.1	94.0
	Streams & River Crossings (Linear Ffeet)		0	8,031	1,271	3,616	6,978	10,061	29,957
	Threatened & Endangered Species and Habitat		No	Yes	Yes	Yes	Yes	Yes	–
Geologic Resources	Construction-Limiting Soils		Unknown / Not Rated	Yes	Yes	Yes	Yes	Yes	–
	Prime Farmland	Prime Soils (Acres)	0	27.65	24.62	56.93	15.8	25.4	150.4
		NRCS Form 106 Score (Points)[1]	0	66	80	93	51	19	–
	Agricultural & Forestal Districts (Acres)		0	0	0	0	0	0	0
Hazardous Materials	Superfund / CERCLA Sites		0	0	0	0	0	0	0
	Recorded Release & Potential Contamination Sites		0	5	3	0	2	25	35
	HAZMAT Facilities		0	5	4	0	0	6	15
	Petroleum Storage Tanks		0	1	3	0	3	7	14
Air Quality[2]	CO_2 Emissions (Tons per Year) Change Compared to No Build		-6,518						-6,518
Noise[3]	Impacted Noise Receptors	Category 1 Moderate	0	0	0	0	0	1	1
		Category 1 Severe	0	0	0	0	0	0	0
		Category 2 Moderate	0	548	67	51	135	416	1,217
		Category 2 Severe	0	99	8	18	14	15	154
		Category 3 Moderate	0	6	1	1	1	7	16
		Category 3 Severe	0	0	0	0	4	0	4
		Total	0	653	76	70	154	439	1,392
Vibration[3]	Impacted Vibration Receptors	Category 1	0	0	0	0	0	0	0
		Category 2	0	15	0	2	25	8	50
		Category 3	0	0	0	0	1	0	1
		Total	0	15	0	2	26	8	51

▶ *Continued – see end of table for notes.*

Table 5.23-1: Summary of Impacts

Environmental Resource			Preferred Alternative						Total for the Preferred Alternative
			1B	2A	3B	4A	5A	6F	
Energy[2]	Energy Consumption (Billions of BTUs) Change Compared to No Build		-293						-293
Aesthetics & Visual Environment	Visual Impact Rating (Low, Moderate, or High)		Low	Low – Moderate	High	Low	Low	Low – High	–
Community & Environmental Justice	Commercial Relocations		0	0	1	0	2	11	14
	Residential Relocations		0	2	0	0	0	3	5
	Compatible with Comprehensive Land Use Plans (Yes / No)		Yes	Yes	Yes	Yes	Yes	Yes	–
	Environmental Justice Census Tracts with Residential Relocations		0	0	0	0	0	0	0
Park Resources	Number / Acres		0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 0.21	1 / 0.21
Cultural Resources	Effects on Archaeological Sites	Adverse Effect	0	1	4	0	0	3	8
		No Adverse Effect	0	0	2	0	0	3	5[4]
		No Effect	0	0	0	0	0	0	0
	Effects on Buildings, Districts, Structures, & Objects	Adverse Effect	0	2	2	2	3	3	13[5]
		No Adverse Effect	2	5	8	8	2	29	54[4]
		No Effect	0	3	4	3	11	9	30
	Effects on Battlefields	Adverse Effect	0	0	0	0	0	0	0
		No Adverse Effect	0	0	4	1	0	5	10
		No Effect	0	0	0	0	0	0	0

▶ *Continued – see end of table for notes.*

Table 5.23-1: Summary of Impacts

Environmental Resource			Preferred Alternative						Total for the Preferred Alternative
			1B	2A	3B	4A	5A	6F	
Transportation	Proposed Public At-Grade Crossing Improvements	Grade Separate[6]	0	0	1	0	2	4	7
		Closure	0	1	0	1	0	5	7
		Four-Quad Gates	0	1	2	4	3	3	13
		Median Treatment	0	0	1	2	1	4	8
		No Action	0	2	0	0	5	1	8
	New Public Crossings		0	0	0	0	0	0	0
	Proposed Private At-Grade Crossing Improvements	Closure	0	0	0	0	0	0	0
		Four-Quad Gates	0	0	0	0	0	2	2
		Locking Gate	0	0	0	10	0	2	12
		No Action	0	5	0	0	0	0	5
	New Private Crossings		0	0	0	0	0	0	0
	Roadway Travel Patterns: % Change in Daily Traffic, Adjacent Roadways at Stations[7]		–	<1%	7-8%	–	<1%	1-2%	–
	Total Daily Delay (hours) / % Intercity Passenger Trains of Total		–	23.01 / 13%	6.59 / 13%	3.35 / 13%	56.33 / 11%	64.22 / 10%	153.50 / 11%

Notes: Reductions in impacts since the Draft EIS are indicated by green font; increases by red font. As indicated in the Introduction to this chapter, permanent effects include all areas where Project infrastructure will physically replace existing conditions. Temporary effects are areas required for construction of the Preferred Alternative, such as for staging or storage of equipment. Only permanent effects are summarized in this table. Refer to Appendix L of this Final EIS for detailed mapbooks of the Preferred Alternative, which show the permanent and temporary LOD throughout the 123-mile Project corridor.

1. NRCS treated each alternative area separately; therefore, there is no "cumulative" corridor assessment score.

2. "Change" shown compares 2045 Preferred Alternative to 2045 No Build conditions. Air Quality and Energy are analyzed corridor-wide based on the station alternative as selected in Richmond (6F), so only a single value is shown in this table.

3. Noise and Vibration categories defined in Section 5.7.

4. Fredericksburg & Spotsylvania Co. Battlefields National Military Park & Cemetery, Lee Drive (111-0147) is both an above and below ground resource, and it is counted in the table twice in the "No Adverse Effect" column, as both an Archaeological Resource and a Historic Resource.

5. The historic RF&P Railroad (500-0001) traverses the Project corridor from the Potomac River on the north to Main Street Station in Richmond on the south; therefore, one resource has been added to the "Adverse Effect" column for "Effects on Buildings, Districts, Structures, & Objects" since it does not fall in a single Alternative Area.

6. Some existing grade-separated crossings will be widened/replaced as part of the Project; these crossings are separate from the proposed new grade separations of existing at-grade crossings that are quantified in this table.

7. "Change" shown compares 2025 Preferred Alternative to 2025 No Build conditions.