5 Environmental Consequences

5.1 Introduction

This chapter defines the impact analysis framework used in this Draft Environmental Impact Statement (DEIS) to adhere to the Federal Railroad Administration (FRA) *Procedures for Considering Environmental Impacts*.[1] Prior to issuing permits or approvals for a project, Federal agencies must consider the environmental effects of their actions in accordance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4321 *et seq.*). To comply with NEPA and the Council on Environmental Quality (CEQ) *Implementing Regulations for NEPA*, this DEIS identifies the direct, indirect, and cumulative effects the Washington Union Station (WUS) Expansion Project (the Project) could have on the human and natural environment.[2] This DEIS also identifies measures to avoid, minimize, or mitigate potential adverse impacts.

Whenever applicable and practicable, FRA conducted the analyses in accordance with the environmental review policies and guidance of relevant Federal agencies as well as state and local jurisdictions. In this way, the DEIS will support the review of the document by Federal, state, and local agencies from which permits or approvals are required for the Project.

5.1.1 Definitions

The CEQ's *Implementing Regulations for NEPA* and *Forty Most Asked Questions*[3] provide the following key definitions:

- **Direct impacts** result from the action and occur at the same time and place.[4]
- **Indirect impacts** result from the action and are later in time or farther removed in distance but are still reasonably foreseeable.

Impacts may vary with regard to their duration, significance, and outcome:

1 64 Federal Register [FR] 28545, Section 12, May 26, 1999 as updated by 78 FR 2713, January 14, 2013.

2 40 Code of Federal Regulations (CFR) 1500-1508.

3 Council on Environmental Quality. 1981. *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*. Accessed from https://www.energy.gov/nepa/downloads/forty-most-asked-questions-concerning-ceqs-national-environmental-policy-act. Accessed on April 3, 2020.

4 Effects and impacts, as used in the CEQ Implementing Regulations and this report, are synonymous.

- **Duration:** The impact analyses for each alternative address operational impacts and construction impacts. Operational impacts are long-term or permanent impacts associated with the operation of the Project. They would occur for the foreseeable future. Construction impacts are associated with the construction phase of the Project and would stop with the completion of construction activities. In that sense, they are short-term or temporary impacts.
- **Context and Intensity:** Depending on the nature of the topic, relevant contexts include society as a whole (human, national), the affected region, the affected interests, or the locality. Intensity refers to the severity of impact and includes consideration of beneficial and adverse impacts. Intensity can be assessed using a wide range of criteria. Among these criteria are public health and safety, unique characteristics of the geographic locale, the level of public controversy, whether the action would fail to comply with applicable laws and regulations, and other considerations. In this DEIS, impacts are assessed using the following scale[5]:
    - **Negligible impacts** may be adverse or beneficial but would occur at the lowest level of detection.
    - **Minor impacts** would be noticeable but would not affect the function or integrity of the resource.
    - **Moderate impacts** would be readily apparent and would influence the function or integrity of the resource.
    - **Major impacts** would be substantial and would result in severely adverse or exceptionally beneficial changes to the resource.
- **Outcome:** Impacts may be beneficial or adverse:
    - **Beneficial impacts** would result in positive outcomes to the natural or human environment.
    - **Adverse impacts** would result in unfavorable or undesirable outcomes to the natural or human environment.

The FRA analyzed and assessed the potential environmental impacts of the No-Action Alternative and six Action Alternatives on fifteen resources. FRA compared the alternatives' impacts to two baselines (see **Table 5-1**):

- The operational impacts of the No-Action Alternative in the 2040 planning horizon year were assessed relative to existing conditions as of 2017.[6]

[5] For some of the resources considered in this chapter, resource-specific definitions that build on and refine these general definitions are provided in the *Methodology* section.

[6] Existing conditions of the affected environment for each resource are described in **Chapter 4**, *Affected Environment*, and in greater detail in **Appendix C2**, *Washington Union Station Expansion Project Affected Environment Technical Report*.

- The operational impacts of the Action Alternatives in the 2040 planning horizon year were assessed relative to No-Action Alternative conditions in 2040, ***and*** relative to existing conditions as of 2017. The two-baseline approach was adopted because the No-Action Alternative includes the development of the privately owned air rights above the WUS rail terminal, a separate, large scale project that would substantially change conditions in the Project Area. Assessment against both No-Action Alternative and existing conditions is intended to provide a more complete understanding of the impacts of the Project.
- The construction impacts of all alternatives were assessed relative to existing conditions.

Table 5-1. Framework for Evaluating Impacts

Alternative	Impacts	No-Action Alternative Baseline (2040)	Existing Conditions Baseline (2017)
No-Action Alternative	Operation (2040)	N/A	●
	Construction	N/A	●
Action Alternatives	Operation (2040)	●	●
	Construction	N/A	●

N/A = Not applicable

5.1.2 Format for Evaluating Impacts in this DEIS

This DEIS analyzes the environmental impacts of the Project for each applicable resource in individual resource sections. The resources considered are listed below:

- **Section 5.2**, Natural Ecological Systems
- **Section 5.3**, Water Resources and Water Quality
- **Section 5.4**, Solid Waste Disposal and Hazardous Materials
- **Section 5.5**, Transportation
- **Section 5.6**, Air Quality
- **Section 5.7**, Greenhouse Gas Emissions and Resilience
- **Section 5.8**, Energy Resources
- **Section 5.9**, Land Use, Land Planning and Property
- **Section 5.10**, Noise and Vibration
- **Section 5.11**, Aesthetics and Visual Quality
- **Section 5.12**, Cultural Resources
- **Section 5.13**, Parks and Recreation Areas

- **Section 5.14**, Social and Economic Conditions
- **Section 5.15**, Public Safety and Security
- **Section 5.16**, Public Health, Elderly and Persons with Disabilities
- **Section 5.17**, Environmental Justice
- **Section 5.18**, Cumulative Impacts
- **Section 5.19**, Commitment of Resources

For each resource, impacts are briefly characterized in bold lettering, followed by a supporting description and analysis. **Appendix C1**, *Washington Union Station Expansion Project Environmental Impact Statement Methodology Report*; **Appendix C2**, *Washington Union Station Expansion Project Affected Environment Technical Report*; and **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report*, provide more detailed analysis information. **Section 5.18**, *Cumulative Impacts*, describes cumulative impacts. **Section 5.19** addresses irreversible or irretrievable commitments of resources as well as the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Chapter 6, *Draft Section 4(f) Evaluation*, presents the Draft Section 4(f) Evaluation. **Chapter 7**, *Mitigation Measures, Project Commitments, and Permits*, lists the measures FRA is considering implementing to avoid, minimize, or mitigate the adverse impacts of the Project, as well as applicable permit requirements.

FRA conducted the impact analyses in accordance with FRA's *Procedures for Considering Environmental Impacts*[7] along with other applicable guidance and regulations. Each section of the report lists the laws and regulations that apply to the resource under consideration and describes the methodologies used for the impact assessment. Whenever applicable and practicable, the analyses have been conducted in accordance with local environmental review policies and guidance.

For each resource category, the following information is provided directly or by reference:

- **Regulatory Context:** List of relevant Federal and local laws and regulations.
- **Study Area:** Definition of the area or areas within which the Project may have impacts.
- **Methodology:** Summary description of the approach adopted to evaluate and assess the potential operational and construction impacts of the alternatives. The methodology section summarizes or completement the information presented in the April 2018 *Environmental Impact Statement Methodology Report.*

[7] 64 Federal Register [FR] 28545, Section 12, May 26, 1999 as updated by 78 FR 2713, January 14, 2013.

- **Impact Analysis:** Description and assessment of the operational (long-term or permanent) and construction impacts of the No-Action Alternative and the six Action Alternatives. In accordance with CEQ's regulations for implementing NEPA, the DEIS assesses impacts based on context and intensity. The assessment uses the scale defined in **Section 5.1.1**, *Definitions* or, as applicable, the more resource-specific scales defined in the *Methodology* section for the affected resource.

  For each resource, the direct and indirect operational impacts of the No-Action Alternative are assessed relative to existing conditions. The direct and indirect operational impacts of the Action Alternatives are assessed relative to the No-Action Alternative. This assessment is complemented by a briefer evaluation of the impacts relative to existing conditions. For the Action Alternatives, indirect impacts include the impacts of potential development in the Federal property that Project elements would not occupy.

- **Comparison of Alternatives:** Comparison of the impacts of each of the seven alternatives highlighting meaningful differences.

- **Avoidance, Minimization, and Mitigation Evaluation:** If applicable, list of recommended measures FRA or the Project Proponents would implement to minimize, avoid, or mitigate the adverse impacts of the Action Alternatives wherever practicable. The measures listed in this section are under consideration.

- **Permits and Regulations:** If applicable, list of relevant permitting or regulatory requirements the Project Proponents would have to comply with. The permit requirements listed in this section are under evaluation.

5.2 Natural Ecological Systems

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on natural ecological systems. If applicable, it also recommends measures to avoid, minimize, or mitigate potential adverse impacts and it identifies relevant permitting and regulatory compliance requirements. Natural ecological systems include resources such as vegetation, common and protected wildlife, wetlands, and floodplains.

5.2.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to natural ecological resources are listed **Section 4.2.1**, *Regulatory Context and Guidance*.

5.2.2 Study Area

As defined in **Section 4.2.2**, *Study Area*, the Local Study Area for natural ecological systems, shown in **Figure 4-1,** includes the Project Area along with a 150-foot buffer. The Regional Study Area includes areas surrounding the Local Project Area out to approximately 1,000 feet.

5.2.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on Natural Ecological Systems. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 2.4**, *Methodology* provides a description of the analysis methodology. A summary is below.

Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.2.3.1 Operational Impacts

The assessment of potential operational impacts on natural ecological systems consisted of a review of the natural ecological systems that may occur within the Study Areas to determine whether WUS operations would interfere with components of these systems.

5.2.3.2 Construction Impacts

Construction impacts were similarly assessed by evaluating whether construction activities would disrupt or damage any natural ecological system components.

5.2.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on natural ecological systems. Because all the Action Alternatives would have the same impacts, they are addressed together to minimize redundancy.

5.2.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would have no direct operational impacts on natural ecological systems.

As documented in the **Section 4.2**, *Natural Ecological Systems,* the Local Study Area is fully developed with transportation infrastructure and buildings. It contains no natural ecological systems. Similarly, the Regional Study Area encompasses urban neighborhoods densely developed with commercial and residential buildings, streets and roads, and paved parking areas. It is devoid of any natural habitat. Therefore, the No-Action Alternative would have no direct operational impacts on natural ecological systems.

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would have no indirect operational impacts on natural ecological systems.

For the same reasons as stated above, the No-Action Alternative would have no indirect operational impacts on natural ecological systems.

Construction Impacts

There would be no construction impacts on natural ecological systems in the No-Action Alternative.

Construction activities associated with the projects included in the No-Action Alternative would likely disturb and displace the urban-dwelling birds or mammals that may be present in the Project Area. Such disturbance is common in urban areas and would only affect birds that could easily relocate to adjacent area or nuisance species such as rats. This would not amount to an impact on natural ecological systems.

5.2.4.2 Action Alternatives

Direct Operational Impacts

Relative to the No-Action Alternative, none of the Action Alternatives would have direct operational impacts on natural ecological systems.

As explained for the No-Action Alternative, and documented in **Section 4.2**, *Natural Ecological Systems*, the Local and Regional Study Areas are fully developed with transportation infrastructure and buildings. They contain no natural ecological systems. Therefore, the Action Alternatives would have no direct operational impacts on natural ecological systems.

Indirect Operational Impacts

Relative to the No-Action Alternative, the Action Alternatives would have no indirect operational impacts on natural ecological systems.

For the same reasons as stated above, none of the Action Alternatives would have indirect operational impacts on natural ecological systems.

Construction Impacts

Construction of all Action Alternatives would result in minor adverse impacts on natural ecological systems.

As documented in **Section 4.2.4.3**, *Vegetation, Wildlife, and Protected Species*, there are approximately 26 ornamental trees (*Zelkova serrata*) on the east sidewalk of First Street NE between G and K Streets and ten trees of the same species on the west sidewalk of 2nd Street NE between G Street and the H Street Bridge. Construction activities along the western edge of the Project Area and along the east side of First Street NE would require the removal of the 26 existing trees. The construction of pick-up and drop off spaces on the west side of 2nd Street NE south of the H Street Bridge would likely require removing four of the ten trees currently present on the sidewalk. These would be minor adverse impacts, as the trees are non-native, ornamental street trees that do not form part of a larger natural system.

Construction activities throughout the Project Area would likely disturb and displace any urban-dwelling birds or mammals that may be present. Such disturbance is common in urban areas and would only affect birds that could easily relocate to adjacent areas or nuisance species such as rats. This would not amount to an impact on natural ecological systems.

5.2.5 Comparison of Alternatives

Table 5-2 presents a comparison of the alternatives. The No-Action Alternative would have no direct operational, indirect operational, or construction impacts on natural ecological systems.

All the Action Alternatives would have the same impacts: no direct or indirect operational impacts and minor adverse construction impacts due to urban tree removal along First Street NE between G and K Streets.

Table 5-2. Comparison of Alternatives, Natural Ecological Systems

Type of Impact	No-Action Alternative	All Action Alternatives
Direct Operational	No impacts	No impacts
Indirect Operational	No impacts	No impacts
Construction	No Impacts	Minor adverse impacts

5.2.6 Avoidance, Minimization, and Mitigation Evaluation

The exact number of street trees to be removed would be determined and minimized during construction planning in coordination with the District Department of Transportation (DDOT) Urban Forestry Ward Arborist. Compensation for removed trees would be provided in accordance with the applicable permitting requirements described in Section 5.2.7, *Permits and Regulatory Compliance*.

5.2.7 Permits and Regulatory Compliance

Removal of street trees would require a Public Space Tree Permit from the DDOT Urban Forestry Division. Compensation for lost trees is based on the health of the tree. Non-hazardous street trees require payment of $200 per inch diameter plus planting of a new street tree per DDOT Green Infrastructure Standards. Hazardous street trees require planting a new street tree per DDOT Green Infrastructure Standards at a 1:1 ratio. [1]

[1] A hazardous tree is a “a tree that, in the opinion of a certified arborist, is defective, diseased, dying, or dead and should be removed; poses a high risk of failure or fracture with the potential to cause injury to people or damage to property and should be removed; or is causing damage to property or structures that cannot be mitigated in any manner other than removal of the tree.” (Code of the District of Columbia, Title 8, Chapter 6B, §8–651.02, *Definitions*.)

5.3 Water Resources and Water Quality

This section describes and characterizes potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on surface and groundwater resources, stormwater, wastewater, and water supply infrastructure. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts, as well as potential permitting and regulatory compliance requirements.

5.3.1 Regulatory Context and Guidance

Relevant Federal policies, regulations, and guidance that pertain to water resources and water quality are listed in **Section 4.3.1**, *Regulatory Context and Guidance*.

5.3.2 Study Area

As defined in **Section 4.3.2**, *Study Area*, the Local Study Area includes the Project Area, extended by 500 feet to encompass adjacent connections to the District of Columbia (DC) Water stormwater, water supply, and wastewater infrastructure (**Figure 4-2**). Because activities from the construction and operation of the Project would be mostly limited to the Project Area, the discussion of impacts generally focuses on the Project Area. On a regional level, water resources were analyzed as they pertain to the Chesapeake Bay Watershed.

5.3.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on water resources and water quality. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 3.4**, *Methodology*, provides a description of the analysis methodology. A summary is below.

The impact analysis characterizes and compares potential impacts to surface water and groundwater quality, and to DC Water stormwater, water supply, and wastewater infrastructure for each alternative. Potential impacts were characterized as beneficial or adverse:

- Beneficial impacts are those that improve surface water and groundwater quality, provide groundwater recharge, reduce potable water usage and wastewater flows, and/or improve the level-of-service for water supply, wastewater, and/or stormwater infrastructure.
- Adverse impacts are those that degrade surface water and groundwater quality, decrease groundwater recharge, increase potable water usage and wastewater flows, and/or impair the level-of-service for water supply, wastewater, and/or stormwater infrastructure.

Potential impacts are characterized as negligible, minor, moderate, or major consistent with the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.3.3.1 Operational Impacts

The operational impacts of each alternative were assessed based on the following information and indicators:

- Anticipated long-term dewatering needs based on preliminary geotechnical modeling.
- Spreadsheet calculation of regulated Stormwater Retention Volume (SWRv) per the District Department of Energy and Environment (DOEE) Stormwater Management Guidebook.
- Projected wastewater generation compared to the available treatment capacity and qualitative assessment of DC Water's wastewater infrastructure to convey those flows.
- Projected drinking water demand compared to available supply and qualitative assessment based of DC Water's water supply infrastructure.
- Proposed mitigation strategies such as stormwater Best Management Practices (BMPs), green infrastructure, water conservation, and water reuse.

5.3.3.2 Construction Impacts

Construction impacts were assessed based on the depth of excavation; dewatering needs; construction techniques for groundwater exclusion; treatment and discharge; and erosion and sediment control practices.

5.3.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on water resources and water quality.

5.3.4.1 No-Action Alternative

Direct Operational Impacts

Surface Waters

Relative to existing conditions, the No-Action Alternative would have no direct operational impacts on surface waterbodies.

There are no surface waterbodies within the Project Area or Local Study Area and, therefore, no potential for direct operational impacts.

Groundwater

Relative to existing conditions, the No-Action Alternative would have negligible adverse direct operational impacts on groundwater.

No public groundwater supplies or wellhead protection areas[1] exist within the Project Area. The water table lies from approximately 15 feet above sea level (asl) south of the H Street Tunnel to about 25 feet asl at the northern end of the Project Area.[2]

Up to 945 drilled shafts would provide structural support for the private air-rights development deck. The drilled shafts would range in diameter from 5 feet to 12 feet, depending on the structural load they would support. Their average depth would be up to 150 feet. Drilling the shafts would displace groundwater. Groundwater displacement may slightly alter localized groundwater levels within the Project Area and Local Study Area. Given the depth to water table, any localized changes to the water table would not noticeably affect infrastructure or vegetation in the Local Study Area. Additionally, the volume occupied by the drill shafts would be very small in the context of the Local Study Area and the entire aquifer, making the resulting displacement negligible. For this reason, groundwater displacement from building foundations generally is not a major concern and DC Municipal Regulations do not regulate it.

The No-Action Alternative would not affect groundwater quality or recharge. The Project Area currently consists of impervious cover that inhibits groundwater recharge. Project Area land cover would remain impervious under the No-Action Alternative.

Stormwater

Relative to existing conditions, the No-Action Alternative would have a minor adverse direct operational impact on stormwater infrastructure. It would have no direct operational impact on stormwater flows, as SWRv would remain unchanged relative to existing conditions.

Modifications to the Project Area's drainage infrastructure would be necessary to accommodate the private air-rights development. These drainage modifications may necessitate minor adjustments to DC Water drainage infrastructure within the Local Study Area such as new catch basins, drainage pipes, and pipe connections within District right-of-way. Such adjustments routinely occur in the context of large development projects and would be a minor adverse impact. DC Water's combined sewer or separate stormwater infrastructure would continue to collect and convey stormwater runoff as it does currently.

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1 W*ellhead protection areas are* surface and subsurface land *areas* regulated to prevent contamination of a well or well-field supplying a public water system. Established under the Safe Drinking Water Act (42 USC 330f-300j), this program is implemented through state governments.

2 Wood Environment & Infrastructure Solutions. February 2019*. Preliminary Report of Aquifer Pump Test and Seepage Analysis, Union Station, Washington, D.C*.

Table 5-3 presents the SWRv calculated for the No-Action Alternative for each drainage area overlapping with the Local Study Area. SWRv represents the volume of stormwater to retain on-site to mimic pre-development hydrologic conditions and protect District waterbodies.[3] An increase in total or drainage-area level SWRv relative to existing conditions would be an adverse impact unless mitigated through stormwater BMPs.

No-Action Alternative and existing conditions SWRv would be the same, amounting to a little more than 221,000 cubic feet. This is because the rail terminal is already entirely impervious. Constructing a deck and buildings above the tracks between WUS and K Street would not create any new impervious or pervious surface.

Table 5-3. No-Action Alternative SWRv in the Project Area

Drainage Area	Paved Area within LOD[1] (Acres)	Compacted Area[3] within LOD (Acres)	Natural Area[4] within LOD (Acres)	Total Area within LOD (Acres)	SWRv[5] (Cubic Feet)
Tiber Creek (CSO[2] 12)	43.4	0	0	43.4	179,799
Northeast Boundary (CSO 19)	9.8	0	0	9.8	40,571
Hickey Run (MS4)	0.2	0	0	0.2	677
Total	**53.4**	**0**	**0**	**53.4**	**221,047**

1. LOD – Limit of Disturbance, defined for this study as the Project Area boundary
2. CSO – Combined Sewer Outfall
3. Compacted Area - Land disturbed and/or graded for use as managed turf or landscaping.
4. Natural Area - Land that is undisturbed and exhibits hydrologic properties equal to or better than meadow in good condition.
5. SWRv – Stormwater retention volume. Calculated using 1.2 inches of rainfall as required for Major Land Disturbing Activities.

Wastewater

Relative to existing conditions, the No-Action Alternative would have minor adverse direct operational impacts on wastewater infrastructure and wastewater flows, due to greater production of wastewater in the Project Area.

The private air-rights development would require modifications to sewer laterals in the Local Study Area to serve the new buildings. No information is available on the location and extent of these modifications. Such work is routine for large development projects and would be a minor adverse impact. DC Water sewer lines would continue to collect wastewater and convey it to the Blue Plains Advanced Wastewater Treatment Plant (Blue Plains), within the Regional Study Area.

[3] District Office of Energy and Environment. 2013. *Stormwater Management Guidebook*. Accessed from https://doee.dc.gov/swguidebook. Accessed on April 2, 2020.

Table 5-4 shows estimated increases in wastewater flows in the No-Action Alternative. Increased ridership at WUS and the private air-rights development would cause an increase in the amount of wastewater produced in the Project Area.

Table 5-4. No-Action Alternative Estimated Wastewater Generation Increase

Location	Use	Unit Flow Rate [1]	Total Unit (2040)	Estimated Average Daily Flow (gpd)
WUS	Rail and Bus[2]	1.7 gpd/ passenger[3]	19,000 additional passengers	32,300
Private air-rights Development	Residential	60 gpd/ resident	2,150 residents	129,000
Private air-rights Development	Hotel	0.25 gpd/ sf	410,000 sf	102,500
Private air-rights Development	Office	0.09 gpd/ sf	2,160,000 sf	194,400
Private air-rights Development	Retail	0.05 gpd/ sf	120,000 sf	6,000
Private Air-rights Development Subtotal				431,900
Total				464,200

gpd = gallons per day; sf= square foot
1. Rates based on Maryland Design Guidelines for Wastewater Facilities unless otherwise noted. [4]
2. Amtrak + Maryland Area Regional Commuter (MARC) + Virginia Railway Express (VRE) + Intercity bus ridership
3. Per-passenger unit rate calculated for existing conditions based on 2017 station water usage.

The average daily wastewater flow would increase by approximately 464,200 gallons per day. Relative to 83,500 gallons per day under existing conditions, this would be a more than fivefold increase.

This impact would be minor because wastewater from the Project Area would continue to be conveyed to the Blue Plains, which has the capacity to treat an average of 384 million gallons per day and in peak wet weather capacity to treat more than one billion gallons per day.[5] Relative to Blue Plains' design capacity, the projected increase in wastewater flow would be minor, representing a little more than 0.1 percent of the average capacity.

[4] Maryland Department of the Environment Engineering and Capital Projects Program (2016) *Design Guidelines for Wastewater Facilities*. Accessed from https://mde.maryland.gov/programs/Permits/WaterManagementPermits/Documents/WastewaterDesignGuidelines-2016.pdf. Accessed on April 3, 2020.

[5] DC Water. *Blue Plains Advanced Wastewater Treatment Plant brochure*. Accessed from https://www.dcwater.com/sites/default/files/Blue_Plains_Plant_brochure.pdf. Accessed on April 2, 2020.

Drinking Water

Relative to existing conditions, the No-Action Alternative would have a minor adverse direct operational impact on drinking water infrastructure and drinking water distribution due to greater demand from the Project Area.

The private air-rights development would require modifications to the water distribution infrastructure in the Local Study Area to provide the additional capacity to meet the demand from the development's occupants. There is no information on the location and extent of the needed modifications, but they would be within the range of what is typical for a large development project and would represent a minor impact.

Increased WUS ridership and the private air-rights requirement would place new demands on the water supply system. Water demand increase was estimated based on wastewater generation, with an added factor of 10 percent to account for consumption, system losses, and other uses. Based on an estimated additional wastewater generation of 464,200 gallons per day, additional water demand in the No-Action Alternative would be 510,620 gallons per day. This would include 35,530 gallons per day for WUS uses and 475,090 gallons per day for private air-rights development uses.

DC Water would continue to distribute water to the Project Area and the Washington Aqueduct would continue to supply the water. The Aqueduct produces an average of 155 million gallons per day in the two treatment plants located in the District.[6] The increase in demand relative to existing conditions would represent approximately 0.3 percent of the Aqueduct's average production.

Indirect Operational Impacts

Surface Waters

Relative to existing conditions, the No-Action Alternative would result in negligible adverse and beneficial indirect operational impact on surface waterbodies, including the Anacostia River, Potomac River, and Chesapeake Bay.

In the No-Action Alternative, combined stormwater and wastewater from the Project Area would continue to flow through DC Water's combined sewer system to either Blue Plains or, to combined sewer overflow (CSO) outfalls in the Anacostia River during large storms. A small portion of the Project Area (approximately 7,000 square feet at the furthest northeast end) would continue to drain to the Anacostia River through the municipal separate storm sewer system (MS4). No changes to drainage subwatersheds would occur.

The No-Action Alternative would see an increase in wastewater flows from WUS and the private air-rights development. Adding wastewater to DC Water's combined sewer system could increase the likelihood of untreated sewage releases from CSO outfalls into the

[6] U.S. Army Corps of Engineers. *Washington Aqueduct*. Accessed from https://www.nab.usace.army.mil/Missions/Washington-Aqueduct/. Accessed on April 2, 2020.

Anacostia River during large storm events. This could exacerbate water quality impairments due to bacterial and nutrient loadings in the Anacostia River and the Chesapeake Bay, a potential adverse impact. However, the reduction in in CSO events that would result from DC Water's Anacostia River Tunnel and Northeast Boundary Tunnel projects would largely offset this increased risk and the adverse impact would be negligible.

Currently, stormwater from the portion of the Project Area that drains to the MS4 is untreated and carries pollutants from the Project Area to the Anacostia River. If the projects included in the No-Action Alternative implement stormwater BMPs to the maximum extent practicable as required by DOEE *Stormwater Management Guidebook* and, for Federal projects, the Energy Independence Security Act (EISA) of 2007 and Executive Order (EO) 13834, runoff volume, peak flow rate, and pollutant loading from the Project Area to the Anacostia River would decrease. Given the small size of the MS4 drainage area relative to the Anacostia River watershed, any potential beneficial impacts from this reduction on water quality in the Anacostia River and downstream waterbodies would be negligible.

Groundwater

Relative to existing conditions, the No-Action Alternative would have no indirect operational impact on groundwater.

There would be no indirect impacts on groundwater because, as described in **Section 5.3.4.1**, *No-Action Alternative, Direct Operational Impacts*, there is no potential to indirectly affect private or public water supply wells, wetlands, or springs.

Stormwater

Relative to existing conditions, the No-Action Alternative would have no indirect operational impact on stormwater.

There would be no indirect impacts on stormwater because the No-Action Alternative would result in no changes to stormwater flows in or outside the Local or Regional Study Area.

Wastewater

Relative to existing conditions, the No-Action Alternative would have no indirect operational impact on wastewater.

There would be no indirect impacts on wastewater because the No-Action Alternative would result in no changes to wastewater production outside the Project Area. As explained in **Section 5.3.4.1**, *No-Action Alternative, Direct Operational Impacts,* DC Water and Blue Plains have sufficient capacity to convey and treat additional wastewater flows from the Study Area.

Drinking Water

In the No-Action Alternative, there would be no indirect operational impact on drinking water.

There would be no indirect impacts on drinking water. The No-Action Alternative would result in no changes to demand for water outside the Project Area. As explained in **Section 5.3.4.1**, *No-Action Alternative*, *Direct Operational Impacts*, DC Water and the Washington Aqueduct have sufficient capacity to meet additional water demand from the Project Area.

Construction Impacts

In the No-Action Alternative, construction of the Project would not occur. Construction of the projects included in the No-Action Alternative, including the private air-rights development, would take place at various times and each would generate construction impacts. Because specific schedules and construction methods are still undetermined, it is only possible to describe and assess these impacts in general terms.

Surface Waters

There would be no construction impacts to surface waterbodies in the No-Action Alternative.

No surface waterbodies lie within or adjacent to the Project Area. Therefore, none of the construction activities that would occur in the No-Action Alternative would affect surface waterbodies.

Groundwater

In the No-Action Alternative, construction activities would cause minor adverse impacts on groundwater.

Construction of drilled shafts for the private air-rights development deck would necessitate dewatering. The amount of groundwater that would be pumped and disposed of cannot be estimated. Provided work complies with applicable National Pollutant Discharge Elimination System (NPDES) construction general permit dewatering requirements as well as with applicable DOEE and DC Water requirements for treating and metering pumped groundwater, adverse impacts would be minor.

Stormwater

In the No-Action Alternative, construction activities would cause minor adverse impacts on stormwater flows.

Ground-disturbing activities associated with the projects included in the No-Action Alternative could result in increased erosion and sedimentation, affecting the quality of stormwater runoff. This risk would be small because these projects would have to include erosion and sediment controls in compliance with NPDES construction general permit and

DOEE's *Erosion and Sediment Control Manual* requirements.[7,8] Erosion and sediment control practices would prevent the transport of sediment from the construction sites to city streets, drainage systems, and waterbodies, resulting in minor adverse impacts.

Wastewater

Wastewater flows from construction-related dewatering would cause a negligible adverse impact on wastewater.

Drilled shafts for the private air-rights development would be located within the CSO drainage area. It is likely that pumped groundwater would be pre-treated, if needed, on site and discharged to the DC Water combined sewer system. This would generate additional flow of clean water through DC Water's MS4 or combined sewer system to Blue Plains. With a capacity to treat an average of 384 million gallons per day and peak wet weather capacity to treat more than one billion gallons per day, Blue Plains would have the capacity to treat the additional flow, resulting in a negligible impact.

Drinking Water

Water demand during construction activities would result in a negligible adverse impact on water supply.

Construction activities would require the use of water for dust control, equipment washing, and construction worker sanitation and consumption. DC Water would likely provide the water. Although it is not possible to estimate the amount of water these activities would use, it would be typical of medium to large-scale construction projects in the District and is not likely to exceed the Washington Aqueduct capacity. Impacts would be negligible.

5.3.4.2 Alternative A

Direct Operational Impacts

Surface Waters

Relative to the No-Action Alternative, Alternative A would have no direct operational impacts on surface waterbodies.

There are no bodies of surface water in or adjacent to the Project Area. Therefore, Alternative A has no potential to directly affect surface waters.

[7] U.S. Environmental Protection Agency. 2017. *National Pollutant Discharge Elimination System (NPDES) Construction General Permit*. Accessed from**Error! Hyperlink reference not valid.** https://www.epa.gov/npdes/2017-construction-general-permit-cgp. Accessed on April 2, 2020.

[8] District Office of Energy and Environment. 2017. *Erosion and Sediment Control Manual*. Accessed from https://doee.dc.gov/esc. Accessed on April 2, 2020.

Groundwater

Relative to the No-Action Alternative, Alternative A would have a negligible adverse direct operational impact on groundwater.

There are no public groundwater supplies or wellhead protection areas within the Project Area. Therefore, Alternative A would have no impacts on those resources. Land cover within the Project Area in the No-Action Alternative would consist of impervious surfaces that inhibit groundwater recharge. The Project Area's land cover would similarly be fully impervious in Alternative A. Therefore, Alternative A would have no impacts on groundwater recharge.

Alternative A would have negligible adverse direct operational impacts on groundwater levels for the following reasons. Compared to the No-Action Alternative, Alternative A would require excavating the Project Area up to a depth of approximately 20 feet asl to construct lower-level concourses. In the Project Area south of H Street, the water table lies at approximately 15 feet asl, although depth may vary across the site and some seeping may occur.[9] Preliminary modeling indicates that in the long term, dewatering rates for excavation in Alternative A would be less than 10 gallons per minute, or less than 14,400 gallons a day that would have to be pumped and disposed of.[10] This is well below the ceiling DC Water established for the issuance of a Non-significant Non-Categorical Industrial User Wastewater Discharge Permit, which applies to industrial or commercial businesses and government agencies that have less than 25,000 gallons per day of process flow.[11] Additionally, inflow would occur only if and where groundwater level exceed 20 feet asl.

Stormwater

Relative to the No-Action Alternative, Alternative A would have minor adverse direct operational impacts on stormwater infrastructure and no direct operational impact on stormwater flows.

Modifications to the Project Area's drainage infrastructure would be necessary to accommodate the Project. These drainage modifications may necessitate minor adjustments to DC Water drainage infrastructure in the Local Study Area, such as new catch basins, drainage pipes, and pipe connections within District right-of-way. Such adjustments would largely overlap with those that would occur in the No-Action Alternative for the private air-rights development and it would be possible to coordinate them. This would minimize the

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9 Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

10 Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

11 DC Water. *Industrial User Wastewater Discharge Permit*. Accessed from https://www.dcwater.com/industrial-user-wastewater-discharge-permit. Accessed on January 4, 2019.

work needed to accommodate the Project. Relative to the No-Action Alternative, adverse impacts would be minor.

Because the Project Area would be entirely impervious in the No-Action Alternative and would remain so in Alternative A, this alternative would cause no change in SWRv. Alternative A would have to implement stormwater BMPs in accordance with DOEE's Stormwater Management Guidebook and, to the maximum extent technically feasible, Section 438 of the EISA of 2007 and EO 13834. These BMPs would decrease runoff volume, peak flow rate, and pollutant loading from the Project Area. Therefore, there would be no impacts on the quantity or quality of stormwater runoff.

Wastewater

Relative to the No-Action Alternative, Alternative A would have minor adverse direct operational impacts on wastewater infrastructure and wastewater.

Alternative A would likely require modifications to sewer laterals to serve the expanded station. No information is available on the location and extent of these modifications, but they would likely overlap with those that would occur in the No-Action Alternative for the private air-rights development as both projects would take place within the boundaries of the WUS rail terminal. Coordination would minimize the work needed to accommodate the Project. Relative to the No-Action Alternative, adverse impacts would be minor.

Table 5-5 presents the estimated additional wastewater flow from the Project Area in Alternative A based on the number of additional passengers relative to the No-Action Alternative. The average additional daily wastewater flow would be approximately 90,130 gallons per day, plus up to approximately 14,400 gallons per day due to long-term groundwater disposal (see above **Section 5.3.4.2**, *Alternative A, Groundwater*) for a total of up to 104,530 gallons per day. This would represent a 22 percent increase relative to the No-Action Alternative.

Table 5-5. Alternative A Estimated Wastewater Generation (Average Daily Flow)

Location	Use	Unit Flow Rate [1]	Total Unit (2040)	Estimated Average Daily Flow (gpd)
WUS	Rail and Bus[1]	1.7 gpd/ passenger[2]	50,900 additional passengers	86,530
WUS	New Retail	0.05 gpd/square foot[3]	72,000 additional square feet of retail	3,600
Total				90,130

1. Amtrak + MARC + VRE + Intercity bus ridership.
2. Per-passenger unit rate calculated for existing conditions based on 2017 station water usage.
3. Rates based on Maryland Design Guidelines for Wastewater Facilities unless otherwise noted.

DC Water sewer lines to Blue Plains would continue to collect and convey wastewater as they do now. Given Blue Plains' capacity, the increase in the amount of wastewater requiring treatment in Alternative A relative to the No-Action Alternative would be a minor adverse impact. It would represent less than 0.02 percent of the average treatment capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative A would have a minor adverse direct operational impact on drinking water infrastructure and demand.

Alternative A would require modifications to the water distribution infrastructure to provide the additional capacity to meet the demand from the expanded station. There is no information on the location and extent of the needed modifications, but they would likely overlap with those that would occur in the No-Action Alternative for the private air-rights development and coordination would be possible. This would minimize the work needed to accommodate the Project. Relative to the No-Action Alternative, adverse impacts would be minor.

Additional water demand from the Project Area in Alternative A, based on wastewater generation with an added factor of 10 percent to account for consumption, system losses, and other use, would be approximately 99,143 gallons per day, a 19 percent increase relative to the No-Action Alternative. Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand relative to the No-Action Alternative would represent about 0.06 percent of the Aqueduct's capacity. This would be a minor adverse impact.

Indirect Operational Impacts

Surface Waters

Relative to the No-Action Alternative, Alternative A would result in negligible adverse indirect operational impacts on surface waterbodies, including the Anacostia River, Potomac River, and Chesapeake Bay.

Alternative A would not generate additional stormwater runoff relative to the No-Action Alternative but it would generate additional wastewater. This increase would have an adverse impact on the quality of water in the surface waterbodies that drain the Project Area. This adverse impact would be negligible because of the small size of the Project Area and net flow increase relative to those waterbodies' drainage basins.

Groundwater

Relative to the No-Action Alternative, Alternative A would have negligible adverse indirect operational impacts on groundwater.

Because of the shallow depth of Alternative A and the limited amount of groundwater that would require pumping, Alternative A would not cause measurable impacts on groundwater, including soil settlement, in or outside the Project Area. There is no potential to indirectly affect private or public water supply wells, wetlands, or springs.

Stormwater

Relative to the No-Action Alternative, Alternative A would have no indirect operational impact on stormwater.

There would be no indirect impacts on stormwater because Alternative A would result in no changes to stormwater flows relative to the No-Action Alternative.

Wastewater

Relative to the No-Action Alternative, Alternative A would have no indirect operational impact on wastewater.

The potential future development of the Federal air rights in Alternative A as additional parking would not generate wastewater beyond what Alternative A would generate directly.

Drinking Water

Relative to the No-Action Alternative, Alternative A would have no indirect operational impact on drinking water.

The potential future development of the Federal air rights in Alternative A as additional parking would not generate drinking water demand beyond that directly resulting from the Project.

Construction Impacts

Surface Waters

Construction of Alternative A would have no impacts on surface waterbodies.

No surface waterbodies lie within or adjacent to the Project Area. Therefore, the construction activities associated with Alternative A would not affect surface waterbodies.

Groundwater

Construction of Alternative A would have negligible adverse impacts on groundwater.

Because of the relative shallowness of the excavation required in Alternative A, and the construction of a cut-off wall around the perimeter of the Project Area, construction would require only a limited amount of dewatering. Groundwater pumped out of the Project Area during construction would be discharged to the wastewater conveyance system after being treated on site if required. Preliminary modeling indicates a short-term dewatering rate of less than 10 gallons per minute, similar to the long-term dewatering rate described in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*. Construction impacts would be negligible for the reasons explained in that section.

Stormwater

Construction of Alternative A would cause minor adverse impacts on stormwater flows.

Ground-disturbing activities associated with the construction of Alternative A could result in increased erosion and sedimentation, which would affect the quality of stormwater runoff from the Project Area. Increased sediment loadings in stormwater conveyed by drainage systems can also result in lost conveyance capacity. These risks would be small because Alternative A would have to include erosion and sediment controls in compliance with the requirements of the NPDES construction general permit and DOEE's *Erosion and Sediment Control Manual*.[12,13] Erosion and sediment control practices would prevent the transport of significant amounts of sediment from the construction site to city streets, drainage systems, and waterbodies. Adverse impacts would be minor.

Wastewater

Wastewater flows from Alternative A construction-related dewatering would cause a negligible adverse impact on wastewater.

As explained above, because of the relatively shallow depth of excavation in Alternative A and the construction of a cut-off wall, the maximum amount of discharged groundwater that DC Water sewer lines would have to convey to Blue Plains as wastewater would be less than 14,400 gallons a day. Given Blue Plains' capacity, the increased amount of wastewater generated by construction activities in Alternative A would represent a negligible impact.

Drinking Water

Water demand during construction of Alternative A would result in a negligible adverse impact on drinking water.

Construction activities involving water use would include dust control, equipment washing, and construction worker sanitation and consumption. DC Water would likely provide the water. Although a specific estimate is not possible, the amount of water these activities would use would be typical of a large-scale construction project in the District and is not likely to exceed the Washington Aqueduct's capacity. Impacts would be negligible.

Comparison to Existing Conditions

The impacts of Alternative A on surface waterbodies, groundwater, and stormwater would be the same relative to existing conditions and to the No-Action Alternative because there are no relevant differences between the two baselines**.** Relative to existing conditions, Alternative A would have minor adverse impacts on wastewater and drinking water.

[12] U.S. Environmental Protection Agency. 2017. *National Pollutant Discharge Elimination System (NPDES) Construction General Permit*. Accessed from**Error! Hyperlink reference not valid.** https://www.epa.gov/npdes/2017-construction-general-permit-cgp. Accessed on April 2, 2020.

[13] District Office of Energy and Environment. 2017. *Erosion and Sediment Control Manual*. Accessed from https://doee.dc.gov/esc. Accessed on April 2, 2020.

Alternative A would cause an increase in demand for these services (**Table 5-6**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative. Impacts would be minor because the increases in demand would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. The increase in wastewater demand would represent approximately 0.04 percent of Blue Plains' average daily capacity. The increase in drinking water demand would represent approximately 0.09 percent of the Washington Aqueduct's daily production.

Table 5-6. Comparison of Alternative A to Existing Conditions

Water Resource Category	Existing Conditions (gpd)	Increased Demand in Alternative A (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	83,500	136,830[1]	164%
Drinking Water	91,850	134,673[2]	147%

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

5.3.4.3 Alternative B

Direct Operational Impacts

Surface Waters

Relative to the No-Action Alternative, Alternative B would have no direct operational impacts on surface waterbodies.

There are no bodies of surface water in or adjacent to the Project Area. Therefore, Alternative B has no potential to directly affect surface waters.

Groundwater

Relative to the No-Action Alternative, Alternative B would have a negligible adverse direct operational impact on groundwater.

For the same reasons as Alternative A (**Section 5.3.4.2,** *Alternative A***,** *Operational Direct Impacts*), Alternative B would have no impacts on public groundwater supplies, wellhead protection, or groundwater recharge.

Alternative B would have negligible direct operational impacts on groundwater levels for the same reasons as Alternative A (**Section 5.3.4.2**, *Alternative A***,** *Operational Direct Impacts*). Alternative B would require excavating most of the rail terminal to a depth of approximately 10 feet below sea level to accommodate two levels of below-ground parking. This would be well below the groundwater elevation in the Project Area (at about 15 feet asl). The construction of a cut-off slurry wall down to bedrock around the perimeter of the excavated area and the installation of concrete pressure slabs at the bottom of the excavation would minimize any long-term groundwater seepage, but it may not eliminate it entirely. Preliminary modeling indicates that in the long term, dewatering for the Project in Alternative B would result in less than 14,400 gallons a day requiring pumping and disposal.[14] This is similar to what would occur in Alternative A. Therefore, impacts would be negligible for the same reasons as stated for Alternative A.

Stormwater

Relative to the No-Action Alternative, Alternative B would have minor adverse direct operational impacts on stormwater infrastructure and no direct operational impact on stormwater flows.

The impacts of Alternative B on stormwater would be the same as those of Alternative A (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*) because the Project Area would remain entirely impervious, like in Alternative A and the No-Action Alternative.

Wastewater

Relative to the No-Action Alternative, Alternative B would have minor adverse direct operational impacts on wastewater infrastructure and wastewater flows.

The impacts of Alternative B on wastewater demand would be the same as those of Alternative A (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). This is because Alternative B would generate the same additional demand for wastewater as Alternative A.

Drinking Water

Relative to the No-Action Alternative, Alternative B would have minor adverse direct operational impacts on drinking water infrastructure and drinking water demand.

The impacts of Alternative B on the water supply would be the same as those of Alternative A (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). This is because Alternative B would generate the same additional demand for water as Alternative A.

Indirect Operational Impacts

Surface Waters, Groundwater, and Stormwater

Relative to the No-Action Alternative, Alternative B would have negligible adverse indirect operational impacts on surface waterbodies and groundwater. It would have no indirect operational impacts on stormwater.

The indirect operational impacts of Alternative B on surface waterbodies, groundwater, and stormwater would be as in Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Indirect Operational Impacts*.

[14] Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

Wastewater

Relative to the No-Action Alternative, Alternative B would have a minor adverse indirect operational impact on wastewater.

In Alternative B, the potential Federal air-rights development would consist of approximately 917,420 gross square feet of office space. This office space would generate approximately 82,600 gallons per day of wastewater (assuming a unit flow rate of 0.09 gallon per square foot per day: see **Table 5-4**).

DC Water sewer lines to Blue Plains would continue to collect and convey wastewater from the Project Area. The additional production of 82,600 gallons per day of wastewater would be a minor adverse impact. It would represent only about 0.02 percent of Blue Plains' average daily capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative B would have a minor adverse indirect operational impact on drinking water.

In Alternative B, the potential development of the Federal air rights would increase drinking water demand by approximately 90,860 gallons per day (calculated as wastewater demand plus 10 percent for consumption, system losses, and other uses). Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand from the Federal air-rights development would represent 0.05 percent of the Aqueduct's capacity, amounting to a minor adverse impact.

Construction Impacts

Surface Waters, Stormwater, and Drinking Water

Construction of Alternative B would have no impacts on surface waterbodies, minor adverse impacts on stormwater, and negligible adverse impacts on drinking water.

The impacts from construction of Alternative B on surface waterbodies, stormwater, and drinking water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Construction Impacts*.

Groundwater

Construction of Alternative B would have a moderate adverse impacts on groundwater.

Because of the depth of the excavation required in Alternative B, groundwater seepage would occur during construction and require dewatering. Preliminary modeling indicates a short-term dewatering rate 374,400 to 619,200 gallons per day.[15] This would be well above

[15] Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

the threshold for a Significant Non-Categorical Industrial User Wastewater Discharge Permit (25,000 gpd). Dewatering would have to be conducted in compliance with NPDES construction general permit dewatering requirement[16] as well as DOEE and DC Water requirement for the treatment and metering of pumped groundwater.

Groundwater withdrawal has the potential to cause soil settlement in the vicinity of the withdrawal. Due to lack of information, the extent of the area that could be affected cannot be determined at this time. Based on preliminary modeling, the features at greatest risk for groundwater drawdown-induced settlement would be shallow utility infrastructure such as sewer lines, gas lines, or water lines in the Project Area or adjacent public roadways; the WUS Metrorail station; and adjoining buildings supported by shallow foundation systems. Most of the larger buildings adjacent to WUS likely sit on deep foundations and are therefore unlikely to experience settlement. [17] Due to their local character, these potential adverse impacts would be moderate.

Wastewater

Wastewater flow from Alternative B construction-related dewatering would cause a minor adverse impact on wastewater.

Groundwater pumped out of the Project Area during construction would be discharged to the wastewater conveyance system after being treated on site, if needed. As explained above, the maximum amount of discharged groundwater would be approximately 619,200 gallons a day. Wastewater would be conveyed via DC Water sewer lines to Blue Plains. Given Blue Plains' capacity, the additional amount of wastewater Alternative B construction would generate would be a minor adverse impact.

Comparison to Existing Conditions

The impacts of Alternative B on surface waterbodies, groundwater, and stormwater would be the same relative to existing conditions and to the No-Action Alternative because there are no relevant differences between the two baselines**.** Relative to existing conditions, Alternative B would have minor adverse impacts on wastewater and drinking water. Alternative B would cause an increase in demand for these services (**Table 5-7**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative.

[16] U.S. Environmental Protection Agency. 2017. *National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Activities*. Section 2.4 Construction Dewatering Requirements. https://www.epa.gov/sites/production/files/2019-05/documents/final_2017_cgpfact_sheet.pdf. Accessed on April 3, 2020.

[17] Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

Table 5-7. Comparison of Alternative B to Existing Conditions

Water Resource Category	Location	Existing Conditions (gpd)	Increased Demand in Alternative B (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	WUS	83,500	136,830[1]	164%
	Federal Air-rights Development	0	82,600	-
	Total	**83,500**	**219,430**	**263%**
Drinking Water	WUS	91,850	134,673[2]	147%
	Federal Air-rights Development	0	90,860	-
	Total	**91,850**	**225,533**	**246%**

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

Adverse impacts would be minor because the projected increases would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. The additional wastewater demand would represent approximately 0.06 percent of Blue Plains' average daily capacity. The additional drinking water demand would represent approximately 0.15 percent of the Washington Aqueduct's daily production.

5.3.4.4 Alternative C (Both Options)

Direct Operational Impacts

Surface Waters

Relative to the No-Action Alternative, Alternative C would have no direct operational impacts on surface waterbodies.

There are no bodies of surface water in or adjacent to the Project Area. Therefore, Alternative C has no potential to directly affect surface waterbodies.

Groundwater

Relative to the No-Action Alternative, Alternative C would have moderate adverse direct operational impacts on groundwater.

Like Alternative A, and for the same reasons (**Section 5.3.4.2,** *Alternative A, Operational Direct Impacts*), Alternative C would have no impacts on public groundwater supplies, wellhead protection, or groundwater recharge.

Alternative C would have moderate direct operational impacts on groundwater levels. Alternative C would require excavating most of the rail terminal to a depth of approximately 3 feet asl to accommodate one level of below-ground parking. This would be below groundwater elevation at the site. The construction of a sheet-pile cut-off down to the Potomac Clay layer underlying the Project Area around the perimeter of the excavation and the installation of concrete pressure slabs at the bottom of the excavation would minimize any long-term groundwater seepage, but it may not eliminate it entirely. Preliminary modeling indicates that in the long term, dewatering rates for the Project in Alternative C would range from approximately 28,800 to 43,200 gallons a day to be pumped and disposed of, after treatment if required.[18] This would be above the ceiling DC Water established for the issuance of Significant Non-Categorical Industrial User Wastewater Discharge Permit, which applies to industrial or commercial businesses and government agencies that have less than 25,000 gallons per day of process flow.[19] Groundwater withdrawal may increase the risk of soil settlement, as described in **Section 5.3.4.3,** *Alternative B, Construction Impacts*.

Stormwater

Relative to the No-Action Alternative, Alternative C would have minor adverse direct operational impacts on stormwater infrastructure and no impact on stormwater flows.

The impacts of Alternative C on stormwater would be the same as those of Alternative A (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*).

Wastewater

Relative to the No-Action Alternative, Alternative C would have minor adverse direct operational impacts on wastewater infrastructure and wastewater flows.

Like Alternative A and the other Action Alternatives, Alternative C would likely require modifications to sewer laterals to serve the expanded station. Such impacts would be minor as explained for Alternative A in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

In Alternative C, the increase in WUS ridership and retail space would cause the same increase in wastewater production as in Alternative A, approximately 90,130 gallons per day (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). In addition, up to 43,200 gallons per day of groundwater from long-term dewatering would be discharged to the sewer conveyance system, for a total of up to 133,330 gallons per day. This would be a 29 percent increase relative to the No-Action Alternative.

DC Water sewer lines would continue to collect wastewater and convey it to Blue Plains. Given Blue Plains' capacity, the increase in the amount of wastewater requiring treatment in

[18] Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

[19] DC Water. *Industrial User Wastewater Discharge Permit*. Accessed from https://www.dcwater.com/industrial-user-wastewater-discharge-permit. Accessed on January 4, 2019.

Alternative C relative to the No-Action Alternative would be a minor adverse impact. It would represent less than 0.03 percent of Blue Plains' average treatment capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative C would have minor adverse direct operational impacts on drinking water infrastructure and drinking water demand.

The impacts of Alternative C on drinking water would be the same as those of Alternative A (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). This is because Alternative C would generate the same additional demand for water as Alternative A.

Indirect Operational Impacts

Surface Waters, Groundwater, and Stormwater

Relative to the No-Action Alternative, Alternative C would have negligible adverse indirect operational impacts on surface waterbodies and groundwater. It would have no indirect operational impacts on stormwater.

The indirect operational impacts of Alternative C on surface waterbodies, groundwater, and stormwater would be as in Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Indirect Operational Impacts*.

Wastewater

Relative to the No-Action Alternative, Alternative C would have a minor adverse indirect operational impact on wastewater.

In Alternative C, the potential Federal air-rights development would consist of approximately 952,600 square feet of office space. This office space would generate approximately 85,700 gallons per day of wastewater.

Wastewater would continue to be collected and conveyed via DC Water sewer lines to Blue Plains. The additional production of 85,700 gallons per day of wastewater would be a minor adverse impact. It would represent about 0.02 percent of Blue Plains' average daily capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative C would have a minor adverse indirect operational impact on drinking water.

In Alternative C, the potential development of the Federal air rights would increase drinking water demand. The Federal air-rights development, consisting of office space, would generate an additional 94,300 gallons per day of water demand (calculated as wastewater demand plus 10 percent for consumption, system losses, and other uses).

Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand from the Federal air-rights development would represent 0.06 percent of the Aqueduct's capacity, amounting to a minor adverse impact.

Construction Impacts

Surface Waters, Stormwater, and Drinking Water

Construction of Alternative C would have no impacts on surface waterbodies, minor adverse impacts on stormwater, and negligible adverse impacts on drinking water.

The construction impacts of Alternative C on surface waterbodies, stormwater, and drinking water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Construction Impacts*.

Groundwater

Construction of Alternative C would have moderate adverse impacts on groundwater.

Because of the depth of the excavation required in Alternative C, groundwater seepage would occur during construction and require dewatering. Preliminary modeling indicates a short-term dewatering rate of approximately 316,800 to 403,200 gallons per day.[20] This would be well above the threshold for a Significant Non-Categorical Industrial User Wastewater Discharge Permit (25,000 gpd). Groundwater withdrawal may increase the risk of soil settlement, as described in **Section 5.3.4.3**, *Alternative B*, *Construction Impacts*.

Wastewater

Wastewater flows from Alternative C construction-related dewatering would cause a minor adverse impact on wastewater.

Groundwater pumped out of the Project Area during construction would be discharged to the wastewater conveyance system after being treated on site, if required. As explained above, the maximum amount of discharged groundwater would be approximately 403,200 gallons a day. DC Water sewer lines would convey wastewater to Blue Plains. Given Blue Plains' treatment capacity, the additional amount generated by Alternative C construction would represent a minor impact.

Comparison to Existing Conditions

The impacts of Alternative C on surface waters, groundwater, and stormwater would be the same relative to existing conditions and to the No-Action Alternative because there are no relevant differences between the two baselines. Relative to existing conditions, Alternative C would have minor adverse impacts on wastewater and drinking water. Alternative C would cause an increase in demand for these services (**Table 5-8**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative.

[20] Wood Environment & Infrastructure Solutions. February 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station, Washington, D.C.*

Table 5-8. Comparison of Alternative C to Existing Conditions

Water Resource Category	Location	Existing Conditions (gpd)	Increased Demand in Alternative C (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	WUS	83,500	165,630[1]	198%
	Federal Air-rights Development	0	85,700	-
	Total	**83,500**	**251,330**	**301%**
Drinking Water	WUS	91,850	134,673[2]	143%
	Federal Air-rights Development	0	94,300	-
	Total	**91,850**	**228,973**	**249%**

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

Impacts would be minor because the projected increases in demand would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. The additional wastewater demand would represent approximately 0.07 percent of Blue Plains' average daily capacity. The additional drinking water demand would represent approximately 0.15 percent of the Washington Aqueduct's daily production.

5.3.4.5 Alternative D

Direct Operational Impacts

Surface Waters and Stormwater

Relative to the No-Action Alternative, Alternative D would have no direct operational impacts on surface waterbodies; and minor adverse operational impacts on stormwater infrastructure and no impacts on stormwater flows.

The direct operational impacts of Alternative D on surface waterbodies and stormwater would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

Groundwater

Relative to the No-Action Alternative, Alternative D would have moderate adverse direct operational impacts on groundwater.

The direct operational impacts of Alternative D on groundwater would be the same as those of Alternative C. These impacts are described in **Section 5.3.4.4**, *Alternative C, Direct Operational Impacts*.

Wastewater

Relative to the No-Action Alternative, Alternative D would have minor adverse direct operational impacts on wastewater infrastructure and wastewater flows.

Like Alternative A and the other Action Alternatives, Alternative D would likely require modifications to sewer laterals to serve the expanded station. Such impacts would be minor as explained for Alternative A in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

In Alternative D, the increase in WUS ridership would cause the same increase in wastewater production as in Alternative A, approximately 86,530 gallons per day (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). The addition of approximately 100,000 square feet of retail space would further generate around 5,000 gallons per day of wastewater. Finally, up to 43,200 gallons per day of groundwater from long-term dewatering would be discharged to the sewer conveyance system. Altogether, Alternative D would generate up to 134,730 gallons per day of wastewater. This would be a 29 percent increase relative to the No-Action Alternative.

DC Water sewer lines would continue to collect wastewater and convey it to Blue Plains. Given Blue Plains' capacity, the increase in the amount of wastewater requiring treatment in Alternative D relative to the No-Action Alternative would be a minor adverse impact. It would represent approximately 0.04 percent of Blue Plains' average treatment capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative D would have a minor adverse direct operational impact on drinking water infrastructure and demand.

Like Alternative A and the other Action Alternatives, Alternative D would require modifications to the water distribution infrastructure to provide the additional capacity to meet the demand from the expanded station. Such impacts would be minor as explained in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

Additional drinking water demand from the Project Area in Alternative D, based on wastewater generation with an added factor of 10 percent to account for consumption, system losses, and other use, would approximately be 100,683 gallons per day, a 20 percent increase relative to the No-Action Alternative. Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand relative to the No-Action Alternative would represent about 0.06 percent of this capacity. This would be a minor adverse impact.

Indirect Operational Impacts

Surface Waters, Groundwater, and Stormwater

Relative to the No-Action Alternative, Alternative D would have negligible adverse indirect operational impacts on surface waterbodies and groundwater. It would have no indirect operational impacts on stormwater.

The indirect operational impacts of Alternative D on surface waterbodies, groundwater, and stormwater would be as in Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Indirect Operational Impacts*.

Wastewater

Relative to the No-Action Alternative, Alternative D would have a minor adverse indirect operational impact on wastewater.

In Alternative D, the potential Federal air-rights development would consist of approximately 688,050 gross square feet of office space. This office space would generate approximately 61,900 gallons per day of wastewater (assuming a unit flow rate of 0.09 gallon per square foot per day: see **Table 5.3-2**).

DC Water sewer lines would continue to collect wastewater from the Project Area and convey it to Blue Plains. Given Blue Plains' capacity, the production of an additional 61,900 gallons per day of wastewater would be a minor adverse impact. It would represent about 0.016 percent of Blue Plains' average daily capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative D would have a minor adverse indirect operational impact on drinking water.

In Alternative D, the potential development of the Federal air rights as office space would increase drinking water demand by approximately an additional 68,100 gallons per day of water (calculated as wastewater demand plus 10 percent for consumption, system losses, and other uses).

Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand from the Federal air-rights development would represent around 0.04 percent of the Aqueduct's capacity, amounting to a minor adverse impact.

Construction Impacts

Surface Waters, Stormwater, and Drinking Water

Construction of Alternative D would have no impacts on surface waterbodies, minor adverse impacts on stormwater, and negligible adverse impacts on drinking water.

The construction impacts of Alternative D on surface waterbodies, stormwater, and drinking water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Construction Impacts*.

Groundwater and Wastewater

Construction of Alternative D would have moderate adverse impacts on groundwater and minor adverse impacts on wastewater.

The construction impacts of Alternative D on groundwater and wastewater would be the same as those of Alternative C. These impacts are described in **Section 5.3.4.4**, *Alternative C, Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative D on surface waterbodies, groundwater, and stormwater would be the same relative to existing conditions as to the No-Action Alternative because there are no relevant differences between the two baselines.

Relative to existing conditions, Alternative D would have minor adverse impacts on wastewater and drinking water. Alternative D would cause an increase in demand for these services (**Table 5-9**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative. The impacts would be minor because projected demand increases would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. Additional wastewater demand would represent approximately 0.06 percent of Blue Plains' average daily capacity. Additional drinking water demand would represent approximately 0.13 percent of the Washington Aqueduct's daily production.

Table 5-9. Comparison of Alternative D to Existing Conditions

Water Resource Category	Location	Existing Conditions (gpd)	Increased Demand in Alternative D (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	WUS	83,500	167,030[1]	200%
	Federal Air-rights Development	0	61,900	-
	Total	**83,500**	**228,930**	**274%**
Drinking Water	WUS	91,850	136,213[2]	148%
	Federal Air-rights Development	0	68,100	-
	Total	**91,850**	**204,313**	**222%**

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

5.3.4.6 Alternative E

Direct Operational Impacts

Surface Waters and Stormwater

Relative to the No-Action Alternative, Alternative E would have no direct operational impacts on surface waterbodies, minor adverse operational impacts on stormwater infrastructure, and no impacts on stormwater flows.

The direct operational impacts of Alternative E on surface waterbodies and stormwater would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Direct Operational Impacts*.

Groundwater

Relative to the No-Action Alternative, Alternative E would have negligible adverse direct operational impacts on groundwater.

The direct operational impacts of Alternative E on groundwater would be the same as those of Alternative B. These impacts are described in **Section 5.3.4.3**, *Alternative B*, *Direct Operational Impacts*.

Wastewater

Relative to the No-Action Alternative, Alternative E would have minor adverse direct operational impacts on wastewater infrastructure and wastewater flows.

Like Alternative A and the other Action Alternatives, Alternative E would likely require modifications to sewer laterals to serve the expanded station. Such impacts would be minor as explained for Alternative A in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

In Alternative E, the increase in WUS ridership would cause the same increase in wastewater production as in Alternative A, approximately 86,530 gallons per day (**Section 5.3.4.2,** *Alternative A*, *Direct Operational Impacts*). The addition of approximately 100,000 square feet of retail space would further generate around 5,000 gallons per day of wastewater. Finally, up to 14,400 gallons per day of groundwater from long-term dewatering would be discharged to the sewer conveyance system. Altogether, Alternative E would generate up to 105,930 gallons per day of wastewater. This would be a 23 percent increase relative to the No-Action Alternative.

Wastewater would continue to be collected and conveyed via DC Water sewer lines to Blue Plains. Given Blue Plains' capacity, the increase in the amount of wastewater to be treated in Alternative D relative to the No-Action Alternative would be a minor adverse impact. It would represent approximately 0.03 percent of the average treatment capacity.

Drinking Water

The impacts of Alternative E on the water supply would be the same as those of Alternative D (see **Section 5.3.4.5**, *Alternative D, Direct Operational Impacts*). Alternative E would generate the same additional demand for water as Alternative D.

Indirect Operational Impacts

Surface Water, Groundwater, and Stormwater

Relative to the No-Action Alternative, Alternative E would have negligible adverse indirect operational impacts on surface waterbodies and groundwater. It would have no indirect operational impacts on stormwater.

The indirect operational impacts of Alternative E on surface waters, groundwater, and stormwater water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Indirect Operational Impacts*.

Wastewater and Drinking Water

Relative to the No-Action Alternative, Alternative E would have minor adverse indirect operational impacts on wastewater and drinking water.

The indirect operational impacts of Alternative E on wastewater and drinking water would be the same as those of Alternative D. These impacts are described in **Section 5.3.4.5**, *Alternative D*, *Indirect Operational Impacts*.

Construction Impacts

Surface Waters, Stormwater, and Drinking Water

Construction of Alternative E would have no impacts on surface waterbodies; minor adverse impacts on stormwater; and negligible adverse impacts on drinking water.

The construction impacts of Alternative E on surface waterbodies, stormwater, and drinking water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A*, *Construction Impacts*.

Groundwater and Wastewater

Construction of Alternative E would have moderate adverse impacts on groundwater and minor adverse impacts on wastewater.

The construction impacts of Alternative E on groundwater and wastewater would be the same as those of Alternative B. These impacts are described in **Section 5.3.4.3**, *Alternative B*, *Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative E on surface waterbodies, groundwater, and stormwater would be the same relative to existing conditions as to the No-Action Alternative because there are no relevant differences between the two baselines. Relative to existing conditions, Alternative E would have minor adverse impacts on wastewater and drinking water. Alternative E would cause an increase in demand for these services (**Table 5-10**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative. The impacts would be minor because the demand increases would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. The additional wastewater demand would represent approximately 0.05 percent of Blue Plains' average daily capacity. The additional drinking water demand would represent approximately 0.13 percent of the Washington Aqueduct's daily production.

Table 5-10. Comparison of Alternative E to Existing Conditions

Water Resource Category	Location	Existing Conditions (gpd)	Increased Demand in Alternative E (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	WUS	83,500	138,230[1]	166%
	Federal Air-rights Development	0	61,900	-
	Total	**83,500**	**200,130**	**240%**
Drinking Water	WUS	91,850	136,213[2]	148%
	Federal Air-rights Development	0	68,100	-
	Total	**91,850**	**204,313**	**222%**

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

5.3.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Surface Waters, Groundwater, Stormwater, Wastewater, and Drinking Water

Relative to the No-Action Alternative, Alternative A-C would have no direct operational impacts on surface waterbodies; negligible adverse impacts on groundwater; minor adverse operational impacts on stormwater infrastructure and no impacts on stormwater flows; minor adverse direct operational impacts on wastewater infrastructure and wastewater flows; and minor adverse direct operational impacts on drinking water infrastructure and demand.

The direct operational impacts of Alternative A-C on surface waterbodies, groundwater, stormwater, wastewater, and drinking water would be the same as those of Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A, Direct Operational Impacts*.

Indirect Operational Impacts

Surface Waters, Groundwater, and Stormwater

Relative to the No-Action Alternative, Alternative A-C would have negligible adverse indirect operational impacts on surface waterbodies and groundwater. It would have no indirect operational impacts on stormwater.

The indirect operational impacts of Alternative A-C on surface waterbodies, groundwater, and stormwater would be as in Alternative A. These impacts are described in **Section 5.3.4.2**, *Alternative A, Indirect Operational Impacts*.

Wastewater

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse indirect operational impact on wastewater.

In Alternative A-C, the potential Federal air-rights development would consist of approximately 380,000 gross square feet of office space. This office space would generate approximately 34,200 gallons per day of wastewater (assuming a unit flow rate of 0.09 gallon per square foot per day: see **Table 5-4**).

DC Water sewer lines would continue to collect wastewater from the Project Area and convey it to Blue Plains. Given Blue Plains' capacity, the production of an additional 34,200 gallons per day of wastewater would be a minor adverse impact. It would represent about 0.008 percent of Blue Plains' average daily capacity.

Drinking Water

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse indirect operational impact on drinking water.

In Alternative A-C, the potential development of the Federal air rights as office space would increase drinking water demand by approximately an additional 37,620 gallons per day of water (calculated as wastewater demand plus 10 percent for consumption, system losses, and other uses).

Drinking water would continue to be distributed by DC Water and supplied by the Washington Aqueduct. The increase in demand from the Federal air-rights development would represent around 0.02 percent of the Aqueduct's capacity, amounting to a minor adverse impact.

Construction Impacts

Surface Waters, Groundwater, Stormwater, Wastewater, and Drinking Water

Construction of Alternative A-C would have no impacts on surface waterbodies; negligible impacts on groundwater; minor adverse impacts on stormwater; negligible adverse impacts on wastewater; and negligible adverse impacts on drinking water.

The construction impacts of Alternative A-C would be the same as those of Alternative A because both alternatives are similar with respect to the relevant factors (such as depth of excavation). These impacts are described in **Section 5.3.4.2**, *Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative A-C on surface waterbodies, groundwater, and stormwater would be the same relative to existing conditions as to the No-Action Alternative because there are no relevant differences between the two baselines. Relative to existing conditions, Alternative A-C would have minor adverse impacts on wastewater and drinking water. Alternative A-C would cause an increase in demand for these services (**Table 5-11**) that would be proportionately greater relative to existing conditions than relative to the No-Action Alternative.

Table 5-11. Comparison of Alternative A-C to Existing Conditions

Water Resource Category	Location	Existing Conditions (gpd)	Increased Demand in Alternative A-C (2040) (gpd)	Increase Relative to Existing Conditions
Wastewater	WUS	83,500	136,830[1]	164%
	Federal Air-rights Development	0	34,200	-
	Total	**83,500**	171,030	**240%**
Drinking Water	WUS	91,850	134,673[2]	147%
	Federal Air-rights Development	0	37,620	-
	Total	**91,850**	172,293	**188%**

1 Based on increase in Amtrak + MARC + VRE + Intercity bus ridership relative to existing conditions, new retail, and groundwater disposal from long-term dewatering.
2 Based on wastewater from total ridership and retail + 10 percent.

The impacts would be minor because the demand increases would be small relative to the capacity of DC Water's water supply and wastewater infrastructure. The additional wastewater demand would represent approximately 0.04 percent of Blue Plains' average daily capacity. The additional drinking water demand would represent approximately 0.1 percent of the Washington Aqueduct's daily production.

5.3.5 Comparison of Alternatives

Table 5-12 presents a comparison of the impacts of the No-Action Alternative and six Action Alternatives. All alternatives would have similar impacts on surface waters and stormwater. Impacts on groundwater would vary among the alternatives. Although no quantitative assessment is possible at this stage, the No-Action Alternative would have the smallest impact, with dewatering required only for the construction of drilled shafts to support the overbuild deck.

The Action Alternatives would require varying amounts of short-term and long-term dewatering depending on the depth of excavation and cut-off wall type associated with each alternative. **Table 5-13** shows estimated amounts. Construction-phase dewatering requirements would be greatest for Alternatives B and E and smallest for Alternatives A and A-C. Long-term dewatering needs would be negligible for all Action Alternatives except for Alternatives C and D. This is because in these two alternatives, the cut-off wall would extend only down to the clay layer underlying the Project Area and, as such, may not be fully effective in preventing seepage.

Table 5-12. Comparison of Alternatives, Water Resources

<table>
<tr><th>Impact Category</th><th>Type of Impact</th><th>No-Action Alternative</th><th>Alternative A</th><th>Alternative B</th><th>Alternative C (Either Option)</th><th>Alternative D</th><th>Alternative E</th><th>Alternative A-C (Preferred)</th></tr>
<tr><td rowspan="3">Surface Waters</td><td>Direct Operational</td><td colspan="7">No impacts</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">Negligible adverse impacts</td></tr>
<tr><td>Construction</td><td colspan="7">No impacts</td></tr>
<tr><td rowspan="3">Groundwater</td><td>Direct Operational</td><td>Negligible adverse impacts</td><td>Negligible adverse impacts</td><td>Negligible adverse impacts</td><td>Moderate adverse impacts</td><td>Moderate adverse impacts</td><td>Negligible adverse impacts</td><td>Negligible adverse impacts</td></tr>
<tr><td>Indirect Operational</td><td>No impacts</td><td colspan="6">Negligible adverse impacts</td></tr>
<tr><td>Construction</td><td>Negligible adverse impacts</td><td>Negligible adverse impacts</td><td colspan="4">Moderate adverse impacts</td><td>Negligible adverse impacts</td></tr>
<tr><td rowspan="3">Stormwater</td><td>Direct Operational</td><td colspan="7">Minor Adverse Impacts on Infrastructure; No impacts on Flows</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">No impacts</td></tr>
<tr><td>Construction</td><td colspan="7">Minor adverse impacts</td></tr>
<tr><td rowspan="2">Wastewater</td><td>Direct Operational</td><td colspan="7">Minor adverse impacts</td></tr>
<tr><td>Indirect Operational</td><td>No impacts</td><td>No impacts</td><td colspan="5">Minor adverse impacts</td></tr>
</table>

Impact Category	Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C (Either Option)	Alternative D	Alternative E	Alternative A-C (Preferred)
	Construction	Negligible adverse impacts	Negligible adverse impacts	Minor adverse impacts				Negligible adverse impacts
Drinking Water	**Direct Operational**	Minor adverse impacts						
	Indirect Operational	No impacts	No impacts	Minor adverse impacts				
	Construction	Negligible adverse impacts						

Table 5-13. Quantitative Estimates by Alternative

Water Resources Category	Parameter	Source	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
Construction-phase Dewatering	**Dewatering Rate (gpm)**	Project Area	N/A	Less than 10	260 to 430	220 to 280	220 to 280	260 to 430	Less than 10
Long-term Dewatering	**Dewatering Rate (gpm)**	Project Area	N/A	Less than 10	Less than 10	20 to 30	20 to 30	Less than 10	Less than 10
Wastewater	**Additional Demand (gpd)**	WUS	32,300	104,530	104,530	133,330	134,730	105, 930	104,530
		Private Air-Rights Development	431,900	0	0	0	0	0	0
		Potential Federal Air-Rights Development	0	0	82,600	85,700	61,900	61,900	34,200
		Total	**464,200**	**104,530**	**187,130**	**219,030**	**196,630**	**167,830**	**138,730**
Water	**Additional Demand (gpd)**	WUS	35,530	99,143	99,143	99,143	100,683	100,683	99,143
		Private Air-Rights Development	475,090	0	0	0	0	0	0
		Potential Federal Air-Rights Development	0	0	90,860	94,300	68,100	68,100	37,620
		Total	**510,620**	**99,143**	**190,003**	**193,443**	**168,783**	**168,783**	**136,763**

Abbreviations: gpm = gallons per minute; gpd = gallons per day; N/A = Not Available

With regard to wastewater and drinking water, all Action Alternatives would generate additional demand relative to the No-Action Alternative, as shown in **Table 5-13**. Differences among the Action Alternatives would result from long-term discharge of groundwater to the wastewater system and from the varying amount of Federally owned air rights that would be available for potential development. Alternative C would generate the greatest additional demand for wastewater and drinking water capacity and Alternative A the smallest.

5.3.6 Avoidance, Minimization and Mitigation Evaluation

The following measures to minimize or mitigate potential adverse impacts to surface waterbodies, groundwater, stormwater, wastewater, and water supply infrastructure are being considered by FRA consistent with the U.S. Environmental Protection Agency (EPA)'s 2017 NPDES Construction General Permit, Section 438 of the EISA, DOEE's *Stormwater Management Guidebook*, District Department of Transportation (DDOT)'s *Green Infrastructure Standards*, DC Water's *Green Infrastructure Utility Protection Guidelines*, and DC Water's *Project Design Manual, Volume 3, Infrastructure Design*:

- The construction contractor would develop and implement erosion and sedimentation controls during construction.
- The construction contractor would be required to provide on-site treatment of pumped groundwater as needed and discharge it through the District's MS4 instead of through the combined sewer system to Blue Plains.
- Prior to the beginning of construction, Project Proponents to conduct additional groundwater studies, including:
    - Performing additional borings to depths of 120 to 150 feet inside and along the perimeter of the Project Area to better characterize the lower aquifer's composition and extent as well as any discontinuities of the Potomac Clay layer separating the aquifers.
    - Performing research on adjacent properties to understand the local impacts of ongoing or periodic dewatering systems operating around the Project Area.
    - Performing additional pump testing that target zones of clay discontinuity in the lower aquifer.
    - If warranted by the above, performing further modeling to map areas with high potential to experience ground subsidence from groundwater drawdown.
- During construction, if warranted by the studies listed above, Project contractor to monitor and control active dewatering on the site so it does not create subsidence in and around adjacent properties.

- Project Proponents to ensure that stormwater management features, including green infrastructure practices such as rainwater collection and reuse, green roofs, and bioretention facilities, are included in Project design as appropriate to manage post-construction stormwater flows in accordance with DOEE's *Stormwater Management Guidebook.*
- Project Proponents to incorporate in Project design additional stormwater management measures to restore, to the maximum extent technically feasible, pre-development site hydrology in compliance with Section 438 of the EISA.

5.3.7 Permits and Regulatory Compliance

DOEE is the lead authority on environmental compliance within the District. DOEE completes reviews and issues permits for land-disturbing projects. The Project would qualify as Major Land Disturbing Activities[21] and would need to secure permits for erosion and sediment control, dewatering, and post-construction stormwater management.

The Project would also be regulated under EPA's NPDES Construction General Permit and would need to submit a Stormwater Pollution Prevention Plan (SWPPP) to both DOEE and the EPA Region 3 that is compliant with the requirements of the permit. A SWPPP is a document that identifies potential sources of stormwater pollution at a construction site, describes practices to reduce pollutants in stormwater discharge from the site, and identifies procedures to achieve compliance.

DC Water is an independent authority that distributes drinking water and collects and treats stormwater and wastewater in the District. The Project would need to secure a DC Water Permit Operations Department approval for water and wastewater connections, as well as for the discharge of pumped groundwater.

DOEE and DC Water regulations and procedures govern construction-phase groundwater discharge. The discharge must comply with DC Municipal Regulation, Title 21 – Water and Sanitation. Particularly relevant sections include Chapter 21-1501, *Discharge Standards and Sewer Use Requirements* and §21-207, *Sanitary Sewer Service Charge for Groundwater: Improved Sites and Construction Sites*. Treatment prior to discharge may be required. DC water measures construction groundwater discharge and charges $3.11 per 1,000 gallons. The Project may require a Large Industrial User Wastewater Discharge Permit (more than 25,000 gallons per day and more than six months duration), which costs $7,500 for five years.

[21] Major Land Disturbing Activity is considered any land disturbance greater than or equal to 5,000 square feet.

5.4 Solid Waste Disposal and Hazardous Materials

This section describes and characterizes potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on solid waste production and disposal and on the use and disposal of hazardous materials. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies relevant permitting and regulatory compliance requirements.

5.4.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to natural ecological resources are listed **Section 4.4.1**, *Regulatory Context and Guidance*.

5.4.2 Study Area

As defined in **Section 4.4.2**, *Study Area*, the Local Study Area for hazardous waste is the same as the Project Area (**Figure 1-1**). It is unlikely that solid waste and hazardous materials present at a regional level would require handling or storage within the Project Area; therefore, a Regional Study Area was not considered.

5.4.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on solid waste disposal and hazardous materials. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 4.4***, Methodology*, provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.4.3.1 Operational Impacts

Operational impacts on solid waste were evaluated based on estimated volumes of solid waste that the Project Area would generate in the various alternatives. Estimates of WUS-generated waste were based on available data on current waste generation. For other land uses, including the private air-rights development and the potential Federal air-rights development, the analysis used generation rates provided by the District Department of Public Works. There is no information on the total amount of solid waste the District produces currently or would produce in 2040, nor is there any information on the number and capacity of available transfer disposal facilities at that time. As a result, waste generation estimates were compared to the most amount of waste processed through the District's two existing waste transfer stations in fiscal year 2017, which represents only a portion of the total amount of waste generated in the District.

The Impact assessment for hazardous materials was qualitative. The analysis presumes that operations at WUS comply and would continue to comply with all applicable laws and regulations.

5.4.3.2 Construction Impacts

Construction impacts were evaluated using a similar approach to that used for the operational impacts. Waste generation estimates were derived from the constructability analysis conducted for the Project. Compliance with laws and regulations pertaining to hazardous materials was presumed.

5.4.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on solid waste disposal and hazardous materials.

5.4.4.1 No-Action Alternative

Direct Operational Impacts

Municipal Solid Waste

Relative to existing conditions, in the No-Action Alternative, there would be minor adverse direct operational impacts from the increased amount of solid waste generated in the Project Area.

Increased activity at WUS in the No-Action Alternative would generate an increase in the amount of municipal solid waste produced at the station. Between January and August 2017, WUS generated approximately 1,145 tons of municipal solid waste and 415 tons of recyclable material, or an average of 195 tons of waste a month. This corresponds to an annual amount of 2,340 tons.

It is possible to develop an order-of-magnitude estimate of the increase in solid waste generation that would occur in the No-Action Alternative based on the assumption that it would be approximately proportional to the increase in ridership. In 2040, daily WUS ridership (Amtrak, VRE, MARC, and intercity buses) is projected to increase by around 33 percent relative to existing conditions. A 33 percent increase in solid waste generation would result in approximately 765 more tons of municipal waste a year.

The private air-rights development, including residential, hotel, office, and retail uses, would also generate new municipal solid waste. An order-of-magnitude estimation based on typical generation rates by use shows that the development would generate approximately 14,480 tons of solid waste annually. How this estimate was developed is explained in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 4.5.1.1**, *Direct Operational Impacts.*

Altogether, in the No-Action Alternative, the Project Area would annually produce approximately 15,245 more tons of solid waste than under existing condition, for a total of 17,585 tons per year. It is not possible to determine how and by whom future waste from the Project Area would be handled. It may be processed through one of the District's two solid waste transfer stations. In fiscal year 2017, the District-owned solid waste transfer station processed approximately 464,000 tons of waste from the District.[1] The increased quantity of waste generated by the Project Area represents a small proportion of this amount (about 3.3 percent). Additionally, it can be anticipated that a large part of the waste would be either recycled or composted, in keeping with District policy.[2] Non-recycled waste would be sent to landfill facilities in Virginia or Maryland. In Virginia alone, total sanitary landfill capacity at the end of 2017 was just under 248 million tons, with a remaining permitted life of 23.1 years. [3] Additional waste from the Project Area in the No-Action Alternative is unlikely to cause capacity issues.

Hazardous Materials and Waste

Relative to existing conditions, in the No-Action Alternative, there would be an increase in the amount of hazardous materials stored, used, and disposed of in the Project Area. This would result in negligible adverse direct operational impacts.

Train operations involve the storage and use of fuel, oils, lubricants, and other hazardous or regulated materials for operation or maintenance of stationary or mobile equipment. There would be an increase in rail operations at WUS in the No-Action Alternative, from 24 percent for Amtrak operations to 6 percent for VRE operations. However, the nature of operations would remain similar to what it is currently. The same types of hazardous materials would continue to be used, though in greater amounts. The storage, utilization, and disposal of these materials would continue to comply with applicable laws, regulations, and policies. Increased activities at WUS may slightly increase the risk of accidental spills and release of oil or hazardous materials (OHM).

The private air-rights development would involve the storage and use of hazardous materials typically found in residential and office buildings. The District has a program for the disposal

[1] District Department of Public Works. *Washington DC Solid Waste Diversion Progress Report. Fiscal Year 2017*. Accessed from: https://dpw.dc.gov/wastediversionreport. Accessed on June 3, 2019.

[2] The District has a goal of diverting 80 percent of citywide waste from landfills and waste-to-energy facilities. To help achieve this goal, the District requires multi-family dwellings, office buildings, and restaurants to recycle a full suite of materials. Accessed from https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 3, 2020.

[3] Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from: https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on June 3, 2019.

of household hazardous materials at the Fort Totten Transfer Station, which would be available to residents of the development.

Indirect Operational Impacts

There would be no indirect operational impacts. The No-Action Alternative would not affect solid waste or hazardous materials generation away from the Project Area.

The No-Action Alternative would not affect the production of solid waste or hazardous materials generation away from the Project Area

Construction Impacts

Construction activities in the No-Action Alternative would result in negligible adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. They would generate potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

In the No-Action Alternative, construction of the Project would not occur and there would be no construction impacts. The construction of several of the projects included in this alternative, including the private air-rights development, the replacement of the H Street Bridge, the relocation of Substation 25A, and the VRE Midday Storage Facility, would generate impacts. Specific information on the construction methods and schedules for those projects is not available. This section assesses anticipated impacts in a general and qualitative manner.

Adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris during construction would be negligible because it can be anticipated that these activities would comply with applicable Federal and local laws and regulations, as explained below.

Construction activities would involve the storage, use, and disposal of petroleum and hazardous materials such as fuel, lubricants, or solvents, among others, for the operation and maintenance of equipment during construction activities. This would create a risk of spill or release into the environment. Compliance with Emergency Planning and Community Right-to-know Act (EPCRA), Oil Pollution Act (OPA), and Resource Conservation and Recovery Act (RCRA) requirements would minimize impacts from spills or releases.

The projects in the No-Action Alternative would generate construction spoils and debris. Limited sampling suggests that soil and groundwater below the rail terminal contain contaminants in low concentrations. Some soil concentrations exceeded regulatory screening levels for total petroleum hydrocarbons, diesel range organics (TPH-DRO), polychlorinated biphenyls (PCB), and arsenic.[4] Construction contractors would be required to handle and

4 Amtrak. November 2019. *Final Washington Union Station Terminal Infrastructure Project Constructability Report*.

dispose of spoil materials and groundwater in accordance with applicable laws and regulations, including RCRA and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The replacement of Substation 25A may generate hazardous debris. Electrical substations include electrical equipment such as transformers or capacitors that contain dielectric fluids. The Toxics Substances Control Act (TSCA) regulates the storage and disposal of PCB-contaminated materials like dielectric fluids. Construction contractors would have to comply with TSCA, as applicable.

Pre-1980 structures, including Substation 25A and the H Street Bridge, may contain asbestos-containing materials (ACM) as well as lead-based paints. In the event such materials are present, special handling during the demolition process would be required. Removal and disposal of these materials would have to be in accordance with the applicable regulations and standard abatement protocols.

In the aggregate, the removal of contaminated materials from the Project Area would constitute a minor beneficial impact. This impact would be minor because of the likely limited level of contamination present.

5.4.4.2 Alternative A

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative A would have a minor adverse direct operational impact on solid waste generation.

Increased activity and ridership at WUS in Alternative A would generate an increase in the amount of municipal solid waste produced by the station. It is possible to calculate an order-of-magnitude estimate of the increase in solid waste generation that would occur based on the assumption that it would be approximately proportional to the increase in ridership. In 2040, daily WUS ridership (Amtrak, VRE, MARC, and intercity buses) would increase by around 65 percent relative to the No-Action Alternative. A proportional increase in annual solid waste generation would result in approximately 2,031 more tons of municipal waste. The addition of 72,000 square feet of retail to the approximately 208,000 square feet that are currently at WUS would contribute approximately 713 tons of additional waste per year, bringing the total increase to 2,744 tons per year. This would be a 16 percent increase relative to the No-Action Alternative.

This increase would amount to approximately 0.6 percent of the 464,000 tons of waste processed at the District's transfer stations during fiscal year 2017 and, consistent with the

District's goals for waste diversion, a large part of it would likely be recycled or composted.[5] The rest would be sent to facilities in Maryland and Virginia, according to availability. In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248 million tons.[6] The additional solid waste generated in Alternative A is not likely to cause capacity issues at landfills.

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative A would a negligible adverse direct operational impact on hazardous materials and waste.

Train operations involve the storage and use of fuel, oils, lubricants, and other hazardous or regulated materials for the operation or maintenance of stationary or mobile equipment. There would be an increase in rail operations at WUS in Alternative A relative to the No-Action Alternative (see **Table 5-16** and **Table 5-27** in **Section 5.5**, *Transportation*). However, the nature of the operations would not change and the same type of hazardous materials would continue to be used, though in greater quantities. The storage, utilization, and disposal of these materials would continue to comply with applicable laws, regulations, and policies. Increased activities and train operations at WUS may slightly increase the risk of accidental spills and release of hazardous materials. Releases would continue to be reported to the applicable regulatory authority in accordance with the EPCRA, OPA, and other applicable laws and regulations. Amtrak's Spill Prevention Control and Countermeasure (SPCC) Plan specifies the actions to be taken in case of spill.

Indirect Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, in Alternative A, the potential development of the Federal air rights would result in a negligible indirect adverse operational impact on solid waste generation.

The potential use of the Federal air rights as additional parking would generate a small amount of solid waste, mostly from the users of the parking. This would represent a negligible increase in the amount of waste produced in Alternative A and would be a negligible adverse impact.

[5] District Department of Public Works. *Washington DC Solid Waste Diversion Progress Report. Fiscal Year 2017*. Accessed from: https://dpw.dc.gov/wastediversionreport. Accessed on June 3, 2019

[6] Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from: https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on June 3, 2019.

Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative A, the potential development of the Federal air rights would result in a negligible indirect operational adverse impact on hazardous material and waste.

Development of the Federal air rights into two levels of parking above the new parking facility would add to the amount of hazardous materials and waste– such as oils and lubricants - used or produced in the Project Area. Because of the moderate size of facility, this increase would be proportionally small and impacts would be negligible.

Construction Impacts

Construction of Alternative A would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

Construction of Alternative A would require the storage, use and disposal of petroleum products and hazardous materials such as fuel, lubricants, antifreeze, fire retardants, brake fluid, adhesives, or solvents for the operation and maintenance of construction equipment and vehicles. This would create a risk of spill or release into the environment. This would be a minor adverse impact because compliance with EPCRA, OPA, RCRA, and other applicable Federal and local laws and regulations would minimize this risk. The implementation of standard best management practices by the construction contractor, including spill prevention plans and the construction and maintenance of containment systems, would contribute to minimizing the risk of spills.

Alternative A would require excavating the rail terminal to a depth of approximately 20 feet asl. [7] It would also involve demolishing existing infrastructure such as tracks, platforms, and catenaries as well as the Claytor Concourse and the existing parking garage. Over the entire construction period (approximately 11 years and 4 months), this would generate a substantial amount of spoils and debris – approximately 1.16 million cubic yards - that would require transport and disposal. However, excavation would not occur all at once but in four separate steps as each construction phase (except the Intermediate Phase) would include a period of significant excavation early in the phase. The shortest period of continuous, major excavation work would be in Phase 1 (approximately 5 months out of a total phase duration of 2 years and 5 months) and the longest in Phase 4 (approximately 1 year and 5 months out of a total phase duration of 3 years and 1 month). The amount of spoil produced in each phase would vary proportionately, from a total of approximately 141,000 cubic yard during Phase 1 to a total of approximately 524,000 cubic yards during Phase 4.

[7] **Appendix A7**. *Support of Excavation (SOE) Diagrams*.

Some of the excavated soil may contain TPH-DRO, PCBs, and arsenic in excess of regulatory levels. Shallow groundwater samples from beneath the former H Street Tunnel contained some metals concentrations in excess of regulatory levels.[8] Construction contractors would be required to handle and dispose of spoil materials and groundwater in accordance with applicable laws and regulations, including RCRA, CERCLA, and other Federal and District laws and regulations, as applicable.

Construction debris would include platforms and railroad tracks. Used wooden railroad ties are typically coated with chemical preservatives including creosote, which contains semi-volatile organic compounds. Materials would be characterized, managed, and disposed of in accordance with RCRA and other applicable regulations. This would also be the case of debris that, based on age, may contain ACM or lead-based paint. All such waste would be disposed of at facilities permitted for this type of material.

Spoil generated under each phase of construction would be disposed of at regional disposal facilities based on the type of waste, facility's capacity, and waste characterization requirements. The appropriate transport methods and disposal locations would be identified as part of construction planning.

The removal of contaminated media materials from the Project Area would constitute a minor beneficial impact. The impact would be minor because of the likely limited level of contamination present. All fill used to replace materials removed during construction would be certified-clean material.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would result in an operational, long-term increase in solid waste generation of approximately 117 percent instead of 16 percent relative to the No-Action Alternative. While this would be a proportionately greater increase, the total amount of additional waste that would require processing would remain the same and it is not likely to exceed the capacity of the District's waste transfer facilities or the capacity of potential receiving facilities in the region. Impacts would be minor.

In Alternative A, there would be an increase in the amount of hazardous materials stored, used, and disposed of in the Project Area relative to existing conditions. This would represent a negligible adverse direct operational impact. The greater number of operations in Alternative A than in under existing conditions would involve an increase in the storage and use of fuel, oils, lubricants, and other hazardous or regulated materials. However, the nature of operations would remain similar to what it is currently. The same type of hazardous materials would continue to be used, though in greater quantities. The storage, utilization, and disposal of these materials would continue to comply with applicable laws, regulations, and policies.

[8] Amtrak. November 2019. *Final Washington Union Station Terminal Infrastructure Project Constructability Report*.

5.4.4.3 Alternative B

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative B would have a minor adverse direct operational impact on solid waste generation.

Alternative B's impacts on solid waste generation would be the same as Alternative A's (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*). This is because the increase in WUS activities would be the same in both alternatives.

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative B would have negligible adverse direct operational impact on hazardous materials and waste.

The impacts of Alternative B would be the same as those of Alternative A (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*). This is because the increase in WUS activities would be the same in both alternatives.

Indirect Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, in Alternative B, the potential development of the Federal air rights would result in a minor adverse indirect operational impact on solid waste generation.

In Alternative B, the potential Federal air-rights development would consist of approximately 917,420 square feet of office space. It would generate an estimated 4,532 tons per year of additional solid waste. [9] While this would more than double the amount of additional waste Alternative B would generate, it would be a small increase (about 0.97 percent) relative to the 464,000 tons of waste processed in the District's two transfer stations in fiscal year 2017. Additionally, a large part of it would likely be recycled, in keeping with the policies in place to achieve the District's goals of diverting 80 percent of the citywide waste stream from landfills or waste-to-energy facilities.[10] Non-recycled waste would be sent to landfills in Maryland and Virginia. In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248

[9] Developed based on generation rates provided by District Department of Public Works, Office of Waste Diversion (January 2019) and volume-to-weight conversion factors obtained from EPA (see https://www.epa.gov/sites/production/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf). Accessed on April 2, 2020.

[10] See https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 2, 2020.

million tons, with a remaining permitted life of 23.1 years. [11] The additional solid waste generated by the potential Federal air-rights development in Alternative B is not likely to cause capacity issues.

Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative B, the potential development of the Federal air rights would result in a negligible indirect operational adverse impact on hazardous material and waste.

Development of the Federal air rights into office space would not involve the storage and use of hazardous materials beyond products typically found in office buildings such as batteries, solvents, paints, or detergents, among others. Impacts would be negligible.

Construction Impacts

Construction of Alternative B would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

Construction of Alternative B would require the storage, use, and disposal of petroleum products and hazardous materials. This would result in minor adverse impacts as in Alternative A (**Section 5.4.4.2**, *Alternative A, Construction Impacts*).

Alternative B would require excavating the rail terminal to approximately 10 feet below sea level. It would also involve demolishing existing infrastructure such as tracks, platforms, and catenaries as well as the Claytor Concourse and the existing parking garage. This would generate a substantial amount of spoils and debris – approximately 1.85 million cubic yards – requiring transport and disposal over the entire construction period (approximately 14 years and 4 months). However, excavation would not occur all at once but in four separate steps as each construction phase (except the Intermediate Phase) would include a period of significant excavation early in the phase. The shortest period of continuous, major excavation work in Alternative B would be in Phase 1 (approximately 5 months out of a total phase duration of 2 years and 5 months) and the longest in Phase 4 (approximately 2 years and 7 months out of a total phase duration of 4 years and 11 months). The amount of spoil produced in each phase would vary proportionately, from a total of approximately 141,000 cubic yards during Phase 1 to a total of approximately 957,000 cubic yards during Phase 4.

[11] Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on June 3, 2019.

Appropriate transport methods and disposal locations would be identified during construction planning.

For the same reasons as stated for Alternative A, the removal of contaminated media materials from the Project Area would constitute a minor beneficial impact. All fill used during construction would be certified-clean material.

Comparison to Existing Conditions

Like Alternative A, Alternative B would result in an operational, long-term increase in solid waste generation of approximately 117 percent relative to existing condition instead of 16 percent relative to the No-Action Alternative. Factoring in the indirect impacts from the potential Federal air-rights development, projected increases would be 299 percent and 40 percent, respectively. While the increase would be proportionately greater relative to existing conditions than relative to the No-Action Alternative, the total amount of additional waste that would require processing would remain the same regardless of the comparison baseline. It is not likely to exceed the capacity of the District's waste transfer facilities or regional receiving facilities. The impact would be minor.

In Alternative B, there would be an increase in the quantity of hazardous materials stored, used, and disposed of in the Project Area relative to existing conditions. This would represent a negligible adverse direct operational impact the same as Alternative A (**Section 5.4.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.4.4.4 Alternative C (Both Options)

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative C would have a minor adverse direct operational impact on solid waste generation.

The impacts of Alternative C on solid waste generation would be the same as those of Alternative A (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*). This is because the increase in WUS activities would be the same in both alternatives.

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative C would have negligible adverse direct operational impacts on hazardous materials and waste.

Alternative C's impacts would be the same as Alternative A's (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*) because the increase in WUS activities would be the same in both alternatives.

Indirect Operational Impacts

Municipal Waste

Relative to the No-Action Alternative, in Alternative C, the potential development of the Federal air rights would result in a minor adverse indirect operational impact on solid waste generation.

In Alternative C, the potential Federal air-rights development would consist of approximately 952,600 square feet of office space. This would generate an estimated 4,700 tons per year of additional solid waste. While this would more than double the amount of additional waste Alternative C would generate, it would be a small increase (about 1 percent) relative to the 464,000 tons of waste processed in the District in fiscal year 2017. Additionally, a large part of it would likely be recycled, in keeping with the policies in place to achieve the District's goals of diverting 80 percent of the citywide waste stream from landfills or waste-to-energy facilities.[12] Non-recycled waste would be sent to landfills in Maryland and Virginia. In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248 million tons, with a remaining permitted life of 23.1 years. [13] The additional solid waste generated by the potential Federal air-rights development in Alternative C is not likely to cause capacity issues.

Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative C, the potential development of the Federal air rights would result in a negligible indirect operational adverse impact on hazardous material and waste.

Development of the Federal air rights into office space would not involve the storage and use of hazardous materials beyond products typically found in office buildings such as batteries, solvents, paints, or detergents, among others. Impacts would be negligible.

Construction Impacts

Construction of Alternative C would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

Construction of Alternative C would require the storage, use and disposal of petroleum products and hazardous materials. This would result in minor adverse impacts as in Alternative A (**Section 5.4.4.2**, *Alternative A, Construction Impacts*).

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12 See https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 2, 2020.

13 Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from: https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on April 2, 2020.

Alternative C would require excavating the rail terminal to a depth of approximately 3 feet asl. It would also involve demolishing existing infrastructure such as tracks, platforms, and catenaries as well as the Claytor Concourse and the existing parking garage. This would generate a substantial amount of spoils and debris – approximately 1.5 million cubic yards requiring transport and disposal over the entire construction period (approximately 12 years and 3 months). However, excavation would not occur all at once but in four separate steps as each construction phase (except the Intermediate Phase) would include a period of significant excavation early in the phase. The shortest period of continuous, major excavation work in Alternative C would be in Phase 1 (approximately 5 months out of a total phase duration of 2 years and 5 months) and the longest in Phase 4 (approximately 2 years out of a total phase duration of 4 years). The amount of spoil produced in each phase would vary proportionately, from a total of approximately 141,000 cubic yard during Phase 1 to a total of approximately 753,000 cubic yards during Phase 4. Appropriate transport methods and disposal locations would be identified during construction planning.

For the same reasons as in Alternative A, the removal of contaminated media materials from the Project Area would constitute a minor beneficial impact. All fill used during construction would be certified-clean material.

Comparison to Existing Conditions

As in Alternatives A and B, in Alternative C solid waste generation would increase by approximately 117 percent relative to existing conditions, compared to 16 percent relative to the No-Action Alternative. Factoring in the indirect impacts from the potential Federal air-rights development, increases would be 318 percent and 42 percent, respectively. While the increase would be proportionately greater relative to existing conditions, the total amount of additional waste requiring processing would remain the same regardless of the comparison baseline. It is not likely to exceed the capacity of the District's waste transfer facilities or regional receiving facilities. The impacts would be minor.

In Alternative C, there would be an increase in the amount of hazardous materials stored, used, and disposed of in the Project Area relative to existing conditions. This would represent a negligible adverse direct operational impact as in Alternative A and for the same reasons (**Section 5.4.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.4.4.5 Alternative D

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative D would have a minor adverse direct operational impact on solid waste generation.

Increased activity and ridership at WUS would generate an increase in the amount of municipal solid waste produced by the station similar to what would occur for Alternative A and the other Action Alternatives. As explained in **Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*, this would result in a total of 2,031 additional tons of solid waste produced annually in the Project Area.

The addition of approximately 100,000 square feet of retail would further contribute approximately 990 tons of waste per year, bringing the total increase to 3,021 tons every year. This would be a 17 percent increment relative to what the No-Action Alternative would generate.

This increase would amount to about 0.65 percent of the 464,000 tons of waste processed in the District's transfer stations in fiscal year 2017.[14] Much of it would likely be recycled, in keeping with the District's goal of diverting 80 percent of citywide waste from landfills or waste-to-energy facilities. [15] Non-recycled waste would be sent to facilities in Maryland and Virginia. . In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248 million tons, with a remaining permitted life of 23.1 years. [16] The projected increase is unlikely to cause capacity issues and adverse impacts would be minor.

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative D would have negligible adverse direct operational impacts in hazardous materials and waste.

Impacts would be the same as in Alternative A (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, in Alternative D, the potential development of the Federal air rights would result in a minor adverse indirect operational impact on solid waste generation.

In Alternative D, the potential Federal air-rights development would consist of approximately 688,050 square feet of office space. This would generate an estimated 3,410 tons per year of additional solid waste. While it would more than double the amount of additional waste Alternative D would generate, it would be a small increase (about 0.7 percent) relative to the 464,000 tons of waste processed in the District in fiscal year 2017. A large part of it would

[14] District Department of Public Works. *Washington DC Solid Waste Diversion Progress Report. Fiscal Year 2017*. Accessed from: https://dpw.dc.gov/wastediversionreport. Accessed on April 2, 2020.

[15] See https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 2, 2020.

[16] Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from: https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on April 2, 2020.

likely be recycled, in keeping with the policies in place to achieve the District's goals of diverting 80 percent of the citywide waste stream from landfills or waste-to-energy facilities.[17] Non-recycled waste would be sent to landfills in Maryland and Virginia. In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248 million tons, with a remaining permitted life of 23.1 years. The additional solid waste generated by the potential Federal air-rights development in Alternative D is not likely to cause capacity issues. The impact would be minor.

Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative D, the potential development of the Federal air rights would result in a negligible indirect operational adverse impact on hazardous material and waste.

Development of the Federal air rights into office space would not involve the storage and use of hazardous materials beyond products typically found in office buildings such as batteries, solvents, paints, or detergents, among others. Impacts would be negligible.

Construction Impacts

Construction of Alternative D would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

The construction impacts of Alternative D would be the same as those of Alternative C (**Section 5.4.4.4**, *Alternative C, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative D would result in an increase in solid waste generation of approximately 129 percent relative to existing condition instead of 17 percent relative to the No-Action Alternative. Factoring in the indirect impacts from the potential Federal air-rights development, the projected increases would be 275 percent and 37 percent, respectively. While the increase would be proportionately greater relative to existing conditions, the total amount of additional waste that would require processing would remain the same regardless of the comparison baseline. It is not likely to exceed the capacity of the District's waste transfer facilities or regional receiving facilities. Adverse impacts would be minor.

In Alternative D, there would be an increase in the amount of hazardous materials stored, used, and disposed of in the Project Area relative to existing conditions. This would represent a negligible adverse direct operational impact as for Alternative A and for the same reasons (**Section 5.4.4.2**, *Alternative A, Comparison to Existing Conditions*).

[17] See https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 2, 2020.

5.4.4.6 Alternative E

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative E would have a minor adverse direct operational impact on solid waste generation.

Impacts would be the same as in Alternative D because the increase in WUS activities would be the same in both alternatives (**Section 5.4.4.5**, *Alternative D, Direct Operational Impacts*).

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative E would have a negligible adverse direct operational impact on hazardous materials and waste.

Impacts would be the same as in Alternative A because the increase in WUS activities would be the same in both alternatives (**Section 5.4.4.2***, Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Municipal Solid Waste and Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative E, the potential development of the Federal air-rights would result in a minor adverse indirect operational impact on solid waste generation and negligible indirect operational impacts on hazardous materials and waste.

Indirect operational impacts would be the same as in Alternative D (**Section 5.4.4.5**, *Alternative D, Indirect Operational Impacts*). This is because the size of the potential federal air-rights development would be the same in both alternatives.

Construction Impacts

Construction of Alternative E would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

The construction impacts of Alternative E would be the same as those of Alternative B (**Section 5.4.4.3**, *Alternative B, Construction Impacts*).

Comparison to Existing Conditions

Alternative E would compare to existing conditions like Alternative D (**Section 5.4.4.5**, *Alternative D, Comparison to Existing Conditions*).

5.4.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse direct operational impact on solid waste generation.

Alternative A-C's impacts on solid waste generation would be the same as Alternative A's (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*). This is because the increase in WUS activities would be the same in both alternatives.

Hazardous Materials and Waste

Relative to the No-Action Alternative, Alternative A-C would have negligible adverse direct operational impact on hazardous materials and waste.

The impacts of Alternative A-C would be the same as those of Alternative A (**Section 5.4.4.2**, *Alternative A, Direct Operational Impacts*). This is because the increase in WUS activities would be the same in both alternatives.

Indirect Operational Impacts

Municipal Solid Waste

Relative to the No-Action Alternative, in Alternative A-C, the potential development of the Federal air rights would result in a minor adverse indirect operational impact on solid waste generation.

In Alternative A-C, the potential Federal air-rights development would consist of approximately 380,000 square feet of office space. It would generate an estimated 1,881 tons per year of additional solid waste.[18] This would be a small increase (about 0.4 percent) relative to the 464,000 tons of waste processed in the District's two transfer stations in fiscal year 2017. Additionally, a large part of it would likely be recycled, in keeping with the policies in place to achieve the District's goals of diverting 80 percent of the citywide waste stream from landfills or waste-to-energy facilities.[19] Non-recycled waste would be sent to landfills in Maryland and Virginia. In Virginia alone, as of the end of 2017, sanitary landfill capacity was just under 248 million tons, with a remaining permitted life of 23.1 years. [20] The additional

[18] Developed based on generation rates provided by District Department of Public Works, Office of Waste Diversion (January 2019) and volume-to-weight conversion factors obtained from EPA (see https://www.epa.gov/sites/production/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf). Accessed on April 2, 2020.

[19] See https://dpw.dc.gov/release/new-dc-recycling-requirements-begin-january-1st. Accessed on April 2, 2020.

[20] Commonwealth of Virginia Department of Environmental Quality. *2018 Annual Solid Waste Report for Calendar Year 2017*. Accessed from:

solid waste generated by the potential Federal air-rights development in Alternative A-C is not likely to cause capacity issues.

Hazardous Materials and Waste

Relative to the No-Action Alternative, in Alternative A-C, the potential development of the Federal air rights would result in a negligible indirect operational adverse impact on hazardous material and waste.

Development of the Federal air rights into office space would not involve the storage and use of hazardous materials beyond products typically found in office buildings such as batteries, solvents, paints, or detergents, among others. Impacts would be negligible.

Construction Impacts

Construction of Alternative A-C would result in minor adverse impacts from the storage and use of hazardous materials and the generation and disposal of hazardous and non-hazardous waste and debris. It would have potential minor beneficial impacts from the removal of contaminated materials or media from the Project Area.

The construction impacts of Alternative A-C would be the same as those of Alternative A (**Section 5.4.4.2**, *Alternative A, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would result in an increase in solid waste generation of approximately 117 percent relative to existing condition instead of 16 percent relative to the No-Action Alternative. Factoring in the indirect impacts from the potential Federal air-rights development, the projected increases would be 198 percent and 26 percent, respectively. While the increase would be proportionately greater relative to existing conditions, the total amount of additional waste that would require processing would remain the same regardless of the comparison baseline. It is not likely to exceed the capacity of the District's waste transfer facilities or regional receiving facilities. Adverse impacts would be minor.

5.4.5 Comparison of Alternatives

Table 5-14 shows a comparison of impacts among the alternatives. The Action Alternatives differ with respect to the amount of municipal solid waste they would generate as well as the amount of construction-related spoil and debris, as shown in **Table 5-15**.

https://www.deq.virginia.gov/Portals/0/DEQ/Land/ReportsPublications/2018%20SWIA%20Report%20for%20CY2017%20-%20ADA.pdf?ver=2018-08-20-151437-490. Accessed on April 2, 2020.

Table 5-14. Comparison of Alternatives, Solid Waste and Hazardous Materials

<table>
<tr><th>Impact Category</th><th>Type of Impact</th><th>No-Action Alternative</th><th>Alternative A</th><th>Alternative B</th><th>Alternative C (Either Option)</th><th>Alternative D</th><th>Alternative E</th><th>Alternative A-C (Preferred)</th></tr>
<tr><td rowspan="3">Municipal Solid Waste</td><td>Direct Operational</td><td colspan="7">Minor Adverse Impacts</td></tr>
<tr><td>Indirect Operational</td><td>No impacts</td><td>Negligible adverse impacts</td><td colspan="5">Minor adverse impacts</td></tr>
<tr><td>Construction</td><td colspan="7">Minor adverse impacts</td></tr>
<tr><td rowspan="3">Hazardous Materials</td><td>Direct Operational</td><td colspan="7">Negligible adverse impacts</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">Negligible impacts</td></tr>
<tr><td>Construction</td><td>Negligible adverse / Minor beneficial impacts</td><td colspan="6">Minor adverse and beneficial impacts</td></tr>
</table>

Table 5-15. Comparison of Estimated Additional Waste Generation per Alternative

Operational Source	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
WUS	765 tpy	2,744 tpy	2,744 tpy	2,744 tpy	3,021 tpy	3,021 tpy	2,744 tpy
Private Air-Rights Development	14,480 tpy	-	-	-	-	-	-
Potential Federal Air-Rights Development	-	Negligible	4,532 tpy	4,700 tpy	3,410 tpy	3,410 tpy	1,881 tpy
Total	**15,245 tpy**	**2,744 tpy**	**7,276 tpy**	**7,444 tpy**	**6,431 tpy**	**6,431 tpy**	**4,625 tpy**
Construction Spoils and Debris	-	1,160,885 cy	1,845,224 cy	1,507,102 cy	1,507,102 cy	1,845,224 cy	1,160,885 cy

Abbreviations: tpy = tons per year; cy = cubic yards

The differences in municipal waste generation arise from the amount of new retail provided in the various Action Alternatives as well as the function and size of the potential Federal air-rights development. Overall, based on the order-of-magnitude estimates provided in the above analysis, Alternative A would cause the smallest increase in the amount of waste and Alternative C the largest one. Alternative A would generate substantially less solid waste than the other Action Alternatives. All six Action Alternatives would generate more waste than the No-Action Alternative.

The amount of construction spoil and debris that would require transportation and disposal varies according to the depth of excavation required by each alternative, with Alternatives A and A-C generating the least amount and Alternatives B and E the most.

There would be no substantive differences among the alternatives with regard to hazardous materials and waste. While the quantities of such substances stored, used, or disposed of in the Project Area would vary, the same regulations and procedures would apply to ensure that any potential adverse effects are negligible, regardless of the alternative.

5.4.6 Avoidance, Minimization and Mitigation Evaluation

The following measures to avoid and minimize adverse impacts pertaining to solid waste and hazardous materials are being considered by FRA:

- WUS' existing SPCC Plan would be updated to reflect any major changes to on-site petroleum product or liquid hazardous waste storage.
- For the construction phase of the Project, the contractor would be required to prepare and implement a construction-specific SPCC.
- The construction contractor would be required to identify and inventory hazardous building materials (such as asbestos, lead-based paint, PCBs, and mercury) would be identified prior to any demolition work. If such materials are present, they would be properly abated by a licensed contractor in accordance with state and local regulations. Debris would be shipped to a receiving facility licensed to handle the relevant type of waste in compliance with applicable shipping regulations.
- The construction contractor would develop a Soil Management Plan (SMP) based upon subsurface investigations, as needed. The purpose of these investigations would be to pre-characterize the soils to be removed during the construction of the Project. An SMP typically outlines standards and procedures for the identification and disposal of contaminated materials encountered during construction.
- The construction contractor would only use certified clean fill to replace excavated soils.
- During soil disturbing activities, the construction contractor would control fugitive dust through wetting, sweeping, and other suppression techniques.

- The construction contractor would develop a Health and Safety Plan to provide the minimum health and safety specifications that must be met during construction, including requirements for environmental monitoring, personnel protective equipment, site control and security, and training.
- The District has adopted a vision to divert 80 percent of all solid waste generated in the District through source reduction, reuse, recycling, composting, and anaerobic digestion. USRC would require municipal solid waste generated at WUS to be managed to maximize opportunities for recycling or other waste diversion methods in support of the District's vision.

5.4.7 Permits and Regulatory Compliance

Spill risk management to prevent the release of hazardous materials due to inappropriate storage and handling is dictated by the local and federal authorities. A SPCC Plan per 40 CFR 112, *Oil Pollution Prevention*, is currently in place at the facility and would be updated as needed. Updates are required when there is a change in the facility design, construction, operation, or maintenance that materially affects its potential for a discharge as described in 40 CFR 112.1(b). SPCC plans must meet standard engineering practices and be certified by a licensed Professional Engineer. During construction, the contractor will be responsible for implementing a construction-specific spill prevention program.

Underground storage tanks that are covered under 20 District of Columbia Municipal Regulations (DCMR) Chapter 55 must be registered in accordance with 20 DCMR Chapter 56. Heating oil USTs less than 1,100 gallons and petroleum USTs that are less than 110 gallons do not have to be registered with the District. Above-ground storage tanks are primarily regulated by the DC Fire code and inspections are required by the Office of the Fire Marshall's Fire Prevention Division.

The abatement of hazardous building materials requires a licensed contractor and prior notification to the District. DOEE provides an *Asbestos Notification Form* for the removal of asbestos and a Lead Abatement and Renovation permit for the abatement of lead-based paints. On-site management of contaminated soil must be in accordance with a SMP that will dictate appropriate handling and storage procedures. In the event that contaminated soil residuals are encountered, they can only be consigned, conveyed, and/or transported to facilities and locations licensed, permitted, or approved to accept such materials by appropriate federal, state or local authorities. Soils meeting the criteria for a listed or characteristic hazardous waste can only be disposed of at a RCRA hazardous waste landfill, TSCA facility, or RCRA hazardous waste incinerator.

Municipal solid waste must be sent to a facility that is appropriately licensed under RCRA Subtitle D and must be managed per 21 DCMR Chapters 7-8. To meet the District's sustainability goals, commercial properties are required to separate for recycling paper, paperboard, cardboard, and clean and rinsed metal, glass and plastic containers per 21 DCMR Chapter 20.

5.5 Transportation

This section describes and characterizes potential direct and indirect impacts of the No-Action Alternative and the five Action Alternatives on the multiple transportation modes (modes) in and around Washington Union Station (WUS). If applicable, this section recommends measures to avoid, minimize, or mitigate potential adverse impacts. It also identifies applicable permitting and regulatory compliance requirements.

The transportation modes considered include:

- Railroad (Amtrak, VRE, and MARC Train);
- Intercity, tour/charter, and sightseeing buses (including hop-on/hop-off buses and daily sightseeing coaches);[1]
- Private vehicles;
- For-hire vehicles;[2]
- Bicycles;
- Transit (Metrorail, Streetcar, and Metrobus); and
- Pedestrians.

5.5.1 Regulatory Context and Guidance

Relevant Federal, regional, and Washington, DC (District) policies, regulations and guidance that pertain to transportation are listed in **Section 4.5.1**, *Affected Environment, Transportation, Regulatory Context and Guidance*.

5.5.2 Study Area

As defined in **Section 4.5.2**, *Affected Environment, Transportation, Study Area,* the Local Study Area for transportation includes the Project Area and immediately adjacent roadway network along with key intersections near WUS (**Figure 4-3**). Traffic conditions and coordination with DDOT were the basis for the identification of these key intersections.

Given transportation patterns in the District, the impacts of the various alternatives on the transportation network would quickly dissipate outside the Local Study Area. Therefore, the

[1] Hop-on/hop-off sightseeing buses provide scheduled routes that allow tourists to visit different sites in Washington, DC and surrounding areas either by continuously riding the bus in a loop, or by getting off the bus at certain stops and then getting back on to continue with their visit. Daily sightseeing buses are coach-style buses that provide scheduled service to certain tourist destinations. Currently, hop-on/hop-off buses serve the front of WUS while daily buses are located in the existing bus facility.

[2] “For-hire” refers to licensed taxicabs, livery cars, and transportation networking companies like Uber and Lyft.

Regional Study Area identified in **Section 4.5.2**, *Affected Environment, Transportation, Study Area*, was used for the purposes of understanding the regional distribution of vehicular and transit trips originating at WUS but it was not used for the analysis of impacts.[3]

5.5.3 Methodology

This section summarizes the methodology for evaluating the probable consequences of the alternatives on transportation. **Appendix C3**, **Section 5.4**, *Methodology*, provides a full description of the analysis methodology. This analysis identifies the impacts of the alternatives on the transportation system due to changes in the volume or patterns of railroad, bus, private vehicle, for-hire vehicle, bicycle, transit, and pedestrian trips. A summary is below. Impacts were assessed as major, moderate, minor, or negligible consistent with the intensity scale defined in **Section 5.1.1**, *Definitions.*

The transportation impact analysis used existing and anticipated trip generation information to estimate future transportation volumes and the resulting impacts on the various modes. Transportation agencies, private operators, and site visits provided the data informing the analysis. Key inputs included:

- Projected ridership, service frequency, and schedule data (provided by Amtrak, DDOT, MARC, Washington Metropolitan Area Transit Authority [WMATA], and VRE);
- National Capital Region Transportation Planning Board (TPB) travel demand model;
- TPB 2040 Constrained Long-Range Transportation Plan;
- Reasonable assumptions about future private and Federal air-rights development programs, including office, residential, and retail uses;
- Projected local transit ridership;
- Projected pedestrian and bicycle activity;
- Projected intercity bus ridership;
- WUS retail uses; and
- Growth from planned private development projects within one ½ mile of WUS and general background growth.

[3] The Methodology Report states that "The regional study area for transportation is the area of the jurisdictions that are members of the Metropolitan Washington Council of Governments (MWCOG)—the local Metropolitan Planning Organization (MPO)—in Maryland, the District of Columbia, and Virginia. This regional study area is being selected because Washington Union Station (WUS) is a Project of regional significance that has an impact on transportation movements in different modes across the MWCOG area. It is at the geography of MWCOG that the Constrained Long-Range Plan and regional modeling efforts are conducted." Further assessment indicated that this regional view was not necessary to capture the impacts of the Project.

FRA developed projections for each mode through a detailed multimodal model (model) using existing and projected ridership and developments, and estimated mode splits.[4] Projections included morning (AM) and evening (PM) peak-hour rail, intercity and tour bus, and transit ridership, traffic,[5] bicycle, and pedestrian information.

The data presented in the tables throughout this section derive from the above-listed sources and are outputs of the FRA NEC FUTURE FEIS, the TPB Constrained Long-Range Transportation Plan, WUS Multimodal Model, or the Synchro model used for traffic impact analysis.

5.5.3.1 Operational Impacts

Operational impacts are long-term or permanent impacts that would result from the operation of the Project after construction is complete in the planning horizon year of 2040. The following mode-specific impacts were assessed:

- **Amtrak, VRE, and MARC commuter railroads:** Increases or decreases in, and ability to meet, expected service levels and ridership;
- **WMATA Metrorail:** Increases or decreases in passenger demand, impacts on passenger flow, capacity issues that may result from increases;
- **DC Streetcar:** Increases or decreases in passenger demand and capacity issues that may result from increases;
- **Intercity, tour, and charter bus:** Increases or decreases in service capacity level and ridership, ability to meet future service capacity levels;
- **Loading:** Availability and accessibility of loading docks and ability to meet WUS needs;
- **Pedestrian and bicycle activity:** Increases or decreases in pedestrian and bicycle activity, ability to meet activity demands, and impacts on safety;
- **WMATA Metrobus, DC Circulator, and commuter buses:** Increases or decreases in passenger demand, impacts on access to transit buses;
- **Parking and rental cars:** Increases or decreases in space available for parking (including from rental car companies); [6]

[4] Mode splits are the percentage of trips that are taken via a certain mode. For example, if twenty percent of station users take transit, their "transit mode split" is twenty percent.

[5] Traffic in this context refers to the movements of different vehicular modes, including private vehicles, for-hire vehicles, trucks for loading and delivering, and buses, on roadways.

[6] The parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or

- **Ride-for-hire circulation:** Increases or decreases in traffic volumes on nearby streets, and ability to meet demands at the WUS curbside space;[7]
- **Private pick-up and drop-off activity:** Increases or decreases in traffic volumes on nearby streets, and ability to meet demands at the WUS curbside space;[8] and
- **Vehicular traffic:** Increases and decreases in traffic volumes on nearby streets, level of service (LOS) impacts, and queuing impacts at key intersections. LOS, increases in average delay, and queuing are the three measures of effectiveness (MOE) on which the assessment of traffic impacts is based.

5.5.3.2 Construction Impacts

Construction impacts are those impacts that would result from constructing the Project and would cease when the Project is complete. The potential impacts from the construction of the Action Alternatives were assessed for each transportation mode. Because construction planning is still in its early stages, the impact analysis is qualitative. In All Action Alternatives, construction of the Project would take place in four phases. The analysis focuses particularly on Phase 4 of construction (beginning 8 to 9 years after the start of construction) because Phase 4 has the greatest potential to affect transportation conditions in the Local Study Area. Demolition of the existing bus facility and parking garage would occur in Phase 4 and the west ramp would be closed for repurposing. This would disrupt bus, parking, and for-hire operations. Phase 4 is also the longest construction phase in all Action Alternatives.

5.5.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on the various transportation modes at WUS. For each alternative, direct and indirect operational as well as construction impacts are considered. Within each alternative, for each mode, impacts are first summarized in bold lettering, followed by a supporting description and analysis. The impacts of the No-Action Alternative are assessed relative to existing conditions. The operational impacts of the Action Alternative are assessed relative to the No-Action Alternative. A brief summary of impacts relative to existing conditions is provided for each mode. Additional data and details are provided in **Section 5**, *Transportation*, of

beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

[7] A single for-hire vehicle generates two trips: one arriving and one departing from WUS, regardless of whether it is picking up or dropping off a passenger. For the purposes of the impact analysis, a single for-hire pick-up or drop-off was estimated to produce 1.5 trips to reflect the linking of trips in the WUS circulation network (“linking of trips” refers to a for-hire vehicle picking-up a passenger just after dropping one off).

[8] A single private pick-up/drop-off trip generates two trips: one arriving and one departing from WUS, regardless of whether it is picking up or dropping off a passenger. For the purposes of the impact analysis, a single private pick-up or drop-off is estimated to produce 2 trips as no linking can be assumed.

Appendix C3, *Washington Union Station Expansion Project Environmental Consequences Technical Report*.

5.5.4.1 No-Action Alternative

Direct Operational Impacts

Commuter and Intercity Railroads

Relative to existing conditions, the No-Action Alternative would have major adverse direct operational impacts on commuter and intercity rail service because their ability to meet future demand would be severely constrained.

Amtrak, MARC, and VRE would continue to provide rail service to and from WUS in 2040. However, concourse and track conditions would be very constrained and limit the growth of rail transportation in the Washington, D.C. area. The constraints on track and platform infrastructure in the No-Action Alternative would cause only 50 percent of the 2040 unconstrained Amtrak service levels and 68 percent of the unconstrained ridership levels to be realized. Only 42 percent of MARC service and 53 percent of MARC ridership would be achieved. Only 37 percent of VRE service and 36 percent of VRE ridership would be achieved. The existing platforms are antiquated and deteriorated, have inadequate width for passenger volumes, and do not meet current ADA or life safety standards.

Table 5-16 shows changes in ridership and daily trains for Amtrak, MARC, and VRE between existing conditions and the No-Action Alternative.

Table 5-161. Daily Train Service and Total Ridership, No-Action Alternative

Service	No-Action Alternative	Existing Conditions	Projected Change
Amtrak Trains	144	116	24%
Amtrak Ridership	21,800	16,400	33%
MARC Trains	106	95	11%
MARC Ridership	37,900	28,100	35%
VRE Trains	34	32	6%
VRE Ridership	4,900	3,900	26%

Intercity Railroad Service

The average number of Amtrak weekday trains would increase by approximately 24 percent to 144 trains a day. Over that same period, average Amtrak weekday ridership would increase by 33 percent, to 21,800 passengers, as a result of planned service improvements and regional and local growth.

MARC

In the No-Action Alternative, MARC would see a modest increase in service, with an 11 percent average increase in weekday trains across the three lines serving WUS from 95 to

106. The Brunswick Line, which would add five trains to and from WUS by 2040, is slated for the largest increase. MARC would see a 35 percent growth in ridership over that same period, with approximately 37,900 average daily riders in 2040.

VRE

VRE would see a 6 percent average increase in weekday revenue trains serving WUS (currently 32, to increase to 34), accompanied by a 26 percent increase in average weekday ridership by 2040. This increase would bring daily VRE ridership to 4,900 daily riders. VRE plans to accommodate the increase by running longer trains and using more double-deck train cars.

WMATA Metrorail

Relative to existing conditions, the No-Action Alternative would result in a moderate adverse direct operational impact on WMATA Metrorail operations at WUS because increased demand would exceed capacity in the PM peak and would exacerbate station circulation issues at the WMATA platform level.

WUS ridership growth would result in an adverse operational impact because volumes at the WUS Metrorail station would exceed capacity in the Glenmont direction during the PM peak. This adverse impact would be moderate as only one direction and one peak period would be affected. Where volume to capacity (V/C) exceeds 100 percent, there would be a need for additional service to prevent overcrowding.[9] **Table 5-17** summarizes WUS-related peak-hour activities at the WUS Metrorail station.

By 2040, peak-hour train loads at the WUS Metrorail Station would follow the same pattern as currently, with higher utilization in the westbound direction (Shady Grove) in the AM peak hour and in the eastbound direction (Glenmont) in the PM peak hour. During both the AM and PM peak, there would be more than 13,000 boardings and alightings, against less than 8,000 in existing conditions.

Volumes would remain below capacity in the Shady Grove direction during the AM peak. They would exceed it in the Glenmont direction during the PM peak (107 percent arriving), creating a need for additional capacity (approximately 1,110 passengers).

The increase in Metrorail ridership at WUS in the No-Action Alternative would adversely affect passenger circulation. Passenger circulation is an existing issue at the station. It can take up to 8 minutes for passengers to clear the two sets of escalators from the platform level. The improvements to circulation included in the planned Concourse Modernization Project would have a beneficial impact on circulation at the WMATA mezzanine level and between the mezzanine level and the WUS concourse. However, the existing circulation between the WMATA platform and the WMATA mezzanine would remain a constraint.

[9] This standard was set to conform with WMATA guidance. The specific service capacity levels were set based on coordination with WMATA.

Increased passenger volumes in the No-Action Alternative relative to existing conditions would further degrade conditions.

Table 5-17. Peak-hour WUS-related Metrorail Activity, No-Action Alternative[10]

	No-Action Alternative		Existing Conditions	
	Shady Grove	Glenmont	Shady Grove	Glenmont
AM Peak Hour				
V/C Arriving at WUS[11]	80%	25%	57%	34%
WUS Boardings	5,202	1,010	2,802	528
WUS Alightings	4,128	2,803	923	3,644
Through Ridership	9,523	1,447	7,576	1,427
Ridership Departing WUS[12]	17,725	2,457	10,378	1,955
V/C After WUS	86%	14%	69%	13%
Excess Demand	0	0	0	0
PM Peak Hour				
V/C Arriving at WUS	20%	**107%**	19%	72%
WUS Boardings	2,559	3,661	3,265	918
WUS Alightings	1,154	6,126	582	3,090
Through Ridership	1,953	10,722	2,010	6,858
Ridership Departing WUS	4,512	14,383	5,275	7,776
V/C After WUS	29%	91%	38%	56%
Excess Demand	0	1,110	0	0

DC Streetcar

Relative to existing conditions, the No-Action Alternative would result in a minor beneficial direct operational impact on DC Streetcar operations. The benefits of increased ridership would be partially offset by greater operational delays.

By 2040, the DC Streetcar would be extended eastward to the Benning Road Metro Station and westward to Georgetown.[13] In the No-Action Alternative, it is likely that ridership growth at WUS and nearby development projects, including the private air-rights development, would generate additional demand. Modeling shows that this demand would contribute to supporting the operation of the Streetcar without creating capacity issues, amounting to a

[10] Estimates of WMATA peak hour capacity are consistent with TPB Constrained Long-Range Transportation Plan elements and direction from WMATA.

[11] Red Line hourly nominal capacity at the peak hour is 19,200 passengers, assuming trains every 3 minutes, 120 passenger capacity, and 100 percent 8-car train operations. However, in this analysis, capacity is curtailed due to peaking factors. As a result, the initial v/c upon arrival at WUS is based on a 1.12 multiplier of actual volumes in the AM peak and 1.22 multiplier of actual volumes in the PM peak.

[12] "Through ridership" refers to riders who neither board nor alight at WUS but ride the Red Line train through the WUS Metrorail Station.

[13] The DC Streetcar extensions to Benning Road and to Georgetown are incorporated in the TPB 2040 Constrained Long-Range Transportation Plan.

beneficial impact. Maximum capacity would be in the eastbound direction in the AM peak (33 percent). This beneficial impact would be minor because the introduction of new signalized intersections on the H Street Bridge for the roadways that would serve the private air-rights development and greater traffic volumes (see **Section 5.5.4.1**, *No-Action Alternative*, *Direct Operational Impacts, Vehicular Traffic*) may create operational delays, which would partially offset the benefits of increased ridership.

Intercity, Tour/Charter, and Sightseeing Buses

Relative to existing conditions, the No-Action Alternative would have a major adverse direct operational impact on bus passenger facilities' ability to accommodate projected increases in users.

In the No-Action Alternative, intercity, tour, daily sightseeing, and charter buses would continue to use the existing 61-slip (parking space) bus facility. Hop-on/hop-off sightseeing buses would continue to serve the front of WUS.

Intercity bus ridership is anticipated to increase by 27 percent by 2040. The average peak-hour intercity, tour, daily sightseeing, and charter bus movements—buses entering and exiting the bus facility – would increase by 37 percent, from a total of 49 to a total of 67. The existing bus facility, which would continue to be used in the No-Action Alternative, would be sufficient to accommodate the increase in bus movements.

However, when completed, the extension of the DC Streetcar to the west would make it impossible for buses exiting the facility to turn left (westward) onto H Street NE. Buses heading to points west would be forced to take an indirect route to their destination. Additionally, the proximity to the exit ramp to the private air-rights development's center road with H Street would create a complex intersection that may complicate bus exiting movements. Additionally, buses coming from the east and making a left turn into the facility would have to navigate an offset intersection created by the road that would run along the northwest side of the private air-rights development.

Existing passenger accommodations are deficient and the No-Action Alternative would exacerbate this situation. Passengers must use cramped walkways to access the Greyhound and Bolt Bus bays and have to cross an active busway to reach other services, including Megabus. Bolt Bus and Megabus lack adequate queueing space. The projected increase in passengers would make these conditions worse. This, together with the constraint on exiting buses, would amount to a major adverse impact.

Loading

In the No-Action Alternative, there would be no direct operational impacts on loading dock operations. The retail and event programs would not change. Loading levels would remain as in existing conditions.

WUS would continue to receive deliveries and service through two existing primary loading locations. One, on First Street NE between Massachusetts Avenue NE and G Street NE, provides access to the train tracks. The other, on H Street NE to the east of the railroad tracks, is shared with the existing Station Place development. Based on existing conditions, eight truck movements would occur in the AM peak and two would occur in the PM peak. Loading dock activity would continue to peak in the mid-morning (10:00 AM to 11:00 AM). Future loading dock activities would mirror existing conditions. Amtrak service access to operations would remain on First and 2nd Streets.

Pedestrians

Relative to existing conditions, the No-Action Alternative would have a major adverse direct operational impact on pedestrian circulation within WUS due to overcrowded conditions in concourses and at access points. Pedestrian volumes near WUS would also increase, with no change to existing pedestrian infrastructure, resulting in a minor adverse direct operational impact.

In the No-Action Alternative, interior pedestrian volumes at WUS would increase substantially relative to existing conditions. In both the AM and PM peaks, volumes would be 33 percent greater as shown in **Table 5-18**. The largest generator of internal pedestrian trips would be passengers transferring between commuter rail and Metrorail. While the Concourse Modernization Project would enhance capacity at WUS, it would not provide sufficient space to handle anticipated 2040 volumes without overcrowding. This would constrain any further growth.

Table 5-18. Interior Pedestrian Volumes, No-Action Alternative

	No-Action Alternative		Existing Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak
Pedestrians	47,703	61,416	35,867	46,178

While a number of pedestrians would remain within WUS to connect to other modes or immediately adjacent land uses, many would exit the station through the existing doors on First Street NE and at the front of the historic station building. **Table 5-19** shows the projected total number of WUS passengers who would be entering and exiting WUS by foot from or to local destinations (excluding the private air-rights development).

Table 5-192. Exterior Pedestrian Volumes, No-Action Alternative

	No-Action Alternative		Existing Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	3,753	6,587	3,419	6,736
Outs	7,370	4,232	4,927	3,654
Total	11,123	10,819	8,346	10,390

Analysis conducted for two signalized pedestrian crossings (the east-west crossing of First Street NE and the east-west crossing of Union Station Drive) showed that, while queuing to cross the street would increase, there would be sufficient sidewalk space to accommodate queueing pedestrians and the adverse impact would be minor.

Anticipated increases in vehicular traffic near WUS, including pick-up and drop-off activities, along with the increases in pedestrian volumes, may cause a greater risk of conflict between pedestrians and vehicles. Based on the projected number and distribution of new multimodal trips, the two locations most likely to be affected would be G Street NE between North Capitol Street and First Street NE, and Union Station Drive in front of WUS.

Bicycle Activity

Relative to existing conditions, the No-Action Alternative would result in a moderate adverse direct operational impact on bicycle activity. Demand for bikeshare spaces[14] and private bicycle parking and storage near WUS would increase with no additional bicycle facilities being provided.

In the No-Action Alternative, existing bicycle facilities near WUS would remain in their current condition: a cycle track along First Street NE; bicycle lanes on the south and east sides of WUS; a secure bike storage facility; and multiple nearby Capital Bikeshare docking stations.

Bicycle traffic would grow by 2040 due to increased activity at WUS and the growing use of bicycle as a mode of transportation in the District. **Table 5-20** shows projected 2040 bicycle volumes. Of these volumes, 80 percent would be westbound and 20 percent eastbound. First Street, D Street, and Louisiana Avenue would see the largest westbound volumes. F Street, 2nd Street, and Massachusetts Avenue would see the largest eastbound volumes.

Table 5-203. Peak-hour Private Bicycle Activity, No-Action Alternative

	No-Action Alternative		Existing Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	89	124	67	93
Outs	118	117	89	88
Total	207	241	156	181

[14] For the purposes of this analysis, dockless bikeshare was not directly considered. Dockless bikeshare is new to the District and has been marked by volatile market conditions, with several firms ending service only months after starting it. The demand for bikeshare shown in this analysis can be understood as the demand for private bikesharing services generally.

The growth of bicycle as a transportation mode has implications for the Capital Bikeshare system. Bikeshare stations rely on a balance between trips starting and trips ending at the station to maintain functionality. When more trips start than end in a given time, the station empties out. When more trips end than start, the station runs out of docking spaces.

Analysis of Bikeshare demand showed that overall, the Columbus Circle station, which is closest to WUS, would see the largest imbalance during the PM peak. The station at the intersection of North Capitol Street and F Street NW would see the largest imbalance during the AM peak.

To eliminate the potential deficit in Bikeshare bicycle docking stations and reduce the need to rebalance by trucking bicycles from station to station, it would be necessary to provide new bicycle docks in equal number to the maximum potential peak-hour imbalance—a projected 59 docks in the No-Action Alternative. The No-Action Alternative includes no new Bikeshare bicycle docks. Thus, the anticipated imbalance would not be remedied. While this would be an adverse impact, this impact would be moderate as Bikeshare stations could nevertheless continue to operate and it is possible that docks would be added through future upgrades or projects.

Greater vehicular and bicycle volumes in the No-Action Alternative may result in more conflicts between bicycles and vehicles. However, planned DDOT bicycle facility improvements, such as on Louisiana Avenue NE and K Street NE, would help provide safe accommodations for bicyclists.

City and Commuter Buses

Relative to existing conditions, in the No-Action Alternative, anticipated increases in ridership and traffic volumes would cause a moderate adverse direct operational impact due to overcrowding of some WMATA buses and likely decreases in bus speeds and reliability.

Both city and commuter buses would experience adverse impacts in the No-Action Alternative from overcrowding or delays due to traffic conditions, or both. Based on the number of affected routes, however, these adverse impacts would be moderate.

Based on available information, in the No-Action Alternative, there would be no changes to commuter bus or WMATA Metrobus routes or stop locations. The DC Circulator that currently runs between WUS and Georgetown (GT-US route) would likely be discontinued to avoid redundancy with the expanded DC Streetcar. Most existing DC Circulator GT-US route boardings and alightings at WUS would divert to the DC Streetcar.[15] The other DC Circulator routes serving WUS would continue to operate as at present, as would all other local and commuter bus services in the Study Area. Employee shuttles serving the United States

[15] Conversely, if the DC Streetcar extension to Georgetown was not constructed, the GT-US route may be maintained and other bus routes created to accommodate the transit demand the Streetcar could not serve.

Citizenship and Immigration Service (USCIS) and Gallaudet University could continue to operate out of the WUS bus facility.

Total projected 2040 peak-hour Metrobus activity generated by WUS would be 1,431 in the AM peak and 1,592 in the PM peak. The AM peak would feature higher volumes of riders exiting WUS and boarding Metrobus, while the PM peak would feature higher volumes alighting at and entering WUS.

Collectively, buses (including Metrobus, DC Circulator, and Maryland Transit Administration [MTA] and Loudoun County Transit [LCT] commuter buses) would operate below capacity. However, assuming service levels remain the same as currently, six WMATA Metrobus routes would experience overcrowding in the AM peak and five would experience overcrowding in the PM peak (**Table 5-21**).

Table 5-214. Bus Routes Over Capacity,[1] No-Action Alternative

	No-Action Alternative	Existing Conditions
AM Peak	80 (Southbound), D4 (Westbound), D6 (Westbound), P6 (Both directions) X1 (Westbound), X2 (Westbound), X9 (Both directions)	X2 (Westbound), X9 (Both directions)
PM Peak	96 (Eastbound), D6 (Eastbound), P6 (Northbound), X2 (Both directions), X9 (Both directions)	X2 (Both directions), X9 (Both directions)

1. Over capacity is in relation to the stated capacity in WMATA's service standards, which is 1.2 times the number of seats on a bus.

Increases in vehicle delays and queues due to greater traffic volumes would likely affect bus reliability and speed. Of the 13 Metrobus routes that pass through the Local Study Area, four would pass through at least two intersections degrading to LOS F in the AM peak and five would do so in the PM peak. One DC Circulator routes and seven commuter buses routes (out of nine) would be similarly affected in the PM peak hour.

Vehicular Parking and Rental Cars

Relative to existing conditions, the No-Action Alternative would have no direct operational impact on parking. It would have a minor adverse direct operational impact on rental car operations at WUS because the existing, already challenged, rental car facility would have to accommodate additional trips.

The existing WUS parking garage would continue to operate in the No-Action Alternative. The private air-rights development would provide new parking facilities. Access to this parking would be via H Street NE, with private air-rights development parking located both to the north and south of the street.

The WUS parking garage capacity would remain unchanged, with room for approximately 2,450 vehicles, including rental cars. The private air-rights development parking facilities would include an estimated 1,320 new parking spaces.[16] These spaces would accommodate the parking needs the development would generate.

Trip generation modeling showed that in 2040 under the No-Action Alternative, relative to existing conditions, there would be an estimated 152 additional peak-hour parking trips (for a total of 487 trips): 61 in the AM peak (for a total of 189 trips in the AM peak) and 92 in the PM peak (for a total of 299 trips in the PM peak). The additional parking demand could be accommodated in the existing garage.

The rental car facility would generate another 14 additional peak-hour trips (for a total of 91 trips): 5 trips in the AM peak (for a total of 46 trips) and 9 trips in the PM peak (for a total of 45 trips). The projected increase in rental car trips would be small enough for the existing rental car facility (which would remain unchanged in the No-Action Alternative) to accommodate it. However, this facility already makes use of "stacked parking" and existing conditions are cramped. With the additional trips, conditions at the unchanged rental car facility would become more challenging, an adverse impact. This adverse impact would be minor, as the facility could accommodate the increase and remain functional.

For-hire Vehicles

Relative to existing conditions, the No-Action Alternative would have a major adverse direct operational impact on for-hire vehicle operations at the front of WUS. The existing lane configuration would remain unchanged and there would be no additional for-hire areas. As a result, the available curb and circulation space would fail to adequately accommodate anticipated increases in the use of for-hire vehicles.

For-hire vehicles, including traditional taxis, limousines, and transportation networking companies (TNC) like Uber and Lyft, would continue to use the existing designated pick-up and drop-off locations at the front of WUS. As shown in **Table 5-22**, growth in use of for-hire vehicles is anticipated to continue through 2040. A projected total of 524 AM peak-hour and 862 PM peak-hour trips for-hire vehicle trips would occur in 2040. Relative to existing conditions, this would represent a 33 percent increase in the AM and PM peaks.[17]

Table 5-225. Peak-hour For-hire vehicle Trips, No-Action Alternative

	No-Action Alternative		Existing Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	262	431	197	324
Outs	262	431	197	324
Total	524	862	394	648

[16] Letter from Akridge to FRA dated May 31, 2016.

[17] New for-hire vehicle trips would also be generated by background development growth and the private air-rights development, in addition to the WUS-generated trips shown in Table 5-22.

With only a single designated location available to for-hire vehicles serving WUS passengers (in front of the historic station building), conditions would deteriorate relative to existing conditions. Existing taxi queues would lengthen during peak periods, leading to increased queueing on H Street NE. Combined with the increase in private pick-up and drop-off (see next section), the outside drop-off lanes would become more congested than they are today. This congestion would create queueing issues at both the entry and exit of the lanes, with potential spillover onto Massachusetts Avenue, amounting to a major adverse impact.

A modest increase in the use of informal pick-up and drop-off locations on First Street NE, 2nd Street NE, and H Street NE would also likely occur. For-hire vehicles would also serve the private air-rights development via the private roadways off both sides of the H Street Bridge.

Private Pick-up and Drop-off[18]

Relative to existing conditions, the No-Action Alternative would have a major adverse direct operational impact on private pick-up and drop-off operations at the front of WUS. The existing lane configuration would remain unchanged and there would be no additional private pick-up and drop-off areas. As a result, the available curb and circulation space would fail to adequately accommodate anticipated increases in private pick-up and drop-off.

The outermost lanes of Union Station Drive NE, at the front of WUS, would remain designated for private pick-up and drop-off activity. Private vehicles would likely also continue to use informal pick-up and drop-off locations on First Street NE, 2nd Street NE, and H Street NE.

A projected total of 872 AM peak-hour and 948 PM peak-hour private pick-up and drop-off trips would occur at WUS in 2040 (**Table 5-23**). Relative to existing conditions, this would represent a 33 percent increase in both the AM and PM peaks.

Table 5-23. Private Pick-up and Drop-off Activity, No-Action Alternative

	No-Action Alternative		Existing Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	436	474	328	356
Outs	436	474	328	356
Total	872	948	656	712

The continued use of a single location for private pick-ups and drop-offs, in front of WUS, would further exacerbate existing congested conditions. The size of the private pick-up and drop-off curb spaces and the storage capacity of the lanes are very constrained and would remain so. The increased volumes would exceed capacity. Queues during both the AM and

[18] "Private pick-up and drop-off" refers to private vehicle transporting passengers to WUS without parking at the station or charging a fare.

PM peak would extend beyond Union Station Drive and spill back into both eastbound and westbound Massachusetts Avenue NE. This spill back would lead to congestion and conflicts on that major thoroughfare.

Vehicular Traffic

Relative to existing conditions, in the No-Action Alternative, there would be major adverse direct operational impacts on traffic operations at several intersections near WUS. During at least one of the peak periods, out of 35 intersections in the Local Study Area, six would degrade to LOS F; 21 would experience an increase in queue length of more than 150 feet; and 18 would experience an increase in average delay of more than 5 seconds.

Table 5-24 and **Table 5-25** show AM-peak (8:00 AM to 9:00 AM) and PM-peak (5:00 PM to 6:00 PM) WUS-related traffic volumes in the No-Action Alternative, along with the corresponding information for existing conditions. Compared to existing conditions, the No-Action Alternative would generate 412 additional AM peak trips (a 34 percent increase) and 551 additional PM peak trips (a 34 percent increase). These volume increases, combined with background and private air-rights development growth, would adversely affect traffic operations in the Local Study Area.

Table 5-24. AM Peak-hour Traffic Volumes, No-Action Alternative

	No-Action Alternative			Existing Conditions		
	Total Trips	In	Out	Total Trips	In	Out
Parking	189	127	62	128	104	24
Private Pick-Up/Drop-Off	872	436	436	656	328	328
For-hire Vehicles	524	262	262	394	197	197
Car Rental	46	28	18	41	26	15
Total Trips	1,631	853	778	1,219	655	564

Table 5-25. PM Peak-hour Traffic Volumes, No-Action Alternative

	No-Action Alternative			Existing Conditions		
	Total Trips	In	Out	Total Trips	In	Out
Parking	299	102	197	207	53	154
Private Pick-Up/Drop-Off	948	474	474	712	356	356
For-hire Vehicles	862	431	431	648	324	324
Car Rental	45	17	28	36	13	23
Total Trips	2,154	1,024	1,130	1,603	746	857

The impacts of the No-Action Alternative on traffic operations were assessed using Synchro modeling. Three indicators were used to assess impacts relative to existing conditions at each of the study intersections:

- Degradation of intersection LOS to F from a better LOS;
- Increase in average vehicle delay of more than five seconds; and
- Increase in 95th-percentile queue lengths of more than 150 feet for any lane group.[19]

While six out of the 35 study intersections would operate at a better LOS in the No-Action Alternative than under existing conditions during at least one peak hour and 15 would experience shorter delays (see **Appendix C3**, **Section 5.5.5.1**, *Direct Operational Impacts, Vehicular Traffic* for more details), in general, traffic conditions would deteriorate.

Figure 5-1 shows projected LOS for the 35 No-Action Alternative study intersections. **Table 5-26** shows the intersections that would degrade to LOS F by 2040 or experience an increase in average delay greater than 5 seconds relative to existing conditions. Six intersections would degrade to LOS F from a better LOS in at least one peak hour: four intersections in the AM peak hour and three in the PM peak hour. Three intersections already operating at LOS F under existing conditions would experience longer delays in the AM peak.

Eighteen of the 35 study intersections would experience an increase in average delay of more than 5 seconds for at least one peak period relative to existing conditions: 14 intersections in the AM peak period and ten in the PM peak period. Some of the increases would be substantial. In the AM peak, average delay at three intersections – North Capitol Street with H Street (#5); Louisiana Avenue with North Capitol Street (#21); and the WUS East Intersection at H Street (#8) – would increase by more than 120 seconds.

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[19] These indicators align with those used by DDOT in identifying traffic operations impacts as included in *DDOT Guidelines for Comprehensive Transportation Review (CTR) Requirements*, available at https://ddot.dc.gov/publication/ddot-guidelines-comprehensive-transportation-review-ctr-requirements.

Figure 5-1. Intersection Peak-Hour LOS, No-Action Alternative

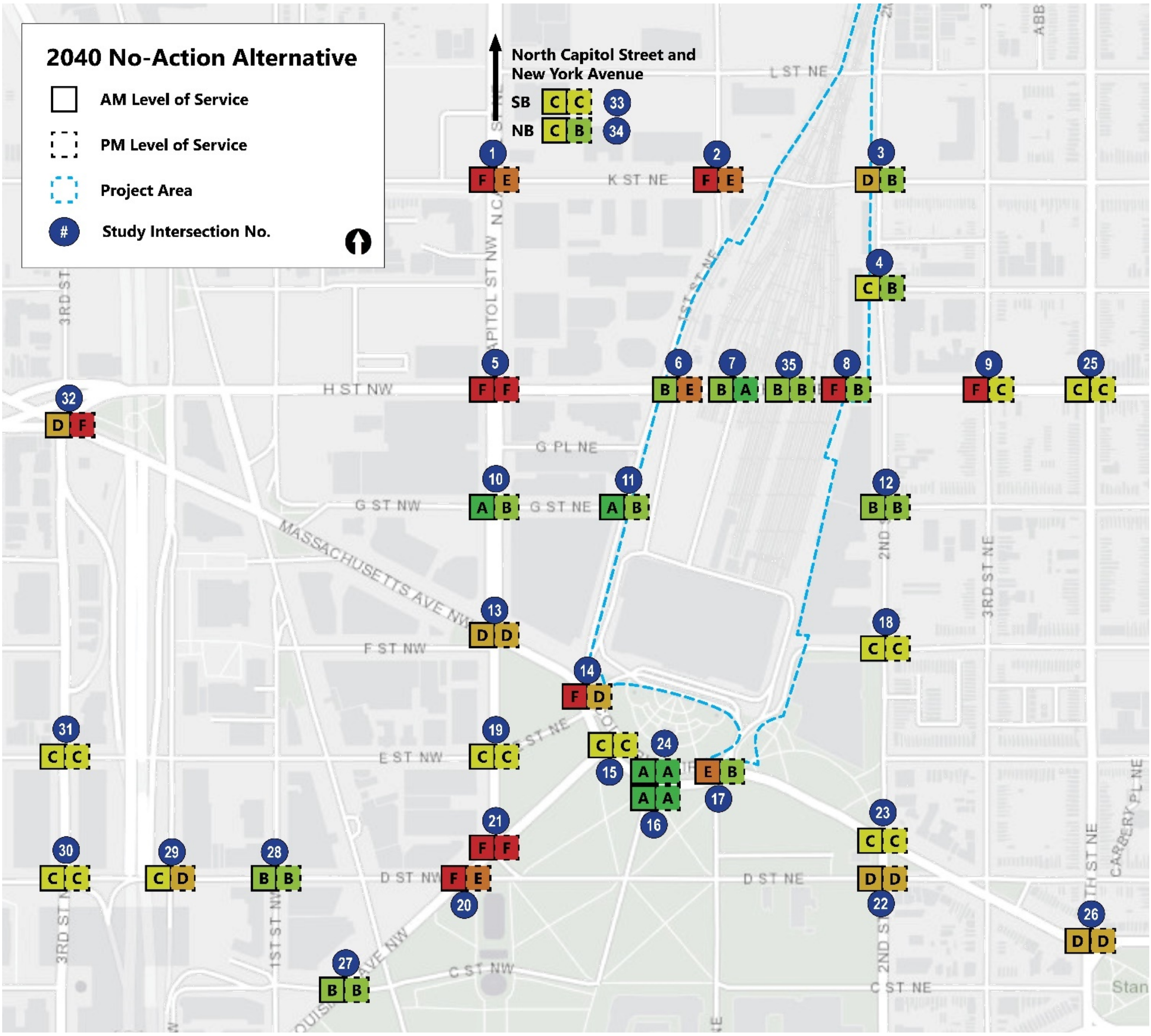

Table 5-26. Intersections Degrading to LOS F or Experiencing Delays > 5 seconds, No-Action Alternative

Intersection #	Intersection Name	No-Action Alternative				Existing Conditions			
		AM		PM		AM		PM	
		LOS	Delay/Change	LOS	Delay/Change	LOS	Delay	LOS	Delay
1	North Capitol Street / K Street	F	**135.2/47**	E	**71.4/35.5**	F	88.2	D	35.9
2	First Street / K Street NE	F	**166.9/71.8**	E	**78.1/18.4**	F	95.1	E	59.7
3	2nd Street / K Street NE	D	**37.9/11.3**	B	13.0/1.0	C	26.6	B	12.0
5	North Capitol Street / H Street	**F**	**178.8/161.2**	**F**	**292.9/265.6**	C	17.6	C	27.3
6	WUS West Intersection / H Street NE	B	**12.3/10.5**	E	**57.1/49.3**	A	1.8	A	7.8
7	WUS Bus Exit / H Street NE	B	**14.2/11.9**	A	7.0/1.5	A	2.3	A	5.5
8	WUS East Intersection / H Street NE	**F**	**160.8/149.9**	B	13.7/3.9	B	10.9	B	9.8
9	3rd Street / H Street NE	**F**	**102.8/44.7**	C	**32.0/7.2**	E	58.1	C	24.8
13	North Capitol Street / Massachusetts Ave	D	39.3/3.9	D	**46.1/10**	D	35.4	D	36.1
14	Massachusetts Avenue / E Street / First St NE	**F**	**86.8/13.9**	D	45.6/-27	E	72.9	E	72.6
15	Louisiana Ave /Massachusetts Avenue NE	C	**27.8/8.9**	C	26.3/-1.7	B	18.9	C	28.0
17	First Street / E Street / Massachusetts Avenue NE	E	**62.6/22.1**	B	19.3/0.8	D	40.5	B	18.5
21	Louisiana Avenue / North Capitol Street	F	**262.1/177.8**	**F**	**203.4/161.4**	F	84.3	D	42.0
25	4th Street / H Street NE	C	21.5/4.5	C	**22.0/10.1**	B	17.0	B	11.9
26	Massachusetts Avenue / C Street / 4th St NE	D	**40.9/11.3**	D	44.3/1.3	C	29.6	D	43.0

Intersection #	Intersection Name	No-Action Alternative				Existing Conditions			
		AM		PM		AM		PM	
		LOS	Delay/Change	LOS	Delay/Change	LOS	Delay	LOS	Delay
27	Louisiana Avenue / C Street NW	B	**18.4/6.1**	B	14.0/4.1	B	12.3	A	9.9
31	3rd Street / E Street NW	C	28.3/2.0	C	**30.0/6.8**	C	26.3	C	23.2
32	3rd Street / Massachusetts Avenue / H St NW	D	42.7/-14.1	**F**	**81.4/32.6**	E	56.8	D	48.8

Two of these intersections - North Capitol Street with H Street (#5) and Louisiana Avenue with North Capitol Street (#21) - would experience a similar increase in the PM peak.

Additionally, 21 intersections would experience queue increases greater than 150 feet for one or more lane groups. Of these, ten would experience such an increase in both peak hours.

Indirect Operational Impacts

There would be no indirect impacts in the No-Action Alternative. No actions would be taken that would induce other transportation changes.

Construction Impacts

In the No-Action Alternative, construction of the Project would not occur. The construction of other projects in the Project Area would cause a range of potential construction-related adverse impacts. The intensity of those impacts would depend on schedules, durations, and methods of construction, which are not known at this time.

The paragraphs below provide a qualitative summary description of the likely potential construction impacts of the projects included in the No-Action Alternative that have the most potential to generate construction impacts on the transportation system.

Concourse Modernization Project and WMATA Metrorail Station Improvements

The Concourse Modernization Project would cause disruptions to passenger circulation in both the Claytor Concourse and the WMATA Metrorail Station mezzanine level. Passengers may have to walk longer distances because of construction activities in the passenger areas. Temporary closure of the WMATA Metrorail north mezzanine may be necessary, which would concentrate pedestrian flows at the south entrance and may cause overcrowded conditions.

VRE Midday Storage Replacement Facility

The construction of the VRE Midday Storage Replacement Facility would cause temporary disruptions to the railroad infrastructure north of K Street NE and to railroad service in the rail terminal when the facility's tracks are connected into the existing system. These disruptions may include track outages, flagger operations, and reduced speed limits, and may require temporary modifications to rail terminal operations.

Other Station and Track Improvements

The other station and track improvements listed in **Section 3.4.1.4**, *Transportation Projects within the Project Area* may cause minor disruptions to the transportation infrastructure from short-term track closures, the temporary unavailability of passenger circulation areas, and temporary disruptions to passenger service including cancellations, delays, and reduced speeds in the rail terminal.

H Street Bridge Replacement

DDOT, in conjunction with the Federal Highway Administration, proposes to replace the H Street Bridge on its existing alignment and within DDOT's right of way.[20] DDOT's construction approach would avoid or minimize transportation impacts. The bridge would remain open to traffic during construction but with one travel lane in each direction. As a result, it is expected that some vehicular traffic would divert to nearby parallel routes. As construction occurs on the bridge deck, existing transit stops would temporarily close. This includes the DC Streetcar WUS stop and two WMATA bus stops. The streetcar would continue to operate between 3rd Street NE and Oklahoma Avenue. A shuttle service between 3rd Street and Union Station would be considered. Pedestrian access across the bridge would be maintained during construction, but it would be limited to one side. Access to the WUS Parking Garage would remain but it may be intermittently rerouted to accommodate construction activities.

The new bridge design was closely coordinated with Amtrak and WMATA to avoid any impacts to the track alignment. The approach to bridge construction would be closely coordinated with Amtrak and WMATA to ensure construction is scheduled to avoid impacts to rail and transit operations.

DC Streetcar Extension

The extension of the DC Streetcar to Georgetown would require construction along H Street NE. This may require lane closures and disrupt traffic operations on H Street. There may be a need for temporary detours for vehicular traffic. This could cause delays and inconvenience to WUS users, the persons residing or working nearby, and commuters.

[20] As of March 2020, preparation of a Categorical Exclusion for this project is ongoing.

Private Air-rights Development

The development of the privately-owned air rights above the rail terminal is the project with the most potential to cause substantial construction-related impacts at and near WUS. Methods and duration of construction are not known at this time. However, construction would likely take place in phases over several years. It would entail building an overbuild deck within the air rights to support buildings and infrastructure. Columns to support the deck would be constructed in the rail terminal, likely requiring modifications to tracks and platforms. Depending on the duration of any construction-related shutdowns, there could be adverse impacts on rail terminal operations, with implications for Amtrak, MARC, and VRE operations. However, Amtrak would have approval authority over the construction activity and would minimize impacts to operations as much as possible.

Construction on the west side of the rail terminal (north of the H Street Bridge, as the air rights on the west side south of the bridge are Federally owned) may affect the operation of Metrorail's Red Line. There may be a need for temporary single-tracking or partial closures, although it is possible that these could be limited to non-revenue hours.

Construction activities on the west side in proximity to the existing bus facility may affect tour and intercity bus operations. Temporary shutdowns during the construction of the adjacent parts of the air-rights deck and buildings could be required and, if so, would need to be coordinated with WUS. If they occur, such shutdowns would disrupt bus operations and may require the establishment of an interim bus terminal. They may also affect parking garage access.

The construction of new intersections on H Street may temporarily affect DC Streetcar operations. Construction activities along First Street NE and 2nd Street NE may affect pedestrian circulation to and from WUS. These activities may also block or complicate access to H Street and the DC Streetcar station.

Construction-generated traffic would affect the local transportation network. Construction would not require large amounts of excavation, limiting the number of trucks that would travel to and from the site. There may be some short-term lane closures along First and 2nd Streets NE, but in general, the construction traffic generated by this project can be anticipated to be commensurate with, and typical of, any large downtown mixed-use development.

5.5.4.2 Alternative A

The following sections present the direct and indirect, operational and construction impacts of Alternative A. **Figure 5-2** illustrates the key transportation elements of Alternative A.

Figure 5-2. Key Transportation Elements, Alternative A

Direct Operational Impacts

Commuter and Intercity Railroads

Relative to the No-Action Alternative, Alternative A would have a major beneficial direct operational impact on commuter and intercity railroad service, as it would support increased service accommodating many more passengers than the No-Action Alternative.

Relative to the No-Action Alternative, Alternative A (and all other Action Alternatives) would have a major beneficial direct operational impact on intercity and commuter railroad service. The reconstruction of the tracks and platforms included in Alternative A as well as the other Action Alternatives would allow for a substantial expansion of rail capacity at WUS.

The new tracks and platforms would support simultaneous boarding of trains, quicker turnaround times for trains, and double berthing.[21] Alternative A would make these procedures possible by providing wider platforms that can safely accommodate more passengers; longer usable edges along the platforms that would lengthen the amount of space effectively usable for passenger activity;[22] and greater redundancy in the track system. These changes would allow for longer trains and for more frequent trains because trains could load and unload passengers more quickly.

Based on this additional capacity, Amtrak developed an operating plan capable of accommodating the anticipated growth in ridership. This operating plan would allow for two new services: a new low-cost intercity service called the "Metropolitan" and MARC through-running trains to Virginia.

The Metropolitan service, introduced in the *Northeast Corridor* (*NEC) FUTURE Final Environmental Impact Statement (FEIS)*, is a proposed unreserved intercity service between Washington, DC and Boston. This service would be less expensive than most Northeast Regional service and would make more frequent intermediate stops. As planned, it would provide intercity service to new markets and attract riders who might otherwise drive or take the bus, potentially reducing vehicular traffic along the northeast corridor. It would also provide commuter service for longer distance commuters.

MARC Through-Running would provide regional commuter rail service between the District, Maryland, and Virginia, with trains connecting from the MARC Penn Line to the two VRE lines. Although it is referred to as MARC Through-Running in this DEIS, MARC and VRE have not reached an agreement on how this service would operate.

Table 5-27 shows anticipated daily train volumes for intercity and commuter train services in Alternative A and all other Action Alternatives. No-Action Alternative data are also provided for comparison.

[21] "Double berthing" is when two trains are lined up, one in front of the other, on the same track.

[22] While some platforms may retain the same total length as today, they would differ greatly in how much of that length is actively used. Portions of platforms are currently unused due to lack of accessibility, insufficient width, and other issues.

Table 5-27. Daily Intercity and Commuter Train Volumes by Alternative

Service	All Action Alternatives	No-Action Alternative
Amtrak Trains (All Services)	288	144
Amtrak Total Ridership	32,000	21,800
MARC Trains (All Services)	250	106
MARC Total Ridership	70,700	37,900
VRE Trains (All Services)	92	34
VRE Total Ridership	13,600	4,900

Train volumes would increase substantially relative to the No-Action Alternative in Alternative A and the other Action Alternatives. Daily intercity train volumes would increase by 100 percent, MARC Trains by 136 percent, and VRE trains by 171 percent.

In contrast to the No-Action Alternative, where increased train volumes would further stress WUS's existing, constrained infrastructure, in Alternative A and the other Action Alternatives, the proposed improvements to platforms and concourses would adequately accommodate these volumes.

Comparison to Existing Conditions

Relative to existing condition, Alternative A and all other Action Alternatives would also have a major beneficial direct operational impact on intercity, MARC, and VRE services.[23] Intercity train services could accommodate 95 percent more passengers than under existing conditions. Intercity train volumes would increase by 148 percent relative to existing conditions. Total MARC ridership would increase by 152 percent and all-day train volumes by 163 percent. Similarly, VRE total daily ridership would increase by 249 percent and all-day train volumes by 188 percent.

Private Train Cars

Relative to the No-Action Alternative, Alternative A would have no direct operational impact on private train car operations.

Currently, Amtrak allows private train cars to be stored at WUS. Under the reconfiguration of the rail terminal in Alternative A and all Action Alternatives, Amtrak has identified space for 8 private train cars to be stored at a time. Therefore, private car storage could continue.

Comparison to Existing Conditions

Impacts relative to existing conditions would be the same as relative to the No-Action Alternative because there is no difference between the two baselines with regard to private train cars.

[23] See **Section 5.5.2.1**, *Direct Operational Impacts, Commuter and Intercity Railroads* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative A would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

Increased train service and ridership in Alternative A, as well as the reduction in parking capacity and new retail uses, would generate increased demand on Metrorail at WUS. **Table 5-28** shows modeled activity in the AM peak and PM peak, along with the corresponding data for the No-Action Alternative. When the projected V/C ratio would exceed 100 percent, there would be a need for additional service to address overcrowding.[24]

Table 5-28. Peak-hour WUS-related Metrorail Activity, Alternative A[25]

	Alternative A		No-Action Alternative	
	Shady Grove	Glenmont	Shady Grove	Glenmont
	AM Peak Hour			
V/C Arriving at WUS	83%	28%	80%	25%
WUS Boardings	8,390	1,623	5,202	1,010
WUS Alightings	5,042	3,423	4,128	2,803
Through Ridership	9,222	1,296	9,523	1,447
Ridership Departing WUS	17,612	2,919	14,725	2,457
V/C Departing WUS	103%	17%	86%	14%
Excess Demand	469	0	0	0
	PM Peak Hour			
V/C Arriving at WUS	20%	115%	20%	107%
WUS Boardings	3,170	4,536	2,559	3,661
WUS Alightings	1,553	8,240	1,154	6,126
Through Ridership	1,647	9,919	1,953	10,722
Ridership Departing WUS	4,817	14,455	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

By 2040, Alternative A volumes would exceed capacity in the Shady Grove direction during the AM peak (departing from WUS) and in the Glenmont direction during the PM peak (arriving at WUS).

Relative to the No-Action Alternative, in the AM peak, Alternative A would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 86 percent in the No-Action Alternative. As a result, Alternative A would increase the excess demand by

24 WMATA capacity standards are based on WMATA's operating manual. The capacity reported in this DEIS (all alternatives) is less than the "crush load" of WMATA trains. Capacity represents the level at which WMATA believes they can operate effectively without delays to trains and passengers due to overcrowding.

25 Estimates of WMATA peak hour capacity are consistent with TPB Constrained Long-Range Transportation Plan elements and direction from WMATA (all alternatives).

approximately 469 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate within the Red Line core.[26]

In the PM peak, capacity exceedance toward Glenmont (115 percent) would be greater in Alternative A than in the No-Action Alternative (107 percent). Alternative A would aggravate the level of crowding, generating an additional demand of approximately 1,311 passengers, for a total of around 2,421.

Relative to the No-Action Alternative, the increase in Metrorail ridership at WUS would further adversely affect passenger circulation at the WMATA platform level. The North Mezzanine improvements included in the Concourse Modernization Project, which would occur in Alternative A as well as in the No-Action Alternative, would improve circulation. The construction of the First Street Concourse and the reconfiguration of access from Metrorail to the rail platform level of Concourse A in Alternative A would accommodate circulation between the WMATA mezzanine and WUS rail platform levels. However, vertical circulation between the WMATA platform and the WMATA mezzanine would remain as in the No-Action Alternative. This connection would be a constraint on circulation in the No-Action Alternative and would remain one in Alternative A. It is likely that in Alternative A, circulation conditions on the WMATA platform for passengers seeking to access the North Mezzanine would further degrade compared to the No-Action Alternative as a result of increased volumes.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would have a major adverse direct operational impact on Metrorail operations at WUS.[27] The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action Alternative.

In the AM peak, Alternative A would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 69 percent in existing conditions. Alternative A would increase the overall demand in the AM peak in the Shady Grove direction by 7,234 passengers. In the PM peak, the Alternative A V/C ratio toward Glenmont would be 115 percent arriving at WUS, against 72 percent in existing conditions. Alternative A would increase overall demand in the PM peak by 8,211 passengers.

DC Streetcar

Relative to the No-Action Alternative, Alternative A would result in a minor beneficial direct operational impact on DC Streetcar operations. The benefits of increased ridership would be partially offset by greater operational delays.

[26] The Red Line core, as defined by WMATA, consists of the line segment between Dupont Circle and WUS.

[27] See **Section 5.5.2.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative A include ridership generated by the private air-rights development.

Relative to the No-Action Alternative, Alternative A would increase Streetcar ridership without creating a capacity exceedance. In the AM peak, passenger volumes would go up by 344 departing in the westbound direction and 86 in the eastbound direction. In the PM peak, passenger volumes would increase by 53 in the westbound direction and 210 in the eastbound direction. Thus, Alternative A would result in greater use of the DC Streetcar than the No-Action Alternative while leaving sufficient room for further growth, a beneficial impact. This beneficial impact would be minor because greater traffic congestion on H Street (see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Traffic*) may create operational delays that would partially offset the benefits of increased ridership.

Comparison to Existing Conditions

Because of the different operational conditions of the DC Streetcar in existing conditions, it is not possible to compare the impacts of Alternative A to this mode to existing conditions. Under existing conditions, the DC Streetcar terminates at WUS, continuing east along H Street/Benning Road NE to Oklahoma Avenue. This service travels every 12 minutes. In the No-Action Alternative and Action Alternatives, the DC Streetcar would continue east to the Benning Road Metrorail Station and west to Georgetown, making it a substantially different transportation element.

Intercity, Tour/Charter, and Sightseeing Buses

Relative to the No-Action Alternative, Alternative A would have a moderate adverse direct operational impact on intercity and tour/charter, and daily sightseeing bus operations because of the new 30-minute time limit for buses at WUS. Alternative A would have a negligible adverse direct operational impact on hop-on/hop-off sightseeing buses as a result of their relocation to G Street NE.

In Alternative A and all action alternatives, intercity buses, tour/charter buses, and daily sightseeing buses,[28] would be accommodated in a new facility replacing the existing one. Hop-on/hop-off sightseeing buses would be accommodated on G Street NE. Impacts to all these modes are assessed in this section.

In Alternative A, the new bus facility would be located in approximately the same location as the existing WUS parking garage. Buses would reach it via the new west intersection on H Street NE. Exit would be via a ramp east of that intersection, near where the existing ramp is located today. All intercity and tour/charter buses that serve WUS would use this facility. As in the No-Action Alternative, exiting buses could only turn right onto eastbound H Street NE. However, the west intersection would not be offset (as it would be in the No-Action Alternative), which would facilitate inbound bus movements.

In Alternative A and all Action Alternatives, an "active management" approach would be used to optimize the capacity of the bus facility. With this approach, buses could not stay at a slip

[28] Daily sightseeing buses are coach-style buses that provide scheduled tours of Washington-area sites and currently depart from the existing WUS bus facility.

for more than 30 minutes during peak hours of operation. This quick turnaround would allow the bus facility to process more buses with a smaller number of slips than would be the case in the No-Action Alternative, which would maintain existing conditions, including no time limits on bus layovers.

In 2040, Alternative A and all Action Alternatives would generate an estimated 117 peak-hour intercity, tour/charter and sightseeing bus movements (**Table 5-29**). Relative to the No-Action Alternative, this would be an increase of 75 percent (22 trips, or 79 percent, in the AM peak and 28 trips, or 72 percent, in the PM peak.)

Bus demand would be lower in Alternative A and all Action Alternatives than in the No-Action Alternative because of the introduction of the lower-cost Metropolitan Train service. However, the 30-minute stay policy would result in more trips in and out of the bus facility and may create additional delays for bus operators. Buses may need to lay over at other locations in the District or the region as a result of the 30-minute policy. These locations have not been determined.

Table 5-29. Peak-hour Bus Trips by Alternative, All Alternatives

	All Action Alternatives		No-Action Alternative	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	25	34	14	20
Outs	25	33	14	19
Total	50	67	28	39

In Alternative A and all Action Alternatives, sightseeing buses, which currently serve the front of WUS, would provide service via a curbside loading zone on the south side of G Street NE (See **Figure 5-2** above). There would be seven slips at that location. Future sightseeing bus operations would need four of them. The additional slips would serve to accommodate any overflow from the bus facility during peak season as well as other vehicular pick-up and drop-off activity. While the 30-minute-stay policy would create a constraint on bus operations at the bus facility, the availability of overflow spaces on G Street NE would provide added flexibility.

Comparison to Existing Conditions

Relative to existing conditions, bus trips would increase by 29 trips (138 percent) in the AM peak and 39 trips (139 percent) in the PM peak.[29] Of the additional trips, 19 percent would be due to the anticipated increase in demand and the rest to the implementation of the 30-minute stay limit.

[29] See **Section 5.5.2.1**, *Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Loading

Relative to the No-Action Alternative, Alternative A would have no adverse direct operational impacts on loading space availability. Demand would increase but it would be met through continued use of the existing docks and the provision of a new dock on 2nd Street NE.

In Alternative A and all Action Alternatives, use of the existing east and west loading docks would continue. A new loading dock (north dock) between 2nd Street and K Street NE with access from 2nd Street NE would be constructed. Relative to the No-Action Alternative, the demand for loading dock slips at WUS would increase an estimated 75 percent because of the greater amount of retail and the increase in multimodal operations. Between the existing loading docks and the new north dock, there would be sufficient capacity to accommodate the expected volume of vehicles and materials.

The east dock would continue to accommodate up to six vehicles per hour, while the west dock would accommodate only Package Express loading needs due to the potential reconfiguration of access from the Metrorail station to WUS. The new north loading dock would include 14 slips, with at least two of these slips designed to accommodate smaller vehicles.

Across all three docks, the AM peak would include 30 loading movements and the PM peak eight loading movements. The heaviest volumes would continue to be in the midday hours (between 10:00 AM to 11:00 AM) with 40 total loading movements.

The north dock would introduce new truck activity along 2nd Street NE relative to the No-Action Alternative. This truck activity would be distributed throughout the day, with the highest volumes outside the rush hour periods. Compliance with existing truck route restrictions would keep truck traffic from spilling into nearby residential streets. Trucks serving the north dock would comply with District law that prohibits backing up in the public right-of-way.

Comparison to Existing Conditions

The impacts of Alternative A on loading relative to existing conditions would be the same as relative to the No-Action Alternative. There is no difference between the two baselines with regard to loading dock conditions.

Pedestrians

Relative to the No-Action Alternative, Alternative A would have a major beneficial direct operational impact on pedestrian circulation inside WUS. Additional access points to WUS would disperse pedestrian traffic and make access to WUS easier. Outside of WUS, Alternative A would have a minor adverse direct operational impact on pedestrian circulation because of increased queueing at certain crossings near the station.

As shown in **Table 5-30**, interior passenger volumes at WUS would increase in Alternative A and all Action Alternatives relative to the No-Action Alternative. In both the AM and PM peaks, volumes would be approximately 50 percent greater. The largest generator of internal pedestrian trips would be passengers transferring between commuter rail and Metrorail.

Table 5-30. Interior Pedestrian Volumes, All Alternatives

	Action Alternatives		No-Action Alternative	
	AM Peak	PM Peak	AM Peak	PM Peak
Total	71,734	92,356	47,703	61,416

By providing new concourse space and access points, Alternative A, like all Action Alternatives, would facilitate the movement of passengers and visitors through and in and out of WUS, avoiding the congestion that would occur in the No-Action Alternative. In the No-Action Alternative, the existing, already congested circulation space and entry points would have to accommodate a growing number of persons. Therefore, in spite of the increase in pedestrian volumes, Alternative A would result in a major beneficial impact on pedestrian conditions in WUS.

Outside WUS, pedestrian volumes would increase by around 61 percent in the AM peak and 55 percent in the PM peak, as shown in **Table 5-31**.

Table 5-31. Exterior Pedestrian Volumes, All Alternatives

	Action Alternatives		No-Action Alternative	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	5,566	10,339	3,753	6,587
Outs	12,372	6,427	7,370	4,232
Total	17,938	16,766	11,123	10,819

In Alternative A, as in all Action Alternatives, projected queues at the two study crossings would be longer than they would be in the No-Action Alternative but they would remain manageable as queues could remain contained within the available sidewalk space at these locations.

Anticipated increases in vehicular traffic near WUS, including pick-up and drop-off activities, along with increases in pedestrian volumes, may result in more conflicts between pedestrians and vehicles. Based on the projected number and distribution of new multimodal trips, the following locations would be most affected: G Street NE between North Capitol Street and First Street NE; First Street NE between G Street NE and K Street NE; H Street NE between the west intersection and east intersection; and 2nd Street NE between F Street NE and K Street NE.

Comparison to Existing Conditions

The impacts of Alternative A relative to existing conditions would be similar to those relative to the No-Action Alternative. The major beneficial impact that would result from the provision of more circulation space and access points would be somewhat greater because it would represent more of an improvement relative to existing conditions than relative to the No-Action Alternative, which would incorporate some changes beneficial to pedestrians, such as those associated with the Concourse Modernization project. The increase in pedestrian volumes inside WUS would also be greater relative to existing conditions (about 115 percent in the AM and 61 percent in the PM peak).[30] Impacts on outside pedestrian circulation would be the same relative to existing conditions as relative to the No-Action Alternative since they are a function of a feature – sidewalk queuing space for pedestrians – which would be the same in both baselines.

Bicycle Activity

Relative to the No-Action Alternative, Alternative A would result in a minor beneficial direct operational impact on bicycle activity. Anticipated demand for private bicycle parking and storage would be accommodated by the provision of 104 Bikeshare spaces and 200 bicycle storage spots. However, this benefit would be partially offset by increased conflicts with pedestrians and vehicles.

In Alternative A, as in all Action Alternatives, a total of 586 WUS-generated peak-hour bicycle trips would be generated, with 285 trips in the AM peak and 301 trips in the PM peak (**Table 5-32**). Alternative A volumes would represent an increase of 78 AM trips and 60 PM trips over the No-Action Alternative.

Alternative A and all Action Alternatives would provide 104 Bikeshare spaces and 200 bicycle storage spaces. These new bicycle storage facilities would be adjacent to the H Street Concourse entrances at First and 2nd Streets NE. With the new bicycle facilities, Alternative A would fully accommodate the increased volumes in bicycle trips unlike the No-Action Alternative, which would not accommodate any additional bicycle storage. Therefore, Alternative A would have a beneficial direct operational impact on bicycle activity relative to the No-Action Alternative.

30 See **Section 5.5.2.1**, *Direct Operational Impacts, Pedestrians* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Table 5-32. Peak-hour Bicycle Trips, All Alternatives

	All Action Alternatives		No-Action Alternative	
	AM Peak	PM Peak	AM Peak	PM Peak
Ins	118	163	89	124
Outs	167	138	118	117
Total	285	301	207	241

However, greater vehicular, pedestrian, and bicycle volumes in Alternative A (and all Action Alternatives) would increase the risk of conflicts between bicycles and vehicles. Bicycle facility improvements planned by DDOT (on Louisiana Avenue NE and K Street NE, for instance) would improve safety. However, the volumes and new activities like pick-up and drop-off on First Street would create conflicts even with these additional safety measures. This would partially offset the beneficial impact from increased storage, resulting in a minor beneficial net impact.

Comparison to Existing Conditions

The impacts of Alternative A relative to existing conditions would be similar to those relative to the No-Action Alternative. Alternative A would generate 129 additional AM peak trips (83 percent increase) and 120 additional PM peak trips (66 percent increase) relative to existing conditions.[31] The bicycle parking and storage facilities included in Alternative A and all Action Alternatives could accommodate up to 200 bicycles, more than enough to cover the anticipated increase, with room for further growth. Based on the growth in peak-hour WUS-related bicycle trips, an additional 88 Bikeshare docks would be required to meet demand under Alternative A relative to existing conditions. Alternative A would fully accommodate this demand as it would provide 104 Bikeshare spaces. Like relative to the No-Action Alternative, greater vehicular, pedestrian, and bicycle volumes would increase the risk of conflict with bicycles.

City and Commuter Buses

Relative to the No-Action Alternative, Alternative A would have a minor adverse direct operational impact on city and commuter buses. Increases in WUS-generated ridership would incrementally contribute to the overcrowding of some city buses and increases in traffic congestion would incrementally contribute to delays experienced by all city and commuter buses. There would also be a moderate adverse direct operational impact on some employee shuttles, which would have to stop operating out of the WUS bus facility.

Alternative A would generate more use of the city and commuter buses (including DC Circulator Metrobus, MTA, and LCT buses) that serve WUS. Compared to the No-Action

[31] See **Section 5.5.2.1**, *Direct Operational Impacts, Bicycle Activity* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Alternative, there would be an additional 384 alighting WUS passengers (81 percent increase) and 865 boarding WUS passengers (104 percent increase) in the AM peak on city and commuter buses. There would be an additional 621 alighting passengers (73 percent increase) and 398 boarding passengers (65 percent increase) in the PM peak.

Considered collectively, city and commuter buses would continue to operate under capacity. The same individual Metrobus routes that would be over capacity in the No-Action Alternative would be over capacity in Alternative A (see **Table 5-33**). Because of the increase in ridership, the overcrowding would be worse but Alternative A would not cause more Metrobus or DC Circulator lines to run above capacity than the No-Action Alternative. As a result, Alternative A would only have a minor adverse direct operational impact on city and commuter buses.

The reconstruction of the bus facility in Alternative A and all Action Alternatives would require employee shuttles currently making use of the facility to relocate to another location. These shuttles serve USCIS and Gallaudet University. The relocation of the employee shuttles would be a moderate adverse impact on their operation because, while they must be proximate to WUS, they do not need to be within the bus facility itself to continue fulfilling their purpose. No impact to traffic operations would occur because of this relocation.

Table 5-33. Bus Routes Over Capacity, All Alternatives

	Metrobus	Direction	Action Alternatives	No-Action Alternative
AM Peak	80	SB	Over Capacity	Over Capacity
	D4	WB	Over Capacity	Over Capacity
	D6	WB	Over Capacity	Over Capacity
	P6	NB	Over Capacity	Over Capacity
	P6	SB	Over Capacity	Over Capacity
	X1	WB	Over Capacity	Over Capacity
	X2	WB	Over Capacity	Over Capacity
	X9	EB	Over Capacity	Over Capacity
	X9	WB	Over Capacity	Over Capacity
PM Peak	96	EB	Over Capacity	Over Capacity
	D6	EB	Over Capacity	Over Capacity
	P6	NB	Over Capacity	Over Capacity
	X2	EB	Over Capacity	Over Capacity
	X2	WB	Over Capacity	Over Capacity
	X9	EB	Over Capacity	Over Capacity
	X9	WB	Over Capacity	Over Capacity

SB: Southbound, WB: Westbound, EB: Eastbound, NB: Northbound

Increases in vehicle delays and queues due to greater traffic volumes would likely affect bus reliability and speed. Out of the 13 Metrobus routes that serve the Local Study Area, four in the AM peak and five in the PM peak would pass through at least two intersections that would degrade to LOS F relative to the No-Action Alternative, a potential source of delays. One DC Circulator routes and seven commuter bus routes (out of nine) would be similarly affected, but in the PM peak only. Conditions would be similar to those in the No-Action Alternative, though delays may be slightly greater.

Comparison to Existing Conditions

Compared to existing conditions, in Alternative A there would be an additional 466 alighting WUS passengers (118 percent) and 977 boarding WUS passengers (136 percent) in the AM peak on city and commuter buses.[32] There would be an additional 756 alighting passengers (105 percent) and 509 boarding passengers (102 percent) in the PM peak. Considered collectively, city and commuter buses would continue to operate under capacity. Because of the increase in ridership, six Metrobuses in the AM peak and three Metrobuses in the PM peak would become over capacity. Impacts on employee shuttles would be the same relative to existing conditions or the No-Action Alternative because there is no difference between the two baselines in this regard.

Compared to existing conditions, in Alternative A buses would see increases in delays and queues that would affect their reliability and speed because of greater traffic. Four bus routes in the AM peak and 13 bus routes in the PM peak would pass through intersections degrading to LOS F relative to existing conditions.

Vehicular Parking and Rental Cars

Relative to the No-Action Alternative, Alternative A would have a moderate adverse direct operational impact on parking at WUS because of a reduction in parking capacity. There would be a minor beneficial direct operational impact on rental car operations.

In Alternative A, all parking and rental car activity would be in a new above-ground facility (multimodal surface transportation center) located within the same general footprint as the existing WUS parking garage, with access via H Street NE (west intersection) and the new southwest road. The new facility would have space for approximately 700 fewer cars than the existing one (which would remain in use in the No-Action Alternative). While this reduction in parking capacity would be an adverse impact, the new facility would meet the parking program for the Project.[33] It would not fully meet the projected parking demand but it is anticipated that lack of parking would cause some users to use different modes to reach

[32] See **Section 5.5.2.1**, *Direct Operational Impacts, City and Commuter Buses* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

[33] As noted in **Section 5.5.3.1**, *Operational Impacts*, the parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

the station.[34] In general, fewer passengers or visitors are expected to be driving to and parking at WUS.[35] Therefore, the adverse impact would be moderate.

Although there would be fewer parking spaces, WUS activity in Alternative A would generate more peak-hour parking trips than would be the case in the No-Action Alternative because greater peak-hour train volumes would bring more people, including drivers, to WUS. Relative to the No-Action Alternative, Alternative A would generate an estimated 99 additional peak-hour trips (20 percent increase): 88 in the AM peak hour (47 percent increase) and 11 in the PM peak hour (4 percent increase). These trips were considered in the traffic impact analysis (see **Tables 5-34 and 5-35** below).

Increased WUS activity would also generate more rental car trips relative to the No-Action Alternative, also because of greater peak-hour train volumes. In both the AM and PM peak hours, the number of car-rental trips would more than double relative to the No-Action Alternative (105 against 46 in the AM peak and 92 against 45 in the PM peak). As with parking, these trips were considered in the traffic impact analysis.

The design of the new rental car facility would address the capacity issues that would occur in the No-Action Alternative, resulting in a beneficial impact. This beneficial impact would be minor, being partially offset by the increase in operations.

Comparison to Existing Conditions

The impacts of Alternative A on parking and rental car activity would be the same relative to existing conditions as relative to the No-Action Alternative since the existing parking garage and rental car facility would be in use in both baselines. The reduction in parking capacity would be the same relative to existing conditions as relative to the No-Action Alternative. Alternative A would generate proportionately more peak-hour parking trips relative to existing conditions than relative to the No-Action Alternative.[36] In the AM peak, Alternative A would generate 149 trips (116 percent) more than in existing conditions. In the PM peak, the increase would be 103 trips (50 percent) above existing conditions. With regard to rental cars, in the AM peak, the number of trips would increase by 64 (156 percent). In the PM peak, trips would increase by 56 (156 percent).

For-hire Vehicles

Relative to the No-Action Alternative, Alternative A would have a moderate beneficial direct operational impact on for-hire vehicle activity because of the provision of new

[34] **Appendix A6**, *Parking Program Memorandum*, provides more information on parking demand projection and the development of the parking program.

[35] The MWCOG Model estimates a 10% reduction in single-occupancy vehicle trips in the WUS area to 2040. Additionally, Amtrak as indicated to FRA that passenger parking is not essential to Amtrak's operation of intercity passenger rail at WUS and it anticipates passenger parking demand to continually decrease in the future.

[36] See **Section 5.5.2.1**, *Direct Operational Impacts, Vehicular Parking and Rental Cars* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

locations for pick-ups and drop-offs. These locations would adequately accommodate the anticipated growth in for-hire trips, but queuing would not be eliminated. Alternative A would also have a major adverse direct operational impact on for-hire vehicles due to increased traffic congestion.

Alternative A would include the four following pick-up and drop-off locations (see **Figure 5-2** above):

- **Front of WUS:** For-hire vehicles would have two means of access depending on trip purpose: from Columbus Circle (drop-off only) and, for taxis, from H Street NE, via the center intersection, center road, and east ramp (pick-up only). Egress from the front of WUS would continue to be via the intersection of Massachusetts Avenue, E Street NE, and First Street NE. In Alternative A, a projected 40 percent of for-hire drop-off activity and 40 percent of for-hire pick-up activity would occur in front of WUS.

  Improvements to the traffic lanes in front of WUS would double the number of lanes available for for-hire drop-off from two to four over the No-Action Alternative. This doubling of capacity would benefit for-hire vehicle operations. Taxi pick-up would continue to have dedicated lanes closest to the WUS entrance.

- **Adjacent to the north-south train hall on the deck level**: For-hire vehicles would access this location via the center intersection on H Street NE, with egress via either the east intersection to H Street NE or the east ramp to F Street NE. In Alternative A, a projected 35 percent of for-hire drop-off activity and 35 percent of for-hire pick-up activity would occur at this location.
- **New H Street Concourse entrance on First Street NE**: This location would serve the new WUS entrance on First Street NE and consist of a curbside pick-up and drop-off area on the east side of the street, north of G Place NE. For-hire vehicles would reach it via northbound First Street NE. In Alternative A, a projected 20 percent of for-hire drop-off activity and 20 percent of for-hire pick-up activity would use this location.
- **New H Street Concourse entrance on 2nd Street NE**: This location would serve the new WUS entrance on 2nd Street NE. It would consist of space for curbside pick-up and drop-off on both sides of the street. These layby areas would be developed to accommodate expected volumes associated with a station entrance. The west side location would be reached via southbound 2nd Street NE. Vehicles would reach the east side location via northbound 2nd Street NE. In Alternative A, a projected 5 percent of for-hire drop-off activity and 5 percent of for-hire pick-up activity would use this location.

Relative to the No-Action Alternative, Alternative A would generate an estimated 1,404 new peak-hour for-hire trips in the AM peak hour (268 percent increase). In the PM peak hour, it would generate an additional 1,206 for-hire trips (140 percent increase). The principal source of increased peak-hour for-hire trips would be the increase in intercity rail activity. These trips were considered in the traffic impact analysis (see **Tables 5-34 and 5-35** below).

As explained below (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Traffic*), volumes associated with for-hire as well as private pick-up and drop-off activity on the deck level and in front of WUS could create queueing and congestion, resulting in a major adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The beneficial impacts of Alternative A on for-hire vehicle activities would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater. Relative to existing conditions, Alternative A would generate an estimated 1,534 new AM peak-hour for-hire trips (389 percent increase) and 1,420 new PM peak-hour for-hire trips (219 percent increase).[37] The principal source of increased peak-hour for-hire trips would be the increase in intercity rail activity.

Private Pick-up and Drop-off

Relative to the No-Action Alternative, Alternative A would have a moderate beneficial direct operational impact on private pick-up and drop-off activities because of the provision of new locations for these activities. These locations would adequately accommodate the anticipated growth in private pick-up and drop-off trips, but queuing may occur. Alternative A would also have a major adverse direct operational impact on private pick-ups and drop-offs due to increased traffic congestion.

The same four locations used by for-hire vehicles would be available for private pick-up and drop-off activity. However, private vehicles would not be allowed to use the east ramp. Relative to the No-Action Alternative, Alternative A would generate an estimated 812 additional private pick-up and drop-off trips in the AM peak hour (93 percent increase) and an estimated 592 private pick-up and drop-off trips in the PM peak hour (63 percent increase). The principal source of increased peak-hour private pick-up and drop-off trips would be the increase in intercity rail activity. The anticipated distribution of trips would be the same as for for-hire vehicles. These trips were considered in the traffic impact analysis (see **Tables 5-34 and 5-35** below).

As explained below (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Traffic*), volumes associated with private pick-up and drop-off, as well as for-hire, activity on the deck level and in front of WUS could create queueing and congestion, resulting in a major adverse impact on private pick-up and drop-off operations at WUS.

[37] See **Section 5.5.2.1**, *Direct Operational Impacts, For-hire Vehicles* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Comparison to Existing Conditions

The beneficial impacts of Alternative A on private pick-up and drop-off activity would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater.[38] Relative to existing conditions, Alternative A would generate an estimated 1,028 additional private pick-up and drop-off trips in the AM peak hour (157 percent) and an estimated 828 additional private pick-up and drop-off trips in the PM peak hour (116 percent). The principal source of increased peak-hour private pick-up and drop-off trips would be the increase in intercity rail activity.

Vehicular Traffic

Relative to the No-Action Alternative, Alternative A would have major adverse direct operational impacts on traffic operations at several intersections near WUS due to increased traffic volumes. During at least one of the peak periods, out of 35 intersections in the Local Study Area, seven would degrade to LOS F; 16 would experience an increase in queue length of more than 150 feet; and 20 would experience an increase in average delay of more than 5 seconds.

Trip Generation and Circulation

WUS-related vehicular activity in Alternative A would be primarily distributed across four locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus and parking facility, and new deck-level pick-up and drop-off location, accessed from H Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse); and
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse).

Parking and rental car activity would converge onto H Street NE to reach the new facility. Private and for-hire pick-up and drop-off activity would be spread across all four locations. Approximately 70 percent of WUS-related traffic is expected to travel to and from points west of WUS, with 30 percent traveling to and from points east of WUS. Deck-level circulation patterns in Alternative A are represented in **Figure 5-3**.[39]

[38] See **Section 5.5.2.1**, *Direct Operational Impacts, Private Pick-up and Drop-off* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

[39] Figure 5-3 shows all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-3. Deck Level Circulation (All Movements), Alternative A

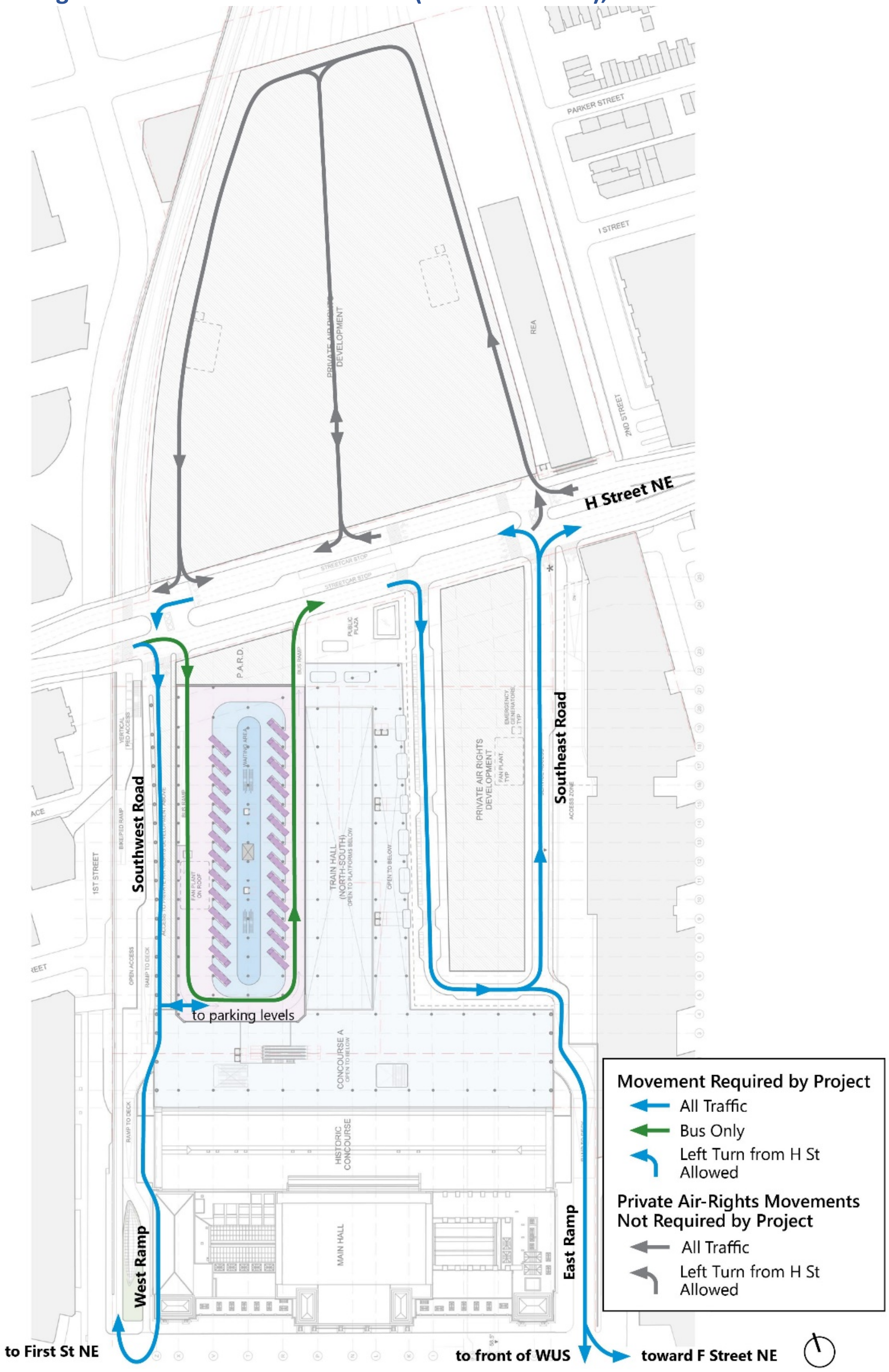

Table 5-34 and **Table 5-35**, respectively, show AM and PM peak WUS-related traffic volumes in Alternative A, along with the corresponding information for the No-Action Alternative. Compared to the No-Action Alternative, Alternative A would generate 2,363 additional AM peak trips (145 percent increase) and 1,856 additional PM peak trips (86 percent increase). These volume increases would result in major adverse impacts to traffic operations at some study intersections, as described below.

Table 5-34. AM Peak-hour Traffic Volumes, Alternative A

	Alternative A			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	277	190	87	189	127	62
Private Pick-Up/Drop-Off	1,684	842	842	872	436	436
For-hire Vehicles	1,928	964	964	524	262	262
Car Rental	105	57	48	46	28	18
Total Trips	3,994	2,053	1,941	1,631	853	778

Table 5-35. PM Peak-hour Traffic Volumes, Alternative A

	Alternative A			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	310	83	227	299	102	197
Private Pick-Up/Drop-Off	1,540	770	770	948	474	474
For-hire Vehicles	2,068	1,034	1,034	862	431	431
Car Rental	92	37	55	45	17	28
Total Trips	4,010	1,924	2,086	2,154	1,024	1,130

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would generate 2,775 additional AM peak trips (228 percent increase) and 2,407 additional PM peak trips (150 percent increase).[40]

Curbside Analysis

The anticipated vehicular volumes associated with for-hire and private pick-up and drop-off activities on the deck level and on First and 2nd Streets NE may create conflicts and could lead to queues. In particular, queues may occur at the intersection of the deck-level pick-up and drop-off area and the southeast road/east ramp. As a result, conflicts could occur

[40] See **Section 5.5.2.1**, *Direct Operational Impacts, Vehicular Traffic* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

between for-hire vehicles heading down the east ramp and vehicles seeking to exit onto H Street NE. Queues may slow down vehicle movements in the pick-up and drop-off area and cause delays.

At deck level, queues at the first layby lane next to the train hall on the center road would be located less than 100 feet from H Street NE and could possibly “spill back” onto this street. In the AM peak, the estimated maximum queue length could reach 15 cars. In the PM peak, the estimated maximum queue length could reach 107 cars. This queue would have a major adverse impact on traffic operations. In these conditions, it is possible that WUS users may walk to nearby destinations to find a for-hire vehicle.

The front of WUS, First Street, and 2nd Street would also experience curbside activity. Queues at the front may spill back into travel lanes on Massachusetts Avenue. The pick-up and drop-off lanes on First and 2nd Streets would help accommodate the excess volumes. No queue would form at the First Street or 2nd Street pick-up and drop-off areas. On First Street, 236 pick-ups and drop-offs would occur in the AM peak and 206 would occur in the PM peak. On 2nd Street, 77 pick-ups and drop-offs would occur in the AM peak and 65 would occur in the PM peak.

Intersection Analysis

The impacts of Alternative A on traffic operations were assessed using Synchro modeling. Three indicators were used to assess the impacts on traffic operations relative to the No-Action Alternative at each of the study intersections:

- Degradation of intersection LOS to F from a better LOS due to vehicle trips generated by the Project;
- Increase in average vehicle delay of more than five seconds; and
- Increase in 95th-percentile queue lengths of more than 150 feet for any lane group in an intersection.[41]

Table 5-36 identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of the three indicators considered in the analysis. The peak hour LOS of each studied intersection is shown in **Figure 5-4**. In Alternative A, relative to the No-Action Alternative, seven out of 35 study intersections would degrade to LOS F in at least one peak hour.

Sixteen intersections out of 35 would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of those 16 intersections, eight would experience such a queue increase in both peak hours.

[41] These indicators align with those used by DDOT in identifying traffic operations impacts as included in *DDOT Guidelines for Comprehensive Transportation Review (CTR) Requirements*, available at https://ddot.dc.gov/publication/ddot-guidelines-comprehensive-transportation-review-ctr-requirements.

Finally, in Alternative A, 20 of the 35 study intersections would experience an increase in average delay of more than 5 seconds for at least one peak period relative to the No-Action Alternative. Fourteen of those 20 intersections would see such an increased delay in both peak hours.

Figure 5-4. Intersection Peak Hour LOS, Alternative A

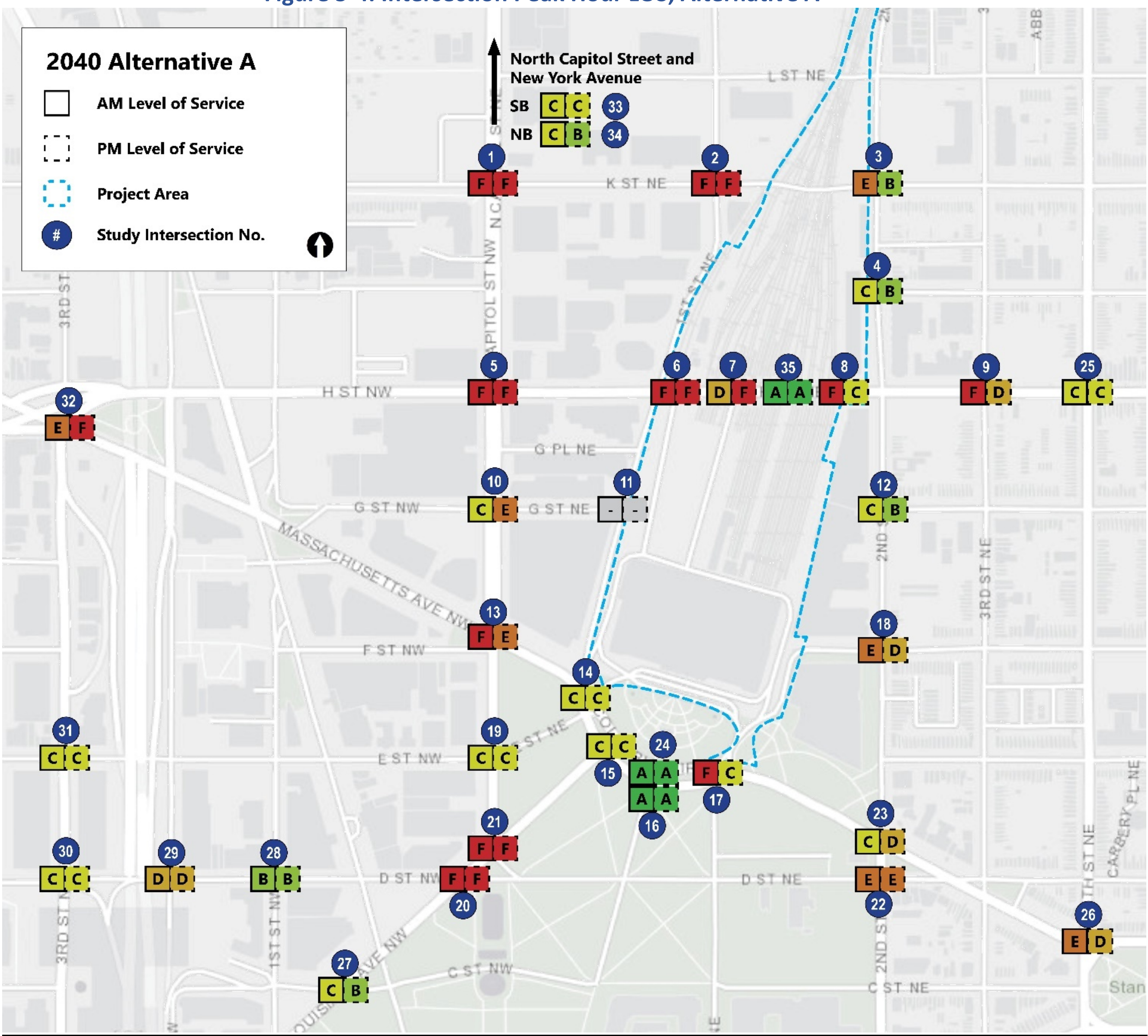

Table 5-36. Summary of Traffic Impacts, Alternative A

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X
3	2nd Street / K Street NE			X
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE	X	X*	X*
7	WUS Bus Exit / H Street NE	X	X*	X*
8	WUS East Intersection / H Street NE		X	X*
9	3rd Street / H Street NE		X	X*
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave	X	X	X*
17	First Street / Massachusetts Avenue NE	X		X
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW	X	X*	X*
21	Louisiana Avenue / North Capitol Street		X	X*
22	2nd Street / D Street NE		X	X*
23	2nd Street / Massachusetts Avenue NE		X	
26	Massachusetts Avenue / C Street / 4th Street NE			X*
27	Louisiana Avenue / C Street NW		X*	X
29	2nd Street / D Street NW			X
31	3rd Street / E Street NW		X	
32	3rd Street / Massachusetts Avenue / H Street NW			X*

* indicates the impact would occur in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative A:[42]

- Eleven intersections would degrade to LOS F in at least one peak period.
- Twenty-six intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 21 projected to do so in both peak hours.
- Twenty-four intersections would experience delay increases of more than 5 seconds, with 18 projected to do so in both peak hours.

Indirect Operational Impacts

Alternative A would have minor adverse indirect operational impacts on traffic because of the trips generated by the potential Federal air-rights development.

[42] See **Section 5.5.2.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

In Alternative A, approximately 323,720 square feet of air rights above the bus and parking facility would be potentially available for development, separately from the Project. Because of the relatively small amount of available space, and its location on top of a multistory ground transportation facility with no direct street access, it was assumed for the purposes of the analysis that this space would be for additional parking.[43] It was further conservatively assumed that the space would operate near capacity. **Table 5-37** shows the trips the Federal air-rights development would generate under this assumption.

Table 5-37. Federal Air-rights Development Trip Generation, Alternative A

	AM Peak			PM Peak		
	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Parking	180	90	90	180	90	90

The potential Federal air-rights development would increase the total number of trips generated by Alternative A by approximately 5 percent. These trips were incorporated in the traffic impact analysis for Alternative A.

Construction Impacts

Construction of Alternative A would take place over approximately 11 years and 5 months. Work would be conducted in four phases moving from the east side to the west side of the Project Area. Between Phases 1 and 2, there would a 12-month period (Intermediate Phase) when only column removal work in the First Street Tunnel would take place. The intensity and location of construction activities would vary with the phase. The following sections characterize the potential impacts of the construction of Alternative A on the various transportation modes at and near WUS. The discussion focuses on Phase 4 of construction. Phase 4 would have the greatest impacts on transportation because of the demolition of the existing parking garage and bus facility that would occur during this phase and because of the concentration of construction activities on the west side of WUS, adjacent to Metrorail's Red Line. In Alternative A, Phase 4 would begin approximately 8 years and 4 months after the start of construction and last for approximately 3 years and 1 month.

During each of the four phases, a similar sequence of activities would take place, as described in **Section 3.5.1,** *Construction Phasing and Sequence.* A set of tracks would be taken out of service. Temporary tracks and connections would be constructed as needed to help maintain operations and potentially support the operation of work trains. Cut-off and support walls (slurry, sheet-pile, or secant-pile walls: see **Section 3.5.2**, *Support of Excavation Options*, for more details) would be installed, as needed, to support excavation and keep groundwater out. Following excavation, drilled shafts would be constructed to provide deep foundations for the slabs supporting the new tracks and the columns supporting the deck on which the

[43] This assumption is for the purposes of the impact analysis only and does not preclude other types of potential development in the remaining Federal air rights.

Project elements would stand. As construction moves to the next phase, the deck-level Project elements would be constructed.

Estimated phases durations in Alternative A are shown in **Table 5-38**. The table also shows the estimated duration of excavation activities in each phase. As explained further in the relevant sections, periods of excavation would be when some impacts are most intense or noticeable.

Table 5-38. Construction and Excavation Duration, Alternative A

Phase	Overall Duration	Duration of Excavation
Phase 1	2 years, 5 months	5 months
Intermediate Phase	*12 months*	None
Phase 2	2 years, 5 months	9 months
Phase 3	2 years, 6 months	8 months
Phase 4	3 years,1 month	1 year, 5 months
Total Project Completion	11 years, 5 months	3 years, 3 months

Commuter and Intercity Railroads

Construction of Alternative A would cause a moderate adverse impact to Intercity and Commuter rail operations. Limited train delays and cancellations may occur during the entire construction period.

Each phase of construction would involve taking a set of tracks out of service, thus reducing the number of tracks and platforms available for train service. The provision of temporary tracks and connections would largely make up for this temporary loss. A construction-period operating plan designed to maximize use of the available infrastructure through a flexible approach to train signaling would be put in place. However, railroad operations would be affected, as certain trips would have to be canceled or rescheduled. **Table 5-39** shows anticipated schedule impacts by service by construction phase. Impacts would continue for the full duration of the relevant construction phase. These impacts would be the same in all Action Alternatives.

Table 5-39. All Day Train Cancellations and Alterations during Construction of Alternative A

Service	Construction			
	Phase 1 & Intermediate Phase	Phase 2	Phase 3	Phase 4
Amtrak Trains Altered (of 144 Daily)	0	2	0	1
MARC Canceled (of 106 Daily)	0	4	0	4
VRE Canceled (of 34 Daily)	2	2	0	0

Not all services would be affected at the same time and none would be affected during the entire construction period. Impacts on VRE operations would occur only in the first two phases of construction while impacts on Amtrak and MARC service would occur only in Phases 2 and 4. There would be no impacts on any service during Phase 3. Amtrak, MARC, and VRE operations during the entire construction period would meet the levels defined in the 2025 operating plan developed for the Project. This operating plan is consistent with short- to medium-term operator plans (see **Appendix B,** *Washington Union Station Terminal Infrastructure EIS Report,* Section 7.2.3)**.**

In all phases, anticipated service cancellations would represent at most approximately 3 percent of the overall service levels at WUS. While moderate and manageable, this would reduce flexibility and increase delays. Phase 4 of construction would see an average delay to train operations of 6 minutes and 12 seconds.[44] Phase 2 would see larger delays and greater disruptions to train operations. During this phase, there would be a total of 8 train cancellations daily. The average train delay would be 18 minutes and 36 seconds. These delays and cancellations would cause disruption for passengers, most notably VRE passengers, as 6 percent of VRE trains would be canceled.

WMATA Metrorail

Construction of Alternative A would have major adverse impacts on WMATA Metrorail Red Line operations due to intermittent stoppages or single-tracking events.

Metrorail's Red Line runs along the western side of the Project Area. Therefore, it would be most affected during Phase 4 of construction, when the First Street Concourse and the First Street entrance to the H Street Concourse would be built. Additionally, in Phase 4, the existing parking garage would be demolished and a new Track 37 would be constructed near the NoMa-Gallaudet station.

These construction activities may require schedule adjustments for safety purposes. Intermittent stoppages or single-tracking may occur on weeknights or weekends. Such impacts would occur throughout Phase 4 (see **Table 5-38** above for the duration of Phase 4 in Alternative A) and their exact frequency or duration is not known at this stage of planning. No extended shutdowns or periods of single-tracking are anticipated.

During the same period, the unavailability of parking at WUS would likely generate additional daily Metrorail trips when the station is open. This would not cause noticeable overcrowding as those trips would be distributed over the entire day.

[44] This is the average delay that a scheduled train would experience due to the construction. This metric does not include canceled trains.

DC Streetcar

Construction of Alternative A would have moderate adverse impacts on DC Streetcar operations due to temporary disruptions to direct access between the WUS Streetcar station and WUS.

DC Streetcar operations would be affected during Project construction if the H Street Bridge were to be closed for safety reasons. Such closures are not likely and if they did occur, they would be rare and of limited duration. The construction of the Project elements and the demolition of the existing parking garage may result in a loss of direct access between the WUS Streetcar station and WUS (including the WUS Metrorail Station) during certain times. Such adverse impacts would be moderate due to their limited duration.

Intercity, Tour/Charter, and Sightseeing Buses

Construction of Alternative A would have major adverse impacts on bus operations and bus passenger accommodations.

Impacts on intercity, tour/charter, and daily sightseeing bus operations would be concentrated in Phase 4 of construction, which would last for approximately 3 years and 1 month and begin approximately 8 years and 4 months after the start of construction. During this time, the entire existing bus facility and parking garage would be demolished to construct the replacement structure.

Without an adequately sized interim bus facility near WUS, intercity, tour/charter, and sightseeing bus service at WUS would be severely disrupted. Adverse impacts would be major. At this stage of planning, no location for an interim bus facility or suitable loading zones have been identified. Buses serving WUS would have to operate curbside within the street grid. As explained in **Section 3.1.6.1**, *Bus Program Size*, a bus program of at least 25 slips would be needed to adequately accommodate future bus service, reduced from 47 slips through the implementation of an active management approach. Because street accommodations may not lend themselves to the type of active management required by the reduced program, it can be estimated that on-street space equivalent to 25 to 47 bus slips would be needed to accommodate bus activity at WUS.

Based on a bus length of 45 feet and adding 25 percent to account for separation and maneuvering room, it would take approximately from 1,400 to 2,600 feet of linear curbside to provide the equivalent of 25 to 47 slips. For purposes of illustration, this would amount to the entire length of First Street NE from the front of WUS to at least I Street NE and as far as north of L Street NE.

Even though the needed space could be divided among several streets, the street grid around WUS would not be able to support this level of bus activity without major disruptions to vehicular traffic, on-street parking, and pedestrian and bicycle movements. The District, or the adjacent property owners such as the Architect of the Capitol (south of WUS), are unlikely to authorize bus companies to operate in these conditions. Additionally, even if authorized, on-street operations would cause a severe deterioration in passenger experience, with longer walking distances to and from WUS; unsheltered boarding or alighting areas; and lack of basic amenities for waiting passengers such as restrooms or benches. As a result, it is likely that some or most bus service would be displaced away from WUS, reducing multimodal connectivity at the station for several years.

Loading

Construction of Alternative A would have a major adverse impact on loading operations and facilities.

The east loading facility, accessed from H Street NE, would remain open for operation during the majority of the Alternative A construction period. However, closure of the west loading dock would occur in Phase 4 during nearby construction activities. The new loading dock at 2nd and K Streets NE would not be operational until the end of the construction period. Because of these constraints, large truck loading on-site would be limited. Deliveries would have to be by small trucks instead. This would require a facility to transfer and screen large loads to smaller trucks. At this stage of planning, the location of this temporary facility has not been determined.

Pedestrians

Construction of Alternative A would have moderate adverse impacts on pedestrian traffic.

Throughout the construction period, circulation within WUS would be affected as tracks and platforms are replaced; sections of the station are closed to allow for column removal in the First Street Tunnel; and new concourses and access points are built. The intensity of the impacts would vary with the phase but would be greatest during Phases 1 and 2 (including the Intermediate Phase), when the column removal work is ongoing, and during Phase 4, because of interior construction activities on the west side of the site. Access to the Metrorail station from within WUS may also be affected.

Externally, throughout the construction period, street and sidewalk segments around WUS would be subject to temporary closures. The affected areas would include the front of the historic station building during the upgrade of the pick-up and drop-off lanes; and First Street NE, G Street, NE, and 2nd Street NE, as multimodal facilities are constructed there. Construction traffic (up to 120 trucks a day during periods of excavation; see **Table 5-38** above for durations) may also make pedestrian movements more challenging and generate conflicts along truck routes, especially 2nd Street NE.

Bicycle Activity

Construction of Alternative A would have a major adverse impact on bicycle circulation during the reconstruction of the First Street Cycle Track.

During Phase 4 of construction, portions of First Street NE would be rebuilt. This would involve reconstructing the existing First Street cycle track to safely accommodate new pick-up and drop-off areas on First Street. During this work, it would not be possible to maintain a bicycle accommodation along the First Street corridor. Bicyclists would likely have to be rerouted to the 2nd Street shared-use path portion of the Metropolitan Branch Trail. How long disruption of the cycle track would last is not known at this time but it would likely be less than the full duration of Phase 4. Temporary road closures around WUS would also disrupt bicycle circulation, as described above for pedestrians.

City and Commuter Buses

Construction of Alternative A would have negligible adverse impacts on city and commuter bus operations as there would only be intermittent disruptions. Construction would have a moderate adverse impact on employee shuttles operating out of the WUS bus facility for the duration of Phase 4.

Construction activities would not significantly affect commuter bus activities. Most commuter bus service in the area serves North Capitol Street and the Columbus Circle area, where the larger transportation network would absorb the construction truck traffic and where there would be no direct access to the site. City bus operations could be disrupted if H Street NE were to be closed for safety reasons. Specific information on the frequency and duration of such closures is not available at this time, but long-term disruptions to H Street NE are not anticipated.

Employees shuttle operations out of the existing bus facility would have to stop in Phase 4, when the facility would be demolished. The shuttles would need to look for a new pick-up and drop-off location. As explained in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, City and Commuter Buses*, it would become a permanent condition since the shuttles could not be accommodated in the new facility. For the reasons explained in that section, this would be a moderate adverse impact.

Vehicular Parking and Rental Cars

Construction of Alternative A would have a major adverse impact on parking between the demolition of the existing parking garage and the completion of the new one in Phase 4 of construction.

Major impacts to parking and rental car operations would occur in Phase 4 of construction, when demolition of the existing parking garage would occur. There would be a partial loss of parking capacity during Phase 3, as partial demolition of the garage would begin but it is only during Phase 4, which would last for approximately 3 years and 1 month and begin approximately 8 years and 4 months after the start of construction that parking would be entirely unavailable at WUS. During that time, the Project's parking program of 1,600 spaces would not be met.

To meet the program, interim parking would have to be provided starting in Phase 3. At the current stage of planning, no potential location or locations have been identified. Without an adequately sized interim parking location, all parking, including rental car parking, would be unavailable at WUS during Phase 4 until the new parking facility is completed, resulting in a major adverse impact on parking.

The loss of parking capacity would likely lead WUS visitors or passengers to use alternative modes of transportation, including Metrorail, for-hire vehicles, and private pick-ups and drop-offs. Based on projected mode distribution, this shift would generate an estimated 581 daily Metrorail trips, 431 daily for-hire trips, and 431 daily private pick-up and drop-off trips. Given the overall daily volumes of these modes, the added trips would be manageable.

It is possible that a number of WUS-users would still drive to the station, including users from areas not well served by transit, who may have a limited set of options. These drivers may seek parking in commercial garages nearby or on the streets around the station. Street parking near WUS is in very limited supply, as most streets within a quarter mile of the station are residential parking permit areas, two-hour parking areas, or monitored parking areas on Architect of the Capitol property. Therefore, no WUS passengers or visitors are likely to use street parking as a substitute for long-term garage parking. There may be some demand for local on-street parking from WUS retail patrons. During Phase 4, the lack of parking at WUS may make the station unusable by anyone who would lack other options to reach it (see also **Section 5.16.4.2**, *Alternative A, Construction Impacts*).

For-hire Vehicles

Construction of Alternative A would have a major adverse impact on for-hire vehicle operations because of extended queueing.

Passenger pick-up and drop-off in front of the historic station building by for-hire vehicles would remain available during most of the construction period. Some disruption would occur during the work associated with the improvement of the taxi and private pick-up and drop-off lanes to enhance traffic flow and promote pedestrian safety. The existing loop road along the back of the station building would be unavailable during the entire period of construction. Therefore, the east ramp currently used by taxis to reach the front of the station would not be accessible until the new southeast road and reconstructed east ramp are completed during Phase 2. Taxis would have to queue along the west ramp as they do today when the east ramp is not available. During Phase 4, the west ramp would be closed for repurposing and taxis would have to queue along the new southeast road on the deck level and the east ramp (both available after completion of Phases 1 and 2). Based on the largest projected volumes of for-hire vehicles, during peak period, the queue may extend to H Street NE. The east ramp would be used for the entirety of Phase 4. The loss of parking likely would result in an uptick in for-hire operations, which would contribute to the adverse impact on these operations during Phase 4.

Private Pick-up and Drop-off

Construction of Alternative A would have a moderate adverse impact on private pick-up and drop-off operations.

Private pick-up and drop-off would remain available in front of WUS during the construction period. During the reconstruction of the traffic lanes in from the station to enhance traffic flow and promote pedestrian safety, there may be temporary and partial closures of the pick-up and drop-off area. Some spaces would remain available at all times. The loss of parking during that Phase 4 likely would result in an uptick in private pick-up and drop-off operations, which would contribute to the adverse impact on these operations.

Vehicular Traffic

Construction of Alternative A would have a major adverse impact on vehicular traffic operations because of roadway closures and construction vehicle traffic.

Construction of Alternative A would result in major adverse impacts on local traffic operations as described below.

In Alternative A as in all Action Alternatives, construction activities at WUS would generate traffic to and from the site throughout the day during the entire construction period, although the volume and nature of this traffic would vary depending on the phase and type of activities being conducted. It would be minimal during the Intermediate Phase, when only column-removal work would be performed. It would be greatest during excavations activities, when up to 120 trucks per 20-hour day could be traveling to and from the site. This is a maximum, conservative estimate that assumes that no work trains would be used to haul spoils away. Use of two work trains a day would eliminate most of this truck traffic. Additionally, while each construction phase (excluding the Intermediate Phase) would include a period of excavation and associated truck traffic, that period would be substantially shorter than the phase itself, as shown in **Table 5-38** above. The longest period of excavation (approximately 1 year and 5 months) would occur during Phase 4, on the west side of the Project Area. During that time, most truck traffic would travel on First Street NE to connect to designated District truck routes along the North Capitol Street and New York Avenue corridors. Phase 1, on the east side of the Project Area, would have the shortest excavation period (approximately 5 months). During that period, trucks would likely travel along portions of 2nd Street NE before connecting to a designated truck route. No trucks would circulate along residential streets or any other street not designated as a truck route by the District.

As WUS would remain operational throughout the construction period, construction traffic would add to the traffic generated by users of the station. By the time of Phase 4, WUS would generate similar levels of vehicular traffic to what it is expected to do in the No-Action Alternative. Although construction traffic would add to total traffic volumes on major WUS access routes, it would be spread out across the entire day, reducing its impact on local traffic operations.

Additionally, at different times during the construction period, temporary roadway closures would be required, especially along First Street NE (between Columbus Circle and K Street) and 2nd Street NE (between Massachusetts Avenue and K Street), to accommodate construction traffic in and out of the construction site. Road closures would generally last from 5 to 6 minutes on average and no more than 20 minutes. During those times, traffic may temporarily move to other streets such as G Street, H Street, K Street, 4th Street, and North Capitol Street.

5.5.4.3 Alternative B

The following sections describe the direct, indirect, operational and construction impacts of Alternative B. **Figure 5-5** illustrates the key transportation elements of Alternative B.

Direct Operational Impacts

The direct operational impacts of Alternative B on commuter and intercity railroads; the DC Streetcar; intercity, tour/charter, and sightseeing buses; loading; pedestrians; and car rental activities would be the same as those of Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*). This section does not address them further. It only addresses hose transportation modes that would experience meaningfully different operational impacts in Alternative B.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative B would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

Increased train service and ridership in Alternative B, as well as the reduction in parking capacity and new retail uses, would generate increased demand on Metrorail at WUS. **Table 5-40** shows modeled activity in the AM peak and PM peak, along with corresponding data for the No-Action Alternative. When the projected V/C ratio would exceed 100 percent, there would be a need for additional service to address overcrowding.

Alternative B volumes would exceed capacity departing from WUS in the Shady Grove direction during the AM peak and in the Glenmont direction during the PM peak arriving at WUS. In the AM peak, Alternative B would cause the V/C ratio leaving toward Shady Grove to reach 102 percent against 86 percent in the No-Action Alternative. As a result, Alternative B would increase the excess demand by around 400 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate in the Red Line core.[45]

In the PM peak, capacity exceedance toward Glenmont (115 percent) would be greater than in the No-Action Alternative (107 percent). As a result, Alternative B would increase the excess demand by 1,311, for a total of 2,421 passengers.

[45] That is, between WUS and Dupont Circle.

Figure 5-5. Key Transportation Elements, Alternative B

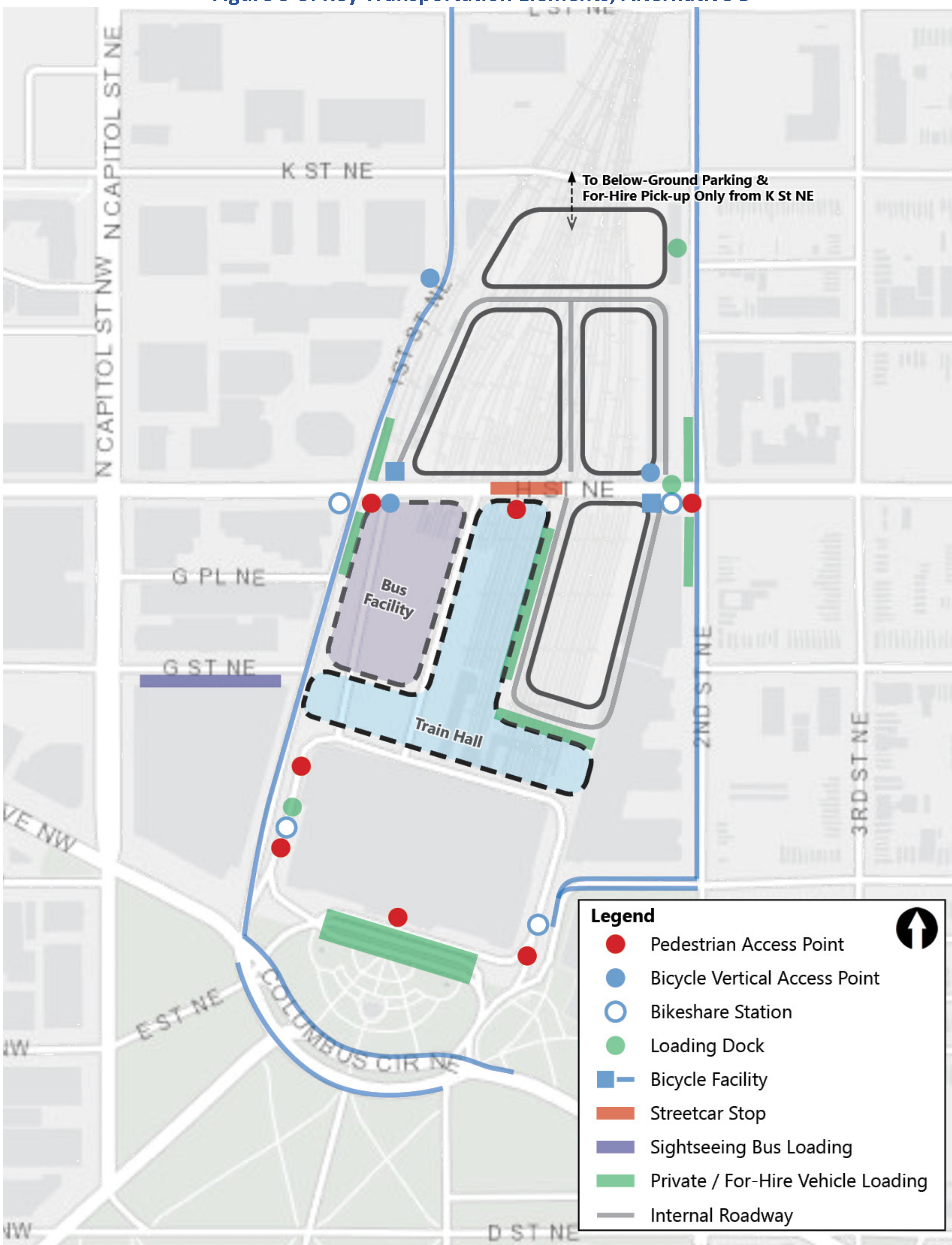

Table 5-40. Peak WUS-related Metrorail Activity, Alternative B

	Alternative B		No-Action Alternative	
	Shady Grove	**Glenmont**	**Shady Grove**	**Glenmont**
AM Peak Hour				
V/C Arriving at WUS	83%	28%	80%	25%
WUS Boardings	8,402	28%	5,202	1,010
WUS Alightings	5,123	1,631	4,128	2,803
Through Ridership	9,141	3,478	9,523	1,447
Ridership Departing WUS	17,543	1,241	14,725	2,457
V/C Departing WUS	102%	2,8721	86%	14%
Excess Demand	400	17%	0	0
PM Peak Hour				
V/C Arriving at WUS	20%	115%	20%	107%
WUS Boardings	3,263	4,670	2,559	3,661
WUS Alightings	1,560	8,276	1,154	6,126
Through Ridership	1,640	9,883	1,953	10,722
Ridership Departing WUS	4,903	14,533	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

The increase in Metrorail ridership at WUS would also affect passenger circulation as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail.*

Comparison to Existing Conditions

Relative to existing conditions, Alternative B would have a major adverse direct operational impact on Metrorail operations at WUS. The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action Alternative. [46] In the AM peak, Alternative B would cause the V/C ratio leaving WUS toward Shady Grove to reach 102 percent, against 69 percent in existing conditions. Alternative B would increase the overall demand in the AM peak in the Shady Grove direction by an estimated 7,165 passengers. In the PM peak, the V/C ratio toward Glenmont arriving at WUS would be 115 percent, against 72 percent under existing conditions. Alternative B would increase overall demand in this direction by approximately 8,211 passengers.

[46] See **Section 5.5.3.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative B include ridership generated by the private air-rights development.

Bicycle Activity

Relative to the No-Action Alternative, Alternative B would result in a minor adverse direct operational impact on bicycle activity. Anticipated demand for private bicycle parking and storage would be accommodated by the provision of 104 Bikeshare spaces and 200 bicycle storage spots. However, this benefit would be offset by increased conflicts with pedestrians and vehicles on both First Street and K Street NE.

Alternative B would have the same impacts on bicycle activity as Alternative A, described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Bicycle Activity*. Additionally, the entrance to the below ground parking facility on K Street NE would create conflicts with proposed K Street bicycle facilities. This adverse impact on K Street, combined with the other adverse impacts described for Alternative A, which would also occur in Alternative B, would offset the benefits from additional storage. On balance, net impacts would be adverse but minor.

City and Commuter Buses

Relative to the No-Action Alternative, Alternative B would have a minor adverse direct operational impact on city and commuter buses. Increases in WUS-generated ridership would incrementally contribute to the overcrowding of some city buses and increases in traffic congestion would incrementally contribute to delays experienced by all buses. There would also be a moderate adverse direct operational impact on some employee shuttles, which would have to stop operating out of the WUS bus facility.

The impacts of Alternative B on city and commuter bus ridership would be the same as those of Alternative A and the other Action Alternatives: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, City and Commuter Buses*.

As in Alternative A and the other Action Alternatives, increases in vehicle delays and queues due to greater traffic volumes would likely affect bus reliability and speed. In Alternative B, out of the 13 Metrobus routes that serve the Local Study Area, four in the AM peak and four in the PM peak would pass through at least two intersections that would degrade to LOS F relative to the No-Action Alternative, a potential source of delays. One DC Circulator routes and seven commuter bus routes (out of nine) would be similarly affected but in the PM peak only. Conditions would be similar to those in the No-Action Alternative, though delays may be slightly greater.

Vehicular Parking and Rental Cars

Relative to the No-Action Alternative, Alternative B would have a minor adverse direct operational impact on parking at WUS because of a reduction in parking capacity. There would be a minor beneficial impact on rental car operations.

In Alternative B, all parking and rental car activity would be in a below-ground facility located beneath the railroad tracks south of K Street NE. Vehicular access to the below-ground facility would be via a new signalized intersection on K Street NE between First Street and

2nd Street NE. While this would change the routes WUS-bound drivers would take to travel to or from the parking facility and affect the local street network, the change in location by itself would not adversely affect parking or car rental activities.

The new parking facility would offer room for approximately 450 fewer cars than the existing one. The reduction in parking capacity would be an adverse impact but the new facility's capacity would exceed the parking program for the Project. [47] It still would not fully meet the projected parking demand, but it is anticipated that users not able to park would use different modes to reach the station.[48] In general, by 2040, fewer passengers or visitors are anticipated to drive and park at WUS. [49]

WUS activity in Alternative B would generate more peak-hour parking trips than would be the case under the No-Action Alternative because of the increase in peak-hour rail service. Relative to the No-Action Alternative, Alternative B would generate an estimated 188 additional peak-hour trips (39 percent increase): 132 in the AM peak hour (70 percent increase) and 56 in the PM peak hour (20 percent increase). These trips were considered in the traffic impact analysis (see **Tables 5-41 and 5-42** below).

Comparison to Existing Conditions

The impacts of Alternative B on parking and rental car activity would be the same relative to existing conditions as relative to the No-Action Alternative since the existing parking garage and rental car facility would be in use in both baselines. The reduction in parking capacity would be the same relative to existing conditions as relative to the No-Action Alternative.

Alternative B would generate proportionately more peak-hour parking trips relative to existing conditions than relative to the No-Action Alternative.[50] In the AM peak, the difference between Alternative B and existing conditions would be 193 trips (151 percent increase). In the PM peak, the difference would be 148 trips (72 percent increase).

For-hire Vehicles

Relative to the No-Action Alternative, Alternative B would have a moderate beneficial direct operational impact on for-hire vehicle activity because of the provision of new locations for pick-ups and drop-offs. These locations would adequately accommodate the

[47] As noted in **Section 5.5.3.1**, *Operational Impacts*, the parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

[48] **Appendix A6**, *Parking Program Memorandum*, provides more information on parking demand projections and the development of the parking program.

[49] The MWCOG Model estimates a 10% reduction in single-occupancy vehicle trips in the WUS area to 2040. Additionally, Amtrak as indicated to FRA that passenger parking is not essential to Amtrak's operation of intercity passenger rail at WUS and it anticipates passenger parking demand to continually decrease in the future.

[50] See **Section 5.5.3.1**, *Direct Operational Impacts, Vehicular Parking and Rental Cars* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

anticipated growth in for-hire trips, but queuing would not be eliminated. Alternative B would also have a major adverse direct operational impact on for-hire vehicles due to increased traffic congestion.

Alternative B would provide five pick-up and drop-off locations (see **Figure 5-5**). The first four would also be in Alternative A:

- **Front of WUS:** See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative B, a projected 40 percent of for-hire drop-off activity and 30 percent of for-hire pick-up activity is anticipated to occur in front of WUS.
- **Adjacent to the north-south train hall on the deck level:** See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative B, a projected 35 percent of for-hire drop-off activity and 25 percent of for-hire pick-up activity would occur at this location.
- **New H Street Concourse entrance on First Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative B, 20 percent of for-hire drop-off activity and 20 percent of for-hire pick-up activity would occur at this location.
- **New H Street Concourse entrance on 2nd Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative B, an anticipated 5 percent of for-hire drop-off activity and 5 percent of for-hire pick-up activity would occur at this location.
- **New below-ground parking facility:** For-hire vehicles serving the below-ground parking facility would access it via a new intersection on K Street NE, between First Street and 2nd Street NE. In Alternative B, a projected 20 percent of for-hire pick-up activity would occur in the below-ground facility; no for-hire drop-off activity would be permitted there.

Relative to the No-Action Alternative, Alternative B would generate an estimated 1,412 new for-hire trips (270 percent increase) in the AM peak hour and an estimated 1,212 new for-hire trips in the PM peak hour (141 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity. These trips were included in the traffic impact analysis (see **Tables 5-41 and 5-42** below).

As explained in **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*, volumes associated with for-hire as well as private pick-up and drop-off activity on the deck level and in front of WUS would potentially create queueing and congestion. This would result in a major adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The beneficial impacts of Alternative B on for-hire vehicle activities would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater.[51] Relative to existing conditions, Alternative B would generate an estimated 1,542 new for-hire trips in the AM peak hour (391 percent increase) and 1,426 new for-hire trips in the PM peak hour (220 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity.

Private Pick-up and Drop-off

Relative to the No-Action Alternative, Alternative B would have a moderate beneficial direct operational impact on private pick-ups and drop-offs because of the provision of new locations for these activities. These locations would adequately accommodate the anticipated growth in private pick-up and drop-off trips, but queuing may occur. Alternative B would also have a major adverse direct operational impact on private pick-ups and drop-offs due to increased traffic congestion.

The same locations used by for-hire vehicles would be available for private pick-up and drop-off activity in Alternative B. However, private vehicles would not be allowed to use the east ramp to reach the front of WUS. The anticipated distribution of trips would be the same as for for-hire vehicles.

Relative to the No-Action Alternative, Alternative B would generate an estimated 824 additional private pick-up and drop-off trips in the AM peak hour (94 percent increase) and 598 private pick-up and drop-off trips in the PM peak hour (63 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity. These trips were considered in the traffic impact analysis (see **Tables 5-41 and 5-42** below).

As explained in **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*, volumes associated with private pick-up and drop-off as well as for-hire activity on the deck level and in front of WUS would potentially create queueing and congestion. This would result in a major adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The beneficial impacts of Alternative B on private pick-up and drop-off activity would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater.[52] Relative to existing conditions, Alternative B would generate an estimated new 1,040 private pick-up and drop-off trips in the AM peak hour (158 percent increase) and 834 new private pick-up and drop-off trips in the PM peak hour (117 percent

[51] See **Section 5.5.3.1**, *Direct Operational Impacts, For-hire Vehicles* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

[52] See **Section 5.5.3.1**, *Direct Operational Impacts, Private Pick-up and Drop-off* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity.

Vehicular Traffic

Relative to the No-Action Alternative, Alternative B would have major adverse direct operational impacts on traffic operations at several intersections near WUS because of increased traffic volumes and changes in traffic patterns due to the new parking facility location. During at least one of the peak periods, out of 36 intersections in the Local Study Area, four would degrade to LOS F; 15 would experience an increase in queue length of more than 150 feet; and 21 would experience an increase in average delay of more than 5 seconds.

Trip Generation and Circulation

WUS-related vehicular activity in Alternative B would be primarily distributed across five locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus facility and new deck-level pick-up and drop-off location accessed from H Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse);
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse); and
- The new below-ground parking facility accessed from K Street NE.

All parking and rental car activity would be in the below-ground parking facility. Relative to the No-Action Alternative, this would redirect all parking facility and rental car traffic from H Street NE or the east ramp to K Street NE. Private and for-hire pick-up and drop-off activity would be spread across all five locations. Approximately 70 percent of WUS-related traffic is expected to travel to and from points west of WUS, with 30 percent traveling to and from points east of WUS. Anticipated circulation patterns on the deck level in Alternative B are represented in **Figure 5-6**.[53]

[53] Figure 5-6 shows all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-6. Deck Level Circulation (All Movements), Alternative B

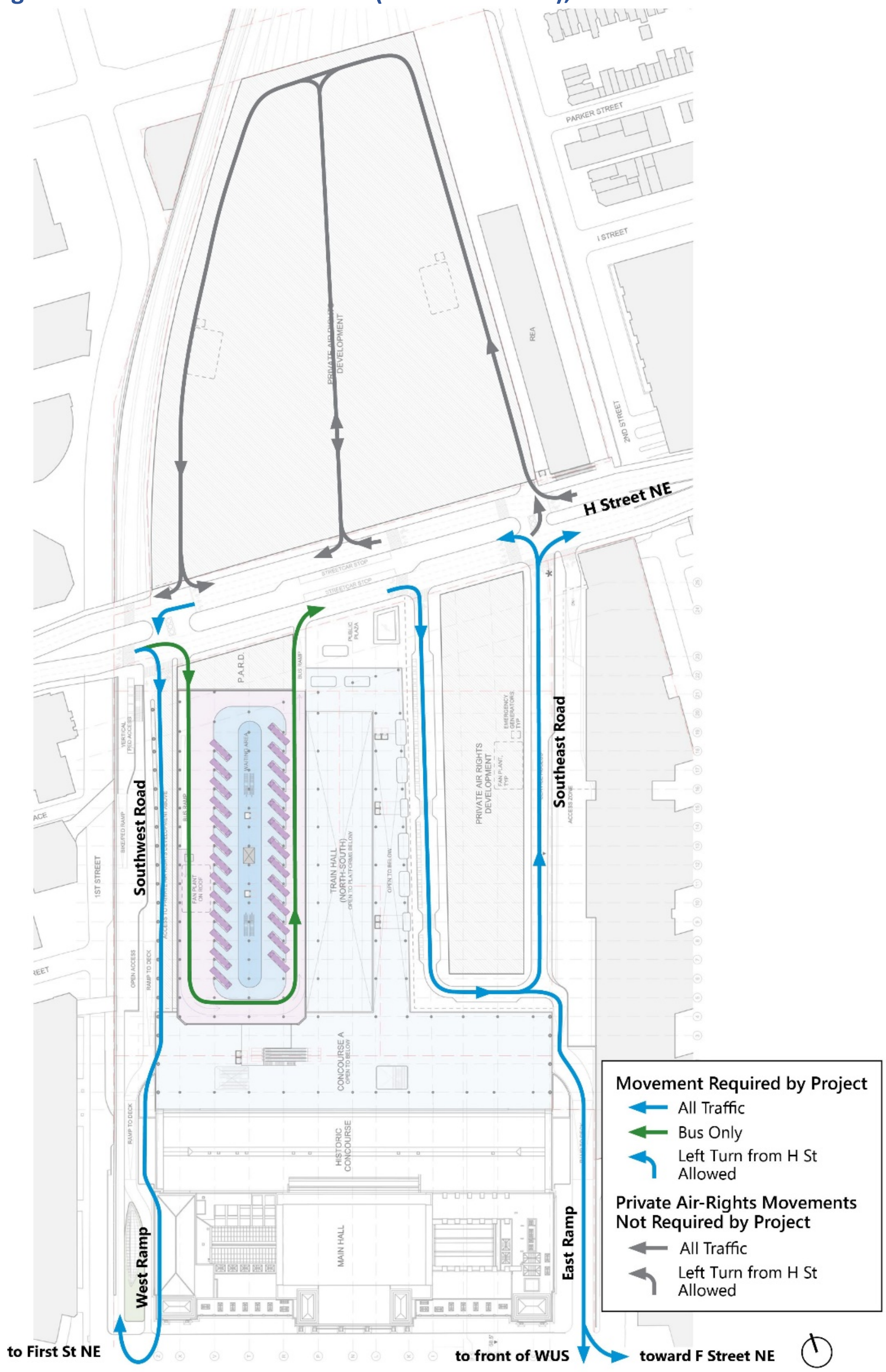

Table 5-41 and **Table 5-42** show AM and PM peak WUS-related traffic volumes in Alternative B, along with the corresponding information for the No-Action Alternative. Compared to the No-Action Alternative, Alternative B would generate 2,427 additional AM peak trips (149 percent increase) and 1,913 additional PM peak trips (89 percent increase). These increases in volumes would result in major adverse impacts to traffic operations at some study intersections, as described below.

Table 5-41. AM Peak-hour Traffic Volumes, Alternative B

	Alternative B			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	321	211	110	189	127	62
Private Pick-Up/Drop-Off	1,696	848	848	872	436	436
For-hire Vehicles	1,936	968	968	524	262	262
Car Rental	105	57	48	46	28	18
Total Trips	4,058	2,084	1,974	1,631	853	778

Table 5-426. PM Peak-hour Traffic Volumes, Alternative B

	Alternative B			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	355	104	251	299	102	197
Private Pick-Up/Drop-Off	1,546	773	773	948	474	474
For-hire Vehicles	2,074	1,037	1,037	862	431	431
Car Rental	92	37	55	45	17	28
Total Trips	4,067	1,951	2,116	2,154	1,024	1,130

Comparison to Existing Conditions

Relative to existing conditions, Alternative B would generate 2,839 additional AM peak trips (233 percent increase) and 2,464 additional PM peak trips (154 percent increase).[54]

Curbside Analysis

The anticipated volumes associated with for-hire and private pick-up and drop-off activity would potentially create conflicts and queueing. At deck level, queues at the first layby lane next to the train hall on the center road would be located less than 100 feet from H Street NE and could possibly “spill back” onto this street. In the AM peak, the estimated maximum queue length could reach 15 cars. In the PM peak, the estimated maximum queue length could reach 107 cars. This queue would have a major adverse impact on traffic operations. In

[54] See **Section 5.5.3.1**, *Direct Operational Impacts, Vehicular Traffic* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

these conditions, it is possible that WUS users may walk to nearby destinations to find a for-hire vehicle.

The front of WUS as well as First and 2nd Streets would also experience curbside activity. Queues at the front may spill back into travel lanes on Massachusetts Avenue. The pick-up and drop-off lanes on First and 2nd Streets would help accommodate the excess volumes. No queue would form at the First Street or 2nd Street pick-up and drop-off area. On First Street, 257 pick-ups and drop-offs would occur in the AM peak; 225 would occur in the PM peak. On 2nd Street, 78 pick-ups and drop-offs would occur in the AM peak; 67 would occur in the PM peak. An estimated 93 pick-ups and drop-offs in the AM peak and 82 pick-ups and drop-offs in the PM peak would use the below-ground parking facility accessed from K Street NE.

Intersection Analysis

As for all alternatives, three indicators were used to assess impacts on traffic operations in Alternative B relative to the No-Action Alternative: degradation of intersection LOS to F due to vehicle trips generated by the alternative; increase in average vehicle delay at an intersection by more than five seconds; and increase in 95th-percentile queue lengths of more than 150 feet for any lane group in an intersection. **Table 5-43** identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of these three indicators.

Table 5-43. Summary of Traffic Impacts, Alternative B

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X*
3	2nd Street / K Street NE			X*
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE	X	X*	X*
7	WUS Bus Exit / H Street NE		X*	X*
8	WUS East Intersection / H Street NE		X	X*
9	3rd Street / H Street NE		X	X
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave		X	X*
17	First Street / Massachusetts Avenue NE	X		X
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW		X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X	X*
23	2nd Street / Massachusetts Avenue NE		X	X
26	Massachusetts Avenue / C Street / 4th Street NE			X*
27	Louisiana Avenue / C Street NW		X*	X*
31	3rd Street / E Street NW		X	X
32	3rd Street / Massachusetts Avenue / H Street NW			X*

* indicates the impact would occur in both peak hours.

Figure 5-7 shows the peak hour LOS at each of the study intersections. In Alternative B, relative to the No-Action Alternative, four out of 36 study intersections would degrade to LOS F in at least one peak hour.

Fifteen intersections out of 36 would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of those 15 intersections, eight would experience such a queue increase in both peak hours.

Finally, in Alternative B, 21 of the 36 study intersections would experience an increase in average delay of more than 5 seconds for at least one peak period relative to the No-Action Alternative. Sixteen of those 21 intersections would see such an increase in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative B:[55]

- Nine intersections would degrade to LOS F in at least one peak period.
- Twenty-six intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 19 projected to do so in both peak hours.
- Twenty-three intersections would experience delay increases of more than 5 seconds, with 19 projected to do so in both peak hours.

Indirect Operational Impacts

Alternative B would have moderate adverse indirect operational impacts on multimodal transportation because of the trips generated by the potential Federal air-rights development.

In Alternative B, around 917,420 square feet of Federal air rights above the bus facility would be potentially available for development separately from the Project. For the purposes of the transportation analysis, it was conservatively assumed that this space would become office space. **Table 5-44** shows the multimodal trips that the potential Federal air-rights development would generate under this assumption.[56] All vehicular trips were considered in the traffic impact analysis. The Federal air-rights development would add trips to most other local transportation modes, an adverse impact. However, the number of trips it would generate would be typical of an office space development of its size and represent a small increment over the number of trips generated directly by Alternative B. Therefore, this adverse indirect impact would be moderate.

[55] See **Section 5.5.3.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

[56] Based on coordination with DDOT and the private air-rights developer in 2016-2017, this analysis assumes 4 employees per 1,000 square feet of office space. Current DDOT CTR guidelines assume 2.5 employees per 1,000 square feet. Therefore, the present analysis provides a conservative projection of office-related transportation demand.

Figure 5-7. Intersection Peak Hour LOS, Alternative B

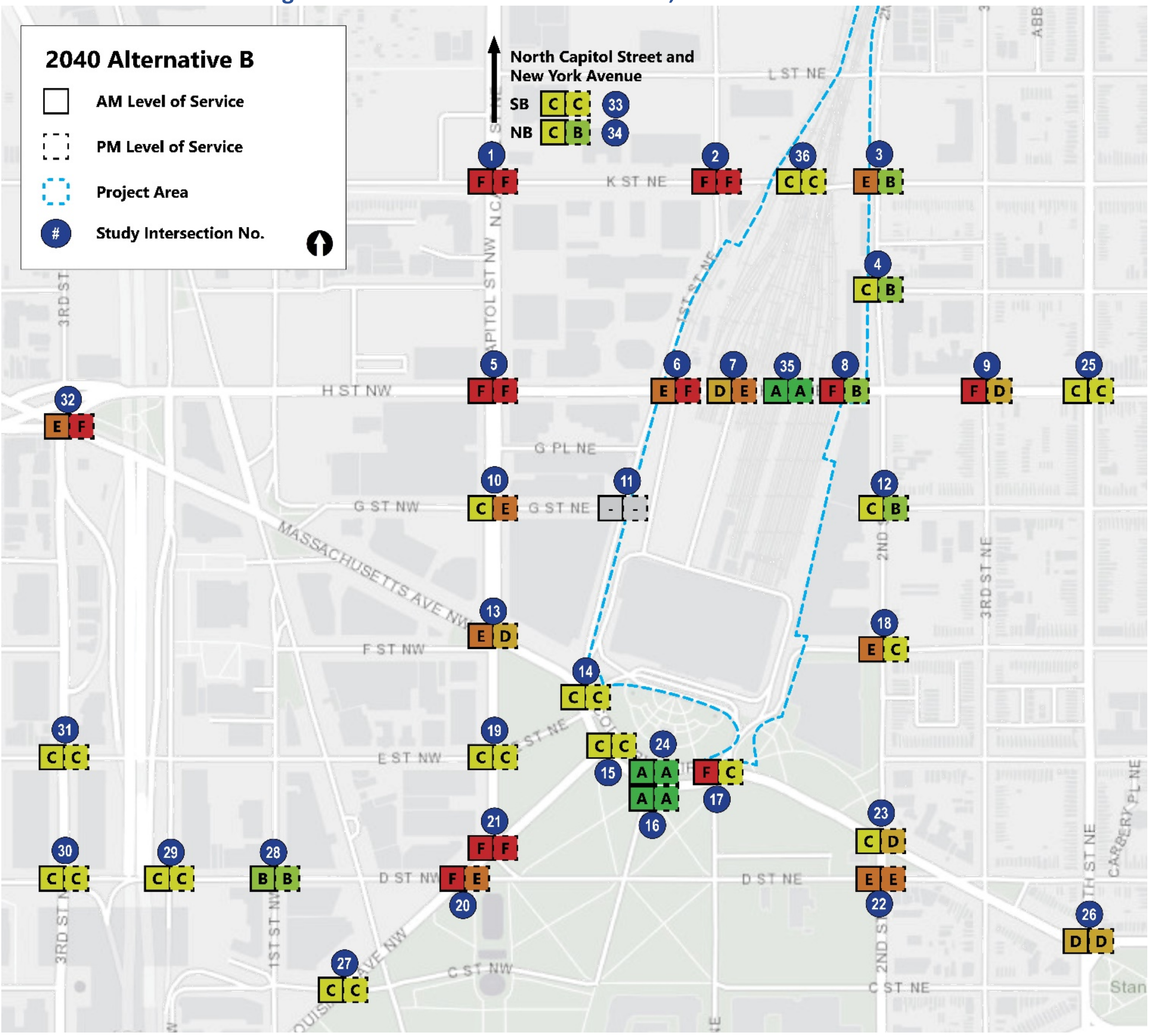

Table 5-44. Federal Air-rights Development Trip Generation, Alternative B

	AM Peak			PM Peak		
	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Parking	287	252	24	282	48	234
Private Pick-Up/Drop-Off	0	0	0	0	0	0
For-hire Vehicles	20	18	2	20	3	17
Car Rental	0	0	0	0	0	0
Amtrak Express	10	9	1	11	2	9
Amtrak Corridor	0	0	0	0	0	0
MARC	133	125	8	141	22	119
VRE	76	71	5	81	13	68
Metrorail	284	267	17	304	48	256
Streetcar	29	27	2	31	5	26
City/Commuter Bus	56	53	3	61	10	51
Pedestrian	95	89	6	101	16	85
Bicycle	95	89	6	101	16	85

Construction Impacts

Construction of Alternative B would take place over approximately 14 years and 4 months. As in all Action Alternatives, and as explained for Alternative A in **Section 5.5.4.2,** *Alternative A, Construction Impacts*, work would be conducted in four east-to-west phases with the greatest impacts on transportation occurring in Phase 4. Phase durations and the duration of excavation activities in each phase for Alternative B are shown in **Table 5-45**.

Table 5-45. Construction and Excavation Duration, Alternative B

Phase	Overall Duration	Duration of Excavation
Phase 1	2 years, 5 months	5 months
Intermediate Phase	*12 months*	None
Phase 2	3 years	11 months
Phase 3	3 years	13 months
Phase 4	4 years, 11 months	2 years, 7 months
Total Project Completion	14 years, 4 months	5 years, 1 month

Except for the difference in duration, the construction impacts of Alternative B on most transportation modes would be as described for Alternative A in **Section 5.5.4.2,** *Alternative A, Construction Impacts*. In particular, adverse impacts on intercity bus operations and parking would be the same but last longer because of the longer duration of Phase 4 in Alternative B. This is because Alternative B would involve the construction of two levels of below-ground parking on the west side of the Project Area as well as that of a new intersection in the K Street NE underpass to provide access to the parking. This would require more excavation during Phase 4 than in Alternative A. It would also cause impacts to K Street NE that would not occur under Alternative A. The following sections focus on those additional impacts. Refer to **Section 5.5.4.2** for a description of impacts on the modes not addressed below.

City and Commuter Buses

The construction of Alternative B would have minor adverse impacts on city and commuter bus operations during periods of lane closure on K Street NE.

In addition to the impacts described in **Section 5.5.4.2**, *Alternative A, Construction Impacts, City and Commuter Buses*, construction of the new intersection in the K Street NE underpass would require the closure of one or both of the existing eastbound lanes for an extended period. One lane of traffic in each direction would remain available during daytime, allowing for traffic movement in both directions. Metrobus Line D4 travels along K Street at that location, as do several MTA commuter bus lines (220, 240, and 260). The closure of one or two of the four existing lanes may cause delays and inconvenience passengers, but it is not likely that buses would have to be rerouted during construction.

Vehicular Traffic

Construction of Alternative B would have major adverse impact on vehicular traffic operations because of roadway closures and construction vehicle traffic.

In addition to the impacts described in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Vehicular Traffic*, the construction of the new intersection providing access to the below-ground parking facility require lane closures under the K Street overpass. As noted above, one lane of traffic in each direction would remain in operation at all times during the day. However, delays and back-up may occur and some traffic may seek alternative routes, such as L Street.

As in the other Action Alternatives, construction of Alternative B would generate truck traffic to and from the Project Area during the entire construction period. The greatest amount of traffic would occur during excavation activities, with up to 120 trucks per day. As explained for Alternative A, this is a maximum, conservative estimate that assumes that no work trains would be used to haul spoils away. As in all Action Alternatives, construction trucks have the potential to result in major adverse impacts on local traffic operations during parts of the construction period. Alternative B (along with Alternative E) would involve deep excavation to accommodate two levels of below-ground parking and it would generate a large amount of spoil material. Excavation for the parking facility would occur mostly in Phase 4 and in Alternative B, excavation-related heavy truck traffic would occur for approximately 2 years and 7 months. Because work in Phase 4 would be on the west side of the Project Area, First Street NE would be the local street most affected. As in all Action Alternatives, use of work train to remove the spoils could reduce or eliminate excavation-related truck traffic.

5.5.4.4 Alternative C

The following sections describe the direct and indirect, operational and construction impacts of Alternative C. Alternative C has two options. The East Option would place the bus facility and above-ground parking along the east side of the Project Area north of H Street NE. The West Option would place them along the west side of the Project Area, also north of H Street. The key transportation elements of each option are illustrated in **Figure 5-8** and **Figure 5-9**, respectively. Unless otherwise specified, the impacts described in the following sections would occur regardless of the option.

Direct Operational Impacts

The direct operational impacts of Alternative C (either option) on commuter and intercity railroads; the DC Streetcar; loading; city and commuter bus ridership; and car rental activities would be the same as those of Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*). Impacts on bicycle activities and city and commuter bus operations would be the same as in Alternative B (**Section 5.5.4.3**, *Alternative B, Direct Operational Impacts*). This section does not address these impacts further. It only addresses those transportation modes that would experience meaningfully different direct operational impacts in Alternative C.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

Increased train service and ridership in Alternative C as well as the reduction in parking capacity and the new retail uses included in the alternative would generate increased demand on Metrorail at WUS. **Table 5-46** shows modeled AM peak and PM peak activity. When the projected V/C ratio would exceed 100 percent, there would be a need for additional service to address overcrowding.

Alternative C volumes would exceed capacity departing from WUS in the Shady Grove direction during the AM peak and arriving at WUS in the Glenmont direction during the PM peak. In the AM peak, Alternative C would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 86 percent in the No-Action Alternative. As a result, Alternative C would create an excess demand of approximately 444 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate within the Red Line core.[57]

[57] The Red Line core, as defined by WMATA, consists of the line segment between Dupont Circle and WUS.

Figure 5-8. Key Transportation Elements, Alternative C East Option

Figure 5-9. Key Transportation Elements, Alternative C West Option

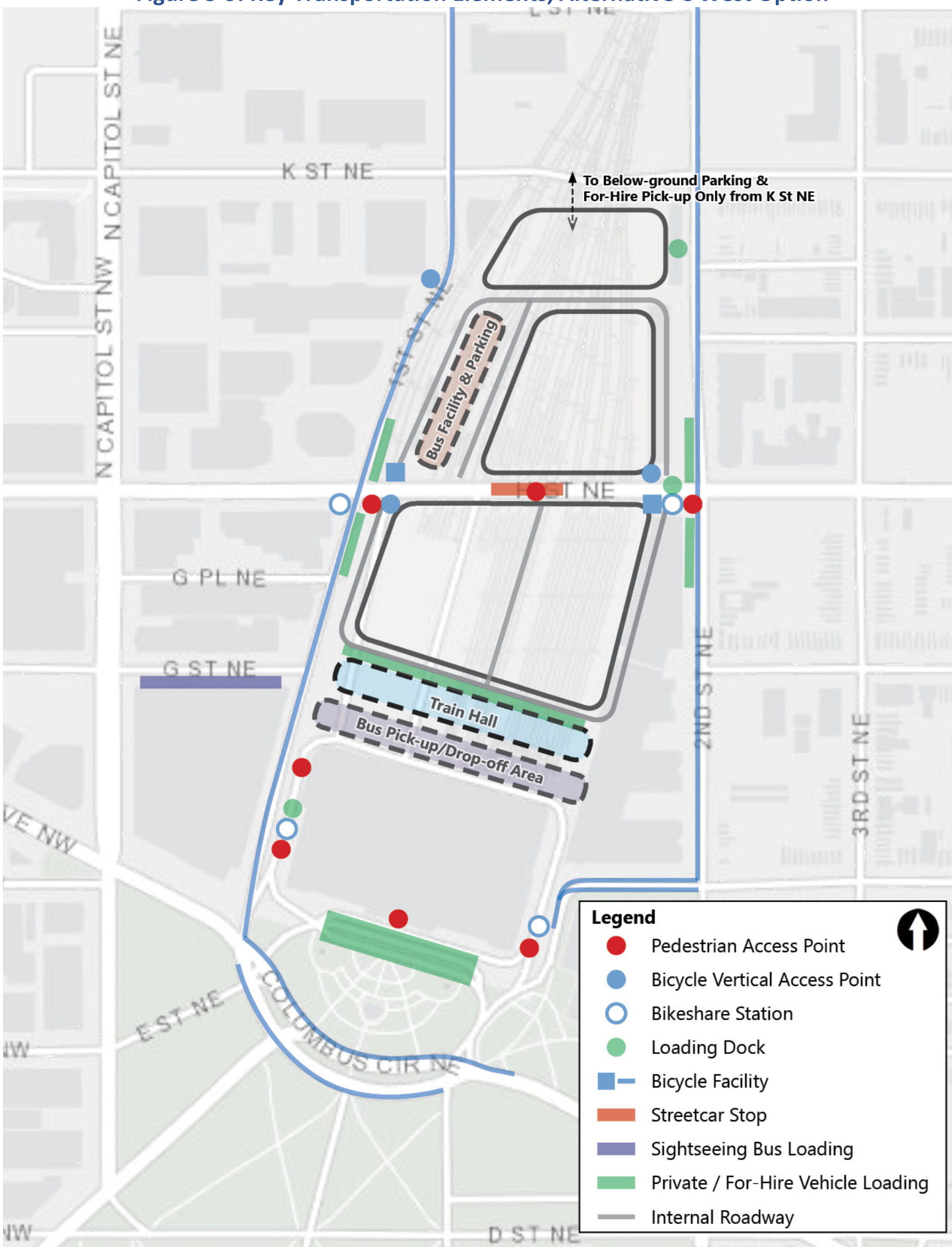

Table 5-46. Peak-hour WUS-related Metrorail Activity, Alternative C

	Alternative C		No-Action Alternative	
	Shady Grove	Glenmont	Shady Grove	Glenmont
AM Peak Hour				
V/C Arriving at WUS	83%	28%	80%	25%
US Boardings	8,365	1,623	5,202	1,010
WUS Alightings	5,042	3,423	4,128	2,803
Through Ridership	9,222	1,296	9,523	1,447
Ridership Departing WUS	17,587	2,929	14,725	2,457
V/C Departing WUS	103%	17%	86%	14%
Excess Demand	444	0	0	0
PM Peak Hour				
V/C Arriving at WUS	20%	115%	20%	107%
WUS Boardings	3,201	4,580	2,559	3,661
WUS Alightings	1,550	8,221	1,154	6,126
Through Ridership	1,650	9,938	1,953	10,722
Ridership Departing WUS	4,851	14,518	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

In the PM peak, capacity exceedance toward Glenmont (115 percent) would be greater in Alternative C than in the No-Action Alternative (107 percent). Alternative C would aggravate the level of crowding, generating an additional excess demand of approximately 1,311 passengers, for a total excess demand of 2,421.

The increase in Metrorail ridership at WUS would affect passenger circulation as described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail*.

Comparison to Existing Conditions

Relative to existing conditions, Alternative C would have a major adverse direct operational impact on Metrorail operations at WUS. The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action Alternative.[58] In the AM peak, Alternative C would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 69 percent under existing conditions. This would increase the overall AM peak demand in the Shady Grove direction by 7,209 passengers. In the PM peak, the V/C ratio toward Glenmont arriving at WUS would be 115 percent, against 72 percent under existing conditions. Alternative C would increase overall demand in this direction by 8,211 passengers.

[58] See **Section 5.5.4.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative C include ridership generated by the private air-rights development.

Intercity, Tour/Charter, and Sightseeing Buses

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate adverse direct operational impact on intercity, tour/charter, and daily sightseeing bus operations because of the new 30-minute time limit for buses at WUS and greater distance between the Metrorail Station and the bus facility. Alternative C (either option) would have a negligible adverse direct operational impact on hop-on/hop-off sightseeing buses as a result of their relocation to G Street NE.

Alternative C would provide two locations for bus operations: a main bus facility to the north of H Street NE and a bus drop-off and pick-up area to the south of H Street NE, adjacent to the train hall. Buses would reach this area from H Street NE via the west intersection. They would exit back to H Street via the east intersection.

The main facility's location and capacity would vary with the option. In the East Option, the facility would be to the northeast of H Street and feature 17 slips. Bus access would be via the east intersection. In the West Option, the facility would be to the northwest of H Street and would have 19 slips. Bus access would be via the west intersection.

The anticipated increases in bus ridership and the impacts of the 30-minute time limit required because of the reduction in the number of slips would be the same as in Alternative A. **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses* describes these impacts.

There would be greater flexibility in bus movements in Alternative C than in the No-Action Alternative. In the West Option, unlike in the No-Action Alternative, buses exiting the facility could turn either left or right onto H Street NE. In the East Option, buses exiting the facility could not turn left (eastward) onto H Street but this movement would be available to buses coming from the bus pick-up and drop-off area.

Because of the location of the main bus facility, the distance bus passengers would have to walk to reach the front of WUS and the Metrorail station would increase relative to No-Action Alternative conditions; passengers connecting to Metrorail would walk approximately an additional 1,100 feet with the East Option and an additional 250 feet with the West Option. The East Option would also offer fewer bus slips than the West Option. Thus, although the impacts of both options would be comparable, the West Option would present some benefits over the East Option.

Comparison to Existing Conditions

The bus facility location would be the same in the No-Action Alternative as under existing conditions. Therefore, impacts pertaining to walking distances would be the same regardless of the baseline.

Pedestrians

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate beneficial direct operational impact on pedestrian circulation inside WUS. Additional

access points would disperse pedestrian traffic and make access to WUS easier; however, some passengers would have to walk longer distances. Outside of WUS, Alternative C (either option) would have a minor adverse direct operational impact on pedestrian circulation because of increased queueing at certain crossings near the station.

The impacts of Alternative C would generally be similar to those of Alternative A, described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Pedestrians,* and would be beneficial. However, increased walking distances between WUS elements would partially offset the benefits from larger circulation space and additional access points, making this impact moderate.

Because of the location of the new main bus facility, walking distances for those passengers transferring between an intercity bus and Metrorail or the front of WUS would increase, as noted above (**Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses*). This would also be the case for visitors or passengers using the new above-ground parking facility. Bus passengers and above-ground parking users would have to walk outside to reach the nearest entry point to the H Street Concourse. Drivers who would park near the northern end of the below-ground parking facility would be farther away from the front of WUS than in the No-Action Alternative.

Not all bus passengers would have to walk greater distances, however, as some buses would also use the bus drop-off and pick-up area adjacent to the train hall, which would bring riders closer to the front of WUS and the Metrorail station. Which buses would use the pick-up and drop-off area would vary depending on destination, schedule, and conditions at the main bus facility.

Comparison to Existing Conditions

The impacts of Alternative C relative to existing conditions would be as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Pedestrians*.

Vehicular Parking and Rental Cars

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate adverse direct operational impact on parking at WUS because of a reduction in parking capacity. Alternative C would have a minor beneficial direct operational impact on rental car operations.

Alternative C would split parking between a new above-ground parking facility (to the northeast or northwest of H Street depending on the option) and a new below-ground facility beneath the railroad tracks south of K Street NE. Vehicular access to below-ground parking would be through a new intersection in the K Street NE underpass, like in Alternative B (see **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, Vehicular Parking and Rental Cars*). All rental car activity would be in the below-ground parking facility. Under either option, the above-ground facility would accommodate an estimated 46 percent of all parking trips, with the below-ground one accommodating the other 54 percent.

While this would change the routes WUS users would take to park at the station, and affect the local network, the change in location by itself would not adversely affect parking or car rental activities. Altogether, the new parking facilities would offer space for approximately 800 fewer cars than the existing garage under the East Option; and for approximately 840 fewer cars under the West Option. This would be an adverse impact.[59] This adverse impact would be moderate because the new facilities would meet the parking program for the Project and while they would not meet the projected parking demand, it is anticipated that users not able to park would use different modes to reach the station.[60] By 2040, fewer passengers or visitors are anticipated to drive and park at WUS.[61]

WUS activity in Alternative C would generate more overall peak-hour parking trips than in the No-Action Alternative in the AM peak and fewer in the PM peak. Relative to the No-Action Alternative, Alternative C would generate an estimated 68 additional peak-hour trips (14 percent increase): 73 additional trips the AM peak hour (39 percent increase) and 5 fewer trips in the PM peak (2 percent decrease). These trips were considered in the traffic impact analysis (see **Tables 5-47 and 5-48** below).

Comparison to Existing Conditions

The impacts of Alternative C on parking and rental car activity would be the same relative to existing conditions as relative to the No-Action Alternative since the existing parking garage and rental car facility would be in use in both baselines. The reduction in parking capacity would be the same relative to existing conditions as relative to the No-Action Alternative. Alternative C would generate proportionately more peak-hour parking trips relative to existing conditions than relative to the No-Action Alternative.[62] In the AM peak, the difference between Alternative C and existing conditions would be 134 trips (105 percent increase). In the PM peak, the difference would be 87 trips (42 percent increase).

For-hire Vehicles

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate beneficial direct operational impact on for-hire vehicle activity because of the provision of new locations for pick-ups and drop-offs. These locations would adequately accommodate the anticipated growth in for-hire trips, but queuing would not be eliminated. Alternative C

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[59] As noted in **Section 5.5.3.1**, *Operational Impacts*, the parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

[60] **Appendix A6**, *Parking Program Memorandum*, provides more information on parking demand projections and the development of the parking program.

[61] The MWCOG Model estimates a 10% reduction in single-occupancy vehicle trips in the WUS area to 2040. Additionally, Amtrak as indicated to FRA that passenger parking is not essential to Amtrak's operation of intercity passenger rail at WUS and it anticipates passenger parking demand to continually decrease in the future.

[62] See **Section 5.5.4.1**, *Direct Operational Impacts, Vehicular Parking and Rental Cars* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

(either option) would also have a moderate adverse direct operational impact on for-hire vehicles due to increased traffic congestion.

The following five pick-up and drop-off locations would be provided in Alternative C:

- **Front of WUS:** See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative C, a projected 40 percent of for-hire drop-off activity and 30 percent of for-hire pick-up activity is anticipated to occur in front of WUS.
- **Adjacent to the east-west train hall on the deck level:** For-hire vehicles would access this location via the west intersection on H Street NE and southwest road, potentially after staging in the first level of the above-ground parking facility. Egress would be either via the southeast road and east intersection to H Street NE or via the east ramp to F Street NE or the front of WUS. A projected 35 percent of for-hire drop-off activity and 25 percent of for-hire pick-up activity is projected to occur at this location.
- **New H Street Concourse entrance on First Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative C, 20 percent of for-hire drop-off activity and 20 percent of for-hire pick-up activity would occur at this location.
- **New H Street Concourse entrance on 2nd Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. An anticipated 5 percent of for-hire drop-off activity and 5 percent of for-hire pick-up activity would occur at this location.
- **New below-ground parking facility:** See **Section 5.5.4.3,** *Alternative B, Direct Operational Impacts, For-hire Vehicles* for a description. A projected 20 percent of for-hire pick-up activity would occur in the below-ground facility; no for-hire drop-off activity would be permitted there.

Relative to the No-Action Alternative, Alternative C would generate an estimated 1,400 additional for-hire trips in the AM peak hour (267 percent increase) and an additional 1,202 for-hire trips (140 percent) in the PM peak hour. The principal source of increased peak-hour trips would be the increase in intercity rail activity. These trips were considered in the traffic impact analysis (see **Tables 5-47 and 5-48** below).

As explained below (**Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*), volumes associated with for-hire as well as private pick-up and drop-off activity in front of WUS could create queueing and congestion, which would result in a moderate adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The beneficial impacts of Alternative C on for-hire vehicle activities would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater.[63] Relative to existing conditions, Alternative C would generate an estimated 1,530 additional for-hire trips in the AM peak hour (388 percent increase) and 1,416 in the PM peak hour (219 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity.

Private Pick-up and Drop-off

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate beneficial direct operational impact on private pick-ups and drop-offs because of the provision of new locations for these activities. These locations would adequately accommodate the anticipated growth in private pick-up and drop-off trips, but queuing may occur. Alternative C (either Option) would also have a moderate adverse direct operational impact on private pick-ups and drop-offs due to increased traffic congestion.

The same locations used by for-hire vehicles would be available for private pick-up and drop-off activity in Alternative C. However, private vehicles would not be allowed to use the east ramp to reach the front of WUS. The anticipated distribution of trips would be the same as for for-hire vehicles.

Relative to the No-Action Alternative, Alternative C would generate an estimated 822 additional private pick-up and drop-off trips (94 percent increase) in the AM peak hour and 600 private pick-up and drop-off trips in the PM peak hour (63 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity. These trips were considered in the traffic impact analysis (see **Tables 5-47 and 5-48** below).

As explained below (**Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*), volumes associated with private pick-up and drop-off as well as for-hire activity in front of WUS could create queueing and congestion, which would result in a moderate adverse impact on private pick-up and drop-off operations at WUS.

Comparison to Existing Conditions

The beneficial impacts of Alternative C on private pick-up and drop-off activity would be the same relative to existing conditions as relative to the No-Action Alternative since pick-up and drop-off locations would be the same in both baselines. The increase in trips would be proportionately greater. [64] Relative to existing conditions, Alternative C would generate an estimated 1,038 additional trips in the AM peak hour (158 percent increase) and 836 in the PM peak hour (117 percent increase). The principal source of increased peak-hour trips would be the increase in intercity rail activity.

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[63] See **Section 5.5.4.1**, *Direct Operational Impacts, For-hire Vehicles* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

[64] See **Section 5.5.4.1**, *Direct Operational Impacts, Private Pick-up and Drop-off* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Vehicular Traffic

Relative to the No-Action Alternative, Alternative C would have major adverse direct operational impacts on traffic operations at several intersections near WUS because of increased traffic volumes and changes in traffic patterns due to the new parking locations.

- **In Alternative C, East Option, during at least one of the peak periods, out of 36 intersections in the Local Study Area, five would degrade to LOS F; 19 would experience an increase in queue length of more than 150 feet; and 21 would experience an increase in average delay of more than 5 seconds.**
- **In Alternative C, West Option, during at least one of the peak periods, out of 36 intersections in the Local Study Area, four would degrade to LOS F; 15 would experience an increase in queue length of more than 150 feet; and 20 would experience an increase in average delay of more than 5 seconds.**

Trip Generation and Circulation

WUS-related vehicular activity in Alternative C would be primarily distributed across five locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus and above-ground parking facilities, and new deck-level pick-up and drop-off location accessed from H Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse);
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse); and
- The new below-ground parking facility accessed from K Street NE.

Alternative C would split parking activity between an above-ground facility, accessed from H Street NE (54 percent of all parking-generated traffic) and a below-ground facility, accessed from K Street NE (46 percent of parking-generated traffic). This would distribute parking-generated traffic approximately equally between the two streets. All rental car activity would be in the below-ground parking. Private and for-hire pick-up and drop-off activity would be spread across all five locations. Approximately 70 percent of WUS-related traffic is expected to travel to and from points west of WUS and 30 percent to and from points east. Deck-level circulation patterns in Alternative C are represented in **Figure 5-10** for the East Option and **Figure 5-11** for the West Option.[65]

[65] These figures show all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-101. Deck Level Circulation (All Movements), Alternative C, East Option

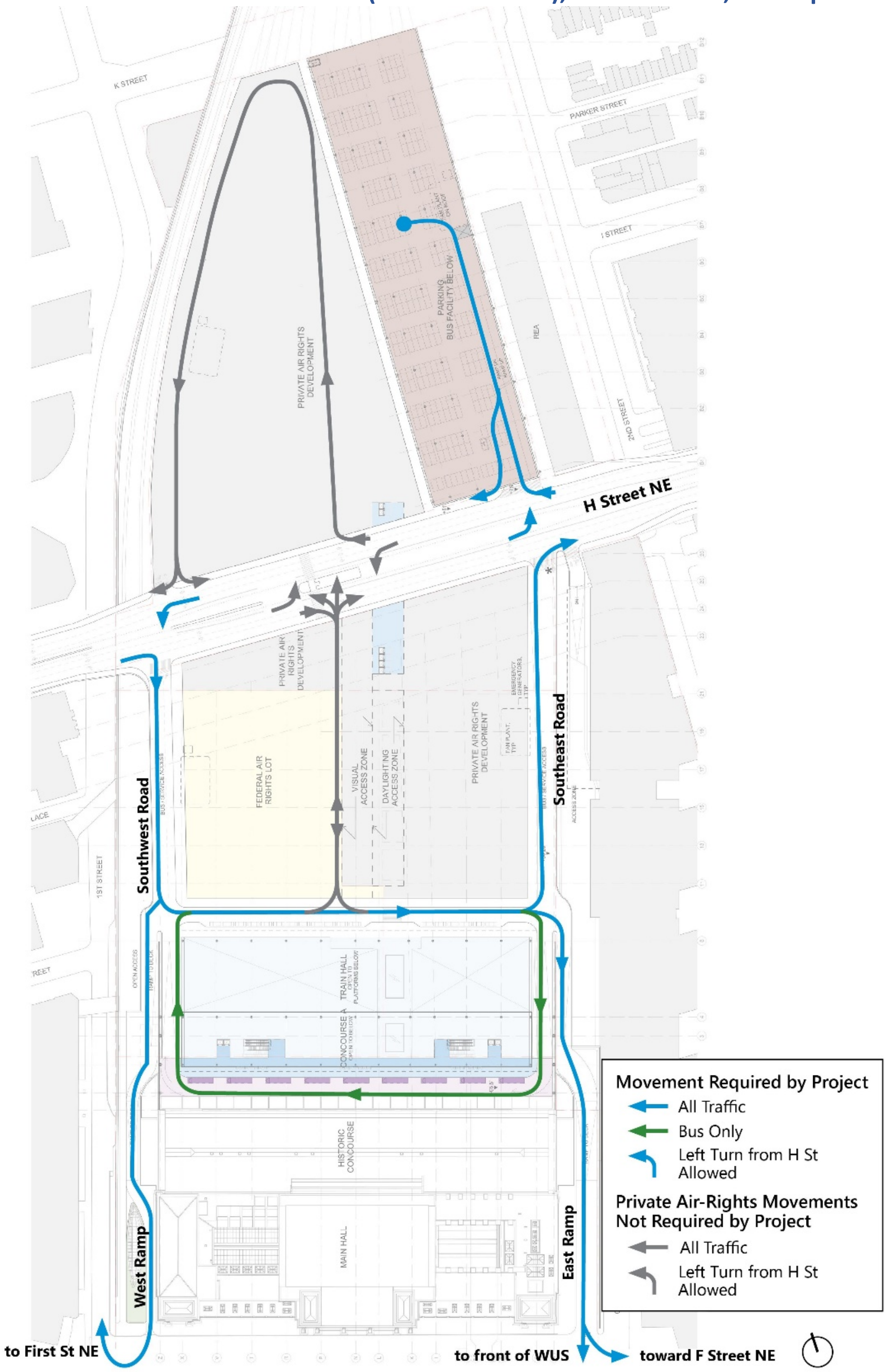


Figure 5-11. Deck Level Circulation (All Movements), Alternative C, West Option

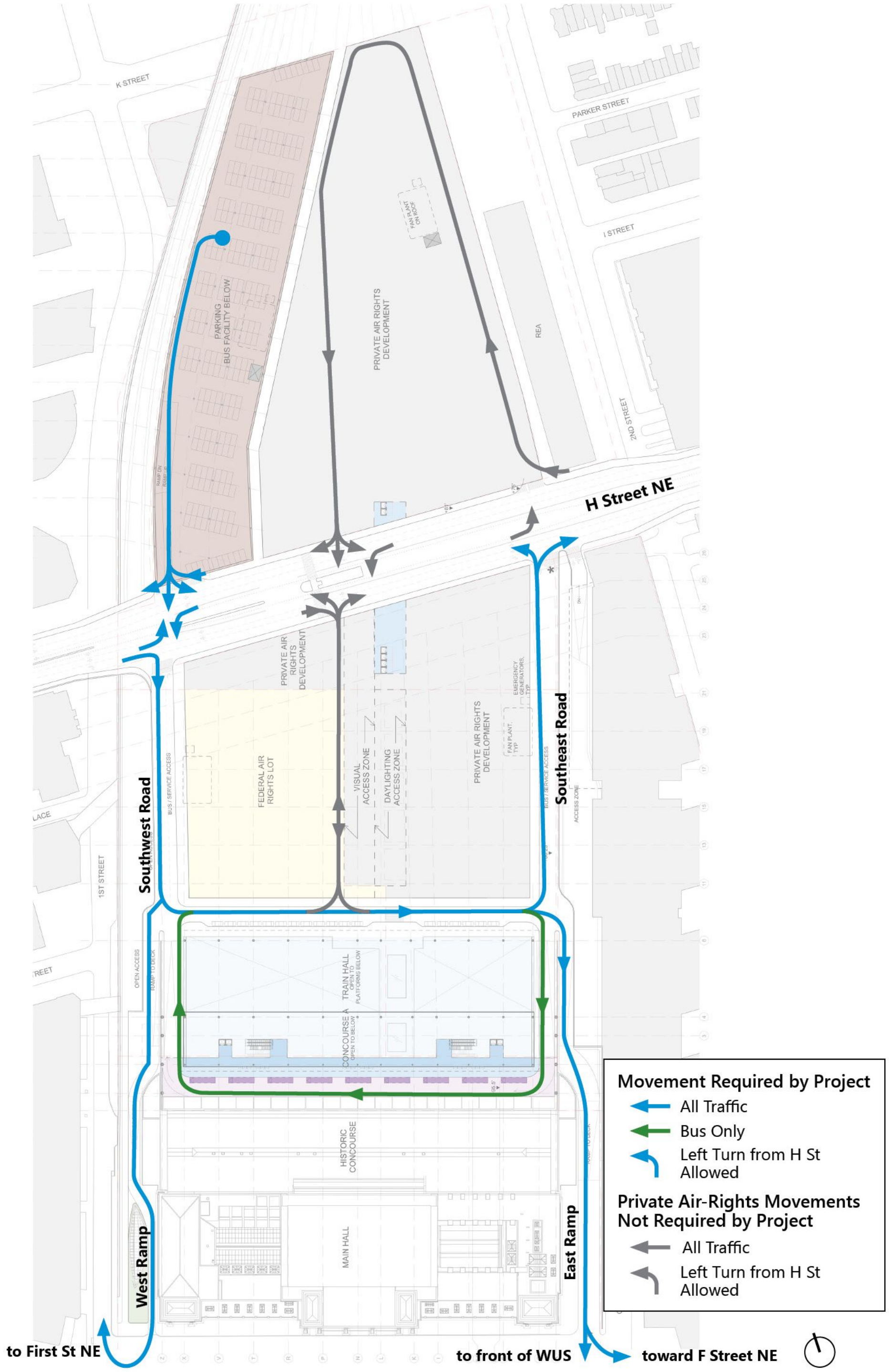


Table 5-47 and **Table 5-48** show Alternative C AM and PM peak WUS-related traffic volumes, respectively, along with the corresponding information for the No-Action Alternative. Compared to the No-Action Alternative, Alternative C would generate 2,354 additional AM peak trips (144 percent increase) and 1,844 additional PM peak trips (86 percent increase). These volume increases would result in major adverse impacts to traffic operations at some study intersections, as described below.

Table 5-47. AM Peak-hour Traffic Volumes, Alternative C

	Alternative C			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	262	183	79	189	127	62
Private Pick-Up/Drop-Off	1,694	847	847	872	436	436
For-hire Vehicles	1,924	962	962	524	262	262
Car Rental	105	57	48	46	28	18
Total Trips	3,985	2,049	1,936	1,631	853	778

Table 5-48. PM Peak-hour Traffic Volumes, Alternative C

	Alternative C			No-Action Alternative		
	Total Trips	In	Out	Total Trips	In	Out
Parking	294	76	218	299	102	197
Private Pick-Up/Drop-Off	1,548	774	774	948	474	474
For-hire Vehicles	2,064	1,032	1,032	862	431	431
Car Rental	92	37	55	45	17	28
Total Trips	3,998	1,919	2,079	2,154	1,024	1,130

Comparison to Existing Conditions

Relative to existing conditions, Alternative C would generate 2,766 additional AM peak trips (227 percent increase) and 2,395 additional PM peak trips (149 percent increase).[66]

Curbside Analysis

The anticipated volumes associated with for-hire and private pick-up and drop-off activity would potentially create conflicts and queueing in the front of WUS. At deck level, queueing analysis indicates that the approximately 550 feet of curbside space adjacent to the east-west train hall would accommodate for-hire vehicles and private pick-up and drop-off without spill-back onto H Street NE. No queue would form at the First Street or 2nd Street pick-up and drop-off areas. On First Street NE, there would be 253 pick-ups and drop-offs in the AM peak and 223 in the PM peak. On 2nd Street NE, there would be 77 pick-up and drop-

[66] See **Section 5.5.4.1**, *Direct Operational Impacts, Vehicular Traffic* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

offs in the AM peak and 67 in the PM peak. In the below-ground parking facility accessed from K Street, 95 pick-up and drop-offs would occur in the AM peak and 82 would occur in the PM peak.

Intersection Analysis

As for the other Action Alternatives, three indicators were used to assess Alternative C's impacts on traffic operations relative to the No-Action Alternative: degradation of intersection LOS to F due to vehicle trips generated by the alternative; increase in average vehicle delay at an intersection of more than five seconds; and increase in 95th-percentile queue lengths of more than 150 feet for any lane group in an intersection.

Alternative C, East Option

Table 5-49 identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of the three indicators considered in the analysis.

Table 5-49. Summary of Traffic Impacts, Alternative C East Option

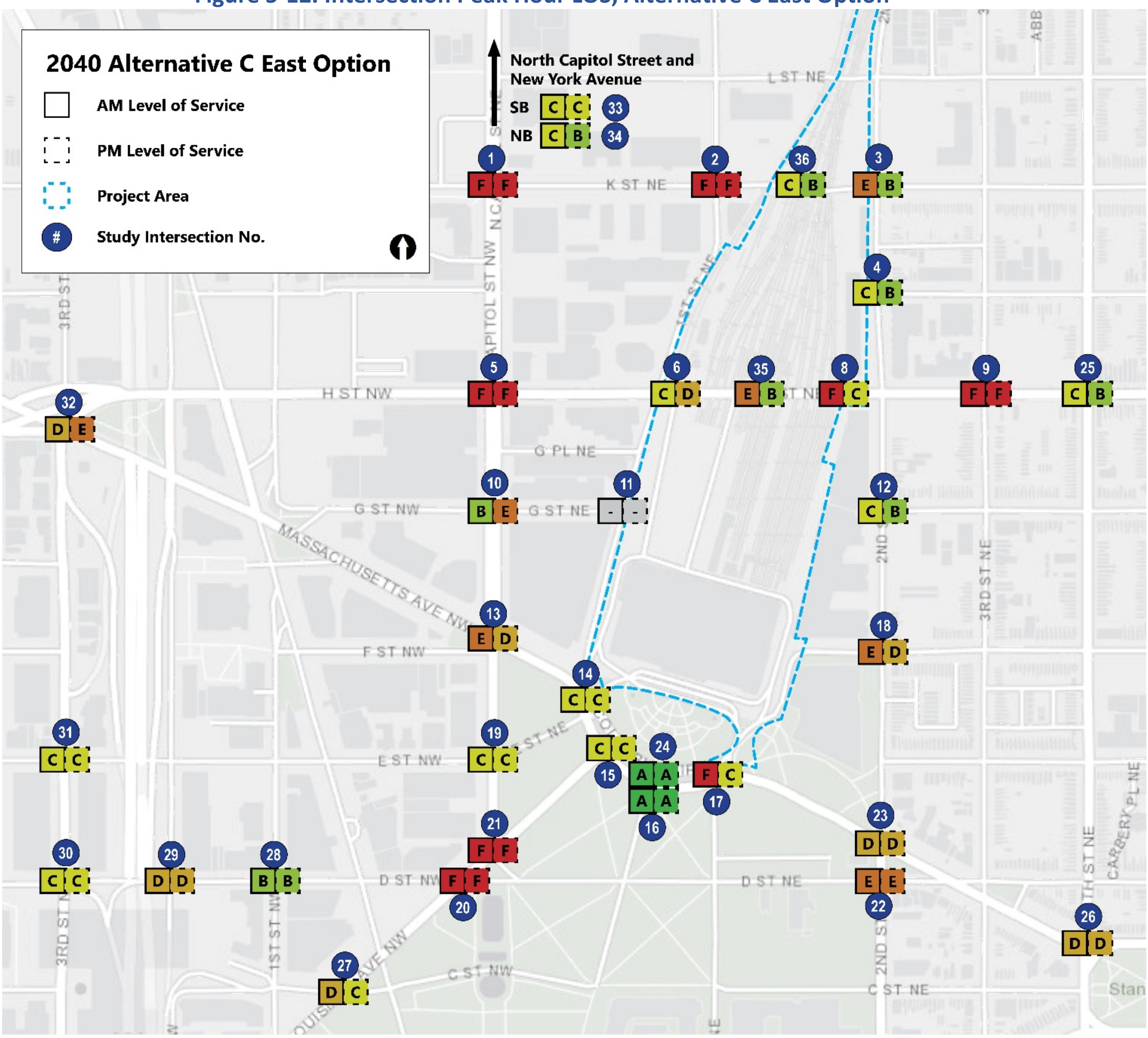
Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X*
3	2nd Street / K Street NE		X	X*
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE		X	X
8	WUS East Intersection / H Street NE		X*	X*
9	3rd Street / H Street NE	X	X*	X*
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave		X	X*
17	First Street / Massachusetts Avenue NE	X	X	X*
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW	X	X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X*	X*
23	2nd Street / Massachusetts Avenue NE		X*	X*
26	Massachusetts Avenue / C Street / 4th Street NE			X
27	Louisiana Avenue / C Street NW		X*	X*
29	2nd Street / D Street NW		X	X*
32	3rd Street / Massachusetts Avenue / H Street NW		X*	X
33	North Capitol Street (SB Ramp) / New York Avenue		X	
34	North Capitol Street (NB Ramp) / New York Avenue		X*	
35	WUS Central Intersection / H Street NE			X*

* indicates the impact would occur in both peak hours.

Figure 5-12 shows peak-hour LOS at each of the study intersections in Alternative C with the East Option. Five out of 36 study intersections would degrade to LOS F in at least one peak hour. Nineteen intersections out of 36 would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of those 19 intersections, 12 would experience such a queue increase in both peak hours.

Finally, in Alternative C with the East Option, 21 of the 36 study intersections would experience an increase in average delay of more than 5 seconds for at least one peak period relative to the No-Action Alternative. Seventeen of those 21 intersections would see such an increased delay in both peak hours.

Figure 5-12. Intersection Peak Hour LOS, Alternative C East Option



Comparison to Existing Conditions

Relative to existing conditions, in Alternative C with the East Option: [67]

- Seven intersections would degrade to LOS F in at least one peak period.
- Twenty-five intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 20 doing so in both peak hours.
- Twenty-three intersections would experience delay increases of more than 5 seconds, with 14 doing so in both peak hours.

Alternative C, West Option

Table 5-50 identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of the three indicators considered in the analysis under Alternative C with the West Option.

Table 5-50. Summary of Traffic Impacts, Alternative C West Option

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X*
3	2nd Street / K Street NE			X*
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE	X	X*	X*
8	WUS East Intersection / H Street NE			X*
9	3rd Street / H Street NE			X
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave		X	X
17	First Street / Massachusetts Avenue NE	X		X
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW		X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X	X*
23	2nd Street / Massachusetts Avenue NE		X	X*
26	Massachusetts Avenue / C Street / 4th Street NE		X	X*
27	Louisiana Avenue / C Street NW		X*	X*
30	3rd Street / I-395 On-ramp / D Street NW		X	
31	3rd Street / E Street NW		X	X
32	3rd Street / Massachusetts Avenue / H Street NW			X*
35	WUS Central Intersection / H Street NE		X	

* indicates the impact would occur in both peak hours.

[67] See **Section 5.5.4.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Figure 5-13 shows the peak hour LOS at each of the 36 study intersections in Alternative C with the West Option. Four intersections would degrade to LOS F during at least one peak hour relative to the No-Action Alternative.

Fifteen intersections out of 36 would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of those 15 intersections, seven would experience such a queue increase in both peak hours.

Finally, in Alternative C with the West Option, 20 of the 36 study intersections would experience an increase in average delay of more than 5 seconds in at least one peak period relative to the No-Action Alternative. Fifteen of those 20 intersections would see such an increase in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative C with the West Option:[68]

- Nine intersections would degrade to LOS F in at least one peak period.
- Twenty-six intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 20 doing so in both peak hours.
- Twenty-two intersections would experience delay increases of more than 5 seconds, with 18 doing so in both peak hours.

Indirect Operational Impacts

Alternative C (either option) would have moderate adverse indirect operational impacts on multimodal transportation because of the trips generated by the potential Federal air-rights development.

In Alternative C, around 952,600 square feet of Federal air rights within the footprint of the existing parking garage and bus facility would be potentially available for development separately from the Project. For the purposes of the transportation analysis, it was conservatively assumed that this space would become office space.

Table 5-51 shows the multimodal trips that the Federal air-rights development would generate under this assumption. All vehicular trips were considered in the traffic impact analysis for Alternative C. The Federal air-rights development would add trips to all other local transportation modes, an adverse impact. The number of additional trips would be typical of an office space development of its size, however, and represent a small increment over the number of trips directly generated by Alternative C. Therefore, this adverse impact would be moderate.

[68] See **Section 5.5.4.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Figure 5-13. Intersection Peak Hour LOS, Alternative C West Option

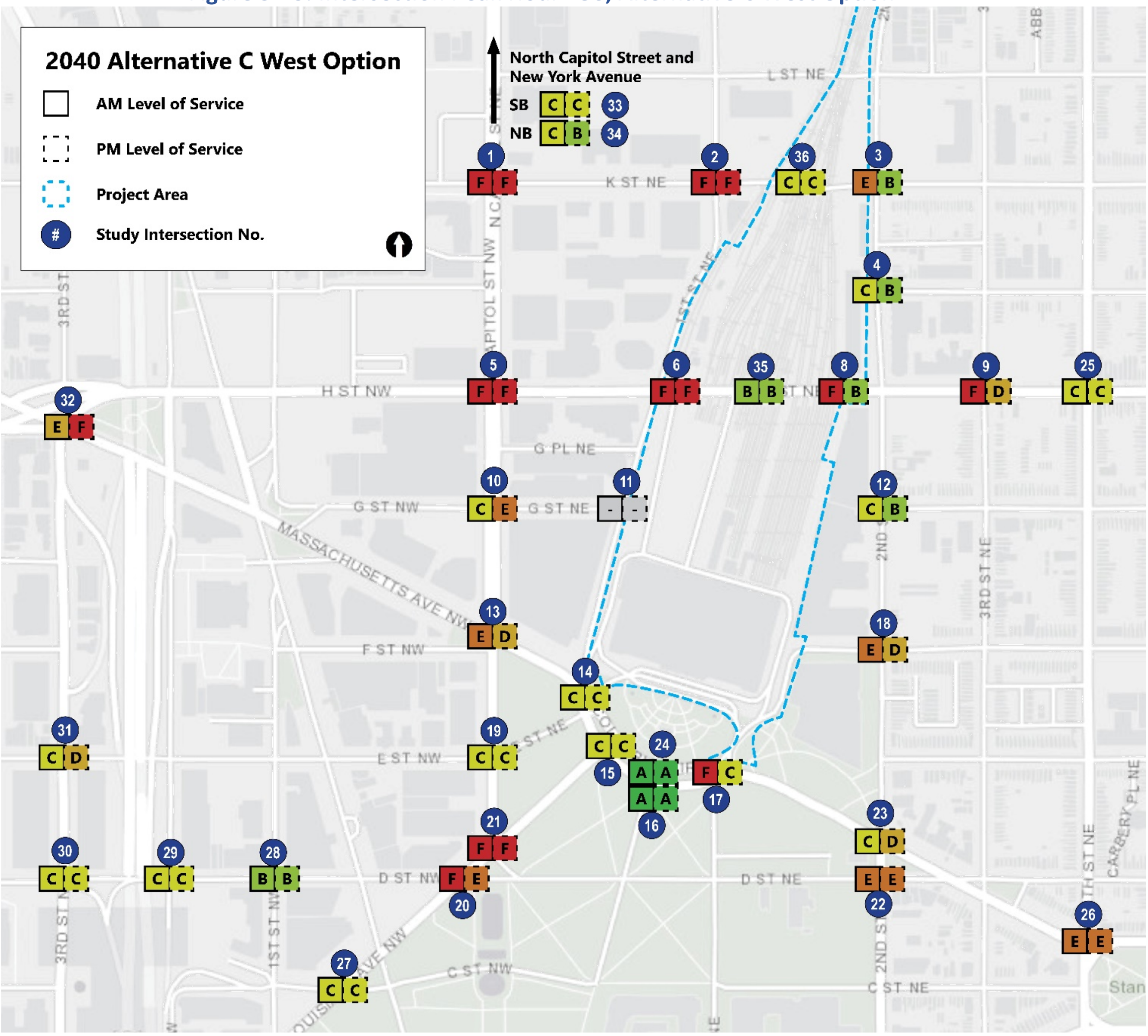


Table 5-51. Federal Air-rights Development Trip Generation, Alternative C

	AM Peak			PM Peak		
	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Parking	296	260	36	292	50	141
Private Pick-Up/Drop-Off	0	0	0	0	0	0
For-hire Vehicles	22	19	3	21	4	17
Car Rental	0	0	0	0	0	0
Amtrak Express	10	9	1	11	2	9
Amtrak Corridor	0	0	0	0	0	0
MARC	137	128	9	147	23	124
VRE	79	74	5	84	13	71
Metrorail	295	276	19	316	50	266
Streetcar	29	27	2	32	5	27
City/Commuter Bus	59	55	4	63	10	53
Pedestrian	98	92	6	105	17	88
Bicycle	98	92	6	195	17	88

Construction Impacts

Construction of Alternative C (either option) would take place over approximately 12 years and 3 months. As in the other Action Alternatives, and as explained for Alternative A in **Section 5.5.4.2,** *Alternative A, Construction Impacts*, work would be conducted in four east-to-west phases with the greatest impacts on transportation occurring in Phase 4. Phase durations and the duration of excavation activities in each phase for Alternative B are shown in **Table 5-52**.

Table 5-52. Construction and Excavation Duration, Alternative C

Phase	Overall Duration	Duration of Excavation
Phase 1	2 years, 5 months	5 months
Intermediate Phase	*12 months*	None
Phase 2	2 years, 4 months	10 months
Phase 3	2 years, 6 months	11 months
Phase 4	4 years	2 years
Total Project Completion	12 years, 3 months	4 years, 2 months

Except for the difference in duration, the construction impacts of Alternative C on all transportation modes considered other than intercity, tour/charter, and sightseeing buses; city and commuter buses; vehicular parking and rental cars; and vehicular traffic would be as described for Alternative A in **Section 5.5.4.2,** *Alternative A, Construction Impacts*.

Construction impacts on city and commuter buses would be as described for Alternative B in **Section 5.5.4.3,** *Alternative B, Construction Impacts*. The following sections focus on those Alternative C impacts that would meaningfully differ from those of Alternative A or Alternative B. Refer to **Section 5.5.4.2** or **5.5.4.3** for impacts on the transportation modes not addressed below.

Intercity, Tour/Charter, and Sightseeing Buses

Construction of Alternative C with the East Option would have minor adverse impacts on bus operations and bus passenger accommodations.

In Alternative C with the East Option, the existing bus facility would remain in operation until its demolition during Phase 4 of construction. Phase 4 would last approximately 4 years and begin approximately 8 years and 3 months after the start of construction. The new facility, located to the north of H Street NE on the eastern side of the Project Area, would be complete by the time the existing one is demolished. Bus operations could move to the new location with minimal disruption. The bus pick-up and drop-off area near the train hall would not be available until the end of Phase 4. However, implementation of an enhanced active management approach would allow the main facility to operate adequately in the interim. The potential reduction in flexibility and the greater active management challenges would be a minor adverse impact.

Construction of Alternative C with the West Option would have major adverse impacts on bus operations and bus passenger accommodations.

In the West Option, neither the bus facility nor the bus pick-up and drop-off area would be available when demolition of the existing bus facility takes place. Therefore, impacts would be as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Intercity, Tour/Charter, and Sightseeing Buses*, except for the difference in duration (4 years in Alternative C).

Vehicular Parking and Rental Cars

Construction of Alternative C (either option) would have a major adverse direct impact on parking between the demolition of the existing parking garage and the completion of the below-ground parking in Phase 4 of construction.

Alternative C, East Option

The existing parking garage would remain in operation until its demolition in Phase 4 of construction, which would last for approximately 4 years and begin approximately 8 years and 3 months after the start of construction. By that time, the new above-ground parking facility on the eastern side of the Project Area would be complete. This facility would provide about 750 spaces. Below-ground parking would not be available until the end of Phase 4. Until the completion of the below-ground parking facility, there would be a shortage of parking at WUS relative to the parking program of 1,600 spaces. The program would not be fully met.

To fully meet the parking program, interim parking would have to be provided. At the current stage of planning, no potential location or locations have been identified. Without an adequately sized interim parking location, during phase 4, there would be a shortage of around 850 parking spaces at WUS relative to the program.

The reduction in parking capacity would likely lead WUS visitors or passengers to use alternative modes of transportation, including Metrorail, for-hire vehicle, and private pick-ups and drop-offs. Based on projected distribution, this shift would generate approximately 114 daily Metrorail trips, 171 daily for-hire trips, and 170 daily private pick-up and drop-off trips. Given the overall daily volumes of these modes, the added trips would be manageable.

As explained for Alternative A in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Vehicular Parking and Rental Cars*, it is possible that some WUS-users would still drive to the station, including users from areas not well served by transit, who may have a limited set of options. These users may seek parking in commercial garages. No significant use of local streets for WUS-related long-term parking is likely because of parking restrictions.

Alternative C, West Option

In the West Option, neither the above-ground nor the below-ground parking facility would be available when demolition of the existing garage occurs. Therefore, impacts would be as described for Alternative A (see **Section 5.5.4.2**, *Alternative A, Construction Impacts, Vehicular Parking and Rental Cars*) except for the duration. In this alternative, parking would be unavailable at WUS for four years.

Vehicular Traffic

Construction of Alternative C (either option) would have major adverse impact on vehicular traffic operations because of roadway closures and construction vehicle traffic.

In addition to the impacts described in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Vehicular Traffic*, the construction of the new intersection providing access to the below-ground parking facility would require lane closures under the K Street overpass. As noted in **Section 5.5.4.3**, *Alternative B, Construction Impacts, Vehicular Traffic,* one lane of traffic in each direction would remain in operation at least during the day. However, delays and back-up may occur, and some traffic may seek alternative routes, such as L Street.

As in the other Action Alternatives, construction of Alternative C would generate truck traffic to and from the Project Area during the entire construction period. The greatest amount of traffic would occur during excavation activities, with up to 120 trucks per day. As explained for Alternative A, this is a maximum, conservative estimate that assumes that no work trains would be used to haul spoils away. As in all Action Alternatives, construction trucks have the potential to result in major adverse impacts on local traffic operations. With one-level of below-ground parking on the west side of the Project Area, Alternative C would require substantial excavation and generate a commensurate amount of spoil. Excavation for the below-ground parking facility would occur in Phase 4. In Alternative C, excavation-related truck traffic would occur for approximately 2 years. Because work in Phase 4 would be on the west side of the Project Area, First Street NE would be the local street most affected. As in all Action Alternatives, use of work train to remove the spoils could reduce or eliminate excavation-related truck traffic.

5.5.4.5 Alternative D

The following sections describe the direct and indirect, operational and construction impacts of Alternative D. **Figure 5-14** illustrates the key transportation elements of Alternative D.

Direct Operational Impacts

The direct operational impacts of Alternative D on commuter and intercity railroads; the DC Streetcar; loading; city and commuter bus ridership; and car rental activities would be the same as those of Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*). Impacts on bicycle activity and city and commuter bus operations would be the same as in Alternative B. (**Section 5.5.4.3**, *Alternative B, Direct Operational Impacts*). Impact on for-hire vehicles and private pick-up and drop-off would be the same as those of Alternative C (**Section 5.5.4.4**, *Alternative C, Direct Operational Impacts*). This section does not address these impacts further. It only addresses those transportation modes that would experience meaningfully different operational impacts in Alternative D.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative D would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

Increased train service and ridership as well as the reduction in parking capacity and the new retail uses included in the alternative would generate increased demand on Metrorail at WUS. **Table 5-53** shows modeled AM peak and PM peak activity in Alternative D. When the projected V/C ratio exceeds 100 percent, there would be a need for additional service to address overcrowding.

Figure 5-14. Key Transportation Elements, Alternative D

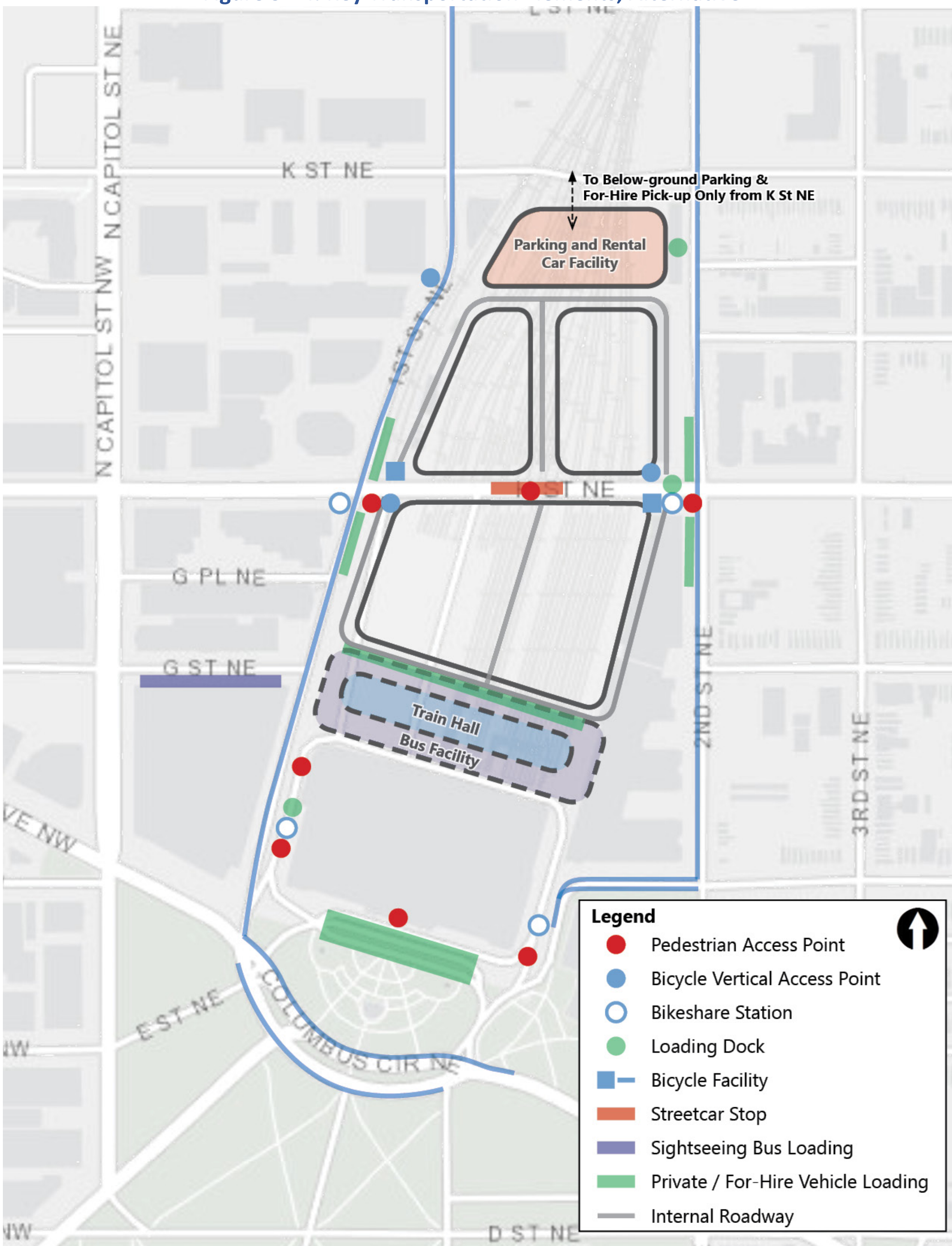


Table 5-53. Peak WUS-related Metrorail Activity, Alternative D

	Alternative D		No-Action Alternative	
	Shady Grove	Glenmont	Shady Grove	Glenmont
		AM Peak Hour		
V/C Arriving at WUS	83%	28%	80%	25%
WUS Boardings	8,377	1,626	5,202	1,010
WUS Alightings	5,050	3,428	4,128	2,803
Through Ridership	9,214	1,291	9,523	1,447
Ridership Departing WUS	17,591	2,917	14,725	2,457
V/C Departing WUS	103%	17%	86%	14%
Excess Demand	448	0	0	0
		PM Peak Hour		
V/C Arriving at WUS	21%	115%	20%	107%
WUS Boardings	3,209	4,591	2,559	3,661
WUS Alightings	1,553	8,239	1,154	6,126
Through Ridership	1,647	9,920	1,953	10,722
Ridership Departing WUS	4,856	14,511	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

In Alternative D, volumes would exceed capacity departing from WUS in the Shady Grove direction during the AM peak and arriving to WUS in the Glenmont direction during the PM peak. In the AM peak, Alternative D would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 86 percent in the No-Action Alternative. This would create an excess demand of around 448 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate within the Red Line core.[69]

In the PM peak, capacity exceedance toward Glenmont (115 percent) would be greater in Alternative D than in the No-Action Alternative (107 percent). Alternative D would aggravate the level of crowding, generating an additional excess demand of approximately 1,311 passengers, for a total of 2,421.

The increase in Metrorail ridership at WUS would affect passenger circulation as described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail*.

Comparison to Existing Conditions

Relative to existing conditions, Alternative D would have a major adverse direct operational impact on Metrorail operations at WUS. The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action

[69] The Red Line core, as defined by WMATA, consists of the line segment between Dupont Circle and WUS.

Alternative.[70] In the AM peak, Alternative D would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 69 percent in existing conditions. This would increase the overall demand in the AM peak in the Shady Grove direction by an estimated 7,213 passengers. In the PM peak, the V/C ratio arriving at WUS toward Glenmont would be 115 percent, against 72 percent under existing conditions. Alternative D would increase overall demand in this direction by around 8,211 passengers.

Intercity, Tour/Charter, and Sightseeing Buses

Relative to the No-Action Alternative, Alternative D would have a moderate adverse direct operational impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Alternative D would have a negligible adverse direct operational impact on sightseeing buses as a result of their relocation to G Street NE.

In Alternative D, the bus facility would be located just north of the historic station building, looping around the new train hall. Access would be from H Street NE via the west intersection and egress back to H Street NE would be via the east intersection. All intercity, and tour/charter buses serving WUS would use this facility.

The anticipated increase in bus ridership and impacts of the 30-minute time limit required because of the reduction in the number of slips relative to the existing facility (which would continue in use in the No-Action Alternative) would be the same as those of Alternative A: see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses*. There would be greater flexibility in bus movements in Alternative D than in the No-Action Alternative because buses exiting the facility could turn either left or right onto H Street NE.

Pedestrians

Relative to the No-Action Alternative, Alternative D would have a moderate beneficial direct operational impact on pedestrian circulation inside WUS. Additional access points would disperse pedestrian traffic and make access to WUS easier; however, some passengers would have to walk longer distances. Outside of WUS, Alternative D would have a minor adverse direct operational impact on pedestrian circulation because of increased queueing at certain crossings near the station.

The impacts of Alternative D would generally be similar to those of Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Pedestrians*) and would be beneficial. Because of the location of the new above- and below-ground parking facilities, however, beneficial impacts would be moderate because longer walking distances would partially offset the benefits from larger circulation spaces and additional access points.

[70] See **Section 5.5.5.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative D include ridership generated by the private air-rights development.

Above-ground parking users would have to walk outside from the facility to H Street NE to reach the nearest entry point to the H Street Concourse.

Comparison to Existing Conditions

The impacts of Alternative D relative to existing conditions would be as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Pedestrians*.

Vehicular Parking and Rental Cars

Relative to the No-Action Alternative, Alternative D would have a moderate adverse direct operational impact on parking at WUS because of a reduction in parking capacity. Alternative D would have a minor beneficial direct operational impact on rental car operations.

Alternative D would split parking between a new above-ground facility (south of K Street NE) and a new below-ground facility beneath the rail terminal. Vehicular access to above-ground parking would be via H Street NE. Inbound vehicles would use the east intersection and outbound ones the west intersection. Vehicular access to below-ground parking would be through a new intersection in the K Street NE underpass, as in Alternatives B and C (see **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, Vehicular Parking and Rental Cars*).

Relative to the No-Action Alternative, this would change the routes WUS users would take to park at the station and affect the local network. However, the change in location by itself would not adversely affect parking or car rental activities. The new parking facilities would have space for approximately 800 fewer cars than the existing one. This would be an adverse impact.[71] This adverse impact would be moderate because the new facilities would meet the parking program for the Project and while they would not meet the projected parking demand, it is anticipated that users not able to park would use different modes to reach the station.[72] Fewer passengers or visitors are anticipated to drive and park at WUS by 2040. [73]

Because parking capacity in Alternative D would be very close to that provided in Alternative C, the number of parking-generated vehicular trips would be the same as in that alternative: see **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Parking and Rental Cars*. However, the trips to the above-ground parking facility would be distributed differently. In Alternative D, parking access would be distributed between two intersections on H Street

[71] As noted in **Section 5.5.3.1**, *Operational Impacts*, the parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

[72] **Appendix A6**, *Parking Program Memorandum*, provides more information on parking demand projections and the development of the parking program.

[73] The MWCOG Model estimates a 10% reduction in single-occupancy vehicle trips in the WUS area to 2040. Additionally, Amtrak as indicated to FRA that passenger parking is not essential to Amtrak's operation of intercity passenger rail at WUS and it anticipates passenger parking demand to continually decrease in the future.

NE (east and west intersections) as opposed to a single intersection (east or west intersection, depending on the option) in Alternative C.

Comparison to Existing Conditions

The impacts of Alternative D relative to existing conditions would be as described for Alternative C in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Parking and Rental Cars*.

Vehicular Traffic

Relative to the No-Action Alternative, Alternative D would have major adverse direct operational impacts on traffic operations at several intersections near WUS because of increased traffic volumes and changes in traffic patterns due to the new parking locations. During at least one of the peak periods, out of 36 intersections in the Local Study Area, four would degrade to LOS F; 14 would experience an increase in queue length of more than 150 feet; and 20 would experience an increase in average delay of more than 5 seconds.

Trip Generation and Circulation

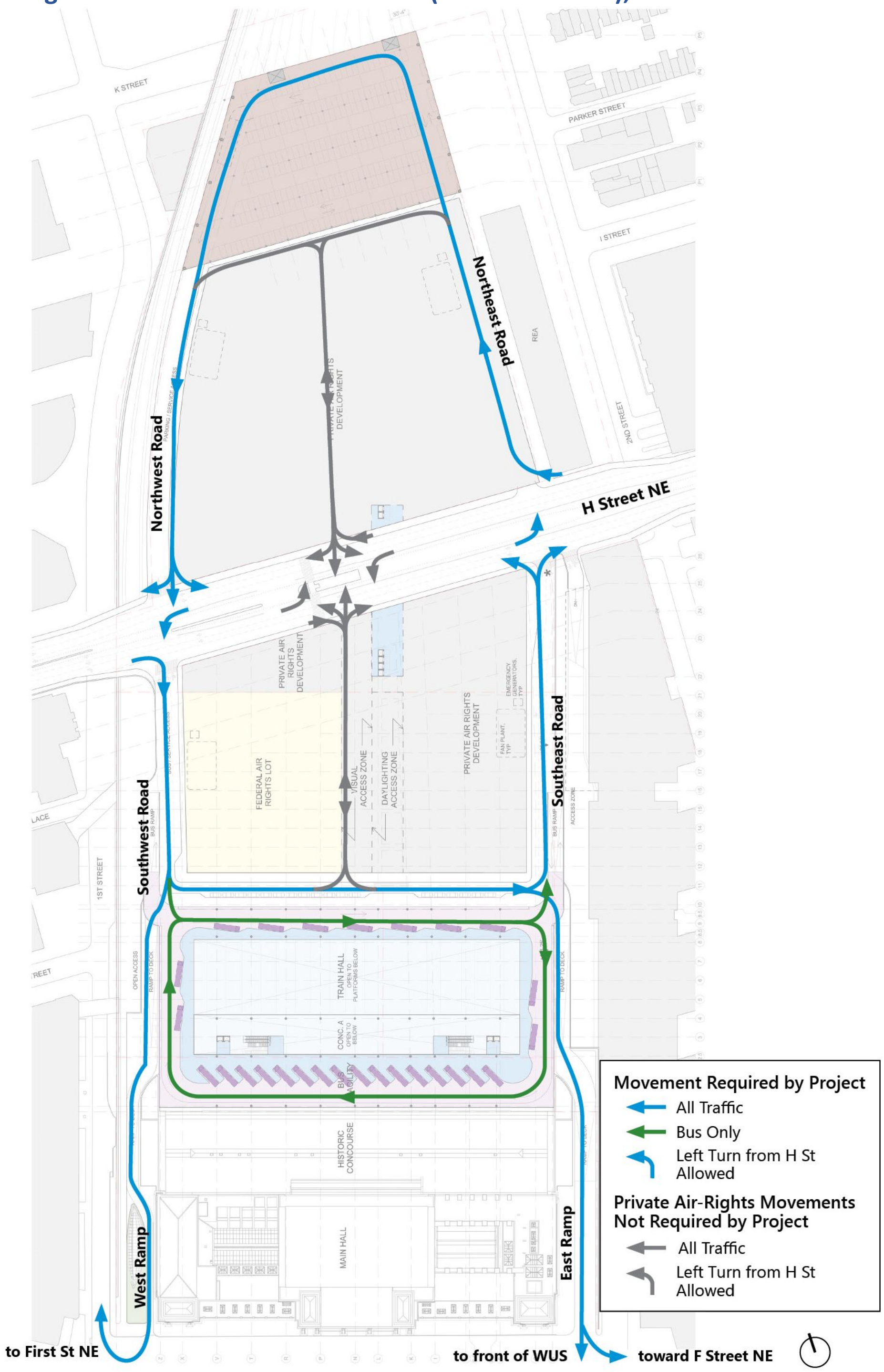
WUS-related vehicular activity in Alternative D would be primarily distributed across five locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus and above-ground parking facilities, and new deck-level pick-up and drop-off location accessed from H Street NE;
- The new below-ground parking facility accessed from K Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse); and
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse).

Alternative D would also generate the same number of WUS-related trips as Alternative C: see **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic*. Approximately 70 percent of WUS-related traffic is expected to travel to and from points west of WUS and 30 percent going to points east. Deck-level circulation in Alternative D is represented in **Figure 5-15**. [74]

[74] Figure 5-15 shows all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-15. Deck Level Circulation (All Movements), Alternative D



Curbside Analysis

The anticipated volumes associated with for-hire and private pick-up and drop-off activity would potentially create conflicts and queueing, as in Alternative C. These impacts are addressed in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*.

Intersection Analysis

As with all the Action Alternatives, three indicators were used to assess impacts on traffic operations in Alternative D, based on comparison to the No-Action Alternative: degradation of intersection LOS to F due to vehicle trips generated by the Project; increase in average vehicle delay at an intersection by more than 5 seconds; and increase in 95th-percentile queue lengths of more than 150 feet for any lane group in an intersection. **Table 5-54** identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of these three indicators.

Figure 5-16 shows peak-hour LOS for each of the study intersections in Alternative D. In this alternative, four intersections would degrade to LOS F during at least one peak hour relative to the No-Action Alternative.

Fourteen intersections out of 36 would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of those 14 intersections, seven would experience such a queue increase in both peak hours.

Finally, in Alternative D, 20 of the 36 study intersections would experience an increase in average delay of more than 5 seconds for at least one peak period relative to the No-Action Alternative. Fourteen of those 20 intersections would see such an increased delay in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative D:[75]

- Eight intersections would degrade to LOS F in at least one peak period.
- Twenty-six intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 19 doing so in both peak hours.
- Twenty-two intersections would experience delay increases of more than 5 seconds, with 18 doing so in both peak hours.

[75] See **Section 5.5.5.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Figure 5-16. Intersection Peak Hour LOS, Alternative D

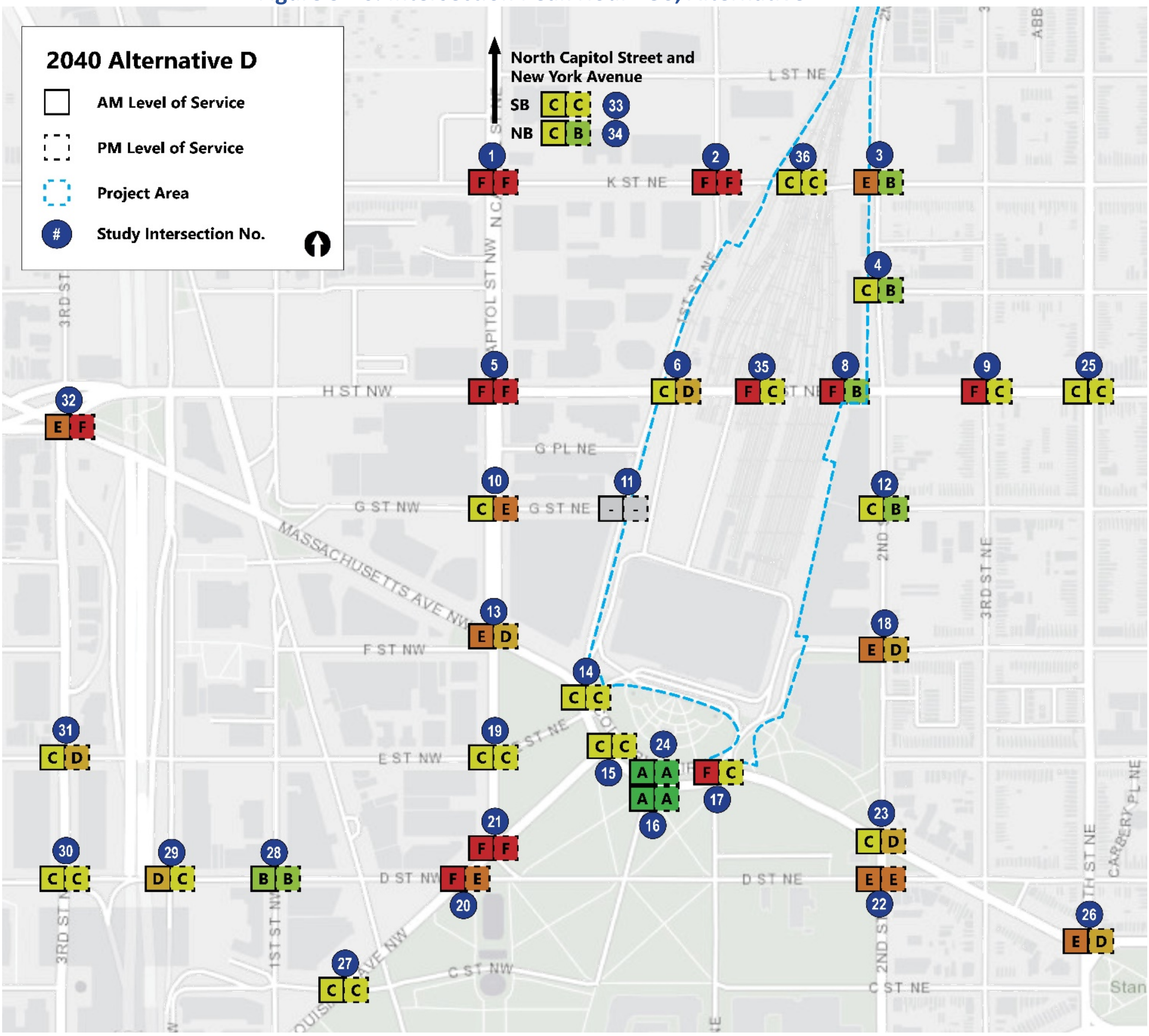


Table 5-54. Summary of Traffic Impacts, Alternative D

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X*
3	2nd Street / K Street NE			X*
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE		X	X
9	3rd Street / H Street NE			X
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave		X	X
17	First Street / Massachusetts Avenue NE	X		X
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW		X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X	X*
23	2nd Street / Massachusetts Avenue NE		X	X*
26	Massachusetts Avenue / C Street / 4th Street NE		X	X*
27	Louisiana Avenue / C Street NW		X*	X*
31	3rd Street / E Street NW		X	X
32	3rd Street / Massachusetts Avenue / H Street NW			X*
35	WUS Central Intersection / H Street NE	X	X*	X*

* indicates the impact would occur in both peak hours.

Indirect Operational Impacts

Alternative D would have moderate adverse indirect operational impacts on multimodal transportation because of the trips generated by the potential Federal air-rights development.

In Alternative D, approximately 688,050 square feet of Federal air rights within the footprint of the existing parking garage and bus facility would be potentially available for development separately from the Project. For the purposes of the transportation impact analysis, it was conservatively assumed that this space would become office space.

Table 5-55 shows the multimodal trips that the Federal air-rights development would generate under this assumption. All vehicular trips were considered in the traffic impact analysis for Alternative D. The Federal air-rights development would add trips to other local transportation modes, an adverse impact. The number of additional trips would be typical of an office space development of its size, however, and represent a small increment over the number of trips directly generated by Alternative D. Therefore, this adverse impact would be moderate.

Table 5-55. Federal Air-rights Development Trip Generation, Alternative D

	AM Peak			PM Peak		
	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Parking	228	201	27	216	37	179
Private Pick-Up/Drop-Off	0	0	0	0	0	0
For-hire Vehicles	16	14	2	16	3	13
Car Rental	0	0	0	0	0	0
Amtrak Express	7	7	0	8	2	6
Amtrak Corridor	0	0	0	0	0	0
MARC	100	96	4	106	16	90
VRE	57	55	2	60	9	51
Metrorail	215	206	9	227	35	192
Streetcar	21	20	1	23	4	19
City/Commuter Bus	43	41	2	45	7	38
Pedestrian	72	69	3	76	12	64
Bicycle	72	69	3	76	12	64

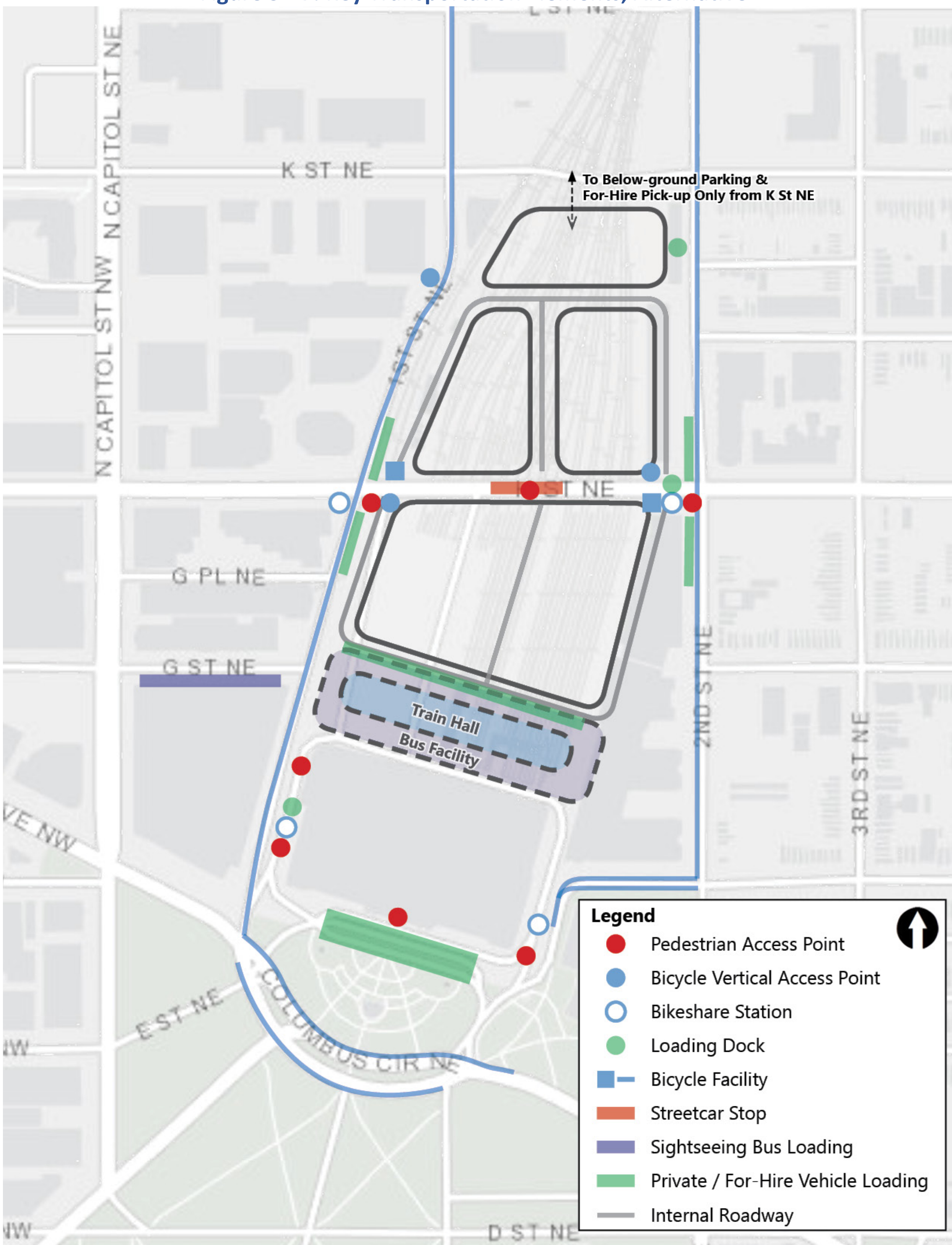
Construction Impacts

With regard to construction, Alternative D would be very similar to Alternative C, placing similar elements in similar locations (one level of below-ground parking, above-ground parking facility north of H Street NE, and bus slips adjacent to the new train hall). The anticipated construction period would be the same (12 years and 3 months) and each phase, including Phase 4, would take the same amount of time. Impacts would be as in Alternative C with the West Option. **Section 5.5.4.4**, *Alternative C, Construction Impacts* addresses these impacts.

5.5.4.6 Alternative E

The following sections describe the direct, indirect, and construction impacts of Alternative E. **Figure 5-17** illustrates the key transportation elements of Alternative E.

Figure 5-17. Key Transportation Elements, Alternative E



Direct Operational Impacts

The direct operational impacts of Alternative E on commuter and intercity railroads; the DC Streetcar; loading; and city and commuter bus ridership would be the same as in Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*). Impacts on pedestrians; bicycle activity; city and commuter bus operations; and vehicular parking and rental cars would be the same as in Alternative B (**Section 5.5.4.3**, *Alternative B, Direct Operational Impacts*). Impact on intercity, tour/charter, and sightseeing buses would be the same as in Alternative D (**Section 5.5.4.5**, *Alternative D, Direct Operational Impacts*). This section does not address these impacts further. It only addresses those transportation modes that would experience meaningfully different operational impacts in Alternative E.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative E would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

In Alternative E, increased train service and ridership as well as the reduction in parking capacity and the new retail uses, would generate increased demand on Metrorail at WUS. **Table 5-56** shows modeled AM peak and PM peak activity in Alternative E. When the projected V/C ratio exceeds 100 percent, there would be a need for additional service to address overcrowding.

Table 5-56. Peak-hour WUS-related Metrorail Activity, Alternative E

	Alternative E		No-Action Alternative	
	Shady Grove	Glenmont	Shady Grove	Glenmont
	AM Peak Hour			
V/C Arriving at WUS	83%	28%	80%	25%
WUS Boardings	8,397	1,630	5,202	1,010
WUS Alightings	5,096	3,459	4,128	2,803
Through Ridership	9,168	1,260	9,523	1,447
Ridership Departing WUS	17,565	2,890	14,725	2,457
V/C Departing WUS	102%	17%	86%	14%
Excess Demand	422	0	0	0
	PM Peak Hour			
V/C Arriving at WUS	20%	115%	20%	107%
WUS Boardings	3,244	4,643	2,559	3,661
WUS Alightings	1,558	8,268	1,154	6,126
Through Ridership	1,642	9,891	1,953	10,722
Ridership Departing WUS	4,886	14,534	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

Alternative E volumes would exceed capacity departing from WUS in the Shady Grove direction during the AM peak. In the PM peak, volumes would exceed capacity in the Glenmont direction when arriving at WUS.

In the AM peak, Alternative E would cause the V/C ratio leaving WUS toward Shady Grove to reach 102 percent, against 86 percent in the No-Action Alternative. This would result in an excess demand of around 422 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate within the Red Line core.[76]

In the PM peak, capacity exceedance toward Glenmont (115 percent) would be greater in Alternative E than in the No-Action Alternative (107 percent). Alternative E would aggravate the level of crowding, generating an additional excess demand of approximately 1,311 passengers, for a total excess demand of 2,421.

The increase in Metrorail ridership at WUS would affect passenger circulation as described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail*.

Comparison to Existing Conditions

Relative to existing conditions, Alternative E would have a major adverse direct operational impact on Metrorail operations at WUS. The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action Alternative.[77] In the AM peak, Alternative E would cause the V/C ratio leaving WUS toward Shady Grove to reach 102 percent, against 69 percent in existing conditions. Alternative E would increase the overall demand in the AM peak in the Shady Grove direction by approximately 7,187 passengers. In the PM peak, the V/C ratio toward Glenmont arriving at WUS in Alternative E would be 115 percent, against 72 percent under existing conditions. This would increase overall demand in this direction by around 8,211 passengers.

For-hire Vehicles

Relative to the No-Action Alternative, Alternative E would have a moderate beneficial direct operational impact on for-hire vehicle activity because of the provision of new locations for pick-ups and drop-offs. These locations would adequately accommodate the anticipated growth in for-hire trips, but queuing would not be eliminated. Alternative E would also have a moderate adverse direct operational impact on for-hire vehicles due to increased traffic congestion.

The same five pick-up and drop-off locations would be provided in Alternative E as in Alternative C. These locations are described in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, For-hire Vehicles*.

[76] The Red Line core, as defined by WMATA, consists of the line segment between Dupont Circle and WUS.

[77] See **Section 5.5.6.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative E include ridership generated by the private air-rights development.

Relative to the No-Action Alternative, Alternative E would generate the same number of additional for-hire trips as Alternative B (see **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, For-hire Vehicles*). However, in Alternative E, the peak-hour trips would make use of the full length of the southwest road, east-west train hall, and southeast road. This loop would provide more space for vehicle circulation and passenger loading and unloading activity than in Alternative B. The additional trips were incorporated in the traffic impact analysis.

In Alternative E, volumes associated with for-hire as well as private pick-up and drop-off activity would potentially create queueing and congestion, as described in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis* for Alternative C. This would result in a moderate adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The impacts of Alternative E on for-hire vehicle activities relative to existing conditions would be as described for Alternative B in **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, for-hire Vehicles, Comparison to Existing Conditions*.

Private Pick-up and Drop-off

Relative to the No-Action Alternative, Alternative E would have a moderate beneficial direct operational impact on private pick-ups and drop-offs because of the provision of new locations for these activities. These locations would adequately accommodate the anticipated growth in private pick-up and drop-off trips, but queuing may occur. Alternative E would also have a major adverse direct operational impact on private pick-ups and drop-offs due to increased traffic congestion.

The same locations used by for-hire vehicles would be available for private pick-up and drop-off activity in Alternative E. However, private vehicles would not be allowed to use the east ramp to reach the front of WUS. The anticipated distribution of trips would be the same as for for-hire vehicles.

Relative to the No-Action Alternative, Alternative E would generate the same number of additional private pick-up and drop-off trips as Alternative B (see **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, For-hire Vehicles*). However, in Alternative E, the peak-hour trips would make use of the full length of the southwest road, east-west train hall, and southeast road. This loop would provide more space for vehicle circulation and passenger loading and unloading activity than in Alternative B. The additional trips were incorporated in the traffic impact analysis.

In Alternative E, volumes associated with private pick-up and drop-off as well as for-hire activity would potentially create queueing and congestion, as described in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis* for Alternative C. This would result in a moderate adverse impact on private pick-up and drop-off vehicle operations at WUS.

Comparison to Existing Conditions

The impacts of Alternative E on private pick-up and drop-off activities relative to existing conditions would be as described for Alternative B in **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts*, *Private Pick-up and Drop-off, Comparison to Existing Conditions*.

Vehicular Traffic

Relative to the No-Action Alternative, Alternative E would have major adverse direct operational impacts on traffic operations at several intersections near WUS because of increased traffic volumes and changes in traffic patterns due to the new parking location. During at least one of the peak periods, out of 36 intersections in the Local Study Area, four would degrade to LOS F; 16 would experience an increase in queue length of more than 150 feet; and 20 intersections would experience an increase in average delay of more than 5 seconds.

Trip Generation and Circulation

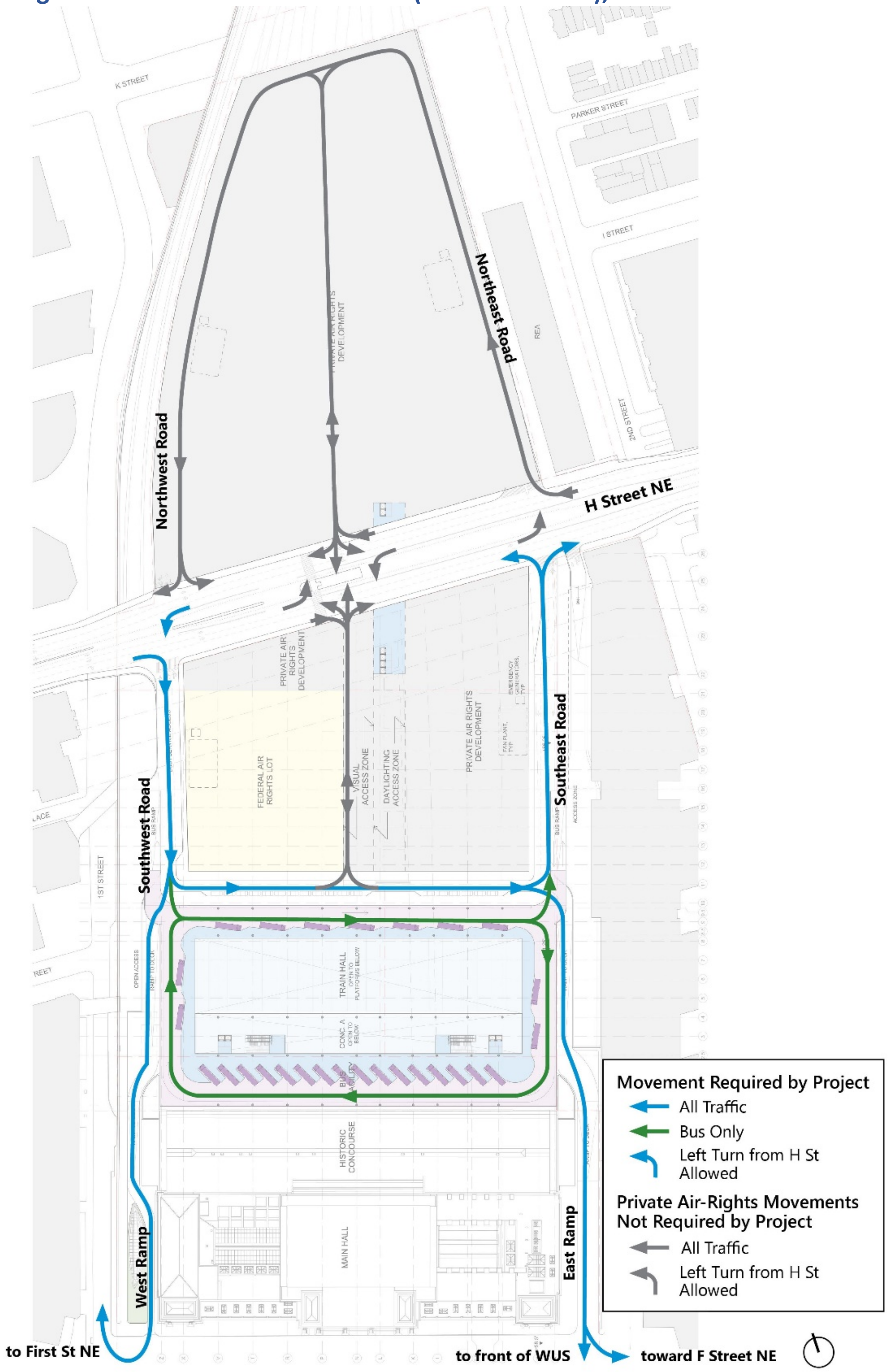
WUS-related vehicular activity in Alternative E would be primarily distributed across five locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus facility and new deck-level pick-up and drop-off location accessed from H Street NE;
- The new below-ground parking facility accessed from K Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse); and
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse).

In Alternative E, all parking and rental car activity would be in the below-ground parking facility accessed from K Street NE. Private and for-hire pick-up and drop-off activity would be spread across all five locations above. Approximately 70 percent of WUS-related traffic would travel to and from points west of WUS and 30 percent to and from points east. Deck-level circulation in Alternative E is represented in **Figure 5-18**. [78] AM and PM peak WUS-related traffic volumes in Alternative E would be the same as in Alternative B: see **Section 5.5.4.3**, *Alternative B, Direct Operational Impacts, Vehicular Traffic*.

[78] Figure 5-18 shows all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-18. Deck Level Circulation (All Movements), Alternative E



Curbside Analysis

The anticipated volumes associated with for-hire and private pick-up and drop-off activity would potentially create conflicts and queueing, as in Alternative C. These impacts are addressed in **Section 5.5.4.4**, *Alternative C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*.

Intersection Analysis

As with all Action Alternatives, three indicators were used to assess impacts on traffic operations in Alternative E relative to the No-Action Alternative: degradation of intersection LOS to F due to vehicle trips generated by the Project; an increase in average vehicle delay at an intersection by more than 5 seconds; and an increase in 95th-percentile queue lengths of more than 150 feet for any lane group in an intersection. **Table 5-57** identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of these three indicators.

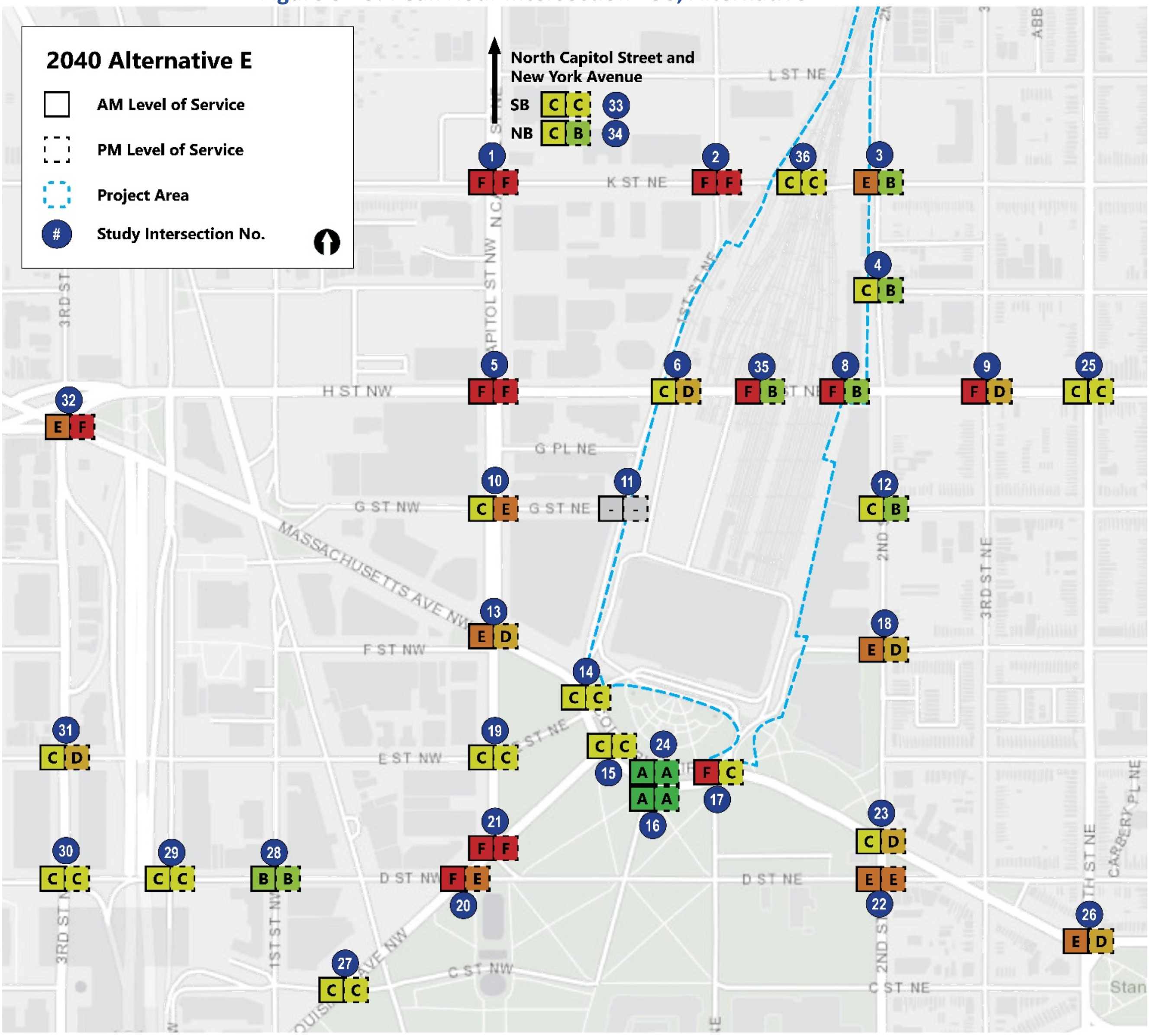
Table 5-57. Summary of Traffic Impacts, Alternative E

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X*
3	2nd Street / K Street NE			X
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE		X	X
8	WUS East Intersection / H Street NE		X*	X
9	3rd Street / H Street NE		X	X
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave		X	X
17	First Street / Massachusetts Avenue NE	X		X
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	
20	Louisiana Avenue / D Street NW		X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X*	X*
23	2nd Street / Massachusetts Avenue NE		X	X*
26	Massachusetts Avenue / C Street / 4th Street NE		X	X*
27	Louisiana Avenue / C Street NW		X*	X*
31	3rd Street / E Street NW		X*	X
32	3rd Street / Massachusetts Avenue / H Street NW			X*
35	WUS Central Intersection / H Street NE	X	X*	X

* indicates the impact would occur in both peak hours.

Figure 5-19 shows peak hour LOS for each of the study intersections. In Alternative E, four intersections out of 36 would degrade to LOS F during at least one peak hour relative to the No-Action Alternative.

Figure 5-19. Peak Hour Intersection LOS, Alternative E



Sixteen intersections would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of these, ten would experience such a queue increase in both peak hours.

Twenty intersections would experience increased average delays relative to the No-Action Alternative of more than 5 seconds in at least one peak period. Twelve would see such delay increases in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative E:[79]

- Eight intersections would degrade to LOS F in at least one peak period.
- Twenty-five intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 20 doing so in both peak hours.
- Twenty-one intersections would experience increased delays of more than 5 seconds, with 18 doing so in both peak hours.

Indirect Operational Impacts

Alternative E would have moderate adverse indirect operational impacts on multimodal transportation because of the trips generated by the potential Federal air-rights development.

In Alternative E, the potential Federal air-rights development would be the same as in Alternative D. Impacts would be the same. They are described in **Section 5.5.4.5**, *Alternative D, Indirect Operational Impacts*.

Construction Impacts

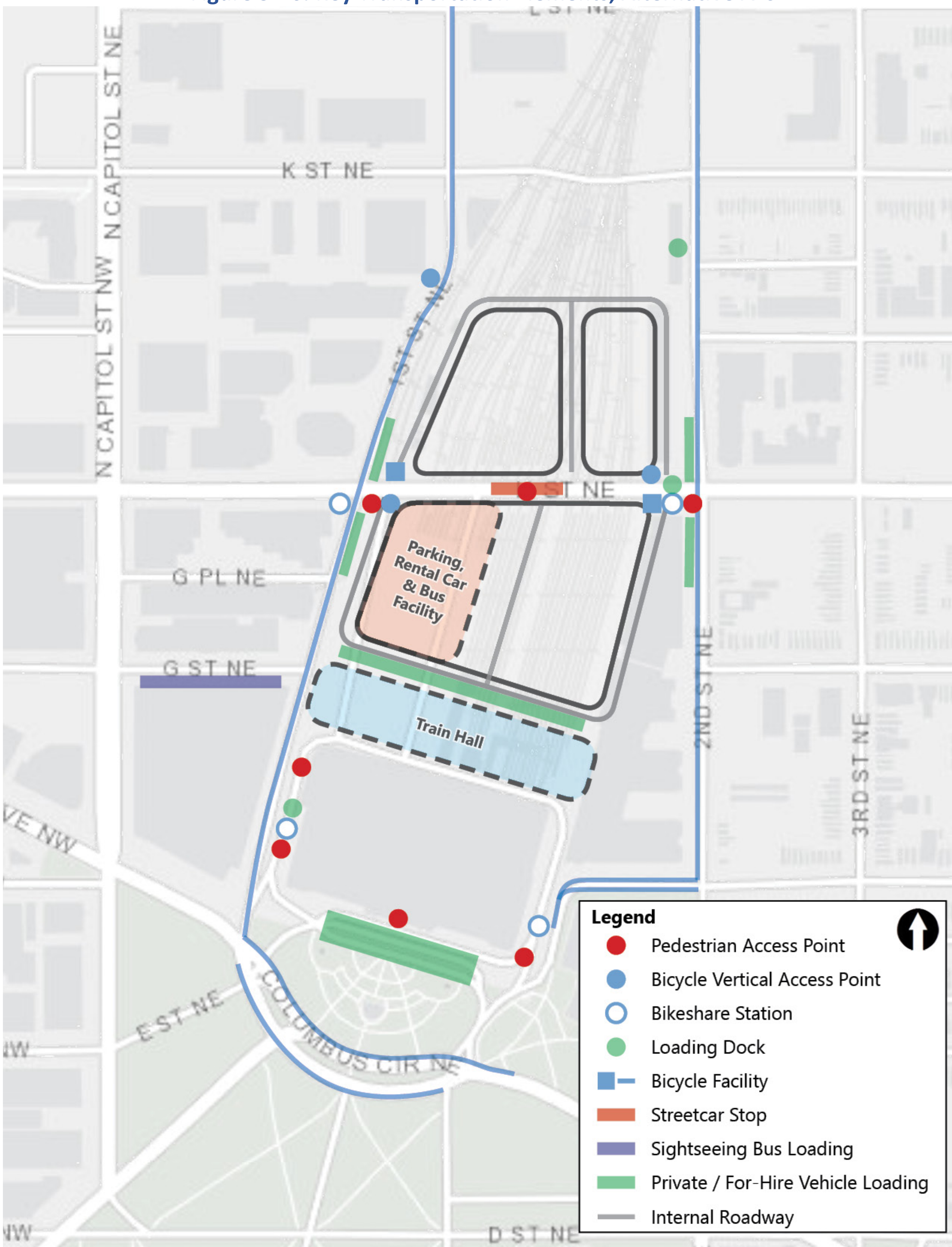
With regard to construction, Alternative E would be very similar to Alternative B, as both alternatives include two levels of below-ground parking. The anticipated construction period would be the same (14 years and 4 months) and each phase, including Phase 4, would take the same amount of time. Therefore, impacts would be as described for Alternative B in **Section 5.5.4.3**, *Alternative B, Construction Impacts*.

5.5.4.7 Alternative A-C (Preferred Alternative)

The following sections describe the direct, indirect, operational and construction impacts of Alternative A-C. **Figure 5-20** illustrates the key transportation elements of Alternative A-C.

[79] See **Section 5.5.6.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Figure 5-20. Key Transportation Elements, Alternative A-C



Direct Operational Impacts

The direct operational impacts of Alternative A-C on commuter and intercity railroads; the DC Streetcar; intercity, tour/charter, and sightseeing buses;[80] loading; pedestrians; bicycle activity; city and commuter buses; and car rental activities would be the same as those of Alternative A (**Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*). This section does not address them further. It only addresses those transportation modes that would experience meaningfully different operational impacts in Alternative A-C.

WMATA Metrorail

Relative to the No-Action Alternative, Alternative A-C would have a moderate adverse direct operational impact on Metrorail operations because of increased demand that would aggravate train overcapacity and station circulation issues.

Increased train service and ridership in Alternative A-C, as well as the reduction in parking capacity and new retail uses, would generate increased demand on Metrorail at WUS. **Table 5-58** shows modeled activity in the AM peak and PM peak, along with the corresponding data for the No-Action Alternative. When the projected V/C ratio exceeds 100 percent, there would be a need for additional service to address overcrowding.

Table 5-58. Peak WUS-related Metrorail Activity, Alternative A-C

	Alternative A-C		No-Action Alternative	
	Shady Grove	Glenmont	Shady Grove	Glenmont
		AM Peak Hour		
V/C Arriving at WUS	83%	28%	80%	25%
WUS Boardings	8,365	1,623	5,202	1,010
WUS Alightings	5,042	3,423	4,128	2,803
Through Ridership	9,222	1,296	9,523	1,447
Ridership Departing WUS	17,587	2,929	14,725	2,457
V/C Departing WUS	103%	17%	86%	14%
Excess Demand	444	0	0	0
		PM Peak Hour		
V/C Arriving at WUS	20%	115%	20%	107%
WUS Boardings	3,201	4,580	2,559	3,661
WUS Alightings	1,550	8,221	1,154	6,126
Through Ridership	1,650	9,938	1,953	10,722
Ridership Departing WUS	4,851	14,518	4,512	14,383
V/C Departing WUS	31%	92%	29%	91%
Excess Demand	0	2,421	0	1,110

[80] Except that in Alternative A-C, the west intersection would be an offset intersection, like in the No-Action Alternative.

Alternative A-C volumes would exceed capacity departing from WUS in the Shady Grove direction during the AM peak and in the Glenmont direction during the PM peak arriving at WUS. In the AM peak, Alternative A-C would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 86 percent in the No-Action Alternative. As a result, Alternative A-C would increase the excess demand by around 444 passengers. Based on WMATA ridership trends, overcapacity conditions are anticipated to dissipate within the Red Line core.[81]

In the PM peak, capacity exceedance toward Glenmont (115 percent arriving) would be greater than in the No-Action Alternative (107 percent). As a result, Alternative A-C would increase the excess demand by 1,311, for a total of 2,421 passengers.

The increase in Metrorail ridership at WUS would affect passenger circulation as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail.*

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would have a major adverse direct operational impact on Metrorail operations at WUS. The increase in overcrowding and need for extra capacity would be greater compared to existing conditions than to the No-Action Alternative.[82] In the AM peak, Alternative A-C would cause the V/C ratio leaving WUS toward Shady Grove to reach 103 percent, against 69 percent in existing conditions. This would increase the overall demand in the AM peak in the Shady Grove direction by an estimated 7,209 passengers. In the PM peak, the V/C ratio arriving at WUS toward Glenmont would be 115 percent, against 72 percent under existing conditions. Alternative A-C would increase overall demand in this direction by around 8,211 passengers.

Vehicular Parking and Rental Cars

Relative to the No-Action Alternative, Alternative A-C would have a moderate adverse direct operational impact on parking at WUS because of a reduction in parking capacity. There would be a minor beneficial impact on rental car operations.

In Alternative A-C, all parking and rental car activity would be in an above-ground facility (multimodal surface transportation center) located within the same general footprint as the existing WUS parking garage, with access from H Street NE via the west intersection and the new southwest road. The new facility would offer space for approximately 850 fewer cars than the existing garage, which would continue to be used in the No-Action Alternative. This

[81] The Red Line core, as defined by WMATA, consists of the line segment between Dupont Circle and WUS.

[82] See **Section 5.5.7.1**, *Direct Operational Impacts, WMATA Metrorail* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data. Total ridership projections for Alternative A-C include ridership generated by the private air-rights development.

would be an adverse impact.[83] This adverse impact would be moderate because the new facility would meet the parking program for the Project and while it would not meet the projected parking demand, it is anticipated that users not able to park would use different modes to reach the station.[84] Fewer passengers or visitors are anticipated to drive and park at WUS by 2040. [85]

Alternative A-C would generate the same number of additional parking trips as Alternative A: see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Parking and Rental Cars*. However, access routes would be different. Parking users would enter the facility from the new southwest and east-west roads. Exiting would be via the southeast road and H Street or the east ramp.

Comparison to Existing Conditions

The impacts of Alternative A-C relative to existing conditions would be as described for Alternative A: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Parking and Rental Cars*.

For-hire Vehicles

Relative to the No-Action Alternative, Alternative A-C would have a moderate beneficial direct operational impact on for-hire vehicle activity because of the provision of new locations for pick-ups and drop-offs. These locations would adequately accommodate the anticipated growth in for-hire trips, but queuing would not be eliminated. Alternative A-C would also have a moderate adverse direct operational impact on for-hire vehicles due to increased traffic congestion.

Alternative A-C would provide four pick-up and drop-off locations (see **Figure 5-20**):

- **Front of WUS:** See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative A-C, a projected 40 percent of for-hire drop-off activity and 40 percent of for-hire pick-up activity is anticipated to occur in front of WUS.
- **Adjacent to the north-south train hall on the deck level:** For-hire vehicles would access this location via the west intersection on H Street NE and southwest road. Egress would be either via the southeast road and east intersection to H Street NE or via the east ramp to F Street NE or the front of WUS. In Alternative A-C, a projected

[83] As noted in **Section 5.5.3.1**, *Operational Impacts*, the parking impact analysis addresses parking as a resource for which there is a demand. Therefore, a reduction in parking availability is considered an adverse impact on parking. A reduction in parking availability may also have adverse or beneficial consequences for other resources or transportation modes. Such consequences are incorporated into the impact analyses for those other resources or transportation modes.

[84] **Appendix A6**, *Parking Program Memorandum*, provides more information on parking demand projections and the development of the parking program.

[85] The MWCOG Model estimates a 10% reduction in single-occupancy vehicle trips in the WUS area to 2040. Additionally, Amtrak as indicated to FRA that passenger parking is not essential to Amtrak's operation of intercity passenger rail at WUS and it anticipates passenger parking demand to continually decrease in the future.

35 percent of for-hire drop-off activity and 35 percent of for-hire pick-up activity is projected to occur at this location.

- **New H Street Concourse entrance on First Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative A-C, 20 percent of for-hire drop-off activity and 20 percent of for-hire pick-up activity would occur at this location.
- **New H Street Concourse entrance on 2nd Street NE**: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles* for a description. In Alternative A-C, an anticipated 5 percent of for-hire drop-off activity and 5 percent of for-hire pick-up activity would occur at this location.

Alternative A-C would generate the same number of additional for-hire vehicular trips as Alternative A: see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-hire Vehicles*. However, the circulation patterns in Alternative A-C would be different. The peak-hour trips would make use of the full length of the southwest road, east-west train hall, and southeast road. This loop would provide more space for vehicle circulation and passenger loading and unloading than in Alternative A.

As explained below (**Section 5.5.4.7**, *Alternative A-C, Direct Operational Impacts, Vehicular Traffic, curbside analysis*), volumes associated with for-hire as well as private pick-up and drop-off activity in front of WUS could create queueing and congestion, which would result in a moderate adverse impact on for-hire vehicle operations at WUS.

Comparison to Existing Conditions

The impacts of Alternative A-C relative to existing conditions would be as described for Alternative A: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-Hire Vehicles*.

Private Pick-up and Drop-off

Relative to the No-Action Alternative, Alternative A-C would have a moderate beneficial direct operational impact on private pick-up and drop-off activities because of the provision of new locations for these activities. These locations would adequately accommodate the anticipated growth in private pick-up and drop-off trips, but queuing may occur. Alternative A-C would also have a moderate adverse direct operational impact on private pick-up and drop-off due to increased traffic congestion.

The same four locations used by for-hire vehicles would be available for private pick-up and drop-off activity. However, private vehicles would not be able to use the east ramp NE. Alternative A-C would generate the same number of additional private pick-up and drop-off trips as Alternative A: see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Private Pick-up and Drop-off.* However, as noted above for the for-hire trips, the peak-hour private pick-up and drop-off trips would make use of the full length of the southwest road, east-west train hall, and southeast road. This loop would provide more space for vehicle circulation and passenger loading and unloading than in Alternative A.

As explained below (**Section 5.5.4.7**, *Alternative A-C, Direct Operational Impacts, Vehicular Traffic, Curbside Analysis*), volumes associated with private pick-up and drop-off as well as for-hire activity in front of WUS could create queueing and congestion, which would result in a moderate adverse impact on private pick-up and drop-off operations at WUS.

Comparison to Existing Conditions

The impacts of Alternative A-C relative to existing conditions would be as described for Alternative A: See **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Private Pick-up and Drop-off.*

Vehicular Traffic

Relative to the No-Action Alternative, Alternative A-C would have major adverse direct operational impacts on traffic operations at several intersections near WUS because of increased traffic volumes. During at least one of the peak periods, out of 35 intersections in the Local Study Area, five would degrade to LOS F; 19 would experience an increase in queue length of more than 150 feet; and 22 would experience an increase in average delay of more than 5 seconds.

Trip Generation and Circulation

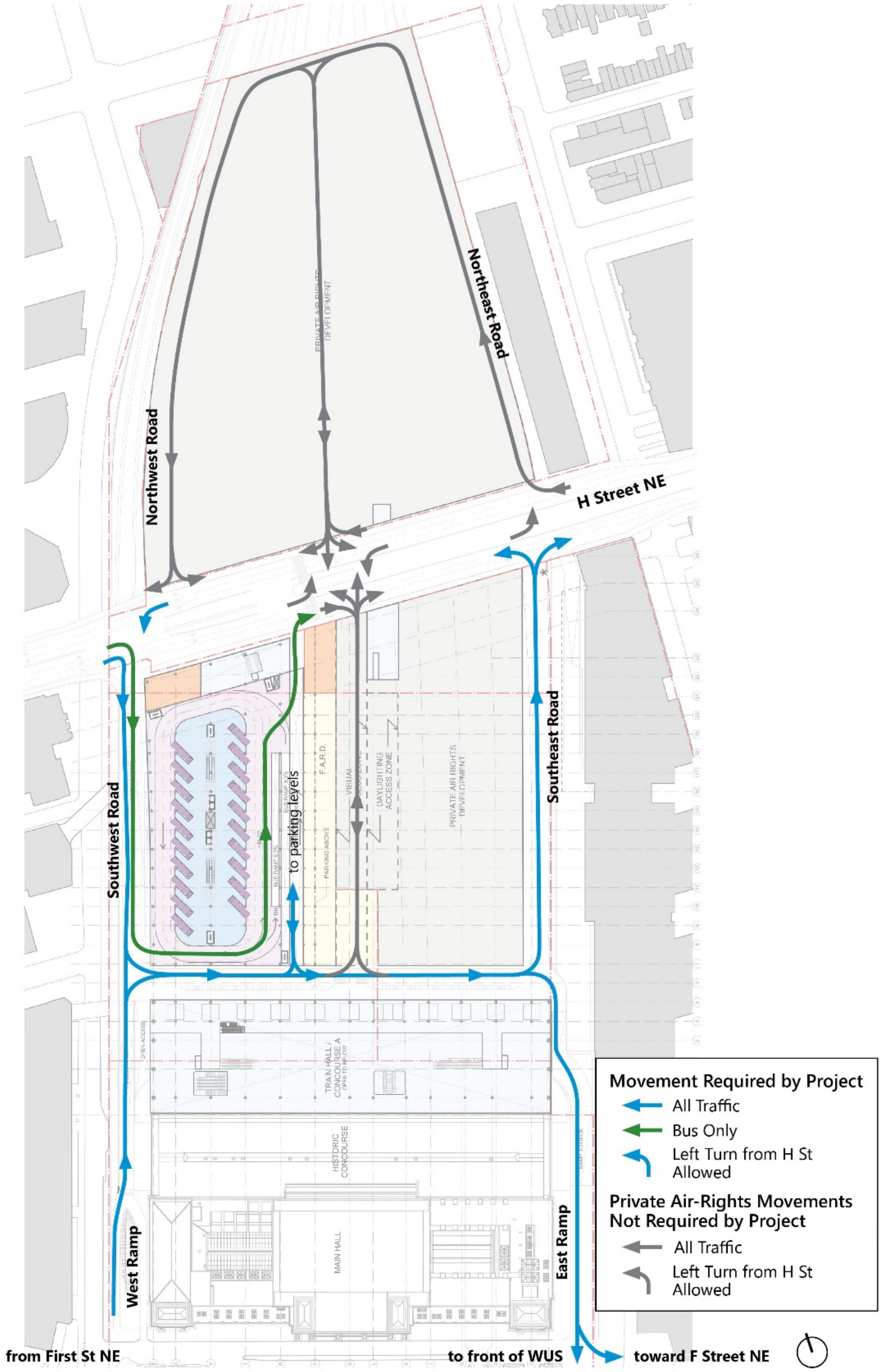
WUS-related vehicular activity in Alternative A-C would be primarily distributed across four locations:

- The pick-up and drop-off loop at the front of WUS;
- The new bus facility and new deck-level pick-up and drop-off location accessed from H Street NE;
- The new curbside pick-up and drop-off location on First Street NE (serving the new H Street Concourse); and
- The new curbside pick-up and drop-off locations on 2nd Street NE (serving the new H Street Concourse).

Parking and rental car activity would converge onto H Street NE to reach the parking facility. Private and for-hire pick-up and drop-off activity would be spread across all four locations. Approximately 70 percent of WUS-related traffic would travel to and from points west of WUS and 30 percent to and from points east. Deck-level circulation in Alternative A-C is represented in **Figure 5-21**. [86]

[86] Figure 5-21 shows all movements, including those assumed in consultation with DDOT for the private air-rights development, to provide a better understanding of anticipated traffic operations on the H Street Bridge. Arrows indicate movements, not planned street alignments.

Figure 5-21. Deck Level Circulation (All Movements), Alternative A-C



Compared to the No-Action Alternative, Alternative A-C would generate 2,364 additional AM peak-hour trips (228 percent increase) and 1,858 additional PM peak trips (86 percent increase). These volume increases would result in major adverse impacts to traffic operations at some study intersections.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would generate 2,776 additional AM peak trips (236 percent increase) and 2,407 additional PM peak trips (116 percent increase).[87]

Curbside Analysis

The anticipated for-hire and private pick-up and drop-off activity at the front of WUS would create conflicts and queueing. At the H Street deck level, queueing analysis indicates that the approximately 550 feet of curbside space adjacent to the east-west train hall would accommodate for-hire vehicles and private pick-up and drop-off without spill-back onto H Street NE. No queue would form at the First Street or 2nd Street pick-up and drop-off areas. On First Street NE, there would be 266 pick-ups and drop-offs in the AM peak and 232 in the PM peak. On 2nd Street NE, there would be 77 pick-up and drop-offs in the AM peak and 65 in the PM peak.

Intersection Analysis

As with all Action Alternatives, three indicators were used to assess the impacts of Alternative A-C on traffic operations relative to the No-Action Alternative: degradation of intersection LOS to F due to vehicle trips generated by the Project; an increase in average vehicle delay at an intersection of more than 5 seconds; and an increase in 95th-percentile queue lengths of more than 150 feet for any lane group. **Table 5-59** identifies the study intersections that would experience an impact relative to the No-Action Alternative under any of these three indicators.

Figure 5-22 shows the peak hour LOS for the study intersections. In Alternative A-C, five intersections out of 35 would degrade to LOS F during at least one peak hour relative to the No-Action Alternative.

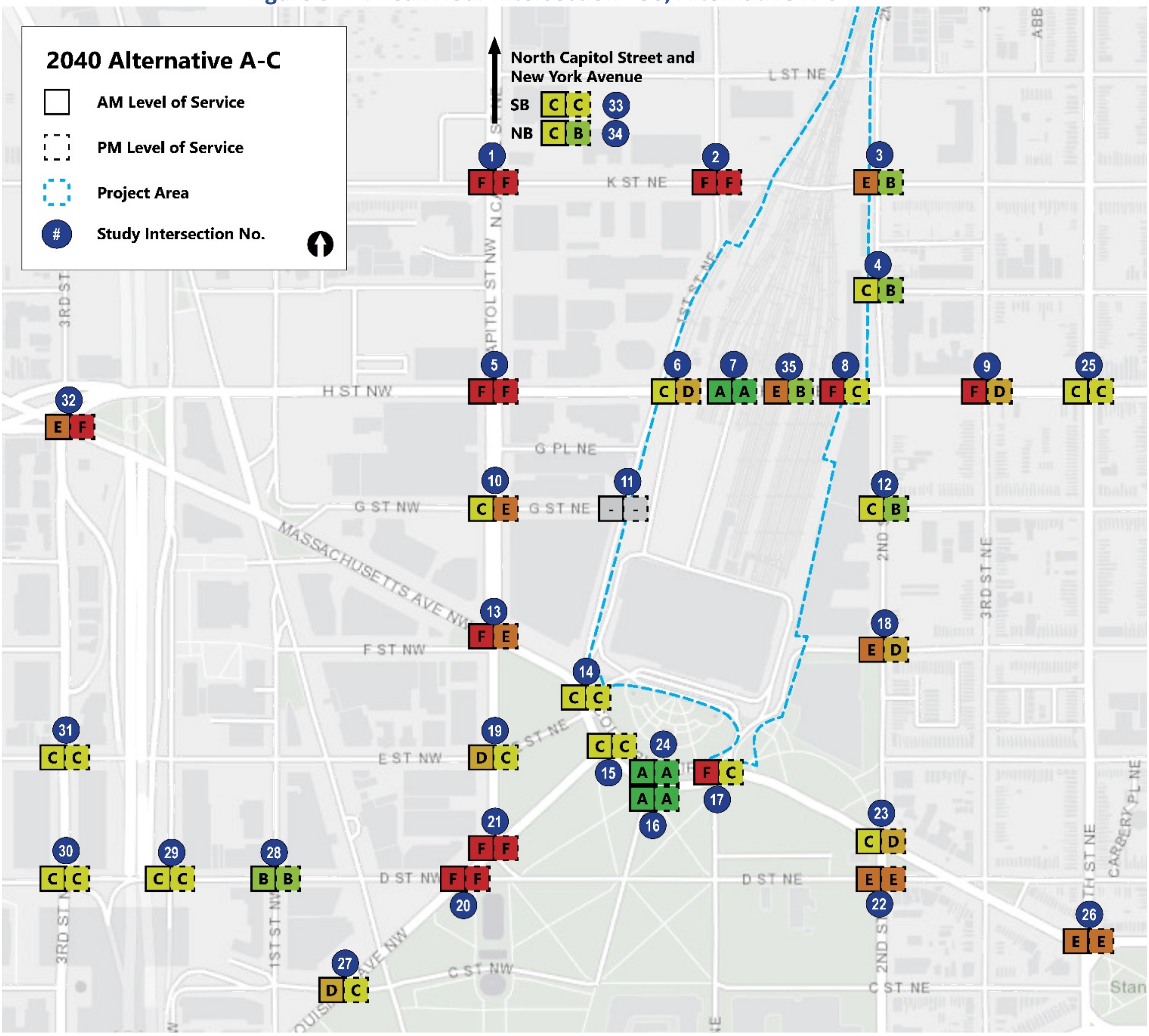
[87] See **Section 5.5.7.1**, *Direct Operational Impacts, Vehicular Traffic* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Table 5-59. Summary of Traffic Impacts, Alternative A-C

Intersection #	Intersection Name	LOS	Queuing	Delay
1	North Capitol Street / K Street	X	X*	X*
2	First Street / K Street NE	X	X*	X
3	2nd Street / K Street NE			X
5	North Capitol Street / H Street		X*	X*
6	WUS West Intersection / H Street NE		X*	X
8	WUS East Intersection / H Street NE		X*	X*
9	3rd Street / H Street NE		X	X*
10	North Capitol Street / G Street		X*	X*
13	North Capitol Street / Massachusetts Ave	X	X	X*
14	Massachusetts Ave / E Street / First Street NE		X*	
17	First Street / Massachusetts Avenue NE	X	X	X*
18	2nd Street / F Street NE			X*
19	North Capitol Street / E Street		X	X
20	Louisiana Avenue / D Street NW	X	X*	X*
21	Louisiana Avenue / North Capitol Street			X*
22	2nd Street / D Street NE		X*	X*
23	2nd Street / Massachusetts Avenue NE		X	X
25	4th Street / H Street NE			X
26	Massachusetts Avenue / C Street / 4th Street NE		X*	X*
27	Louisiana Avenue / C Street NW		X*	X*
30	3rd Street / I-395 On-ramp / D Street NW		X	
31	3rd Street / E Street NW		X*	X*
32	3rd Street / Massachusetts Avenue / H Street NW			X*
35	WUS Central Intersection / H Street NE		X*	X*

* indicates the impact would occur in both peak hours.

Figure 5-22. Peak Hour Intersection LOS, Alternative A-C



Nineteen intersections would experience an increase in queue length of more than 150 feet for one or more lane groups relative to the No-Action Alternative. Of these, 13 would experience such a queue increase in both peak hours.

Twenty-two intersections would experience increased delays relative to the No-Action Alternative of more than 5 seconds in at least one peak period. Sixteen would see such delay increases in both peak hours.

Comparison to Existing Conditions

Relative to existing conditions, in Alternative A-C:[88]

- Nine intersections would degrade to LOS F in at least one peak period.
- Twenty-four intersections would experience an increase in queue length of more than 150 feet for one or more lane groups, with 20 doing so in both peak hours.
- Twenty-two intersections would experience increased delays of more than 5 seconds, with 17 doing so in both peak hours.

Indirect Operational Impacts

Alternative A-C would have minor adverse indirect operational impacts on multimodal transportation because of the trips generated by the potential Federal air-rights development.

In Alternative A-C, around 380,000 square feet of Federal air rights would be potentially available for development separately from the Project. For the purposes of the transportation analysis, it was conservatively assumed that this space would be used for office space.

Table 5-60 shows the multimodal trips the Federal air-rights development would generate under this assumption. Vehicular trips were considered in the traffic impact analysis. The Federal air-rights development would add trips to other local transportation modes as well, an adverse impact. The number of additional trips would be typical of an office space development of its size. The development would be of relatively modest size in Alternative A-C and its impacts on transportation demand would be minor.

[88] See **Section 5.5.7.1**, *Direct Operational Impacts, Vehicular Traffic* in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report* for existing conditions data.

Table 5-60. Federal Air-rights Development Trip Generation, Alternative A-C

	AM Peak			PM Peak		
	Total Trips	Inbound	Outbound	Total Trips	Inbound	Outbound
Parking	121	117	4	115	19	96
Private Pick-Up/Drop-Off	0	0	0	0	0	0
For-hire Vehicles	9	8	1	8	1	7
Car Rental	0	0	0	0	0	0
Amtrak Express	5	5	0	5	1	4
Amtrak Corridor	0	0	0	0	0	0
MARC	66	64	2	63	10	53
VRE	38	37	1	36	6	30
Metrorail	142	138	4	136	22	114
Streetcar	14	14	0	13	2	11
City/Commuter Bus	29	28	1	27	4	23
Pedestrian	47	46	1	45	7	38
Bicycle	47	46	1	45	7	38

Construction Impacts

With regard to construction, Alternative A-C would be very similar to Alternative A, placing similar elements in similar locations (bus facility and above-ground parking southwest of H Street NE) and involving the same depth of excavation. Therefore, the anticipated construction period would be the same (11 years and 5 months) and impacts would be as described for Alternative A in **Section 5.5.4.2**, *Alternative A, Construction Impacts*.

5.5.5 Comparison of Alternatives

Each Action Alternative entails some level of impact to the multimodal transportation network in the Local Study Area relative to the No-Action Alternative. **Table 5-61** summarizes the intensity of the potential impacts by mode for each Action Alternative relative to the Existing Conditions and the No-Action Alternative. **Table 5-62** provides more detailed information and estimates.

5.5.6 Avoidance, Minimization and Mitigation Evaluation

The transportation impacts analysis identified a series of potential impacts that may require actions that would avoid, minimize, or mitigate these impacts. **Table 5-63** lists avoidance, minimization, and mitigation actions FRA is considering for each type of potential impact.

Table 5-61. Comparison of Alternatives, Transportation

Mode	Type of Impact	No-Action Alternative	Action Alternative A	Action Alternative B	Action Alternative C	Action Alternative D	Action Alternative E	Alternative A-C (Preferred)
Commuter and Intercity Railroads	Direct Operational	Major adverse impact	Major beneficial impact					
	Construction	N/A	Moderate adverse impact					
WMATA Metrorail	Direct Operational	Moderate adverse Impact						
	Construction	N/A	Moderate adverse impact					
DC Streetcar	Direct Operational	Minor beneficial impact						
	Construction	N/A	Moderate adverse impact					
Intercity, Tour/Charter, and Sightseeing Buses	Direct Operational	Major adverse impact	Negligible (hop-on/hop-off buses) or moderate (all others) adverse impact					
	Construction	N/A	Major adverse impact		East Option: Minor adverse impact West Option: Major adverse impact	Major adverse impact		
Loading	Direct Operational	No Impact	No impact					
	Construction	N/A	Major adverse impact					
Pedestrians	Direct Operational	Major Adverse Impact	Major beneficial (inside WUS) and minor adverse (outside WUS) impacts		Moderate beneficial (inside WUS) and minor adverse (outside WUS) impacts		Major beneficial (inside WUS) and minor adverse (outside WUS) impacts	
	Construction	N/A	Moderate adverse impact					
Bicycle Activity	Direct Operational	Moderate Adverse Impact	Minor beneficial impact	Minor adverse impact				Minor beneficial impact
	Construction	N/A	Major adverse impact					
City and Commuter Buses	Direct Operational	Moderate Adverse Impact	Minor adverse impact					
	Construction	N/A	Negligible adverse impact	Minor adverse impact				Negligible adverse impact
Employee Shuttles	Direct Operational	No Impact	Moderate adverse impact					
	Construction	N/A	Moderate adverse impact					
Vehicular Parking	Direct Operational	No Impact	Moderate adverse impact	Minor adverse impact	Moderate adverse impact	Moderate adverse impact	Minor adverse impact	Moderate adverse impact
	Construction	N/A	Major adverse impact					
Rental Cars	Direct Operational	Minor Adverse Impact	Minor beneficial impact					
	Construction	N/A	Major adverse impact					
For-hire Vehicles	Direct Operational	Major Adverse Impact	Moderate beneficial (facilities) and major adverse (traffic congestion) impacts		Moderate beneficial (facilities) and moderate adverse (traffic congestion) impacts			
	Construction	N/A	Major adverse impact					
Private Pick-up/Drop-off	Direct Operational	Major Adverse Impact	Moderate beneficial (facilities) and major adverse (traffic congestion) impacts		Moderate beneficial (facilities) and moderate adverse (traffic congestion) impacts			
	Construction	N/A	Moderate adverse impact					
Vehicular Traffic	Direct Operational	Major adverse impact						
	Construction	N/A	Major adverse impact					
All Modes	Indirect Operational	N/A	Minor adverse impact	Moderate adverse impact				Minor adverse impact

Table 5-62. Detailed Comparison of Alternatives

Mode	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
Direct Operational Impacts							
Commuter and Intercity Railroads	Major adverse impact: constraint on ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.	Major beneficial impact: ability to accommodate ridership growth.
Amtrak							
Daily Train Volume	144	288	288	288	288	288	288
Peak Train Volume	17	20	20	20	20	20	20
Daily Ridership	21,800	32,000	32,000	32,000	32,000	32,000	32,000
Private Cars	Storage Available.	Storage Available.	Storage Available.	Storage Available.	Storage Available.	Storage Available.	Storage Available.
MARC							
Daily Train Volume	106	250	250	250	250	250	250
Peak Train Volume	15	34	34	34	34	34	34
Daily Ridership	37,900	70,700	70,700	70,700	70,700	70,700	70,700
VRE							
Daily Train Volume	34	92	92	92	92	92	92
Peak Train Volume	4	16	16	16	16	16	16
Daily Ridership	4,900	13,600	13,600	13,600	13,600	13,600	13,600
WMATA Metrorail	Moderate adverse impact due to capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.	Moderate adverse impact due to increased capacity exceedance.
AM V/C Arriving at WUS from Glenmont	80%	83%	83%	83%	83%	83%	83%
AM V/C Leaving WUS toward Shady Grove	86%	103%	102%	103%	103%	102%	103%
Excess Passengers Shady Grove	0	469	400	444	448	422	444
PM V/C Arriving at WUS from Shady Grove	107%	115%	115%	115%	115%	115%	115%
PM V/C Leaving WUS toward Glenmont	91%	92%	92%	92%	92%	92%	92%
Excess Passengers Glenmont	1,110	2,421	2,421	2,421	2,421	2,421	2,421
DC Streetcar	Moderate beneficial impact from additional ridership and minor adverse impact from new intersections.	Moderate beneficial impact from additional ridership within capacity.	Moderate beneficial impact from additional ridership within capacity.	Moderate beneficial impact from additional ridership within capacity.	Moderate beneficial impact from additional ridership within capacity.	Moderate beneficial impact from additional ridership within capacity.	Moderate beneficial impact from additional ridership within capacity.
V/C Eastbound AM(PM) Arriving at WUS	15% (20%)	18% (31%)	18% (31%)	18% (31%)	18% (31%)	18% (31%)	18% (31%)
V/C Eastbound AM(PM) Leaving WUS	33% (27%)	42% (42%)	42% (42%)	42% (42%)	42% (42%)	42% (42%)	42% (42%)
V/C Westbound AM (PM) Arriving at WUS	50% (17%)	65% (25%)	65% (25%)	65% (25%)	65% (25%)	65% (25%)	65% (25%)
V/C Westbound AM (PM) Leaving WUS	32% (7%)	50% (8%)	50% (8%)	50% (8%)	50% (8%)	50% (8%)	50% (8%)

Mode	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
Intercity, Tour/Charter, and Sightseeing Buses	Major adverse impact on bus passenger facilities' ability to accommodate projected increases in users.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.	Moderate adverse impact on intercity and tour/charter bus operations because of the new 30-minute time limit for buses at WUS. Negligible adverse impact on hop-on/hop-off sightseeing buses as a result of relocation to G Street NE.
Peak-hour Bus Trips AM (PM)	28 (39)	50 (67)	50 (67)	50 (67)	50 (67)	50 (67)	50 (67)
Loading	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.	No impact due to sufficient loading capacity.
Pedestrians	Major adverse impact due to increased volumes in and out of WUS.	Major beneficial impact inside and minor adverse impact outside of WUS.	Major beneficial impact inside and minor adverse impact outside of WUS.	Moderate beneficial impact inside and minor adverse impact outside of WUS.	Moderate beneficial impact inside and minor adverse impact outside of WUS.	Major beneficial impact inside and minor adverse impact outside of WUS.	Major beneficial impact inside and minor adverse impact outside of WUS.
Peak Interior Volumes AM (PM)	47,703 (61,646)	71,734 (92,356)	71,734 (92,356)	71,734 (92,356)	71,734 (92,356)	71,734 (92,356)	71,734 (92,356)
Peak Exterior Volumes AM (PM)	11,123 (10,819)	17,938 (16,766)	17,938 (16,766)	17,938 (16,766)	17,938 (16,766)	17,938 (16,766)	17,938 (16,766)
Bicycle Activity	Moderate adverse impact from increased volumes with no change to facilities. No impact to existing bicycle facilities.	Minor beneficial impact from added storage and parking capable of accommodating increased bicycle volumes, though increased conflicts would partially offset benefits.	Minor adverse impact from conflicts on First and K Street NE. Adverse impact partially offset by added storage and parking capable of accommodating increased bicycle volumes.	Minor adverse impact from conflicts on First and K Street NE. Adverse impact partially offset by added storage and parking capable of accommodating increased bicycle volumes.	Minor adverse impact from conflicts on First and K Street NE. Adverse impact partially offset by added storage and parking capable of accommodating increased bicycle volumes.	Minor adverse impact from conflicts on First and K Street NE. Adverse impact partially offset by added storage and parking capable of accommodating increased bicycle volumes.	Minor beneficial impact from added storage and parking capable of accommodating increased volumes, though increased conflicts would partially offset benefits.
Peak Activity AM (PM)	207 (241)	285 (301)	285 (301)	285 (301)	285 (301)	285 (301)	285 (301)
City and Commuter Buses	Moderate adverse impact from overcrowding of some routes and increases in traffic congestion.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.	Minor adverse impact from incrementally greater overcrowding of some routes and traffic congestion. Moderate impacts on some employee shuttle.
V/C AM/PM (All Buses)	54% (48%)	65% (54%)	65% (54%)	65% (54%)	65% (54%)	65% (54%)	65% (54%)
Over Capacity Routes	All 16	All 16	All 16	All 16	All 16	All 16	All 16
Vehicular Parking and Rental Cars	No impact on parking. Minor adverse impacts on rental car operations from increased activity with same facilities.	Moderate adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.	Minor adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.	Moderate adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.	Moderate adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.	Minor adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.	Moderate adverse impact from loss of parking capacity. Minor beneficial adverse impacts on rental car operation because of new facility.
Change in Parking Capacity	0	-700	-450	- 800 (East Option) - 840 (West Option)	-800	-450	-850
Peak-hour Parking Trips AM (PM)	189 (299)	277 (310)	321 (355)	262 (294)	262 (294)	321 (355)	277 (310)
Peak-hour Rental Car Trips AM (PM)	46 (45)	105 (92)	105 (92)	105 (92)	105 (92)	105 (92)	105 (92)

Mode	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
For-hire Vehicles	Major adverse impact from increased volumes with no change to infrastructure.	Moderate beneficial impact from more location to accommodate increased volumes. Major adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Major adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.
Peak-hour For-hire trips AM (PM)	524 (862)	1,928 (2,068)	1,936 (2,074)	1,924 (2,064)	1,924 (2,064)	1,936 (2,074)	1,928 (2,068)
Private Pick-up/Drop-off	Major adverse impact from increased volumes with no change to infrastructure.	Moderate beneficial impact from more location to accommodate increased volumes. Major adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Major adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.	Moderate beneficial impact from more location to accommodate increased volumes. Moderate adverse impact from traffic congestion.
Peak-hour Private Pick-up/Drop-off AM (PM)	872 (948)	1,684 (1,540)	1,696 (1,546)	1,694 (1,548)	1,694 (1,548)	1,696 (1,546)	1,684 (1,540)
Vehicular Traffic	Major adverse impact to traffic operations relative to existing conditions. Six intersections degrading to F during at least on peak hour; 21 intersections experiencing increases in queue length of more than 150 feet; 18 intersections experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Seven intersections degrading to F during at least on peak hour; 16 intersections experiencing increases in queue length of more than 150 feet; 20 intersections experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Four intersections degrading to F during at least on peak hour; 15 intersections experiencing increases in queue length of more than 150 feet; 21 intersections experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Five (East Option) or four (west Option) intersections degrading to F during at least on peak hour; 19 (East Option) or 21 (West Option) intersections experiencing increases in queue length of more than 150 feet; 21 (East Option) or 20 (West Option) experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Four intersections degrading to F during at least on peak hour; 14 intersections experiencing increases in queue length of more than 150 feet; 20 intersections experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Four intersections degrading to F during at least on peak hour; 16 intersections experiencing increases in queue length of more than 150 feet; 20 intersections experiencing average delay increases of more than 5 seconds.	Major adverse impact to traffic operations relative to No-Action. Five intersections degrading to F during at least on peak hour; 19 intersections experiencing increases in queue length of more than 150 feet; 22 intersections experiencing average delay increases of more than 5 seconds.
Peak-hour Traffic Volumes AM (PM)	1,631 (2,154)	3,994 (4,010)	4,058 (4,067)	3,985 (3,998)	3,985 (3,998)	4,058 (4,067)	3,994 (4,010)
Indirect Operational Impacts							
Potential Federal Air-Rights Development		Minor adverse impact from generated activity.	Moderate adverse impact from generated activity.	Moderate adverse impact from generated activity.	Moderate adverse impact from generated activity.	Moderate adverse impact from generated activity.	Minor adverse impact from generated activity.
Size of Federal Air-rights Development (Square Feet)		323,720	917,420	952,600	688,050	688,050	380,000
Peak-hour Vehicular Trips AM (PM)		180 (180)	307 (302)	318 (313)	244 (232)	244 (232)	130 (123)
Peak-hour Combined Rail and Transit Trips AM (PM)		0	588 (629)	609 (653)	443 (469)	443 (469)	294 (280)
Construction Impacts							
Intercity and Commuter Railroads		Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [2 years 5 months]) and delays (maximum of 18.5 minutes in Phase 2).	Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [3 years]) and delays (maximum of 18.5 minutes in Phase 2).	Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [2 years 4 months]) and delays (maximum of 18.5 minutes in Phase 2).	Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [2 years 4 months]) and delays (maximum of 18.5 minutes in Phase 2).	Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [3 years]) and delays (maximum of 18.5 minutes in Phase 2).	Moderate adverse impacts due to limited train cancellations (maximum of 8 in Phase 2 [2 years 5 months]) and delays (maximum of 18.5 minutes in Phase 2).

Mode	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
WMATA Metrorail		Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (3 years 1 month).	Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (4 years 11 months).	Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (4 years).	Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (4 years).	Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (4 years 11 months).	Moderate adverse impacts to Red Line operations due to delays or intermittent stoppages on evenings and weekends during Phase 4 (3 years and 1 month).
DC Streetcar		Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.	Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.	Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.	Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.	Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.	Moderate adverse impact from temporary losses of direct access from WUS. H Street closure possible but unlikely.
Intercity, Tour/Charter, and Sightseeing Buses		Major adverse impacts in Phase 4 (3 years 1 month) between the demolition of the existing facility and completion of the new one.	Major adverse impacts in Phase 4 (4 years 11 months) between the demolition of the existing facility and completion of the new one.	East Option: Minor adverse impacts in Phase 4 (4 years) until completion of the pick-up and drop-off area. West Option: Major adverse impacts in Phase 4 (4 years) between the demolition of the existing facility and completion of the new one.	Major adverse impacts in Phase 4 (4 years) between the demolition of the existing facility and completion of the new one.	Major adverse impacts in Phase 4 (4 years 11 months) between the demolition of the existing facility and completion of the new one.	Major adverse impacts in Phase 4 (3 years 1 month) between the demolition of the existing facility and completion of the new one.
Loading		Major adverse impacts from closure of the west dock in Phase 4 (3 years 1 month).	Major adverse impacts from closure of the west dock in Phase 4 (4 years 11 months).	Major adverse impacts from closure of the west dock in Phase 4 (4 years).	Major adverse impacts from closure of the west dock in Phase 4 (4 years).	Major adverse impacts from closure of the west dock in Phase 4 (4 years 11 months).	Major adverse impacts from closure of the west dock in Phase 4 (3 years 1 month).
Pedestrians		Moderate adverse impacts from disruption of interior and exterior spaces.	Moderate adverse impacts from disruption of interior and exterior spaces.	Moderate adverse impacts from disruption of interior and exterior spaces.	Moderate adverse impacts from disruption of interior and exterior spaces.	Moderate adverse impacts from disruption of interior and exterior spaces.	Moderate adverse impacts from disruption of interior and exterior spaces.
Bicycle Activity		Major adverse impact during reconstruction of First Street cycle track.	Major adverse impact during reconstruction of First Street cycle track.	Major adverse impact during reconstruction of First Street cycle track.	Major adverse impact during reconstruction of First Street cycle track.	Major adverse impact during reconstruction of First Street cycle track.	Major adverse impact during reconstruction of First Street cycle track.
City and Commuter Buses		Negligible adverse impact. H Street closure is unlikely.	Minor adverse impacts on K Street bus routes during construction of the below-ground parking entrance.	Minor adverse impacts on K Street bus routes during construction of the below-ground parking entrance.	Minor adverse impacts on K Street bus routes during construction of the below-ground parking entrance.	Minor adverse impacts on K Street bus routes during construction of the below-ground parking entrance.	Negligible adverse impact. H Street closure is unlikely.
Vehicular Parking and Rental Cars		Major adverse impact on parking in Phase 4 (3 years 1 month) between the demolition of the existing parking garage and the completion of the new parking facility.	Major adverse impact on parking in Phase 4 (4 years 11 months) between the demolition of the existing parking garage and the completion of the new parking facility.	East Option: Major adverse impact on parking in Phase 4 (4 years) between the demolition of the existing parking garage and the completion of the below-ground parking facility. West Option: Major adverse impact on parking in Phase 4 (4 years) between the demolition of the existing parking garage and the new parking facilities.	Major adverse impact on parking in Phase 4 (4 years) between the demolition of the existing parking garage and the completion of the new parking facilities.	Major adverse impact on parking in Phase 4 (4 years 11 months) between the demolition of the existing parking garage and the completion of the new parking facilities.	Major adverse impact on parking in Phase 4 (3 years 1 month) between the demolition of the existing parking garage and the completion of the new parking facility.
For-hire Vehicles		Major adverse impacts from loss of queuing space.	Major adverse impacts from loss of queuing space.	Major adverse impacts from loss of queuing space.	Major adverse impacts from loss of queuing space.	Major adverse impacts from loss of queuing space.	Major adverse impacts from loss of queuing space.

Mode	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C
Private Pick-up/Drop-off		Moderate adverse impacts due to temporary lane closures.	Moderate adverse impacts due to temporary lane closures.	Moderate adverse impacts due to temporary lane closures.	Moderate adverse impacts due to temporary lane closures.	Moderate adverse impacts due to temporary lane closures.	Moderate adverse impacts due to temporary lane closures.
Vehicular Traffic		Major adverse impacts from roads closures and construction traffic.	Major adverse impacts from roads closures and construction traffic.	Major adverse impacts from roads closures and construction traffic.	Major adverse impacts from roads closures and construction traffic.	Major adverse impacts from roads closures and construction traffic.	Major adverse impacts from roads closures and construction traffic.

Table 5-63. Potential Mitigation

Mode	Impact	Proposed Responsible Party[1]	Recommended Action
All Modes - Construction	All construction impacts on transportation	Proponents	Proponents to require the construction contractor to prepare an integrated Construction Transportation Management Plan defining the measures to be implemented by the construction contractor to avoid, minimize, or mitigate impacts from construction on all transportation modes in each phase of construction, along with procedures to enforce, monitor, and evaluate these measures.
Amtrak – Construction	During construction, up to two Amtrak trains may be canceled daily.	Amtrak	No mitigation is available.
MARC – Construction	During construction, up to 4 MARC trains may be canceled daily.	Amtrak	Amtrak to coordinate with MARC on alternative service options for affected MARC passengers, including the honoring of MARC tickets on alternative services.
VRE - Construction	During construction, up to 2 VRE trains may be canceled daily.	Amtrak	Amtrak to coordinate with VRE on alternative service options for affected VRE passengers, including the honoring of VRE tickets on alternative services.
Metrorail	Increase in passenger volumes would have moderate impact on passenger circulation at WUS WMATA Station.	Proponents	Proponents to contribute to improvements identified in WMATA's Station Access and Capacity Study that have not been addressed by the Concourse Modernization Project or by WMATA by the time of implementation.
Metrorail	Increase in passenger volumes would contribute to capacity issues on WMATA Red Line.	Proponents	Proponents to coordinate with WMATA about regional efforts to increase mainline capacity along the Red Line.
Metrorail - Construction	During construction Phase 4, temporary schedule adjustments or intermittent stoppages may be required on evenings or during weekends.	Proponents	Proponents to coordinate with WMATA on construction approaches that would minimize delays and stoppages on the Red Line.

Mode	Impact	Proposed Responsible Party[1]	Recommended Action
DC Streetcar – Construction	During construction, activities may block direct access from Streetcar station to WUS facilities.	Proponents	Proponents to coordinate with DDOT on options for temporary Streetcar station access during construction. Proponents to take steps with the District State Safety Office to address issues that may affect Streetcar certification.
Intercity Bus	Active management approach may adversely affect intercity bus operations due to 30-minute timeframe limit during peak hour.	USRC	USRC to develop Bus Facility Operations Plan in concert with intercity and tour/charter operators. USRC to work with DDOT and DCOP on strategies to address potential off-site bus layover activities.
Intercity Bus	Active management approach may have impact on tour/charter bus parking needs within the District.	USRC	USRC to coordinate with DDOT on strategy to address bus parking capacity loss associated with the Project.
Intercity Bus	In Alternative C-East Option, the distance between the bus facility and WMATA or the front of WUS would be substantially increased.	USRC	In Alternative C-East Option, Proponents to refine facility design to ensure that the connection among the different destinations is entirely covered or within the concourse environments of WUS.
Intercity Bus - Construction	In all Action Alternatives except Alternative C East Option, bus service would not be accommodated at WUS during Phase 4 of construction.	USRC	USRC to work with the District to identify a location for an adequately sized interim bus facility or bus loading zones as close to WUS as possible.
Vehicular Parking and Rental Cars – Construction	Loss of parking capacity during Phase 4 of construction.	USRC	USRC to identify adequately sized interim parking facilities outside the Project Area.
Private and For-hire Pick-up and Drop-off	The large increases in pick-up and drop-off volumes are likely to cause major congestion at the designated pickup points, which may also have a moderate impact on pedestrian safety due to conflicts with these vehicles.	USRC	USRC to ensure there is sufficient staffing to monitor traffic levels and ensure safe pedestrian crossing at all designated pick-up and drop-off areas. USRC to coordinate with Metropolitan Police Department (MPD) on enforcement strategies.

Mode	Impact	Proposed Responsible Party[1]	Recommended Action
	Increased traffic volumes may negatively affect pick-up and drop-off operations.		USRC to coordinate with District Department of Public Works and MPD to provide coordinated enforcement of active curb areas along public streets. USRC to coordinate with the District Department of For-Hire Vehicles (DDFHV) to develop regulatory strategies to manage taxis and TNCs' pick-up and drop-off activity at WUS, including a performance-based strategy for reducing impacts. USRC to coordinate with MPD to provide coordinated enforcement to minimize queues on public roadways. USRC to develop, in coordination with DDOT and DDFHV, an advanced vehicle dispatching strategy to distribute taxis and TNCs and maintain consistent queue lengths. USRC to manage, in coordination with DDOT and DDFHV, a regular monitoring program to reduce queues and spillback, particularly onto H Street NE from the deck roadways.
For-hire Pick-up – Construction	During Phase 4 of the construction period, the demolition of the west ramp and back ramp would be unavailable, forcing for-hire vehicles to queue on the southeast road and east ramp. This queue could interfere with traffic operations on the deck.	USRC	USRC to develop a for-hire vehicle plan as part of the integrated Construction Management Plan. The Plan should prioritize maintaining safe traffic operations and distributing pick-ups and drop-offs.
Pedestrian	The large increases in passenger volumes adjacent to WUS may have a moderate impact on pedestrian crossing and queueing conditions.	USRC	USRC to coordinate with DDOT to adjust signal timings to provide sufficient crossing time for pedestrians exiting the front of WUS and to pursue opportunities to provide enhanced pedestrian accommodations at the front of WUS.

Mode	Impact	Proposed Responsible Party[1]	Recommended Action
			USRC to coordinate with DDOT on additional pedestrian safety infrastructure measures.
Bicycle – Construction	Work on First Street NE would disrupt use of the Cycle track during parts of the construction period.	USRC	USRC to coordinate with DDOT on appropriate bicycle accommodations and wayfinding plan, to direct bicyclists to 2nd Street shared use path portion of Metropolitan Branch Trail.
Bicycle – Operations	Conflicts between bicycles, pedestrians, and vehicles on the First Street cycle track.	USRC	USRC to coordinate with DDOT on appropriate bicycle facilities and strategies to reduce conflicts among bicyclists, pedestrians, and vehicles.
Hop-on/Hop-off Sightseeing Buses	Movement of hop-on/hop-off sightseeing buses from front of WUS.	USRC	USRC to provide enhanced facilities at new G Street hop-on/hop-off bus location and to work with DDOT to provide an enhanced pedestrian connection to WUS entrances.
Employee Shuttles	Loss of spaces for employee shuttles.	USRC	USRC to coordinate with USCIS and Gallaudet University to identify new stop locations convenient to WUS.
Vehicular Traffic	Increases in traffic volumes would result in increases in delay and queueing at multiple intersections.	Proponents	Proponents to work with DDOT to identify solutions out of a toolbox of traffic mitigation approaches, including, but not limited to, regular monitoring activities, turn restrictions, alternative intersection phasing, lane reassignment, parking restrictions, and street pattern changes, at the most severely impacted intersections in the study area. Proponents to coordinate with DDOT and WMATA on opportunities to achieve greater core transit capacity through additional lines or services, in order to accommodate a greater mode shift from vehicles to transit. Proponents to coordinate with DDOT on transportation demand management, for-hire, and transit strategies to reduce the total number of 2040 trips by 20%.

Mode	Impact	Proposed Responsible Party[1]	Recommended Action
Truck Traffic-Construction	During excavation, up to 120 daily construction trucks would enter and exit the site.	Proponents	Proponents to incorporate truck traffic plan into the integrated Construction Transportation Management Plan to minimize impacts of truck traffic on residential neighborhoods. Truck traffic plan to be coordinated with DDOT. Affected Advisory Neighborhood Commissions to be given an opportunity to comment on the plan. If possible without major disruptions to train operations, Amtrak to allow for the use of work trains instead of dump trucks to haul away excavation spoil. This approach would substantially eliminate the work trucks associated with excavation. Typical construction truck traffic would be addressed by the integrated Construction Transportation Management Plan.
Indirect Impacts	Potential Federal air-rights development would generate additional vehicular activity.	USRC	USRC to coordinate with DDOT on required transportation demand management practices to reduce traffic activity associated with the development through Comprehensive Transportation Review (CTR) process.

1. Attribution proposed on the basis of each Proponent's area of responsibility. Attribution to "Proponents" means shared or undetermined responsibility. Responsibilities will be finalized along with the mitigation measures.

5.5.7 Permits and Regulatory Compliance

The following regulatory processes are required to implement the transportation elements of the Project:

- Section 4(f) of the Department of Transportation Act of 1966: Chapter 6 of this DEIS contains a draft Section 4(f) evaluation for the Project.
- Amtrak Engineering Requirements: The track and platform plan implemented as part of this Project, as well as any structures that interact with the tracks, platforms, and overhead catenary systems, would need to be approved by Amtrak's Engineering Department.
- DDOT Comprehensive Transportation Review: As a large project located within the District, WUS would complete a Comprehensive Transportation Review with DDOT.
- DDOT Design and Engineering Manual: Designs for public right-of-way must comport with requirements in the Design and Engineering Manual, unless waivers are obtained.
- DC Zoning Commission Review: As part of the expected rezoning of the Federal air-rights development parcel, transportation conditions governing the Federal air-rights development are expected.

The following permits are expected to implement the transportation elements of the Project:

- DDOT permits governing the use of the public right-of-way and creation of roadway access permits[89] would be required, including:
  - Public Space Permit – Construction
  - Public Space Permit - Occupancy
  - Traffic Control Plan for both Construction and Occupancy Permits
- Project Proponents are expected to coordinate with DDOT to obtain necessary permits and permissions through the Transportation Online Permitting System (TOPS).
- The transfer of the H Street underpass right-of-way would be coordinated through the DC Surveyor's Office (DCSO) and the Council of the District of Columbia.
- Utility and maintenance access easements would be coordinated with DDOT, DCSO, and the appropriate utilities.

[89] District Department of Transportation Public Space Permit. Accessed from https://ddot.dc.gov/node/496092. Accessed on March 29, 2020.

- DDOT manuals and guidance would need to be followed in the design and implementation of the transportation elements, including:
    - DDOT DC Temporary Traffic Control Manual
    - DC Streetcar Design Criteria
    - DC Streetcar Utilities Standard of Practice
- WMATA permits governing adjacent construction and service closure would be required. WMATA's *Adjacent Construction Project Manual* outlines the requirements applicable to all projects next to or impacting WMATA facilities.

5.6 Air Quality

This section describes and characterizes potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on air quality. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies potential permitting and regulatory compliance requirements.

5.6.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to air quality are listed in **Section 4.6.1**, *Regulatory Context and Guidance*.

5.6.2 Study Area

As defined in **Section 4.6.2**, *Study Area*, the air quality Local Study Area is the same as the transportation Local Study Area (**Figure 4-3**). The Regional Study Area (**Figure 4-6**) encompasses the jurisdictions that are members of MWCOG.

5.6.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on air quality. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 6.4**, *Methodology*, provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible consistent with the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.6.3.1 Criteria Pollutants and General Conformity

The EPA has established National Ambient Air Quality Standards (NAAQS) for air criteria pollutants as explained in **Section 4.6.4.2**, *Ambient Air Quality*: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter sized 10 micrometers or less (PM_{10}) and 2.5 micrometers or less ($PM_{2.5}$), and lead (Pb). The NAAQS include primary and secondary standards. The primary standards are designed to protect human health, including sensitive populations such as children, the elderly, and persons with respiratory diseases, with an adequate margin of safety. The secondary standards are designed to protect public welfare, damage to property, transportation hazards, economic values, and personal comfort and well-being (see **Section 6.4.1**, *Criteria Pollutants and General Conformity* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report*).

The EPA assesses an area's compliance with the NAAQS by assigning it one of four designations for each criteria pollutant:

- **Attainment** when ambient air concentrations of the pollutant are below the NAAQS.
- **Nonattainment** when ambient air concentrations of the pollutant are above the NAAQS.
- **Maintenance** when an area has recently achieved attainment status after being previously designated as a Nonattainment area.
- **Unclassifiable** when insufficient data exist to assign a designation. Unclassifiable areas are generally treated as Attainment areas.

General Conformity requirements under the Clean Air Act (CAA) ensure that Federal actions in Nonattainment or Maintenance areas do not interfere with a state's plans to attain and maintain the NAAQS. Per these requirements, Federal activities must not cause or contribute to new violations of the NAAQS; not worsen existing violations of the NAAQS; and not delay the attainment of the NAAQS. To determine whether a project meets General Conformity requirements, EPA established *de minimis* thresholds, or amounts of annual emissions a project within a Nonattainment or Maintenance area should not exceed (**Table 5-64**). The EPA has designated the District a Marginal Nonattainment area for the 8-hour O_3 standard in an Ozone Transport Region and a Moderate Maintenance area for CO and $PM_{2.5}$.

5.6.3.2 Operational Impacts

Operational impacts on air quality were analyzed on two scales: microscale analysis for local, direct impacts and mesoscale analysis for regional, indirect impacts.

Microscale Methodology

Microscale analysis determines a project's local impacts on pollutant concentrations. The microscale analysis for the Project had three components: a CO hotspot analysis; a $PM_{2.5}$ hotspot analysis; and a parking facility hotspot analysis for CO emissions. Details on the modeling procedures used to assess microscale impacts are available in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 6.4.2**, *Operational Impacts*. In all three analyses, estimated emissions attributable to the Project were compared to the applicable NAAQS.

- **CO Hotspot Analysis:** This analysis evaluated CO concentrations at the most congested intersections in the Local Study Area. Intersections were ranked based on traffic volumes and level of service (LOS) as determined by the transportation impact analysis documented in **Section 5.5**, *Transportation*. Depending on the analysis, the intersections analyzed included: North Capitol Street and K Street; North Capitol Street and H Street; First Street and K Street; WUS facility access and H Street; and North Capitol Street and Massachusetts Avenue.

Table 5-64. General Conformity *de minimis* Emissions Levels

Pollutant	Tons per Year	Area Type
O_3 (VOC or NO_X)[1]	50	Serious Nonattainment
	25	Severe Nonattainment
	10	Extreme Nonattainment
	100	Other Areas Outside an Ozone Transport Region
O_3 (NO_X)	100	Marginal and Moderate Nonattainment Inside an Ozone Transport Region
	100	Maintenance
O_3 (VOC)	50	Marginal and Moderate Nonattainment Inside an Ozone Transport Region
	50	Maintenance Within an Ozone Transport Region
	100	Maintenance Outside an Ozone Transport Region
CO, SO_2, and NO_2	100	All Nonattainment and Maintenance
PM_{10}	70	Serious Nonattainment
	100	Moderate Nonattainment and Maintenance
$PM_{2.5}$[2]	70	Serious Nonattainment
	100	Moderate Nonattainment and Maintenance
Pb	25	All Nonattainment and Maintenance

Source: EPA, https://www.epa.gov/general-conformity/de-minimis-tables. Accessed June 8, 2019.
1. Volatile organic compounds (VOC) and nitrogen oxides (NO_X) are precursors emissions that combine in the atmosphere to form O_3.
2. Direct emissions, SO_2, NO_X (unless determined not to be a significant precursor), VOC, or ammonia (if determined to be a significant precursor).

- **Particulate Matter Hotspot Analysis:** $PM_{2.5}$ concentrations were evaluated at select intersections in the Local Study Area in accordance with EPA guidance.[1] Intersections that would experience the greatest increase in $PM_{2.5}$ emissions are those frequented by heavy-duty diesel vehicles. For the Project, these intersections were those providing access to the bus facility.
- **Parking Facility Analysis:** Depending on the alternative, a naturally ventilated above-ground parking facility or a mechanically ventilated below-ground parking facility, or both, were considered. Emissions from parking ventilation can combine with emissions from traffic on nearby streets. To assess the resulting potential impacts, the analysis modeled CO concentrations at the near and far sidewalk of the most heavily travelled street adjacent to parking ventilation.

[1] U.S. Environmental Protection Agency. November 2015. *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*. EPA-420-B-15-084.

Microscale analysis also included a qualitative consideration of stationary source emissions. The only Project-related stationary source equipment with direct emissions would be emergency generators and cooling towers, a minor source of emissions. The stationary source analysis for each Action Alternative was based on available information on size and location as well as on applicable regulatory requirements.

Mesoscale Methodology

The mesoscale analysis considered roadway and rail emission sources, including diesel locomotives, motor vehicles, and buses, on a regional level. Details about the modeling procedures used to conduct this analysis are available in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 6.4.2.3**, *Mesoscale Methodology*. The mesoscale analysis had two components:

- **Criteria Pollutant Emissions**: Quantitative estimation of the change in annual area-wide emissions of VOC, NO_X (precursors of O_3), CO, and PM attributable to the Project. Project-related emissions were compared to the applicable *de minimis* thresholds to assess impacts on air quality, in compliance with General Conformity requirements.
- **Mobile Source Air Toxics (MSAT) Emissions:** Qualitative analysis of MSAT emissions, as the Action Alternatives have low potential for MSAT impacts. The analysis considered anticipated volumes, vehicle mix, and routing and speed of traffic as well as future rail activity.

5.6.3.3 Construction Impacts

The duration of construction would exceed five years in all Action Alternatives. To comply with General Conformity requirements, a quantitative modeling of potential peak construction year emissions was performed. Excavation and spoil removal typically are the most emission-intensive construction activities. The analysis considered two spoil removal scenarios: one assuming removal of spoil by dump trucks only (up to 120 trucks per day) and the other one assuming removal by work trains (two work trains a day). The first scenario yields a conservative, maximum emission estimate for all Action Alternatives. The second scenario shows by how much using work trains to haul away spoil could reduce emissions. At this time, the removal method is undetermined.

Other major construction activities considered in the analysis were: support of excavation construction; caisson drilling; pressure slab construction; and overbuild deck construction. In all Action Alternatives, construction would proceed in four phases. Peak-activity emissions in each phase were estimated assuming a worst-case scenario where these activities would all take place within a single calendar year. [2]

5.6.4 Impacts Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on air quality.

5.6.4.1 No-Action Alternative

Direct Operational Impacts

Direct impacts are those resulting from pollutant emissions at a local scale and are assessed through microscale analysis. This section presents the CO and $PM_{2.5}$ hotspot analyses and parking facility analysis for the No-Action Alternative.

The No-Action Alternative includes various station improvement projects but no major changes that would cause significant amounts of new air pollutant emissions at WUS. The private air rights above the rail terminal would be developed, causing increases in local traffic volumes. Traffic volumes in the Local Study Area and railroad operations at WUS would also increase due to background growth in population and future travel demand. There would be changes in local vehicular and locomotive emissions driven by regulation and technology.

Microscale Analysis: CO Hotspot

Relative to existing conditions, in the No-Action Alternative, there would be a minor adverse direct operational impact on air quality from CO emissions. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

All estimated concentrations include background concentrations of 1.7 parts per million (ppm) for the 1-hour averaging period and 1.5 ppm for the 8-hour averaging period. One-hour CO concentrations would range from 1.9 parts per million (ppm) (0.2 ppm above background) to 2.2 ppm (0.5 ppm above background) while 8-hour concentrations would range from 1.6 ppm (0.1 ppm above background) to 1.8 ppm (0.3 ppm above background). All concentrations would be only slightly above background levels and well below the

[2] The quantitative modeling of construction impacts does not include emissions associated with the column removal work, which would be the same in all Action Alternatives. During Phases 1 and 2 of construction, the column removal work would overlap with the excavation and reconstruction of portions of the rail terminal and would contribute additional emissions. However, this work would take place within the historic station building and involve installing temporary supports, removing, and replacing structural elements. These activities are not machine-intensive and would not involve the type of excavation or foundation installation work associated with the reconstruction of the rail terminal. In none of the Action Alternatives are annual emissions in Phases 1 or 2 anticipated to exceed 50 percent of the applicable *de minimis* levels, as documented in this section. Given the small scale of the column removal work, the emissions associated with this work have no potential to result in an exceedance of the *de minimis* in Phase 1 or 2, or during the Intermediate Phase.

applicable NAAQS of 35 ppm for 1-hour concentrations, and 9 ppm for 8-hour concentrations.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to existing conditions, in the No-Action Alternative, there would be a minor adverse direct operational impact on air quality from $PM_{2.5}$. At all modeled receptor locations, $PM_{2.5}$ concentrations would be below the applicable NAAQS.

$PM_{2.5}$ emissions were modeled for the intersections on H Street NE providing access to, and exit from, the existing bus facility. For modeling purposes, receptors were divided into two groups: north of H Street and south of H Street.

All estimates include background concentrations of 22 micrograms per cubic meter (μg/m^3) for the 24-hour averaging period and 9.2 μg/m^3 for the annual averaging period. North of H Street, receptors would experience a maximum 24-hour concentration of 23.6 μg/m^3 (1.6 μg/m^3 above background) and a maximum annual concentration of 9.9 μg/m^3 (0.7 μg/m^3 above background). South of H Street, receptors would experience a maximum 24-hour concentration of 23.4 μg/m^3 (1.4 μg/m^3 above background) and a maximum annual concentration of 10 μg/m^3 (0.8 μg/m^3 above background).

In both locations, concentrations would be below the applicable NAAQS of 35 μg/m^3 for 24-hour and 12 μg/m^3 for annual concentrations. While total concentrations would approach the NAAQS (approximately 69 percent of the 24-hour standard and 83 percent of the annual standard), this would mostly be due to background conditions.

Microscale Analysis: Parking Facility

Relative to existing conditions, in the No-Action Alternative, there would be a minor adverse direct operational impact on air quality from CO near the parking garage. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

The parking facility analysis for the No-Action Alternative considered the existing, naturally ventilated parking garage with projected No-Action Alternative traffic volumes and operations. Passenger vehicles were assumed to travel an average of 1,500 feet in the garage when departing and 1,750 feet when parking. Buses using the terminal were assumed to travel only on the bus deck, for an average distance of 500 feet.

All concentrations include background concentrations of 1.7 ppm for the 1-hour averaging period and 1.5 ppm for the 8-hour averaging period. The maximum CO concentrations would be primarily the result of traffic on H Street NE rather than garage operations. For the near sidewalk, modeled CO concentrations would be 2.1 ppm (0.4 ppm above background) for the 1-hour averaging period and 1.7 ppm (0.2 ppm above background) for the 8-hour averaging period. Concentrations at the far sidewalk would be slightly lower (2.1 ppm). At both locations, modeled concentrations remain well below the NAAQS (35ppm for 1-hour and 9ppm for 8-hour concentrations).

Indirect Operational Impacts

Mesoscale Analysis

Relative to existing conditions, in the No-Action Alternative, reductions in emissions of VOC, NO_X, CO, and $PM_{2.5}$ would result in a beneficial indirect operational impact on air quality.

As shown in **Table 5-65**, regional emissions of VOC, NOX, CO, and $PM_{2.5}$ in the No-Action Alternative would decrease substantially compared to the existing conditions. This is attributable to the anticipated effect of new regulations and improved technology in vehicles and locomotives. PM_{10} emissions would increase relative to existing conditions because of increased vehicular traffic on local streets and emissions generated from brake-and-tire wear.

Table 5-65. Mesoscale Inventory, No-Action Alternative

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	33.9	4.1	63.9	4.4	0.9
Locomotive Emissions	0.9	26.5	12.2	0.5	0.5
Total Emissions	34.8	30.6	76.0	4.8	1.3
Existing Conditions Emissions	62.2	73.0	161.0	4.3	2.1

Construction Impacts

Construction of the projects included in the No-Action Alternative would cause air pollutant emissions. Available information on methods and schedules of construction is insufficient to quantify and characterize impacts on air quality.

The construction of the private air-rights development, replacement of the H Street Bridge, and other projects included in the No-Action Alternative would generate emissions of air criteria pollutants. Primary sources would include construction equipment and heavy machinery exhaust as well as ground disturbing activities. The total annual amount of emissions would depend on equipment and vehicle types as well as on the schedule of each project. This information is not currently available, precluding the development of quantitative estimates.

5.6.4.2 Alternative A

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative A, there would be a minor adverse direct operational impact on air quality due to small increases in CO concentrations. At all

modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

In Alternative A, total 1-hour CO concentrations at modeled locations would range from 2.0 ppm (0.3 ppm above background) to 2.3 ppm (0.5 ppm above background). Eight-hour concentrations would range from 1.7 ppm (0.2 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Comparing total emissions in Alternative A to emissions in the No-Action Alternative shows the amount of emission specifically due to the Project. In Alternative A, changes in concentrations of no more than 0.2 ppm would occur for the 1-hour averaging time. For the 8-hour averaging time, emissions would increase by no more than 0.1 ppm. All concentrations would remain well below the applicable NAAQS of 35 ppm for 1-hour and 9 ppm for 8-hour concentrations.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative A, there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

In Alternative A, the modeled intersections were the H Street NE entrance and exit from the new bus facility. North of H Street NE, receptors would experience a maximum 24-hour concentration of 23.7 $\mu g/m^3$ (1.7 $\mu g/m^3$ above background) and a maximum annual concentration of 10.0 $\mu g/m^3$ (0.8 $\mu g/m^3$ above background). South of H Street, concentrations would be the same.

Compared to the No-Action Alternative estimates, in Alternative A there would be an increase in maximum concentrations of 0.1 $\mu g/m^3$ for both the 24-hour averaging time and the annual averaging time. In both modeled locations, emission levels would be below the applicable NAAQS. While total concentrations would approach the NAAQS of 35 for 24-hour and 12 for annual concentrations (approximately 68 percent of the 24-hour standard and 83 percent of the annual standard), this would mostly be due to background levels.

Microscale Analysis: Parking Facility Analysis

Relative to the No-Action Alternative, in Alternative A, there would be a minor adverse direct operational impact on air quality near the parking facility due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

The microscale parking facility analysis for Alternative A considered the operation of the proposed bus facility and parking facility along with projected future traffic volumes and operations for Alternative A. The bus facility would be where the existing garage currently stands and buses would enter and exit through H Street NE. Parking would be on several levels above the bus facility, with vehicle access via H Street NE. Emissions from vehicles travelling on H Street NE were included in the analysis.

CO concentrations were evaluated at receptor locations on the near and far sidewalks adjacent to the parking facility on H Street NE. These locations would experience the highest CO concentrations because they are near both the facility and the heavily travelled H Street Bridge. A car's average path through the parking facility was assumed to be 5,475 feet when departing and 5,725 feet when parking, based on the planned dimensions of the facility and assuming an equal distribution of users across the parking levels. Buses using the facility were assumed to travel only on the bus deck with an average path length of 630 feet inbound and 630 feet outbound.

On the near and far sidewalk, modeled CO concentrations would be 2.2 ppm for the 1-hour averaging period (0.5 ppm above background) and 2.0 ppm for the 8-hour averaging period (0.5 ppm above background.

Relative to the No-Action Alternative, emissions in Alternative A would be slightly higher. For the 1-hour averaging time, there would be an increase of 0.2 ppm (far sidewalk) or 0.1 ppm (near sidewalk). For the 8-hour averaging time, the increase would be 0.3 ppm at both locations. All concentrations would remain well below the NAAQS of 35 ppm for 1-hour and 9 ppm for 8-hour concentrations.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative A would have negligible adverse direct operational impacts on air quality.

The stationary source analysis included a preliminary assessment of the potential location of heat, ventilation, and air conditioning (HVAC) equipment in Alternative A. Cooling towers would likely be next to the northside of the Railway Express Agency (REA) Building, on the east side of the Project Area. Cooling towers are a minor source of particulate matter emissions. They do not emit pollutants through a combustion process. The towers would be placed at least 30 feet from adjacent buildings or on a roof to maintain good ambient air quality.

Emergency generators would be installed next to the cooling towers. The exact number, size, and model of these generators have not yet been determined and would be defined during the final design process. They would be sized to serve the needs of both WUS and the private air-rights development. Emergency generators are direct sources of air pollutant emissions from combustion. However, the operation of emergency generators is limited to 500 hours per year and they can be operated only during emergency situations and for periodic testing. Current design criteria indicate that the emergency generators would have to be located at least 30 feet from adjacent buildings or on a rooftop. They would require obtaining an air quality permit from DOEE before installation and operation. During the permitting process, the applicant would be required to demonstrate that the generators would not cause an impact on air quality.

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative A would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative A would be below the General Conformity *de minimis* criteria applicable to the District.

The mesoscale analysis considered the changes in VOC, NO_X, CO, and PM emissions from motor vehicle and locomotive anticipated to occur by 2040 under Alternative A, using data (volumes, delays, and speeds) from the Alternative A traffic analysis. Locomotive emissions were modeled based on future rail operations and assumed the use of diesel locomotives. The analysis accounted for emissions from locomotive propulsion and idling as well as for generator activity.

Emissions from ventilation fans were also considered. Fan plants likely would be in three locations across the Project Area: one south of H Street NE, on the west side of WUS near the service road at the southern end of the private air-rights development area; and two north of H Street NE, in the east and west corners of the private air-right development area, respectively, immediately adjacent to K Street NE. Fans would be at least 30 feet from the nearest operable windows, louvers, or doors.

Modeling showed that Alternative A would have moderate adverse indirect operational impacts on air quality. As shown in **Table 5-66**, emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ all would increase relative to the No-Action Alternative. NO_X emissions would increase the most in both absolute and relative terms. The emissions of NO_X attributable to Alternative A represent a 116 percent increase relative to No-Action Alternative emissions and around a third of the applicable *de minimis* level. Emissions of CO would increase substantially by approximately 32 percent and the CO emissions attributable to Alternative A would represent almost one quarter of the applicable *de minimis* level. All emissions attributable to Alternative A would remain below the applicable *de minimis* level.

Table 5-66. Mesoscale Inventory, Alternative A

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	37.7	4.7	70.8	4.7	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	39.7	66.1	100.6	5.8	2.0
No-Action Emissions	34.8	30.6	76	4.8	1.3
Total Alternative A Emissions[1]	**4.9**	**35.5**	**24.6**	**1.0**	**0.7**
***De Minimis* Criteria**	50	100	100	100	100

1. Emissions specifically attributable to the Project in Alternative A. Calculated by subtracting total No-Action Alternative emissions from total Alternative A emissions.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative A may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The amount of MSAT emitted in Alternative A would be proportional to the amount of bus vehicle miles traveled (VMT) and railroad activity, assuming other variables (such as travel not associated with WUS) remain the same. Most Project-generated motor vehicle traffic would be light-duty vehicles, which are not a substantial source of MSAT. Although in Alternative A the capacity of the new bus facility would be less than in the No-Action Alternative, this would not prevent peak-hour bus activity to increase to accommodate an increased number of passengers. Rail operations would also increase relative to the No-Action Alternative. The increase in bus VMT and rail activity would lead to higher diesel particulate matter emissions (a component of MSAT) near WUS. The higher emissions could be partly offset by two factors: the decrease in regional traffic due to greater use of commuter rail and increased speed on area highways due to the decrease in commuter traffic.

Only a portion of the increase in railroad activity would be associated with electric locomotives, which do not generate MSAT emissions. Therefore, increases in railroad activity would cause an increase in operations by diesel-fuel locomotives and in diesel-related emissions near homes, schools, and businesses next to WUS. Therefore, there may be areas where ambient concentrations of MSAT would be locally higher in Alternative A than in the No-Action Alternative. The magnitude and duration of these potential impacts cannot be reliably quantified due to incomplete or unavailable information.

On a regional basis, EPA's vehicle and fuel regulations, coupled with the progressive replacement over time of older vehicles by newer ones, is anticipated to cause substantial reductions in MSAT emissions over time, resulting in overall lower MSAT levels in 2040. EPA's national control programs are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050.[3]

Construction Impacts

Construction of Alternative A would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative A would cause air pollutant emissions in amounts that would vary across the construction period, which would last approximately 11 years and 5

[3] U.S. Department of Transportation, Federal Highway Administration. October 18, 2016. *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*. Accessed from https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/. Accessed on April 4, 2020.

months. This would include emissions from construction equipment and heavy machinery exhaust; fugitive dust from ground-disturbing activities; and fugitive dust from the operation of construction vehicles on unpaved roadways. Construction-related air quality impacts were estimated for each of the four construction phases. Since excavation would be the most emission-intensive part of the construction process, two scenarios were analyzed for the removal of spoils: removal by trucks and removal by work trains.

Of all four construction phases, Phase 4 would generate the largest amount of emissions for all criteria pollutants. Spoil removal via trucks would generate more emissions than removal by work trains for all pollutants except NO_X. Otherwise, the greatest amounts of annual emissions would occur during Phase 4 of the All Truck Scenario, with 6.6 tons of VOC, 23.3 tons of CO, 3.2 tons of PM_{10}, and 1.4 tons of $PM_{2.5}$.

During all phases and in both scenarios, emissions of criteria pollutants would remain below the applicable *de minimis* level even with the conservative scheduling assumption used for the analysis (**Table 5-67** and **Table 5-68**).

Table 5-67. Construction Emissions per Phase, Alternative A (All Truck Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	3.3	24.3	11.1	1.4	0.9
Phase 2	4.8	35.6	16.4	2.2	1.4
Phase 3	3.9	29.6	13.7	1.9	1.2
Phase 4	6.6	50.3	23.3	3.2	2.0
***De Minimis* Criteria**	50	100	100	100	100

Table 5-68. Construction Emissions per Phase, Alternative A (Work Train Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	2.6	27.1	9.7	0.7	0.7
Phase 2	3.5	40.2	14.0	1.1	1.0
Phase 3	2.9	33.6	11.6	0.9	0.8
Phase 4	4.8	57.1	19.8	1.5	1.4
***De Minimis* Criteria**	50	100	100	100	100

Comparison to Existing Conditions

At the local level, the impacts of Alternative A on air quality relative to existing conditions would generally be the same as relative to the No-Action Alternative. Increases in pollutant concentrations would be proportionally slightly greater relative to existing conditions but would remain small. Concentrations would remain below the NAAQS.

At the regional level (**Table 5-69**), emissions attributable to Alternative A would not change but total emissions would be less or the same as under existing conditions for all pollutants except PM_{10}. This is because total emissions in Alternative A would incorporate the reduction in criteria pollutant emissions anticipated to occur by 2040 as a result of regulations and improved technology for vehicles and locomotives.

Table 5-69. Mesoscale Inventory Comparison, Alternative A

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative A	39.7	66.1	100.6	5.8	2.0
Emissions Attributable to Alternative A[1]	4.9	35.5	24.6	1.0	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative A emissions.

5.6.4.3 Alternative B

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative B, there would be a minor adverse direct operational impact on air quality due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

In Alternative B, 1-hour CO concentrations at modeled locations would range from 2.1 ppm (0.4 ppm above background) to 2.6 ppm (0.9 ppm above background). Eight-hour concentrations would range from 1.7 ppm (0.2 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Compared to modeled No-Action Alternative estimates, differences would increase by up to 0.5 ppm for the 1-hour averaging time. For the 8-hour averaging time, emissions would increase by up to 0.2 ppm. All concentrations would remain well below the applicable NAAQS.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative B, there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

The $PM_{2.5}$ microscale analysis for Alternative B was conducted for the same receptor locations as for Alternative A because the bus facility would be in the same location (**Section 5.6.4.2**, *Air Quality, Direct Operational Impacts, Microscale Analysis*).

Both north and south of H Street NE, receptors would experience a maximum 24-hour concentration of 23.6 µg/m^3 (1.6 µg/m^3 above background) and a maximum annual concentration of 9.9 µg/m^3 (0.7 µg/m^3 above background).

Compared to the No-Action Alternative, there would be a maximum increase in concentrations of 0.2 µg/m^3 for the 24-hour averaging time and no significant change for the annual averaging time. Emission levels would be below the applicable NAAQS of 35 µg/m^3 for 24-hour or 12 µg/m^3 for annual concentrations. While total concentrations would approach the NAAQS (approximately 67 percent of the 24-hour standard and 83 percent of the annual standard), this would mostly be due to background levels.

Microscale Analysis: Parking Facility

Relative to the No-Action Alternative, in Alternative B, there would be a minor adverse direct operational impact on air quality near the parking facility due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

In Alternative B, the new bus facility and new parking facility would be separate. The bus facility would be approximately where the existing parking garage stands. Buses would enter and exit through H Street NE. Parking would be in two below-ground levels beneath the rail terminal. Vehicles would enter and exit via K Street NE. The parking facility microscale analysis considered both facilities along with future traffic volumes and operations for Alternative B. Emissions from vehicles travelling along H Street, K Street, and First Streets NE were included in the analysis.

CO concentrations were evaluated at receptor locations on near and far sidewalks on H Street NE and at the intersection of K Street NE with First Street NE. Emissions from the parking facility were considered at the two fan locations near the intersection of K and First Street NE and on top of the bus deck. The bus facility was modeled as a volume source to represent the bus deck. Emissions from vehicles travelling along H Street NE and K Street NE were included in the analysis.

The average path through the parking facility was estimated to be 1,554 feet when departing and 2,697 feet when parking based on the planned dimensions of the facility and assuming an equal distribution of users across the two levels. Buses in the bus facility were assumed to travel only on the bus deck, with an average path length of 630 feet for both inbound and outbound trips.

For the H Street NE receptors, maximum CO concentrations would be 2.3 ppm for the 1-hour averaging period (0.6 ppm above background) and 1.9 ppm for the 8-hour averaging period (0.4 ppm above background) on the near sidewalk. For the receptors at K Street NE and First Street NE intersection, maximum CO concentrations would be 2.5 ppm for the 1-hour averaging period (0.9 ppm above background) and 1.9 ppm for the 8-hour averaging period on the near sidewalk (0.4 ppm above background).

Relative to the No-Action Alternative, on H Street NE, emissions would be slightly higher. For the 1-hour averaging time, there would be an increase of 0.2 ppm (both sidewalks). For the 8-hour averaging time, the increase would be 0.2 ppm (near sidewalk) or 0.1 ppm (far sidewalk). In all locations, CO concentrations would be well below the NAAQS.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative B would have negligible adverse direct operational impacts on air quality.

The stationary source analysis for Alternative A also applies to Alternative B (**Section 5.6.4.2**, *Alternative A, Stationary Source Analysis*). The locations of fan plants would be different in Alternative B but this does not affect the conclusions of the analysis. The plants would exhaust air from the interior of WUS and the below-ground parking. In Alternative B, the plants would be at four locations across the Project Area: two would be south of H Street NE, adjacent to the east and west ends of the bus facility at the southern end of the private air-rights development; and two would be north of H Street NE, at the east and west corners of the Project Area adjacent to K Street NE.

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative B would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative B would be below the General Conformity *de minimis* criteria applicable to the District.

Alternative B would have moderate adverse indirect operational impacts on air quality. Emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ would increase relative to the No-Action Alternative. NO_X emissions would increase the most in both absolute and relative terms (**Table 5-70**). The emissions of NO_X attributable to Alternative B would represent a 117 percent increase relative to No-Action emissions and more than a third of the applicable *de minimis* level. Emissions of CO would increase by approximately 27 percent and the emissions attributable to Alternative B represent just under 30 percent of the applicable *de minimis* level. All emissions attributable to Alternative B would remain below the applicable *de minimis* level (**Table 5-64**).

Table 5-70. Mesoscale Inventory, Alternative B

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	39.6	4.9	74.6	5.0	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	41.6	66.3	104.4	6.0	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative B Emissions[1]	**6.8**	**35.7**	**28.4**	**1.2**	**0.7**
***De Minimis* Criteria**	50	100	100	100	100

1. Emissions specifically attributable to the Project under Alternative B. Calculated by subtracting No-Action Alternative total emissions from total Alternative B emissions.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative B may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The MSAT analysis for Alternative B is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Mobile Source Air Toxics Analysis*).

Construction Impacts

Construction of Alternative B would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative B would cause air pollutant emissions in amounts that would vary across the construction period, which would last approximately 14 years and 4 months. Main types and sources of emissions in Alternative B would be the same as in Alternative A (**Section 5.6.4.2**, *Construction Impacts*).

Phase 4 of construction would generate the largest amount of emissions for all pollutants. Spoil removal via trucks would produce greater emissions than removal by work trains for all pollutants excluding NO_X, which is a major pollutant produced by locomotives. During Phase 4, annual NO_X emissions in the Work Train Scenario would reach 60 tons. Otherwise, the greatest amounts of annual emissions would occur during Phase 4 under the All Truck Scenario, with 6.8 tons of VOC, 24.7 tons of CO, 3.5 tons of PM_{10}, and 2.1 tons of $PM_{2.5}$ (**Table 5-71** and **Table 5-72**). During all phases and in both scenarios, emissions of criteria pollutants would remain below the applicable *de minimis* level even with the conservative scheduling assumption used for the analysis.

Table 5-71. Construction Emissions per Phase, Alternative B (All Truck Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	3.3	24.5	11.2	1.4	0.9
Phase 2	5.9	44.2	20.4	2.5	1.7
Phase 3	5.0	38.2	18.0	2.5	1.5
Phase 4	6.8	52.4	24.7	3.5	2.1
***De Minimis* Criteria**	50	100	100	100	100

Table 5-72. Construction Emissions per Phase, Alternative B (Work Train Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	2.6	27.2	9.8	0.7	0.7
Phase 2	4.7	48.9	18.0	1.3	1.3
Phase 3	3.5	43.8	15.0	1.1	1.1
Phase 4	4.8	60.0	20.7	1.5	1.5
***De Minimis* Criteria**	50	100	100	100	100

Comparison to Existing Conditions

At the local level, the impacts of Alternative B on air quality relative to existing conditions would generally be the same as relative to the No-Action Alternative. Increases in pollutant concentrations would be proportionally slightly greater relative to existing conditions but they would remain small. Concentrations would remain below the NAAQS.

At the regional level, as shown in **Table 5-73**, the emissions specifically attributable to Alternative B would not change but total emissions would be less or the same as in existing conditions for all pollutants except PM_{10}. This is because total emissions in Alternative B would incorporate the reduction in emissions anticipated to occur by 2040 from regulations and improved technology for vehicles and locomotives.

Table 5-73. Mesoscale Inventory Comparison, Alternative B

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative B	41.6	66.3	104.4	6.0	2.0
Emissions Attributable to Alternative B[1]	6.8	35.7	28.4	1.2	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative B emissions.

5.6.4.4 Alternative C

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative C (either option), there would be a minor adverse direct operational impact on air quality due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

In Alternative C, the modeled intersections would vary with the option. For the East Option, North Capitol Street and K street, North Capitol Street and H Street, and First Street and K Street. For the West Option, Capitol Street and K street, North Capitol Street and H Street, and parking access and H Street.

Concentrations would be similar regardless of the option. One-hour CO concentrations would range from 2.1 ppm (0.4 ppm above background) to 2.6 ppm (0.9 ppm above background). Eight-hour concentrations would range from 1.6 ppm (0.1 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Compared to modeled No-Action Alternative estimates, differences would increase by up to 0.5 ppm for the 1-hour averaging time. For the 8-hour averaging time, emissions would increase by up to 0.2 ppm. All concentrations would remain well below the applicable NAAQS.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative C (either option), there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

The $PM_{2.5}$ microscale analysis for Alternative C was conducted for receptor locations at the H Street NE entrance to the bus facility and at the bus pick-up and drop-off area. In Alternative C with the East Option, receptors would experience a maximum 24-hour concentration of 25.1 $\mu g/m^3$ (3.1 $\mu g/m^3$ above background) and a maximum annual concentration of 10.8 $\mu g/m^3$ (1.6 $\mu g/m^3$ above background).

In Alternative C with the West Option, receptors would experience a maximum 24-hour concentration of 25.0 $\mu g/m^3$ (3.0 $\mu g/m^3$ above background) and a maximum annual concentration of 10.5 $\mu g/m^3$ (1.3 $\mu g/m^3$ above background).

Compared to the No-Action Alternative estimates, there would be an increase in concentrations of up to 1.5 $\mu g/m^3$ for the 24-hour averaging time and up to 0.8 $\mu g/m^3$ for the annual averaging time. $PM_{2.5}$ concentrations at all receptor locations would be below the NAAQS of 35 $\mu g/m^3$ for 24-hour and 12 $\mu g/m^3$ for annual concentrations. While total concentrations would approach the NAAQS (approximately 71 percent of the 24-hour standard and 90 percent of the annual standard), this would mostly be due to background concentrations.

Microscale Analysis: Parking Facility

Relative to the No-Action Alternative, in Alternative C (either option), there would be a minor adverse direct operational impact on air quality near the parking facility and bus pick-up and drop-off area due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

The parking facility analysis for Alternative C considered the operation of the new bus facility, parking facilities, and bus pick-up and drop-off area in combination with future traffic volumes and operations under this alternative. Emissions from vehicles traveling on H Street, K Street, First Street and 2nd Street NE were included in the analysis.

CO concentrations in Alternative C were evaluated at receptor locations on both sidewalks along H Street, K Street, First Street, and 2nd Street NE and along the bus pick-up and drop-off area access road. Emissions from the below-ground facility were considered at the two western fan locations near the intersection of K Street and First Street NE and near the southwest corner of the bus pick-up and drop-off area.

The average path through the below-ground facility was estimated to be 777 feet when departing and 1,920 feet when parking. In the above-ground facility, the corresponding distances were estimated to be 3,288 feet and 3,826 feet, respectively. These path lengths were estimated based on the planned dimensions of the facility and assuming an equal distribution of users across the parking levels. Buses using the bus facility were assumed to travel only on the bus deck with an average path length of 366 feet into and out of the facility.

The maximum CO concentrations for both options would occur at the bus pick-up and drop-off area near traveling buses and the below-ground parking exhaust vent. Concentrations there would reach 2.7 ppm (1.0 ppm above background) for the 1-hour averaging time and 2.2 ppm (0.7 ppm above background) for the 8-hour averaging time. All CO concentrations would remain well below the NAAQS of 35 ppm for 1-hour and 9 ppm for 8-hour concentrations.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative C (either option) would have negligible adverse direct operational impacts on air quality.

The stationary source analysis for Alternative C is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Stationary Source Analysis*). The locations of fan plants in Alternative C would be the same as in Alternative B (**Section 5.6.4.3,** *Alternative B, Stationary Source Analysis*) but this does not affect the conclusions of the analysis.

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative C (either option) would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative C would be below the General Conformity *de minimis* criteria applicable to the District.

The mesoscale air quality analysis for each option of Alternative C was conducted for VOC, NO_X, CO, and PM emissions using vehicle and train traffic data from the Alternative C transportation impact analysis. Emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ all would increase relative to the No-Action Alternative (**Table 5-74** and **Table 5-75**). NO_X emissions would increase the most in both absolute and relative terms. In either option, the emissions of NO_X attributable to Alternative C would represent a 117 percent increase relative to No-Action Alternative emissions and more than a third of the applicable *de minimis* level. CO Emissions would also increase in both options, by approximately 36 percent (East Option) or 35 percent (West Option). The emissions attributable to Alternative C would represent less than 30 percent of the applicable *de minimis* level. All emissions attributable to Alternative C in either option would remain below the applicable *de minimis* level.

Table 5-74. Mesoscale Inventory, Alternative C East Option

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	38.9	4.8	73.7	4.9	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	40.9	66.2	103.5	5.9	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative C East Option Emissions[1]	6.1	35.6	27.5	1.1	0.7
***De Minimis* Criteria**	50	100	100	100	100

1. Calculated by subtracting total No-Action Alternative total emissions from total Alternative C, East Option emissions.

Table 5-75. Mesoscale Inventory, Alternative C West Option

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	38.8	4.7	72.8	4.9	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	40.8	66.1	102.6	5.9	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative C West Option Emissions[1]	6.0	35.5	26.6	1.1	0.7
***De Minimis* Criteria**	50	100	100	100	100

1. Calculated by subtracting total No-Action Alternative total emissions from total Alternative C, West Option emissions.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative C (either option) may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The MSAT analysis for Alternative C is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Mobile Source Air Toxics Analysis*).

Construction Impacts

Construction of Alternative C (either option) would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative C would cause air pollutant emissions in amounts that would vary across the construction period, approximately 12 years and 3 months. The main types and sources of emissions would be as described for Alternative A (**Section 5.6.4.2,** *Alternative A, Construction Impacts*).

In Alternative C as in the other Action Alternatives, Phase 4 would generate the largest amount of emissions for all pollutants. Spoil removal via trucks would produce the greatest emission levels for all pollutants excluding NO_X, which is a major pollutant produced by locomotives. During Phase 4, annual NO_X emissions in the Work Trains Scenario would reach 55.9 tons. Otherwise, the greatest amounts of annual emissions would occur during Phase 4 of the All Trucks Scenario, with 6.3 tons of VOC, 22.8 tons of CO, 3.3 tons of PM_{10}, and 1.9 tons of $PM_{2.5}$.

During all phases and in both scenarios, emissions of criteria pollutants would remain below the applicable *de minimis* level even with the conservative scheduling assumption used for the analysis (**Table 5-76** and **Table 5-77**).

Table 5-76. Construction Emissions per Phase, Alternative C Either Option (All Truck Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	3.1	22.9	10.5	1.4	0.9
Phase 2	5.1	38.3	17.8	2.4	1.5
Phase 3	4.8	37.0	17.3	2.4	1.5
Phase 4	6.3	48.4	22.8	3.3	1.9
***De Minimis* Criteria**	50	100	100	100	100

Table 5-77. Construction Emissions per Phase, Alternative C Either Option (Work Train Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	2.4	25.7	9.0	0.7	0.7
Phase 2	3.7	43.5	15.1	1.1	1.1
Phase 3	3.4	42.3	14.5	1.1	1.0
Phase 4	4.3	55.9	18.9	1.4	1.3
***De Minimis* Criteria**	50	100	100	100	100

Comparison to Existing Conditions

At the local level, the impacts of Alternative C (either option) on air quality relative to existing conditions would generally be the same as relative to the No-Action Alternative. Increases in pollutant concentrations would be slightly greater relative to existing conditions but would remain small. Concentrations would remain below the NAAQS.

At the regional level, emissions specifically attributable to Alternative C would not change but total emissions would be less or the same as existing conditions for all pollutants except PM_{10} (**Table 5-78**). This is because total emissions in Alternative C incorporate the reduction in emissions anticipated to occur by 2040 from regulations and improved technology for vehicles and locomotives.

Table 5-78. Mesoscale Inventory Comparison, Alternative C

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative C East Option	40.9	66.2	103.5	5.9	2.0
Emissions Attributable to Alternative C East Option[1]	6.1	35.6	27.5	1.1	0.7
Alternative C West Option	40.8	66.1	102.6	5.9	2.0
Emissions Attributable to Alternative C West Option[1]	6.0	35.5	26.6	1.1	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative C emissions.

5.6.4.5 Alternative D

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative D, there would be a minor adverse direct operational impact on air quality due to small increases in CO. At all modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

One-hour CO concentrations in Alternative D would range from 2.1 ppm (0.4 ppm above background) to 2.4 ppm (0.7 ppm above background). Eight-hour concentrations would range from 1.7 ppm (0.2 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Compared to the No-Action Alternative estimates, there would be increases of up to 0.4 ppm for the 1-hour averaging time. For the 8-hour averaging time, emissions would increase by up to 0.2 ppm. All concentrations would remain well below the applicable NAAQS of 35 ppm for the 1-hour standard and 9 ppm for the 8-hour standard.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative D, there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

The $PM_{2.5}$ microscale analysis for Alternative D was conducted for receptor groupings on H Street NE and on the roads leading to and from the bus facility adjacent to the train hall.

On the bus facility's exit road, receptors would experience a maximum 24-hour concentration of 23.8 $\mu g/m^3$ (1.8 $\mu g/m^3$ above background) and annual concentration of 10.2 $\mu g/m^3$ (1.0 $\mu g/m^3$ above background). The highest concentrations would occur on H Street NE, where receptors would experience a maximum 24-hour concentration of 24.5 $\mu g/m^3$ (2.5 $\mu g/m^3$ above background) and a maximum annual concentration of 10.6 $\mu g/m^3$ (1.4 $\mu g/m^3$ above background).

Compared to the No-Action Alternative maximum estimates, there would be an increase in concentrations on H Street of up to 0.9 $\mu g/m^3$ for the 24-hour averaging time and up to 0.6 $\mu g/m^3$ for the annual averaging time. In all modeled locations, emission levels would be below the applicable NAAQS. While maximum total concentrations would approach the NAAQS (approximately 70 percent of the 24-hour standard and 88 percent of the annual standard), this would mostly be due to background concentrations.

Microscale Analysis: Parking Facility Analysis

Relative to the No-Action Alternative, in Alternative D, there would be a minor adverse direct operational impact on air quality near the parking facility and bus facility due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

In Alternative D, the bus facility would consist of a loop around the train hall. Buses using the facility would access it via H Street NE. Parking would be provided in a one-level below-ground facility along the western side of the Project Area and in a multi-story above-ground facility south of K Street NE. Vehicles would access the below-ground parking facility via K Street NE and the above-ground facility via H Street NE.

The parking facility microscale analysis for Alternative D considered the operations of the proposed bus facility, below-ground parking facility, and above-ground parking facility along with future traffic volumes and operations for this alternative. The analysis incorporated emissions from vehicles traveling on H Street, K Street, First Street, 2nd Street NE, and access roads to the bus facility and the above-ground parking facility.

CO concentrations were evaluated at receptor locations placed on H Street, K Street, First Street, 2nd Street NE and the bus facility access roads. These would experience the highest CO concentrations as they are near the bus facility, parking vents, and heavily traveled streets. H Street and the bus facility roadway receptors are close to the parking facility's southern fan plant and bus facility. Receptors on K Street, First Street and 2nd Street NE are close to the parking's northern fan plant and the above-ground parking facility.

Emissions from the below-ground parking facility were considered at the two western fan locations: near the intersection of K Street and First Street NE and near the western end of the bus facility. The average path through the below-ground parking facility was estimated at 777 feet when departing and 1,531 feet when parking. In the above-ground facility, it would be 2,145 feet when departing and 2,466 feet when parking. These path lengths were estimated based on the planned dimensions of the facilities. They assume an equal distribution of users across all parking levels. Buses using the bus facility were assumed to travel an average path length of 876 feet in and out of the facility.

Maximum CO concentrations in Alternative D would occur along the bus facility's access roadways. These concentrations would be the result of emissions from the facility and the nearby below-ground parking exhaust vent. At this location, the maximum 1-hour CO concentration would reach 2.3 ppm (0.6 ppm above background) and the maximum 8-hour concentration would reach 2.0 ppm (0.5 ppm above background). All concentrations would remain well below the NAAQS of 35 ppm for 1-hour concentrations and 9 ppm for 8-hour concentrations.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative D would have negligible adverse direct operational impacts on air quality.

The stationary source analysis for Alternative D is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Stationary Source Analysis*). The locations of fan plants in Alternative D would be as in Alternative B (**Section 5.6.4.3**, *Alternative B, Stationary Source Analysis*) but this does not affect the conclusions of the analysis.

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative D would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative D would be below the General Conformity *de minimis* criteria applicable to the District.

Emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ in Alternative D would increase relative to the No-Action Alternative. NO_X emissions would increase the most in both absolute and relative terms. The emissions of NO_X attributable to Alternative D would represent a 116 percent increase relative to No-Action emissions and more than a third of the applicable *de minimis* level. Emissions of CO would increase by approximately 34 percent. The CO emissions attributable to Alternative D would represent more than a quarter of the applicable *de minimis* level. All emissions attributable to Alternative D would remain below the applicable *de minimis* level (**Table 5-79**).

Table 5-79. Mesoscale Inventory, Alternative D

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	38.3	4.6	72.2	4.9	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	40.3	66.0	102.0	5.9	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative D Emissions[1]	**5.5**	**35.4**	**25.9**	**1.1**	**0.7**
***De Minimis* Criteria**	50	100	100	100	100

1. Emissions specifically attributable to the Project under Alternative D. Calculated by subtracting total No-Action Alternative emissions from total Alternative D emissions.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative D may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The MSAT analysis conducted for Alternative D is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Mobile Source Air Toxics Analysis*).

Construction Impacts

Construction of Alternative D would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative D would cause air pollutant emissions in amounts that would vary across the construction period, approximately 12 years and 3 months. The main types and sources of emissions would be as described for Alternative A (**Section 5.6.4.2**, *Alternative A, Construction Impacts*).

In Alternative D as in the other Action Alternatives, Phase 4 would generate the largest amount of emissions for all criteria pollutants. Spoil removal via trucks only would produce greater emission levels than removal by work trains for all pollutants except NO_X, which is a major pollutant produced by locomotives. During Phase 4, annual NO_X emissions in the Work Train Scenario would reach 55.9 tons. Otherwise, the greatest amounts of annual emissions would occur during Phase 4 of the All Truck Scenario, with 6.3 tons of VOC, 22.8 tons of CO, 3.3 tons of PM_{10}, and 1.9 tons of $PM_{2.5}$ (**Table 5-80** and **Table 5-81**). During all phases and in both scenarios, emissions of criteria pollutants would remain below the applicable *de minimis* level even with the conservative scheduling assumption used for the analysis.

Table 5-80. Construction Emissions per Phase, Alternative D (All Trucks Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	3.1	22.9	10.5	1.4	0.9
Phase 2	5.1	38.3	17.8	2.4	1.5
Phase 3	4.8	37.0	17.3	2.4	1.5
Phase 4	6.3	48.4	22.8	3.3	1.9
***De Minimis* Criteria**	50	100	100	100	100

Table 5-81. Construction Emissions per Phase, Alternative D (Work Train Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	2.4	25.7	9.0	0.7	0.7
Phase 2	3.7	43.5	15.1	1.1	1.1
Phase 3	3.4	42.3	14.5	1.1	1.0
Phase 4	4.3	55.9	18.9	1.4	1.3
***De Minimis* Criteria**	50	100	100	100	100

Comparison to Existing Conditions

At the local level, the impacts of Alternative D on air quality would generally be the same relative to existing conditions as relative to the No-Action Alternative. Increases in pollutant concentrations would be proportionally greater relative to existing conditions but would remain small. Concentrations would remain below the NAAQS.

At the regional level, as show in **Table 5-82**, emissions specifically attributable to Alternative D would not change but total emissions would be less or the same as in existing conditions for all pollutants except PM_{10}. This is because total emissions in Alternative D would incorporate the reduction in emissions anticipated to occur by 2040 from regulations and improved technology for vehicles and locomotives.

Table 5-82. Mesoscale Inventory Comparison, Alternative D

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative D[1]	40.3	66.0	102.0	5.9	2.0
Emissions Attributable to Alternative D	5.5	35.4	25.9	1.1	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative D emissions.

5.6.4.6 Alternative E

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative E, there would be a minor adverse direct operational impact on air quality due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

One-hour CO concentrations in Alternative E would range from 2.1 ppm (0.4 ppm above background) to 2.5 ppm (0.8 ppm above background). Eight-hour concentrations would range from 1.7 ppm (0.2 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Compared to the No-Action Alternative estimates, there would be increases of up to 0.3 ppm for the 1-hour averaging time. For the 8-hour averaging time, emissions would increase by up to 0.1 ppm. All concentrations would remain well below the applicable NAAQS.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative E, there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

The microscale $PM_{2.5}$ analysis for Alternative E is the same as for Alternative D because the bus facility and bus traffic would be the same in both alternatives. See **Section 5.6.4.5**, *Alternative D, Microscale Analysis: PM2.5 Hotspot*.

Microscale Analysis: Parking Facility

Relative to the No-Action Alternative, in Alternative E, there would be a minor adverse direct operational impact on air quality near the parking facility and bus facility due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

The parking facility microscale analysis for Alternative E considered the operations of the proposed bus facility and below-ground parking facility along with future traffic volumes and operations. The analysis incorporated the emissions from vehicles traveling on H Street, K Street, and First Street NE as well as on the access roads to the bus facility.

CO concentrations in Alternative E were evaluated at receptor locations placed on the near and far sidewalks on H Street, K Street, and First Street NE as well as the bus facility's access roads. These locations would experience the highest CO concentrations as they would be near the bus facility, parking facility vents, and heavily traveled streets. The H Street NE and bus facility roadway receptors would be close to the bus facility and parking facility's southern fan plant. Receptors on K Street NE and First Street NE would be close to the parking facility's northern fan plant.

Emissions from the below-ground parking facility were considered at the two fan locations near the intersection of K Street NE and First Street NE and near the bus facility. Vehicles using the facility were estimated to travel an average path of 1,554 feet when departing and 2,697 feet when parking. These path lengths were estimated based on the planned dimensions of the facility and assuming an equal distribution of users across the two parking levels. Buses using the bus facility were assumed to travel an average length of 876 feet in and out of the bus facility.

Maximum CO concentrations in Alternative E would occur on the bus facility's access roadways. These concentrations would be the result of pollutant emissions from both the bus facility and the below-ground parking exhaust vent. At this location, the maximum 1-hour CO concentration would reach 2.6 ppm (0.9 ppm above background) and the maximum 8-hour concentration would reach 2.2 ppm (0.7 ppm above background). All concentrations would remain well below the NAAQS of 35 ppm for 1-hour concentrations and 9 ppm for 8-hour concentrations.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative E would have negligible adverse direct operational impacts on air quality.

The stationary source analysis for Alternative E is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Stationary Source Analysis*). The locations of fan plants in Alternative E would be as in Alternative B (**Section 5.6.4.3**, *Alternative B, Stationary Source Analysis*) but this does not affect the conclusions of the analysis.

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative E would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative E would be below the General Conformity *de minimis* criteria applicable to the District.

Emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ for Alternative E would increase relative to the No-Action Alternative (**Table 5-83**). NO_X emissions would increase the most in both absolute and relative terms. The emissions of NO_X attributable to Alternative E would represent a 117 percent increase relative to No-Action Alternative emissions and more than a third of the applicable *de minimis* level. Emissions of CO would increase by approximately 35 percent. The CO emissions attributable to Alternative E would represent more than 25 percent of the applicable *de minimis* level. All emissions attributable to Alternative E would remain below the applicable *de minimis* level.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative E may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The MSAT analysis conducted for Alternative E is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Mobile Source Air Toxics Analysis*).

Table 5-83. Mesoscale Inventory, Alternative E

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	38.8	4.7	73.2	5.0	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	40.8	66.1	103.0	6.0	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative E Emissions[1]	6.0	35.5	27.0	1.2	0.7
***De Minimis* Criteria**	50	100	100	100	100

1. Emissions specifically attributable to the Project under Alternative E. Calculated by subtracting total No-Action Alternative emissions from total Alternative E emissions.

Construction Impacts

Construction of Alternative E would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative E would cause air pollutant emissions in amounts that would vary across the construction period, approximately 14 years and 4 months. The main types and sources of emissions would be as described for Alternative A (**Section 5.6.4.2**).

Like in the other Action Alternatives, Phase 4 would generate the largest amount of emissions for all pollutants. Spoil removal via trucks would produce greater emission levels for all pollutants than removal by work trains except for NO_X, which is a major pollutant produced by locomotives. During Phase 4, annual NO_X emissions in the Work Train Scenario would reach 60 tons. Otherwise, the greatest amounts of annual emissions would occur during Phase 4 of the All Truck Scenario, with 6.8 tons of VOC, 24.7 tons of CO, 3.5 tons of PM_{10}, and 2.1 tons of $PM_{2.5}$. During all phases and in both scenarios, emissions of criteria pollutants would remain below the applicable *de minimis* level even with the conservative scheduling assumption used for the analysis (**Table 5-84** and **Table 5-85**).

Table 5-84. Construction Emissions per Phase, Alternative E (All Truck Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	3.3	24.5	11.2	1.4	0.9
Phase 2	5.9	44.2	20.4	2.5	1.7
Phase 3	5.0	38.2	18.0	2.5	1.5
Phase 4	6.8	52.4	24.7	3.5	2.1
***De Minimis* Criteria**	50	100	100	100	100

Table 5-85. Construction Emissions per Phase, Alternative E (Work Trains Scenario)

Construction Period	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Phase 1	2.6	27.2	9.8	0.7	0.7
Phase 2	4.7	48.9	18.0	1.3	1.3
Phase 3	3.5	43.8	15.0	1.1	1.1
Phase 4	4.8	60.0	20.7	1.5	1.5
***De Minimis* Criteria**	50	100	100	100	100

Comparison to Existing Conditions

At the local level, the impacts of Alternative E on air quality relative to existing conditions would generally be the same as relative to the No-Action Alternative. Increases in pollutant concentrations would be proportionally greater relative to existing conditions but would remain small. Concentrations would remain below the NAAQS.

At the regional level, the emissions specifically attributable to Alternative E would not change but total emissions would be less or the same as in existing conditions for all pollutants except PM_{10} (**Table 5-86**). This is because total emissions in Alternative E would incorporate the reduction in emissions anticipated by 2040 from regulations and improved technology for vehicles and locomotives.

Table 5-86. Mesoscale Inventory Comparison, Alternative E

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative E	40.8	66.1	103.0	6.0	2.0
Emissions Attributable to Alternative E[1]	6.0	35.5	27.0	1.2	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative E emissions.

5.6.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Microscale Analysis: CO Hotspot

Relative to the No-Action Alternative, in Alternative A-C, there would be a minor adverse direct operational impact on air quality due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would remain well below the applicable NAAQS.

One-hour CO concentrations in Alternative A-C would range from 2.0 ppm (0.3 ppm above background) to 2.3 ppm (0.6 ppm above background). Eight-hour concentrations would range from 1.7 ppm (0.2 ppm above background) to 1.9 ppm (0.4 ppm above background). All concentrations would be only slightly above background levels.

Compared to the No-Action Alternative estimates, emissions would increase by up to 0.1 ppm for the 1-hour averaging time and the 8-hour averaging time. All concentrations would remain well below the applicable NAAQS of 35 ppm for 1 hour and 9 ppm for 8-hour concentrations.

Microscale Analysis: $PM_{2.5}$ Hotspot

Relative to the No-Action Alternative, in Alternative A-C, there would be a minor adverse direct operational impact on air quality due to small increases in $PM_{2.5}$ concentrations. At all modeled receptor locations, $PM_{2.5}$ concentrations would remain below the applicable NAAQS.

The $PM_{2.5}$ microscale analysis for Alternative A-C was conducted for the same receptor locations as for Alternative A, as the bus facility would be in the same general location.

North of H Street NE, receptors would experience a maximum 24-hour concentration of 23.9 µg/m^3 (1.9 µg/m^3 above background) and a maximum annual concentration of 10.1 µg/m^3 (0.9 µg/m^3 above background). South of H Street, receptors would experience a maximum 24-hour concentration of 23.7 µg/m^3 (1.7 µg/m^3 above background) and a maximum annual concentration of 10.2 µg/m^3 (1.0 µg/m^3 above background).

Compared to the No-Action Alternative estimates, there would be an increase in concentrations of 0.3 µg/m^3 for the 24-hour averaging time and 0.2 µg/m^3 for the annual averaging time. In both modeled locations, emission levels would be below the applicable NAAQS. While total concentrations would approach the NAAQS (approximately 68 percent of the 24-hour standard and 85 percent of the annual standard), this would mostly be due to background concentrations.

Microscale Analysis: Parking Facility

Relative to the No-Action Alternative, in Alternative A-C, there would be a minor adverse direct operational impact on air quality near the parking facility and bus facility due to small increases in CO concentrations. At all modeled receptor locations, CO concentrations would be well below the applicable NAAQS.

The microscale parking facility analysis for Alternative A-C considered the operation of the proposed bus facility and parking facility along with projected future traffic volumes and operations for Alternative A-C. The bus facility would be approximately where the existing garage currently stands. Buses would enter via H Street NE; they would exit directly to H Street NE via a dedicated ramp. Parking would be provided on six levels above the bus facility. Vehicles would access and exit the parking facility via H Street (west intersection) and the east-west road running along the length of the train hall. Emissions from vehicles travelling on H Street NE were included in the analysis.

CO concentrations were evaluated at receptor locations on the near and far sidewalks adjacent to the parking facility, north and south of H Street NE. These locations would experience the highest CO concentrations as they are near both the parking facility and the heavily travelled H Street Bridge. A car's average path through the facility was assumed to be 4,421 feet when departing and 4,671 feet when parking, based on the planned dimensions of the parking facility and assuming an equal distribution of users across the parking levels. Buses using the facility were assumed to travel only on the bus deck with an average path length of 894 feet inbound and 894 feet outbound.

North of H Street, modeled CO concentrations would be 2.4 ppm for the 1-hour averaging period (0.7 ppm above background) and 1.9 ppm for the 8-hour averaging period (0.4 ppm above background). Concentrations south of H Street would be slightly lower.

Relative to the No-Action Alternative, emissions in Alternative A-C would be slightly higher. For the 1-hour averaging time, there would be an increase of up to 0.3 ppm. For the 8-hour averaging time, the increase would be of up to 0.2 ppm. All concentrations would remain well below the NAAQS of 35 ppm for 1-hour and 9 ppm for 8-hour concentrations.

Stationary Source Analysis

Relative to the No-Action Alternative, stationary source emissions in Alternative A-C would have negligible adverse direct operational impacts on air quality.

The stationary source analysis for Alternative A-C is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Stationary Source Analysis*).

Indirect Operational Impacts

Mesoscale Analysis

Relative to the No-Action Alternative, Alternative A-C would have moderate adverse indirect operational impacts on air quality due to increased emissions. Emissions of criteria pollutants attributable to Alternative A-C would be below the General Conformity *de minimis* criteria applicable to the District.

Emissions of VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$ for Alternative A-C would increase relative to the No-Action Alternative (**Table 5-87**). NO_X emissions would increase the most in both absolute and relative terms. The emissions of NO_X attributable to Alternative A-C would represent a 116 percent increase relative to No-Action Alternative emissions and more than a third of the applicable *de minimis* level. Emissions of CO would increase by approximately 31 percent and CO emissions attributable to Alternative A-C would represent more than 25 percent of the applicable *de minimis* level. All emissions attributable to Alternative A-C would remain below the applicable *de minimis* level.

Table 5-87. Mesoscale Inventory, Alternative A-C

Source	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Motor Vehicle Emissions	37.4	4.6	70.1	4.8	1.0
Locomotive Emissions	2.0	61.4	29.8	1.0	1.0
Subtotal	39.4	66.0	99.9	5.8	2.0
No-Action Emissions	34.8	30.6	76.0	4.8	1.3
Alternative A-C Emissions[1]	4.6	35.4	23.9	1.0	0.7
***De Minimis* Criteria**	50	100	100	100	100

1. Emissions specifically attributable to the Project under Alternative A-C. Calculated by subtracting total No-Action Alternative emissions from total Alternative A-C emissions.

Mobile Source Air Toxics Analysis

Relative to the No-Action Alternative, Alternative A-C may result in localized, higher levels of MSAT emissions in the Local Study Area. Information to quantitatively assess these impacts is not available. Based on existing information, they are anticipated to be minor.

The MSAT analysis conducted for Alternative A-C is the same as for Alternative A (**Section 5.6.4.2**, *Alternative A, Mobile Source Air Toxics Analysis*).

Construction Impacts

Construction of Alternative A-C would have moderate adverse impacts on air quality due to increased annual emissions during all phases of construction. Emissions of criteria pollutants would be below the General Conformity *de minimis* criteria applicable to the District.

Construction activities in Alternative A-C would be the same as in Alternative A, as both alternatives would involve the same depth of excavation, support of excavation methods, and would take the same amount of time to construct. Construction-related emissions would be as in Alternative A (see **Section 5.6.4.2**, *Alternative A, Construction Impacts*).

Comparison to Existing Conditions

At the local level, the impacts of Alternative A-C on air quality relative to existing conditions would generally be the same as relative to the No-Action Alternative. Increases in pollutant concentrations would be proportionally greater relative to existing conditions but would remain small. Concentrations would remain below the NAAQS.

At the regional level, the emissions specifically attributable to Alternative A-C would not change but total emissions would be less or the same as in existing conditions for all pollutants except PM_{10} (**Table 5-88**). This is because total emissions in Alternative A-C would incorporate the reduction in emissions anticipated by 2040 from regulations and improved technology for vehicles and locomotives.

Table 5-88. Mesoscale Inventory Comparison, Alternative A-C

Total Emissions	VOC Tons/Year	NO_X Tons/Year	CO Tons/Year	PM_{10} Tons/Year	$PM_{2.5}$ Tons/Year
Existing Conditions	62.6	73.0	161.0	4.3	2.1
No-Action Alternative	34.8	30.6	76.0	4.8	1.3
Alternative A-C	39.4	66.0	99.9	5.8	2.0
Emissions Attributable to Alternative A-C[1]	4.6	35.4	23.8	1.0	0.7

1. Calculated by subtracting total No-Action Alternative emissions from total Alternative A-C emissions.

5.6.5 Comparison of Alternatives

All Action Alternatives would cause impacts on air quality (**Table 5-89**). All would generate operational and construction-related air pollutant emissions that would not occur in the No-Action Alternative. The amount of new emissions attributable to each Action Alternative would be similar, varying only across a narrow range.

Table 5-89. Comparison of Alternatives. Air Quality

Type of Impact	Analysis	No-Action Alternative	All Action Alternatives
Direct Operational	Microscale CO	Minor adverse impact	Minor adverse impact
	Microscale $PM_{2.5}$	Minor adverse impact	Minor adverse impact
	Microscale Parking	Minor adverse impact	Minor adverse impact
	Stationary Source	N/A	Negligible adverse impact
Indirect Operational	Mesoscale	Beneficial impact	Moderate adverse impact
	MSAT	N/A	Minor adverse impact
Construction		N/A	Moderate adverse impact

As a result, the intensity of impacts relative to the No-Action Alternative would be the same for all Action Alternatives. All Action Alternatives would have:

- Minor adverse direct operational impacts on local air quality due to small, localized increases of CO and $PM_{2.5}$ concentrations from mobile sources (motor vehicles and trains). Total concentrations would remain well below the NAAQS at all locations.
- Moderate adverse indirect operational impacts on regional air quality because they would increase annual NO_X emissions by 116 to 117 percent relative to the No-Action Alternative, amounting to more than a third of the *de minimis* level. Annual CO emissions would increase by approximately 31 to 37 percent relative to the No-Action Alternative, amounting to 24 to 28 percent of the *de minimis* level. Annual emissions of all criteria pollutants would remain below the *de minimis* levels and all Action Alternatives would meet General Conformity requirements with respect to operational impacts.
- Moderate construction-related impacts due to estimated annual emissions of NO_X, up to approximately 60 percent of the *de minimis* level and annual emission of CO representing from approximately 20 to 25 percent of the *de minimis* level for this pollutant. Annual emissions of all criteria pollutants would remain below the *de minimis* levels. All Action Alternatives would meet General Conformity requirements with respect to construction impacts.

The No-Action Alternative would have:

- A minor adverse direct operational impact on air quality from CO and $PM_{2.5}$ emissions. Emissions of both pollutants would be well below the applicable NAAQS.

- A beneficial indirect operational impact on air quality due to reductions in emissions of VOC, NOX, CO, and $PM_{2.5}$.

Undetermined construction-related impacts.

5.6.6 Avoidance, Minimization, and Mitigation Evaluation

The following avoidance, minimization, and mitigation measures are being considered by FRA.

Operational Impacts

None of the Action Alternatives would result in major adverse operational impacts. To avoid or minimize less than major adverse impacts on local air quality, the Project Proponents would ensure that Project design places ventilation fans at least 30 feet from the nearest operable windows, louvers, or doors. Emergency generators would be at least 30 feet from the nearest building or on a rooftop. Rail operators would impose restrictions on diesel locomotive idling to minimize MSAT emissions.

Construction Impacts

Even with conservative scheduling assumptions placing the most emission-intensive activities within one calendar year for each construction phase, construction-related emissions would not exceed the applicable *de minimis* criteria under any of the Action Alternatives. Although no major adverse impacts are anticipated during construction, measures would be taken to reduce pollutant emissions. Such measures, to be implemented by the construction contractor, would include but are not limited to:

- Dust suppression; idling restrictions; use of Ultra Low Sulfur Diesel (ULSD) fuel; proper maintenance of all motor vehicles, machinery, and equipment; and fitting of equipment with mufflers or other regulatory-required emissions control devices would be used.
- Compliance with the District's anti-idling law (20 DCMR 900) during all construction phases. This regulation limits non-road engine idling to three minutes. Idling restriction signs would be placed on the premises to remind drivers and construction personnel of the applicable regulations. Drivers and equipment operators would be trained accordingly.
- Fitting all diesel-fuel construction equipment with after-engine emission controls. The construction contractor would also be required to use ULSD fuel for all off-road construction vehicles as an additional measure to reduce air emissions. Any non-road diesel equipment would have to be rated 50 horsepower or greater to meet EPA's Tier 4 emission limits or be retrofitted with appropriate emission reduction equipment. Emission reduction equipment could include EPA-verified or California Air Resource Board-verified diesel oxidation catalysts or diesel particulate filters.

- Implementing measures to protect local residents, visitors, passengers, and passers-by from off-site exposure to dust and debris in accordance with 20 DCMR 605. Appropriate methods of dust control would be determined according to the surfaces concerned (roadways or disturbed areas) and include, as applicable: application of water during ground-disturbing activities; stone surfacing of construction roads; seeding of areas of exposed or stock-piled soils; wheel washing; and regular sweeping of paved roadways. Recycling construction waste and demolition materials may also reduce dust emissions.
- During construction in or immediately adjacent to the historic station building (demolition of the Claytor Concourse, column removal), put airtight walls or partitions in place around the construction areas, as needed to eliminate the risk of train engine exhaust fumes or dust drifting into the indoor areas accessible to the public or station employees.

5.6.7 Permits and Regulatory Compliance

In any of the Action Alternatives considered, the Project would cause no exceedances of the applicable NAAQS and emissions inventories would remain below the applicable *de minimis* thresholds. The Project would comply with applicable regulations and General Conformity Rule requirements.

5.7 Greenhouse Gas Emissions and Resilience

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the five Action Alternatives on greenhouse gas (GHG) emissions and resilience. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies potential permitting and regulatory compliance requirements.

5.7.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to greenhouse gas emissions and resilience are listed in **Section 4.7.1**, *Regulatory Context and Guidance*.

5.7.2 Study Area

As defined in **Section 4.7.2**, *Study Area*, the Local Study Area consists of the Project Area and the surrounding area within a half mile (**Figure 4-7**). The Local Study Area only applies to the resilience impact analysis. Concerns about GHG emissions are primarily related to climate change, a regional and global phenomenon. The state of dispersion science is not sufficiently advanced to usefully consider GHG emission impacts at a local, microscale level. Therefore, a Local Study Area was not defined for GHG and the study area for GHGs is regional only. The Regional Study Area encompasses the jurisdictions of MWCOG (**Figure 4-6**).

5.7.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on greenhouse gas emissions and resilience. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 7.4**, *Methodology*, provides a description of the analysis methodology. A summary is below.

5.7.3.1 Operational Impacts

The primary GHG associated with the operation of WUS is CO_2 from mobile and stationary sources. The operational impact analysis consisted of estimating CO_2 emissions associated with each alternative. Estimated emissions were compared to the District's CO_2-equivalent (CO_2e) emissions inventory for 2017 (7.3 million metric tons) and to the District's emission target for 2032 (5.05 million metric tons).[1] Impacts from changes in CO_2 emissions were

[1] District of Columbia Department of Energy and Environment (DDOE). *2006-2017 Greenhouse Gas Inventory*. Accessed from: https://doee.dc.gov/service/greenhouse-gas-inventories. Accessed on April 2, 2020. The District set emission reduction target for 2032 and 2050. The target for 2032 was used for this analysis as being closer to the Project's planning horizon year.

considered negligible if annual emissions would be equal to or less than 1 percent of the 2017 emission inventory and 2032 emission target amount; minor if they would be equal to or less than 1 percent of the 2017 inventory and between 1 and 2 percent of the 2032 target amount; moderate if they would be between 1 and 2 percent of both; and major if they would be more than 2 percent of either.

Stationary Source Emissions

The methodology for assessing CO_2 emissions from stationary sources was adapted from the methodology used to estimate energy impacts (**Appendix C2**, *Washington Union Station Expansion Project Affected Environment Technical Report*, **Section 8.4**, *Methodology*), by converting estimated energy use into CO_2 emissions. Conversion factors for electricity and natural gas were from the U.S. Energy Information Administration (EIA). Conversion factors for steam and chilled water were based on EPA guidance and published efficiencies of the Capitol Power Plant.

Emissions of CO_2 that would occur in the Project Area were considered direct impacts. Only emissions from natural gas use at the private air-rights development would have direct stationary source impacts. Emissions from the consumption of energy produced away from the Project Area were considered indirect impacts. These include emissions associated with electricity consumption at both WUS and the private air-rights development as well as those associated with cooling (chilled water) and heating (steam) at WUS.

Mobile Source Emissions

The mobile source analysis considered street and rail traffic emissions. Annual CO_2 emissions were evaluated at the mesoscale level for the same diesel locomotive, motor vehicle, and bus operations considered in the air quality impact analysis (**Section 5.6**, *Air Quality*). Motor vehicle emission estimates were developed based on data from traffic impact analysis for the alternative under consideration. Locomotive emissions were estimated based on planned operations of diesel locomotives in the Project Area, including locomotive propulsion, idling, and generator activity as well as anticipated train consists and movements.

Resilience

Potential impacts to resilience were assessed qualitatively for the Project and immediately adjacent infrastructure. The analysis also considered consistency with *Resilient DC. A strategy to Thrive in the Face of Change*.[2]

[2] Issued in April 2019. Available at: https://resilient.dc.gov/. Accessed on August 20, 2019.

5.7.3.2 Construction Impacts

Analysis of construction impacts involved the quantitative modeling of potential CO_2 emissions during the peak construction year for each phase, when emissions would be at their greatest, especially during excavation. [3] The analysis also factored in other major construction activities such as support of excavation, caisson drilling, pressure slab construction and overbuild deck construction. Two options were analyzed for spoil removal associated with excavation: removal by dump trucks only and removal by work trains only.

Emissions from the peak activities under each phase of construction were estimated using the conservative assumption that these activities would take place for the entire year. The analysis accounted for emissions generated by on- and off-site diesel-powered construction equipment and vehicles. The analysis considered phasing schedules, location, and activities occurring throughout the construction period.

5.7.4 Impacts Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on GHG emissions and resilience.

5.7.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would result in a negligible adverse direct operational impact on CO_2 emissions due to new stationary sources of emissions in the Project Area.

The No-Action Alternative does not include any changes to WUS that would cause CO_2 emissions at WUS to vary significantly from existing conditions. New stationary source emissions would be introduced by the construction of the private air-rights development. The exact type of mechanical and combustion equipment that would be operated at the private air-rights development is not known. The total estimated annual energy use of the private air-rights development would be approximately 263,766,000 kilo British thermal units

[3] The quantitative modeling of construction impacts does not include emissions associated with the column removal work, which would be the same in all Action Alternatives. During Phases 1 and 2 of construction, the column removal work would overlap with the excavation and reconstruction of portions of the rail terminal and would contribute additional GHG emissions. However, these emissions would be negligible because the work would take place within the historic station building and involve installing temporary supports, removing, and replacing structural elements; such activities are not machine-intensive and would not involve the type of emission-intensive excavation or foundation installation work associated with the reconstruction of the rail terminal.

(kBTUs), causing emissions of approximately 3,220 metric tons per year of CO_2.[4, 5] This would represent approximately 0.04 percent of the District's total 2017 GHG emissions (7.3 million metric tons of CO_2e) and 0.06 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would result in a minor adverse indirect operational impact on CO_2 emissions due to new stationary and mobile sources of emissions.

Total stationary and mobile source emissions associated with the No-Action Alternative would be approximately 76,568 metric tons, representing about 1.05 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 1.52 percent of its 2032 emission target (5.05 million metric tons of CO_2e). The following sections describe the stationary and mobile source emissions in more detail.

Stationary Source Analysis

The station improvement projects included in the No-Action Alternative would not substantially affect energy usage. Electricity, steam, and chilled water consumption at WUS, and the associated CO_2 emissions would remain in the same range as the existing ones. Altogether, this would result in annual CO_2 emissions of approximately 12,274 tons. Electrical consumption from the private air-rights development would generate an additional 32,833 tons of CO_2. Total annual stationary source CO_2 emissions would amount to approximately 45,107 metric tons. This would represent approximately 0.62 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.89 percent of its emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Combined annual mobile source CO_2 emissions would amount to approximately 31,461 metric tons. This would represent 0.43 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.62 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

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4 A kBTU is 1,000 BTU. A BTU is a measure of the heat content of fuels or energy sources. Specifically, it is the quantity of heat required to raise the temperature of 1 pound of liquid water by 1 degree Fahrenheit at the temperature that water has its greatest density (approximately 39 degrees Fahrenheit).

5 U.S. Energy Information Administration. *Carbon Dioxide Emissions Coefficients.* Accessed from https://www.eia.gov/environment/emissions/co2_vol_mass.php. Accessed on April 2, 2020.

Total Direct and Indirect CO_2 Emissions

Relative to existing conditions, combining direct and indirect impacts, the No-Action Alternative would result in moderate adverse direct and indirect operational impacts on CO_2 emissions due to new mobile and stationary sources of emissions.

Total CO_2 emissions would be approximately 79,788 metric tons, representing 1.09 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 1.578 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to existing conditions, the No-Action Alternative would have a moderate adverse impact on resilience at WUS. Climate change impacts would likely increase resiliency challenges while WUS infrastructure would remain mostly unchanged.

In the No-Action Alternative, no major upgrades or retrofitting of the station's infrastructure that would provide the opportunity to improve its resilience would occur. The No-Action Alternative would not fully support the transportation objectives of *Resilient DC*, which calls for greater integration, capacity, and frequency of regional transit systems at Union Station. As climate change-related weather events become more numerous and challenging, WUS's current infrastructure may become less and less able to withstand them, potentially leading to disruptions in service and a deterioration of passenger and visitor experience. Such potential impacts are summarized in **Table 5-90.**

By 2040, WUS may experience increased temperatures, increased frequency and duration of heat waves, and increased frequency and intensity of precipitation and extreme storm events, as noted for the District in the *Climate Ready DC Plan.* The District will become more vulnerable to storm surge flooding from coastal storms and hurricanes. The most intense impacts are likely to occur later than 2040, however, and the No-Action Alternative would not preclude later upgrades to improve resiliency. Therefore, adverse impacts would be moderate.

Due to its location, WUS is not likely to be directly affected by sea level rise and increased storm surge risks. The elevation of the Local Study Area ranges from approximately 50 feet near Columbus Plaza to near 100 feet at the northern end of the Project Area.

Construction Impacts

Construction of the projects included in the No-Action Alternative would cause CO_2 emissions. Available information on methods and schedules of construction is insufficient to quantify and characterize impacts.

Projects that would be constructed through 2040 in the No-Action Alternative would generate CO_2 emissions from construction equipment and heavy machinery exhaust. Sufficient information on the total annual amount of emissions, type of equipment, vehicles, and project schedules is currently not available to develop estimates.

Table 5-90. Potential Impacts of Climate Change

	Potential Impacts
Increasing temperatures and frequency and duration of heat waves	▪ Power outages due to larger demand for cooling during hot days ▪ Increased internal temperatures of buildings if ventilation is not adequate ▪ Increased stress on transmission lines, rail tracks, and critical electrical equipment ▪ Expanded joints or buckled rail tracks ▪ Increased risk of regional power loss, resulting in interruption or delay of service ▪ Increased risk of heat exposure and heat-related illness to construction workers, terminal employees, and passengers ▪ Improved safety and train services due to fewer cold days ▪ Reduced environmental impacts (from salt and chemicals) and costs from less need for snow and ice removal
Increasing frequency and intensity of precipitation and extreme storm events	▪ Damages to facilities, disruption of operations and services due to flooding and standing water ▪ Flood risks near the Project due to overwhelmed stormwater/drainage systems that would impact access to the Project Site ▪ Damage to train and electrical equipment due to electrical voltage spikes during severe storms ▪ Fallen trees and debris (from high wind, ice storms, and other severe storm events), resulting in damaged rail infrastructure and terminal building ▪ Safety risk for outdoor workers and passengers ▪ Limitation of outdoor operations and maintenance services

5.7.4.2 Alternative A

Direct Operational Impacts

Stationary Source Analysis

Relative to the No-Action Alternative, Alternative A would result in no direct operational impact on CO_2 emissions.

WUS is not a substantial source of direct (on-site) stationary source emissions of CO_2, as it receives electricity, chilled water, and steam from sources outside of the Project Area. At this stage of Project design, it is anticipated that WUS would continue to receive energy from these outside sources. All CO_2 impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

Total annual CO_2 emissions due to Alternative A (detailed in the following sections) would be approximately 17,370 metric tons, approximately 0.24 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.34 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would be approximately a 22 percent increase over No-Action Alternative emissions.

Stationary Source Analysis

Stationary source CO_2 emissions in Alternative A were estimated based on the anticipated increase in energy consumption associated with the additional space requiring lighting, cooling, and heating that the Project would construct. The expanded station would use an additional 37,517,700 kBTUs per year of energy. Based on the proportion of each energy source used at WUS in existing conditions, 52 percent of this energy would be electrical; 30 percent chilled water; and 18 percent steam. The production of this energy would generate approximately 5,331 metric tons of stationary source CO_2 emissions annually. This would be an increase of 12 percent over the No-Action Alternative. It would represent approximately 0.07 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.11 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Potential Federal Air-right Development

The potential development of the Federal air rights as additional parking space would add approximately 3,690,408 kBTUs to WUS's annual energy consumption, assumed to be electricity. Producing this energy would generate approximately 597 metric tons of CO_2, representing 0.01 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and of its 2032 emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Increased vehicular and rail traffic would generate additional CO_2 emissions on the regional level. Relative to the No-Action Alternative, Alternative A would generate 11,442 additional metric tons of mobile source CO_2 per year. This would be a 36 percent increase over the No-Action Alternative. It would represent 0.16 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.23 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative A would have a beneficial impact on WUS's resilience.

Alternative A would result in a beneficial impact to the extent that it would provide an opportunity to improve the station's resilience. Features or measures designed to increase the resiliency of WUS could be incorporated into the design and operation of the proposed expansion to minimize the potential impacts of extreme weather events. Examples of potential resilience-enhancing measures are listed in **Section 5.7.6.1**, *Operational Impacts, Resilience.*

Station expansion in Alternative A would also support the transportation objectives of *Resilient DC*, which calls for greater integration, capacity, and frequency of regional transit systems at Union Station. [6]

Construction Impacts

Construction of Alternative A would result in negligible adverse impacts on CO_2 emissions.

Construction of Alternative A would generate CO_2 emissions from the use of construction equipment, heavy machinery, and truck and vehicular traffic. Excavation, including the loading, transportation and disposal of surplus soil and other materials, would require the use of large diesel-fueled equipment (such as excavators and dump trailers) and would be the most CO_2 intensive part of construction. Support of excavation, caisson drilling, pressure slab and overbuild deck construction would also generate substantial amounts of CO_2.

Modeling of construction emissions shows that the All Truck Scenario would generate more CO_2 emissions than the Work Train Scenario in all four phases of construction. In both scenarios, Phase 4 would be the most emission-intensive phase. Phase 4 All Truck Scenario emissions would be approximately 18,289 metric tons annually. This would represent 0.25 percent of the District's total 2017 CO_2e emissions (7.3 million metric tons) and 0.36 percent of its 2032 emission target (5.05 million metric tons).

Comparison to Existing Conditions

Alternative A would result in a greater proportional increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates the emissions from the private air-rights development as well as those from increased vehicular traffic and train service. For instance, with only WUS as a source, stationary source emissions in Alternative A would increase by 44 percent relative to existing conditions (47 percent with the potential Federal air-rights development) instead of 11 percent relative to the No-Action Alternative (13 percent with the potential Federal air-rights development).

However, the total amount of CO_2 emissions Alternative A would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

[6] *Resilient DC. A Strategy to Thrive in the Face of Change*. Accessed from https://resilient.dc.gov/. Accessed on August 20, 2019.

5.7.4.3 Alternative B

Direct Operational Impacts

Stationary Source Analysis

Relative to the No-Action Alternative, Alternative B would result in no direct operational impact on CO_2 emissions.

Like in the other Action Alternatives, there would be no direct impacts because WUS is not a significant source of on-site stationary source CO_2 emissions. All impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

Total annual CO_2 emissions in Alternative B (detailed in the following sections) would be approximately 26,453 metric tons, amounting to approximately 0.36 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.53 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would represent approximately a 33 percent increase over No-Action Alternative emissions (79,611 metric tons).

Stationary Source Analysis

Alternative B would generate an additional 5,995 metric tons of stationary source CO_2 emissions annually. This would be an increase of 13 percent over the No-Action Alternative. It would represent approximately 0.08 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.12 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Potential Federal Air-right Development

The potential development of the remaining Federal air rights above the new bus facility as additional office space would add approximately 61,742,366 kBTUs to WUS's annual energy consumption. This energy would be partly from natural gas and electricity. The generation of this energy would generate approximately 8,439 metric tons of CO_2 emissions annually. This would be equivalent to 0.12 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.17 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Relative to the No-Action Alternative, Alternative B would generate annually approximately 12,019 additional metric tons of mobile source CO_2. This would be a 38 percent increase over No-Action Alternative emissions. It would be equivalent to 0.16 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.24 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative B would have a beneficial impact on WUS's resilience.

The impacts of Alternative B on WUS's resilience would be the same as Alternative A's (**Section 5.7.4.2**, *Alternative A, Resilience*).

Construction Impacts

Construction of Alternative B would result in negligible adverse impacts on CO_2 emissions.

Alternative B's construction-related CO_2 emissions were estimated using the same approach as for Alternative A (see **Section 5.7.4.3**, *Alternative A, Construction Impacts*). As in all Action Alternatives, in Alternative B, the greatest amount of CO_2 emissions would occur during Phase 4 in both spoil removal scenarios. The All Truck Scenario would generate more emissions than the Work Train Scenario in all phases. Phase 4 All Truck Scenario emissions would be approximately 18,736 metric tons. This would represent 0.26 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.36 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Comparison to Existing Conditions

Alternative B would result in a greater proportional increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates the emissions from the private air-rights development and from increased vehicular traffic and train service. With only WUS as a source, stationary source emissions in Alternative B would increase by 49 percent relative to existing conditions (113 percent if the potential Federal air-rights development is included) instead of 13 percent relative to the No-Action Alternative (31 percent with the potential Federal air-rights development). However, the total amount of CO_2 emissions Alternative B would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

5.7.4.4 Alternative C

Direct Operational Impacts

Stationary Source Analysis

Relative to the No-Action Alternative, Alternative C (either option) would result in no direct operational impact on CO_2 emissions.

Like in the other Action Alternatives, there would be no direct impacts because WUS is not a significant source of on-site stationary source CO_2 emissions. All impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

The difference between the Alternative C East and West Options for stationary and mobile source CO_2 emissions would be negligible. Total annual emissions (detailed in the following sections) would be 24,845 (East Option) or 24,681 (West Option) metric tons, amounting to approximately 0.34 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.49 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would represent approximately a 31 percent increase over emissions in the No-Action Alternative.

Stationary Source Analysis

Alternative C with the East Option would cause WUS to use an additional 37,834,170 kBTUs of energy per year. The corresponding number for Alternative C with the West Option would be 37,614,720 kBTUs. To produce this energy, Alternative C with the East Option would generate 5,376 metric tons of stationary source CO_2 emissions annually. The West Option would generate 5,345 metric tons. In both cases, this would be an increase of approximately 12 percent over the No-Action Alternative. It would represent 0.07 percent of the District's total 2017 CO_2e emissions (7.3 million metric tons) and 0.11 percent of its 2032 emission target (5.05 million metric tons).

Potential Federal Air-right Development

In Alternative C (either option), the potential development of the Federal air rights as additional office space would add approximately 64,109,980 kBTUs to WUS's annual energy consumption. This energy would be partly from natural gas and electricity. Production of this energy would generate annually around 8,762 metric tons of CO_2. This would represent 0.12 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.17 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Alternative C, East Option would produce approximately 10,707 metric tons of mobile source CO_2 emissions annually, a 34 percent increase over the No-Action Alternative. This would be equivalent to 0.15 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.21 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Alternative C, West Option would generate approximately 10,574 additional metric tons of mobile source CO_2 annually over the No-Action Alternative, also a 34 percent increase. This would be equivalent to 0.14 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.21 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative C (either option) would have a beneficial impact on WUS's resilience.

The impacts of Alternative C on WUS's resilience would be the same as Alternative A (**Section 5.7.4.2**, *Alternative A, Resilience*).

Construction Impacts

Construction of Alternative C with either option would result in negligible adverse impacts on CO_2 emissions.

Alternative C 's construction-related CO_2 emissions were estimated using the same approach as for Alternative A (see **Section 5.7.4.3**, *Alternative A, Construction Impacts*). As in all Action Alternatives, the All Truck Scenario would generate more emissions than the Work Train Scenario in all phases. The greatest amount of emissions would occur during Phase 4 in both scenarios. Phase 4 All Truck Scenario CO_2 emissions would amount to approximately 17,260 metric tons annually. This would represent 0.24 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.34 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Comparison to Existing Conditions

Like the other Action Alternatives, Alternative C with either option would result in a greater proportional increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates the emissions from the private air-rights development and from increased vehicular traffic and train service. For instance, with only WUS as a source, stationary source emissions in Alternative C would increase by 44 percent relative to existing conditions (115 percent if the potential Federal air-rights development is included) instead of 12 percent relative to the No-Action Alternative (31 percent with the potential Federal air-rights development). However, the total amount of CO_2 emissions Alternative C would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

5.7.4.5 Alternative D

Direct Operational Impacts

Stationary Source Analysis

Relative to the No-Action Alternative, Alternative D would result in no direct operational impact on CO_2 emissions.

Like in the other Action Alternatives, there would be no direct impacts in Alternative D. This is because WUS is not a significant source of on-site stationary source CO_2 emissions. All impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

Total annual CO_2 emissions due to Alternative D (detailed in the following sections) would be approximately 21,070 metric tons, amounting to 0.29 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.42 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would be an approximately 26 percent increase over the No-Action Alternative.

Stationary Source Analysis

Alternative D would cause WUS to use an additional 38,058,466 kBTUs of energy annually. Producing this energy would generate approximately 5,409 metric tons of stationary source CO_2 emissions, a 12 percent increase over the No-Action Alternative. It would represent 0.07 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.11 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Potential Federal Air-Rights Development

In Alternative D, the potential development of the Federal air rights as additional office space would add 46,305,765 kBTUs to WUS's annual energy consumption. This energy would be partly from natural gas and electricity. Producing this energy would generate approximately 6,329 metric tons of CO_2 annually. This would represent 0.09 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and of 0.13 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Annually, Alternative D would generate approximately 9,332 metric tons of mobile source CO_2 from motor vehicle and locomotive emissions. This would represent a 30 percent increase over the No-Action Alternative. It would be equivalent to 0.13 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.18 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative D would have a beneficial impact on resilience relative to the No-Action Alternative.

The impacts of Alternative D on WUS's resilience would be the same as Alternative A's (**Section 5.7.4.2**, *Alternative A, Resilience*).

Construction Impacts

Construction of Alternative D would result in negligible adverse impacts on CO_2 emissions.

Alternative D's construction-related CO_2 emissions would be the same as those of Alternative C. This is because both alternatives would involve a similar amount of excavation work over a similar schedule. See **Section 5.7.4.4**, *Alternative C, Construction Impacts*.

Comparison to Existing Conditions

Like the other Action Alternatives, Alternative D, proportionately, would cause a greater increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates the emissions from the private air-rights development as well as those from increased vehicular traffic and train service. For instance, with only WUS as a source, stationary source emissions in Alternative D would increase by 44 percent relative to existing conditions (96 percent if the potential Federal air-rights development is included) instead of 12 percent relative to the No-Action Alternative (26 percent with the potential Federal air-rights development). However, the total amount of CO_2 emissions Alternative D would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

5.7.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would result in no direct operational impact on CO_2 emissions.

As in the other Action Alternatives, there would be no direct impacts in Alternative E. WUS is not a significant source of on-site stationary source CO_2 emissions. All impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

Total CO_2 emissions due to Alternative E (detailed in the following sections) would be approximately 22, 887 metric tons annually, amounting to 0.31 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.45 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would represent approximately a 29 percent increase over emissions in the No-Action Alternative.

Stationary Source Analysis

Alternative E would cause WUS to use an additional 41,210,140 kBTUs of energy annually, which would generate approximately 5,856 metric tons of stationary source CO_2 emissions. This would be an increase of 13 percent over the No-Action Alternative. It would represent 0.08 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.12 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Potential Federal Air-rights Development

The size of the potential Federal air-rights development in Alternative E would be the same as in Alternative D. It would consume the same amount of energy, resulting in the same amount of annual CO_2 emissions: 6,329 metric tons (**Section 5.7.4.5**, *Alternative D, Potential Federal Air-rights Development*).

Mobile Source Analysis

Alternative E would generate approximately 10,702 additional metric tons of mobile source CO_2 per year. This would be a 34 percent increase over mobile source No-Action Alternative emissions. It would represent 0.15 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.21 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative E would have a beneficial impact on WUS's resilience.

The impacts of Alternative E on WUS's resilience would be the same as those of Alternative A (**Section 5.7.4.2**, *Alternative A, Resilience*).

Construction Impacts

Construction of Alternative E would result in negligible adverse impacts on CO_2 emissions.

Alternative E's construction-related CO_2 emissions would be the same as those of Alternative B. Both alternatives would involve a similar amount of excavation work over a similar schedule. See **Section 5.7.4.3**, *Alternative B, Construction Impacts*.

Comparison to Existing Conditions

Like the other Action Alternatives, Alternative E would generate a greater proportional increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates emissions from the private air-rights development and from increased vehicular traffic and train service. For instance, with only WUS as a source, stationary source emissions in Alternative E would increase by 47 percent relative to existing conditions (99 percent if the potential Federal air-rights development is included) instead of 13 percent relative to the No-Action Alternative (27 percent with the potential Federal air-rights development). However, the total amount of CO_2 emissions Alternative E would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

5.7.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would result in no direct operational impact on CO_2 emissions.

As in the other Action Alternatives, there would be no direct operational impacts in Alternative A-C. WUS is not a significant source of on-site stationary source CO_2 emissions. All impacts would be indirect.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would result in negligible adverse indirect operational impacts on CO_2 emissions from mobile and stationary sources.

Total CO_2 emissions due to Alternative A-C (detailed in the following sections) would be approximately 18,506 metric tons annually, amounting to 0.25 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.37 percent of its 2032 emission target (5.05 million metric tons of CO_2e). This would represent approximately a 23 percent increase over emissions in the No-Action Alternative.

Stationary Source Analysis

Alternative A-C would cause WUS to use an additional 36,735,090 kBTUs of energy annually, which would generate approximately 5,220 metric tons of stationary source CO_2 emissions. This would be an increase of 11.5 percent over the No-Action Alternative. It would represent 0.07 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.1 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Potential Federal Air-rights Development

In Alternative A-C, the potential development of the remaining Federal air rights above the new bus and parking facilities as additional office space would add approximately 25,574,000 kBTUs to WUS's annual energy consumption. This energy would be partly from natural gas and electricity. The generation of this energy would generate approximately 3,495 metric tons of CO_2 emissions annually. This would represent around 0.05 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.07 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Mobile Source Analysis

Alternative A-C would generate approximately 9,791 additional metric tons of mobile source CO_2 per year. This would be a 31 percent increase over mobile source No-Action Alternative emissions. It would represent 0.13 percent of the District's total 2017 emissions (7.3 million metric tons of CO_2e) and 0.19 percent of its 2032 emission target (5.05 million metric tons of CO_2e).

Resilience

Relative to the No-Action Alternative, Alternative A-C would have a beneficial impact on WUS's resilience.

The impacts of Alternative A-C on WUS's resilience would be the same as those of Alternative A (**Section 5.7.4.2**, *Alternative A, Resilience*).

Construction Impacts

Construction of Alternative A-C would result in negligible adverse impacts on CO_2 emissions.

Alternative A-C's construction-related CO_2 emissions would be the same as those of Alternative A. Both alternatives would involve a similar amount of excavation work over a similar schedule. See **Section 5.7.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

Like the other Action Alternatives, Alternative A-C would generate a greater proportional increase in CO_2 emissions relative to existing conditions than relative to the No-Action Alternative. This is because the No-Action Alternative baseline incorporates emissions from the private air-rights development and from increased vehicular traffic and train service. For instance, with only WUS as a source, stationary source emissions in Alternative A-C would increase by 43 percent relative to existing conditions (71 percent if the potential Federal air-rights development is included) instead of 11.5 percent relative to the No-Action Alternative (19 percent with the potential Federal air-rights development). However, the total amount of CO_2 emissions Alternative A-C would generate; their size relative to overall District emissions; and their potential effect on climate change would be the same regardless of the baseline.

5.7.5 Comparison of Alternatives

Table 5-91 summarizes the impacts of the alternatives. **Table 5-92** provides a summary comparison of estimated emissions among alternatives. **Table 5-**93 provides a summary comparison of estimated construction emissions among alternatives.

All Action Alternatives would generate emissions of CO_2 that would not occur in the No-Action Alternative. Operational emissions would result from the energy needs of the expanded station and associated street and rail traffic while construction emissions would result from the operation of equipment and vehicles throughout the construction period. Based on the estimates presented in this section, Alternatives A and A-C would generate the smallest amount of CO_2 emissions and Alternatives B and E the largest. In the context of total emissions in the District, emissions would be proportionately very small regardless of the Action Alternative. As a result, the impact intensities relative to the No-Action Alternative would be the same for all Action Alternatives.

All Action Alternatives would have:

- No direct operational impacts because no Action Alternatives would create sources of CO_2 emissions in the Project Area.
- Negligible indirect operational impacts, because CO_2 emissions from energy consumption or vehicular and rail traffic would be small, amounting to 1 percent or less of both the District's 2017 CO_2e emissions and its 2032 emission target.
- Negligible construction impacts, as the highest level of annual emissions (during Phase 4 if only trucks are used to remove excavation spoils) would amount to 1 percent or less of both the District's 2017 CO_2e emissions and its 2032 emission target.
- Beneficial impacts on WUS's resilience, as all Action Alternatives would provide the opportunity to improve WUS's ability to better withstand the effects of climate change through design decisions.

The CO_2 emissions generated by the Action Alternatives would be well below those generated by the No-Action Alternative. The No-Action Alternative includes the development of the private air rights above the rail terminal, which would generate a substantial increase in energy demand and subsequent CO_2 emissions.

Table 5-91. Comparison of Alternatives, GHG Emissions

Impact Category	Type of Impact	No-Action Alternative	All Action Alternatives
GHG	**Direct Operational**	Negligible adverse impacts	No impacts
	Indirect Operational	Minor adverse impacts	Negligible adverse impacts
	Combined Direct and Indirect	Moderate adverse impacts	Negligible adverse impacts
	Construction	Undetermined	Negligible Adverse Impacts
Resilience		Moderate adverse impacts	Beneficial impacts

Table 5-92. Total Operational, Mobile Source, and Stationary Source CO_2 Emissions Summary

Alternative	Total Operational CO_2 Emissions (Metric tons/ year)	Total Operational Mobile Source CO_2 Emissions (Metric tons/year)	Total Operational Stationary Source CO_2 Emissions (Metric tons/year)	
			Alternative Only	Alternative + Potential Federal Air Rights
No-Action	79,778	N/A	45,107	N/A
A	17,370	11,442	5,331	5,928
B	26,453	12,019	5,994	14,433
C East Option	24,845	10,707	5,376	14,138
C West Option	24,681	10,574	5,345	14,107
D	21,070	9,332	5,409	11,738
E	22,887	10,702	5,856	12,185
A-C	18,506	9,791	5,220	8,715
District Total (2017)	7,300,000	N/A	N/A	N/A

Table 5-93. Construction CO_2 Emissions Summary (All Truck Scenario / Work Train Scenario)

Alternative	Phase	CO_2 Emissions (Metric tons per year)
A	Phase 1	9,201 / 6,438
	Phase 2	13,195 / 8,495
	Phase 3	10,289 / 6,709
	Phase 4	18,289 / 11,342
B	Phase 1	9,267 /6,505
	Phase 2	16,765 / 12,020
	Phase 3	13,700 / 8,028
	Phase 4	18,736 / 10,975
C (either option)	Phase 1	8,722 / 5,959
	Phase 2	14,028 / 8,702
	Phase 3	13,272 / 7,820
	Phase 4	17,260 / 9,680
D	Phase 1	8,722 / 5,959
	Phase 2	14,028 / 8,702
	Phase 3	13,272 / 7,820
	Phase 4	17,260 / 9,680
E	Phase 1	9,267 /6,505
	Phase 2	16,765 / 12,020
	Phase 3	13,700 / 8,028
	Phase 4	18,736 / 10,975
A-C	Phase 1	9,201 / 6,438
	Phase 2	13,195 / 8,495
	Phase 3	10,289 / 6,709
	Phase 4	18,289 / 11,342

5.7.6 Avoidance, Minimization, and Mitigation Evaluation

The following avoidance, minimization, and mitigation measures are being considered by FRA.

5.7.6.1 Operational Impacts

As anticipated adverse GHG impacts would be negligible, no mitigation is needed. The most effective means to reduce stationary source GHG emissions would be to reduce energy consumption. **Section 5.8.6**, *Avoidance, Minimization, and Mitigation Evaluation* discusses potential energy conservation measures that could be implemented as part of the Project. Such measures would also reduce indirect GHG emissions.

Resilience

Strategies being considered by FRA to enhance WUS's resilience include the adoption of the following measures by the Project Proponents:

- Monitoring and incorporating into the Project design and technology features to minimize buckled railroad tracks.
- Increasing power supply redundancy and backup generation.
- Reducing dependency on centralized power by installing renewable energy systems at WUS.
- Designing shelter facilities to provide shading and natural ventilation for passenger comfort and safety.
- Incorporating water conservation and green infrastructure features (see **Section 5.3.6**, *Avoidance, Minimization, and Mitigation Evaluation*).
- Considering reflective roofs or green roofs to reduce heat island effect.
- Considering appropriate glazing for the train hall to control solar heat by season.
- Although the Project Area is located outside of the floodplain:
  - Considering raising electrical components above ground level to protect from flash flood events during extreme storm events.
  - Considering the use of building materials that can withstand inundation, or installing flood barriers at openings of below-grade structures that may become vulnerable to flooding
  - Considering dry and wet floodproofing measures for proposed below-grade parking areas.

5.7.6.2 Construction Impacts

Although only negligible GHG emissions are anticipated to result from the construction of the Project under any of the Action Alternatives, measures could be taken to minimize these emissions. Such measures would be the same as described in **Section 5.6.6**, *Avoidance, Minimization, and Mitigation Evaluation* for other air pollutant emissions.

5.7.7 Permits and Regulatory Compliance

There are no permits pertaining to GHG emissions or resilience. During construction, the contractors would have to comply with the District's anti-idling regulations, as applicable.

5.8 Energy Resources

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on energy resources. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies relevant permitting and regulatory compliance requirements.

5.8.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to energy are listed **Section 4.8.1**, *Regulatory Context and Guidance*.

5.8.2 Study Area

The Local Study Area includes the portion of the Project Area extending from the front of WUS up to K Street (**Figure 4-8**). The Regional Study Area includes the District.

5.8.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on energy. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 8.4**, *Methodology*, provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible consistent with the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.8.3.1 Operational Impacts

Order-of-magnitude estimates of future on-site energy use, measured in kilo British thermal units (kBTUs),[1] were calculated by multiplying the square footage of the facilities provided in the No-Action and the Action Alternatives by estimated Energy Use Intensity (EUI) measures provided by the U.S. Federal Government's Energy Star Program. [2] EUI is expressed as energy per square foot per year. It is calculated by dividing the total energy consumed by a building in one year by the total gross floor area of the building. There are different EUIs for different types of building spaces. The impact analysis used the EUIs best applicable to the facilities included in each alternative. To provide a measure against which the intensity of the

[1] A kBTU is one thousand BTU. A BTU is "a measure of the heat content of fuels or energy sources." Specifically, it is the quantity of heat required to raise the temperature of 1 pound of liquid water by 1 degree Fahrenheit at the temperature that water has its greatest density (approximately 39 degrees Fahrenheit).

[2] Energy Star Portfolio Manager. March 2016. *Technical Reference. U.S. Energy Use Intensity by Property Type*.

resulting impacts could be assessed, projected energy uses was compared to the total amount of energy consumed in the District in 2017, which was 168 billion kBTUs.[3]

5.8.3.2 Construction Impacts

Construction of the Project would require the operation of a wide range of equipment powered by diesel fuel such as trucks, earth moving equipment, cranes, air compressors, and forklifts. Additionally, some electrical equipment and battery-operated tools would need to be charged on-site. The energy use related to the construction of each alternative is difficult to quantify. In a 2011 conference paper addressing building construction in the United States titled *Estimating Energy Consumption During Construction of Buildings: A Contractor's Perspective*, the authors noted that:

"Presently, there are plenty of research works assessing the energy consumption and environmental impacts of buildings, but few encompass construction process in complete life cycle. Some studies have included the construction phase; however, this was limited to various stages of material extraction, production, and transportation and did not include on-site construction processes. The industry's energy consumption during construction is not well understood because of its fragmentized nature and involvement of many parties during construction phase. That is why, at the time of design and even before construction starts, it is hard to predict the energy required and its impact at the construction phase."[4]

Therefore, in this DEIS, energy use from construction is assessed qualitatively.

5.8.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on energy.

5.8.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would have a minor adverse direct operational impact on energy resources.

In the No-Action Alternative, energy consumption at WUS would remain approximately the same as under existing conditions because the station would not undergo any major physical

[3] U.S. Energy Information Administration. *District of Columbia Energy Profile*. https://www.eia.gov/state/print.php?sid=DC. Accessed on August 21, 2019.

[4] Shrivastava, Sandeep et al. 2018. *Estimating energy consumption during construction of buildings: a contractor's perspective*. Available from: **Error! Hyperlink reference not valid.**https://www.researchgate.net/publication/273693109_Estimating_energy_consumption_during_construction_of_buildings_a_contractor's_perspective. Accessed on April 2, 2020.

expansion. Existing consumption is approximately 103.5 million kBTUs. It may decrease between now and 2040 due to the greater energy-efficiency of upgraded heat, ventilation, and air conditioning systems; lighting fixtures; and other equipment.

Therefore, the primary source of additional energy consumption in the Project Area would be the private air-rights development. **Table 5-94** shows an estimate of the annual energy use of this development. Altogether, the on-site energy use of the private air-rights development would be approximately 264 million kBTUs per year.

Table 5-94. Estimated Annual Energy Use of Private Air-Rights Development

Private Air Rights Development Space	Square Footage [1]	EUI[2] kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Office	2,160,000	67.3	145,368,000
Retail	120,000	93.7	11,244,000
Hotel	410,000	73.4	30,094,000
Residential	1,050,000	73.4	77,070,000
Total	**3,740,000**	**-**	**263,776,000**

1. Akridge. 2016. Burnham Place Feasible Maximum Program Estimates Applicable to Station Expansion Project No-Build Option. Letter from Akridge to FRA dated May 31, 2016.
2. Values derived from Energy Star Portfolio Manager. March 2016. *Technical Reference. U.S. Energy Use Intensity by Property Type*.

This impact would be minor for the following reasons. The estimated additional energy consumption in the No-Action Alternative would represent only a small fraction (around 0.16 percent) of the District's total energy consumption in 2017 (168 billion kBTUs). As such, it is unlikely to create capacity issues or to require the development of a dedicated energy source (such as a new power plant).

The additional electrical load from the private air-rights development may require a new substation.[5,6] The new substation is likely to increase the electrical load on the local distribution system and could result in other necessary upgrades to ensure stable and reliable delivery of electricity to local customers. Such upgrades are typical for development project of that size.

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would have no indirect operational impacts on energy resources.

The No-Action Alternative would not affect energy consumption away from the Project Area.

[5] A substation is a set of equipment that reduces the high voltage of electrical power transmission to levels suitable for supply to consumers.

[6] Shalom Baranes Associates. 2015. *Washington Union Station: Concept Feasibility Review Report (Draft).* BuroHappold Engineers, Hensel Phelps.

Construction Impacts

Construction of the projects included in the No-Action Alternative would result in minor adverse impacts on energy resources.

In the No-Action Alternative, the Project would not be constructed and there would be no energy-related impacts. The construction of other projects in the Project Area through 2040 would consume varying amounts of energy depending on the scale and duration of the construction activities. While it is not possible to develop a quantitative estimate, this consumption would be a minor adverse impact for the following reasons.

The projects included in the No-Action Alternative are of a type and size that are not unusual in a large city like the District. Even the largest one – the development of the private air rights – is similar in scale and nature, for instance, to the recent development of the air rights above Interstate 95, a short distance from WUS. While the construction of such projects requires large amounts of energy, mostly in the form of diesel fuel for construction vehicles and equipment, the demand they generate is not such that it can create shortages or capacity issues for energy suppliers. Additionally, the projects would be implemented at different times and on different schedules, spreading the associated energy consumption over up to two decades.

5.8.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A would have a minor adverse direct operational impact on energy resources.

In Alternative A, relative to the No-Action Alternative, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-95** provides an order-of-magnitude estimate of the increase in energy consumption that would result from each relevant element. The resulting impact would be minor for the reasons explained below.

Alternative A would result in an increase in energy consumption of approximately 37.5 million kBTUs a year. This would be 10 percent of the Project Area's projected consumption in the No-Action Alternative estimate but amounts to only approximately 0.02 percent of the District's total energy consumption in 2017 (168 billion kBTUs). As such, it is not likely to create capacity issues or to require the development of a dedicated energy source (such as a new power plant).

Table 5-95. Estimated Change in Annual Energy Use, Alternative A

Alternative Element	Additional Square Footage	EUI[1] kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	72,000	93.7	6,746,400
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	180,000	45.3	8,154,000
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	- 453,600	11.4	- 5,171,040
Total	**255,200**	**-**	**37,517,700**

1. Values derived *from Energy Star Portfolio Manager. Technical Reference. U.S. Energy Use Intensity by Property Type*, March 2016 and *Parking and the ENERGY STAR Score in the United States and Canada*, August 2018.

Based on a review of energy bills for WUS in 2014 and 2015, approximately 52 percent of the energy used at the station comes from electricity. Therefore, it is likely that the majority of the increased energy consumption in Alternative A would be in the form of electrical power. Increased electricity demand may require upgrades to the local distribution and transmission systems.[7] However, they are not likely to be beyond what it is commonly done for large-scale development projects.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would have a negligible adverse indirect operational impact on energy resources.

The potential development of the Federal air rights into additional parking space would result in a further increase in energy consumption at WUS. **Table 5-96** provides an order-of-magnitude estimate. Additional energy consumption from the parking space would represent approximately 10 percent over the increase that would directly result from the Project. It would represent approximately 0.002 percent of the District's total energy consumption in 2017. As such, the resulting impact would be negligible.

Table 5-96. Estimated Annual Energy Use of Federal Air-rights Development, Alternative A

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Parking Space	323,720	11.4	3,690,408

7 The potentially affected systems are protected as Critical Energy Infrastructure Information (CEII). Only the owning utility has access to this information and would need to conduct the appropriate to measure how the Project could affect them prior. Such analysis, and follow-on actions, would be conducted during the later stages of Project design.

Construction Impacts

Construction of Alternative A would result in minor adverse impacts on energy resources.

Construction of Alternative A would consume large amounts of energy, mostly in the form of diesel fuel used for construction vehicles and equipment. As explained in **Section 5.8.3.2,** *Construction Impacts*, it is difficult to develop a quantitative estimate. However, impacts can be anticipated to be minor, as large-scale construction projects such as the Project are common in large urban areas like the District. While they require large amounts of energy, they do not create shortages or create capacity issues for suppliers or distributors. Also, construction of Alternative A would take place over 11 years and 5 months. Therefore, the demand for energy would be distributed over time, reducing the impact on both source and distribution.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would result in an estimated increase in energy consumption representing 40 percent of the existing WUS consumption. This would be a proportionately greater increase than relative to the No-Action Alternative (see **Table 5-97**). The total amount of additional energy would remain the same. As explained above, it would amount to a minor adverse impact.

Table 5-97. Comparison of Alternative A Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative A Impact (kBTUs)	Alternative A Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative A Impact Relative to No-Action Alternative
103,500,000	41,208,108	40%	263,776,000	367,276,000	11%

5.8.4.3 Alternative B

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a minor adverse direct operational impact on energy resources.

In Alternative B, as in the other Action Alternatives, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-98** provides an order-of-magnitude estimate of the increase in energy consumption that would result from Alternative B.

Table 5-98. Estimated Change in Annual Energy Use, Alternative B

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	72,000	93.7	6,746,400
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	180,000	45.3	8,154,000
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	- 44,550	11.4	-507,870
Total	**664,250**	**-**	**42,180,870**

Alternative B would result in an increase in energy consumption of approximately 42.2 million kBTUs a year. This would be 11.5 percent of the Project Area's projected consumption under the No-Action Alternative but amount to only approximately 0.03 percent of the District's total energy consumption in 2017 (168 billion kBTUs). For the same reasons as for Alternative A (**Section 5.8.4.2**, *Alternative A, Direct Operational Analysis*), this would represent a minor adverse impact.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a minor adverse indirect operational impact on energy resources.

The potential development of the Federal air rights into office space would result in a further increase in energy consumption at WUS. **Table 5-99** provides an order-of-magnitude estimate. Additional energy consumption from the office space would represent 146 percent of the increase that would result directly from the Project. It would be approximately 0.03 percent of the District's total energy consumption in 2017. As such, the resulting adverse impact would be minor.

Table 5-99. Estimated Annual Energy Use of Federal Air-rights Development, Alternative B

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Office Space	917,420	67.3	61,742,366

Construction Impacts

Construction of Alternative B would result in minor adverse impacts on energy resources.

The construction of Alternative B, like that of Alternative A, would consume large amounts of energy, mostly in the form of diesel fuel used for construction vehicles and equipment. Construction of Alternative B would take place over approximately 14 years and 4 months. While the longer duration would result in greater total energy consumption, annual consumption would likely be within the same range as for Alternative A. For the same reasons as explained in **Section 5.8.4.2**, *Alternative A, Construction Impacts*, the resulting impacts on energy resources would be minor.

Comparison to Existing Conditions

Relative to existing conditions, Alternative B would result in an estimated increase in energy consumption that would double the existing WUS consumption. This would be a proportionately greater increase relative to the No-Action Alternative (see **Table 5-100**). The total amount of additional energy consumed would remain the same, however. As explained above, it would amount to a minor adverse impact.

Table 5-100. Comparison of Alternative B Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative B Impact (kBTUs)	Alternative B Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative B Impact Relative to No-Action Alternative
103,500,000	103,923,236	100%	263,776,000	367,276,000	28%

5.8.4.4 Alternative C

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have a minor adverse direct operational impact on energy because of increased energy consumption at WUS.

In Alternative C, as in the other Action Alternatives, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-101** and **Table 5-102** show order-of-magnitude estimates of the increase in energy consumption that would result from both options of Alternative C, respectively. As can be seen, the difference between the two options would be negligible.

Table 5-101. Estimated Change in Annual Energy Use, Alternative C East Option

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	72,000	93.7	6,746,400
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	115,000	45.3	5,209,500
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	-167,550	11.4	-1,910,070
Total	**476,192**		**37,834,170**

Table 5-102. Estimated Change in Annual Energy Use, Alternative C West Option

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	72,000	93.7	6,746,400
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	115,000	45.3	5,209,500
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	-186,800	11.4	-2,129,520
Total	**457,000**		**37,614,720**

Alternative C would result in an increase in energy consumption of approximately 37.6 to 37.8 million kBTUs a year. This would be a 10 percent of the Project Area's projected consumption under the No-Action Alternative but amount to only approximately 0.02 percent of the District's total energy consumption in 2017 (168 billion kBTUs). For the same reasons as for Alternative A (**Section 5.8.4.2**, *Alternative A, Direct Operational Impacts*), this would represent a minor adverse impact.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have a minor adverse indirect operational impact on energy consumption in the Project Area.

The potential development of the Federal air rights into office space would result in a further increase in energy consumption at WUS. **Table 5-103** provides an order-of-magnitude estimate. Additional energy consumption from the office space would represent an increase of 170 percent over the increase that would result directly from the Project. It would represent approximately 0.04 percent of the District's total energy consumption in 2017. As such, the resulting impact would be minor.

Table 5-103. Estimated Annual Energy Use of Federal Air-rights Development, Alternative C

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Office Space	952,600	67.3	64,109,980

Construction Impacts

Construction of Alternative C (either option) would result in minor adverse impacts on energy resources.

Construction of Alternative C, like that of Alternative A and the other Action Alternatives, would consume large amounts of energy, mostly in the form of diesel fuel used for construction vehicles and equipment. Construction of Alternative C would take place over approximately 12 years and 3 months. While the longer duration would result in greater total energy consumption, annual consumption would likely be within the same range as for

Alternative A. For the same reasons as explained in **Section 5.8.4.2**, *Alternative A, Construction Impacts*, the resulting impacts on energy resources would be minor.

Comparison to Existing Conditions

Relative to existing conditions, Alternative C would result in an estimated increase in energy consumption representing approximately 98 percent of the existing WUS consumption. This would be a proportionately greater increase than relative to the No-Action Alternative (see **Table 5-104**). The total amount of additional energy consumed would remain the same, however. As explained above, it would amount to a minor adverse impact.

Table 5-104. Comparison of Alternative C Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative C Impact (kBTUs)	Alternative C Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative C Impact Relative to No-Action Alternative
103,500,000	101,944,150	98%	263,776,000	367,276,000	28%

5.8.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a minor adverse direct operational impact on energy because of increased energy consumption at WUS.

In Alternative D as in the other Action Alternatives, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-105** provides an order-of-magnitude estimate of the increase in energy consumption that would result from Alternative D.

Alternative D would result in an increase in energy consumption of approximately 38 million kBTUs a year. This would be 10.4 percent of the Project Area's projected consumption in the No-Action Alternative and amount to only approximately 0.02 percent of the District's total energy consumption in 2017 (168 billion kBTUs). For the same reasons as for Alternative A (**Section 5.8.4.2**, *Alternative A, Direct Operational Impacts*), this would represent a minor adverse impact.

Table 5-105. Estimated Change in Annual Energy Use, Alternative D

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	100,000	93.7	9,370,000
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	100,000	45.3	4,530,000
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	-318,410	11.4	-3,629,874
Total	**338,390**	**-**	**38,058,466**

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a minor adverse indirect operational impact on energy consumption in the Project Area.

The potential development of the Federal air rights into office space would result in a further increase in energy consumption at WUS. **Table 5-106** provides an order-of-magnitude estimate. Additional energy consumption from the office space would represent 122 percent of the increase that would result directly from the Project. It would be approximately 0.03 percent of the District's total energy consumption in 2017. As such, the resulting impact would be minor.

Table 5-106. Estimated Annual Energy Use of Federal Air-rights Development, Alternative D

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Office Space	688,050	67.3	46,305,765

Construction Impacts

Construction of Alternative D would result in minor adverse impacts on energy resources.

The construction impacts of Alternative D would be the same as those of Alternative C. Both alternatives would involve the same depth of excavation and take the same amount of time to construct (**Section 5.8.4.4**, *Environmental Consequences, Energy Resources, Impact Analysis, Alternative C, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative D would result in an estimated increase in energy consumption representing approximately 82 percent of the existing WUS consumption. This would be a proportionately greater increase than relative to the No-Action Alternative (see **Table 5-107**). The total amount of additional energy consumed would remain the same, however. As explained above, it would amount to a minor adverse impact.

Table 5-107. Comparison of Alternative D Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative D Impact (kBTUs)	Alternative D Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative D Impact Relative to No-Action Alternative
103,500,000	84,364,231	82%	263,776,000	367,276,000	23%

5.8.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would have a minor adverse direct operational impact on energy because of increased energy consumption at WUS.

In Alternative E, as in the other Action Alternatives, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-108** provides an order-of-magnitude estimate of the increase in energy consumption that would result from Alternative E.

Table 5-108. Estimated Change in Annual Energy Use, Alternative E

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/year	Estimated Annual Facility Use (kBTUs)
Additional Retail	100,000	93.7	9,370,000
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	100,000	45.3	4,530,000
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	-41,916	11.4	-478,200
Total	**614,884**	-	**41,210,140**

Alternative E would result in an increase in energy consumption of approximately 41.2 million kBTUs a year. This would be 11 percent of the Project Area's projected consumption in the No-Action Alternative and amount to only approximately 0.02 percent of the District's total energy consumption in 2017 (168 billion kBTUs). For the same reasons as for Alternative A (**Section 5.8.4.2**, *Alternative A, Direct Operational Impacts*), this would represent a minor adverse impact.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would have a minor adverse indirect operational impact on energy consumption in the Project Area.

The indirect impacts of Alternative E would be the same as those of Alternative D. This is because the potential Federal air-rights development would be the same in both alternatives (**Section 5.8.4.5**, *Alternative D, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative E would result in minor adverse impacts on energy resources.

The construction impacts of Alternative E would be the same as those of Alternative B. Both alternatives would require the same depth of excavation and take the same amount of time to construct (**Section 5.8.4.3**, *Alternative B, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative E would result in an estimated increase in energy consumption representing approximately 85 percent of the existing WUS consumption. This would be a proportionately greater increase than relative to the No-Action Alternative (see **Table 5-109**). The total amount of additional energy would remain the same, however. As explained above, it would amount to a minor adverse impact.

Table 5-109. Comparison of Alternative E Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative E Impact (kBTUs)	Alternative E Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative E Impact Relative to No-Action Alternative
103,500,000	87,515,905	85%	263,776,000	367,276,000	24%

5.8.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse direct operational impact on energy because of increased energy consumption at WUS.

In Alternative A-C as in the other Action Alternatives, the expanded WUS would consume additional energy to operate the new station elements. **Table 5-110** provides an order-of-magnitude estimate of the increase in energy consumption that would result from Alternative A-C.

Table 5-110. Estimated Change in Annual Energy Use, Alternative A-C

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Retail	72,000	93.7	6,746,400
Additional Amtrak Support Space	211,800	78.8	16,689,840
Train Hall	113,500	45.3	5,141,550
Additional Concourse Space	245,000	45.3	11,098,500
Reduction in Parking/Bus Space	-258,000	11.4	-2,941,200
Total	**384,300**	**-**	**36,735,090**

Alternative A-C would result in an increase in energy consumption of approximately 36.7 million kBTUs a year. This would be 10 percent of the Project Area's projected consumption in the No-Action Alternative and amount to only approximately 0.02 percent of the District's total energy consumption in 2017 (168 billion kBTUs). For the same reasons as for Alternative A (**Section 5.8.4.2**, *Alternative A, Direct Operational Impacts*), this would represent a minor adverse impact.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse indirect operational impact on energy consumption in the Project Area.

The potential development of the Federal air rights into office space would result in a further increase in energy consumption at WUS. **Table 5-111** provides an order-of-magnitude estimate. Additional energy consumption from the office space would represent 70 percent of the increase that would result directly from the Project. It would be approximately 0.015 percent of the District's total energy consumption in 2017. As such, the resulting adverse impact would be minor.

Table 5-111. Estimated Annual Energy Use of Federal Air-rights Development, Alternative A-C

Alternative Element	Additional Square Footage	EUI kBTUs/Square Foot/Year	Estimated Annual Facility Use (kBTUs)
Additional Office Space	380,000	67.3	25,574,000

Construction Impacts

Construction of Alternative A-C would result in minor adverse impacts on energy resources.

Construction of Alternative A-C, like that of Alternative A and the other Action Alternatives, would consume large amounts of energy, mostly in the form of diesel fuel used for construction vehicles and equipment. Construction of Alternative A-C would take place over approximately 11 years and 5 months, like construction of Alternative A. For the same reasons as explained in **Section 5.8.4.2**, *Alternative A, Construction Impacts*, the resulting impacts on energy resources would be minor.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would result in an estimated increase in energy consumption representing approximately 60 percent of the existing WUS consumption. This would be a proportionately greater increase than relative to the No-Action Alternative (see **Table 5-112**). The total amount of additional energy would remain the same, however. As explained above, it would amount to a minor adverse impact.

Table 5-112. Comparison of Alternative A-C Energy Impacts to Existing Conditions

Existing Conditions (kBTUs)	Alternative A-C Impact (kBTUs)	Alternative A-C Impact Relative to Existing Conditions	Additional Consumption No-Action Alternative (kBTUs)	Total No-Action Alternative (kBTUs)	Alternative A-C Impact Relative to No-Action Alternative
103,500,000	62,309,090	60%	263,776,000	367,276,000	17%

5.8.5 Comparison of Alternatives

Table 5-113 summarizes the impacts of all alternatives. **Table 5-114** shows order-of-magnitude direct and indirect energy impacts for each alternative. All Action Alternatives would result in lesser impacts than the No-Action Alternative because of the large size of the private air-right development and associated energy consumption. With regard to direct impacts, the Action Alternatives would vary within a narrow range, from 36.7 million kBTUs (Alternative A-C) to 42.2 million kBTUs (Alternative B).

Differences would become greater when factoring in the indirect impacts from the potential Federal air-rights development, with the impacts of Alternative A being substantially less than those of the other Action Alternatives. This is because of the smaller size and different function of the Federal air-rights development in Alternative A (parking instead of office space), which would require less energy. Alternatives B and C would have the greatest combined direct and indirect impacts. For all alternatives, the estimated impacts of the potential Federal air-rights development would be a very small fraction of the District's energy consumption in 2017. As such, they are not likely to generate supply or capacity issues.

Table 5-113. Comparison of Alternatives, Energy Resources

Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C (Either Option)	Alternative D	Alternative E	Alternative A-C (Preferred)
Direct Operational	Minor adverse impacts						
Indirect Operational	No impacts	Negligible adverse impacts	Minor adverse impacts				
Construction	Minor adverse impacts						

Table 5-114. Comparison of Estimated Energy Impacts by Alternative (Million kBTUs per Year)

	Alternative							
	No-Action	A	B	C East	C West	D	E	A-C
WUS Expansion	-	37.5	42.2	37.8	37.6	38	41.2	36.7
Private Air-Rights Development	264	-	-	-	-	-	-	-
Potential Federal Air-Rights Development	-	3.7	61.7	64.1	64.1	46.3	46.3	25.6
Total	**264**	**41.2**	**103.9**	**101.9**	**101.7**	**84.3**	**87.5**	**62.3**

Construction of the alternatives would also consume energy. While it is not possible to quantify this impact, it would generally be proportional to the size of the development and the duration of the construction. On this basis, Alternatives A and A-C would have the smallest construction impact and Alternatives B and E the greatest. In general, these impacts would be in the range of what is typical of large construction projects.

5.8.6 Avoidance, Minimization and Mitigation Evaluation

The following avoidance, minimization, and mitigation measures are being considered by FRA to minimize energy impacts as much as possible:

- The Project Proponents would incorporate cost-effective energy efficiency technologies into the Project design. Numerous small upgrades to systems such as lighting, refrigeration, water heating and cooling, space heating and cooling, windows, doors, and building insulation, would result in major energy savings at reasonable costs and with short payback periods. Other technologies would save additional energy by adjusting energy consumption to the needs of the people using the space. These include, but are not limited to, programmable and learning thermostats; energy management systems that react to utility price signals and energy demand in the region; and light motion sensors and dimmers.

- USRC would develop a Tenant Manual. The retail space in WUS is leased by USRC to a single entity (Ashkenazy Acquisition Corporation, operating as Union Station Investco [USI]), which in turn leases the individual spaces to tenants. A Tenant Manual would be prepared for USI and any future entities that may control the new retail space created by the Project. In that manual, USRC would identify strategies to reduce energy consumption. Such strategies may include but are not limited to identifying core and shell features that allow tenant choices in energy-related fit-out and requiring or encouraging tenants to adopt appropriate sustainable design, energy efficiency, water use, and water pollution control commitments to the extent feasible as part of their respective lease agreements.

5.8.7 Permits and Regulatory Compliance

The Project would need to submit Green Determination Requests to the District Department of Consumer and Regulatory Affairs to determine the applicability of green and energy laws and regulations in the Green Building Design Process. When filing a Green Determination Request, the project owner is seeking to determine which green building codes and laws are applicable to the project.

The Green Building Division (Division) regulates construction in the District that falls under the regulations of the Green Building Act,[8] Green Construction Code,[9] and Energy Conservation Code.[10] The Division is responsible for plan reviews, building inspections, and certificate of occupancy review.

[8] District of Columbia Official Code. 2013 District of Columbia Building Code. Green Building Act. Division I, Title 6, Chapter 14A, § 6-1451.01 — 6-1451.11.

[9] *District of Columbia Green Construction Code*. 2013. Accessed from https://doee.dc.gov/publication/districts-green-construction-code. Accessed on April 2, 2020.

[10] District of Columbia Official Code. 2013 District of Columbia Energy Code. Energy Conservation Code. Chapter 4 – Commercial Energy Efficiency. Accessed from https://codes.iccsafe.org/content/document/921?site_type=public. Accessed on April 2, 2020.

5.9 Land Use, Land Planning, and Property

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on zoning and land use; property; and applicable local and regional plans and policies. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts, as well as potential permitting and regulatory compliance requirements.

5.9.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to energy are listed in **Section 4.9.1**, *Regulatory Context and Guidance*.

5.9.2 Study Area

As defined in **Section 4.9.2**, *Study Area*, the Local Study Area is the Project Area and the zoning districts within one-half mile of the Project Area. North of K Street, where the Project consists solely of track modifications, the Local Study Area is the track area and the zoning districts within one-quarter mile of the Project Area (**Figure 4-9**). The Regional Study Area includes the neighborhoods adjacent to the Project Area. The outer limits of the Regional Study Area are the limits of Capitol Hill, the Atlas District/H Street Corridor, the Monumental Core, NoMA, and Mount Vernon Triangle neighborhoods. This Regional Study Area represents the broader land use context of the Project (**Figure 4-9**).

5.9.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on land use, property, and regional plans and policies. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 9.4**, *Methodology,* provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible consistent with the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.9.3.1 Operational Impacts

Impacts on land use were determined by comparing the elements of the alternatives with the designated land use of the parcels comprising the Project Area. Impacts within the Project Area to property ownership, land acquisitions, and displacements were assessed by identifying the need for property acquisition as required for project implementation, including air-rights property. The alternatives' impacts on local and regional plans were determined by considering the consistency of the Project program and elements with the relevant goals of the plans.

Potential indirect impacts such as induced development, changes in development patterns, or increased rates of development outside the Project Area are described qualitatively. Indirect impacts resulting from the potential development of the Federal air rights in the Project Area were determined based on the uses (parking or office) assumed for the purposes of the DEIS analysis.

Federal property is not subject to local zoning. Federal development in the District is subject to review and approval by the National Capital Planning Commission (NCPC) as the zoning authority for Federal land. FRA has determined that it is reasonably foreseeable that the Federal air-rights area would be rezoned to match the District's Union Station North (USN) zoning designation that applies to the adjacent private air rights. Development consistent with USN zoning was assumed for the Federal air rights.

Current PDR-3 zoning limits overall building height to 90 feet above existing grade; does not allow residential uses; and would be unlikely to support a consistent pattern of development on either side of the historic station building. USN zoning allows development to a maximum height of up to 130 feet above the crest of the H Street Bridge with a 20-foot height step down to 110 feet within 300 feet of the historic station building and another 20-foot height step down to 90 feet within 150 feet of it.

5.9.3.2 Construction Impacts

Impacts from construction were evaluated based on whether construction activities would cause inconsistencies with, or modifications or delays to, existing or planned land uses and developments in the Local Study Area that are distinct from potential operational impacts.

5.9.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on land use, land planning, and property.

5.9.4.1 No-Action Alternative

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to existing conditions, the No-Action Alternative would have a major beneficial direct operational impact on land use and development. It would have no direct operational impacts on zoning.

The projects included in the No-Action Alternative would be consistent with existing zoning and, as such, would have no impacts on zoning. The various station and track improvements in this alternative would be consistent with PDR-3 zoning. The private air-rights development would be within what the USN zoning district allows. There would be no need for a zoning amendment.

The various projects included in the No-Action Alternative would moderately enhance WUS as a multi-modal transportation hub. Additionally, the private air-rights development would result in denser and more varied land uses within the Project Area. This would be a major beneficial impact on land use, as it would create a new mixed-use development consistent with zoning and land use plans that would bridge the gap created by the existing rail terminal in the local urban fabric. The No-Action Alternative would be consistent with DC Office of Planning (DCOP)'s Future Land Use Map.

In spite of the beneficial impact on land use in the Project Area, the No-Action Alternative would see a marked deterioration of WUS user experience. The number of visitors and travelers would increase substantially. While the improvement projects included in the No-Action Alternative, such as the Concourse Modernization Project, would contribute to improving circulation conditions, they would not be sufficient to prevent increasing congestion in the station. Overcrowding would exacerbate those existing short-comings that the No-Action Alternative would leave unaddressed (for instance narrow platforms), making boarding and alighting from trains more difficult. While the historic station building would continue to be the center and heart of WUS, congested conditions would keep many visitors and travelers from fully appreciating and enjoying its grand architecture.

Property Ownership, Land Acquisitions, and Displacements

Relative to existing conditions, the No-Action Alternative would have no direct operational impacts pertaining to property ownership, land acquisitions, or displacements.

With one exception, the projects in the No-Action Alternative would entirely occur within areas already owned or controlled by the respective project proponents. The exception is the private air-rights development. North of the H Street Bridge and south of the bridge above the stub-end tracks, the lower limit (vertical datum) of the private air rights stands at elevation 80 feet. South of the H Street Bridge, there would be insufficient vertical space to accommodate the full depth of a structural deck as proposed by the private air-rights developer without encroaching into Federal property.[1] A similar encroachment would occur within Amtrak property north of the H Street Bridge. Therefore, construction of this portion of the private air-rights deck would require property agreements with the Federal government and Amtrak.

Within the portion of the private air rights where the vertical datum is at 70 feet (southeast of the H Street Bridge above the run-through tracks), there would be sufficient vertical space to construct the structural deck and associated systems within the private air rights.

[1] Akridge. November 15, 2017. *Burnham Place and Washington Union Station. Concept Level Podium Structural Systems for 30'x55' Column Grid Areas.*

Consistency with Local and Regional Plans

Relative to existing conditions, the No-Action Alternative would have minor adverse direct operational impacts on most local and regional plans.

Table 5-115 summarizes the impacts of the No-Action Alternative on local and regional plans. In general, the No-Action Alternative would fail to fully support the relevant goals of most plans, resulting in adverse impacts. These impacts would be minor because the No-Action Alternative would not preclude achieving all or a majority of the plans' goals. See **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 9.5.1.1**, *Direct Operational Impacts, Consistency with Local and Regional Plans* for more detailed analysis.

Table 5-115. Impacts of the No-Action Alternative on Local and Regional Plans

Plan	Impacts
Comprehensive Plan for The National Capital	**Minor adverse impact:** The No-Action Alternative would not be fully consistent with the goals of the *Comprehensive Plan for the National Capital Transportation Element*, which calls for WUS to increase and expand its multimodal capacities and connectivity.
H Street NE Strategic Development Plan	**Minor adverse impact:** The No-Action Alternative would not be fully consistent with the goals of the *H Street NE Strategic Development Plan*, which calls for the strengthening of the connection between WUS and the H Street corridor and for the area to serve as a multi-modal center.
NoMA Vision Plan and Development Strategy	**Minor adverse impact:** The No-Action Alternative would not be fully consistent with the goals of the *NoMA Vision Plan and Development Strategy*, which calls for improved transit accessibility and vehicular circulation.
Northwest One Redevelopment Plan	**Minor adverse impact:** The No-Action Alternative would not support the goals of the *Northwest One Redevelopment Plan*, which calls for reconstructing the grid pattern of streets in the area, including using public space design on K Street consistent with the design developed for the Mount Vernon Triangle District to better connect the Northwest One neighborhood with its neighbors to the east and west.
Mount Vernon Triangle Action Agenda	**No impact:** The No-Action Alternative would be generally consistent with the *Mount Vernon Triangle Action Agenda* but the elements of the No-Action Alternative are outside the plan's area.

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The development of the private air rights in the Project Area may encourage or accelerate further medium- or high-density development in the H Street Corridor, which currently is comprised of a high-activity street (H Street NE) surrounded by low-density residential neighborhoods, and throughout Capitol Hill, where row houses predominate. Land use in the other neighborhoods within the Local and Regional Study Areas, such as Mount Vernon Triangle and NoMA, is already characterized by medium- and high-density development. Everywhere, zoning regulations and applicable plans would continue to guide the density and character of future developments. This would avoid incompatible land uses and ensure that neighborhoods evolve in accordance with the District's vision for their respective futures.

Construction Impacts

Construction activities in the No-Action Alternative would result in minor adverse impacts on land use and no impacts on zoning or development; property ownership, land acquisitions, and displacement; or local and regional plans.

In the No-Action Alternative, the Project would not be constructed and would have no construction impacts. Construction of the various projects included in the No-Action Alternative would result in no more than minor adverse impacts on land use. The largest of these projects - the private air-rights development, the replacement of the H Street Bridge, and the VRE Midday Storage Facility - would take place within the footprint of the rail terminal and have the potential to affect its operations. Amtrak must authorize work in the rail terminal. The permitting process would ensure that any impacts to rail operations are minimized.

While construction activities and staging areas would likely remain within the respective footprints of the projects, the noise, pollution, or transportation disruptions typically associated with construction activities in a dense urban environment would affect adjacent land uses. However, these impacts, which would be typical of medium to large construction projects, are not likely to create durable incompatibilities that would prevent adjacent facilities and buildings from continuing to operate or forcing them to relocate.

5.9.4.2 Alternative A

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative A would have no direct operational impact on zoning. It would have a major beneficial direct operational impact on land use and development.

Alternative A would have no impact on zoning. Federal property is not subject to local zoning and Federal development in the District is subject to review and approval by NCPC as the zoning authority. As explained in **Section 5.9.3.1**, *Operational Impacts*, it can reasonably be assumed that development within the Federal air rights would be conducted consistent with the requirements of the USN zoning designation applying to the adjacent private air rights. Project elements in Alternative A include a train hall that would be approximately 42 feet in height above the crest of the H Street Bridge elevation. This would be consistent with both PDR-3 and USN zoning. Alternative also includes a bus facility and parking above it (multimodal surface transportation center), which would rise about 91 feet above the H Street Bridge. Although this height would not be compatible with the existing PDR-3 zoning, it would be compatible with the USN zoning designation.

Alternative A would have a major beneficial impact on land use by enhancing multi-modal transportation uses and connectivity within the Project Area and providing a more accessible, up-to-date multi-modal facility capable of accommodating more passengers and more train and bus service than in the No-Action Alternative. It would make efficient use of a highly constrained area by keeping all WUS-related uses close together south of the H Street Bridge. Alternative A would also benefit the neighborhood by creating new connections between the areas on either side of the rail terminal and be compatible with the DCOP Future Land Use Map.

The beneficial impact on land use would translate into an improvement in WUS user experience relative to the No-Action Alternative. New access points from First, 2nd, and H Streets into the H Street Concourse would make it easier to enter WUS from the surrounding neighborhoods. It would also provide connectivity and continuity from First Street to 2nd Street. Retail in the new concourses could potentially become a destination for local residents as well as tourists.

The historic station building would remain the heart of the station and its most visible and inviting entrance. By alleviating congestion, especially during peak travel times, the additional concourse space and access points would make it easier for passengers and visitors to appreciate and enjoy the grand architecture of the historic station. The north-south train hall, which would be designed to be a monumental, compelling gateway space worthy of welcoming visitors and travelers to the nation’s capital, would extend areas of architectural interest past the historic station building to encompass part of the track and platform area. In combination with enhanced accessibility (wider platforms, full compliance with ADA-requirements, effective signage), more spacious waiting areas, and greater amounts of natural light, this would make boarding or alighting from trains at WUS a much easier and more enjoyable experience than would be the case in the No-Action Alternative.

Similarly, intercity bus passengers would enjoy the benefits of a more contemporary facility with better amenities and greater functional and visual integration with the rest of the station, including the historic station building, via Concourse A. Improved internal circulation, including additional vertical circulation elements, would provide passengers with better connections to the Metrorail Station, an important mode of access for WUS users, particularly tourists and travelers unfamiliar with the station. The First Street, Central, and H Street Concourses, along with headhouses on H Street, would provide a more direct and welcoming connection for DC Streetcar users.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative A would have a moderate adverse direct operational impact on property ownership, land acquisitions, and displacements.

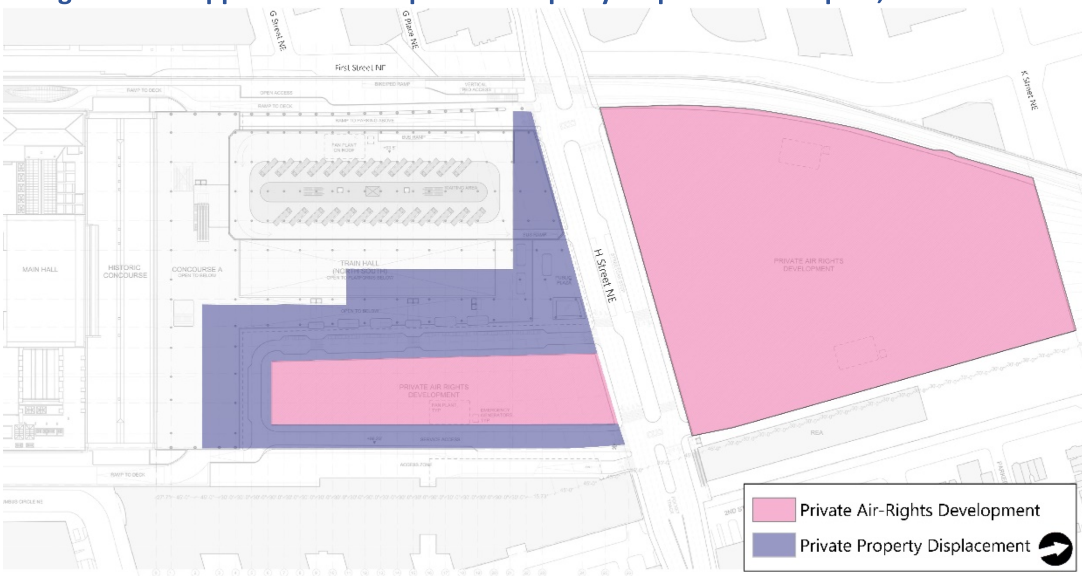
Alternative A would have an adverse impact on property ownership because it would involve constructing a portion of the new train hall and access roads adjacent to the train hall within the private air rights above the rail terminal. Also, the area between H Street NE and the bus facility would be used by the Project to establish an entrance into the station. Altogether, this would require acquiring approximately 135,700 square feet of private air-rights property (approximately 3.1 acres) south of H Street.[2] **Figure 5-23** shows the approximate footprint of the private air-rights property that would need to be acquired. It would represent approximately 22 percent of the 622,800-gross-square-foot footprint of the private air rights.[3]

The adverse impact would be moderate because, although sizable, the reduction would not preclude developing the remaining air rights. Additionally, the 3.1 acres that would be affected include roads that are needed to serve the private air-rights development as well as WUS. Also, WUS-related structures would be concentrated south of H Street NE, leaving the portion of air rights north of H Street fully available for development and minimizing the fragmentation of the developable area.

[2] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[3] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

Figure 5-23. Approximate Footprint of Property Displacement Impact, Alternative A



The Project would also require a property transaction to construct the new H Street Concourse at the location of the existing H Street Tunnel. This is the former at-grade alignment of H Street NE between First and Second Streets NE. This section of H Street was closed off after the construction of the H Street Bridge. It is owned by DDOT. In Alternative A and all Action Alternatives, the H Street Tunnel would be acquired and replaced by the new concourse. [4]

Relative to the No-Action Alternative, Alternative A would reduce the amount of Federal property for which the private air-rights developer would need an agreement with the Federal government (see **Section 9.5.1.1**, *Direct Operational Impacts, Property Ownership, Land Acquisitions, and Displacements*). The reduction would be important, as the entire private air-rights deck south of H Street would be within the 70-foot datum area. A property agreement with Amtrak would be potentially needed only for the private air-rights area north of H Street NE, as in the No-Action Alternative.

[4] The exact process through which the tunnel would be acquired has not yet been determined.

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative A would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

Table 5-116 shows the direct operational impacts of Alternative A on local and regional plans. The impacts of Alternative A on plans would generally be beneficial relative to the No-Action Alternative because Alternative A would support many of the goals the No-Action Alternative would not support.

Table 5-116. Impacts of Alternative A on Local and Regional Plans

Plan	Impacts
Comprehensive Plan for The National Capital	**Major beneficial impact:** Alternative A would support the plan's policies of increasing the utilization of passenger rail service in the Northeast Corridor and points south and west to serve Washington's Union Station, reinforcing its status as a Capital Gateway that announces entry into the capital city. Alternative A would be consistent with these policies. It would expand and modernize WUS, a major goal of the *Comprehensive Plan for the National Capital Transportation Element* that the No-Action Alternative would not support.
H Street NE Strategic Development Plan	**Moderate beneficial impact**: Alternative A would help achieve the connectivity goals of the *H Street NE Strategic Development Plan* by providing connections between H Street NE and WUS. It would support the plan's transit goals by expanding and modernizing multimodal options that the No-Action Alternative would not support. These goals are part of a larger set of plan objectives that Alternative A would neither prevent nor support; therefore, the impact would be moderate.
NoMA Vision Plan and Development Strategy	**Moderate beneficial impact:** Alternative A would support the connectivity goals of the *NoMA Vision Plan and Development Strategy* that the No-Action Alternative would not support by bringing the station elements into compliance with Americans with Disabilities Act (ADA) and Life Safety[5] requirements, providing new pedestrian entrances, and increasing the number of bikeshare docks and capacity for bicycle storage. The connectivity goals are part of a larger set of plan objectives that Alternative A would neither prevent nor support; therefore, the impact would be moderate.
Northwest One Redevelopment Plan	**Minor beneficial impact**: Alternative A would provide new access points on and below the H Street Bridge, generally supporting the connectivity goals of the *Northwest One Redevelopment Plan* that the No-Action would not support. These access points are outside of the plan area; therefore, the impact would be minor.
The Mount Vernon Triangle Action Agenda	**No impact**: Alternative A would be generally consistent with the *Mount Vernon Triangle Action Agenda*, including providing new retail, but it is outside the plan's area.

Indirect Operational Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the potential Federal air-rights development in Alternative A would have a minor beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

Alternative A would construct a new bus facility and parking facility in the Federally owned air rights to the southwest of H Street NE. The new structure would rise approximately 91 feet above the crest of the H Street Bridge. Within the part of this area starting approximately 300 feet from the historic station building, the USN zoning designation (assumed to apply by 2040) would allow for heights of up to 130 feet above the H Street Bridge. Therefore, air-rights space would be available for potential commercial development that would bring the new, combined structure to the maximum permitted height. While the mechanism to allow for this development has not yet been determined, as an example, FRA could lease the air rights to USRC, which in turn would sublease the development rights.[6]

Alternative A would have no indirect adverse impacts on zoning. As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, Federal land is not subject to local zoning and NCPC is the zoning authority for Federal land in the District. It can be anticipated that the potential Federal air-rights development would be planned consistent with the USN zoning that applies to the adjacent private air rights. Based on USN zoning, a maximum envelope of approximately 323,720 gross square feet (GSF) would be available for development. If and as planning and design for this development occurs, Floor Area Ratio (FAR) requirements would be reviewed to ensure, as much as practicable, full consistency with USN zoning.

Because of its relatively modest size and location on top of a bus facility and parking facility, with no opportunity for direct access from the street level, it is assumed for the purposes of this DEIS that the space would be used for additional parking.[7] This would be a beneficial impact because it would contribute to supporting WUS operations by making use of potentially developable space that otherwise would remain unproductive in a manner consistent with surrounding land uses. This beneficial impact would be minor because such a development would not be fully consistent with DCOP's Future Land Use Map, which shows mixed-use development with residential, retail, and office space at this location.

[6] The FRA-USRC lease and USRC's organizational documents would permit USRC to facilitate the development similar to USRC's role in the 1980s development.

[7] This assumption is for analysis purposes only and does not preclude any other type of potential development within the remaining Federal air rights. Of the plausible uses of this space, parking allows for a conservative evaluation of traffic impacts.

Regional Study Area

Relative to the No-Action Alternative, Alternative A would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The improved connectivity and activity at WUS promoted by Alternative A may accelerate medium- or high-density development near the station. Such development already characterizes most of the Regional Study Area, such as Mount Vernon Triangle and NoMA. Indirect impacts from induced development may be more noticeable along and near the H Street Corridor, which currently is comprised of a high-activity street (H Street NE) surrounded by residential rowhouse neighborhoods, and throughout Capitol Hill. However, the District's zoning regulations and applicable plans would continue to guide the density and character of potential future developments in all areas. This would avoid incompatible land uses and ensure that neighborhoods evolve in accordance with the District's vision for their respective futures. Therefore, no adverse impacts are anticipated.

Construction Impacts

Construction of Alternative A would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction activities in Alternative A would largely be contained within the footprint of the rail terminal. Construction would affect rail operations but the phased, east-to-west construction approach would minimize this impact and the resulting disruptions in service (see **Section 5.5.4.2**, *Alternative A, Construction Impacts,* for further discussion of potential impacts on intercity buses and parking during Phase 4). At various times over the construction period (approximately 11 years and 5 months[8]), five areas may be used for access and staging: the West Rail Yard (between K Street and H Street); WUS east access ramp, First Street NE, 2nd Street NE, and the H Street Bridge curbs; the H Street Tunnel; the Railway Express Agency (REA) Parking Lot; and a train access area for material delivery and removal in the constricted "throat" of the rail terminal north of K Street NE.

Of these, the WUS east access ramp, First Street NE, and 2nd Street NE curbs are just outside the Project Area. They would be used as access points for personnel, minor equipment, Short-term truck parking, and limited material deliveries, generally consistent with their existing use. The H Street Bridge, although within the Project Area, is a public right-of-way. In addition to the uses just listed, it could also be used to place equipment to hoist or pump materials into and out of the site. This would be a short-term use occurring multiple times

[8] This includes the 12-month Intermediate Phase between Phases 1 and 2, during which only column removal work would be performed. The need for outside staging space during this phase would be minimal.

over the entire period of construction. Close coordination with DDOT and Amtrak would ensure that disruptions to street and rail traffic do not occur or remain minimal.

Use of the West Rail Yard area and the REA Parking Lot for construction access and staging would involve a change in the current use of these areas, including demolitions of existing buildings and construction of access ramps. The West Rail Yard would be a major staging area during Phases 1 to 3 (excluding the Intermediate phase) and part of Phase 4. Use of the REA Parking Lot likely would be mostly during Phase 1. Amtrak, one of the Project Proponents, controls those areas. Construction planning would include minimizing any impacts on the operation of the rail terminal.

The H Street Tunnel (former at-grade H Street right-of-way) would be used for east side access during Phase 1 but that end of the tunnel would be demolished during Phase 1 excavation. The west end of the tunnel would be used for access during Phases 2 through 4. [9]

For the entire duration of the First Street Tunnel column removal work, part of the Retail and Ticketing Concourse would be closed to the public to allow for the removal of columns in the tunnel underneath the historic station building. This would affect the uses currently accommodated in the eastern part of the concourse, including retail outlets, which would be displaced for up to approximately 2 years and 6 months (total duration of the column removal work including part of Phase 1, the Intermediate Phase, and part of Phase 2).

Preliminary planning indicates that in Alternative A, construction of the deck-level portion of the private air-rights development would not be able to start until the completion of Phase 3 of the construction of the Project. This would be approximately 8 years and 4 months after the start of construction.[10]

During Phase 4 of construction, the existing bus facility and parking garage would be demolished and replaced. Intercity bus service and parking would not be available at WUS during this period of approximately 3 years and 1 month (see **Section 5.5.4.2**, *Alternative A, Construction Impacts* for further discussion of potential impacts on intercity buses and parking during Phase 4).

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would have major adverse direct and indirect operational impacts on zoning. This is because the height of the combined new bus and parking facilities and, potentially, the height of the Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Most the impacts of Alternative A on land use, property ownership, and plans relative to existing conditions would be the same as they would be relative to the No-Action alternative.

[9] As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, the H Street Tunnel would be acquired to construct the new H Street Concourse.

[10] Amtrak. November 2019*. Washington Union Station Terminal Infrastructure Project Constructability Report.*

These impacts would result from features of Alternative A or the Study Area that would not change with the baseline.

5.9.4.3 Alternative B

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative B would have no direct operational impact on zoning. It would have a major beneficial direct operational impact on land use and development.

Alternative B would have no adverse impact on zoning for the same reasons as explained for Alternative A (see **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*). The train hall and bus facility would be 42 feet in height above the crest of the H Street Bridge elevation, consistent with both PDR-3 and USN zoning.

Alternative B would have a major beneficial impact on land use by enhancing multi-modal transportation uses and connectivity within the Project Area and providing a more accessible, up-to-date multi-modal facility capable of accommodating more passengers and more train and bus service than in the No-Action Alternative. Alternative B would also benefit the neighborhood by creating new connections between the areas on either side of the rail terminal and it would be compatible with the DCOP Future Land Use Map. Alternative B would keep all WUS-related uses close together south of the H Street Bridge or below ground, making efficient use of a highly constrained area.

Improved land use in Alternative B would be accompanied by the same beneficial impacts on WUS user experience as in Alternative A. These impacts are described in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative B would have a moderate adverse direct operational impact on property ownership, land acquisitions, and displacements.

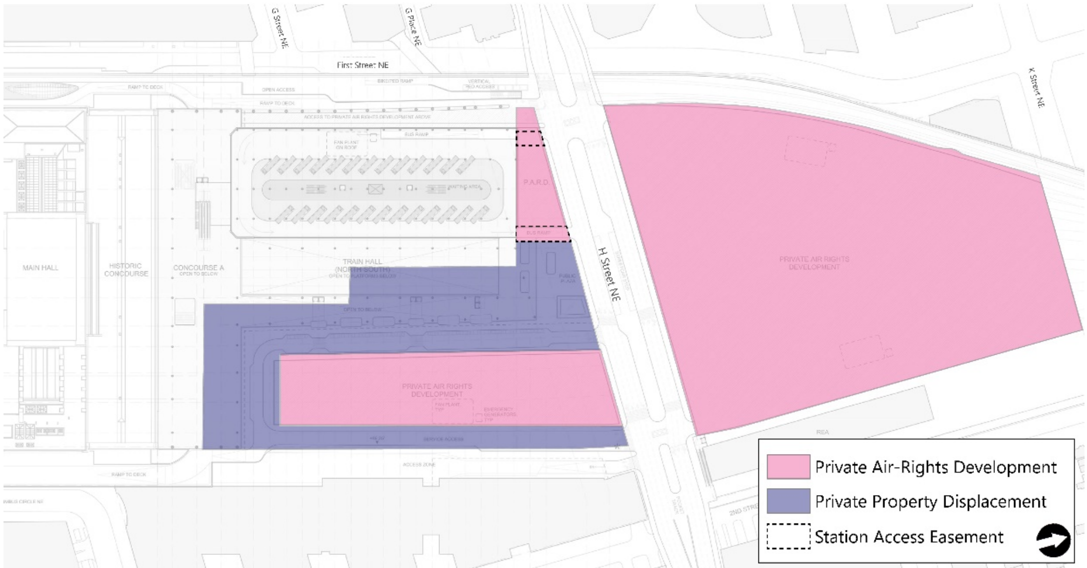
Alternative B would have an adverse impact on property ownership because it would involve constructing a portion of the new train hall and access roads adjacent to the train hall within the private air rights above the rail terminal. This would require acquiring approximately 120,800 square feet of private air-rights property (approximately 2.8 acres) south of H Street.[11] **Figure 5-24** shows the approximate footprint of the private air-rights property that would be affected. It would represent approximately 19 percent of the 622,800-gross-square-foot footprint of the private air rights.[12] Alternative B would also require the

[11] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[12] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

acquisition of easement through the private air rights for the access ramps in and out of the bus facility.

Figure 5-24. Property Displacement Impacts, Alternative B



These adverse impacts would be moderate for the same reasons as explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*). Also as explained in **Section 5.9.4.2**, Alternative B would require acquiring the H Street Tunnel to construct the new H Street Concourse, as in all Action Alternatives. [13]

Relative to the No-Action Alternative, Alternative B, like Alternative A, would reduce the amount of Federal property for which the private air-rights developer would need an agreement with the Federal government, as explained in **Section 5.9.4.2.**

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative B would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

The impacts of Alternative B on local and regional plan would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts* and **Table 5-116**).

[13] The exact process through which the tunnel would be acquired has not yet been determined.

Indirect Operational Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the development of the Federal air rights in Alternative B would have a major beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning or development; property ownership, land acquisitions, and displacement; or local and regional plans.

Alternative B would construct a new bus facility in the Federally owned air-rights to the southwest of H Street NE. The new facility would rise approximately 42 feet above the crest of the H Street Bridge. Within part of this area, approximately 300 feet from the historic station building, the USN zoning designation (which it is assumed would apply by 2040) allows for heights of up to 130 feet above the H Street Bridge. Therefore, air rights would remain available above the facility for potential commercial development that would bring the facility to the maximum permitted height. As explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*), the mechanism for this development has not yet been determined, but it could be achieved through a lease of the Federal air-rights by FRA to USRC, which in turn would sublease the development rights.

Alternative B would have no indirect adverse impacts on zoning. As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, for Alternative A, Federal land is not subject to local zoning and NCPC is the zoning authority for Federal land in the District. It is anticipated that the potential Federal air-right development would be planned consistent with the USN zoning that applies to the adjacent private air rights. Based on USN zoning, a maximum envelope of approximately 917,420 GSF would be available for development. If and as planning and design for this development occurs, FAR requirements would be reviewed to ensure, as much as practicable, full consistency with USN zoning.

As explained in **Section 3.4.3.1**, *Summary Description*, in Alternative B, it is assumed for the purposes of the DEIS that this space would be developed as office space. This would have a major beneficial impact on land use within the Project Area. It would be consistent with the DCOP's Future Land Use Map, which shows mixed-use development with residential, retail, and office space at this location. It would also contribute to supporting WUS operations by making use of potentially developable space that otherwise would remain unproductive.

Regional Study Area

Relative to the No-Action Alternative, Alternative B would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The indirect impacts of Alternative B on the Regional Study Area would be the same as those of Alternative A (**Section 5.9.4.2***, Alternative A, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative B would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction of Alternative B would generally have similar impacts to those of the construction of Alternative A (**Section 5.9.4.2**, *Alternative A, Construction Impacts*). The same access and staging areas would be used for similar activities, although for a longer period (approximately 14 years and 4 months in total, including the 12-month Intermediate Phase during which only column removal work in the First Street Tunnel would be performed). During Phase 4, or approximately 4 years 11 months, intercity bus service and parking would not be available at WUS.

In Alternative B, construction of the deck-level part of the private air-rights development would not be able to start until the completion of Phase 3 of Project construction. This would be approximately 9 years and 5 months after the start of construction.[14]

Comparison to Existing Conditions

Relative to existing conditions, Alternative B would have major adverse indirect operational impacts on zoning. This is because the height of the potential Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Other impacts of Alternative B on land use, property ownership, and plans would be the same relative to existing conditions as they would be relative to the No-Action Alternative. These impacts would result from features of Alternative B or the Study Area that would not change with the baseline.

5.9.4.4 Alternative C

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative C (either option) would have no direct operational impact on zoning. It would have a moderate beneficial direct operational impact on land use and development.

Alternative C would have no adverse impact on zoning for the same reasons as explained for Alternative A (see **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*). The train hall would be approximately 42 feet in height above the crest of the H Street Bridge elevation, consistent with both PDR-3 and USN zoning. The bus facility and above-ground parking facility above it would be approximately 59 feet high, consistent with USN zoning.

[14] Amtrak. November 2019. *Washington Union Station Terminal Infrastructure Project Constructability Report.*

Alternative C would have a beneficial impact on land use by enhancing multi-modal transportation uses and connectivity within the Project Area and providing a more accessible, up-to-date multi-modal facility capable of accommodating more passengers and more train and bus service than in the No-Action Alternative. Alternative C would also benefit the neighborhood by creating new connections between the areas on either side of the rail terminal and be compatible with the DCOP Future Land Use Map. This beneficial impact would be moderate because of the location of the main bus facility and above-ground parking to the north of the H Street Bridge. This would increase the distance between these facilities and the front of WUS and result in a more spread-out, less cohesive multimodal station than in the No-Action Alternative.

The beneficial impact on land use would translate into an improvement in WUS user experience relative to the No-Action Alternative. In Alternative C, as in all Action Alternatives, new access points from First, 2nd, and H Streets into the H Street Concourse would make it easier to enter WUS from the surrounding neighborhoods and provide connectivity and continuity from First Street to 2nd Street. Retail in the new concourses could potentially become a local destination.

The historic station building would remain the heart of the station and its most visible and inviting entrance. By alleviating congestion, especially during peak travel times, the additional concourse space and access points would make it easier for passengers and visitors to appreciate and enjoy the building's grand architecture. Concourse A and the integrated east-west train hall, which would be designed to be a monumental, compelling space on a scale commensurate with the nation's capital, would extend the area of architectural interest beyond the historic station building and open up a visual connection toward the track and platform area. This would create in the visitor a better sense of being at a train station than would be the case in the No-Action Alternative, in which tracks and platforms would remain largely out of sight, as they are today. This visual connection, in combination with enhanced accessibility through wider platforms, full compliance with ADA-requirements, effective signage, more spacious waiting areas, and greater amounts of natural light, would make boarding or alighting from trains at WUS a much easier, more enjoyable experience than in the No-Action Alternative.

Intercity bus passengers would enjoy the benefits of a more contemporary facility with better amenities. However, the greater distance between the main bus facility and the historic station building would weaken the functional and visual integration between WUS's intermodal elements and detract somewhat from bus riders' experience of the station as a unified place (see **Section 5.16.4.4**, *Alternative C, Direct Operational Impacts*, for further information). Passengers of buses using the bus pick-up and drop-off area would enjoy a more integrated experience, with a direct connection to the rest of the station, including the Historic Station Building, via Concourse A.

As in the other Action Alternatives, improved internal circulation, including additional vertical circulation elements, would provide passengers with better connections to the Metrorail

Station, an important mode of access for WUS users, particularly tourists and travelers unfamiliar with the station. The First Street, Central, and H Street Concourses, along with headhouses and the main bus facility on H Street, would provide a more direct and welcoming connection for DC Streetcar users.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative C (either option) would have a major adverse direct operational impact on property ownership, land acquisitions, and displacements.

Alternative C would have a major adverse impact on property ownership because it would involve constructing part of the train hall and bus pick-up and drop-off area as well as the entirety of the bus facility and above-ground parking facility, in the private air rights above the rail terminal. This would require acquiring approximately 201,200 square feet (East Option) or approximately 208,000 square feet (West Option) of private air-rights property (approximately 4.6 and 4.8 acres, respectively) south and north of H Street NE.[15] **Figure 5-25** and **Figure 5-26** show the approximate footprint of the private air-rights property that would need to be acquired under each option, respectively. It would represent approximately 32 percent (East Option) or 33 percent (West Option) of the 622,800-gross-square-foot footprint of the private air rights.[16] Additional space would also be needed to accommodate daylighting and access easements.[17]

However, the loss in total developable envelope would be less than that because the air rights above the bus and parking facility (which would rise approximately 59 feet above the H Street Bridge elevation) would potentially remain available for development. Additionally, the reduction estimate includes areas for roadways needed to serve the private development as well as WUS. The total adverse impact would still be major because of the large square footage of private air rights that would need to be acquired and their distribution across the entire rail terminal, both south and north of H Street NE.

As explained for Alternative A in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, Alternative C, like all Action Alternatives, would require acquiring the H Street Tunnel to construct the new H Street Concourse. [18]

[15] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[16] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

[17] Daylighting features would be located in the Daylight Access Zone. The shape, number, and exact location of the daylighting feature easements shown in Figures 5-25 and 5-26 are for illustrative purposes only.

[18] The exact process through which the tunnel would be acquired has not yet been determined.

Figure 5-25. Property Displacement Impacts, Alternative C – East Option

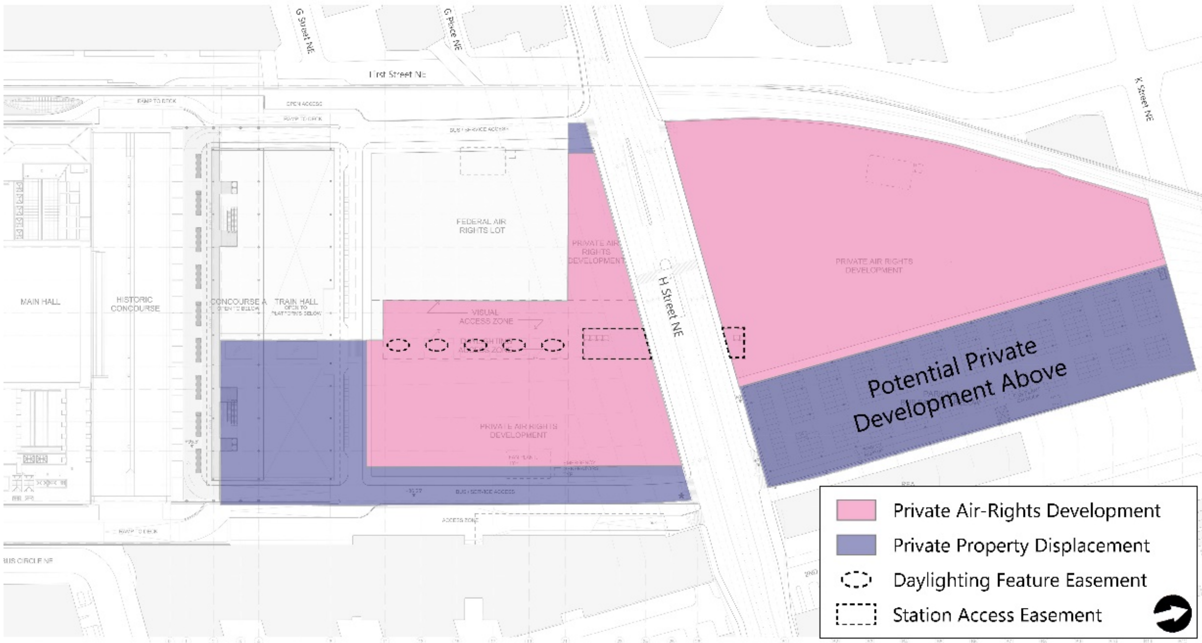


Figure 5-26. Property Displacement Impacts, Alternative C – West Option

Relative to the No-Action Alternative, Alternative C with either option would reduce the amount of property for which the private developer would need agreements with the Federal government and Amtrak. South of H Street NE, the reduction would be small, as most of the private air rights within the 80-foot datum area (see **Section 5.9.4.1***, No Action Alternative, Direct Operational Impacts, Property Ownership, Land Acquisition, and Displacements*) would remain available for private development. North of H Street NE, a property agreement with Amtrak would be potentially needed only for the private air-rights area not acquired for construction of the new bus and above-ground parking facilities.

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative C (either option) would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

The impacts of Alternative C (both options) on local and regional plan would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, and **Table 5-116**).

Indirect Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the development of the Federal air rights in Alternative C (either option) would have a major beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

Alternative C would demolish the existing parking garage. The new bus pick-up and drop-off area and train hall would occupy part of the demolished garage's footprint. The remainder would be available for potential commercial development up to the height permitted under the future USN zoning designation. As explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*), this could be achieved, for example, through a lease of the Federal air-rights by FRA to USRC, who would then sublease the development rights.

Alternative C would have no indirect adverse impacts on zoning. As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, for Alternative A, Federal land is not subject to local zoning and NCPC is the zoning authority for Federal land in the District. It can be anticipated that the potential Federal air-right development would be planned consistent with the USN zoning that applies to the adjacent private air rights. Based on USN zoning, a maximum envelope of approximately 952,600 GSF would be available for development. If and as planning and design for this development occurs, FAR requirements would be reviewed to ensure, as much as practicable, full consistency with USN zoning.

As explained in **Section 3.4.4.1**, *Summary Description*, it is assumed for the purposes of the DEIS that in Alternative C, this space would be developed as office space. This would have a beneficial impact on land use in the Project Area. It would be consistent with DCOP's Future Land Use Map, which shows mixed-use development with residential, retail, and office space at this location. It would also contribute to supporting WUS operations by making use of potentially developable space that otherwise would remain unproductive. The beneficial impact would be major because the development would fill in what would otherwise remain a major gap in land use in the Project Area.

Regional Study Area

Relative to the No-Action Alternative, Alternative C (either option) would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The indirect impacts of Alternative C within the Regional Study Area would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative C (either option) would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction of Alternative C would generally have similar impacts to those of the construction of Alternative A (**Section 5.9.4.2**, *Alternative A, Construction Impacts*). The same access and staging areas would be used for similar activities, although for a longer period (approximately 12 years and 3 months in total including the 12-month Intermediate Phase during which only column removal work in the First Street Tunnel would be performed).

Construction of the deck-level part of the private air-rights development would not be able to begin until the completion of Phase 3 of the construction of the Project. This would be approximately 8 years and 3 months after the start of construction.[19]

The existing bus facility and parking garage would be demolished during Phase 4 of construction. In Alternative C with the West Option, intercity bus service and parking would not be available at WUS for the duration of Phase 4, or approximately 4 years, until the new parking facility and bus facility are completed. Under Alternative C with the East Option, because the new bus facility and parking facility, on the east side of the rail terminal, could be completed before the existing bus facility and parking garage are demolished, this impact would not occur (see **Section 5.5.4.4**, *Alternative C*, *Construction Impacts* for further discussion of potential impacts on intercity buses and parking during Phase 4).

[19] Amtrak. November 2019. *Washington Union Station Terminal Infrastructure Project Constructability Report.*

Comparison to Existing Conditions

Relative to existing conditions, Alternative C (either option) would have major adverse indirect operational impacts on zoning. This is because the height of the potential Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Other impacts of Alternative C on land use, property ownership, and plans would be the same relative to existing conditions as they would be relative to the No-Action alternative. These impacts would result from features of Alternative C or the Study Area that would not change with the baseline.

5.9.4.5 Alternative D

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative D would have no direct operational impact on zoning. It would have a moderate beneficial direct operational impact on land use and development.

Alternative D would have no adverse impact on zoning for the same reasons as explained for Alternative A (see **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*). The train hall would be approximately 44 feet in height above the crest of the H Street Bridge elevation, consistent with both PDR-3 and USN zoning. The above-ground parking facility, just south of K Street NE, would be 43 feet high, consistent with the USN designation.

Alternative D would have a beneficial impact on land use by enhancing multi-modal transportation uses and connectivity within the Project Area and providing a more accessible, up-to-date multi-modal facility capable of accommodating more passengers and more train and bus service than in the No-Action Alternative. Alternative D would also benefit the neighborhood by creating new connections between the areas on either side of the rail terminal and be compatible with the DCOP Future Land Use Map. This beneficial impact would be moderate because of the location of the above-ground parking facility to the north of the H Street Bridge, just south of K Street. This would increase walking distances for some WUS users and make a more spread-out, less cohesive multimodal station than in the No-Action Alternative.

The beneficial impact on land use would translate into an improvement in WUS user experience relative to the No-Action Alternative. In Alternative D, as in all Action Alternatives, new access points from First, 2nd, and H Streets into the H Street Concourse would make it easier to enter WUS from the surrounding neighborhoods and provide connectivity and continuity from First Street to 2nd Street. Retail in the new concourses could potentially become a local destination. However, the historic station building would remain the heart of the station and its most visible and inviting entrance. By alleviating congestion, especially during peak travel times, the additional concourse space and access points would make it easier for passengers and visitors to appreciate and enjoy the building's grand architecture.

Concourse A and the integrated east-west train hall, which would be designed to be a monumental, compelling space on a scale commensurate with the nation's capital, would extend the area of architectural interest past the historic station building and open up a visual connection toward the track and platform area. This would create in the visitor a better sense of being at a train station than would be the case in the No-Action Alternative, in which tracks and platforms would remain largely out of sight as they are today. This visual connection, in combination with enhanced accessibility through wider platforms, full compliance with ADA-requirements, effective signage, more spacious waiting areas, and greater amounts of natural light, would make boarding or alighting from trains at WUS a much easier, more enjoyable experience than in the No-Action Alternative.

Intercity bus passengers would enjoy the benefits of a facility functionally and visually integrated with the train hall and the rest of the station, including the historic station building, reinforcing the experience of WUS as a single place and multimodal transportation center. As in the other Action Alternatives, improved internal circulation, including additional vertical circulation elements, would provide passengers with better connections to the Metrorail Station, an important mode of access for WUS users, particularly tourists and travelers unfamiliar with the station. The First Street, Central, and H Street Concourses, along with headhouses and the main bus facility on H Street, would provide a more direct and welcoming connection for DC Streetcar users.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative D would have a moderate adverse direct operational impact on property ownership, land acquisitions, and displacements.

Alternative D would have a major adverse impact on property ownership because it would involve constructing part of the train hall and bus facility, as well as the whole of the above-ground parking facility, within the private air rights above the rail terminal. This would require acquiring approximately 211,100 square feet of private air-rights property (approximately 4.8 acres) south and north of H Street NE.[20] **Figure 5-27** shows the approximate footprint of the private air-rights property that would need to be acquired. It would represent approximately 34 percent of the 622,800-gross-square-foot footprint of the private air rights.[21] Space would also be to accommodate daylighting and access easements.[22] However, the loss in total developable envelope would be less than that

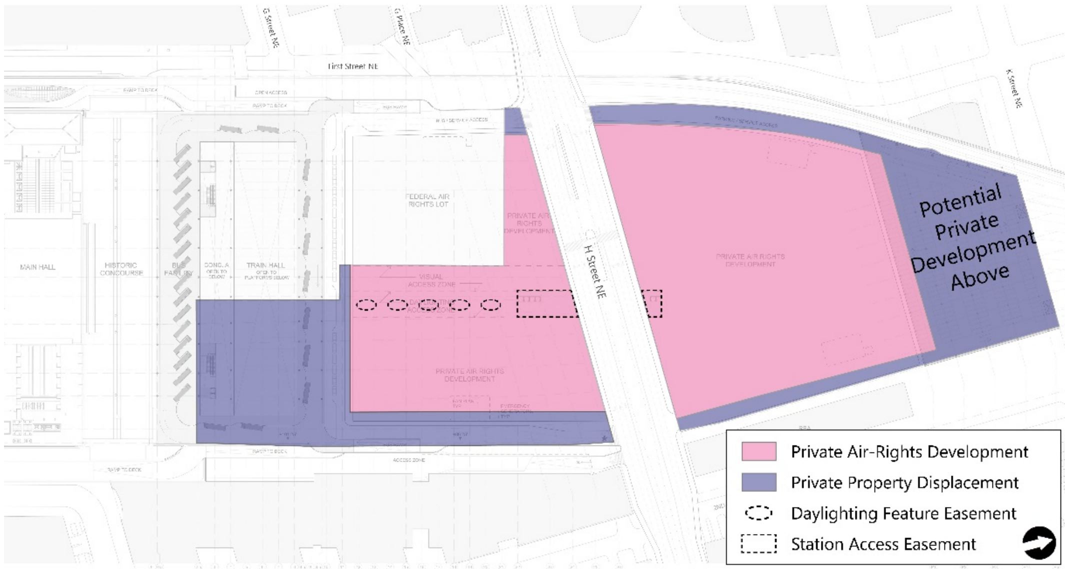
[20] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[21] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

[22] Daylighting features would be located in the Daylight Access Zone. The shape, number, and exact location of the daylighting feature easements shown in Figure 5-27 are for illustrative purposes only.

because the air rights above the parking facility (which would rise approximately 43 feet above the H Street Bridge elevation) would potentially remain available for development.

Figure 5-27. Property Displacement Impacts, Alternative D



The total impact would be moderate because, despite the substantial amount of private air-rights space that would need to be acquired, it would be located on the edge of the private air-rights area, minimizing the fragmentation of the developable space. Additionally, the reduction estimate takes into account areas for roadways that would be needed to serve the private development as well as WUS.

As explained for Alternative A in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, Alternative D, like all Action Alternatives, would require acquiring the H Street Tunnel to construct the new H Street Concourse. [23]

Relative to the No-Action Alternative, Alternative D would reduce the amount of property for which the private developer would need agreements with the Federal government and Amtrak. South of H Street NE, the reduction would be small, as most of the private air rights within the 80-foot datum area (see **Section 5.9.4.1**, *No Action Alternative, Direct Operational Impacts, Property Ownership, Land Acquisition, and Displacements*) would remain available for private development. North of H Street NE, a property agreement with Amtrak would potentially be needed only for the private air-rights area not acquired for construction of the new above-ground parking facility.

[23] The exact process through which the tunnel would be acquired has not yet been determined.

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative D would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

The impacts of Alternative D on local and regional plan would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts* and **Table 5-116**).

Indirect Operational Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the development of the Federal air rights in Alternative D would have a major beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

Alternative D would demolish the existing parking garage. The train hall and new bus facility would occupy part of the demolished garage's footprint. The remainder would be available for potential commercial development up to the height permitted under the future USN zoning designation. As explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*), the specific mechanism for this has not yet been determined, but it could be achieved through a lease of the Federal air-rights by FRA to USRC, who in turn would sublease the development rights.

Alternative D would have no indirect adverse impacts on zoning. As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, for Alternative A, Federal land is not subject to local zoning and NCPC is the zoning authority for Federal land in the District. It can be anticipated that the potential Federal air-right development would be planned consistent with the USN zoning that applies to the adjacent private air rights. Based on USN zoning, a maximum envelope of approximately 688,050 GSF would be available for development. If and as planning and design for this development occurs, FAR requirements would be reviewed to ensure, as much as practicable, full consistency with USN zoning.

As explained in **Section 3.4.5.1**, *Summary Description*, in Alternative D, it is assumed for the purposes of the DEIS that this space would be developed as office space. This would be a beneficial impact on land use in the Project Area. It would be consistent with DCOP's Future Land Use Map, which shows mixed-use development with residential, retail, and office space at this location. It would also contribute to supporting WUS operations by making use of potentially developable space that otherwise would remain unproductive. The beneficial impact would be major because the development would fill in what would otherwise remain a major gap in land coverage in the Project Area.

Regional Study Area

Relative to the No-Action Alternative, Alternative D would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The indirect impacts of Alternative D within the Regional Study Area would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative D would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction in Alternative D would have similar impacts to those in Alternative C with the West Option (**Section 5.9.4.4**, *Alternative C, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative D would have major adverse indirect operational impacts on zoning. This is because the height of the potential Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Other impacts of Alternative D on land use, property ownership, and plans would be the same relative to existing conditions as they would be relative to the No-Action alternative. These impacts would result from features of Alternative D or the Study Area that would not change with the baseline.

5.9.4.6 Alternative E

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative E would have no direct operational impact on zoning. It would have a major beneficial direct operational impact on land use and development.

Alternative E would have no adverse impact on zoning for the same reasons as explained for Alternative A (see **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*). The train hall would be approximately 44 feet in height above the crest of the H Street Bridge elevation, consistent with both PDR-3 and USN zoning.

Like Alternative B and for similar reasons, Alternative E would have a major beneficial impact on land use within the Project Area (**Section 5.9.4.3**, *Alternative B, Direct Operational Impacts*).

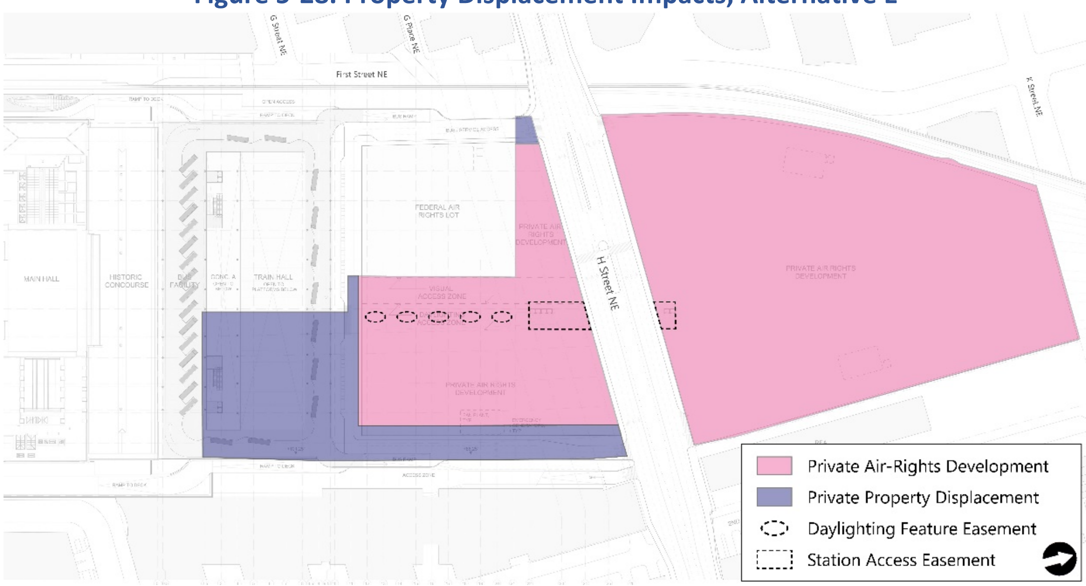
Improved land use in Alternative E would be accompanied by the same beneficial impacts on WUS user experience as in Alternative D. These impacts are described in **Section 5.9.4.5**, *Alternative D, Direct Operational Impacts*.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative E would have a moderate adverse direct operational impact on property ownership, land acquisitions, and displacements.

Alternative E would have a moderate adverse impact on property ownership because it would involve constructing part of the train hall and bus facility within the private air rights above the rail terminal. This would require acquiring approximately 85,000 square feet of private air-rights property (approximately 1.9 acres) south of H Street NE.[24] **Figure 5-28** shows the approximate footprint of the private air-rights property that would need to be acquired. It would represent approximately 14 percent of the 622,800-gross-square-foot footprint of the private air rights.[25] Space would also be needed to accommodate daylighting and access easements.[26]

Figure 5-28. Property Displacement Impacts, Alternative E



[24] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[25] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

[26] Daylighting features would be located in the Daylight Access Zone. The shape, number, and exact location of the daylighting feature easements shown in Figure 5-28 are for illustrative purposes only.

The adverse impact would be moderate for the same reasons as explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*).

As explained for Alternative A in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, Alternative E, like all Action Alternatives, would require acquiring the H Street Tunnel to construct the new H Street Concourse. [27]

Relative to the No-Action Alternative, Alternative E would reduce the amount of property for which the private developer would need an agreement with the Federal government. The reduction would be moderate, as most of the private air rights within the 80-foot datum area (see **Section 5.9.4.1***, No Action Alternative, Direct Operational Impacts, Property Ownership, Land Acquisition, and Displacements*) would remain available for private development. A property agreement with Amtrak would potentially be needed north of H Street, as in the No-Action Alternative.

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative E would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

The impacts of Alternative E on local and regional plan would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts* and **Table 5-116**).

Indirect Operational Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the development of the Federal air rights in Alternative E would have a major beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

In Alternative E, the same envelope of Federal air rights would be available for potential development as in Alternative D. Impacts would be as described for Alternative D (**Section 5.9.4.5**, *Alternative D, Indirect Operational Impacts*).

Regional Study Area

Relative to the No-Action Alternative, Alternative E would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The indirect impacts of Alternative E within the Regional Study Area would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*).

[27] The exact process through which the tunnel would be acquired has not yet been determined.

Construction Impacts

Construction of Alternative E would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction of Alternative E would have the same impacts as construction of Alternative B (**Section 5.9.4.3**, *Alternative B, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative E would have major adverse indirect operational impacts on zoning. This is because the height of the potential Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Other impacts of Alternative E on land use, property ownership, and plans would be the same relative to existing conditions as they would be relative to the No-Action Alternative. These impacts would result from features of Alternative E or the Study Area that would not change with the baseline.

5.9.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Zoning, Land Use, and Development

Relative to the No-Action Alternative, Alternative A-C would have no direct operational impact on zoning. It would have a major beneficial direct operational impact on land use and development.

The impacts of Alternative A-C on zoning, land use, and development would be the same as those of Alternative A, described in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*.

The beneficial impact on land use would translate into an improvement in WUS user experience relative to the No-Action Alternative. As in all Action Alternatives, new access points from First, 2nd, and H Streets into the H Street Concourse would make it easier to enter WUS from the surrounding neighborhoods. They would also provide connectivity and continuity from First Street to 2nd Street. Retail in the new concourses could potentially become a destination for local residents as well as tourists. The historic station building would remain the heart of the station and its most visible and inviting entrance, however. By alleviating congestion, especially during peak travel times, the additional concourse space and access points would make it easier for passengers and visitors to appreciate and enjoy the grand architecture of the historic station.

Concourse A and the integrated east-west train hall, which would be designed to be a monumental, compelling space on a scale commensurate with the nation's capital, would extend the area of architectural interest past the historic station building and open up a visual connection toward the track and platform area. This would create in the visitor a better sense of being at a train station than would be the case in the No-Action Alternative, in which tracks and platforms would remain largely out of sight as they are today. This visual connection, in combination with enhanced accessibility through wider platforms, full compliance with ADA-requirements, effective signage, more spacious waiting areas, and greater amounts of natural light, would make boarding or alighting from trains at WUS a much easier, more enjoyable experience than in the No-Action Alternative.

Similarly, intercity bus passengers would enjoy the benefits of a more modern facility with better amenities and greater functional and visual integration with the rest of the station, including the historic station building, via Concourse A. In Alternative A-C, as in the other Action Alternatives, improved internal circulation, including additional vertical circulation elements, would provide passengers with better connections to the Metrorail Station, an important mode of access for WUS users, particularly tourists and travelers unfamiliar with the station. The First Street, Central, and H Street Concourses, along with headhouses and the main bus facility on H Street, would provide a more direct and welcoming connection for DC Streetcar users.

Property Ownership, Land Acquisitions, and Displacements

Relative to the No-Action Alternative, Alternative A-C would have a moderate adverse direct operational impact on property ownership, land acquisitions, and displacements.

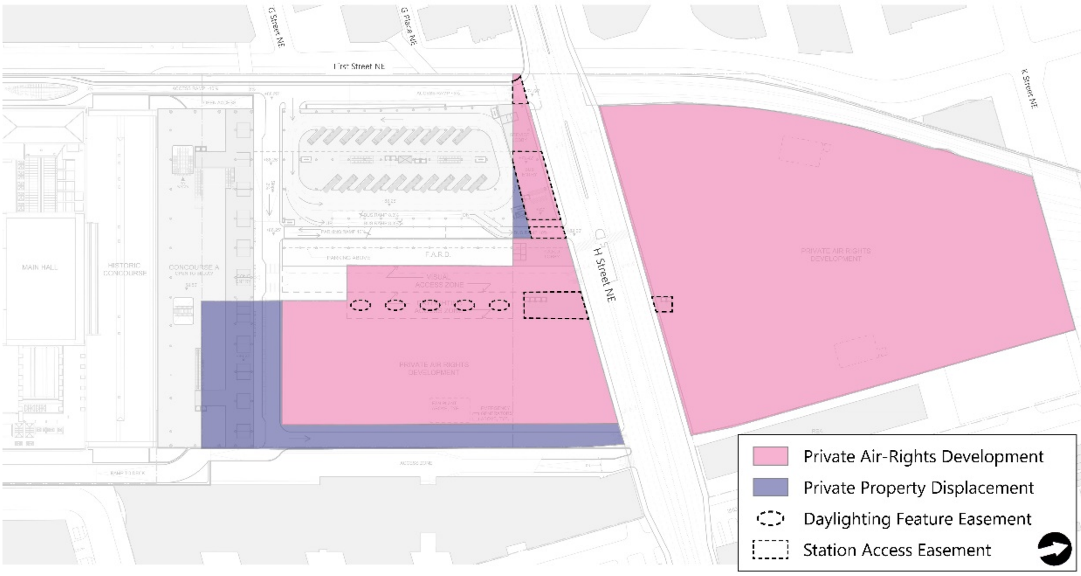
Alternative A-C would have an adverse impact on property ownership because it would involve constructing a portion of the new train hall and east-west access road within the private air rights above the rail terminal. This would require acquiring approximately 49,500 square feet of private air-rights property (approximately 1.1 acres) south of H Street NE.[28] **Figure 5-29** shows the approximate footprint of the private air-rights property that would need to be acquired. It would represent approximately 7 percent of the 622,800 gross square foot footprint of the private air rights.[29] Additional space would also be needed to accommodate daylighting and access easements, including an entrance to the bus facility. [30]

[28] The method of acquisition has not yet been determined and may vary according to the element being accommodated.

[29] Total area as stated in Letter from Akridge to FRA dated May 31, 2016.

[30] Daylighting features would be located in the Daylight Access Zone. The shape, number, and exact location of the daylighting feature easements shown in Figure 5-29 are for illustrative purposes only.

Figure 5-29. Approximate Footprint of Property Displacement Impact, Alternative A-C



The adverse impact would be moderate for the same reasons as explained for Alternative A (see **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*.

As explained for Alternative A in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, Alternative A-C, like all Action Alternatives, would require acquiring the H Street Tunnel to construct the new H Street Concourse. [31]

Relative to the No-Action Alternative, Alternative A-C would reduce the amount of Federal property for which the private air-rights developer would need an agreement with the Federal government (see **Section 5.9.4.1**, *No Action Alternative, Direct Operational Impacts, Property Ownership, Land Acquisition, and Displacements*). The reduction would be substantial, as the entire private deck south of H Street would be within the 70-foot datum area. A property agreement with Amtrak would be potentially needed only for the private air-rights area north of H Street NE, as in the No-Action Alternative.

Consistency with Local and Regional Plans

Relative to the No-Action Alternative, Alternative A-C would have minor to major beneficial direct operational impacts on most relevant local and regional plans.

The impacts of Alternative A-C on local and regional plan would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Direct Operational Impacts* and **Table 5-116**).

[31] The exact process through which the tunnel would be acquired has not yet been determined.

Indirect Operational Impacts

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, the development of the Federal air rights in Alternative A-C would have a major beneficial indirect operational impact on land use. It would have no adverse indirect operational impacts on zoning or development; property ownership, land acquisitions, and displacement; or local and regional plans.

Alternative A-C would construct a new bus facility and parking facility (multimodal surface transportation center) in the Federally owned air rights to the southwest of H Street NE. The new facility would rise approximately 104 feet above the crest of the H Street Bridge. Within part of this area, approximately 300 feet from the historic station building, the USN zoning designation, which it is assumed would apply by 2040, allows for heights of up to 130 feet above the H Street Bridge. Therefore, air rights would remain available above the facility for potential commercial development that would bring the facility to the maximum permitted height. Space within the Federal air rights would also be available along the eastern side of the bus facility and parking facility. As explained for Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*), the specific mechanism for this has not yet been determined, but it could be achieved through a lease of the Federal air-rights by FRA to USRC, who in turn would sublease the development rights.

Alternative A-C would have no indirect adverse impacts on zoning. As explained in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts*, for Alternative A, Federal land is not subject to local zoning and NCPC is the zoning authority for Federal land in the District. It can be anticipated that the potential Federal air-right development would be planned consistent with the USN zoning that applies to the adjacent private air rights. Based on USN zoning, a maximum envelope of approximately 380,000 GSF would be available for development. If and as planning and design for this development occurs, FAR requirements would be reviewed to ensure, as much as practicable, full consistency with USN zoning.

As explained in **Section 3.4.7.1**, ***Summary Description***, it is assumed for the purposes of the DEIS that in Alternative A-C, this space would be developed as office space. This would be a major beneficial impact on land use in the Project Area, as it would make optimal use of available developable space. It would be consistent with the District's Future Land Use Map, which shows mixed-use development with residential, retail, and office space at this location.

Regional Study Area

Relative to the No-Action Alternative, Alternative A-C would have no adverse indirect operational impacts on zoning, land use, or development; property ownership, land acquisitions, and displacement; or local and regional plans.

The indirect impacts of Alternative A-C in the Regional Study Area would be the same as those of Alternative A (**Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative A-C would have moderate adverse impacts on land use and development. It would have no impacts on zoning; property ownership, land acquisitions, and displacement; or local and regional plans.

Construction of Alternative A-C would have the same impacts as construction of Alternative A (**Section 5.9.4.2**, *Alternative A, Construction Impacts*).

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would have major adverse indirect operational impacts on zoning. This is because the height of the potential Federal air-rights development would exceed what the existing PDR-3 zoning allows.

Other impacts of Alternative A-C on land use, property ownership, and plans would be the same relative to existing conditions as they would be relative to the No-Action Alternative. These impacts would result from features of Alternative E or the Study Area that would not change with the baseline.

5.9.5 Comparison of Alternatives

Table 5-117 compares the alternatives, including the No-Action Alternative, to each other. All alternatives would be consistent with anticipated future zoning in the Project Area and would result in more varied and intensive land use than currently. The No-Action Alternative would differ from the Action Alternatives in the following respects:

- It would not enhance multi-modal transportation uses in the Project Area or improve connectivity with surrounding neighborhoods. As such, unlike the Action Alternatives, it would not support most relevant local and regional plans.
- It would allow for the full development of the private air rights above the bus facility. The Action Alternatives would require acquiring part of these air rights to accommodate some of the Project elements.
- In areas where the lower limit of the private air rights is at 80 feet, construction of the private air-rights deck would encroach into Federal and Amtrak property and potentially require an agreement with the Federal government and Amtrak.
- It would not provide the opportunity to develop the Federally owned air rights above the rail terminal. Part or all of the Federal air-rights could potentially be developed in all Action Alternatives.

Among themselves, the Action Alternatives would differ in several respects:

- **Land Use:** All Action Alternatives would enhance multimodal land uses in the Project Area. However, they would vary regarding how the various Project elements are located in relation to each other. Alternatives A, A-C, B, and E would place all Project elements south of the H Street Bridge or below-ground, making an efficient use of a very constrained area. The other Action Alternatives would have above-ground elements both north and south of the H Street Bridge, resulting in a more spread-out layout and greater distances among elements. Alternative D would be the Action Alternative with the greatest distance between the above-ground parking facility and the front of WUS. Alternative C, East Option would be the alternative with the greatest distance between the bus facility and the front of WUS, followed by Alternative C with the West Option. As a result, while all Action Alternatives would result in a marked improvement in WUS user experience, this improvement would be somewhat less in Alternatives C and D.

- **Private Property:** All Action Alternatives would require acquiring some of the privately owned air rights above WUS. Amount and spatial distribution would vary depending on the alternative. Alternative A-C would have the smallest impact, with approximately 1.1 acres, all south of the H Street Bridge. Alternative C with the West Option and Alternative D would have the greatest impact, with a total of approximately 4.8 acres on both sides of the bridge.
- **Federal and Amtrak Property:** In all Action Alternatives, the potential amount of property for which the private air-rights developer would need an agreement with the Federal government would be reduced relative to the No-Action Alternative due to the acquisition for the Project of some of the private air rights within the 80-foot datum area. Alternatives A and B would result in the greatest reduction and Alternatives C and A-C in the smallest one. Only Alternatives C and D would also reduce the potential need for an agreement with Amtrak north of H Street NE.
- **Federal Air Rights:** All Action Alternatives would allow for the potential development of the Federally owned air rights that would not be needed for Project elements. The size of the maximum developable envelope would vary with the alternative, with Alternative A offering the smallest envelope and Alternative C (either option) the largest one.

Table 5-117. Comparison of Alternatives, Land Use, Planning, and Property

Impact Category	Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C – East Option	Alternative C – West Option	Alternative D	Alternative E	Alternative A-C (Preferred)
Zoning	**Direct Operational**	No Impacts							
	Indirect Operational	No Impacts							
	Construction	No Impacts							
Land Use and Development	**Direct Operational**	**Major Beneficial Impact** due to private air rights development.	**Major Beneficial Impact** due to enhanced multimodal uses and increased connectivity. All WUS uses concentrated south of H Street Bridge.	**Major Beneficial Impact** due to enhanced multimodal uses and increased connectivity. All WUS uses south of the H Street Bridge or below-ground.	**Moderate Beneficial Impact** due to enhanced multimodal uses and increased connectivity. Above-ground parking and bus facility to the northeast of H Street Bridge.	**Moderate Beneficial Impact** due to enhanced multimodal uses and increased connectivity. Above-ground parking and bus facility to the northwest of H Street Bridge.	**Moderate Beneficial Impact** due to enhanced multimodal uses and increased connectivity. Above-ground parking south of K Street NE.	**Major Beneficial Impact** due to enhanced multimodal uses and increased connectivity. All WUS uses south of the H Street Bridge or below-ground.	**Major beneficial impact** due to enhanced multimodal uses and increased connectivity. All WUS uses concentrated south of H Street Bridge.
	Indirect Operational	**No impact**	**Minor beneficial impact** from potential Federal air-rights development.	**Major beneficial impact** from potential Federal air-rights development.					
	Construction	**Minor adverse impact**	**Moderate adverse impact.** Construction of deck-level part of the private air-rights development could not start until approximately 8 years and 4 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.	**Moderate adverse impact.** Construction of deck-level part of the private air-rights development could not start until approximately 9 years and 5 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.	**Moderate adverse impact**. Construction of deck-level part of the private air-right development could not start until approximately 8 years and 3 months from the start of construction.	**Moderate adverse impact.** Construction of deck-level part of the private air-right development could not start until approximately 8 years and 3 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.	**Moderate adverse impact.** Construction of deck-level part of the private air-right development could not start until 8 years and 3 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.	**Moderate adverse impact.** Construction of deck-level part of the private air-right development could not start until approximately 9 years and 5 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.	**Moderate adverse impact.** Construction of deck-level part of the private air-rights development could not start until approximately 8 years and 4 months from the start of construction. Interim bus and parking facility in private air rights during Phase 4.
Property	**Direct Operational**	**No impact.** Potential encroachment of the private air-rights development deck into Federal and Amtrak property	**Moderate adverse impact**. Acquisition of approximately 3.1 acres all south of H Street Bridge.	**Moderate adverse impact**. Acquisition of approximately 2.8 acres all south of H Street Bridge	**Major adverse impact.** Acquisition of approximately 4.6 acres on both sides of H Street Bridge.	**Major adverse impact**. Acquisition of approximately 4.8 acres on both sides of H Street Bridge.	**Moderate adverse impact.** Acquisition of approximately 4.8 acres on both sides of H Street Bridge but limited fragmentation.	**Moderate adverse impact**. Acquisition of approximately 1.9 acres all south of H Street Bridge.	**Moderate adverse impact.** Acquisition of approximately 1.1 acres all south of H Street Bridge.
	Indirect Operational	**No impacts**							

Impact Category	Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C – East Option	Alternative C – West Option	Alternative D	Alternative E	Alternative A-C (Preferred)
	Construction	**No impact**							
Local and Regional Plans	**Direct Operational**	**Minor adverse impact**. Generally inconsistent due to no improvement to connectivity.	**Major to minor beneficial impacts** depending on the plan. Consistent with the relevant goals and objectives of most plans.						
	Indirect Operational	**No impact**							
	Construction	**No impact**							

5.9.6 Avoidance, Minimization and Mitigation Evaluation

During conceptual design of the Action Alternatives, minimization and avoidance measures to land use impacts were considered to the greatest extent possible. The Action Alternatives were designed to be consistent with the zoning, land use, and regional and local plans. All the Action Alternatives would have an adverse impact on private property due to the displacement of approximately 1.1 to 4.8 acres of private air rights. Acquisition of the needed property would be conducted consistent with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended, which would ensure the owner of the air rights received just compensation for the property.[32]

All Action Alternatives would also potentially result in construction delays for the development of the adjacent private air rights. Such delays would be minimized as much as practicable through coordination with the private air-rights developer by the Project Proponents during construction planning.

5.9.7 Permits and Regulatory Compliance

The following regulations and permits may apply to the Project:

- **District Department of Consumer and Regulatory Affairs (DCRA):** DCRA authorizes the building of a project according to a specific scope of work, including approved plans. Any modification of permit scope or approved plans must also be approved. Applicable regulations include:
    - 12 District of Columbia Municipal Regulations (DCMR), Construction Codes.[33]
    - Title 6 Housing and Building Restrictions and Regulations.[34]
    - Title 42 Real Property.[35]

  The following permit may be required:
    - Building Permit. [36]

[32] 49 CFR 24, *Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-Assisted Programs*.

[33] District of Columbia Construction Codes, 12 DCMR. Accessed from https://dcra.dc.gov/page/dc-construction-codes. Accessed on March 29, 2020.

[34] District of Columbia Title 6 Housing and Building Restrictions and Regulations. Accessed from https://code.dccouncil.us/dc/council/code/titles/6/. Accessed on March 29, 2020.

[35] District of Columbia Title 42 Real Property. Accessed from https://code.dccouncil.us/dc/council/code/titles/42/. Accessed on March 29, 2020.

[36] District of Columbia Building Permit Application. Accessed from https://mybusiness.dc.gov/#/. Accessed on March 29, 2020.

- **DDOT**: DDOT manages and maintains the publicly owned transportation infrastructure in the District. It is the lead agency with authority over the planning, design, construction, and maintenance of alleys, bridges, sidewalks, streets, street lights, and traffic signals in DC. The *Right-of-Way Policies and Procedures Manual* to establish a fair and efficient manner to complete the acquisitions or transfers of property, and to issue permits to allow for uses of the right-of-way that is compatible with overall operations.[37]

The following permits may be required (see also **Section 5.5.7**, *Permits and Regulatory Compliance*):

- Public Space Permit- Construction and Occupancy. [38]
- Fences and Retaining Walls Permit.[39]
- Sidewalk, Curb, and Gutter Permit.[40]

37 District Department of Transportation. 2011. *Right of Way Policies and Procedures Manual.* Accessed from https://ddot.dc.gov/page/right-way-policies-and-procedures-manual. Accessed on March 29, 2020.

38 District Department of Transportation Public Space Permit. Accessed from https://ddot.dc.gov/node/496092. Accessed on March 29, 2020.

39 District Department of Transportation, Fences and Retaining Walls. Accessed from https://ddot.dc.gov/node/482312. Accessed on March 29, 2020.

40 District Department of Transportation, Sidewalk, Curb, Gutter. Accessed from https://ddot.dc.gov/node/482482. Accessed on March 29, 2020.

5.10 Noise and Vibration

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on noise and vibration levels. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and it identifies potential permitting and regulatory compliance requirements.

5.10.1 Regulatory Context and Guidance

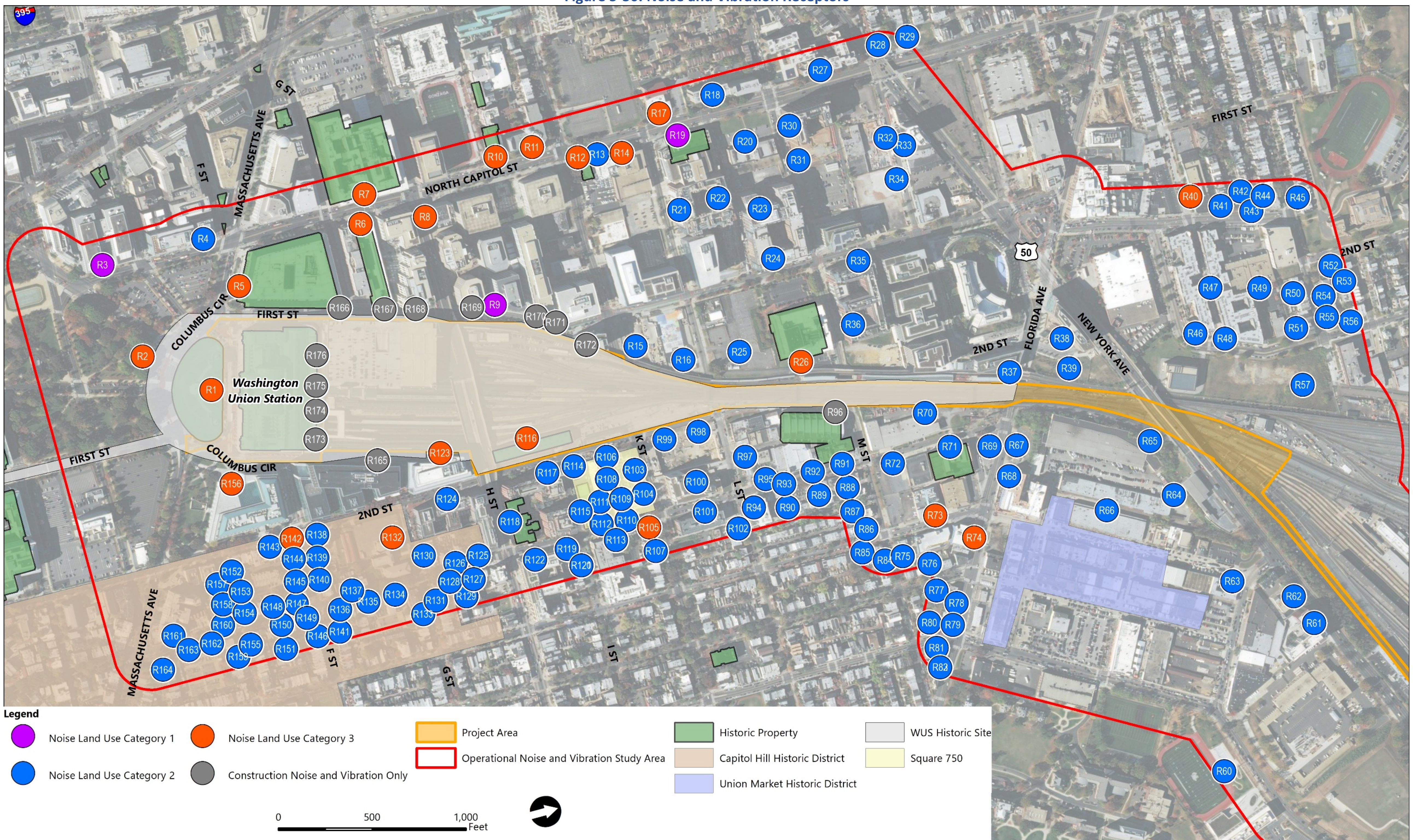
Relevant Federal policies, regulations and guidance that pertain to noise and vibration are listed in **Section 4.10.1**, *Regulatory Context and Guidance*.

5.10.2 Study Area

As defined in **Section 4.10.2**, *Study Area*, the operational noise and vibration study area encompasses the Project Area and nearby noise and vibration-sensitive locations (**Figure 4-11**). It includes noise and vibration-sensitive receptors that are within 600 feet of the Project Area or in the traffic study area. The construction noise and vibration study area extends out 500 feet from the Project Area (**Figure 4-12**). It is approximately bounded by D Street NE to the south; 3rd Street NE to the east south of M Street; 6th Street NE to the east north of M Street; Brentwood Parkway and New York Avenue to the northeast; R Street NE, Harry Thomas Way NE, and Eckington Place NE to the northwest; and North Capitol Street to the west.

Noise and vibration impacts were evaluated at the following receptors, which are shown in **Figure 5-30** and briefly described below.

Figure 5-30. Noise and Vibration Receptors



- **West of Union Station, South of K Street NE (Receptors R1 – R11):** Receptors in this area are primarily Federal Transit Administration (FTA) Category 3 institutional land uses.[1] These include Gonzaga College High School (R11), University of the District of Columbia (UDC) Community College (R8), and St. Aloysius Church (R10). The Smithsonian Postal Museum (R5); Lower Senate Park (R2); and Union Station Plaza (R1) are historic properties. The Cable News Network (CNN) (R9), and National Broadcasting Company (NBC) and Fox News (R3) television studios – which are FTA Category 1 land uses – are also located in this area. Since the historic station building and existing parking garage shield receptors in this area from train operations, the primary source of noise is traffic on major nearby roadways such as Massachusetts Avenue and North Capitol Street.
- **North of K Street NE and South of New York Avenue NE (Receptors R12 – R39):** Receptors in this area are primarily FTA Category 2 land uses, including high-density residential apartment buildings and hotels along First Street NE and North Capitol Street. There are also several planned residential or mixed-use developments in this area. Institutional FTA Category 3 receptors include places of worship such as St. Phillips Baptist Church (R12) and Mt. Airy Baptist Church (R17) as well as U.S. Equal Employment Opportunity Commission (EEOC) historic building (R26). The National Public Radio (NPR) broadcasting studio (R19) is an FTA Category 1 land use. Primary sources of noise in this area are traffic on local roadways such as North Capitol Street and New York Avenue, and train operations for receptors close to the tracks.
- **North of New York Avenue NE (Receptors R40 – R57):** Receptors in this area consist primarily of FTA Category 2 land uses, including single or multi-family residential buildings; high-density residential apartment buildings; and FTA Category 3 institutional land uses such as the Friendship Public Charter School (R40). Several high-density residential buildings are planned for development in this area. The primary sources of noise are traffic on New York Avenue and WMATA Red Line train operations.
- **New York Avenue Area (Receptors R58 – R62):** Receptors in this area include primarily FTA Category 2 land uses such as existing and proposed high-density apartment buildings; houses; and hotels. Institutional FTA Category 3 land uses include the Gallaudet University campus (R60). Because the tracks are setback from receptors on New York Avenue, the primary source of noise in this area is traffic on New York Avenue.
- **Union Market Area (Receptors R63 – R68):** The historic Union Market area includes FTA Category 2 land uses such as high-density residential buildings; several residential and mixed-use developments under construction; and several planned developments. The primary sources of noise in this area are delivery trucks traveling

[1] See **Section 4.10.3**, *Methodology*, **Table 4-10** for a definition of FTA categories.

to the area for delivery loading and unloading as well as train operations and traffic on Florida Avenue.

- **South of Florida Avenue NE and North of K Street NE (Receptors R69 – R102):** Receptors in this area are primarily FTA Category 2 land uses, including single or multi-family residential buildings interspersed with a few high-density apartment buildings. There are several high-density apartment buildings planned for development. Institutional land uses include the Two Rivers Public Charter School (R72-R73). The primary sources of noise in this area are traffic on major roadways such as Florida Avenue and train operations.
- **East of Union Station, South of K Street NE (Receptors R103 –R164):** Receptors in this area include FTA Category 2 land uses such as historic residential rowhouses and townhomes along 2nd Street NE and 3rd Street NE between K Street NE and E Street NE as well as high-density residential apartments and condominium buildings. Institutional FTA Category 3 land uses include the Center City Public Charter School within the historic REA Building (R116); the Capitol Hill Montessori School (R132); Community Holiness Church (R105); National Community Church (R142); the historic Thurgood Marshall Building (R156); and the Kaiser Permanente Medical Center (R123). The REA Building/Center City Public Charter School and the Kaiser Permanente Medical Center are particularly susceptible to noise and vibration impacts because they are adjacent to the rail terminal.

5.10.3 Methodology

This section summarizes the methodology for evaluating the probable consequences of the alternatives on noise and vibration. **Appendix C3***, Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 10.4***, Methodology* provides a description of the analysis methodology. A summary is below.

5.10.3.1 Operational Impacts

The Project may have operational noise and vibration impacts because of modifications to the transportation infrastructure; increases in vehicle traffic volumes; and increases in train operations. Substantial increases in noise can affect people by causing annoyance at sensitive locations (for example residences, medical facilities, places of worship, or parks). Increases in vibration levels can affect people by causing annoyance inside vibration-sensitive buildings. The metrics (ways of measuring) used to quantify noise and vibration levels are explained in **Section 4.10.3**, *Methodology*.

Operational Noise Prediction Methodology

Operational noise impacts from mobile sources (trains, streetcars, and street traffic) were modeled quantitatively using standard computer models and methods used by FTA and FHWA. See **Appendix C3**, *Washington Union Station Expansion Project, Environmental*

Consequences Technical Report **Section 10.4.1.1**, *Operational Noise Prediction Methodology* for more information on the models and model inputs used.

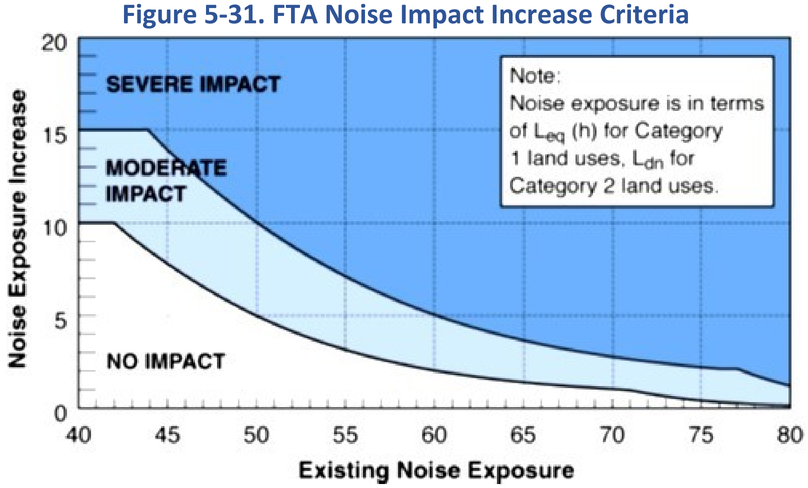
The noise analysis generated site-specific results at individual receptors and broader noise level mapping across the Study Area. The noise level mapping showed absolute sound level as well as comparative contours showing the change in noise that would occur in each Action Alternative relative to existing conditions and the No-Action Alternative.

The Project would also create new stationary sources of noise such as exhaust fans and emergency generators. Potential impacts from stationary sources were assessed qualitatively.

Operational Noise Impact Criteria

To assess the intensity of noise impacts, criteria defined by FTA were used. FTA's criteria categorize impacts as no impact, moderate impact, or severe impact based on the existing ambient noise level and the anticipated change caused by a project, as shown in **Figure 5-31**: the higher the existing noise level, the smaller the change resulting in a moderate or a severe impact. A severe impact is when a significant percentage of people would be highly annoyed by the projected noise. A moderate impact is when the change noise level would be noticeable to most people but generally not sufficient to generate strong, adverse reactions.

Figure 5-31. FTA Noise Impact Increase Criteria



Source: FTA, 2006

Based on the FTA impact criteria, NEPA noise impacts assessments were made using the following scale: FTA severe impacts were considered major adverse impacts and FTA moderate impacts were considered moderate adverse impacts. No impact per the FTA criteria was considered no adverse impact under NEPA (although some measurable changes in noise levels may occur, they would always be below three dBA, which is the lowest perceptible change). When noise levels would decrease rather than increase, the impact was considered beneficial without further characterization.

Operational Vibration Prediction Methodology

Impacts on vibration levels were evaluated based on increases caused by modifications to the railroad track infrastructure and increases in the number of vibration events resulting from more numerous train operations. The analysis included a detailed vibration assessment consistent with FTA's approved methodology. See **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report* **Section 10.4.1.2**, *Operational Vibration Prediction Methodology*, for more information.

The analysis considered the risk of structural damage from vibration. However, typically, vibration from train operations is substantially below the thresholds for potential structural damage, although historic buildings may be more fragile and susceptible to damage from vibration than more recent structures.

Operational Vibration Impact Criteria

FTA's has two sets of vibration assessment impact criteria. The general criteria and the detailed criteria. The general criteria reflect the potential for human annoyance depending on land use. **Table 5-118** shown the general criteria for ground-borne vibration for the three land use categories defined by FTA.

Table 5-118. FTA General Ground-Borne Vibration Impact Criteria[2]

Land Use Category	Ground-Borne Vibration Levels (Vibration Decibel Level)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
1: Buildings where low vibration is essential for interior operations	65	65	65
2: Residences and buildings where people normally sleep	72	75	80
3: Institutional buildings with primarily daytime use	75	78	83

1. More than 70 events per day.
2. Between 30 and 70 events per day.
3.Fewer than 30 events per day.
Source: FTA, 2006.

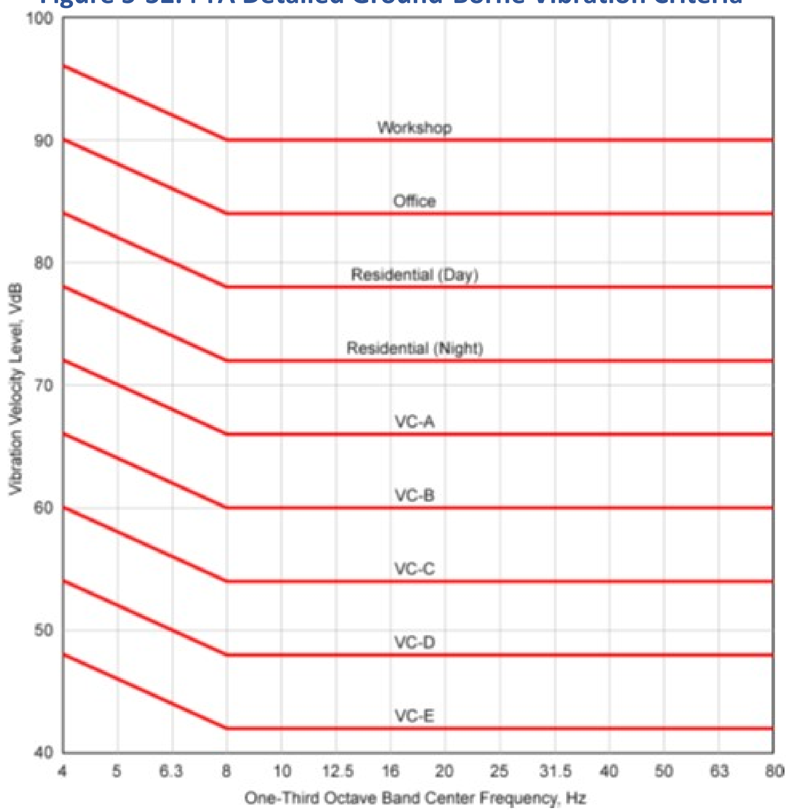
In general, 65 Vibration Decibels (VdB) is the threshold of human perceptibility of vibration. The detailed vibration assessment impact criteria, illustrated in **Figure 5-32**, are used when vibration data is available through measurements and modeling. The general criteria are

[2] The general criteria also include criteria for ground-borne noise levels. Ground-borne noise is typically only assessed at locations with subway or tunnel operations where there is no airborne noise path, or for buildings with substantial sound insulation such as a recording studio. The ground-borne noise criteria are shown in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report* **Section 10.4.1.2**, *Operational Vibration Prediction Methodology,* **Table 10-2**.

more conservative than the detailed criteria because they are based on vibration levels over the entire frequency range rather than separated into specific frequency bands.

Vibration assessment also depend on existing conditions. For projects in existing railroad corridors with more than 12 trains per day, a project is considered to cause impacts if (1) projected vibration levels would exceed the FTA criteria; and (2) the project would significantly increase the number of vibration events (approximately doubling it) or increase vibration levels by 3 VdB or more. If a project moves existing railroad tracks, there would be impacts only if the track relocation results in vibration levels exceeding the FTA criteria and increasing vibration levels by more than 3 VdB.

Figure 5-32. FTA Detailed Ground-Borne Vibration Criteria[3]



Source: FTA, 2006.

5.10.3.2 Construction Impacts

Noise and vibration from construction activities have the potential to affect nearby receptors by causing annoyance; perceptible vibration inside buildings; and structural damage to

[3] Categories VC-A through VC-E refer to extremely sensitive uses that are not relevant to this analysis.

buildings and structures. The methodology for predicting and assessing construction noise and vibration impacts depends on the noise and vibration source.[4]

Methodology for Predicting Construction Noise

Construction noise from stationary sources (construction equipment) and mobile sources (trucks and work trains) was modeled quantitatively using computer software and methodologies in accordance with FTA and FHWA 's guidance. See **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report* **Section 10.4.2.1**, *Methodology for Predicting Construction Noise* for details.

Construction noise was evaluated at 25 feet from the outermost limits of construction, in accordance with the District's noise ordinance and at specific residential, commercial, and industrial receptor locations, in accordance with FTA guidelines. Noise modeling was based on the type of equipment that would be mobilized during each phase of construction and the amount of time, or utilization factor, that the equipment would be used.

Construction noise was modeled for support of excavation (SOE) construction, excavation, and for drilling, which generally are the longest-lasting and loudest construction activities. Noise was evaluated assuming open-cut excavation methods at both the start of excavation (highest elevation) and the end of excavation (lowest elevation). As excavation proceeds, the active equipment would be deeper and closer to the bottom, resulting in greater sound attenuation from the SOE structures and lower noise levels at nearby receptors.

Construction of the Project would involve substantial excavation and removal of soils and debris for disposal. Excavation spoil removal could occur by dump trucks or gondola trains. Because the removal method is undetermined at this time, the construction noise analysis considered three scenarios for spoil removal: removal by trucks only (120 trucks per day); removal by trucks and work trains (one train and 60 trucks per day); and removal by work trains only (two trains per day). The first scenario yields a conservative, maximum estimate of construction-related mobile source noise. The other scenarios show by how much noise levels could be reduced by using work trains. Regardless of the spoil removal method, approximately 10 to 20 trucks would travel to and from the site for deliveries every day during the construction period. When modeling noise generated by construction trucks and trains, existing noise from traffic and train operations was taken into account.

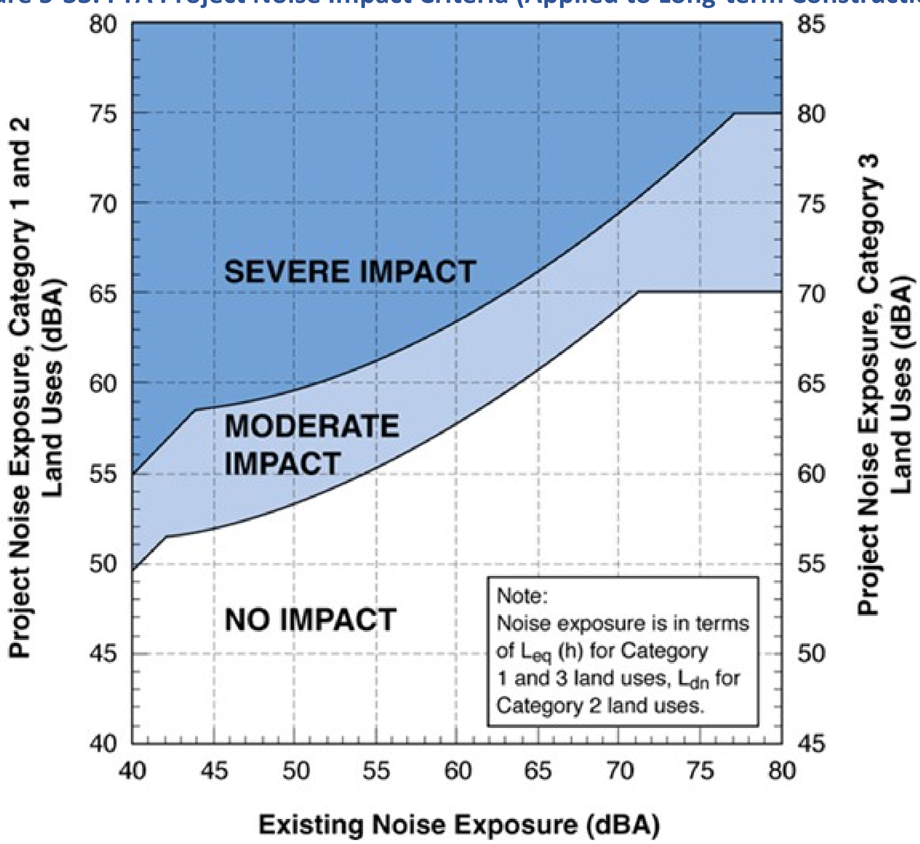
[4] The construction impact modeling does not include the column removal work. In all Action Alternatives, the contribution of this work to ambient noise levels in the study area would be the same and would be negligible. During Phases 1 and 2 of construction, the column removal work would overlap with the excavation and reconstruction of portions of the rail terminal. However, this work would take place within the historic station building and involve installing temporary supports, removing, and replacing structural elements. These activities are not machine-intensive and would not involve the type of noisy excavation or foundation installation work associated with the reconstruction of the rail terminal. The part of WUS where the work would take place would be walled off from the rest of the building. Given the small scale of the column removal work, the noise and vibration associated with this work has no potential to result in an exceedance of any applicable criterion at any modeled locations.

Construction Noise Impact Criteria

FTA has defined construction noise criteria that depend on the type of land use affected and the time of day. However, because Project construction would take place over a long time (from more than 10 years to more than 13 years, depending on the Action Alternatives), the construction noise impact analysis used FTA's long-term project noise impact criteria instead. These criteria are more conservative than the construction criteria. They are shown in **Figure 5-33**.

The District's Noise Ordinance (Municipal Regulations Chapter 20-27 and 20-28) prohibits construction sound levels above 80 dBA Leq (except for pile driving) as measured 25 feet from the outermost limits of the construction site between 7:00 AM and 7:00 PM unless a variance is granted. From 7:00 PM to 7:00 AM, construction activities are limited to 65 dBA (Lmax) 25 feet from the outermost limits of the construction site for noise originating in an industrial zone. These criteria are intended to apply to stationary construction sources, not to construction vehicles.

Figure 5-33. FTA Project Noise Impact Criteria (Applied to Long-term Construction)



Source: FTA, 2006.

Methodology for the Prediction of Construction Vibration

The construction vibration analysis was conducted for activities that typically generates substantial vibration such as use of clam shovels during slurry wall construction; drilling during secant pile wall construction; vibratory sheet pile driving; caisson drilling; operation of hoe rams and jackhammers during concrete removal; operation of excavators, backhoes, and loaded trucks during excavation; and use of vibratory rollers for track re-construction.

Impacts were evaluated using FTA's guidance. FTA's assessment methodology includes identifying the types of vibration-generating construction equipment and predicting typical construction vibration levels at various distances from the equipment. This information provides a general estimate of construction vibration and potential increase in the risk of structural damage.

Construction Vibration Impact Criteria

Construction vibration can damage nearby structure or generate annoyance among local residents or workers. The potential for structural damage is typically limited to impact-type activities, such as drilling and slurry wall construction, that are conducted very close to buildings (within 25 feet). Potential damage from vibration depends on the specific activity and how the building is constructed. FTA criteria for potential structural damage are shown in **Table 5-119**. Criteria for annoyance are the same as for the operational vibration analysis.

Table 5-119. FTA Criteria for Potential Structural Damage

Building Construction	Criterion for Potential Damage to Structures	
	Vibration Level (VdB)	Peak-Particle Velocity (inches/second)
I. Reinforced-concrete, steel or timber	102	0.5
II. Engineered-concrete and masonry	98	0.3
III. Non-engineered timber and masonry	94	0.2
IV. Buildings extremely susceptible to vibration damage	90	0.12

Source: FTA, 2006.

5.10.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on noise and vibration levels.

5.10.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would have beneficial direct operational noise impacts at locations near the private air-rights development. There would be negligible adverse direct operational noise impacts elsewhere in the Study Area

as noise levels would increase by no more than 3 dBA relative to existing levels. There would be negligible adverse direct operational impacts on vibration levels.

Operational Noise

Figure 5-34 shows modeled noise levels in the No-Action Alternative. Noise levels would range from 60 to 75 dBA (average day-night sound level [Ldn]) at most locations. Such levels are typical of a dense urban area. Predominant sources of noise include the rail terminal, New York Avenue NE, Florida Avenue NE, K Street NE, and Massachusetts Avenue NE.

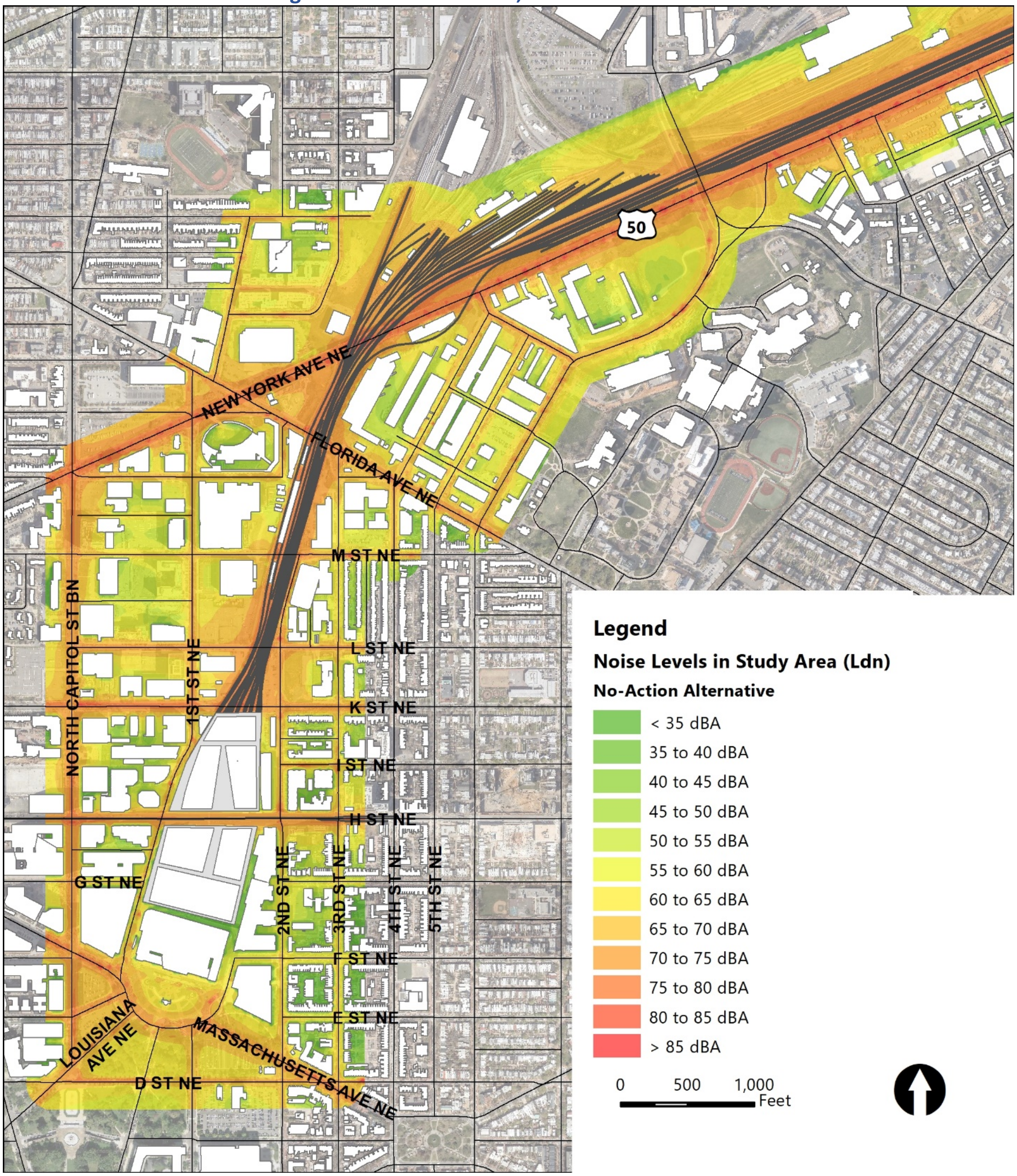
There would be a beneficial impact at receptors adjacent to the private air-rights development south of K Street NE. Noise levels there would decrease relative to existing conditions because of the acoustic shielding the development would provide as it would enclose the rail terminal**.** Reductions would vary depending on the receptor. At the Kaiser Permanente Medical Center (R123) and REA Building/Center City Public Charter School (R116), it would be greater than 10 dBA. A reduction of 10 dBA is generally perceived as a halving of the noise level. Multiple residential receptors along 2nd Street NE and Parker Street NE would experience appreciable sound level reductions as well.

At receptors north of K Street NE and away from the private air-rights development, noise from trains and traffic would increase because of greater traffic volumes and more train operations. This would be a negligible adverse impact because everywhere increases would be less than 1 dBA, except in the Union Market area. There, increases could be higher because of the introduction of a new track leading to the new VRE MSR Facility and the operation of non-revenue VRE trains on this track during midday storage. The track would have relatively tight-radius curves, which has the potential to generate wheel squeal and may result in high amplitude, high-frequency noise from the interaction of the wheels with the rail surface. Even assuming that track design would minimize the risk of wheel squeal, modeling shows that noise levels in the Union Market area would increase at some locations. However, the increase would not exceed 3 dBA and remain a negligible impact.

Noise impacts from new stationary sources would also be negligible. Several new stationary sources would be introduced in the Project Area in the No-Action Alternative:

- Fan plants in the southern portion of the private air-rights development on the east side of the Project Area, south of H Street NE; and in the northern portion of the private air-rights development on both the east and west sides of the Project Area, south of K Street NE.
- An emergency generator in the private air-rights development on the east side of the Project Area, mid-way between H Street NE and K Street NE.
- A cooling tower in the private air-rights development on the east side of the Project Area, mid-way between H Street NE and K Street NE.

Figure 5-34. Noise Levels, No-Action Alternative



This stationary mechanical equipment would likely be located approximately 50 feet from the property line, which would attenuate sound and maintain noise levels below the District's Noise Ordinance standard. [5] The equipment would also be required to meet the noise level requirements set forth in the National Fire Protection Association (NFPA) 130 Standard for Fixed Guideway Transit and Passenger rail Systems. As mechanical equipment designs advance, other sound attenuation elements would likely be incorporated, if and as needed. Adverse impacts from stationary noise sources are anticipated to be negligible.

Operational Vibration

Impacts from changes in vibration levels would be negligible in the No-Action Alternative. Improvements to the track infrastructure would be completed (including electrifying Tracks 8-9; rehabilitating Track 22; and introducing new tracks with the proposed VRE MSRF). These would not affect track location and condition, nor would it affect train operations or speeds at most locations. Vibration levels from train passing by would not change except for receptors in the Union Market area near the new track to the proposed VRE MSRF. While vibration levels at some receptor locations in this area would increase, they would remain below the applicable FTA criteria.

Appendix C3, *Washington Union Station Expansion Project, Environmental Consequences Technical Report* **Section 10.5.1.1**, *Direct Operational Impacts, Operational Vibration,* provides a more detailed description of those negligible vibration impacts.

Indirect Operational Impacts

Relative to existing conditions, there would be no indirect noise or vibration effects in the No-Action Alternative.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Construction of the projects included in the No-Action Alternative would cause noise and vibration impacts. Available information on methods and schedules of construction is insufficient to characterize these impacts.

In the No-Action Alternative, the Project would not be constructed and would not cause any construction-related noise or vibration impacts. Construction of the private air-rights development, replacement of the H Street Bridge, and other projects included in the No-Action Alternative would generate noise and vibration from construction equipment and vehicle operations. Noise and vibration levels would depend on the type of equipment and vehicles used as well as the schedule of each project. This information is not currently

[5] The District's Noise Ordinance (Chapter 20-2801) limits noise from stationary mechanical equipment such as fan plant rooms, cooling towers, and emergency generators to 60 dBA when measured at the property line or as close to the property lines as practicable if there is an obstruction.

available. It can be assumed that noise and vibration levels would be typical of medium- to large-scale construction projects.

5.10.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, in Alternative A noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative A would have a minor localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise

Noise levels in Alternative A, shown in **Figure 5-35**, would range from approximately 60 to 75 dBA (Ldn). Such levels are typical of a dense urban setting. Primary noise sources would include the rail terminal and traffic on streets such as New York Avenue NE, Florida Avenue NE, K Street NE, and Massachusetts Avenue NE.

At locations along First Street NE, noise levels would decrease due to a reduction in traffic volumes as First Street NE would change from a two-way to a one-way street. Elsewhere, increases in train operations and traffic would generally cause noise levels to increase relative to the No-Action Alternative. South of K Street NE, increases would be less than 1 dBA. North of K Street NE, they would range from 1 to 3 dBA. Changes less than 3 dBA are generally not perceptible. Therefore, anticipated increases in noise levels would result in negligible adverse noise impacts except at locations where they would cause the FTA impact threshold for moderate impact (**Figure 5-31**) to be exceeded. These locations are shown in **Figure 5-36**. Detailed modeling results for those locations where the threshold would be exceeded can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report***, Section 10.5.2.1***, Direct Operational Impacts, Operational Noise,* **Table 10-7**.

Moderate noise impacts would occur close to the rail terminal due to the increase in train operations. Affected receptors would include the Equity Residential building (R15); TIAA Flats Apartments (R36); Washington Gateway Elevation Apartments (R38); and Toll Brothers City Living (R98 and R99). Moderate impacts along New York Avenue, at the Hecht Warehouse Lofts (R58) and the Homewood Suites and Hampton Inn (R61), would be due to the projected growth in traffic volumes on this roadway.

Figure 5-35. Noise Levels, Alternative A

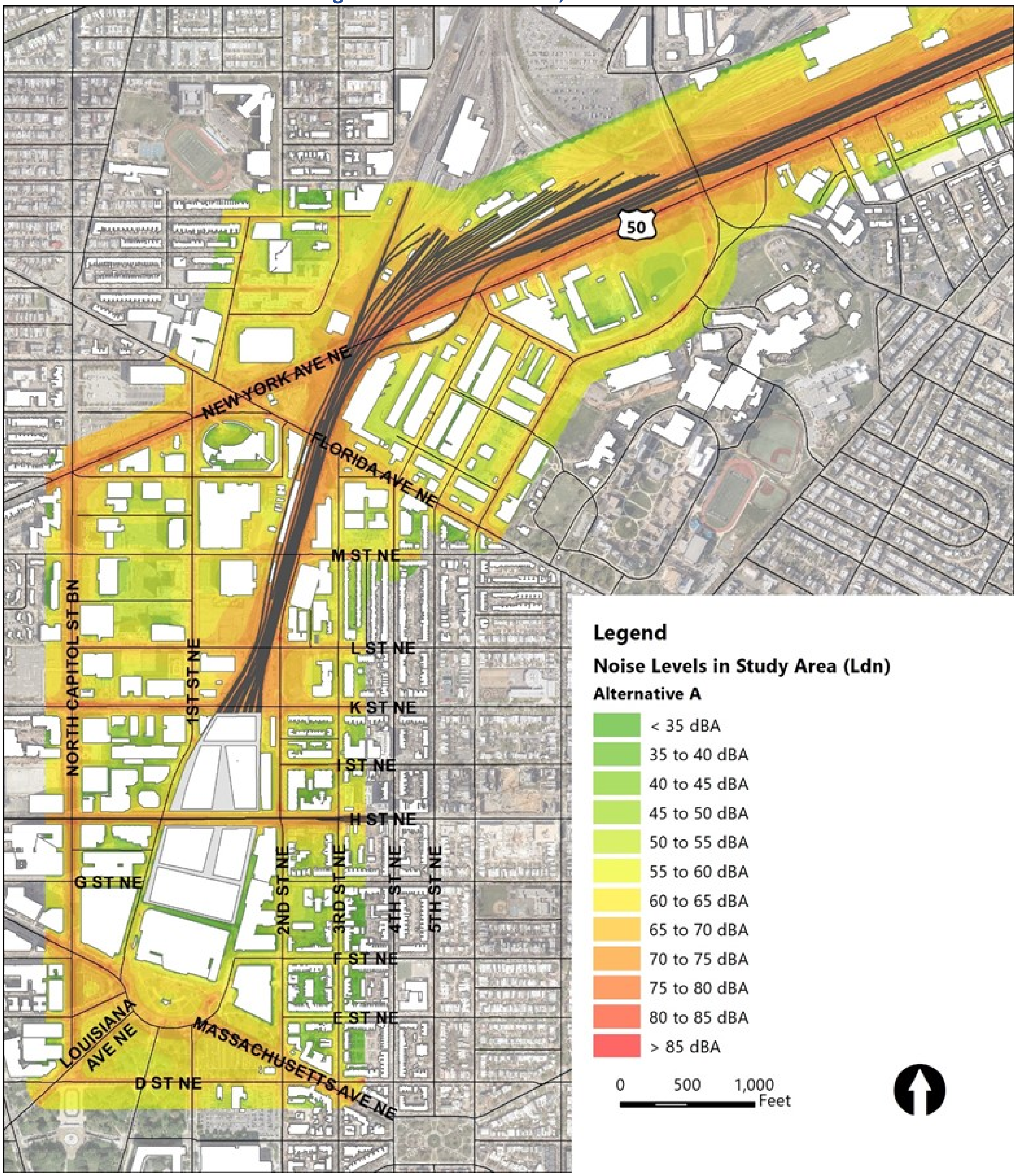
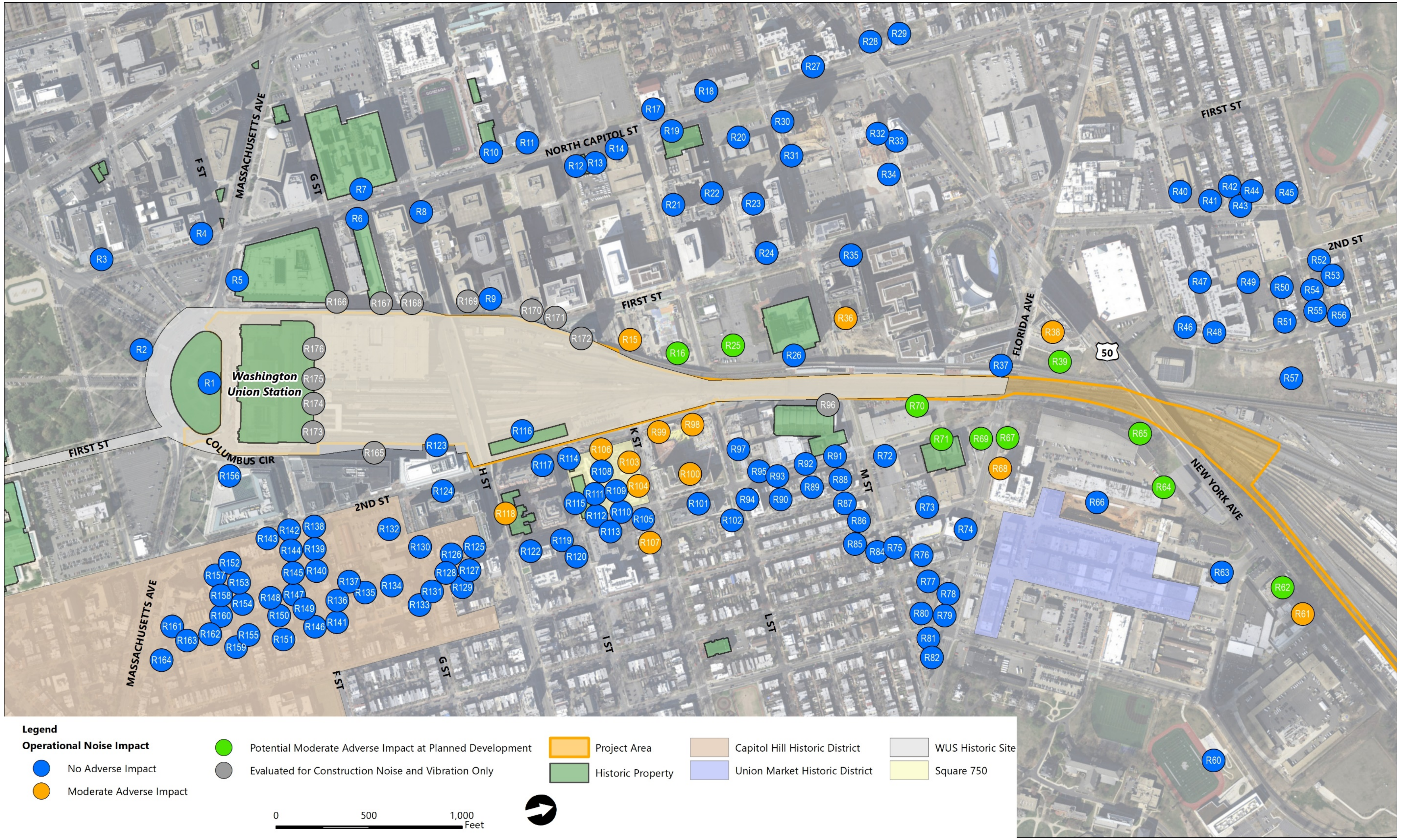


Figure 5-36. Operational Noise Impacts, Alternative A



At other locations, such as the Edison building (R58) on Florida Avenue NE and residential receptors along K Street NE, moderate impacts would be due to both train operations and traffic volumes increases. Additionally, the FTA threshold for moderate or severe impacts would be exceeded at ten planned development locations.[6]

Impacts from stationary noise sources are anticipated to be negligible. Alternative A would create the same new stationary sources of noise as the No-Action Alternative (**Section 5.10.4.1**, *No-Action Alternative, Operational Noise*).

Operational Vibration

In Alternative A, although the number of train operations (not including Metrorail and DC Streetcar operations) would approximately triple relative to the No-Action Alternative, the FTA vibration criteria would not be exceeded at any receptor location. Vibration levels would be similar to those in the No-Action Alternative with one exception: there would be an increase in vibration of up to 2 VdB at those receptors closest to Track 43 in the throat of the rail terminal. This would be a minor adverse impact.

Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative A.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Support of Excavation Noise

In Alternative A, SOE construction would result in major adverse noise impacts at 26 locations and moderate adverse noise impacts at six locations.

Construction of the secant pile cut-off wall (64 feet deep) and interior sheet-pile walls (100 feet deep) would involve the use of cranes, drill rigs, dump trucks, concrete pump trucks, and vibratory sheet pile drivers that would generate noise while operating. Modeling indicates that the noise generated by SOE construction activities would exceed District or FTA criteria at multiple receptors adjacent to WUS and along 2nd Street NE north of H Street. **Figure 5-37** illustrates these impacts.[7]

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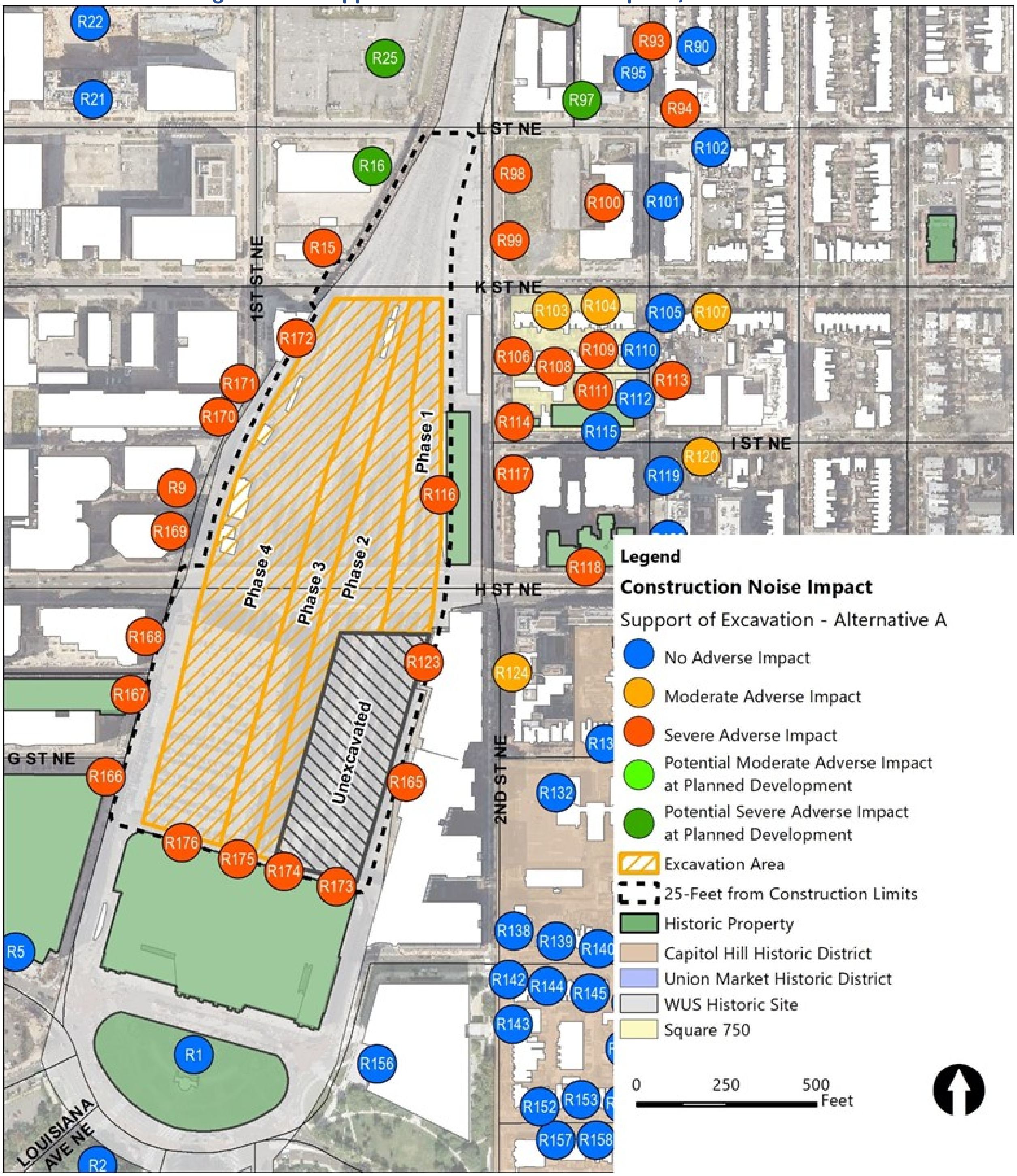
[6] Noise levels at planned developments were modeled but not assessed for impacts. Impacts would occur at these locations only if they have been developed with or permitted for sensitive land uses at the time Project construction occurs.

[7] Some locations include multiple modeled receptors.

Figure 5-37. Support of Excavation Noise Impacts, Alternative A



Detailed modeling results for the affected locations can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.2.3**, *Construction Impacts,* **Table 10-8.** Impacts would occur during all four phases of construction at most affected locations.

Locations where there would be major adverse noise impacts from SOE construction include: WUS at the south end of the rail terminal (R173-176); the REA Building (R116); the US Securities and Exchange Commission building (R165); and the Kaiser Permanente Medical Center (R123) as well as multiple residential and commercial building along First, 2nd, K, I (Eye), and Parker Streets NE. In addition, the sites of three planned developments (Storey Park [R16], 170 L Street NE [R25], 1109 Congress Street NE [R97]) would experience noise levels in excess of the severe threshold. Impacts would occur at these locations only if they have been developed with or permitted for sensitive land uses at the time Project construction occurs.

Excavation Noise

In Alternative A, the rail terminal would be excavated down to the concourse level, with minimal deeper excavation for back of the house space. Excavation equipment would include dump trucks, backhoes, bulldozers, and clam shovels. Spoil removal would be by truck, work train, or a mix of both. As explained in **Section 5.10.3.2**, *Construction Impacts, Methodology for Predicting Construction Noise*, three scenarios were considered: All Truck Scenario (120 trucks a day); Work Train Scenario (2 trains a day); and Mixed Scenario (60 trucks and 1 train a day). Trucks would travel along designated truck routes and only use local streets (K Street NE, G Street NE between North Capitol Street and First Street, First Street NE, and 2nd Street NE) to access the construction site. Trucks would travel north and south from and to the Project Area on either First Street or 2nd Street NE; therefore, only approximately half the trucks would operate on each. Farther out, trucks would travel on New York Avenue, North Capitol Street, Massachusetts Avenue, H Street NE, and K Street NE east of 2nd Street NE. Trains would generally move outside of the peak service periods.

Start of Excavation

In Alternative A, at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck Scenario and Mixed Scenario) or eight locations (Work Train Scenario).

The start of excavation is when noise impacts would be greatest because equipment would be operating at street level. Noise levels generated by start of excavation activities would vary according to methods of spoil removal. Noise levels would be highest in the All Truck Scenario (60 to 91 dBA [Ldn]) and lowest in the Work Train Scenario (50 to 88 dBA [Ldn]). **Figure 5-38** and **Figure 5-39** illustrate anticipated impacts under these two scenarios. Noise levels under the Mixed Scenario (57 to 90 dBA [Ldn]) would fall in-between.

Figure 5-38. Start of Excavation Noise Impacts (All Truck Scenario), Alternative A

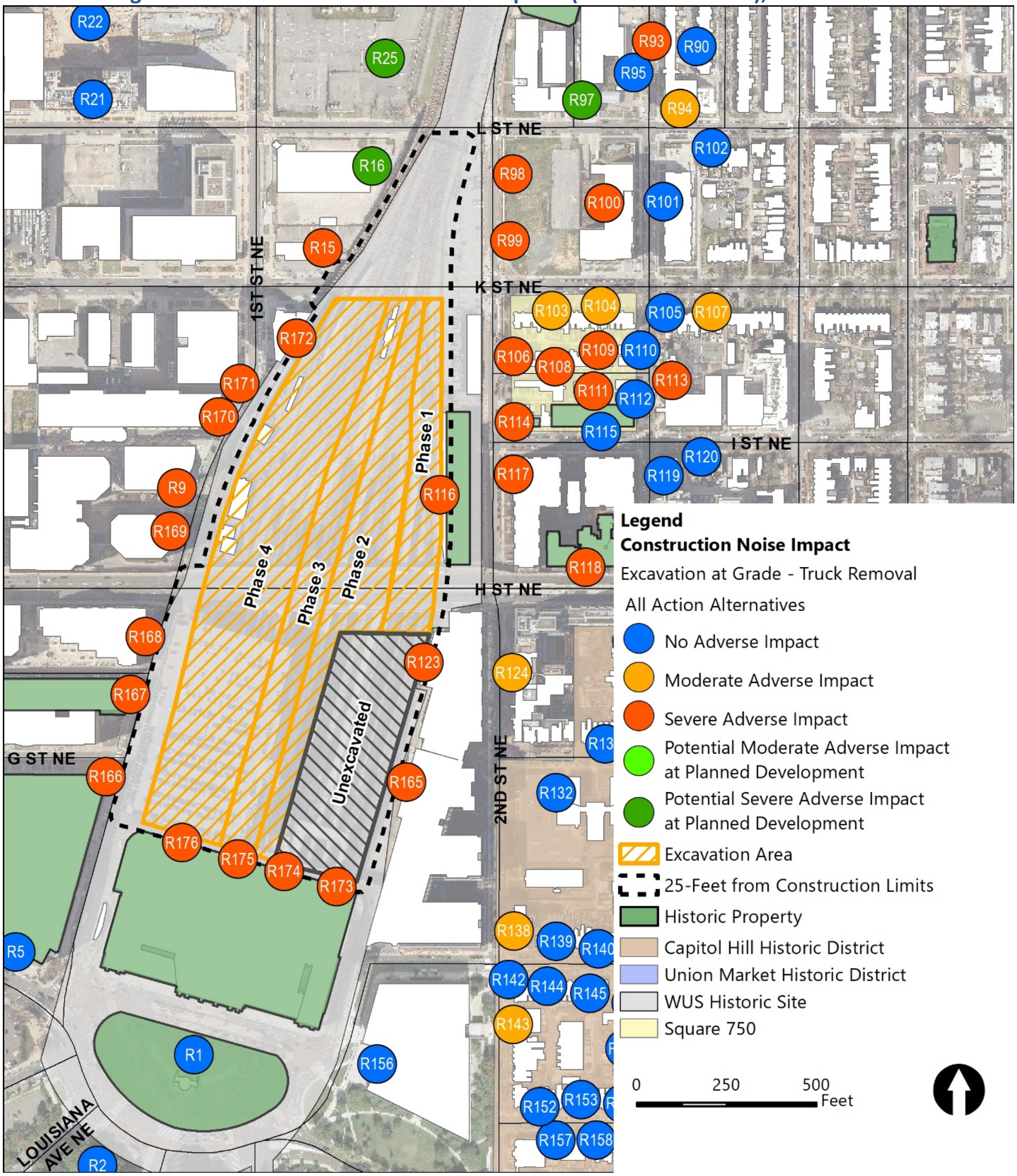
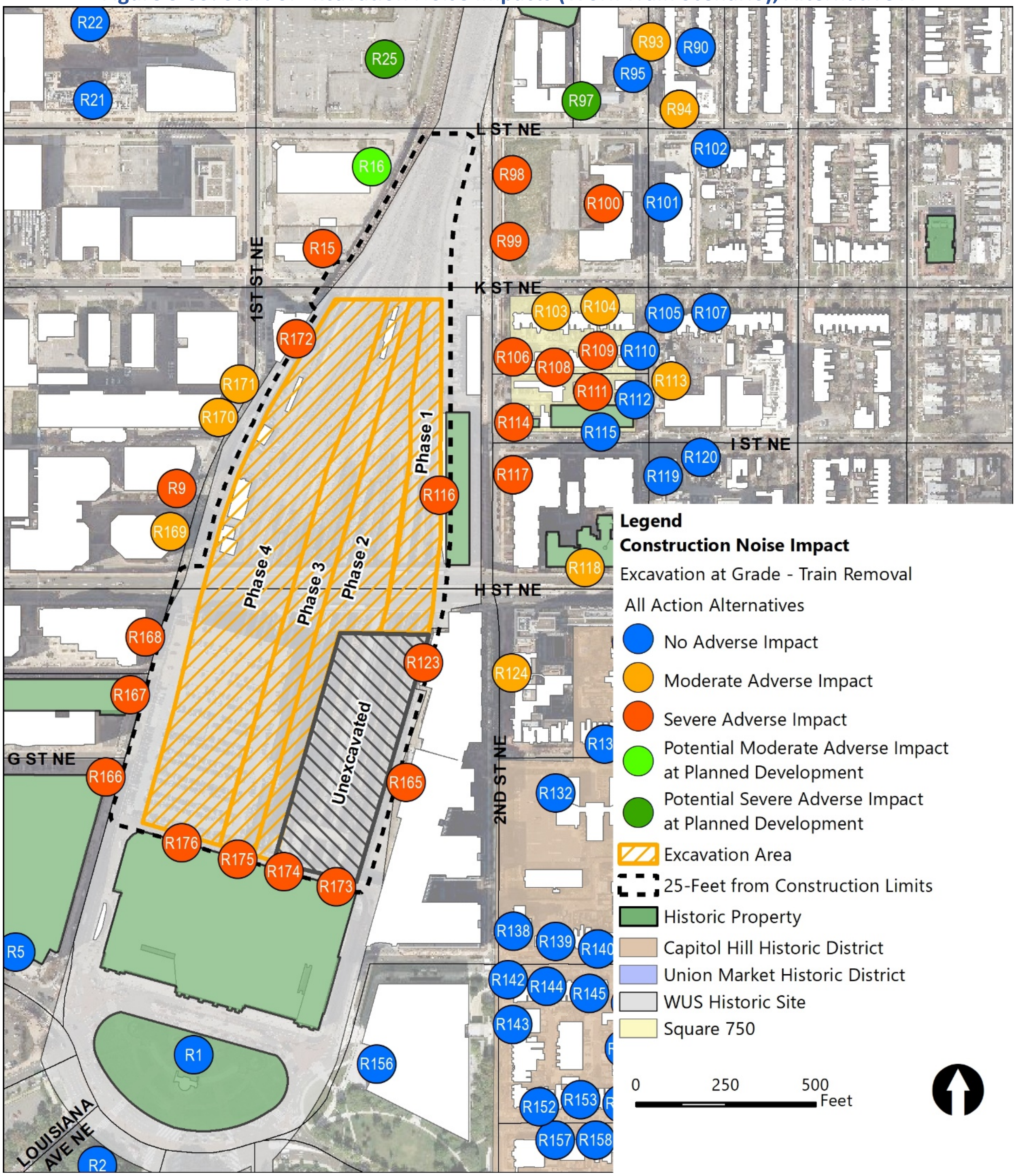


Figure 5-39. Start of Excavation Noise Impacts (Work Train Scenario), Alternative A



Detailed modeling results for the affected locations under all three scenarios can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.2.3**, *Construction Impacts,* **Table 10-9.** Generally, construction noise levels would be approximately 4 dBA (Ldn) higher in the All Truck Scenario than in the Work Train Scenario. The difference would be due to trucks operating during the nighttime hours of the 20-hour daily construction period. Primary sources of noise during excavation would be on-site dump trucks, clam shovels, and excavators; noise exposure from these sources would be steadier than exposure from dump truck passing by.

At multiple locations, in all three scenarios, noise levels would exceed the long-term construction noise impact criteria for severe or moderate impacts or the District's noise ordinance standard, resulting in major and moderate noise impacts. Locations adjacent to the rail terminal, such as the north side of the historic station building (R173-176); the REA Building (R116); the US Securities and Exchange Commission Building (R165); and the Kaiser Permanente Medical Center (R123) as well as multiple commercial and residential uses along K Street NE, First Street NE, 2nd Street NE north of H Street, and Parker Street NE, would experience major adverse impacts in all three scenarios. Most locations that would experience lesser impacts in the Work Train Scenario are located along the streets that trucks would use to travel in and out of the Project Area: First Street NE, 2nd Street NE, and K Street NE. The most notable difference would be on 2nd Street NE south of H Street, where several locations that would experience moderate adverse impacts in the All Truck Scenario would drop below the threshold in the Work Train Scenario. On First Street NE north of H Street, several locations would drop below the severe impact criteria but remain above the moderate criteria.

The criteria for severe or moderate impact would also be exceeded at three locations planned for development (Storey Park [R16], 1170 L Street NE [R25], and 1109 Congress Street NE [497]). There would be impacts at those locations only if they have been developed with or permitted for sensitive uses by the time construction occurs.

End of Excavation

In Alternative A, at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario and Mixed Scenario) or four locations (Work Train Scenario). There would be moderate adverse noise impacts at 19 locations (All Truck Scenario), 15 locations (Mixed Scenario), or 12 locations (Work Train Scenario).

As excavation proceeds, noisy equipment would be located closer to the bottom, resulting in greater sound attenuation. By the end of the excavation, noise levels would be significantly lower than at the start. In the All Truck Scenario, they would range from 56 to 88 dBA (Ldn); in the Mixed Scenario, they would range from 55 to 87 dBA (Ldn); and in the Work Train Scenario, they would range from 48 to 85 dBA (Ldn). Noise levels would be approximately 4 dBA (Ldn) higher in the All Truck Scenario than in the Work Train Scenario. **Figure 5-40** and **Figure 5-41** illustrate anticipated impacts under the All Truck and the Work Train Scenarios.

Figure 5-40. End of Excavation Noise Impacts (All Truck Scenario), Alternative A

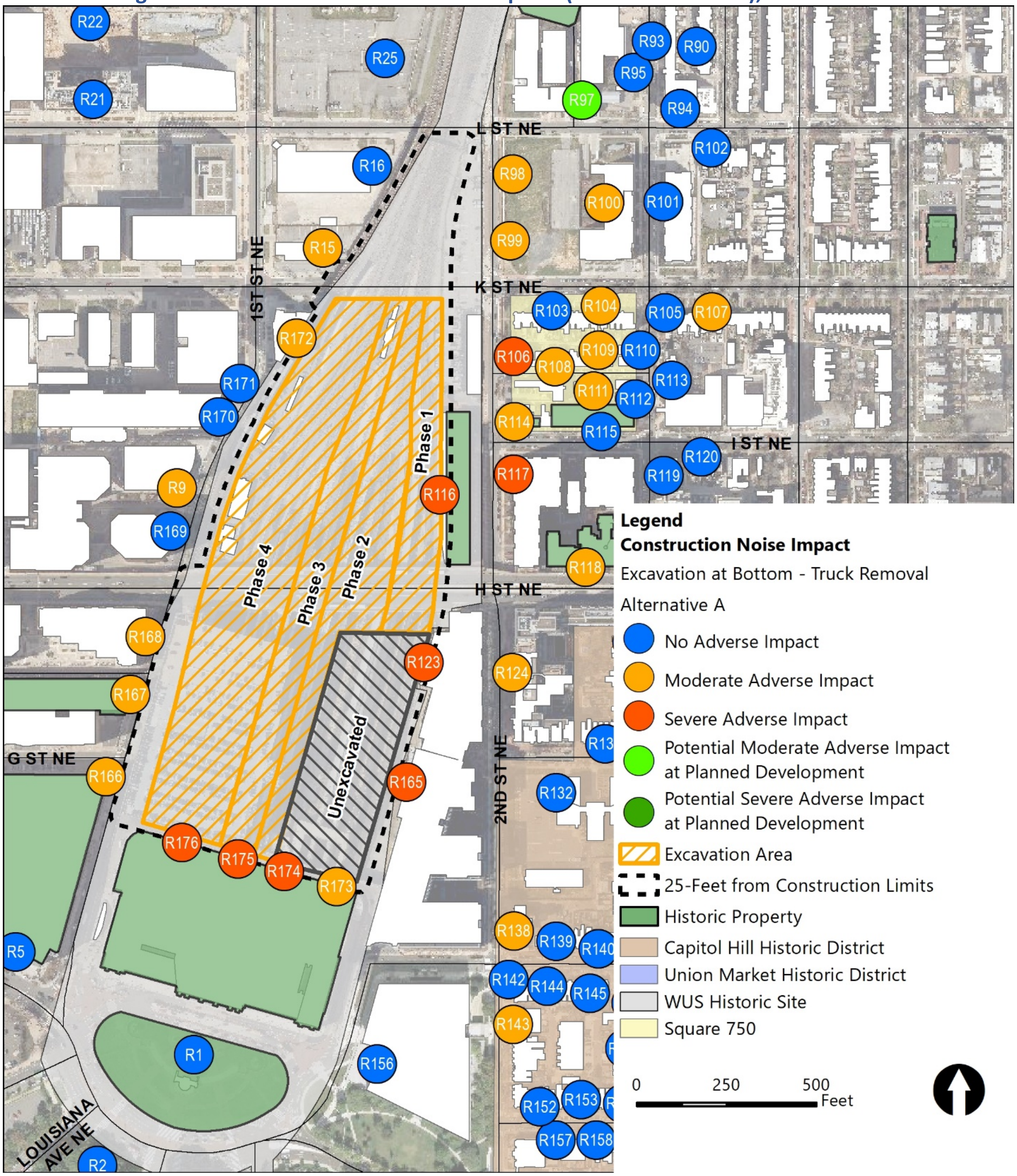
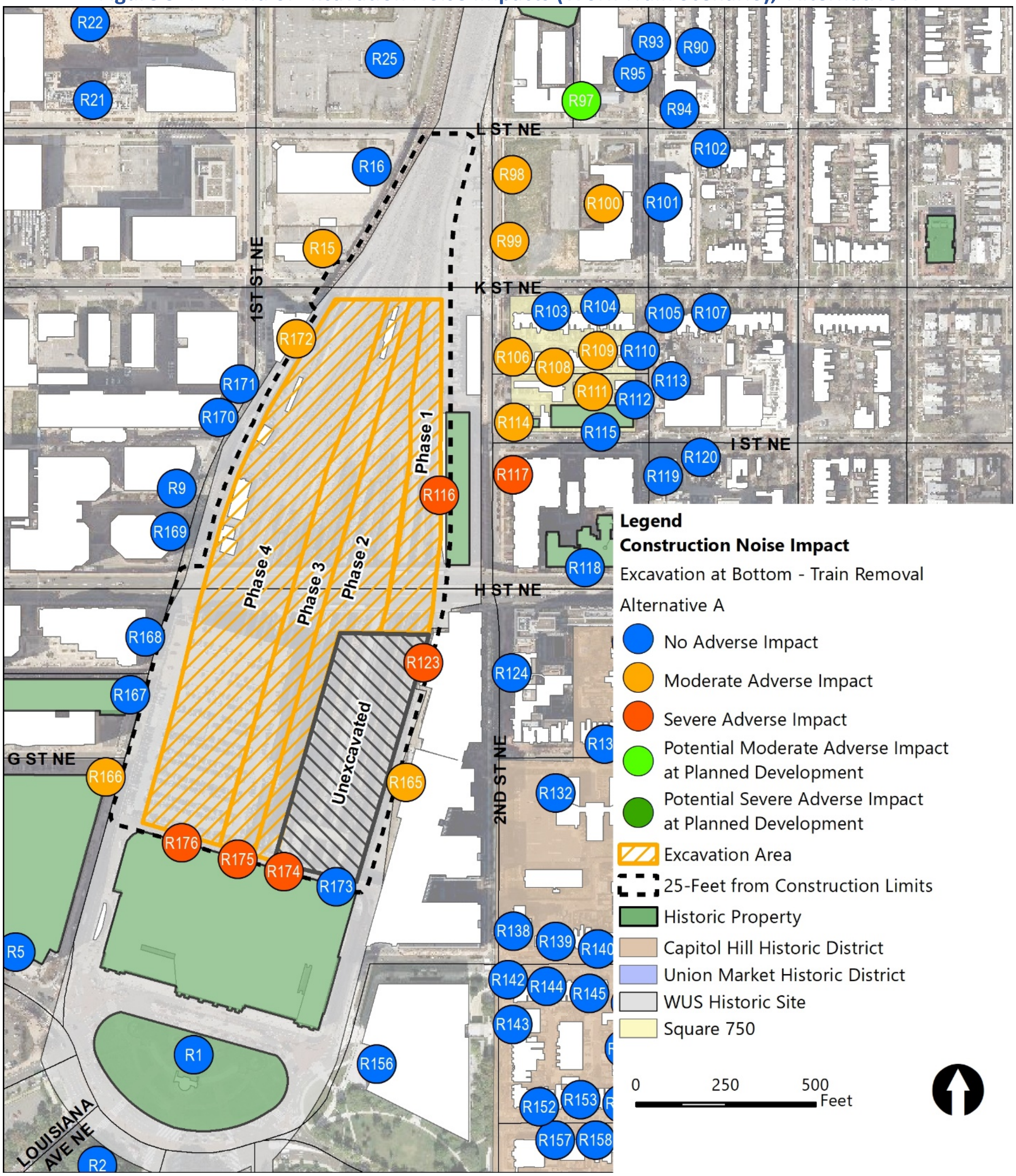


Figure 5-411. End of Excavation Noise Impacts (Work Train Scenario), Alternative A



Detailed modeling results for the affected locations under all three scenarios can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.2.3**, *Construction Impacts,* **Table 10-10.**

Major adverse impacts would occur in all three scenarios at the north side of the historic station building (R173-176); the REA Building (R116); the Kaiser Permanente Medical Center (R123); and the Senate Square Apartments on I (Eye) Street NE (R117). The US Securities and Exchange Commission Building (R165) would experience a major adverse impact in the All Truck and Moderate Scenarios, but a moderate adverse impact only in the Work Train Scenario. The criteria for moderate impact would be exceeded at one location with a planned development (1109 Congress Street NE [R97]) in all three scenarios. There would be a moderate impact at this location if it has been developed with or permitted for sensitive uses by the time construction occurs.

Construction Vibration Impacts

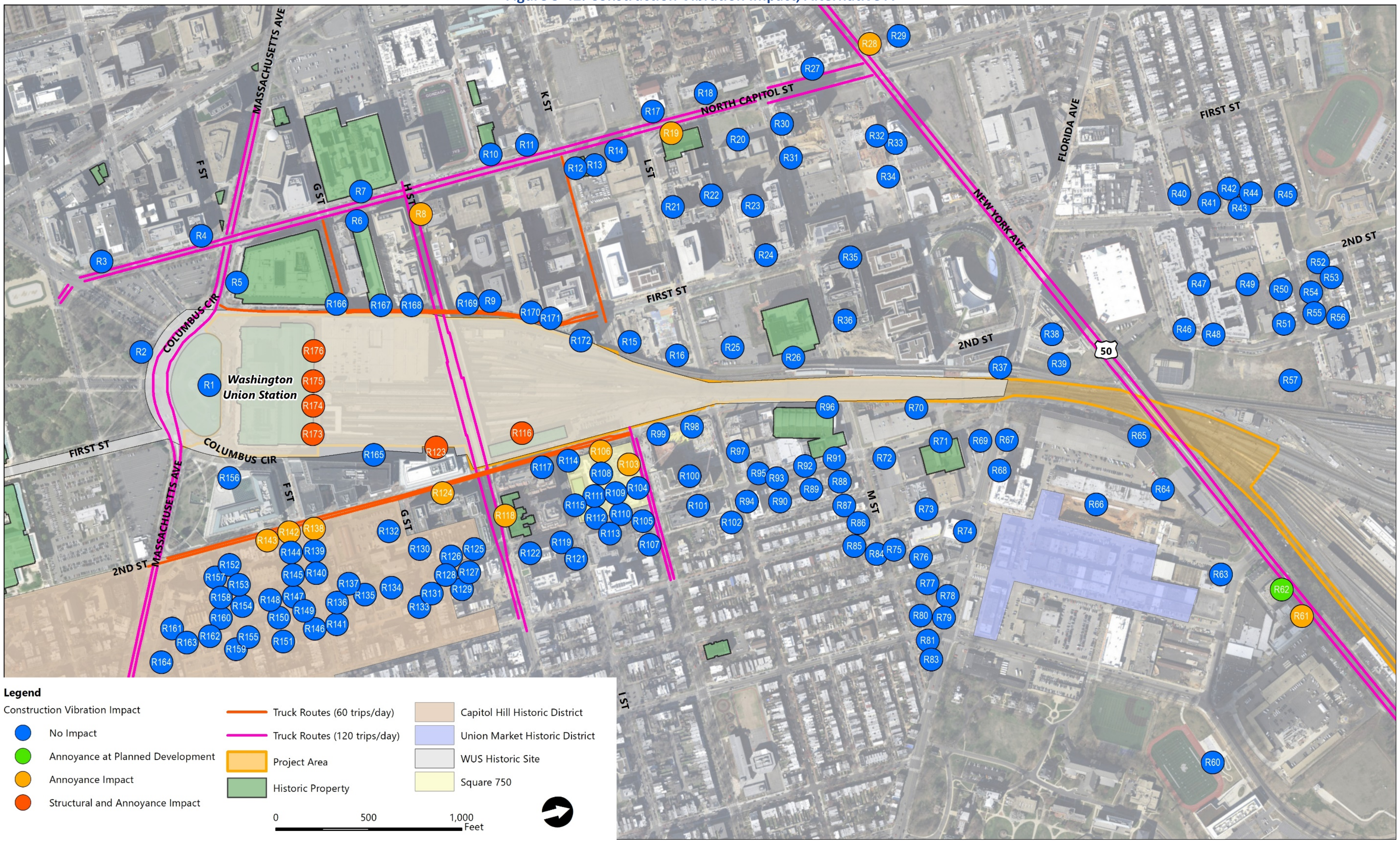
In Alternative A, there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, and the Union Station historic station building due to potential risk of structural damage. There would be moderate adverse impacts from truck-generated vibration at 12 locations due to annoyance.

Construction equipment-caused vibration has the potential to cause structural damage to buildings near the construction site and annoy persons in nearby buildings. Vibration-generating activities would include drilling during secant pile wall construction; vibratory sheet pile driving; concrete removal with hoe rams and jackhammers; excavation with excavators, back hoes, and loaded trucks; and track reconstruction with vibratory rollers.

Figure 5-42 shows the receptors that would experience vibration impacts during construction of Alternative A. Detailed modeling results for these locations are provided in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.2.3**, *Construction Impacts,* **Table 10-11**.

Vibratory pile driving associated with the sheet pile wall construction has the potential to cause structural damage within 31 feet of the most fragile buildings and within 13 feet of buildings with reinforced concrete, steel, or timber frames. Drilling associated with secant pile wall SOE has the potential to cause structural damage within 20 feet of the most fragile buildings and within 8 feet of buildings with reinforced concrete, steel, or timber frames. Vibratory pile driving would occur within 10 to 16 feet of the REA Building (R116), the Kaiser Permanente Medical Center (R123), and the Union Station historic station building (R173-176), with vibration levels of approximately 0.33 to 0.67 in/s. In its initial stages, the column removal work may generate vibration impacts within the eastern part of the historic station building if jackhammers are to break the existing flooring and access girders and column from above. Such impacts would be of brief duration.

Figure 5-42. Construction Vibration Impact, Alternative A



Vibration levels at the three buildings may exceed the criterion for increased risk of structural damage but this would depend on building sensitivity, which in turn is a function of the type of construction (see **Table 5-119** above). All three buildings were designed within the context of an active rail terminal and are all large masonry structures. Therefore, they can be expected to have low sensitivity, reducing the risk of structural impact. However, as historic structures, the REA Building and the historic station building may warrant the application of a lower criterion than the one applicable to buildings of similar construction but more recent. The sensitivity of the buildings would have to be assessed in the Construction Noise and Vibration Plan that would be prepared for the Project (see **Section 5.10.6**, *Avoidance, Minimization, and Mitigation Evaluation*).

Interior vibration conditions at the same three receptors may range from 80 to 90 VdB, which would exceed the threshold for human annoyance. This would only occur when vibration-generating work is conducted near the buildings, however. Vibration annoyance typically would not occur beyond 50 feet of the vibration source.

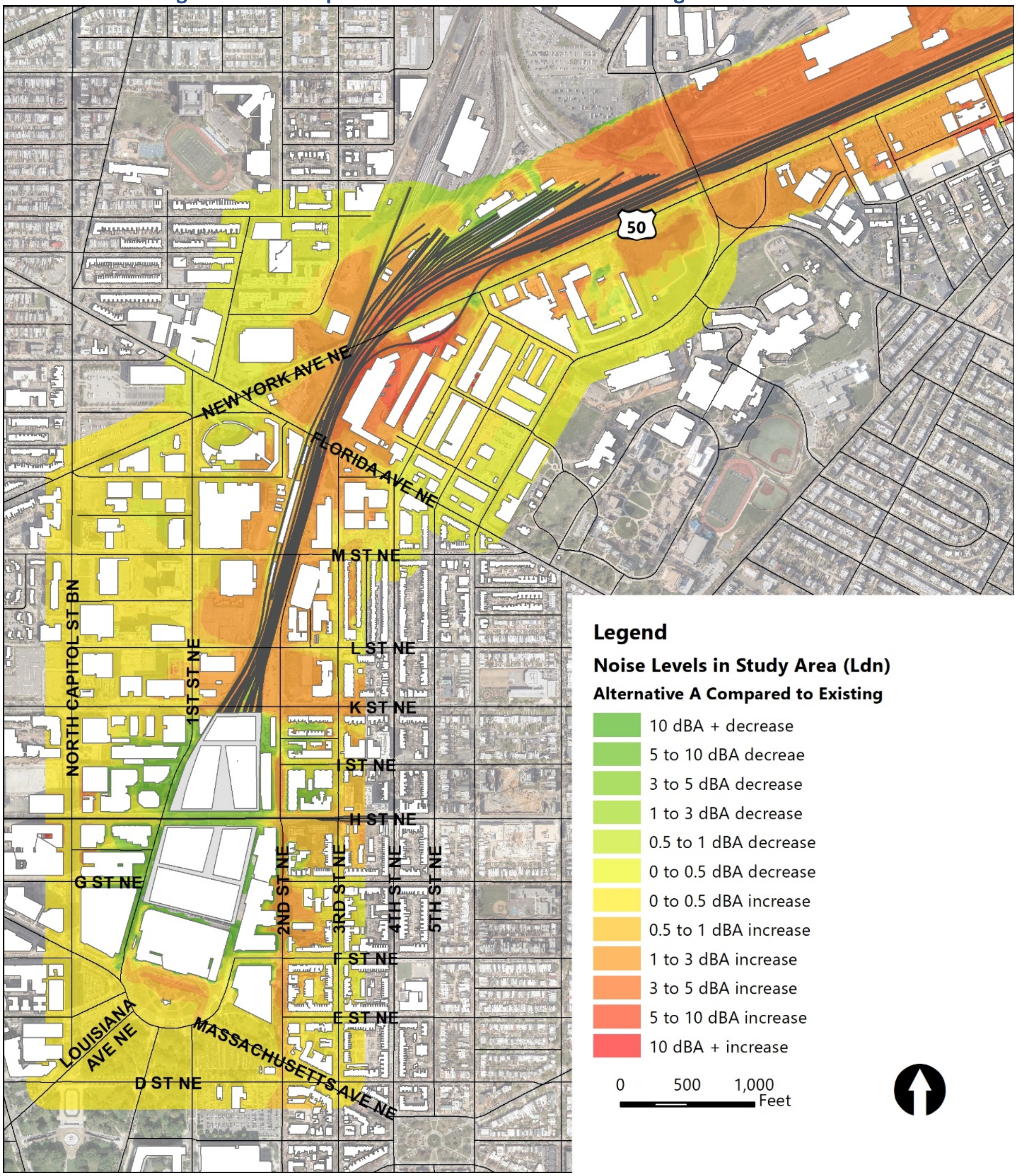
Vibration from truck traffic would cause moderate adverse impacts by exceeding the threshold for annoyance at 12 locations close to New York Avenue, North Capitol Street and 2nd Street NE. These locations include UDC Community College (R8); the C&P Telephone Company/NPR Studio building (R19); the Hecht Warehouse lofts (R58); residential units in the Square 750 block (203-219 K Street NE, 917-923 2nd Street NE) (R103 and R106); residential and institutional receptors on the edge of the Capitol Hill Historic District (603-607 2nd Street NE [R138], 205 F Street NE [R142], 521-527 2nd Street NE [R143]); and Landmark Lofts (R118) in the historic St. Joseph's Home building. One planned development location at 411 New York Ave NE (R62) also would be moderately impacted if the development has been completed at the time of construction. These impacts would occur in the All Truck and Mixed Scenarios but would be less noticeable in the Work Train Scenario.

Comparison to Existing Conditions

Figure 5-43 shows changes in noise levels in Alternative A relative to existing conditions. In most locations, Alternative A would result in negligible adverse operational impacts from increase in noise levels not exceeding 3 dBA (Ldn) (less than 3 dBA changes are commonly imperceptible). These negligible impacts would be the result of increases in street traffic and rail operations.

In locations closest to the rail terminal south of K Street NE, Alternative A would have a beneficial impact on noise levels relative to existing conditions. Noise would decrease substantially (from approximately 5 to 10 dBA) because the Project elements and the private air-rights development would cover the currently open rail terminal. Reductions in traffic volumes on First Street NE, which would become a one-way road, would also contribute to the reduction.

Figure 5-43. Comparison of Alternative A and Existing Noise Conditions



There would be minor adverse operational impacts due to increases in vibration in Alternative A relative to existing conditions. The greatest potential for increase in vibration would come from the re-introduction of Track 43 and the VRE MSRF tracks (a separate project). Re-introducing Track 43 would shift the easternmost track up to 10 feet closer to receptors on the east side of WUS. For the closest receptors, approximately 50 feet away from the nearest track, Track 43 would increase vibration by approximately up to 2 VdB, a minor impact.

Given the track improvements proposed in Alternative A, all vibration-sensitive receptors would be below the FTA vibration impact criteria in all areas, except the Union Market area. At the planned Kettler development (300 Morse Street NE) (R65), interior vibration levels would be 77 VdB (maximum in any 1/3-octave band) due to the new VRE MSRF tracks, which exceeds the FTA vibration criteria. The developer is working with VRE to address potential noise and vibration effects.

5.10.4.3 Alternative B

Direct Operational Impacts

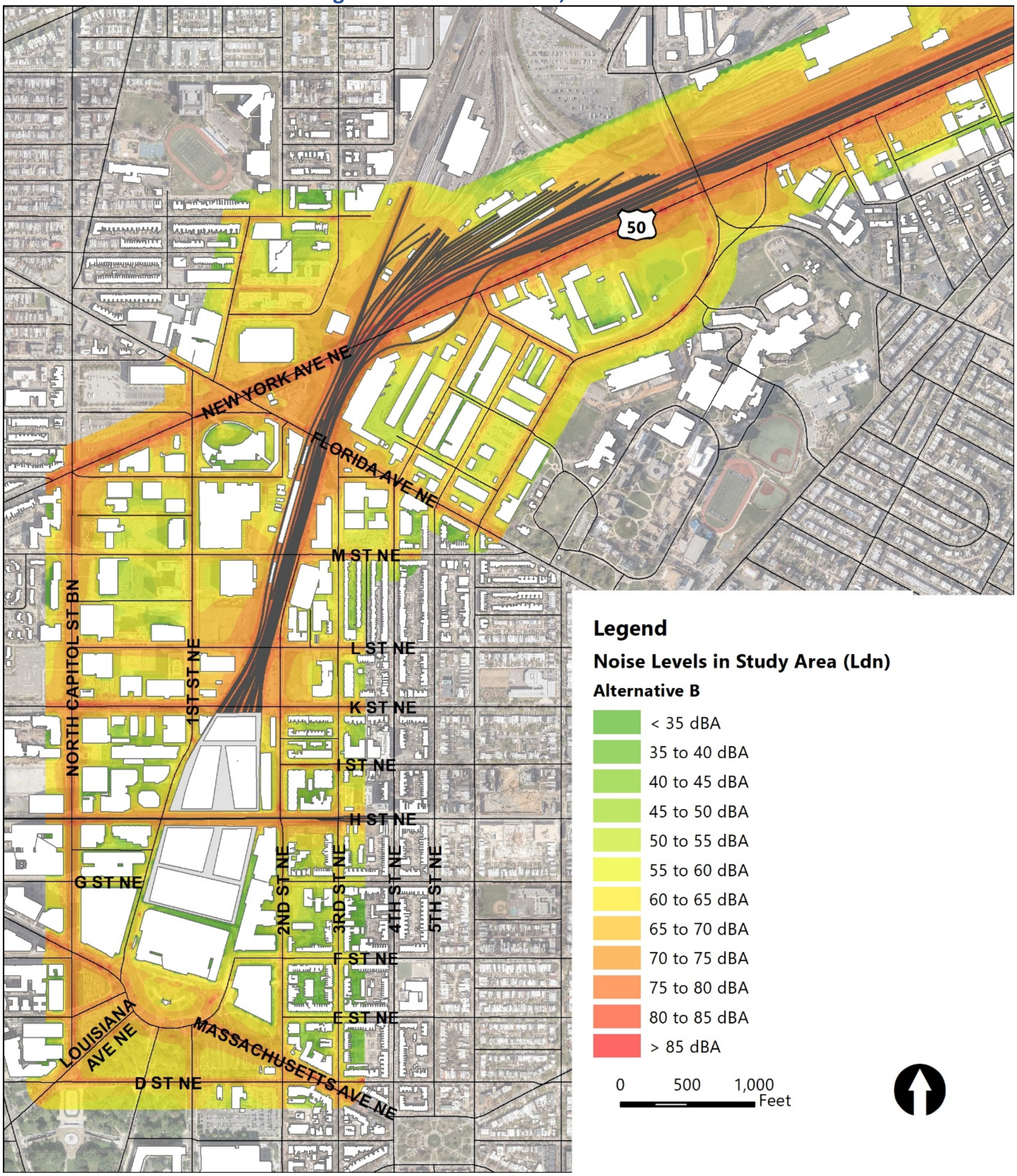
Relative to the No-Action Alternative, in Alternative B, noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative B would have a minor, localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise

Figure 5-44 shows modeled operational noise levels in Alternative B. Impacts would generally be the same as in Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impacts* and **Figure 5-36**).[8] Noise levels would range from 60 to 75 dBA (Ldn), which is typical for a dense urban setting. Detailed modeling results for those locations where the moderate threshold would be exceeded can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report*, **Section 10.5.3.1**, *Direct Operational Impacts, Operational Noise,* **Table 10-12**. Stationary noise sources would be the same in Alternative B as in Alternative A. The same negligible impacts would occur (**Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

[8] Rail operations would be the same in all Action Alternatives as would be the overall increase in road traffic relative to the No-Action Alternative. Because in Alternative B, the parking entrance would be on K Street NE rather than H Street NE, traffic volumes on these streets would be different in Alternative A and Alternative B. However, the resulting difference in noise levels would be within 0.2 dBA, which would be imperceptible.

Figure 5-44. Noise Levels, Alternative B



Operational Vibration

Operational vibration impacts in Alternative B would be the same as in Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative B.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Support of Excavation Noise

In Alternative B, SOE construction would result in major adverse noise impacts at 28 locations and moderate adverse noise impacts at nine locations.

Alternative B's SOE would include a slurry wall down to bedrock; secant pile walls (64 feet deep) around the easternmost edge of the Project Area; and interior sheet pile walls (up to 100 feet deep).

Construction of the SOE structures would involve slurry wall construction with clam shovels; secant pile wall construction using drill rigs; vibratory pile driving for sheet pile wall construction; and operation of cranes, dump trucks, and excavators.

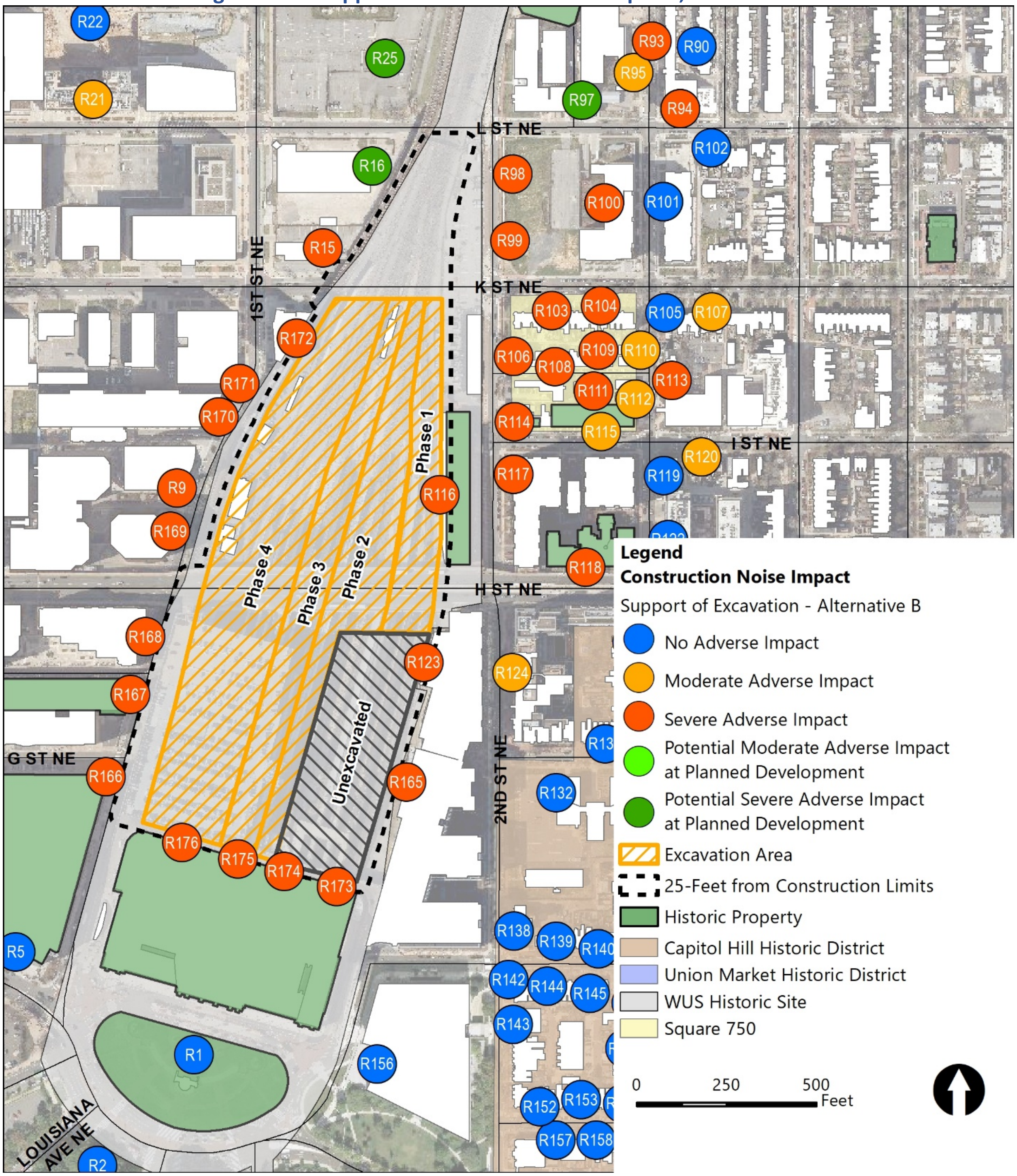
In Alternative B, the noise generated by SOE construction activities would exceed applicable District or FTA criteria at multiple receptors adjacent to WUS and along 2nd Street NE north of H Street, resulting in major adverse noise impacts at 28 locations and moderate adverse impacts at nine locations. Affected receptors are shown in **Figure 5-45**.[9] Detailed modeling results for these receptors can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.3.3**, *Construction Impacts,* **Table 10-13.**

Locations where there would be major adverse noise impacts from SOE construction include: WUS at the south end of the rail terminal (R173-176); the REA Building (R116); the US Securities and Exchange Commission building (R165); and the Kaiser Permanente Medical Center (R123) as well as several residential and commercial building along First Street NE, 2nd Street NE, I (Eye) Street NE, and Parker Street, NE. In addition, the sites of three planned developments (Storey Park [R16], 170 L Street NE [R25], 1109 Congress Street NE [R97]) would experience noise levels in excess of the severe impact threshold.[10]

[9] Some locations include multiple modeled receptors.

[10] Noise levels at planned developments were modeled but not assessed for impacts. Impacts would occur at these locations only if they have been developed at the time Project construction occurs.

Figure 5-45. Support of Excavation Noise Impacts, Alternative B



Excavation Noise

Start of Excavation

In Alternative B, at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck Scenario and Mixed Scenario) or eight locations (Work Train Scenario).

At the beginning of excavation, there would be no difference in the noise produced by the various Action Alternatives. The same equipment would perform the same activities at street level, resulting in similar noise levels. Impacts would be as described in **Section 5.10.4.2**, *Alternative A, Construction Noise Impacts*.

End of Excavation

In Alternative B, at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario) or four locations (Mixed Scenario and Work Train Scenario). There would be moderate adverse noise impacts at 13 locations (All Truck Scenario), seven locations (Mixed Scenario), or two locations (Work Train Scenario).

At the end of excavation in Alternative B, noise-producing equipment would operate at the bottom of a pit deep enough to accommodate two levels of below-ground parking, resulting in significant attenuation and street-level noise substantially lower than at the start of excavation. Noise levels would range from 56 to 86 dBA (Ldn) in the All Truck Scenario; from 55 to 85 dBA (Ldn) in the Mixed Scenario; and from 48 to 83 dBA (Ldn) in the mixed Scenario. They would be approximately 4 dBA (Ldn) higher in the All Truck Scenario than in the Work Train Scenario.

Figure 5-46 and **Figure 5-47** illustrate end-of-excavation impacts in the All Truck Scenario and in the Work Train Scenario, respectively. Detailed modeling results for the affected locations under all three scenarios can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.3.3**, *Construction Impacts,* **Table 10-14.**

The north side of the historic station building (R173-176), the REA Building (R116), the Kaiser Permanente Medical Center (R123), and the Senate Square Apartments on I (Eye) Street NE (R117) would experience major adverse impacts in all three scenarios. The US Securities and Exchange Commission Building (R165) would experience a major adverse impact in the All Truck Scenario and a moderate impact only in the other two scenarios. The criteria for moderate impact would be exceeded at one location with a planned development (1109 Congress Street NE [R97]) in the All Truck Scenario. There would be a moderate adverse impact at this location under this scenario if it has been developed with or permitted for sensitive uses by the time construction occurs.

Figure 5-46. End of Excavation Noise Impacts (All Truck Scenario), Alternative B

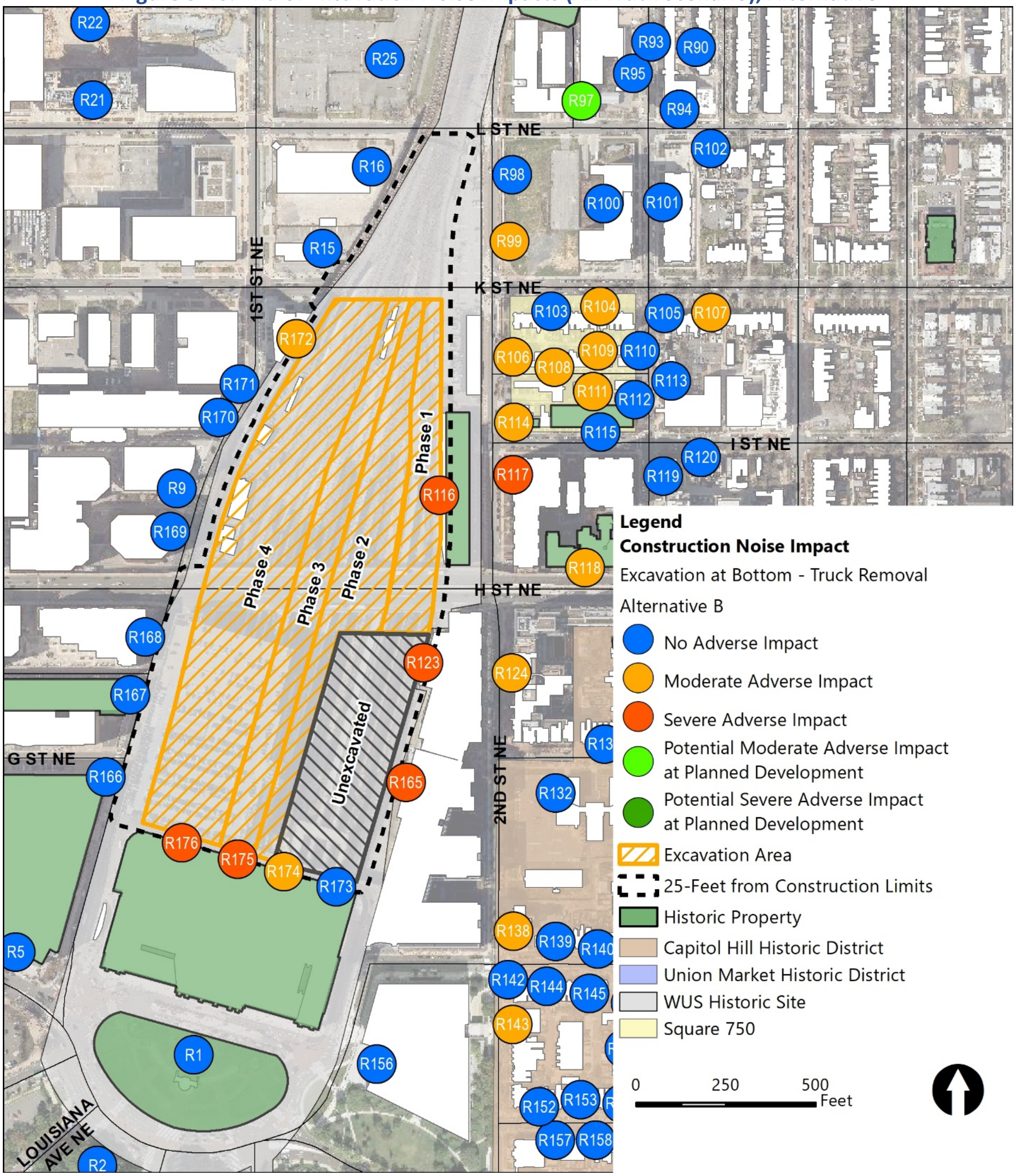
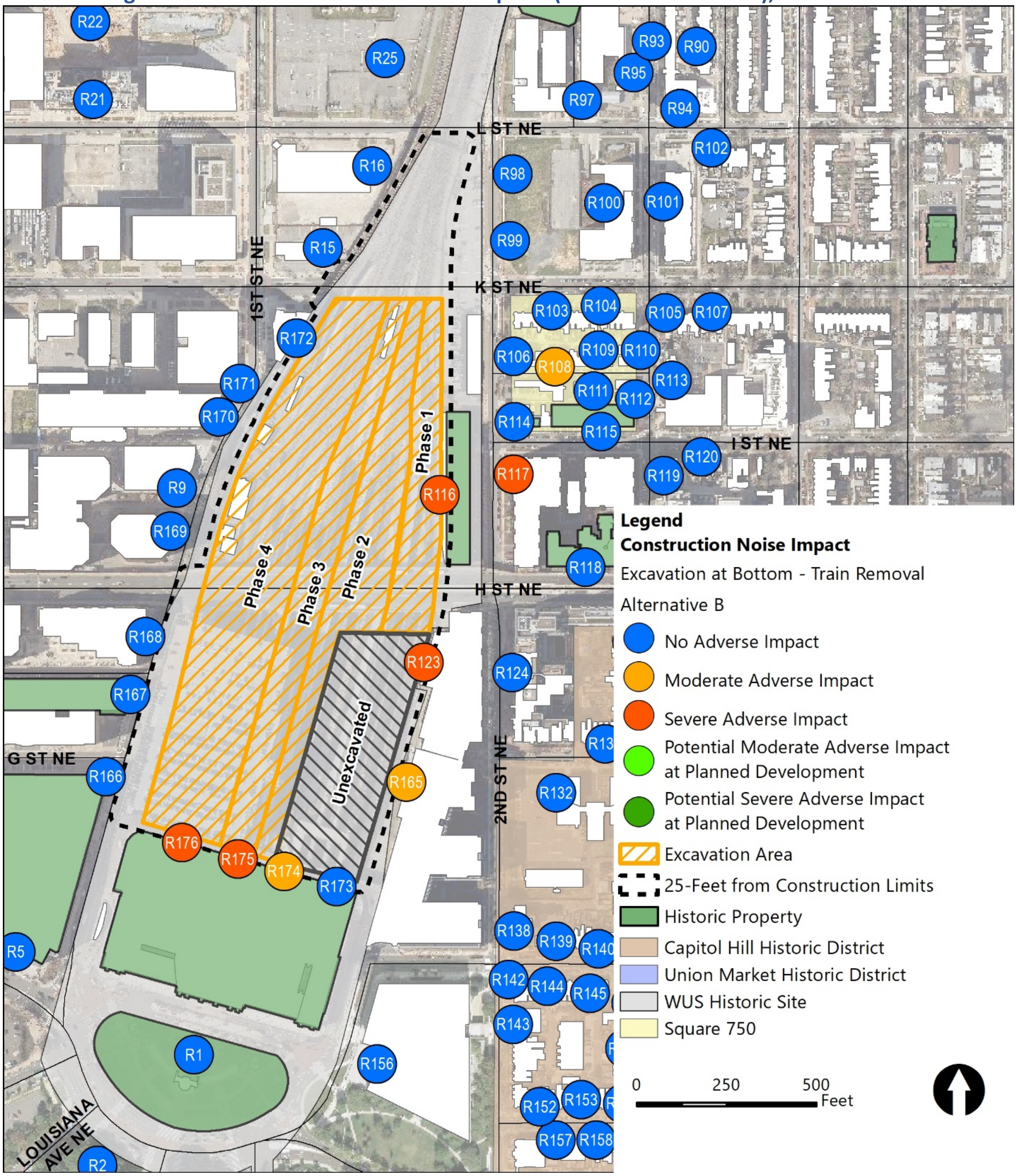


Figure 5-47. End of Excavation Noise Impacts (Work Train Scenario), Alternative B



Construction Vibration Impacts

In Alternative B, there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, the National Association of Student Personnel Administrators (NASPA) building, and the Union Station historic station building due to potential risk of structural damage. There would be moderate adverse impact from truck-generated vibration at 12 locations due to annoyance.

Figure 5-48 shows the receptors that would experience vibration impacts during construction of Alternative B. Detailed modeling results for these locations are provided in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.3.3**, *Construction Impacts,* **Table 10-15.**

Vibration from construction activities would potentially cause major adverse impacts on the Union Station historic station building (R173-176) and NASPA building (R172) because clam shovel drops associated with slurry wall construction may occur within 10 feet of the former and 35 feet of the latter, resulting in vibration levels of approximately 0.12 to 0.8 in/s. Drilling for secant pile walls may occur within 10 to 16 feet of the REA building (R116) and Kaiser Permanente Medical Center (R123), resulting in vibration levels of approximately 0.17 to 0.35 in/s. Vibratory sheet pile driving may occur within 10 to 16 feet of the REA building and Union Station historic station building, resulting in vibration levels of 0.33 to 0.67 in/s.

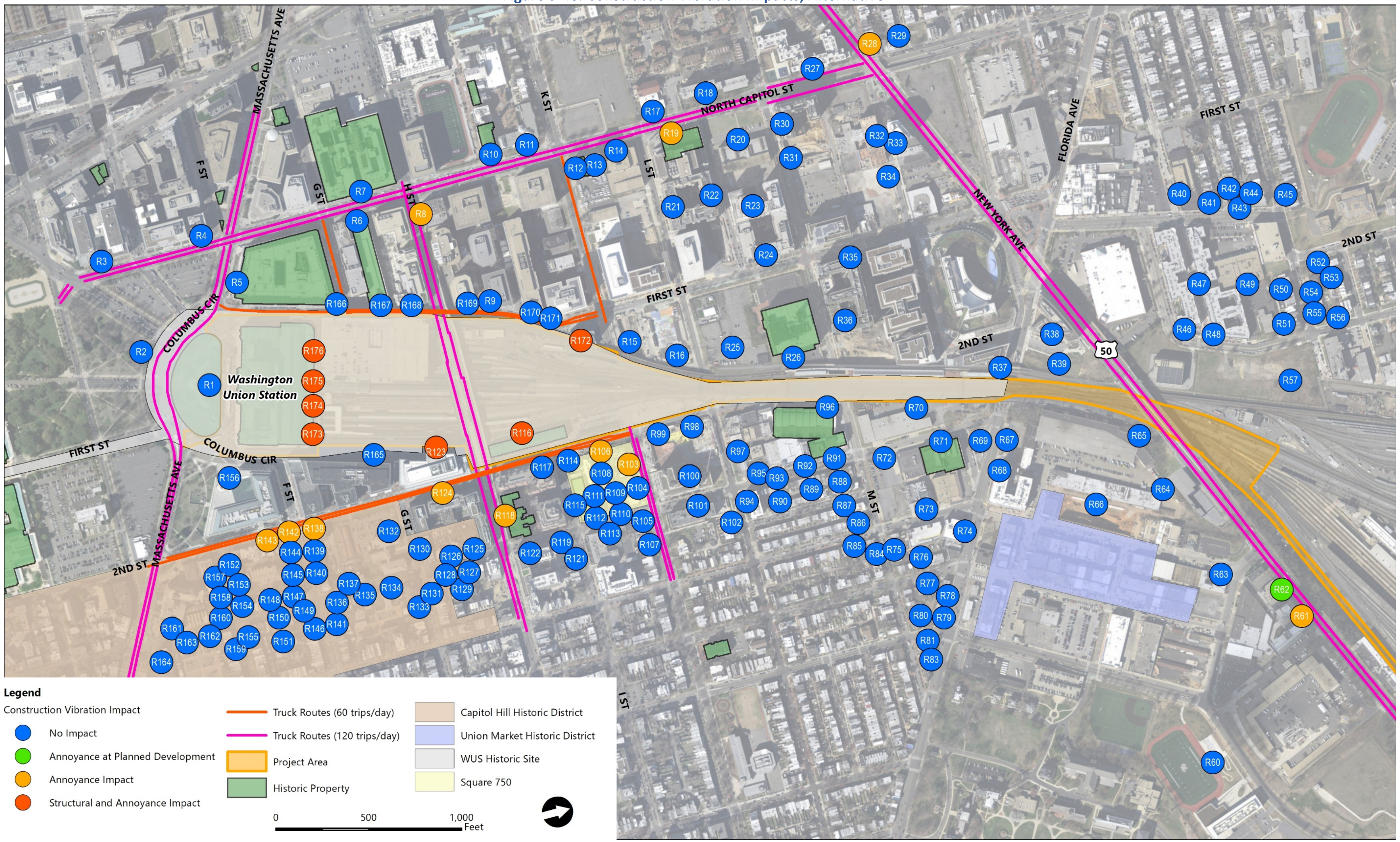
In its initial stages, the column removal work may generate vibration impacts within the eastern part of the historic station building if jackhammers are to break the existing flooring and access girders and column from above. Such impacts would be of brief duration.

Vibration levels at the four buildings may exceed the criterion for increased risk of structural damage but this would depend on building sensitivity, which in turn is a function of the type of construction (see **Table 5-119** above). All four buildings were designed within the context of an active rail terminal and are all large masonry structures. Therefore, they can be expected to have low sensitivity, reducing the risk of structural impact. However, as historic structures, the REA Building and the historic station building may warrant the application of a lower criterion than the one applicable to buildings of similar construction but more recent. The sensitivity of the buildings would have to be assessed in the Construction Noise and Vibration Plan that would be prepared for the Project (see **Section 5.10.6**, *Avoidance, Minimization, and Mitigation*).

Interior vibration conditions at the same receptors may exceed 75 VdB, which would be above the threshold for human annoyance. This would only occur when vibration-generating work is conducted near the buildings, however. Vibration annoyance typically would not occur beyond 50 feet of the vibration source.

Alternative B would have moderate adverse impacts from truck traffic vibration at the same 12 locations and one planned development as Alternative A. These are described in **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

Figure 5-48. Construction Vibration Impacts, Alternative B



Comparison to Existing Conditions

Because the operational noise impacts of Alternative B on noise and vibration levels relative to the No-Action Alternative would be indistinguishable from those of Alternative A, its impacts relative to existing conditions would also be the same. These are described in **Section 5.10.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.10.4.4 Alternative C

Direct Operational Impacts

Relative to the No-Action Alternative, in Alternative C (either option), noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative C (either option) would have a minor, localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise Impacts

Figure 5-49 and **Figure 5-50** show modeled operational noise levels in Alternative C with the East Option and the West Option, respectively.

There are no measurable differences between the two options. Impacts would generally be the same as in Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impacts* and **Figure 5-36**).[11] Noise levels would range from 60 to 75 dBA (Ldn), which is typical for a dense urban setting.

Detailed modeling results for those locations where the moderate threshold would be exceeded can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report*, **Section 10.5.4.1**, *Direct Operational Impacts, Operational Noise,* **Table 10-16** (East Option) and **Table 10-17** (West Option). Stationary noise sources would be the same in Alternative C as in Alternative A. The same negligible impacts would occur (**Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

Operational Vibration Impacts

Operational vibration impacts in Alternative C would be the same as in Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

[11] Rail operations would be the same in all Action Alternatives as would be the overall increase in road traffic relative to the No-Action Alternative. Because in Alternative C, access to parking would be split between K Street NE and H Street NE, traffic volumes on these streets would be different in Alternative A and Alternative C. However, the resulting difference in noise levels would be within 0.2 dBA, which would be imperceptible.

Figure 5-49. Noise Levels, Alternative C East Option

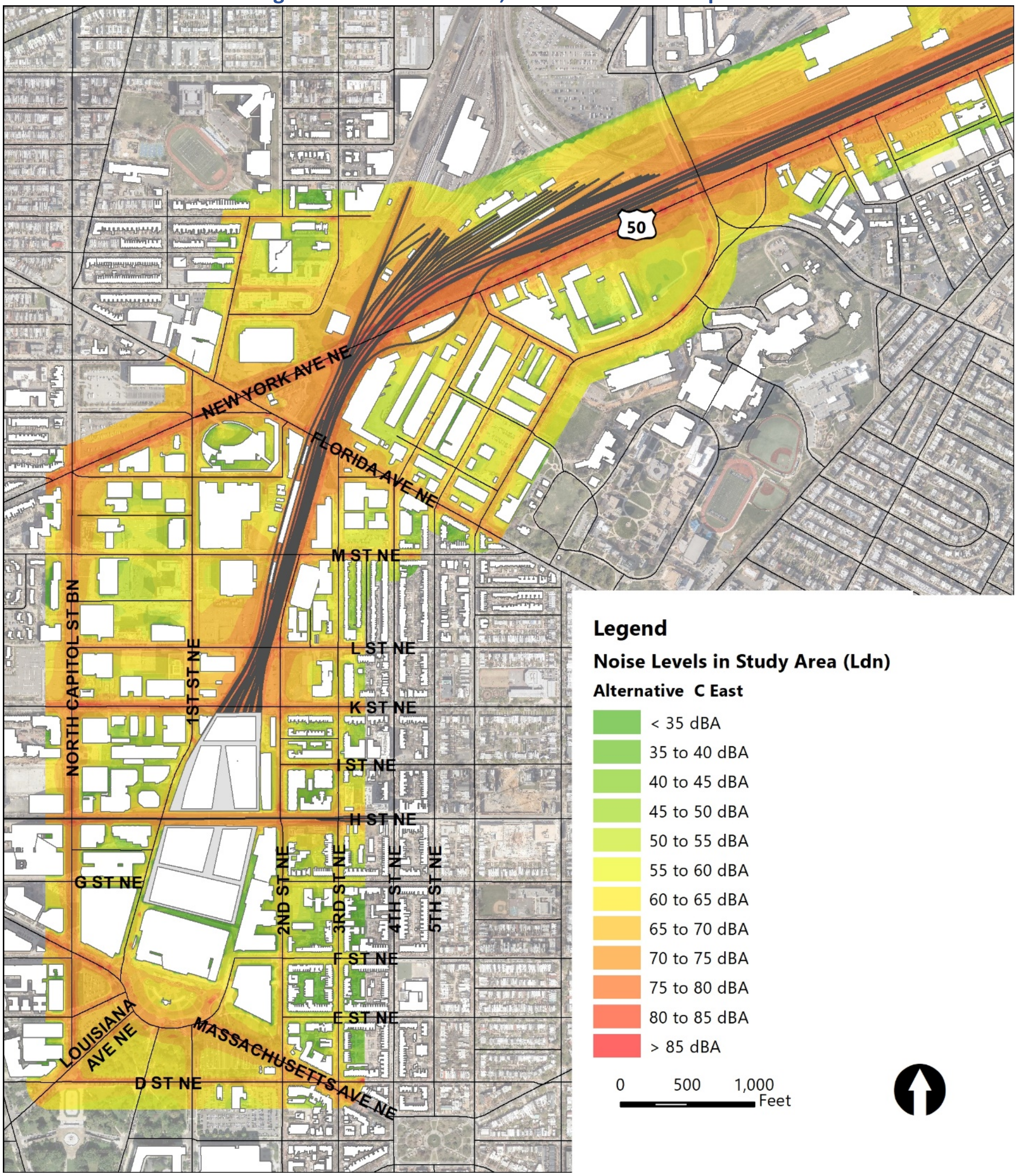
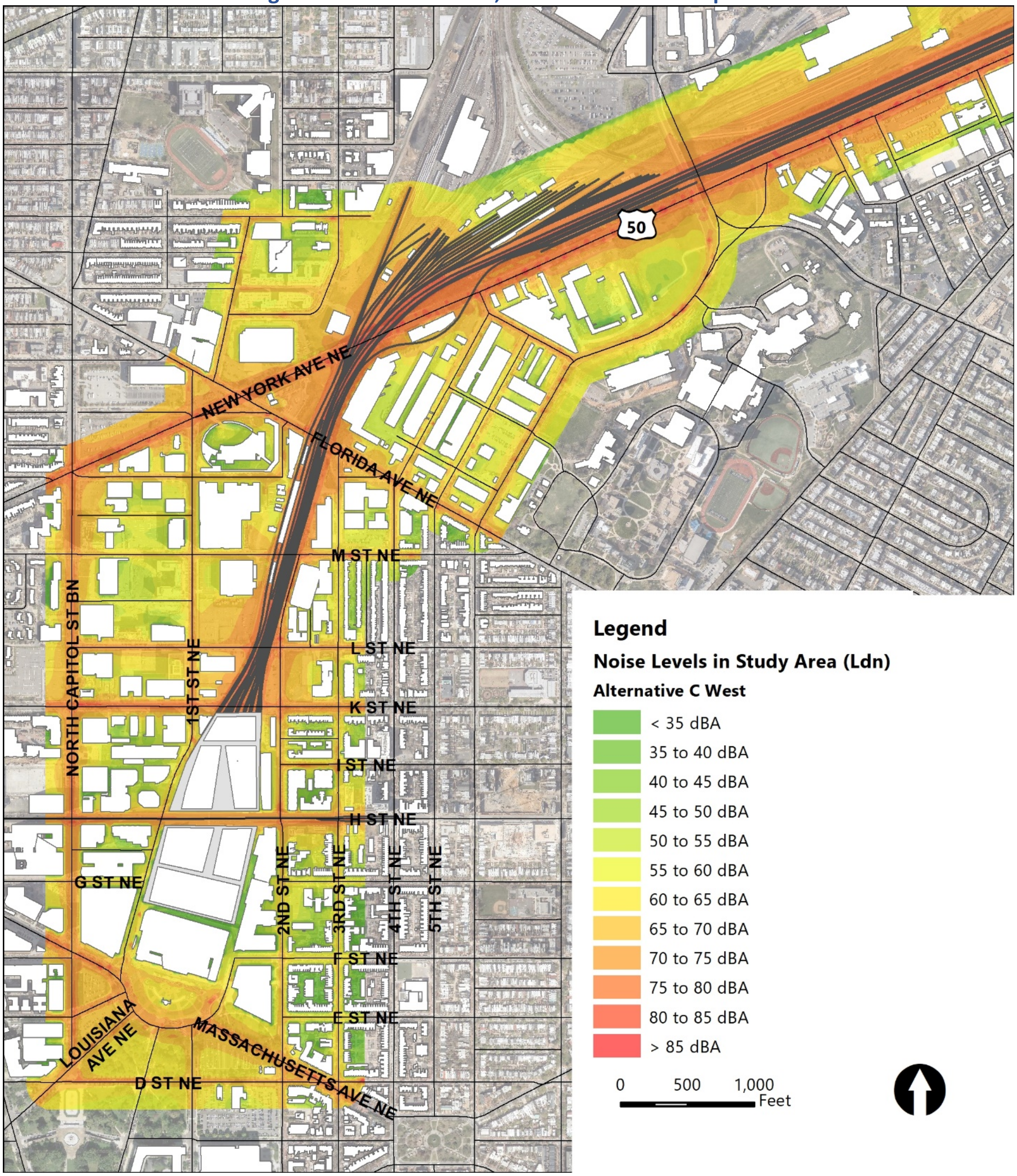


Figure 5-50. Noise Levels, Alternative C West Option



Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative C.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area**.**

Construction Impacts

Support of Excavation Noise

In Alternative C (either option), SOE construction would result in major adverse noise impacts at 25 locations and moderate adverse noise impacts at four locations.

In either option, the Alternative C SOE would include sheet pile walls 100 and 64 feet around and inside the Project Area. Construction of the SOE structures in all phases would involve the use of vibratory sheet pile drivers, cranes, drill rigs, dump trucks, and excavators.

In Alternative C, the noise generated by SOE construction activities would exceed applicable District or FTA criteria at multiple receptors adjacent to WUS and along 2nd Street NE north of H Street, resulting in major adverse noise impacts at 25 locations and moderate impacts at four locations. The affected receptors are shown in **Figure 5-51**. [12]

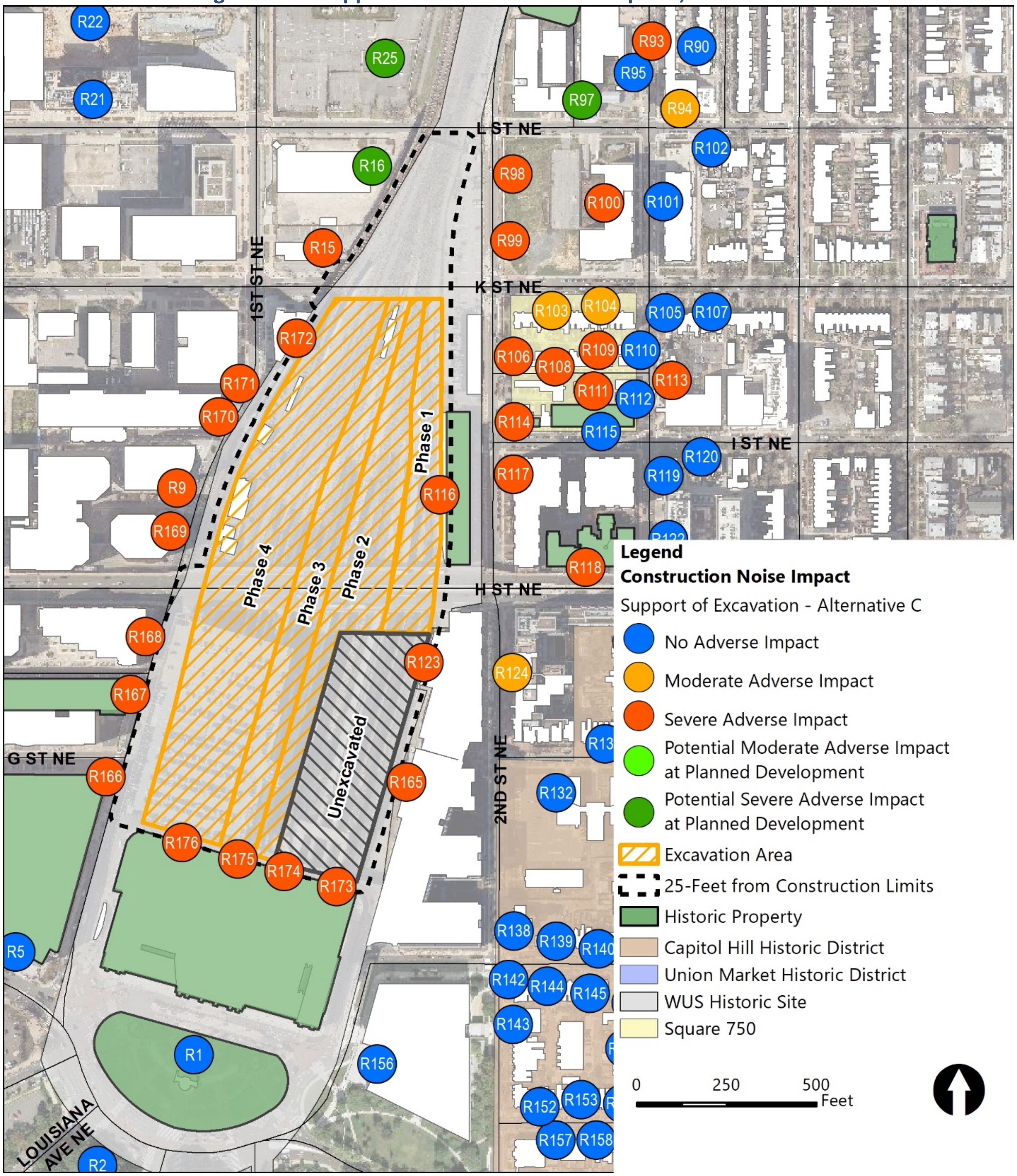
Detailed modeling results for these receptors can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.4.3**, *Construction Impacts,* **Table 10-18.**

Locations where there would be major adverse noise impacts from SOE construction in Alternative C include: WUS at the south end of the rail terminal (R173-176); the REA Building (R116); the US Securities and Exchange Commission building (R165); and the Kaiser Permanente Medical Center (R123) as well as several residential and commercial building along First Street NE, 2nd Street NE, and Parker Street, NE. Additionally, the sites of three planned developments (Storey Park [R16], 170 L Street NE [R25], and 1109 Congress Street NE [R97]) would experience noise levels in excess of the threshold for severe impacts. [13]

[12] Some locations include multiple modeled receptors.

[13] Noise levels at planned developments were modeled but not assessed for impacts. Impacts would occur at these locations only if they have been developed at the time Project construction occurs.

Figure 5-51. Support of Excavation Noise Impacts, Alternative C



Excavation Noise

Start of Excavation

In Alternative C (either option), at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck and Mixed Scenarios) or eight locations (Work Train Scenario).

At the beginning of excavation, there would be no difference in the noise produced by the various Action Alternatives. The same equipment would perform the same activities at street level, resulting in similar noise levels. Impacts would be as described in **Section 5.10.4.2**, *Alternative A, Construction Noise Impacts*.

End of Excavation

In Alternative C (either option), at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario) or four locations (Mixed Scenario and Work Train Scenario). There would be moderate adverse noise impacts at 17 locations (All Truck Scenario), 11 locations (Mixed Scenario), or five locations (Work Train Scenario).

At the end of excavation in Alternative C, noise-producing equipment would operate at the bottom of a pit deep enough to accommodate one level of below-ground parking, causing noise attenuation and reducing street-level noise relative to the start of excavation. Noise levels would range from 56 to 86 dBA (Ldn) in the All Truck Scenario; from 55 to 85 dBA (Ldn) in the Mixed Scenario; and from 49 to 83 dBA (Ldn) in the mixed Scenario. They would be approximately 4 dBA (Ldn) higher in the All Truck Scenario than in the Work Train Scenario.

Figure 5-52 and **Figure 5-53** illustrate end-of-excavation noise impacts in the All Truck Scenario and in the Work Train Scenario, respectively.

Detailed modeling results for the affected locations under all three scenarios can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.4.3**, *Construction Impacts,* **Table 10-19.**

The north side of the historic station building (R173-176), the REA Building (R116), the Kaiser Permanente Medical Center (R123), and the Senate Square Apartments on I (Eye) Street NE (R117) would experience major adverse impacts in all three scenarios. The US Securities and Exchange Commission Building (R165) would experience a major adverse impact in the All Truck Scenario and a moderate impact only in the other two scenarios.

Figure 5-52. End of Excavation Noise Impacts (All Truck Scenario), Alternative C

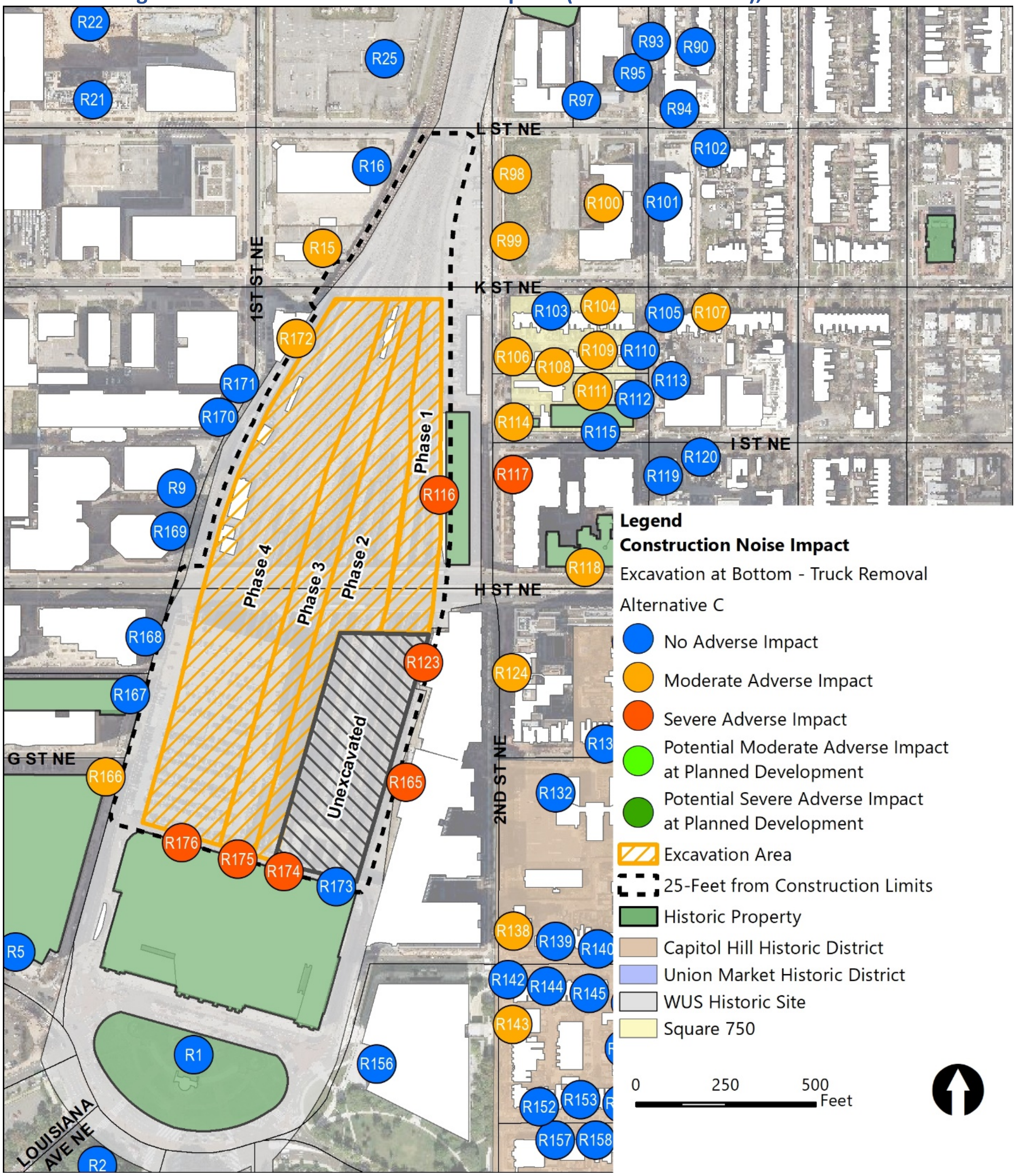
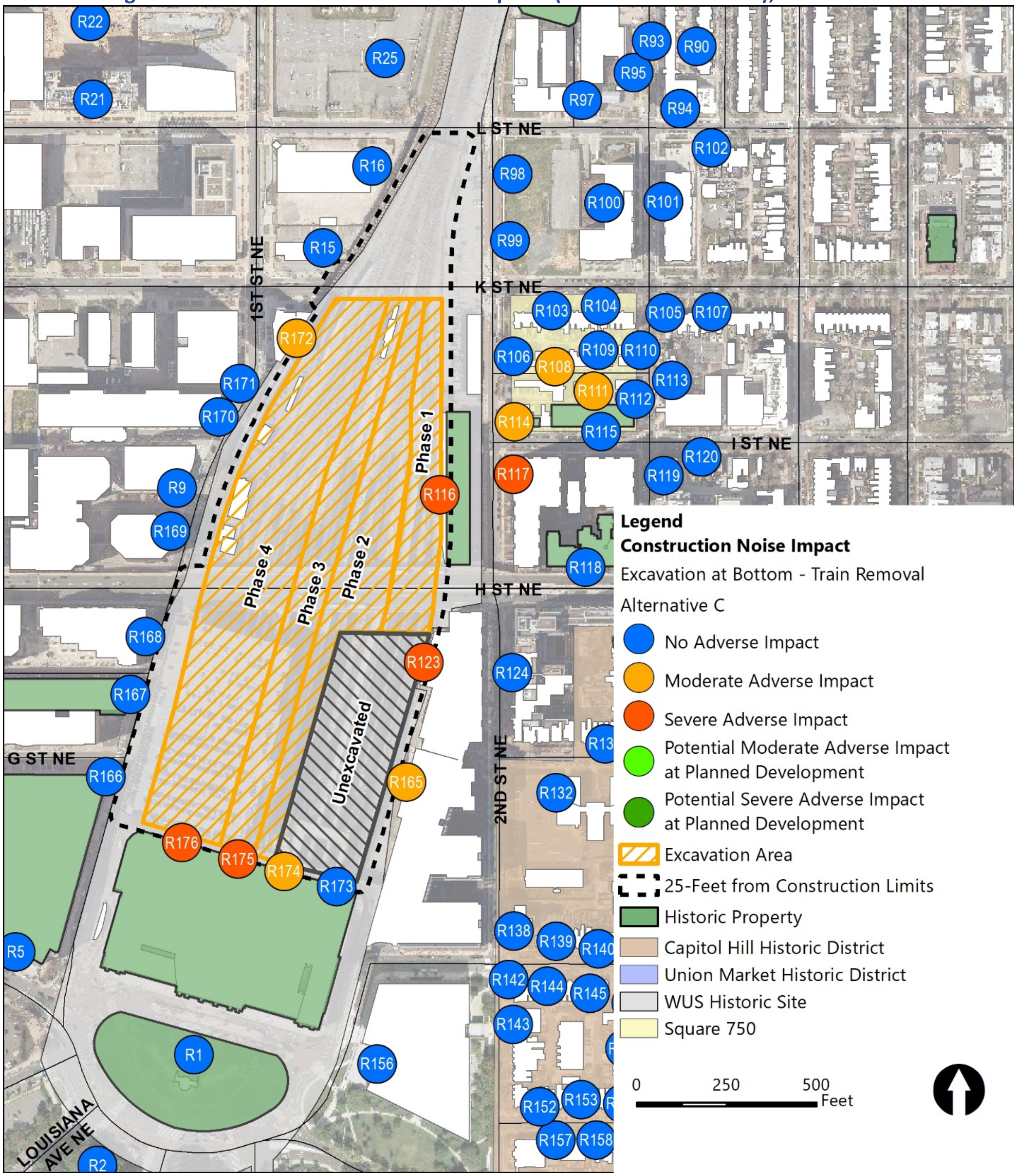


Figure 5-53. End of Excavation Noise Impacts (Work Train Scenario), Alternative C



Construction Vibration Impacts

In Alternative C (either option), there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, and the Union Station historic station building due to potential risk of structural damage. There would be moderate adverse impact from truck-generated vibration at 12 locations due to annoyance.

Figure 5-54 shows the receptors that would experience vibration impacts during the construction of Alternative C. Detailed modeling results for these locations are provided in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 10.5.4.3**, *Construction Impacts,* **Table 10-20.**

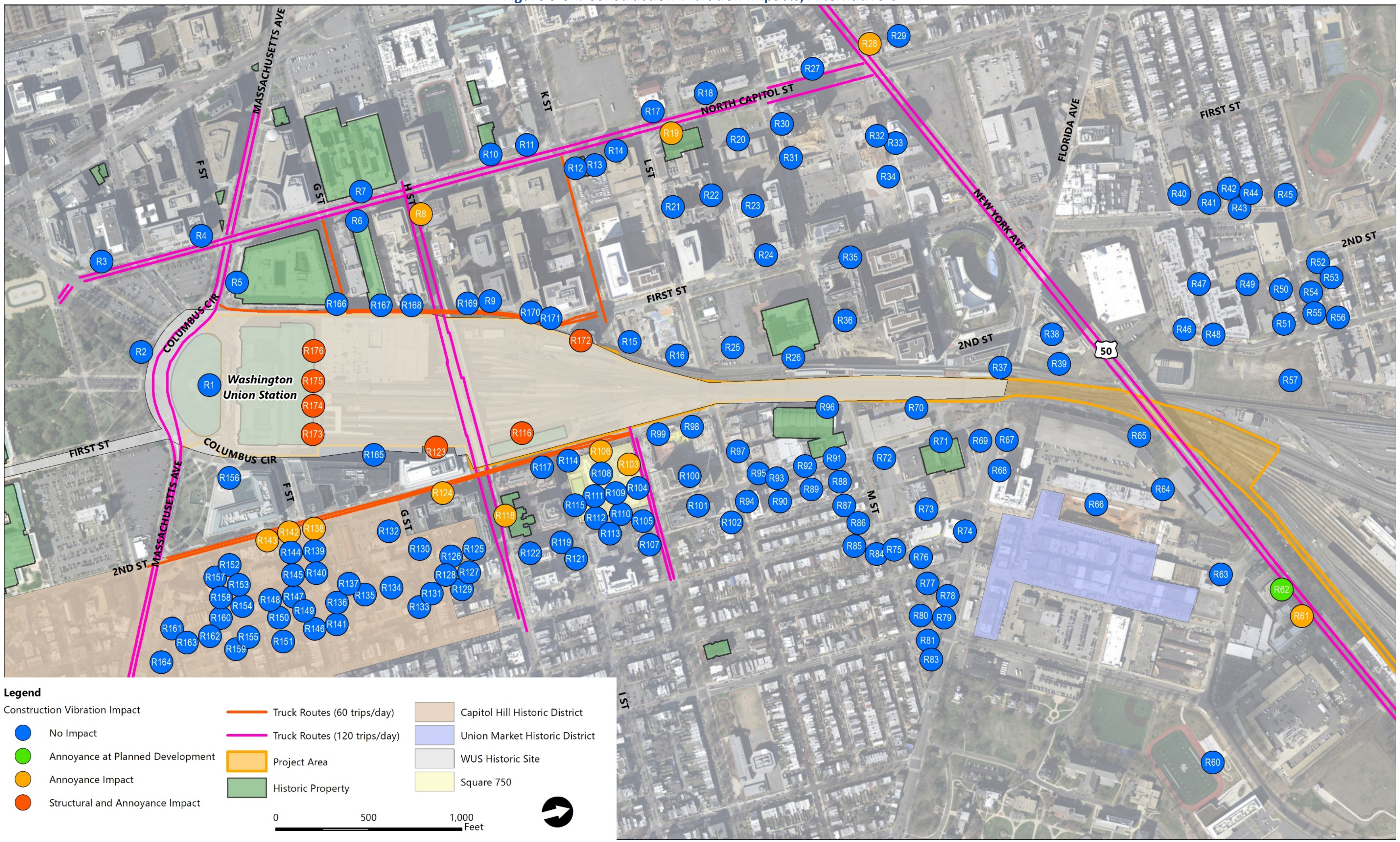
There would be major adverse impacts on the Union Station historic station building (R174-176), REA Building (R116), and Kaiser Permanent Medical Center (R123) because sheet pile driving may occur within 10 to 16 feet of these buildings, resulting in vibration levels of approximately 0.33 to 0.67 in/s. As in all Action Alternatives, in its initial stages, the column removal work may generate vibration impacts within the eastern part of the historic station building if jackhammers are to break the existing flooring and access girders and column from above. Such impacts would be of brief duration.

Vibration levels at the three buildings may exceed the criterion for increased risk of structural damage but this would depend on building sensitivity, which in turn is a function of the type of construction (see **Table 5-119** above). All three buildings were designed within the context of an active rail terminal and are all large masonry structures. Therefore, they can be expected to have low sensitivity, reducing the risk of structural impact. However, as historic structures, the REA Building and the historic station building may warrant the application of a lower criterion than the one applicable to buildings of similar construction but more recent. The sensitivity of the buildings would have to be assessed in the Construction Noise and Vibration Plan that would be prepared for the Project (see **Section 5.10.6**, *Avoidance, Minimization, and Mitigation*).

Interior vibration conditions at the same receptors may exceed 75 VdB, which would be above the threshold for human annoyance. This would only occur when vibration-generating work is conducted near the buildings, however. Vibration annoyance typically would not occur beyond 50 feet of the vibration source.

Alternative C would cause moderate adverse impacts from truck traffic vibration at the same 12 locations and one planned development, as in Alternative A. These are described in **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

Figure 5-54. Construction Vibration Impacts, Alternative C



Comparison to Existing Conditions

Because the operational noise impacts of Alternative C on noise and vibration levels relative to the No-Action Alternative would be indistinguishable from those of Alternative A, it impacts relative to existing conditions would also be the same. They are described in **Section 5.10.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.10.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, in Alternative D, noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative D would have a minor localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise Impacts

Figure 5-55 shows modeled operational noise levels in Alternative D. Impacts would generally be the same as in Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impacts* and **Figure 5-36**).[14] Noise levels would range from 60 to 75 dBA (Ldn), which is typical for a dense urban setting.

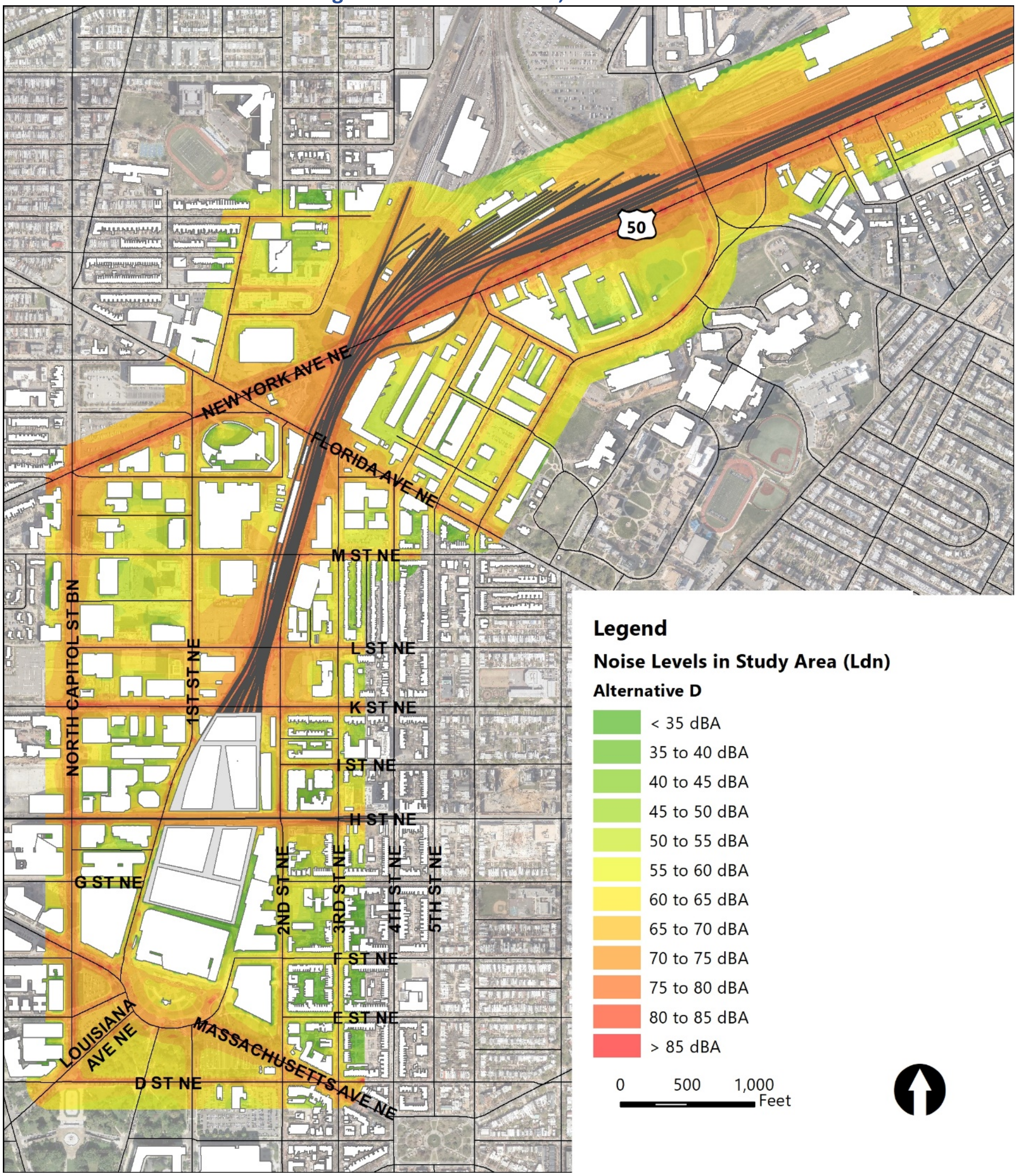
Detailed modeling results for those locations where the moderate threshold would be exceeded can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report*, **Section 10.5.5.1**, *Direct Operational Impacts, Operational Noise,* **Table 10-21**. Stationary noise sources would be the same in Alternative D as in Alternative A. The same negligible impacts would occur (see **Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

Operational Vibration Impacts

Operational vibration impacts in Alternative D would be the same as in Alternative A. These impacts are described in **Section 5.10.4.2**, *Alternative A, Direct Operational Impact*.

[14] Rail operations would be the same in all Action Alternatives as would be the overall increase in road traffic relative to the No-Action Alternative. Because in Alternative D, access to parking would be split between K Street NE and H Street NE, traffic volumes on these streets would be different in Alternative A and Alternative D. However, the resulting difference in noise levels would be within 0.2 dBA, which would be imperceptible.

Figure 5-55. Noise Levels, Alternative D



Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative D.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Support of Excavation Noise

In Alternative D, SOE construction would result in major adverse noise impacts at 25 locations and moderate adverse noise impacts at four locations.

Construction of Alternative D would involve the same SOE as construction of Alternative C. Impacts would be the same and are described in **Section 5.10.4.4**, *Alternative C, Construction Impacts*.

Excavation Noise

Start of Excavation

In Alternative D, at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck and Mixed Scenarios) or eight locations (Work Train Scenario).

At the beginning of excavation, there would be no difference in the noise produced by the various Action Alternatives. The same equipment would perform the same activities at street level, resulting in similar noise levels. Impacts would be as described in **Section 5.10.4.2**, *Alternative A, Construction Noise Impacts*.

End of Excavation

In Alternative D, at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario) or four locations (Mixed Scenario and Work Train Scenario). There would be moderate adverse noise impacts at 17 locations (All Truck Scenario), 11 locations (Mixed Scenario) or five locations (Work Train Scenario).

The depth of excavation and noise impacts in Alternative D would be the same as in Alternative C and impacts on noise levels would be the same. These impacts are described in **Section 5.10.4.4**, *Alternative C, Construction Impacts*.

Construction Vibration Impacts

In Alternative D, there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, and the Union Station historic station building due to potential risk of structural damage. There would be moderate adverse impact from truck generated vibration at 12 locations due to annoyance.

Construction of Alternative D would involve the same vibration-generating activities and impacts as construction of Alternative C. Impacts are described in **Section 5.10.4.4**, *Alternative C, Construction Impacts*.

Comparison to Existing Conditions

Because the operational noise impacts of Alternative D on noise and vibration levels relative to the No-Action Alternative would be indistinguishable from those of Alternative A, its impacts relative to existing conditions would also be the same as those of this alternative (**Section 5.10.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.10.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, in Alternative E, noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative E would have a minor localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise Impacts

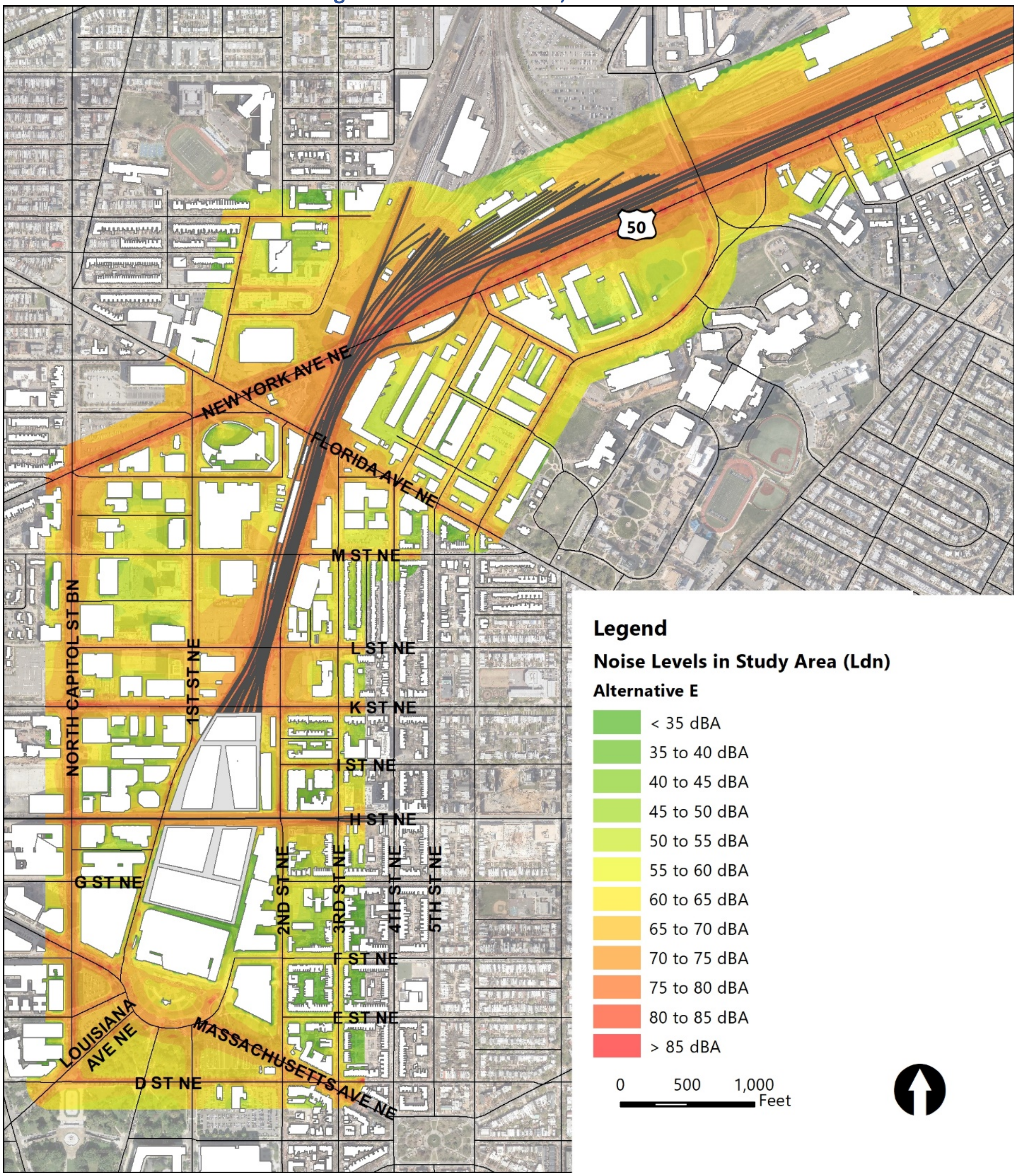
Figure 5-56 shows modeled operational noise levels in Alternative E. Impacts would generally be the same as those of Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impacts* and **Figure 5-36**).[15] Noise levels would range from 60 to 75 dBA (Ldn), which is typical for a dense urban setting. Detailed modeling results for those locations where the moderate threshold would be exceeded can be found in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report*, **Section 10.5.6.1**, *Direct Operational Impacts, Operational Noise,* **Table 10-22**. Stationary noise sources would be the same in Alternative E as in Alternative A. The same negligible impacts would occur (see **Section 5.10.4.2**, *Alternative A, Direct Operational Impact*).

Operational Vibration Impacts

Operational vibration impacts in Alternative E would be the same as in Alternative A. These impacts are described in **Section 5.10.4.2**, *Alternative A, Direct Operational Impact*.

[15] Rail operations would be the same in all Action Alternatives as would be the overall increase in road traffic relative to the No-Action Alternative. Because in Alternative E, the parking entrance would be on K Street NE rather than H Street NE, traffic volumes on these streets would be different in Alternative A and Alternative E. However, the resulting difference in noise levels would be within 0.2 dBA, which would be imperceptible.

Figure 5-56. Noise Levels, Alternative E



Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative E.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Support of Excavation Noise

In Alternative E, SOE construction would result in major adverse noise impacts at 28 locations and moderate adverse noise impacts at nine locations.

Construction of Alternative E would involve the same SOE as construction of Alternative B. Impacts would be the same and are described in **Section 5.10.4.3**, *Alternative B, Construction Impacts*.

Excavation Noise

Start of Excavation

In Alternative E, at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck and Mixed Scenarios) or eight locations (Work Train Scenario).

At the beginning of excavation, there would be no difference in the noise produced by the various Action Alternatives. The same equipment would perform the same activities at street level, resulting in similar noise levels. Impacts would be as described in **Section 5.10.4.2**, *Alternative A, Construction Noise Impacts*.

End of Excavation

In Alternative E, at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario) or four locations (Mixed Scenario and Work Train Scenario). There would be moderate adverse noise impacts at 17 locations (All Truck Scenario), seven locations (Mixed Scenario), or two locations (Work Train Scenario).

The depth of excavation in Alternative E would be the same as in Alternative B. Excavation activities and noise impacts would be the same. Impacts would be as described in **Section 5.10.4.3**, *Alternative B, Construction Impacts*.

Construction Vibration Impacts

In Alternative E, there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, the NASPA building, and the Union Station historic station building due to potential risk of structural

damage. There would be moderate adverse impact from truck-generated vibration at 12 locations due to annoyance.

Construction of Alternative E would involve the same vibration-generating activities and impacts as construction of Alternative B. Impacts are described in **Section 5.10.4.3**, *Alternative B, Construction Impacts*.

Comparison to Existing Conditions

Because the operational noise impacts of Alternative E on noise and vibration levels relative to the No-Action Alternative would be indistinguishable from those of Alternative A, its impacts relative to existing conditions would also be the same. They are described in **Section 5.10.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.10.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, in Alternative A-C, noise levels would increase by no more than 3 dBA. This would result in moderate adverse operational direct impacts at 14 locations in the Study Area. Alternative A-C would have a minor localized adverse direct operational impact on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere.

Operational Noise

Operational noise impacts in Alternative A-C would be the same as in Alternative A (see **Section 5.10.4.2**, *Alternative A, Direct Operational Impacts*). The location of the relevant Project elements (such as the parking facility) and the vehicular routes to and from those elements would be the same under both alternatives. Vehicular volumes along those routes may vary slightly due to differences in parking capacity and pick-up and drop-off locations between the two alternatives. However, this has no potential to result in perceptibly different noise levels, as evidenced by the lack of perceptible differences among Alternatives A through E in spite of the different locations and sizes of the Project elements in those alternatives.

Operational Vibration

Operational vibration impacts in Alternative A-C would be the same as in Alternative A (see S**ection 5.10.4.2**, *Alternative A, Direct Operational Impacts*). Alternative A-C includes the same improvements to the track infrastructure of the rail terminal and the throat. The number of trains, train types operating on each track, and train speeds would be the same.

Indirect Operational Impacts

Relative to the No-Action Alternative, there would be no indirect noise or vibration operational impacts in Alternative A-C.

All noise and vibration impacts would take place at the same time as the action and none would occur beyond the Operational Noise and Vibration Study Area.

Construction Impacts

Support of Excavation Noise

In Alternative A-C, construction of the SOE structures would result in major adverse noise impacts at 26 locations and moderate adverse noise impacts at six locations.

Construction of Alternative A-C would involve the same SOE as construction of Alternative A. Impacts would be the same: see **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

Excavation Noise

Start of Excavation

In Alternative A-C, at the start of excavation, there would be major adverse noise impacts at 25 locations (All Truck Scenario), 24 locations (Mixed Scenario), or 20 locations (Work Train Scenario). There would be moderate adverse noise impacts at seven locations (All Truck and Mixed Scenarios) or eight locations (Work Train Scenario).

At the beginning of excavation, there would be no difference between the Action Alternatives. The noise impacts of Alternative A-C would be the same as those of Alternative A: see **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

End of Excavation

In Alternative A-C, at the end of excavation, there would be major adverse noise impacts at five locations (All Truck Scenario and Mixed Scenario) or four locations (Work Train Scenario). There would be moderate adverse noise impacts at 19 locations (All Truck Scenario), 15 locations (Mixed Scenario) or 12 locations (Work Train Scenario).

The depth of excavation in Alternative A-C would be the same as in Alternative A. Therefore, noise impacts at the end of excavation in this alternative would be the same as in Alternative A: see **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

Construction Vibration

In Alternative A-C, there would be a major adverse impact from vibration during SOE construction on the REA Building, the Kaiser Permanente Medical Center, and the Union Station historic station building due to potential risk of structural damage. There would be moderate adverse impact from truck generated vibration at 12 locations due to annoyance.

Construction of Alternative A-C would involve the same vibration-generating activities as Alternative A's construction. Impacts would be the same: see **Section 5.10.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

Because the operational noise impacts of Alternative A-C on noise and vibration levels relative to the No-Action Alternative would be the same as those of Alternative A, it impacts relative to existing conditions would also be the same. **Section 5.10.4.2**, *Alternative A, Comparison to Existing Conditions*, characterizes these impacts.

5.10.5 Comparison of Alternatives

The following sections and **Table 5-120** compare the No-Action Alternative and the Action Alternatives with respect to operational and construction-related noise and vibration impacts.

5.10.5.1 Operational Noise and Vibration

Noise

All Action Alternatives would result in moderate adverse operational noise impacts on 14 locations. Noise levels would also exceed the threshold for a moderate or severe impact at 10 planned development locations. Ambient noise levels in the Operational Noise and Vibration Study Area would range from 60 to 75 dBA (Ldn) at most receptor locations. Such noise levels are typical of a dense urban area.

In all Action Alternatives, relative to the No-Action Alternative, operational noise levels south of K Street NE would generally increase by less than 1 dBA. North of K Street NE, they would increase by 1 to 3 dBA. Changes of 3dBA or smaller are generally not perceptible. The primary sources of noise would be vehicular traffic and, near the tracks north of K Street NE, and train operations. Along First Street NE, which would become a one-way street in all Action Alternatives, traffic volumes and associated noise would decrease.

Ambient noise levels would also increase in the No-Action Alternative relative to existing conditions except near the rail terminal south of K Street NE. There, construction of the private air-rights development would enclose the terminal and reduce noise from train operations. At locations adjacent to the rail terminal, such as the REA Building and the Kaiser Permanente Medical Center, noise would decrease by more than 10 dBA, which is generally perceived as a halving of the noise level. At most other locations in the Operational Noise and Vibration Study Area, the No-Action Alternative would see increases in traffic that would cause higher noise level. The change would remain within 1 dBA, except in the area of Union Market, where the new VRE MSRF facility would generate increases of up to 3 dBA. As noted above, however, changes of 3dBA or smaller are generally not perceptible.

Table 5-120. Comparison of Alternatives, Noise and Vibration

Type of Impact[1]	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C (Preferred)
Direct Operational Noise Impacts	**Beneficial impacts**: Decreases in noise south of K Street NE due to private air-rights development. **Negligible Adverse impacts**: Noise increases typically less than 1 dBA further away from private air-rights development.	▪ **Moderate adverse impacts** at 14 locations. ▪ Potential moderate or severe impacts at 10 planned development locations. ▪ Increases up to 3 dBA over existing due to projected increase of train operations and traffic conditions.					
Construction Noise Impacts during SOE Construction	N/A	**Major adverse impacts at 26** commercial and residential receptors. **Moderate adverse impacts at six** receptors. Potential severe impact at three planned developments.	**Major adverse impacts at 28** commercial and residential receptors. **Moderate adverse impacts at nine** receptors. Potential severe impact at three planned developments.	**Major adverse impacts at 25** commercial and residential receptors. **Moderate adverse impacts at four** receptors. Potential severe impact at three planned developments.	**Major adverse impacts at 25** commercial and residential receptors. **Moderate adverse impacts at four** receptors. Potential severe impact at three planned developments.	**Major adverse impacts at 28** commercial and residential receptors. **Moderate adverse impacts at nine** receptors. Potential severe impact at three planned developments.	**Major adverse impacts at 26** commercial and residential receptors. **Moderate adverse impacts at six** receptors. Potential severe impact at three planned developments.

Type of Impact[1]	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C (Preferred)
		All Action Alternatives would exceed: ▪ 80 dBA (equivalent sound level [Leq]) 25 feet from the outermost limits of the construction site along the east side of the site during Phase 1; and ▪ The 65 dBA (Lmax) District noise ordinance limit for nighttime construction.					
Construction Noise Impacts at Start of Excavation	N/A	**Major adverse impacts at 25/24/20** residential and commercial receptors. **Moderate impacts at 7/7/8** Potential severe impacts at 3/1/2 planned developments.[2] In all Action Alternatives, construction noise would: ▪ Be approximately four dBA (Ldn) higher removing excavation by trucks than by trains; ▪ Exceed 80 dBA (Leq) 25 feet from the outermost limits of the construction site along the east side of the site during Phase 1 of construction; and ▪ Exceed the 65 dBA (Lmax) District noise ordinance limit for nighttime construction.					
Construction Noise Impacts at End of Excavation	N/A	**Major adverse impacts at 5/5/4** residential and commercial receptors. **Moderate adverse impacts at 19/15/12** Potential moderate impacts at 1/1/1 planned development.[2]	**Major adverse impacts at 5/4/4** residential and commercial receptors. **Moderate adverse impacts at 13/7/2** Potential moderate impacts at 1/0/0 planned development.[2]	**Major adverse impacts at 5/4/4** residential and commercial receptors. **Moderate adverse impacts at 17/11/5.**[2]	**Major adverse impacts at 5/4/4** residential and commercial receptors. **Moderate adverse impacts at 17/11/5.**[2]	**Major adverse impacts at 5/4/4** residential and commercial receptors. **Moderate adverse impacts at 13/7/2** Potential moderate impacts at 1/0/0 planned development.[2]	**Major adverse impacts at 5/5/4** residential and commercial receptors. **Moderate adverse impacts at 19/15/12** Potential moderate impacts at 1/1/1 planned development.[2]
		In all Action Alternatives, construction noise levels: ▪ Would be approximately 4 dBA (Ldn) higher for removing excavation by trucks compared to trains; ▪ Would exceed 80 dBA (Leq) 25 feet from the outermost limits of the construction site along the east side of the site during Phase 1; and ▪ Would exceed the 65 dBA (Lmax) District noise ordinance limit for nighttime construction.					

Type of Impact[1]	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C (Preferred)
Direct Operational Vibration Impacts	**Negligible Adverse Impacts:** Vibration would be similar to existing conditions at most locations and would remain below the FTA criteria. Vibration may exceed the FTA vibration criteria at the planned Kettler development associated with the re-introduction of tracks for the proposed VRE MSRF.	**Minor adverse impacts**: The number of vibration events would increase throughout due to increased train operations, but vibration levels would remain below the FTA criteria.					

Type of Impact[1]	No-Action Alternative	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A-C (Preferred)
Construction Vibration Impacts	N/A	**Major adverse impacts** from potential risk of structural damage and annoyance at three buildings: REA Building, Kaiser Permanente Medical Center, and Union Station. Vibration levels 0.17 to 0.67 in/s during SOE.	**Major adverse impacts** from potential risk of structural damage and annoyance at four buildings: REA Building, Kaiser Permanente Medical Center, NASPA, and Union Station. Vibration levels 0.12 to 0.8 in/s during SOE.	**Major adverse impacts** from potential risk of structural damage and annoyance at three buildings: REA Building, Kaiser Permanente Medical Center, and Union Station. Vibration levels 0.33 to 0.67 in/s during SOE.	**Major adverse impacts** from potential risk of structural damage and annoyance at three buildings: REA Building, Kaiser Permanente Medical Center, and Union Station. Vibration levels 0.33 to 0.67 in/s during SOE.	**Major adverse impacts** from potential risk of structural damage and annoyance at four buildings: REA Building, Kaiser Permanente Medical Center, NASPA, and Union Station. Vibration levels 0.12 to 0.8 in/s during SOE.	**Major adverse impacts** from potential risk of structural damage and annoyance at three buildings: REA Building, Kaiser Permanente Medical Center, and Union Station. Vibration levels 0.17 to 0.67 in/s during SOE.
		Moderate adverse impacts from truck-generated vibration that may cause annoyance at 12 receptors and one planned development close to the routes along New York Avenue, North Capitol Street, and 2nd Street.					

1. None of the alternatives would have indirect operational impacts. 2. All Truck Scenario/Mixed Scenario/Work Train Scenario.

Vibration

All Action Alternatives would have minor localized adverse operational impacts on vibration near the throat of the rail terminal and negligible adverse operational direct elsewhere in the Operational Noise and Vibration Study Area. The Action Alternatives would not affect the types of trains operating on each track or train speeds. Therefore, vibration conditions would remain similar to what they would be in the No-Action Alternative with one partial exception. Re-introduction of Track 43, which would shift the easternmost track up to 10 feet closer to receptors on the east side of WUS, could increase vibration by approximately up to 2 VdB, a minor impact.

The No-Action Alternative would have negligible adverse operational impacts on vibration levels at receptors in the Union Market Area near the new track leading to the proposed VRE MSRF. Vibration levels elsewhere in the Operational Noise and Vibration Study Area would not change.

5.10.5.2 Construction Noise and Vibration

Noise

All Action Alternatives would cause major noise impacts at several locations during SOE construction. The number of locations affected would depend on the type of SOE used. In Alternative A and Alternative A-C, there would be major SOE construction noise impacts at 26 locations and moderate SOE construction noise impacts at six locations. In Alternatives B and E, there would be major SOE construction noise impacts at 28 locations and moderate SOE construction noise impacts at nine locations. In Alternatives C (either option) and D, there would be major construction SOE noise impacts at 25 locations and moderate SOE construction noise impacts at four locations.

All Action Alternatives would cause major and moderate adverse noise impacts at multiple locations at the start of excavation. The number of affected locations would depend on the method used to transport excavation spoil from the Project Area. In all Action Alternatives, transport by trucks only would cause major adverse noise impacts at 25 locations and moderate adverse noise impacts at seven. Mixed transport by train and trucks would cause major adverse noise impacts at 24 locations and moderate adverse noise impacts at seven. Transport by work trains only would cause major adverse noise impacts at 20 locations and moderate adverse noise impacts at eight.

At the end of excavation, noise impacts would be much reduced in all Action Alternatives. In Alternatives A and A-C, there would be major adverse impacts at five or four locations and moderate adverse impacts at 12 to 19 locations, depending on how spoil would be transported. In Alternatives B and E, there would be major adverse impacts at the same number of locations and moderate adverse impacts at two to 13 locations. In Alternatives C and D, there would be major adverse impacts at the same number of locations and moderate adverse impacts at five to 17 locations.

In the No-Action Alternative, the Project would not be constructed and would not cause any construction noise impacts. The construction of other projects included in the No-Action Alternative would generate noise. Information is insufficient to estimate the resulting impacts.

Vibration

In all Action Alternatives, construction vibration would result in a potential risk of structural damage at three locations, a major adverse impact: the WUS historic station building, the REA Building, and the Kaiser Permanent Medical Center. In Alternatives B and E, there would additionally be a similar major adverse impact on a fourth location, the NASPA building. Alternatives B and E would have greater adverse impacts than the other Action Alternatives because of the type of SOE (slurry cut-off wall construction instead of secant pile or sheet pile cut-off wall in the other Action Alternatives).

In all Action Alternatives, construction vibration would be high enough to cause annoyance at 12 locations near New York Avenue, North Capitol Street and 2nd Street NE, a moderate adverse impact.

In the No-Action Alternative, the Project would not be constructed and would not cause any construction vibration impacts. The construction of other projects included in the No-Action Alternative would generate vibration but, as with noise, information is insufficient to estimate the resulting impacts.

5.10.6 Avoidance, Minimization, and Mitigation Evaluation

The potential for permanent, operational noise impacts warrants a consideration of avoidance, minimization measures, and mitigation measures. None of the Action Alternatives would result in operational vibration impacts requiring the consideration of such measures.

All Action Alternatives would also cause major and moderate construction noise and vibration impacts. These impacts would cease when construction is complete, but they would occur at various times during a long period, from approximately 11 years and 5 months to approximately 14 years and 4 months depending on the Action Alternative. Mitigation measures and best management practices would be warranted to reduce major noise and vibration impact due to construction. The measures being considered by FRA are described below.

Noise mitigation depends on the need, feasibility, reasonableness, and effectiveness of the potential options. Moderate impacts are caused by changes in the cumulative noise level that are noticeable to most people but may not be sufficient to generate strong, adverse reactions. Severe impacts are expected to highly annoy a significant percentage of the local population. The anticipated level of noise impact is an important factor in determining the need for mitigation. Severe noise impacts create the most compelling need for mitigation, though moderate noise impacts should also be considered for mitigation, especially when they are anticipated to last for a significant period.

For severe noise impacts, most rail infrastructure projects implement mitigation measures that account for safety, constructability, acoustical effectiveness, and cost effectiveness. For moderate noise impacts, mitigation is implemented accounting for the same factors but also considering where the impacts stand within the range of moderate noise impact criteria and the sensitivity of the affected receptors. The following sections describe mitigation measures FRA is considering for severe and moderate adverse impacts.

5.10.6.1 Operational Noise and Vibration

In all Action Alternatives, there would be moderate noise impacts at 14 locations and noise levels would increase to moderate or severe levels at 10 planned development locations. These impacts would primarily be caused by increases in train operations and traffic. Future noise levels would typically be within 3 dBA or less of existing and No-Action Alternative levels, which is at the lower end of the moderate impact range.

Options for mitigating increases in traffic noise in an urban setting are very limited. Speed restrictions would not substantially reduce traffic noise and further truck route restrictions are generally not warranted. Noise barriers along the railroad corridor to reduce train noise would be ineffective at most upper-floor receptors and would conflict with planned developments and urban design considerations.

When developments within the Study Area are planned, developers would be able to design their buildings to incorporate noise reducing features such as providing windows and walls that attenuate sound in interior spaces; placing outdoor spaces away from the tracks; and using the building or other architectural features to provide acoustic shielding. Based on these considerations, FRA is not proposing to mitigate the moderate operational noise impacts of the Action Alternatives.

5.10.6.2 Construction Noise and Vibration

Construction noise impacts would occur during SOE construction and throughout excavation in all Action Alternatives. Construction noise levels would exceed the District’s noise ordinance and FTA long-term construction noise impact criteria. Without mitigation, this would result in major adverse impacts. Construction vibration would potentially create a risk of structural damage at up to four buildings adjacent to SOE activities, depending on the Action Alternative, resulting in a major adverse impact without mitigation. All Action Alternatives would cause moderate vibration impacts from truck traffic, potentially causing human annoyance at 12 receptors and one planned development close to New York Avenue, North Capitol Street, and 2nd Street NE.

Given the long duration of construction activities in all Action Alternatives and the proximity of sensitive receptors to the Project Area, the Project Proponents would require the construction contractor to prepare and implement a *Construction Noise and Vibration Control Plan*. This plan would include detailed predictions of construction noise and vibration levels; requirements for conducting construction noise and vibration monitoring; and, if necessary, detailed approaches to mitigate potential construction-period noise and vibration impacts. The plan would set acceptable vibration limits and address the need to conduct pre-construction crack surveys; install crack detection monitors; and conduct vibration monitoring. The plan would define a process to alert the contractor of any limit exceedances and implement corrective actions. It would also contain a public engagement plan specifying measures that would be implemented to inform neighbors of anticipated noisy activities, noise or vibration level exceedances, and measures to be taken to remedy these exceedances.

The following are typical construction noise mitigation measures known to be effective in minimizing noise from both stationary equipment and truck traffic. At a minimum, these measures would be included in the *Construction Noise and Vibration Control Plan* unless equivalent but more Project-or location-specific measures are identified during the preparation of the plan:

- Ensuring equipment is properly functioning and equipped with mufflers and other noise-reducing features.
- Locating especially noisy equipment as far from sensitive receptors as possible.
- Using quieter construction equipment and methods, as feasible.
- Using path noise control measures such as temporary noise barriers or portable enclosures for small equipment (such as, jackhammers and concrete saws).
- Replacing backup alarms with strobes, if and as allowed by Occupational Safety and Health Administration (OSHA) regulations.
- Maintaining smooth truck route surfaces within and next to the Project Area.
- Establishing and implementing procedures to maintain strong communications with neighbors.

If warranted by the projections in the *Construction Noise and Vibration Control Plan*, a temporary noise wall approximately 12 feet tall would be constructed along the perimeter of the Project Area where there are not adjacent buildings. Such a wall would be effective in reducing construction noise at ground level by up to 10 dBA at receptors close to the Project Area.

Construction vibration from drilling during secant pile wall construction, vibratory sheet pile driving, and clam shovel operation during slurry wall construction may increase the risk of structural damage at three to four buildings, including the historic station building and the REA Building. As part of the preparation of the *Construction Noise and Vibration Control Plan,* the buildings at risk would be assessed to determine the appropriate threshold applicable to each based on its type of construction and condition. The plan would define measures to be taken to minimize the risk of damage based on these thresholds. As warranted by the assessment and projections in the *Construction Noise and Vibration Control Plan*, and as technically feasible, alternative construction methods would be implemented, including but not limited to:

- Using a hydromill instead of a clam shovel for slurry wall construction when working close to a building. A clam shovel may increase the risk of damage to fragile buildings within 34 feet, as opposed to eight feet for a hydromill.
- Using push-in type sheeting equipment rather than vibratory equipment to install sheet-pile walls.
- Using sonic drill rigs instead of traditional drill rigs. Sonic rigs help break up the soil, can speed up the drilling process, and reduce vibration levels at nearby buildings.

If possible without major disruptions to rail operations, Amtrak would allow the use of work trains rather than trucks to haul away excavation spoils to reduce noise and vibration from passing trucks. Construction trucks would not generate sufficient vibration to risk causing structural damage but there is a potential for human annoyance at 12 receptors and one planned development. Other measures that would be included in the *Construction Noise and Vibration Control Plan* and implemented to minimize annoyance from truck traffic if warranted and practicable include:

- Among the potential truck routes to and from the Project Area, using those routes with fewer residential receptors.
- Limiting truck speeds or directing trucks to use travel lanes farther from receptors on multi-lane roads such as New York Avenue.

5.10.7 Permits and Regulatory Compliance

There are no formal permits required to demonstrate regulatory compliance with regard to operational noise and vibration impact assessment. Since construction of the proposed Project may result in exceedances of the District’s noise ordinance limits, a variance may be required.

5.11 Aesthetics and Visual Quality

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on aesthetics and visual quality. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies relevant permitting and regulatory compliance requirements.

5.11.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to aesthetics and visual quality are listed in **Section 4.11.1**, *Regulatory Context and Guidance*.

5.11.2 Study Area

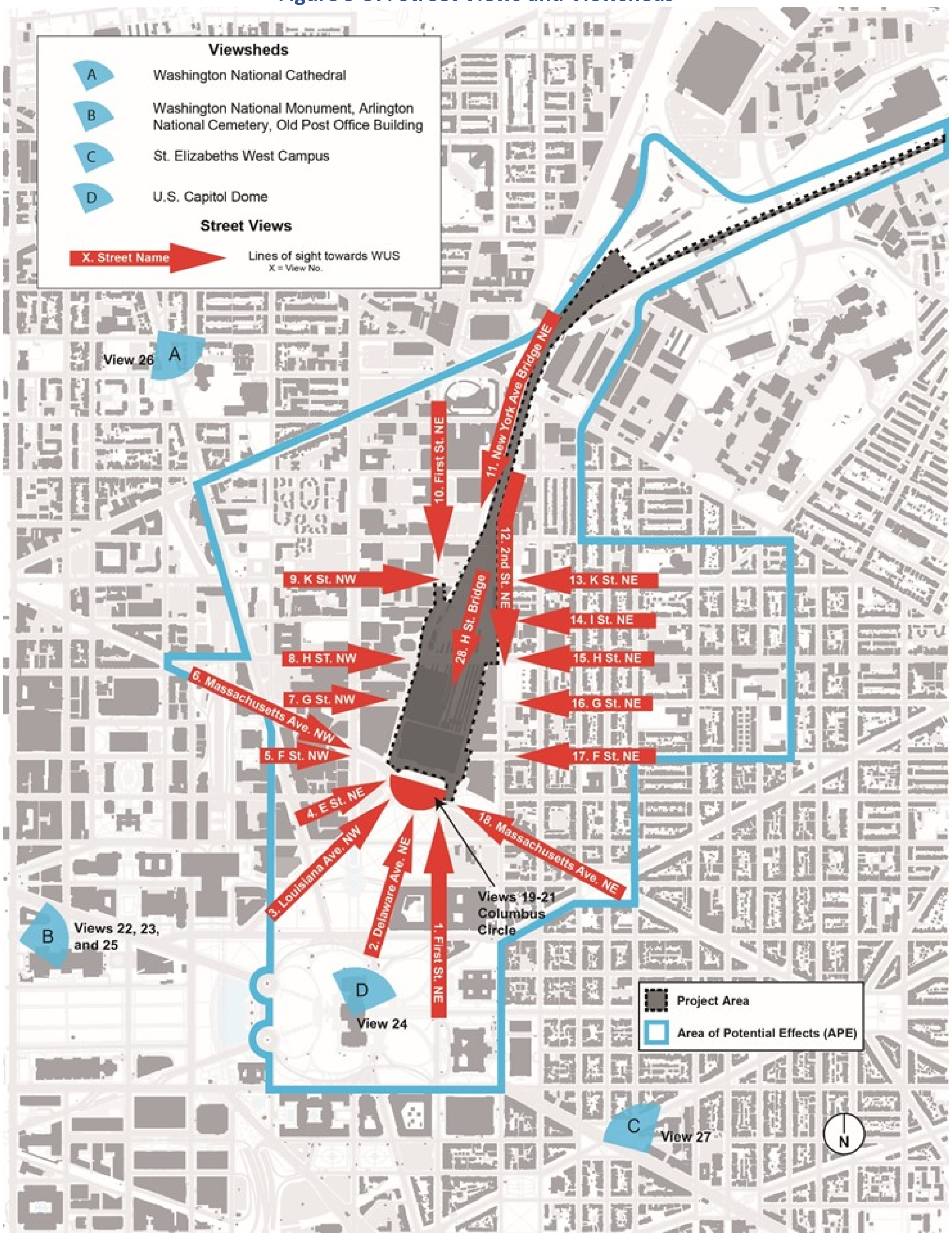
As defined in **Section 4.11.2**, *Study Area*, the Local Study Area for aesthetics and visual quality is same as that for cultural resources (**Figure 4-18**). It coincides with the Section 106 Area of Potential Effects (APE). There is no Regional Study Area because there is no potential for visual impacts outside the Local Study Area.

5.11.3 Methodology

This section summarizes the methodology for evaluating the impacts of the alternatives on aesthetics and visual quality. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 11.4**, *Methodology,* provides a description of the analysis methodology. A summary is below.

The assessment of impacts on aesthetics and visual quality was conducted based on 22 significant street views and six culturally significant viewsheds with views toward the Project Area, for a total of 28 views as shown in **Figure 5-57** (viewsheds A, C, and D contain one view each and viewshed B containing three views). To assess the visual impacts of the alternatives, visual simulations were developed by superimposing building volumes onto photographs of the 28 views. These simulations convey building mass, height, and setback. Building volumes reflect the anticipated size of the Project elements or maximum allowable zoning volumes. They do not incorporate specific design elements, which are not known at this time. The simulations can be found in **Appendix C3a**, *Washington Union Station Expansion Project Aesthetics and Visual Quality: Visual Assessment.*

Figure 5-57. Street Views and Viewsheds



Impacts were assessed based on the sensitivity and visibility of anticipated changes. Sensitivity refers to how much the anticipated change would affect defining elements of the view in a way that would change a viewer's experience. Sensitivity measures how much the massing and height of new elements would change general visual and cultural character of the environment.

The intensity of visual impacts for each of the 28 views were measured by the degree of visibility and sensitivity. Impact intensities were defined as follows:

- **No Impact:** Changes would not be visible and would not alter the visual or cultural character of the view.
- **Negligible Adverse Impact:** Changes would be just noticeable but have little to no potential to alter the visual or cultural character of the view.
- **Minor Adverse Impact:** Changes would be readily noticeable but would alter the visual and cultural character of the view to only a low degree.
- **Moderate Adverse Impact:** Changes would be very noticeable but would alter the visual and cultural character of the view to only a low or moderate degree.
- **Major Adverse Impact:** Changes would be very noticeable and alter the visual and cultural character of the view to a high degree.
- **Beneficial Impact:** Changes would be noticeable but would alter the visual character of a view in such a way as to return an impacted view to its original state or change the view to be less impactful than the existing condition.

5.11.3.1 Operational Impacts

The operational, permanent long-term impacts of the Project were evaluated based on the simulations, and the sensitivity and visibility of anticipated changes as described above.

5.11.3.2 Construction Impacts

Construction impacts were evaluated based on the anticipated visibility of the construction site and equipment such trailers, machinery, and material stockpiles.

5.11.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on aesthetics and visual quality. It summarizes the more detailed analyses (including visual simulations) presented in **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report***, Section 11.5***, Impact Analysis* and **Appendix C3a**, *Washington Union Station Expansion Project Aesthetics and Visual Quality: Visual Assessment.* This section focuses on views that would be affected. See **Appendix C3a** for a detailed assessment of all views, including those that would experience no impacts.

5.11.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would result in direct operational impacts on 21 out of 28 views, as shown in Table 5-121.

Table 5-121. Direct Operational Visual Impacts, No-Action Alternative

Impact	Number of Views Affected	Views Affected[1]
Major Adverse	6	First Street NE (#1), Delaware Avenue NE (#2), Louisiana Avenue NE (#3), New York Avenue Bridge (#11), 2nd Street NE (#12), H Street Bridge (28)
Moderate Adverse	6	E Street NE (#4), First Street NE (#10), K Street NE (#13), I (eye) Street NE (#14), Columbus Circle Drive (#20), U.S. Capitol Dome (#24)
Minor Adverse	5	H Street NW (#8), K Street NW (#9), H Street NE (#15), G Street NE (#16), Columbus Plaza (#19)
Negligible Adverse	4	F Street NE (#17), Massachusetts Avenue NE (#18), Washington Monument (#22), Old Post Office Building (#25)

1. # refers to the number assigned to the view in **Figure 5-57**.

In the No-Action Alternative, aesthetics and visual quality in the Study Area would be primarily affected by the construction of the private air-rights development above the rail terminal. The development would be built on a deck over the entire rail terminal between H and K Streets NE and the eastern part of the terminal between H Street and the historic station building. As the design of the private air-rights development has not yet been defined, its impacts can only be assessed based on the maximum buildable volume allowed by zoning regulations.[1]

The views most affected would be those looking directly onto the rail terminal and those along the corridors adjacent to the terminal. There, the private air-rights development would cause highly visible changes that would alter the character of the views and result in major to moderate adverse impacts. The view along H Street, in particular, would be affected, as the perceived openness beyond the barrier wall looking south towards WUS would disappear and the private development facing the bridge would be highly visible.

Views from the east toward the back of WUS would also be affected. The most noticeable change would be to the view along I (Eye) Street NE, which currently terminates at the low-rise REA Building. The private air-rights development would close out the view and result in a moderate adverse impact. Other adverse impacts on east-west views from either side of WUS, north of the historic station building, would range from minor to moderate, depending on how visible the new development would be. Visible changes to the H Street Corridor from

[1] See **Appendix C2**, *Washington Union Station Expansion Project, Affected Environment Technical Report*, **Section 9.5**, *Affected Environment*.

both the east and the west, where the existing gap on both sides of the H Street Bridge would be replaced with new streetscape, would result in a minor adverse impact. Views from the east, along Massachusetts Avenue and F Street, would experience barely visible changes and negligible adverse impacts. Seen from these directions, the historic station building would hide most of the development to its north.

Views from the south of WUS toward the historic station building would also be affected. Louisiana and Delaware Avenues, and First Street NE provide direct views of WUS, visually connecting it with the U.S. Capitol and Capitol Grounds. The existing view is characterized by the uninterrupted silhouette of the barrel-vault roof of the historic station building and wide tree-lined streets used for U.S. government parking. The private air-rights development would be visible from various points along Louisiana Avenue, Delaware Avenue, and First Street, in addition to views from E Street NE and from the east and west sides of Columbus Circle Drive. Views where the development would interrupt the silhouette of WUS at the barrel vault would cause major or moderate adverse impacts depending on how much of the development would be seen above the station's roofline.

The private air-rights development would be barely visible from the Washington Monument and Old Post Office Building and cause negligible impacts to views from these monuments. It would be highly visible from the U.S. Capitol Dome, resulting in a moderate adverse impact.

Indirect Operational Impacts

Relative to existing conditions, there would be no indirect operational visual impacts in the No-Action Alternative.

All visual impacts are direct impacts. The projects included in the No-Action Alternative would not cause visual impacts after their completion or outside the areas from which they would be visible.

Construction Impacts

In the No-Action Alternative, there would be a moderate adverse impact on one view, minor adverse construction impacts on 10 views, and negligible adverse construction impacts on nine views, as shown in Table 5-122.

In the No-Action Alternative, the primary cause of visual impacts would be the construction of the private air-rights development above the rail terminal. Distance, perspective, and the location and height of heavy construction equipment and activities would influence the character and intensity of the impacts.

Table 5-122. Visual Construction Impacts, No-Action Alternative

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	H Street Bridge (#28)
Minor Adverse	10	First Street NE (#1), H Street NW (#8), K Street NW (#9), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), K Street NE (#13), I (Eye) Street NE (#14), H Street NE (#15), U.S. Capitol Dome (#24).
Negligible Adverse	9	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), E Street NE (#4), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Plaza (#19), Columbus Circle Drive (#20), Washington Monument (#22), and Old Post Office Building (#25).

1. # refers to the number assigned to the view in **Figure 5-57.**

Nine views would experience negligible impacts. Although construction would be visible from these locations, distance or intervening structures (including the historic station building) would hide or mask most of it. Construction would be more noticeable from ten locations and impacts on these views would be minor. The Project Area, a rail terminal, has a semi-industrial appearance. Visually, construction activities would accentuate this aspect and visual impacts would remain within the range of those typically caused by large-scale construction projects in the District. Impacts would be greater on the view from the H Street Bridge (#28) due to the proximity of the construction relative to the bridge and passersby and, as such, would be of moderate intensity.

5.11.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A would result in adverse direct operational impacts on three views and a beneficial impact on one view, as shown in Table 5-123.

Table 5-123. Direct Operational Visual Impacts, Alternative A

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	Delaware Avenue NE (#2)
Negligible Adverse	2	First Street NE (#10), H Street NE (#15)
Beneficial	1	Columbus Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

The direct operational impacts of Alternative A would change views from the south. From Delaware Avenue NE, the Project would rise above the roofline of WUS's West Pavilion, causing a moderate adverse impact. Alternative A would have negligible impacts on two other views. From these locations, either the Project would barely be visible or the mass of the private air-rights development would obscure or encompass the Project elements. Impacts on two other views would be negligible as the Project would be just barely visible against the mass of the private air-rights development.

In Alternative A, a new bus facility and parking facility would occupy the footprint to the existing parking garage but the portion projecting over the service roadway on the west side of the Project Area would be eliminated, re-establishing views along First Street NE. This would result in a beneficial impact on the view from the west side of Columbus Circle Drive.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would result in adverse indirect operational impacts on seven views, as shown in Table 5-124.

Table 5-124. Indirect Operational Visual Impacts, Alternative A

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	2	Louisiana Avenue NE (#3), E Street NE (#4)
Minor Adverse	3	First Street NE (#1), G Street NW (#7), Columbus Plaza (#19)
Negligible Adverse	2	F Street NW (#5), Massachusetts Avenue NE (#18)

1. # refers to the number assigned to the view in **Figure 5-57**.

Indirect operational impacts would be caused by the mass and height of the potential Federal air-rights development. Currently, these impacts can only be assessed based on the maximum allowed buildable volume consistent with the USN zoning that is anticipated to apply to the area.[2]

The potential Federal air-rights development would be most noticeable from Louisiana Avenue NE and E Street NE, as it would rise above the roofline of the west pavilion of the historic station building. Adverse impacts would be moderate because the views would remain dominated by the parking facility and the private air-rights development. From the other affected views, the Federal air-rights development would be less visible against the background of the existing station and the private air-rights development, resulting in minor or negligible impacts.

[2] See **Section 5.9.3.1**, Operational Impacts.

Construction Impacts

Construction of Alternative A would result in a moderate adverse impact on one view, minor adverse impacts on nine views, and negligible adverse impacts on eight views, as shown in Table 5-125.

Table 5-125. Visual Construction Impacts, Alternative A

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	H Street Bridge (#28)
Minor Adverse	9	E Street NE (#4), G Street NW (#7), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), I (Eye) Street NE (#14), H Street NE (#15), Columbus Circle Drive (#21), U.S. Capitol (#24)
Negligible Adverse	8	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), H Street NW (#8), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Plaza (#19), Columbus Circle Drive (#20); Washington Monument (#22)

1. # refers to the number assigned to the view in **Figure 5-57**.

Construction of Alternative A would change the appearance of the rail terminal and its immediate surroundings for the duration of the construction period, approximately 11 years and 5 months. Features typical of a large construction site would be fully or partially visible from outside the Project Area. This would affect the visual quality of several views around WUS.

Alternative A would result in negligible adverse impacts on eight views. Distance or intervening structures would hide most of the construction equipment or activities from those views. Alternative A would result in minor adverse impacts on nine views. Construction equipment and activities would be distinctly visible from those views for part of the construction period. The Project Area, as a rail terminal, already has a semi-industrial appearance. Construction would accentuate this appearance rather than represent a major change in visual quality. Impacts on H Street Bridge would be moderate, due the proximity of the construction to the bridge and passersby.

Although construction would take place over approximately 11 years and 5 months, the focus of activities and the corresponding impacts would change over time. This would make the impacts of constructing Alternative A on any single view similar to those of most large-scale construction projects in the District. In general, impacts would be greater during Phases 1 and 4, when the focus would be on the eastern and western edges of the terminal, respectively, than during Phases 2 and 3, when activities would be in the middle of the terminal and less visible from outside, or during the 12-month Intermediate Phase, when only column removal work in the First Street Tunnel would take place.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would have adverse direct and indirect operational impacts on 20 views. It would also have a beneficial impact on one view, as shown in **Table 5-126**. In general, impacts relative to existing conditions would be greater than relative to the No-Action Alternative because the changes caused by Alternative A would be more noticeable against a baseline that does not include the private air-rights development.

Table 5-126. Direct and Indirect Visual Impacts Relative to Existing Conditions, Alternative A

Impact	Number of Views Affected	Views Affected[1]
Major Adverse	2	Delaware Avenue NE (#2), H Street Bridge (#28)
Moderate Adverse	6	First Street NE (#1), Louisiana Avenue NE (#3), E Street NE (#4), First Street NE (#10), New York Avenue Bridge (#11), view from U.S. Capitol Dome (#24)
Minor Adverse	5	G Street NW (#7), K Street NW (#9), K Street NE (#13), H Street NE (#15), view from Columbus Plaza (#19)
Negligible Adverse	7	F Street NW (#5), H Street NW (#8), Second Street NE (#12), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Circle Drive (#20), Washington Monument (#22)
Beneficial	1	Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

5.11.4.3 Alternative B

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative B would result in adverse direct operational impacts on one view and a beneficial impact on one view, as shown in Table 5-127.

Table 5-127. Direct Operational Visual Impacts, Alternative B

Impact	Number of Views Affected	Views Affected[1]
Negligible Adverse	1	H Street NE (#15)
Beneficial	1	Columbus Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

In Alternative B, all parking would be below ground. There would be no parking above the bus facility, resulting in a structure that would not be as tall as in the No-Action Alternative. Only the view from H Street NE looking west (#15) would experience an adverse impact, and this impact would be negligible due to low building elevation. There would be a beneficial impact on the view from the west side of Columbus Circle Drive (#21) as in Alternative A (**Section 5.11.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would result in adverse indirect operational impacts on nine views, as shown in Table 5-128.

Table 5-128. Indirect Operational Visual Impacts, Alternative B

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	3	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), E Street NE (#4)
Minor Adverse	3	First Street NE (#1), G Street NW (#7), View from Columbus Plaza (#19)
Negligible Adverse	3	F Street NW (#5), First Street NE (#10), Massachusetts Avenue NE (#18)

1. # refers to the number assigned to the view in **Figure 5-57**.

The indirect operational impacts of Alternative B would be similar to those of Alternative A (see **Section 5.11.4.2**, *Alternative A, Indirect Operational Impacts)* because the total massing of the combined bus facility and potential Federal air-rights development would be the same in both alternatives and affect the same views in a similar fashion (see **Section 5.11.4.2**, *Alternative A, Indirect Operational Impacts*). However, because the area available for potential Federal air rights development would be larger, there would be additionally a moderate indirect operational impact to Delaware Avenue NE (#2) and a negligible indirect operational impact to First Street NE (#10).

Construction Impacts

Construction of Alternative B would result in a moderate adverse impact on one view, minor adverse impacts on 11 views, and negligible adverse impacts on eight views, as shown in Table 5-129.

Table 5-129. Construction Visual Impacts, Alternative B

Impact	Number of Views Affected	Views Affected[1]
Moderate Impact	1	H Street Bridge (#28)
Minor Adverse	11	E Street NE (#4), G Street NW (#7), K Street NW (#9), K Street NE (#13), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), I (Eye) Street NE (#14), H Street NE (#15), Columbus Circle Drive (#21), U.S. Capitol (#24)
Negligible Adverse	8	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), H Street NW (#8), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Plaza (#19), Columbus Circle Drive (#20); Washington Monument (#22)

1. # refers to the number assigned to the view in **Figure 5-57**.

The impacts of constructing Alternative B would be the same as those of constructing Alternative A (**Section 5.11.4.2**, *Alternative A, Construction Impacts*) with two exceptions.[3] Heavier construction activity in the K Street NE underpass would additionally affect views from K Street NW looking east and west in addition to the views that would be affected in Alternative A. Impacts on these views would be minor for the same reasons as explained for Alternative A.

Comparison to Existing Conditions

Relative to existing conditions, Alternative B would result in adverse direct and indirect operational impacts on 20 views and a beneficial impact on one view, like Alternative A (see **Table 5-126** above).

5.11.4.4 Alternative C

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would result in beneficial adverse direct operational impacts on two views.

Alternative C's east-west train hall would span the width of the rail terminal. A new bus facility north of H Street would be located on the east or west side of the Project Area with a bus drop-off and pick-up area integrated with the train hall. Parking would be provided above-ground north of H Street, either on the east or west side of the site, and below ground.

In Alternative C, the projecting portion of the existing garage and associated service roadway would be removed, resulting in the reestablishment of the view along First Street NE and a beneficial impact on the view from the west side of Columbus Circle Drive (#21). There would also be a beneficial impact on views from G Street NW (#7) because of the reduction in building massing and removal of the existing parking garage. From all other locations, the Project elements would not visually stand out against the background of the private air-rights development.

Indirect Impacts

Relative to the No-Action Alternative, Alternative C (either option) would result in adverse indirect operational impacts on five views, as shown in Table 5-130.

[3] Alternative B would take longer to complete than Alternative A (approximately 14 years and 4 months). However, the longer duration would largely be due to the deeper excavation needed to accommodate two levels of below-ground parking. Most of this additional work would take place below grade and, as such, would not cause additional visual disruptions.

Table 5-130. Indirect Operational Visual Impacts, Alternative C

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	2	Delaware Avenue NE (#2), E Street NE (#4)
Minor Adverse	2	First Street NE (#1), Louisiana Avenue NE (#3)
Negligible Adverse	1	First Street NE (#10)

1. # refers to the number assigned to the view in **Figure 5-57**.

Indirect visual impacts would be caused by the mass and height of the potential Federal air-rights development within the approximate footprint of the existing parking garage up to the maximum height allowed under zoning. The potential Federal air-rights development would be most noticeable looking northeast from Delaware Avenue NE (#2) and E Street NE (#4), as it would rise above the roofline of the west pavilion of the historic station building and would not be obscured by the private air-rights development, resulting in moderate adverse impacts. There would be minor adverse impacts on the views from First Street NE (#1) and Louisiana Avenue NE (#3), and negligible adverse impacts on the view from First Street NE (#10). While visible from there, the Federal air-rights would largely blend in with the private air-rights development.

Construction Impacts

Construction of Alternative C (either option) would result in a moderate adverse impact on one view, minor adverse impacts on 12 views, and negligible adverse impacts on six views, as shown in Table 5-131.

Table 5-131. Construction Visual Impacts, Alternative C

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	H Street Bridge (#28)
Minor Adverse	12	E Street NE (#4), G Street NW (#7), H Street NW (#8), K Street NW (#9), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), K Street NE (#13), I (Eye) Street NE (#14), H Street NE (#15), Columbus Circle Drive (#21), U.S. Capitol Dome (#24)
Negligible Adverse	6	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), G Street NE (#16), Columbus Plaza (#19), Columbus Circle Drive (#20), Washington Monument (#22)

1. # refers to the number assigned to the view in **Figure 5-57**.

Like that of the other Action Alternatives, construction of Alternative C would change the appearance of the rail terminal and its immediate surroundings for the duration of the construction period, approximately 12 years and 3 months. Based on distance, perspective, and the anticipated location and height of heavy construction equipment and activities, construction of Alternative C (either option) would result in negligible adverse impacts on six views. Distance or intervening structures would hide most of the construction equipment or activities from those views. Alternative C would also result in minor adverse impacts on 12 views. From these viewpoints, construction equipment and activities would be more visible for at least part of the construction period. Impacts would be minor for the same reasons as explained for Alternative A (see **Section 5.11.4.2**, *Alternative A, Construction Impacts*). Also as in Alternative A, impacts on the H Street Bridge would be moderate, due the proximity of the construction to the bridge and passersby.

Comparison to Existing Conditions

Relative to existing conditions, Alternative C would result in adverse direct and indirect operational impacts on 17 (East Option) or 16 (West Option) views and a beneficial impact on two views (**Table 5-132**). As with the other Action Alternatives, the impacts of Alternative C relative to existing conditions would be greater than relative to the No-Action Alternative because the changes caused by Alternative C would be more noticeable against a baseline that does not include the private air-rights development.

Table 5-132. Direct and Indirect Visual Impacts Relative to Existing Conditions, Alternative C

Impact	Number of Views Affected	Views Affected[1,2]
Major Adverse	3	First Street NE (#1), Delaware Avenue NE (#2), New York Avenue Bridge (#11)
Moderate Adverse	6 (East Option) 5 (West Option)	Louisiana Avenue NE (#3), E Street NE (#4), First Street NE (#10), I (Eye) Street NE (#14)[3], U.S. Capitol Dome (#24), H Street Bridge (#28)
Minor Adverse	4	H Street NW (#8), K Street NW (#9), K Street NE (#13), H Street NE (#15)
Negligible Adverse	4	2nd Street NE (#12), G Street NE (#16), Columbus Circle Drive (#20), Washington Monument (#22)
Beneficial	2	G Street NW (#7), Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.
2. Both options unless otherwise noted.
3. East Option only.

5.11.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative D would result in beneficial adverse direct operational impacts on two views.

Alternative D's east-west train hall would cover the rail terminal north of the historic station building, extending over all tracks and platforms. The bus facility would be integrated with the train hall and an above-ground parking facility would be provided south of K Street NE.

The beneficial impacts of Alternative D would be the same as those of Alternative C (see **Section 5.11.4.4**, *Alternative C, Direct Operational Impacts*). As in Alternative C, in Alternative D the Project elements would not visually stand out against the background of the private air-rights development and have no adverse impacts on any views.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would result in adverse indirect operational impacts on five views.

The indirect operational impacts of Alternative D would be the same as those of Alternative C as the potential Federal air-rights development would be the same (see **Section 5.11.4.4**, *Alternative C, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative D would result in a moderate adverse impact on one view, minor adverse impacts on 11 views, and negligible adverse impacts on eight views, as shown in Table 5-133.

Table 5-133. Construction Visual Impacts, Alternative D

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	H Street Bridge (#28)
Minor Adverse	11	E Street NE (#4), G Street NW (#7), K Street NW (#9), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), K street NE (#13), I (Eye) Street NE (#14), H Street NE (#15), Columbus Circle Drive (#21), U.S. Capitol Dome (#24)
Negligible Adverse	8	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), H Street NW (#8), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Plaza (#19), Columbus Circle Drive (#20), Washington Monument (#22)

1. # refers to the number assigned to the view in **Figure 5-57**.

Based on distance, perspective, and the anticipated location and height of heavy construction equipment and activities, construction of Alternative D would result in negligible adverse impacts on eight views. Distance or intervening structures would hide most of the construction equipment or activities from those views. Alternative D would also result in minor adverse impacts on 11 views. From these viewpoints, construction equipment and activities would be more visible for at least part of the construction period. Impacts would be minor for the same reasons as explained for Alternative A (see **Section 5.11.4.2**, *Alternative A, Construction Impacts*). Impacts would be moderate on H Street NE (#28) due to the proximity of the construction operations to the bridge.

Comparison to Existing Conditions

Relative to existing conditions, Alternative D would result in adverse direct and indirect operational impacts on 16 views and a beneficial impact on two views, as shown in **Table 5-134**. As with the other Action Alternatives, the impacts of Alternative D relative to existing conditions would be greater than relative to the No-Action Alternative because the changes caused by Alternative D would be more noticeable against a baseline that does not include the private air-rights development.

Table 5-134. Direct and Indirect Visual Impacts Relative to Existing Conditions, Alternative D

Impact	Number of Views Affected	Views Affected[1]
Major Adverse	3	First Street NE (#1), Delaware Avenue NE (#2), New York Avenue Bridge (#11)
Moderate Adverse	7	Louisiana Avenue NE (#3), E Street NE (#4), First Street NE (#10), 2nd Street NE (#12), K Street NE (#13), U.S. Capitol Dome (#24), H Street Bridge (#28)
Minor Adverse	3	K Street NW (#9), H Street NE (#15), Columbus Circle Drive (#20)
Negligible Adverse	3	H Street NW (#8), G Street NE (#16), Washington Monument (#22)
Beneficial	2	G Street NW (#7), Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

5.11.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would result in beneficial direct operational impacts on two views.

Alternative E's east-west train hall would cover the rail terminal north of the headhouse, extending over all tracks and platforms. The proposed bus facility would be integrated with the train hall. All parking would be below-ground. The existing parking garage would be removed.

The beneficial impacts of Alternative E would be the same as those of Alternative C (see **Section 5.11.4.4**, *Alternative C, Direct Operational Impacts*). As in Alternative C, in Alternative E, the Project elements would not visually stand out against the background of the private air-rights development and have no adverse impacts on any views.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would result in adverse indirect operational impacts on five views.

The indirect operational impacts of Alternative E would be the same as those of Alternative C (see **Section 5.11.4.4**, *Alternative C, Indirect Operational Impacts*).

Construction Impacts

Construction of Alternative E would result in a moderate adverse impact on one view, minor adverse impacts on 11 views, and negligible adverse impacts on eight views.

Like that of the other Action Alternatives, construction of Alternative E would change the appearance of the rail terminal and its immediate surroundings for the duration of the construction period, approximately 14 years and 4 months. Based on distance, perspective, and the anticipated location and height of heavy construction equipment and activities, construction of Alternative E would result in adverse impacts on the same views as Alternative D (see **Section 5.11.4.5**, *Alternative D, Construction Impacts* and **Table 5-133** above).

Comparison to Existing Conditions

Relative to existing conditions, Alternative E would result in adverse direct and indirect operational impacts on 16 views and a beneficial impact on two views, as shown in **Table 5-135**. As with the other Action Alternatives, the impacts of Alternative E relative to existing conditions would be greater than relative to the No-Action Alternative because the changes caused by Alternative E would be more noticeable against a baseline that does not include the private air-rights development.

Table 5-135. Direct and Indirect Visual Impacts Relative to Existing Conditions, Alternative E

Impact	Number of Views Affected	Views Affected[1]
Major Adverse	3	First Street NE (#1), Delaware Avenue NE (#2), New York Avenue Bridge (#11)
Moderate Adverse	5	Louisiana Avenue NE (#3), E Street NE (#4), First Street NE (#10), U.S. Capitol Dome (#24), H Street Bridge (#28)
Minor Adverse	4	K Street NW (#9), K Street NE (#13), H Street NE (#15), Columbus Circle Drive (#20)
Negligible Adverse	4	H Street NW (#8), 2nd Street NE (#12), G Street NE (#16), Washington Monument (#22)
Beneficial	2	G Street NW (#7), Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

5.11.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would result in adverse direct operational impacts on three views and a beneficial direct operational impacts on one view as shown in Table 5-136.

Table 5-136. Direct Operational Visual Impacts, Alternative A-C

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	Delaware Avenue NE (#2)
Minor Adverse	1	Louisiana Avenue NE (#3),
Negligible Adverse	1	First Street NE (#10)
Beneficial	1	Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

Alternative A-C would have a moderate adverse impact on the view from Delaware Avenue NE (#2) because the parking facility would be distinctly visible above the station's west pavilion adjacent to the barrel vault roof of the central pavilion. It would be less visible from Louisiana Avenue NE and First Street NE, resulting in minor and negligible impacts, respectively. The new bus facility and parking facility would occupy approximately the same volume as the existing parking garage, but the portion projecting over the service roadway on the west side would be eliminated, re-establishing views along First Street NE. This would amount to a beneficial impact on the view from the west side of Columbus Circle Drive (View #21).

Indirect Impacts

Relative to the No-Action Alternative, Alternative A-C would result in adverse indirect operational impacts on seven views, as shown in Table 5-137.

Table 5-137. Indirect Operational Visual Impacts, Alternative A-C

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	E Street NE (#4)
Minor Adverse	4	First Street NE (#1), G Street NW (#7), Columbus Plaza (#19), Columbus Circle Drive (#20)
Negligible Adverse	2	F Street NW (#5), Massachusetts Avenue NE (#18)

1. # refers to the number assigned to the view in **Figure 5-57**.

In Alternative A-C, the potential Federal air-rights development would be most noticeable from View #4, as it would rise above the roofline of the west pavilion, resulting in a moderate adverse impact. Views #1, #7, #19, and #20 would experience minor adverse impacts, and views #5 and #18 negligible adverse impacts because the development, while visible, would be less noticeable against the background of the existing station and the private air-rights development.

Construction Impacts

Construction of Alternative A-C would result in a moderate adverse impact on one view, minor adverse impacts on nine views, and negligible adverse impacts on eight views, as shown in Table 5-138.

Table 5-138. Construction Visual Impacts, Alternative A-C

Impact	Number of Views Affected	Views Affected[1]
Moderate Adverse	1	H Street Bridge (#28)
Minor Adverse	9	E Street NE (#4), G Street NW (#7), First Street NE (#10), New York Avenue Bridge NE (#11), 2nd Street NE (#12), I (Eye) Street NE (#14), H Street NE (#15), Columbus Circle Drive (#21), U.S. Capitol Dome (#24)
Negligible Adverse	8	Delaware Avenue NE (#2), Louisiana Avenue NE (#3), H Street NW (#8), G Street NE (#16), Massachusetts Avenue NE (#18), Columbus Plaza (#19), Columbus Circle Drive (#20), Washington Monument (#22)

1. # refers to the number assigned to the view in **Figure 5-57**.

Based on distance, perspective, and the anticipated location and height of heavy construction equipment and activities, construction of Alternative A-C would result in negligible adverse impacts on eight views. Distance or intervening structures would hide most of the construction equipment or activities from those views. Alternative A-C would also result in minor adverse impacts on 9 views. From these viewpoints, construction equipment and activities would be more visible for at least part of the construction period.

Impacts would be minor for the same reasons as explained for Alternative A (see **Section 5.11.4.2**, *Alternative A, Construction Impacts*). Impacts would be moderate on H Street NE (#28) due to the proximity of the construction operations to the bridge.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A-C would result in adverse direct and indirect operational impacts on 20 views and a beneficial impact on one view, as shown in **Table 5-139**. As with the other Action Alternatives, the impacts of Alternative A-C relative to existing conditions would be greater than relative to the No-Action Alternative because the changes caused by Alternative A-C would be more noticeable against a baseline that does not include the private air-rights development.

Table 5-139. Direct and Indirect Visual Impacts Relative to Existing Conditions, Alternative A-C

Impact	Number of Views Affected	Views Affected[1]
Major Adverse	3	First Street NE (#1), Delaware Avenue NE (#2), New York Avenue Bridge (#11)
Moderate Adverse	5	Louisiana Avenue NE (#3), E Street NE (#4), First Street NE (#10), U.S. Capitol Dome (#24), H Street Bridge (#28)
Minor Adverse	6	G Street NW (#7), K Street NW (#9), K Street NE (#13), H Street NE (#15), Columbus Plaza (#19), Columbus Circle Drive (#20)
Negligible Adverse	6	F Street NW (#5), H Street NW (#8), 2nd Street NE (#12), G Street NE (#16), Massachusetts Avenue NE (#18), Washington Monument (#22)
Beneficial	1	Columbus Circle Drive (#21)

1. # refers to the number assigned to the view in **Figure 5-57**.

5.11.5 Comparison of Alternatives

A summary of the impacts of the Action Alternatives as compared to the No-Action Alternative is provided in **Table 5-140**. Among all the alternatives, the No-Action Alternative would have the greatest visual impacts because of the size and height of the private air-rights development. Only the No-Action Alternative would result in major adverse impacts on six views. In general, the Project and the potential Federal air-rights development would be visually compatible, obscured, encompassed, or balanced by the massing of the private air-rights development. Therefore, the visual impacts of the Action Alternatives would be smaller than those of the No-Action Alternative, in terms of both the number of affected views and intensity.

Alternatives C (both options), D, and E would adversely affect the fewest views (5 out of 28) while Alternatives A, B, and A-C would adversely affect the most (10 out of 28). None of the Action Alternatives would result in major adverse impacts. With regard to other impacts, the Action Alternatives fall into two groups: Alternatives A, B, and A-C on the one hand, and

Alternatives C through E on the other. Overall, the first group would have greater visual impacts than the second one.

While all Action Alternatives would have a moderate adverse impact on views from E Street NE looking northeast (#4) and from Delaware Avenue NE looking northeast (#2), only Alternatives A and B would have a moderate adverse impact to the view from Louisiana Avenue (#3). This is because the potential Federal air-rights development would be highly visible regardless of the presence of the private air-rights development. Alternatives A, B, and A-C would be the only Action Alternatives with minor impacts on the view from Columbus Plaza (#19). All other Action Alternatives would have no impacts because the Project and the potential Federal air-rights development would not be visible from the plaza. Alternative A-C is the only alternative with an adverse impact to the view from the east side of Columbus Circle Drive (#20). This is because a portion of the Federal air rights would be visible extending from the barrel vault roof of the station. This adverse impact would be minor. Finally, Alternatives A and B would have a beneficial impact on only one view, instead of two for the other Action Alternatives.

All Action Alternatives would result in a beneficial impact to the view from the west side of Columbus Circle Drive, due to the removal of the existing, visually incompatible parking garage. This would reestablish the open view down First Street NE originally created by the L'Enfant Plan. Only Alternatives C through E would also have a beneficial impact on the view from G Street NW to the east, because of the reduction in building massing and opening of the view resulting from the removal of the existing parking garage and construction of the train hall.

Table 5-140. Comparison of Impacts, Aesthetics and Visual Quality

View	Alternative and Direct or Indirect Operational Impact[1]							
	No-Action	A	B	C-East	C-West	D	E	A-C (Preferred)
1.First Street NE, looking north	Major Adverse	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	Minor Adverse
2.Delaware Avenue NE, looking northeast	Major Adverse	Moderate Adverse	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	Moderate Adverse
3.Louisiana Avenue NE, looking northeast	Major Adverse	*Moderate Adverse*	*Moderate Adverse*	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	*Minor Adverse*	Minor Adverse
4.E Street NE, looking northeast	Moderate Adverse	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	*Moderate Adverse*	Moderate Adverse
5.F Street NW, looking east	No Impact	*Negligible Adverse*	*Negligible Adverse*	No Impact	No Impact	No Impact	No Impact	*Negligible Adverse*
6.Massachusetts Avenue NW, looking east	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
7.G Street NW, looking east	No Impact	*Minor Adverse*	*Minor Adverse*	Beneficial	Beneficial	Beneficial	Beneficial	*Minor Adverse*
8.H Street NW, looking east	Minor Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
9. K Street NW, looking east	Minor Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
10.First Street NE, looking south	Moderate Adverse	Negligible Adverse	*Negligible Adverse*	*Negligible Adverse*	*Negligible Adverse*	*Negligible Adverse*	*Negligible Adverse*	Negligible Adverse
11.New York Avenue Bridge NE, looking south	Major Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
12.2nd Street NE, looking south	Major Adverse	No Impact	No Impact	No Impact	No Impact	Minor Adverse	No Impact	No Impact
13.K Street NE, looking west	Moderate Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
14.I Street NE, looking west	Moderate Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
15.H Street NE, looking west	Minor Adverse	Negligible Adverse	Negligible Adverse	No Impact	No Impact	No Impact	No Impact	No Impact
16.G Street NE, looking west	Minor Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
17.F Street NE, looking west	Negligible Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
18.Massachusetts Avenue NE, looking northwest	Negligible Adverse	*Negligible Adverse*	*Negligible Adverse*	No Impact	No Impact	No Impact	No Impact	*Negligible Adverse*
19.Columbus Plaza	Minor Adverse	*Minor Adverse*	*Minor Adverse*	No Impact	No Impact	No Impact	No Impact	*Minor Adverse*
20.Columbus Circle Drive – East Side	Moderate Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	*Minor Adverse*
21.Columbus Circle Drive – West Side	No Impact	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
22.Washington Monument	Negligible Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
23.Arlington House at Arlington National Cemetery	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
24.U.S. Capitol Dome	Moderate Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
25.Old Post Office Building	Negligible Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
26.Washington National Cathedral	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
27.St. Elizabeths West Campus	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
28.H Street Bridge	Major Adverse	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Total Views with No Impact	7	17	17	21	21	21	21	17
Total Views with Negligible Adverse Impact[2]	4 (2)(0)	4 (2)(2)	4 (1)(3)	1 (0)(1)	1 (0)(1)	1 (0)(1)	1 (0)(1)	3 (1)(2)
Total Views with Minor Adverse Impact[2]	5 (5)(0)	3 (0)(3)	3 (0)(3)	2 (0)(2)	2 (0)(2)	2 (0)(2)	2 (0)(2)	5 (1)(4)
Total Views with Moderate Adverse Impact[2]	6 (6)(0)	3 (1)(2)	3 (0)(3)	2 (0)(2)	2 (0)(2)	2 (0)(2)	2 (0)(2)	2 (1)(1)
Total Views with Major Adverse Impact[2]	6 (6)(0)	0	0	0	0	0	0	0
Total Views with Beneficial Impacts[2]	0	1 (1)(0)	1 (1)(0)	2 (2)(0)	2 (2)(0)	2 (2)(0)	2 (2)(0)	1 (1)(0)

Notes: 1. Italics indicate indirect impact.
2. Total (direct impacts) (indirect impacts).

5.11.6 Avoidance, Minimization and Mitigation Evaluation

Visual impacts were assessed by reviewing the compatibility and sensitivity of the visual changes. Due to the still undefined exact massing, form, and materials in the No-Action Alternative and Action Alternatives' design, findings of adverse impacts are conservative. They do not take into account that actual design, particularly as it relates to massing, form, and materials, may affect compatibility and sensitivity and avoid or mitigate the impact. To avoid, minimize, or mitigate adverse impacts, FRA is proposing that, as much as possible, the Project Proponents design the Project with context-compatible architecture and materials, and in a manner that is sensitive to surrounding structures.

Adverse impacts to certain views would also be avoided or mitigated if the private air-rights development and the potential Federal air-rights development are designed and constructed to be lower than their maximum buildable volume. This is especially true for the views from Delaware Avenue NE, First Street NE, Louisiana Avenue NE, and E Street NE, where the maximum buildable volume would result in structures rising above the barrel vault and side pavilions of the historic station building. Adverse impacts to views from the south of WUS would be minimized if the private air-rights and potential Federal air-rights developments are constructed to be the same height and of similar form and materials, creating a symmetrical pattern. The overall color of the buildings should also be taken into consideration, as this would also affect visual compatibility. However, decisions regarding the design of the future private air-rights development would be made by the property owner.

5.11.7 Permits and Regulatory Compliance

The Project would be reviewed by the National Capital Planning Commission (NCPC) and the Commission of Fine Arts (CFA) for final approval. Typically, NCPC reviews at pre-design/programming, during schematic design (preliminary review), and at design development (final review). CFA reviews at the concept design phase and the final design phase.

In addition, any reviews stipulated as part of a Programmatic Agreement resulting from the Section 106 process or as part of the Record of Decision would have to be met. For all views where the Action Alternatives were found to cause an adverse impact, the Project design may contribute to avoiding this impact.

The various components of the No-Action Alternative would also be reviewed and would need final approval from NCPC, CFA, and the District's Historic Preservation Review Board. All three bodies would have to approve the final design and site plan information. Approval of each project's design is critical because design would contribute greatly to the compatibility and sensitivity of the aesthetic and visual quality of the Project. For all views where the No-Action Alternative was found to cause an adverse impact, the design may contribute to a reduction in the intensity of the impact or in no impact.

All further regulatory compliance would follow Federal and District regulations and guidelines concerning aesthetics or changes to visual resources, including:

- The Comprehensive Plan for the National Capital, Federal Urban Design Element;
- Executive Order 1259: CFA Review of Public Buildings in the District of Columbia Proposed by the Federal or DC governments;
- Shipstead-Luce Act of 1930 (Public Law 71-231, Public Law 76-248);
- Executive Order 1862: CFA Review of New Structures and Matters of Art Proposed by the Federal Government in DC;
- Executive Order 11593: Protection and Enhancement of the Cultural Environment;
- The Historic Landmark and Historic District Protection Act of 1978 (D. Law 2-144, as amended through October 1, 2016); and
- The Height of Buildings Act of 1910.

5.12 Cultural Resources

This section describes and characterizes potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on cultural resources. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and it describes permitting and regulatory compliance requirements.

"Cultural resources" for the purposes of this section consist of the historic properties evaluated as part of the Section 106 of the National Historic Preservation Act of 1966 (Section 106) process for the Washington Union Station (WUS) Expansion Project (Project). They include districts, buildings, sites, structures, and objects included in or eligible for inclusion in the National Register of Historic Places (NRHP) and the District of Columbia Inventory of Historic Sites (DC Inventory); properties that fall within the purview of the Architect of the Capitol (AOC) and are listed as AOC Heritage Assets; and properties that are under the jurisdiction of the National Park Service's National Mall and Memorial Parks.

In March 2019, FRA completed a Draft Assessment of Effects (AOE) in compliance with Section 106 to evaluate how the Project would affect historic properties and provided it for review and comment to the District State Historic Preservation Officer (DC SHPO) and the Section 106 Consulting Parties. [1] On April 30, 2019, FRA hosted a Consulting Party Meeting to present the Draft AOE and receive comments.

The March 2019 AOE did not address Alternative A-C, which FRA and the Project Proponents developed and identified as the Preferred Alternative in summer and fall 2019. FRA presented the Preferred Alternative to the Consulting Parties at a meeting held on November 19, 2019.

Following this meeting, FRA prepared a revised Draft AOE incorporating Alternative A-C and addressing the comments received on the March 2019 Draft AOE. The revised Draft AOE has been submitted for review to the DC SHPO and Consulting Parties at the same time as this DEIS. It is included in the DEIS as **Appendix D1**. The cultural resource impact assessment presented in this section, summarized from **Section 12**, *Cultural Resources* of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* builds on the findings of the revised Draft AOE.

[1] See **Section 8.4**, *National Historic Preservation Act Section 106 Consultation*, for a summary of the Section 106 consultation process prior to this date. Consulting Parties are certain individuals and organizations with a demonstrated interest in the undertaking, who may participate in the Section 106 process due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effect on historic properties.

5.12.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to cultural resources are listed in **Section 4.12.1**, *Affected Environment, Cultural Resources, Regulatory Context and Guidance*.

5.12.2 Study Area

As defined in **Section 4.12.2**, *Affected Environment, Cultural Resources, Study Area*, the Local Study Area consists of the APE (**Figure 4-26**). There is no Regional Study Area because neither the No-Action Alternative nor the Action Alternatives have the potential to affect cultural resources beyond the Local Study Area. The process for developing the APE is available in **Appendix D1**, *Washington Union Station Expansion Project Draft Section 106 Assessment of Effects to Historic Properties.* The inventory of historic properties in the APE is documented in **Appendix D1a**, *Washington Union Station Expansion Project Appendices to the Draft Section 106 Assessment of Effects to Historic Properties*.

5.12.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on cultural resources. **Appendix C3**, **Section 12.3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report, Cultural Resources, Methodology*, provides a full description of the analysis methodology. A summary is below.

The cultural resources impact assessment is based on the Draft AOE prepared in accordance with Section 106, which evaluates effects based on existing conditions. [2] Therefore, for cultural resources, unlike other resources in this DEIS, impacts are first assessed relative to existing conditions to remain consistent with the Section 106 assessment. A secondary comparison against the No-Action Alternative is provided for each Action Alternative. Only visual impacts vary with the baseline.

A major adverse impact on a cultural resource would occur if the Project would cause an adverse effect to the resource under Section 106. An adverse effect is an effect that would alter, directly or indirectly, the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association in a manner that would result in a finding of adverse effect under Section 106.[3] Examples of major adverse impacts include:

[2] **Appendix D1**. In the No-Action Alternative, the Project would not occur and, therefore, there would be no Federal undertaking for the purposes of Section 106. For the purpose of the NEPA assessment, the impacts of the No-Action Alternative on cultural resources were assessed based on available data and, when possible, using a similar approach to the approach used for the Action Alternatives, but there are no corresponding Section 106 findings for this alternative.

[3] 36 CFR 800.5.

- Physical destruction of or damage to all or part of the property;
- Alteration of a property that is not consistent with the *Secretary's Standards for the Treatment of Historic Properties* and applicable guidelines;
- Removal of the property from its historic location;
- Change of character of the property's use or of physical features within the property's setting that contributes to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

If the Project would change or alter a resource's location, design, setting, materials, workmanship, feeling, or association but not sufficiently to result in an adverse effect under Section 106, a negligible, minor, or moderate adverse impact may occur under NEPA. A negligible, minor, or adverse impact under NEPA does not mean that there would be an adverse effect under Section 106. When adverse impacts may occur but insufficient data are available to determine whether they would in fact occur and what their intensity would be, they are identified only as potential adverse impacts.

5.12.3.1 Operational Impacts

Direct operational impacts may be physical, visual, or related to traffic, noise, and vibration. To assess direct operational physical impacts, the alternatives were reviewed to determine whether they would potentially cause the destruction, alteration, or removal of part or whole of a resource and the potential of such changes to diminish the resource's integrity.

Visual impacts may affect a resource's integrity of setting, feeling and association by changing the way it relates to its environment and the experience of users, visitors, or passers-by. Visual simulations prepared as part of the Section 106 assessment are the basis for assessing visual impacts on cultural resources. [4] The assessment of visual impacts on cultural resources was based on the visibility of these changes and the sensitivity of the affected view to such changes. Visibility and sensitivity informed the impact finding as shown in **Table 5-141**.

[4] The simulations can be found in **Appendix D1**.

Table 5-141. Intensity of Visual Impacts on Cultural Resources[5]

Visibility	Sensitivity	Intensity of Impact
None	None	None
Low	Low	Negligible
Low	High	Minor
Low	Moderate	Minor
High	Low	Minor
Moderate	Low	Minor
High	Moderate	Moderate
Moderate	Moderate	Moderate
Moderate	High	Moderate
High	High	Major

Impacts from noise and vibration were assessed based on the analyses presented in **Section 5.10**, *Environmental Consequences, Noise and Vibration*. Impacts from noise and vibration on a cultural resource's integrity of setting, feeling, and association were assessed using the following scale:

- **No Impact:** No measurable change in noise or vibration levels.
- **Negligible Impact:** Change in noise level of less than 3 decibels (dBA)[6] and resulting in no impact per FTA criteria; vibration levels below FTA criteria.[7]
- **Minor Impact:** Change in noise level less than 3 dBA and resulting in moderate impact per FTA criteria; vibration levels below FTA criteria.
- **Moderate Impacts:** Change in noise levels less than 3 dBA resulting in a severe impact per FTA criteria; vibration levels below FTA criteria.
- **Major Impacts:** Change in noise levels more than 3 dBA resulting in a severe impact per FTA criteria or vibration levels above FTA criteria.

Vehicular traffic would be the main source of noise impacts in all alternatives. Other impacts from traffic were assessed based on the findings of the traffic impact analysis presented in **Section 5.5**, *Transportation* and a qualitative estimate of the potential for changes in traffic volumes to diminish a resource's integrity of setting, feeling, or association.

Indirect operational impacts are those that would result from the potential development of the Federally owned air rights at WUS not needed for the Project. The only indirect impacts

5 For the Action Alternatives, *No Impact* corresponds to *No Effect* under Section 106; *Negligible*, *Minor*, and *Moderate Impact* correspond to *No Adverse Effect*; *Major Impacts* corresponds to *Adverse Effect*.

6 A change of less than 3 dBA is generally considered barely perceptible (U.S. Department of Transportation. Federal Highway Administration. *Traffic Noise: Analysis and Abatement Guidance* [June 2010] in District Department of Transportation, *Noise Policy* [January 10, 2011], p. 9, Table 4).

7 See **Section 10.4.1**, *Washington Union Station Expansion Project Environmental Consequences Technical Report, Noise and Vibration, Operational Impacts*, for a definition of the FTA criteria.

would be visual. They were assessed using the same approach as that used for direct visual impacts.

5.12.3.2 Construction Impacts

Construction impacts were assessed in a similar manner to operational impacts. Assessment of noise and vibration impacts used the FTA thresholds applicable to construction noise and vibration. Steps to evaluate potential construction impacts to cultural resources included: identifying what physical construction effects may occur; potential visual impacts to cultural resources or visual character due to construction activities; and indirect impacts of noise and vibration.

5.12.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on cultural resources.

5.12.4.1 No-Action Alternative

Direct Operational Impacts

Physical Impacts

In the No-Action Alternative, relative to existing conditions, projects that would be completed in the Project Area would potentially result in adverse direct operational physical impacts on WUS and the WUS Historic Site.[8]

Several projects included in the No-Action Alternative (listed in **Section 3.3.1**, *No Action Alternative*, **Section 3.3.1.3**, *Near-Term Station and Track Improvements at WUS*, **Section 3.3.1.4**, *Transportation Projects within the Project Area*, and **Section 3.3.1.5**, *Private Air-rights Development*), could result in direct adverse operational impacts on WUS and the WUS Historic Site.

Station improvement projects such as those listed in **Section 3.3.1.3**, *Near-Term Station and Track Improvements at WUS* could result in direct adverse operational impacts on WUS and the WUS Historic Site if not completed in accordance with the Secretary of the Interior's (SOI) Standards. The relocation of Substation 25A would alter the physical and historic integrity of the WUS Historic Site, to which it is a contributing element. The private air-rights development would cover the currently open rail terminal between the historic station building and K Street would involve modifications to the physical layout of the rail terminal that may affect the physical and historic integrity of the WUS Historic Site.

8 The WUS Historic Site, as defined in the *Determination of Eligibility Amendment* that FRA prepared in 2017, includes the rail terminal in addition to the historic station building, Columbus Plaza, and the First Street Tunnel.

These potential direct adverse impacts could be avoided, minimized, or mitigated through compliance with Section 106, which require all projects funded, permitted, or authorized by the Federal government to undergo consultation with the DC SHPO and other parties, as appropriate. In the case of the private air-rights development, historic preservation covenants attached to the property require review and approval by the DC SHPO and the CFA. WUS projects would also be designed and implemented in accordance with the 2015 *Washington Union Station Historic Preservation Plan.* [9] The plan provides design considerations and guidelines consistent with the SOI Standards.

Visual Impacts

In the No-Action Alternative, relative to existing conditions, visual changes would result in major adverse direct operational impacts on three cultural resources: WUS, the WUS Historic Site, and the Railway Express Agency (REA) Building. They would result in moderate adverse direct operational impacts on seven cultural resources; minor adverse direct operational impacts on five resources; and negligible adverse direct operational impacts on three resources.

The development of the private air rights above the rail terminal southeast and north of H Street NE and the construction of several building blocks on a deck within this area would noticeably change the visual surroundings of WUS, the WUS Historic Site, and the REA Building. The new visual elements would diminish the integrity of setting, feeling, and association of these three cultural resources and cause a major adverse impact (**Table 5-142**). Also as described in **Table 5-142**, other cultural resources and one cultural viewshed would be affected visually but not in a manner that would alter any of their respective character-defining features and diminish their integrity of setting, feeling, and association.

Table 5-142. Direct Operational Visual Impacts on Cultural Resources, No-Action Alternative

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ Private air-rights development north of historic station building would change character of views towards the building. ▪ Top of new buildings would be visible above roof of historic station on east side. ▪ No change on west side. This would disrupt visual symmetry of station's Beaux Arts design, noticeable from Delaware Avenue NE; First Street and C Street NE; and east side of Columbus Circle Drive. ▪ Disruption of cultural landscape's open character north of historic station building and sever visual connection to rail terminal. **WUS Historic Site** ▪ Private air-rights development would replace the existing, open rail terminal south of K Street NE. Change would be noticeable from north (New York Avenue Bridge).

[9] Union Station Redevelopment Corporation. 2015. *Washington Union Station Historic Preservation Plan.* Accessed from https://www.usrcdc.com/projects/historic-preservation-plan/. Accessed on March 28, 2019.

Impact	Resources and Summary Description
	▪ The private air-rights development would fully hide the rail terminal and back of the historic station building breaking visual connection between the rail terminal and the historic station building. **REA Building** ▪ Eastern edge of private air-rights deck and development would rise high behind the building, visually cutting it off from the rest of the rail terminal.
Moderate Adverse	**Square 750 Rowhouse Development; 901 Second Street NE; Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former); Woodward and Lothrop Service Warehouse** ▪ Private air-rights development would be highly to moderately visible from these resources. ▪ They all have moderate sensitivity to changes because other large-scale multi-story and mixed-use developments have already compromised their small-scale setting. **L'Enfant-McMillan Plan** ▪ Private air-rights development would affect vistas along street corridors that are part of the L'Enfant-McMillan Plan. Visibility of the development would vary but not block or interrupt significant perspectives. **U.S. Capitol Dome** ▪ Private air-rights development would be highly visible from the dome but would not interrupt the horizon or any views along North Capitol Street or Delaware Avenue toward Columbus Plaza and the historic station building.
Minor Adverse	**Senate Parks, Underground Garage, and Fountains; St. Joseph's Home (Former); Uline Ice Company Plant and Arena Complex; Columbus Plaza; Capitol Hill Historic District** ▪ Private air-rights development would be moderately or highly visible from these resources. ▪ Low sensitivity to visual changes because integrity of setting, feeling, or association does not depend on the affected visual relationships.
Negligible Adverse	**Dirksen and Hart Senate Office Buildings; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building** ▪ Private air-rights development would be barely visible from these resources because of distance and intervening structures or vegetation. ▪ Integrity of setting, feeling, or association does not depend on those slightly changed views.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, in the No-Action Alternative, there would be negligible adverse direct operational impacts from increases in noise and vibration on 18 cultural resources. Increased traffic volumes have the potential to result in adverse direct operational impacts on the Capitol Hill Historic District due to visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

These impacts are described in **Table 5-143**.

Table 5-143. Potential Direct Operational Traffic, Noise, and Vibration Impacts on Cultural Resources, No-Action Alternative

Impact	Resources and Summary Description
Potential Adverse	**Capitol Hill Historic District** ▪ Peak-time traffic on 2nd Street NE between Massachusetts Avenue and H Street would increase by 12 percent (approximately 1,400 to 1,560 trips); peak-time traffic on F Street NE would increase by 13 percent (approximately 550 to 620 trips). ▪ Increases in traffic volumes on H Street NE, Massachusetts Avenue NE may result in potential for traffic diversion through local streets.
Negligible Adverse	**WUS, the C&P Telephone Company Warehouse; the Capitol Press Building (Former); the City Post Office /Postal Museum; Government Printing Office (GPO) Warehouse No.4; Holodomor Ukrainian Holocaust Memorial; Square 750 Rowhouse Development; St. Aloysius Catholic Church; St. Joseph's Home (Former); St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former); Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; 901 Second Street NE; Union Market Historic District; Capitol Hill Historic District (along 2nd Street NE)** ▪ Change in noise levels caused by greater vehicular traffic ▪ Would not exceed 3 dBA ▪ Vibration levels would not affect the integrity of any cultural resource

Indirect Operational Impacts

In the No-Action Alternative, the Federally owned air rights would not be developed. There would be no impacts on cultural resources.

Construction Impacts

In the No-Action Alternative, the construction of projects in the Project Area could cause a range of potential construction-related adverse impacts, including potential adverse impacts on undiscovered archaeological resources within the WUS rail terminal.

The private air-rights development would require establishing foundations within the rail terminal for columns supporting the air-rights decks. Much of the rail terminal has moderate to high archaeological potential. Although there are no known archaeological resources in this area, it is possible that excavation and other ground-disturbance may inadvertently damage or destroy unknown significant archaeological deposits.

It is likely that the resources shown in **Table 5-142**, which would experience adverse operational visual impacts, also would experience construction-related adverse visual impacts, although information to determine the intensity of these impacts is not available. Construction of the private air-rights development and other projects in or near the rail terminal would involve storing, staging, and use of construction equipment and materials within or next to the Project Area. Although construction equipment and activities may detract from the visual setting of a cultural resource, they are a common sight in an urban environment and their presence would not be a permanent condition.

Construction activities would also generate noise and vibration from the operation of construction equipment, including trucks that would travel on nearby streets to reach the site, including First Street NE, 2nd Street NE, and H Street NE. It is not possible to assess the intensity of these potential impacts since they would vary with the method and duration of construction for each project, which is unavailable information. However, the private air-rights development has the greatest potential to cause noise and vibration-related impacts and would likely affect the same resources as construction of the Action Alternatives (**Section 5.12.4.2**, *Alternative A, Construction Impacts*).

5.12.4.2 Alternative A

Direct Operational Impacts

Physical Impacts

Relative to existing conditions, Alternative A would have major adverse direct operational physical impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

The physical direct operational impacts of Alternative A on WUS and the WUS Historic Site are presented in **Table 5-144**.

Visual Impacts

Relative to existing conditions, in Alternative A, visual changes would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and REA Building; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two other cultural resources. They would also result in a beneficial direct operational impact on one cultural resource.

The direct operational visual impacts of Alternative A are described in **Table 5-145**.

Table 5-144. Direct Operational Physical Impacts on Cultural Resources, Alternative A

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ Removal of the Claytor Concourse, and the construction of Concourse A and the train hall could cause physical impact to the fabric of the historic station building. ▪ North façade of the Retail and Ticketing Concourse could be affected by removal of Claytor Concourse. ▪ A section of entablature supported by the original Doric columns may be encapsulated by the Claytor Concourse and would be affected by construction. ▪ The overall mass of WUS would be increased. ▪ Approximately 15,000 of original floor structure in the Retail and Ticketing Concourse would be demolished and 18 columns removed from the First Street Tunnel. ▪ These impacts would adversely affect the integrity of the overall design of the historic station building. **WUS Historic Site** ▪ Extensive modifications to the railroad terminal, including the reconstruction of all tracks, platforms, and associated infrastructure. ▪ Reconstruction of rail terminal, construction of the new concourses and of structural deck for the new bus and parking facility and associated roadways would require removal of numerous structures throughout the historic site (K Tower, all existing platforms, umbrella sheds, catenary poles, catenary with cross beam, signal bridges, and pneumatic switch valves). ▪ Ventilation intake may require insertion of vents in the southwest portion of the historic retaining walls (Burnham Wall). ▪ These impacts would be detrimental to the WUS Historic Site's integrity of design, setting, materials, workmanship, feeling, and association.
Potential adverse	**REA Building** ▪ Use of the portion of the historic property parcel that overlaps with the H Street Tunnel (approximately 9,800 square feet out of 63,000) for the H Street Concourse ▪ Modification or elimination of the existing connection between the H Street Tunnel and the basement of the building. ▪ Impacts undetermined at this early stage of design but potentially adverse.

Table 5-1451. Direct Operational Visual Impacts on Cultural Resources, Alternative A

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ Top of new bus and parking facility would be visible above historic station's roofline from Delaware Avenue at D and C Streets NE, introducing noticeable asymmetry in the view of the station. ▪ New parking facility would be visible from west side of Columbus Circle Drive (massing would be similar to existing garage). ▪ Visual changes would be highly noticeable and the sensitivity of WUS is high, largely due to the loss of symmetry in the view from the south. **WUS Historic Site** ▪ Reconstruction of the rail terminal and construction of the train hall, bus facility, and parking facility would change the appearance of the historic site and alter visual connections. ▪ From north, train hall and new parking facility would partially hide the rail terminal and back of historic station building. ▪ Highly visible changes would likely compromise character-defining features and integrity of setting, feeling, and association. **REA Building** ▪ Reconstruction of the rail terminal would change the character of visual connection with the tracks. ▪ New train hall and parking facility would be visible to the southwest. ▪ Changes in visual environment would be highly noticeable and the REA Building's sensitivity to these changes is high.
Minor Adverse	**Thurgood Marshall Federal Judiciary Building; Woodward Lothrop Service Warehouse** ▪ Moderate to high visibility of the Project elements from these resources. ▪ Low sensitivity to visual changes as they do not derive their significance from visual connections to WUS.
Negligible Adverse	**Square 750 Rowhouse Development; St. Joseph's Home (Former)** ▪ Bus facility, parking facility, and train hall just visible. ▪ Low sensitivity would not affect the resources' integrity.
Beneficial	**GPO Warehouse No. 4** ▪ Less visibility of WUS elements from this resource.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative A would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 other cultural resources. Increased traffic volumes in Alternative A have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The direct operational noise, vibration, and traffic impacts of Alternative A on cultural resources are described in **Table 5-146**.

Table 5-146. Direct Operational Traffic, Noise, and Vibration Impacts on Cultural Resources, Alternative A

Impact	Resources and Summary Description
Potential Adverse	**Capitol Hill Historic District** ▪ Peak-time traffic on 2nd Street NE between Massachusetts Avenue and H Street would increase by 22 percent (approximately 1,400 to 1,700 trips); peak-time traffic on F Street NE would increase by 37 percent (approximately 550 to 750 trips). ▪ Potential for diversion of traffic through the historic district due to increased volumes on H Street and Massachusetts Avenue. ▪ Although the Capitol Hill Historic District, as characterized in the NRHP nomination, primarily derives its significance from its architecture and its contribution to the development of Washington, DC, greater traffic volumes may potentially create visual impacts, conflicts with pedestrians and bicyclists, and other disturbances affecting access to homes and businesses that would detract from peaceful setting some residents consider to be a defining character of their historic neighborhood.
Minor Adverse	**St. Joseph's Home (Former); Square 750 Rowhouse Development (K Street NE side); Capitol Press Building (Former)** ▪ Noise increase relative to existing conditions would exceed FTA criteria but would be less than 3 dBA. ▪ Imperceptible change that would not compromise the resources' integrity of setting, feeling, or association.
Negligible Adverse	**WUS; C&P Telephone Company Warehouse; City Post Office/Postal Museum; GPO Warehouse No.4; Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former); Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; 901 Second Street NE; Union Market Historic District; and Capitol Hill Historic District (along 2nd Street NE)** ▪ Noise increases would be less than 3dBA and would not exceed FTA criteria. ▪ Would not compromise the resources' integrity of setting, feeling, or association. ▪ Changes in vibration levels would be negligible and would not affect the integrity of any cultural resource.

Indirect Operational Impacts

Relative to existing conditions, with the potential Federal air-rights development, visual changes in Alternative A would have the following indirect operational impacts on cultural resources in addition to the direct impacts: moderate adverse visual impact on one cultural resource; minor adverse visual impacts on five cultural resources; and negligible adverse visual impacts on six cultural resources.

In Alternative A, the potential Federal air-rights development would sit atop the new parking facility, not exceeding the 130-foot height limit under the anticipated zoning. The change would be small relative to the scale of the entire structure. The impacts of Alternative A would remain the same as described in **Section 5.12.4.2**, *Alternative A, Direct Operational Impacts* with exceptions shown in **Table 5-147**.

Table 5-147. Indirect Operational Visual Impacts on Cultural Resources, Alternative A

Impact	Resources and Summary Description
Moderate Adverse	**U.S. Capitol Dome Viewshed** ▪ Potential Federal air-right development visible from the dome. ▪ Would not rise above the horizon or block or disrupt any views. ▪ Viewshed is moderately sensitive to these changes.
Minor Adverse	**L'Enfant-McMillan Plan** ▪ Potential Federal air-right would affect several street corridors that are part of the plan. ▪ Out of 19 evaluated views, major visual impacts to one, moderate impacts to four, minor impacts to four, negligible impacts to six, beneficial impacts to one. ▪ In the aggregate, visual changes would have limited visibility and would not affect the plan's integrity. **City Post Office/Postal Museum; Senate Parks, Underground Garage and Fountains; Columbus Plaza; Capitol Hill Historic District** ▪ Low to moderately visible visual changes due to the potential Federal air-rights development. ▪ Resources have low to moderate sensitivity to these changes. ▪ Federal air-rights development would be distinctly visible from Columbus Plaza but would not compromise its integrity of setting as a forecourt to WUS.
Negligible Adverse	**Dirksen and Hart Senate Office Buildings; GPO; Library of Congress Thomas Jefferson Building; St. Joseph's Home (Former); Uline Ice Company Plant and Arena Complex; Russel Senate Office Building** ▪ The potential Federal air-rights development would be visible from these resources. ▪ Because of the distance, and intervening buildings and vegetation, the change would barely be noticeable and would not compromise integrity of setting, feeling, or association.

Construction Impacts

Alternative A's construction would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on one cultural resource; and negligible adverse impacts on 15 cultural resources. Noise and vibration from construction activities would result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on two cultural resources; and negligible adverse impacts on ten cultural resources.

Table 5-148 provides details on the construction impacts of Alternative A.

Table 5-148. Construction Impacts on Cultural Resources, Alternative A

Impact	Resources and Summary Description
Physical	
Potential Adverse	**WUS Historic Site** ▪ Excavation of most of the rail terminal to reconstruct the tracks and platforms, construct concourses, and set foundations and columns supporting the overbuild structures. ▪ Much of rail terminal was identified as having moderate to high archaeological potential, although it contains no known archaeological resources. Possible that excavations and ground disturbance could inadvertently damage or destroy unknown significant archaeological deposits.
Visual	
Moderate Adverse	**WUS; WUS Historic Site; REA Building** ▪ Construction would occur within or directly adjacent next to these resources over the entire construction period of 11 years and 5 months. ▪ WUS Historic Site would become a construction site with highly visible fencing around construction areas (including the interior historic station building during column removal); staging areas; heavy construction equipment; excavated areas; and structures under construction. ▪ Resources have moderate sensitivity: construction is not a permanent condition; phased construction would move the focus of visually disruptive activities over time; visitor experience would be temporarily diminished but not entirely compromised.
Minor Adverse	**U.S. Capitol Dome Viewshed** ▪ Construction activities would be highly visible from the dome. ▪ Low sensitivity due to distance and common character of construction sites in an urban setting.
Negligible Adverse	**City Post Office/Postal Museum; Dirksen and Hart Senate Office Buildings; GPO; GPO Warehouse No. 4; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building; Senate Parks, Underground Garage, and Fountains; Square 750 Rowhouse Development; St. Joseph's Home (Former); Thurgood Marshall Federal Judiciary Building; Uline Ice Company Plant and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Capitol Hill Historic District; L'Enfant-McMillan Plan** ▪ Construction would take place in phases over a duration of approximately 11 years and 5 months. ▪ Resources have low sensitivity due to distance and moving focus of construction activities over time. ▪ Construction sites are a common sight in urban environments and are not be a permanent condition.
Traffic, Noise, and Vibration	
Major Adverse	**WUS; REA Building** ▪ Vibratory pile driving would occur within 10 to 16 feet of both resources, resulting in vibration levels of approximately 0.33 to 0.67 inches per second (in/s). ▪ Depending on the sensitivity of the buildings, which has not been determined, this could exceed the threshold for structural damage and compromise their physical integrity.

Impact	Resources and Summary Description
	▪ During support of excavation (SOE) construction activities, noise levels in the back of WUS and at the REA Building would reach up to 90.1 dBA and 92.9 dBA, respectively. ▪ This would be above the FTA criteria for severe noise impacts. ▪ These noise levels, while elevated, would not compromise the resources' integrity of setting, feeling, or association. WUS's has always been a site of great activity and noise. The REA Building's significance comes from its architectural design and association with WUS, not its quiet setting.
Moderate Adverse	**City Post Office/Postal Museum; GPO Warehouse No.4; St. Joseph's Home (Former); Square 750 Rowhouse Development (917-923 2nd Street NE; 208-224, 226-242, and 219-231 Parker Street NE); 901 Second Street NE.** ▪ During SOE construction and at the beginning of excavation activities, noise levels at or near these resources would exceed the FTA criteria for severe noise impacts. ▪ St. Joseph's Home and parts of Square 750 (203-219 K Street NE and 917-923 2nd Street NE) would experience levels of construction vibration above the annoyance threshold. ▪ The significance of none of these resources is dependent on a quiet environment. ▪ All five resources already experience heavy traffic and associated noise and vibration.
Minor Adverse	**C&P Telephone Company Warehouse** ▪ Vibration from construction truck traffic would exceed the FTA threshold for annoyance near C&P Telephone Company Warehouse. Vibration would not create risk of structural damage. **Capitol Hill Historic District (northwestern edge)** ▪ If only trucks are used to haul away excavation debris, truck noise and vibration would exceed FTA threshold for moderate impacts and FTA threshold for annoyance. ▪ Impacts would be localized and limited to edge of the district bordering 2nd Street NE. Majority of the historic district would experience no noise or vibration impacts. ▪ Impacts would not be continuous and would stop after excavation is complete. ▪ Excavation operations would last approximately 5 months in Phase 1 (out of a total phase duration of 2 years and 5 months). Phase 1 is the phase that would most affect conditions along 2nd Street NE. Phase 4 would have the longest excavation period (approximately 1 year and 5 months out of a total duration of 3 years and 1 month) but would be the phase furthest from the Capitol Hill Historic District. ▪ Noise and vibration would not compromise or diminish the architectural characteristics of the Capitol Hill Historic District or its significance to the development of the District.
Negligible Adverse	**Capitol Press Building (Former); Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former); Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Union Market Historic District**

Impact	Resources and Summary Description
	▪ Any noise and vibration these properties may experience would be negligible and would not affect the integrity of their respective settings.

Comparison to the No-Action Alternative

The physical and noise and vibration-related operational impacts of Alternative A on cultural resources relative to the No-Action Alternative would generally be the same as those relative to existing conditions. Column removal, the demolition of the Claytor Concourse, and the reconstruction of the rail terminal would affect WUS and the WUS Historic Site in the same manner. Noise-related impacts would also be the same because the operational noise and vibration impact analysis showed that differences in noise levels in Alternative A would be within 1 or 2 dBA of what they would be in the No-Action Alternative. This difference is not likely to be noticeable. For the purposes of the analysis of noise-related impacts on cultural resources, therefore, the two baselines are equivalent.

With regard to traffic impacts on the Capitol Hill Historic District, the proportional increase in the traffic that would or may travel through the district would be smaller relative to the No-Action Alternative than relative to existing conditions. During peak time, traffic on F Street NE east of 2nd Street would increase by approximately 24 percent relative to the No-Action Alternative (from around 620 trips to around 750) against 37 percent relative to existing conditions. Peak time trips along 2nd Street NE would increase by 10 percent relative to the No-Action Alternative (from around 1,560 trips to around 1,700 trips) instead of 22 percent relative to existing conditions.

Visual impacts on cultural resources relative to the No-Action Alternative would generally be less than relative to existing conditions. The mass of the private air-rights development above the rail terminal would mask Project elements from certain locations. In Alternative A, relative to the No-Action Alternative, all visual impacts would be the same with exception of those listed in **Table 5-149**.

Table 5-149. Comparison of Alternative A Operational Visual Impacts on Cultural Resources Relative to the No-Action Alternative and Existing Conditions

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
	Direct Impacts	
WUS Historic Site	Major adverse	Minor adverse
REA Building	Major adverse	No impact
Woodward and Lothrop Service Warehouse	Minor adverse	No impact
Thurgood Marshall Federal Judiciary Building	Minor adverse	No impact
St. Joseph's Home (Former)	Negligible adverse	No impact
Square 750 Rowhouse Development	Negligible adverse	No impact

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
Indirect Impacts		
Senate Parks, Underground Garage and Fountains	Minor adverse	Negligible adverse
Capitol Hill Historic District	Minor adverse	Negligible adverse
Dirksen and Hart Senate Office Building	Negligible adverse	No impact
Uline Ice Company Plant and Arena Complex	Negligible adverse	No impact
U.S. Dome Viewshed	Moderate adverse	No impact
L'Enfant-McMillan Plan	Minor adverse	Negligible adverse

5.12.4.3 Alternative B

Direct Operational Impacts

Physical impacts

Relative to existing conditions, Alternative B would have major adverse direct operational physical impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

Alternative B's physical impacts on WUS would be the same as Alternative A's as the source of these impacts, such as the column removal work and the demolition of the Claytor Concourse and its replacement with Concourse A and a new train hall, would be the same in both alternatives. Impacts are described in **Table 5-144** above.

Similarly, Alternative B's physical impacts on the WUS Historic Site would be the same as those of Alternative A, described in Impacts are described in **Table 5-144** above. Additionally, construction of the access ramp to the below-ground parking facility in Alternative B would require opening a large portal in the retaining wall (Burnham Wall) under the K Street Bridge. The wall is a contributing feature of the historic site.

The potential adverse physical impact of Alternative B on the REA Building would be the same as described for Alternative A in **Table 5-144** above.

Visual Impacts

Relative to existing conditions, in Alternative B, visual changes would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and REA Building; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two other cultural resources. They would also result in a beneficial direct operational impact on one cultural resource.

The direct operational visual impacts of Alternative B are presented in **Table 5-150.** The intensity of Alternative B's impacts would be similar to that of Alternative A's. With regard to visual changes, the only difference between these two alternatives is that in Alternative B, the new bus facility would not have parking above it, resulting in a lower structure than the existing parking garage. From the south of WUS, this structure would not be visible above the roofline of the historic station building but it would be visible from the west side of Columbus Circle. The replacement of the existing garage with a smaller bus facility would be highly visible. Given the high sensitivity of WUS and the WUS Historic Site to this change, it would have the potential to result in a major adverse visual impact on these resources.

Table 5-150. Direct Operational Visual Impacts on Cultural Resources, Alternative B

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ New bus facility would be visible from west side of Columbus Circle Drive (massing would be similar to existing garage). ▪ Visual changes would be highly noticeable and the sensitivity of WUS is high. **WUS Historic Site** ▪ Reconstruction of the rail terminal and construction of the train hall and bus facility would change the appearance of the historic site and alter visual connections. ▪ From the north, the train hall would partially hide the rail terminal and back of historic station building. ▪ Highly visible changes would likely compromise character-defining features and integrity of setting, feeling, and association. **REA Building** ▪ Reconstruction of the rail terminal would change the character of visual connection with the tracks. ▪ New train hall and bus facility would be visible to the southwest. ▪ Changes in visual environment would be highly noticeable and the REA Building's sensitivity to these changes is high.
Minor Adverse	**Thurgood Marshall Federal Judiciary Building; Woodward Lothrop Service Warehouse** ▪ Moderate to high visibility of the Project elements from these resources. ▪ Low sensitivity to visual changes as they do not derive their significance from visual connections to WUS.
Negligible Adverse	**Square 750 Rowhouse Development; St. Joseph's Home (Former)** ▪ Bus facility and train hall just visible. ▪ Low visibility would not affect the resources' integrity.
Beneficial	**GPO Warehouse No. 4** ▪ Less visibility of WUS elements from this resource.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative B would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 other cultural resources. Increased traffic volumes in Alternative B have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The traffic, noise, and vibration impacts of Alternative B on cultural resources would be the same as those of Alternative A. These impacts are presented in **Table 5-146.** Operational noise impacts everywhere in Alternative B would be within 0.2 dBA of those predicted for Alternative A, an imperceptible difference. Because of the entrance of the below-ground parking facility on K Street NE, more traffic would travel along K Street and L Street NE and less traffic along H Street NE and North Capitol Street than in Alternative A. The operational noise analysis showed that this would not result in noticeably different ambient noise levels along those roadways.

Potential adverse impacts on the Capitol Hill Historic District from traffic would also be as in Alternative A. While the exact volumes of traffic that would travel along K Street NE and H Street NE may differ slightly between Alternative B and Alternative A, the difference would not be great enough to result in measurably greater or less impacts on the historic district.

Indirect Operational Impacts

Relative to existing conditions, with the potential Federal air-rights development, visual changes in Alternative B would have the following indirect operational impacts on cultural resources in addition to the direct impacts: moderate adverse visual impact on one cultural resource; minor adverse visual impacts on five cultural resources; and negligible adverse visual impacts on six cultural resources.

In Alternative B, the Federal air rights not needed to build the new bus facility would potentially be developed to the maximum extent allowed by the zoning. The resulting combined massing would be the same as in Alternative A, with the same indirect impacts as presented in **Table 5-147.**

Construction Impacts

Alternative B's construction would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on one; and negligible adverse impacts on 15. Noise and vibration from construction activities would result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on three cultural resources; and negligible adverse impacts on nine cultural resources.

The construction impacts of Alternative B on cultural resources are described in **Table 5-151.**

Table 5-151. Construction Impacts on Cultural Resources, Alternative B

Impact	Resources and Summary Description
	Physical
Potential Adverse	**WUS Historic Site** ▪ Same as Alternative A (**Table 5-148**).
	Visual
Moderate Adverse	**WUS; WUS Historic Site; REA Building** ▪ Construction would occur within or directly adjacent next to these resources over the entire construction period of 14 years and 4 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Minor Adverse	**U.S. Capitol Dome Viewshed** ▪ Same as Alternative A (**Table 5-148**).
Negligible Adverse	**City Post Office/Postal Museum; Dirksen and Hart Senate Office Buildings; GPO; GPO Warehouse No. 4; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building; Senate Parks, Underground Garage, and Fountains; Square 750 Rowhouse Development; St. Joseph's Home (Former); Thurgood Marshall Federal Judiciary Building; Uline Ice Company Plant and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Capitol Hill Historic District; L'Enfant-McMillan Plan** ▪ Construction would take place in phases over a duration of approximately 14 years and 4 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
	Traffic, Noise, and Vibration
Major Adverse	**WUS; REA Building** ▪ Clam shovel drops associated with slurry wall construction may occur within 10 feet of WUS, resulting in vibration levels of approximately 0.12 to 0.8 in/s. ▪ Drilling for secant pile walls may occur within 10 to 16 feet of the REA Building, resulting in vibration levels of approximately 0.17 to 0.35 in/s. ▪ During SOE construction activities, noise levels in the back of WUS and at the REA Building would reach up to 90.1 dBA and 92.9 dBA, respectively. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Moderate Adverse	**City Post Office/Postal Museum; GPO Warehouse No.4; St. Joseph's Home (Former); Square 750 Rowhouse Development (917-923 2nd Street NE; 208-224, 226-242, and 219-231 Parker Street NE); 901 Second Street NE.** ▪ Same as Alternative A (**Table 5-148**).
Minor Adverse	**C&P Telephone Company Warehouse; Topham's Luggage Factory (Former); Capitol Hill Historic District (northwestern edge)** ▪ Same as Alternative A (**Table 5-148**), except that excavation operations in Phase 4 would last for approximately 2 years and 7 months out of a total phase duration of 4 years and 11 months.
Negligible Adverse	**Capitol Press Building (Former); Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Union Market Historic District** ▪ Same as Alternative A (**Table 5-148**).

Comparison to the No-Action Alternative

The physical and noise and vibration-related operational impacts of Alternative B on cultural resources relative to the No-Action Alternative would be the same as those relative to existing conditions for the same reasons as explained for Alternative A. Differences in traffic impacts on the Capitol Hill Historic District and differences in visual impacts would also be as described for Alternative A; see **Section 5.12.4.2**, *Alternative A, Comparison to the No-Action Alternative*.

5.12.4.4 Alternative C

Direct Operational Impacts

Physical Impacts

Relative to existing conditions, Alternative C (either option) would have major adverse direct operational physical impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

Alternative C's physical impacts on WUS would be the same as Alternative A's as the source of these impacts, such as the column removal work and the demolition of the Claytor Concourse and its replacement with Concourse A and a new train hall, would be the same in both alternatives. Impacts are described in **Table 5-144** above.

Similarly, Alternative C's physical impacts on the WUS Historic Site would be the same as those of Alternative A, described in Impacts are described in **Table 5-144** above. Additionally, construction of the access ramp to the below-ground parking facility in Alternative C would require opening a large portal in the retaining wall (Burnham Wall) under the K Street Bridge. The wall is a contributing feature of the historic site.

The potential adverse physical impact of Alternative C on the REA Building would be the same as described for Alternative A in **Table 5-144** above.

Visual Impacts - East Option

Relative to existing conditions, visual changes in Alternative C with the East Option would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and the REA Building; minor adverse direct operational impacts on five cultural resources; and negligible adverse direct operational impacts on one cultural resource. They would also result in beneficial direct operational impacts on two cultural resources.

The visual direct operational impacts of Alternative C with the East Option are described in **Table 5-152**.

Table 5-152. Direct Operational Visual Impacts on Cultural Resources, Alternative C East Option

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ Bus pick-up and drop-off area and train hall behind historic station building would be highly visible from First Street and 2nd Street NE. ▪ These changes would alter the visual environment of WUS in a manner that would alter its integrity of setting, feeling, and association ▪ Demolition of the existing parking garage would be highly visible, but removal would not adversely affect WUS since existing garage is incompatible. **WUS Historic Site** ▪ Reconstruction of railroad terminal and construction of the bus pick-up and drop-off area and train hall would change the appearance of the historic site south of H Street Bridge. ▪ Construction of the bus facility and parking facility to northeast of H Street Bridge would create visual obstruction in a currently open part of the rail terminal. ▪ Changes within rail terminal would noticeably alter existing visual connections between components south and north of H Street Bridge. **REA Building** ▪ New bus facility and above-ground parking facility would rise behind the building, blocking visual connections with rail terminal on west side. ▪ Same new facilities would alter views toward REA Building from the east side along I (Eye) Street NE and would be highly visible above the roofline.
Minor Adverse	**Square 750 Rowhouse Development; 901 Second Street NE; Woodward Lothrop Service Warehouse** ▪ Bus facility and parking facility would be highly visible. ▪ Resources have low sensitivity as they have lost much of their integrity of feeling, association, and setting due to recent nearby developments. **Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former)** ▪ Project elements partially visible from these resources. ▪ Resources have low sensitivity to such changes as they do not derive their significance from visual connections to WUS.
Negligible Adverse	**St. Joseph's Home (Former)** ▪ Project element just visible. ▪ Low sensitivity would not affect the resources' integrity.
Beneficial	**GPO; GPO Warehouse No. 4** ▪ Less visibility of WUS elements from these resources.

Visual Impacts - West Option

Relative to existing conditions, visual changes in Alternative C with the West Option would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and the REA Building; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two cultural resources. They would also result in beneficial direct operational impacts on two resources.

The visual direct operational impacts of Alternative C with the West Option are described in **Table 5-153**.

Table 5-153. Direct Operational Visual Impacts on Cultural Resources, Alternative C West Option

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ Same as East Option. **WUS Historic Site** ▪ Same as East Option. **REA Building** ▪ New bus facility and above-ground parking facility would rise behind the building across the rail terminal. ▪ Change would affect the visual relationship of the building to the rail terminal. ▪ The resource has high sensitivity to such a change, which would alter its integrity of setting, feeling, and association.
Minor Adverse	**Woodward Lothrop Service Warehouse** ▪ Same as East Option. **Thurgood Marshall Federal Judiciary Building; Topham's Luggage Factory (Former)** ▪ Same as East Option.
Negligible Adverse	**Square 750 Rowhouse Development; St. Joseph's Home (Former)** ▪ Project element just visible. ▪ Low sensitivity would not affect the resources' integrity.
Beneficial	**GPO; GPO Warehouse No. 4** ▪ Same as East Option.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative C (either option) would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 cultural resources. Increased traffic volumes in Alternative C have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The noise and vibration impacts of Alternative C on cultural resources would be the same as those of Alternative A (see **Table 5-146** above). Everywhere operational noise impacts in Alternative C would be within 0.2 dBA of those predicted for Alternative A, an imperceptible difference. Because of the entrance of the below-ground parking facility on K Street NE, more traffic would travel along K Street and L Street NE and less traffic along H Street NE and North Capitol Street than in Alternative A. The operational noise analysis showed that this would not result in noticeably different ambient noise levels along those roadways.

Potential traffic impacts on the Capitol Hill Historic District would also be as in Alternative A. While the exact volumes of traffic that would travel along K Street NE and H Street NE may differ slightly between Alternative C and Alternative A, the difference would not be great enough to result in measurably greater or less impacts on the historic district.

Indirect Operational Impacts

Relative to existing conditions, with the potential Federal air-rights development, visual changes in Alternative C (either option) would have the following indirect operational impacts on cultural resources in addition to the alternative's direct impacts: moderate adverse visual impacts on one cultural resource; minor adverse visual impacts on three cultural resources; and negligible adverse visual impacts on six cultural resources.

In Alternative C, the Federal air rights where the existing parking garage stands would potentially be developed consistent with the anticipated zoning. The structure would have the same height as in Alternative A, with similar impacts. Because the east-west train hall would push the potential Federal air-rights development further back from the station than under that alternative, it would be less visible from some resources.

With the potential Federal air-rights development, Alternative C would have the additional visual impacts described in **Table 5-154**.

Table 5-154. Indirect Operational Visual Impacts on Cultural Resources, Alternative C

Impact	Resources and Summary Description
Moderate Adverse	**U.S. Capitol Dome Viewshed** ▪ Potential Federal air-right development visible from the dome. ▪ Would not rise above the horizon or block or disrupt any views. ▪ Viewshed is moderately sensitive to these changes.
Minor Adverse	**L'Enfant-McMillan Plan** ▪ Potential Federal air-right would affect several street corridors that are part of the plan. ▪ Out of 19 evaluated views, major visual impacts to two, moderate impacts to four (East Option) or three (West Option), minor impacts to four, negligible impacts to three, beneficial impacts to one. ▪ In the aggregate, visual changes would have limited visibility and would not affect the plan's integrity. **Senate Parks, Underground Garage and Fountains; Capitol Hill Historic District** ▪ Low to moderately visible visual changes due to the potential Federal air-rights development. ▪ Resources have low to moderate sensitivity to these changes.
Negligible Adverse	**Dirksen and Hart Senate Office Buildings; Library of Congress Thomas Jefferson Building; St. Joseph's Home (Former); Uline Ice Company Plant and Arena Complex; Russel Senate Office Building** ▪ The potential Federal air-rights development would be visible from these resources. ▪ Because of the distance, and intervening buildings and vegetation, the change would barely be noticeable and would not compromise integrity of setting, feeling, or association. **City Post Office/Postal Museum** ▪ The potential Federal air-rights development would be visible from it but would occupy almost the same space as the existing parking garage. ▪ The resource's sensitivity to the change would be low.

Construction Impacts

Construction of Alternative C (either option) would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on one cultural resource; and negligible adverse impacts on 16 (East Option) or 14 (West Option) cultural resources. Noise and vibration from construction activities in Alternative C (either option) would result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on two cultural resources; and negligible adverse impacts on ten cultural resources.

The construction impacts of Alternative C on cultural resources are presented in **Table 5-155**.

Table 5-155. Construction Impacts on Cultural Resources, Alternative C

Impact	Resources and Summary Description
Physical	
Potential Adverse	**WUS Historic Site** ▪ Same as Alternative A (**Table 5-148**).
Visual	
Moderate Adverse	**WUS; WUS Historic Site; REA Building** ▪ Construction would occur within or directly adjacent next to these resources over the entire construction period of 12 years and 3 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Minor Adverse	**U.S. Capitol Dome Viewshed** ▪ Same as Alternative A (**Table 5-148**).
Negligible Adverse (* indicates that impact would occur only in the East Option)	**City Post Office/Postal Museum; Dirksen and Hart Senate Office Buildings; GPO; GPO Warehouse No. 4; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building; Senate Parks, Underground Garage, and Fountains; Square 750; St. Joseph's Home (former); Thurgood Marshall Federal Judiciary Building; Uline Ice Company Plant and Arena Complex; Woodward and Lothrop Service Warehouse; Capitol Hill Historic District; L'Enfant-McMillan Plan; Topham's Luggage Factory*; 901 Second Street*** ▪ Construction would take place in phases over a duration of approximately 12 years and 3 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Traffic, Noise, and Vibration	
Major Adverse	**WUS; REA Building** ▪ Same as Alternative A (**Table 5-148**).
Moderate Adverse	**City Post Office/Postal Museum; GPO Warehouse No.4; St. Joseph's Home (Former); Square 750 Rowhouse Development (917-923 2nd Street NE; 208-224, 226-242, and 219-231 Parker Street NE); 901 Second Street NE.** ▪ Same as Alternative A (**Table 5-148**).
Minor Adverse	**C&P Telephone Company Warehouse; Topham's Luggage Factory (Former); Capitol Hill Historic District (northwestern edge)** ▪ Same as Alternative A (**Table 5-148**), except that excavation operations in Phase 4 would last for approximately 2 years out of a total phase duration of 4 years.

Impact	Resources and Summary Description
Negligible Adverse	**Capitol Press Building (Former); Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Union Market Historic District** **C&P Telephone Company Warehouse; Topham's Luggage Factory (Former); Capitol Hill Historic District (northwestern edge)** ▪ Same as Alternative A (**Table 5-148**).

Comparison to the No-Action Alternative

The physical and noise and vibration-related operational impacts of Alternative C (either option) on cultural resources relative to the No-Action Alternative would be the same as those relative to existing conditions for the same reasons as explained for Alternative A (**Section 12.5.2.4**, *Comparison to the No-Action Alternative*). Differences in traffic impacts on the Capitol Hill Historic District would also be as described for Alternative A.

Visual impacts on cultural resources relative to the No-Action Alternative would generally be less than relative to existing conditions. The mass of the private air-rights development above the rail terminal would mask Project elements from certain locations. In Alternative C relative to the No-Action Alternative, all visual impacts would be the same with exception of those listed in **Table 5-156**.

Table 5-156. Comparison of Alternative C Operational Visual Impacts on Cultural Resources Relative to the No-Action Alternative and Existing Conditions

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
Direct Impacts		
WUS Historic Site	Major adverse	Minor adverse
REA Building	Major adverse	No impact
Woodward and Lothrop Service Warehouse	Minor adverse	No impact
Thurgood Marshall Federal Judiciary Building	Minor adverse	No impact
St. Joseph's Home (Former)	Negligible adverse	No impact
Square 750 Rowhouse Development	Negligible (West Option) or minor (East Option) adverse	No impact
Indirect Impacts		
Senate Parks, Underground Garage and Fountains	Minor adverse	Negligible adverse
Capitol Hill Historic District	Minor adverse	Negligible adverse
Dirksen and Hart Senate Office Building	Negligible adverse	No impact
Uline Ice Company Plant and Arena Complex	Negligible adverse	No impact

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
U.S. Dome Viewshed	Moderate adverse	No impact
L'Enfant-McMillan Plan	Minor adverse	Negligible adverse

5.12.4.5 Alternative D

Direct Operational Impacts

Physical Impacts

Relative to existing conditions, Alternative D would have major adverse direct operational physical impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

Alternative D's physical impacts on WUS would be the same as Alternative A's as the source of these impacts, such as the column removal work and the demolition of the Claytor Concourse and its replacement with Concourse A and a new train hall, would be the same in both alternatives. Impacts are described in Table 5-144 above.

Similarly, Alternative D's physical impacts on the WUS Historic Site would be the same as those of Alternative A, described in **Table 5-144** above. Additionally, construction of the access ramp to the below-ground parking facility in Alternative D would require opening a large portal in the retaining wall (Burnham Wall) under the K Street Bridge. The wall is a contributing feature of the historic site.

The potential adverse physical impact of Alternative D on the REA Building would be the same as described for Alternative A in Table 5-144 above.

Visual Impacts

Relative to existing conditions, visual changes in Alternative D would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and the REA Building; moderate adverse direct operational impacts on one cultural resource; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two cultural resources. They would also result in beneficial direct operational impacts on two cultural resources

The direct operational visual impacts of Alternative D are presented in **Table 5-157**.

Table 5-157. Direct Operational Visual Impacts on Cultural Resources, Alternative D

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ The bus facility and train hall behind the historic station building would be highly visible from First Street and 2nd Street NE. ▪ These changes would alter the visual environment of WUS in a manner that would alter its integrity of setting, feeling, and association ▪ Demolition of the existing parking garage would be highly visible, but removal would not adversely affect WUS since existing garage is incompatible. **WUS Historic Site** ▪ Reconstruction of railroad terminal and construction of the bus facility and train hall would change the appearance of historic site south of H Street Bridge. ▪ Construction of the above-ground parking facility south of K Street NE would create a visual obstruction in a currently open part of the rail terminal. ▪ Changes within the rail terminal would noticeably alter existing visual connections between components south and north of H Street Bridge. **REA Building** ▪ The above-ground parking facility would be highly visible to the north of the building. ▪ Although tracks and platforms would remain visible from the building, the new parking facility would affect the visual relationship of the building to the rail terminal.
Moderate Adverse	**Square 750 Rowhouse Development** ▪ The above-ground parking facility would be highly visible from this resource. ▪ It would stand at the western end of Parker Street NE, where it would close the view, instead of Substation 25A, with a noticeable increase in the height of the structure. ▪ The resource's sensitivity to this change is low as it has lost much of its integrity of feeling, association, and setting due to recent development nearby.
Minor Adverse	**Thurgood Marshall Federal Judiciary Building; Woodward Lothrop Service Warehouse** ▪ Project elements would be moderately to highly visible from these resources. ▪ Resources have low sensitivity to such changes
Negligible Adverse	**St. Joseph's Home (Former); Uline Ice Company Plant and Arena Complex** ▪ Project element just visible. ▪ Low sensitivity would not affect the resources' integrity.
Beneficial	**GPO; GPO Warehouse No. 4** ▪ Less visibility of WUS elements from these resources.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative D would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 cultural resources. Increased traffic volumes in Alternative D have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The noise and vibration impacts of Alternative D on cultural resources would be the same as those of Alternative A (see **Table 5-146** above). Everywhere operational noise impacts in Alternative D would be within 0.2 dBA of those predicted for Alternative A, an imperceptible difference. Because of the entrance of the below-ground parking facility on K Street NE, more traffic would travel along K Street and L Street NE and less traffic along H Street NE and North Capitol Street than in Alternative A. The operational noise analysis showed that this would not result in noticeably different ambient noise levels along those roadways.

Potential traffic impacts on the Capitol Hill Historic District would also be as in Alternative A. While the exact volumes of traffic that would travel along K Street NE and H Street NE may differ slightly between Alternative D and Alternative A, the difference would not be great enough to result in measurably greater or less impacts on the historic district.

Indirect Operational Impacts

Relative to existing conditions, with the potential Federal air-rights development, visual changes in Alternative D would have the following indirect operational impacts on cultural resources in addition to the alternative's direct impacts: moderate adverse visual impacts on two cultural resources; minor adverse visual impacts on two cultural resources; and negligible adverse visual impacts on five cultural resources.

In Alternative D, the Federal air rights where the existing parking garage stands would potentially be developed consistent with the anticipated zoning. The structure would have the same height as in Alternative A, with similar impacts. Because the east-west train hall would push the potential Federal air-rights development further back from the station than under that alternative, it would be less visible from some resources.

With the potential Federal air-rights development, Alternative D would have the additional visual impacts described in **Table 5-158**.

Table 5-158. Indirect Operational Visual Impacts on Cultural Resources, Alternative D

Impact	Resources and Summary Description
Moderate Adverse	**U.S. Capitol Dome Viewshed** ▪ Potential Federal air-right development visible from the dome. ▪ Would not rise above the horizon or block or disrupt any views. ▪ Viewshed is moderately sensitive to these changes. **L'Enfant-McMillan Plan** ▪ Potential Federal air-right would affect several street corridors that are part of the plan. ▪ Out of 19 evaluated views, major visual impacts to two, moderate impacts to five, minor impacts to three, negligible impacts to two, beneficial impacts to one. ▪ In the aggregate, visual changes would be noticeable from several locations.
Minor Adverse	**Senate Parks, Underground Garage and Fountains; Capitol Hill Historic District** ▪ Low to moderately visible visual changes due to the potential Federal air-rights development. ▪ Resources have low to moderate sensitivity to these changes.

Impact	Resources and Summary Description
Negligible Adverse	**Dirksen and Hart Senate Office Buildings; Library of Congress Thomas Jefferson Building; St. Joseph's Home (Former); Russel Senate Office Building** ▪ The potential Federal air-rights development would be visible from these resources. ▪ Because of the distance, and intervening buildings and vegetation, the change would barely be noticeable and would not compromise integrity of setting, feeling, or association. **City Post Office/Postal Museum** ▪ The potential Federal air-rights development would be visible from it but would occupy almost the same space as the existing parking garage. ▪ The resource's sensitivity to the change would be low.

Construction Impacts

Construction of Alternative D would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on three cultural resource; and negligible adverse impacts on 12 cultural resources. Noise and vibration from construction activities in Alternative D would also result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on two cultural resources; and negligible adverse impacts on ten cultural resources.

The construction impacts of Alternative D on cultural resources are presented in **Table 5-159**.

Table 5-159. Construction Impacts on Cultural Resources, Alternative D

Impact	Resources and Summary Description
Physical	
Potential Adverse	**WUS Historic Site** ▪ Same as Alternative A (**Table 5-148**).
Visual	
Moderate Adverse	**WUS; WUS Historic Site; REA Building** ▪ Construction would occur within or directly adjacent next to these resources over the entire construction period of 12 years and 3 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Minor Adverse	**Square 750 Rowhouse Development; L'Enfant-McMillan Plan** ▪ Construction would be highly visible. ▪ Resources have low sensitivity to such changes. **U.S. Capitol Dome Viewshed** ▪ Same as Alternative A (**Table 5-148**).

Impact	Resources and Summary Description
Negligible Adverse	**City Post Office/Postal Museum; Dirksen and Hart Senate Office Buildings; GPO; GPO Warehouse No. 4; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building; Senate Parks, Underground Garage, and Fountains; St. Joseph's Home (former); Thurgood Marshall Federal Judiciary Building; Uline Ice Company Plant and Arena Complex; Woodward and Lothrop Service Warehouse; Capitol Hill Historic District** ▪ Construction would take place in phases over a duration of approximately 12 years and 3 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Traffic, Noise, and Vibration	
Major Adverse	**WUS; REA Building** ▪ Same as Alternative A (**Table 5-148**).
Moderate Adverse	**City Post Office/Postal Museum; GPO Warehouse No.4; St. Joseph's Home (Former); Square 750 Rowhouse Development (917-923 2nd Street NE; 208-224, 226-242, and 219-231 Parker Street NE); 901 Second Street NE.** ▪ Same as Alternative A (**Table 5-148**).
Minor Adverse	**C&P Telephone Company Warehouse; Capitol Hill Historic District (northwestern edge)** ▪ Same as Alternative A (**Table 5-148**), except that excavation operations in Phase 4 would last for approximately 2 years out of a total phase duration of 4 years.
Negligible Adverse	**Capitol Press Building (Former); Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Union Market Historic DistrictTopham's Luggage Factory (Former).** ▪ Same as Alternative A (**Table 5-148**).

Comparison to the No-Action Alternative

The physical and noise and vibration-related operational impacts of Alternative D on cultural resources relative to the No-Action Alternative would be the same as those relative to existing conditions for the same reasons as explained for Alternative A (**Section 12.5.2.4**, *Comparison to the No-Action Alternative*). Differences in traffic impacts on the Capitol Hill Historic District would also be as described for Alternative A.

Visual impacts on cultural resources relative to the No-Action Alternative would generally be less than relative to existing conditions. The mass of the private air-rights development above the rail terminal would mask Project elements from certain locations. In Alternative D relative to the No-Action Alternative, all visual impacts would be the same with exception of those listed in **Table 5-160**.

Table 5-160. Comparison of Alternative D Operational Visual Impacts on Cultural Resources Relative to the No-Action Alternative and Existing Conditions

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
Direct Impacts		
WUS Historic Site	Major adverse	Minor adverse
REA Building	Major adverse	No impact
Woodward and Lothrop Service Warehouse	Minor adverse	No impact
Thurgood Marshall Federal Judiciary Building	Minor adverse	No impact
St. Joseph's Home (Former)	Negligible adverse	No impact
Square 750 Rowhouse Development	Moderate adverse	No impact
Uline Ice Company Plant and Arena Complex	Negligible adverse	No impact
Indirect Impacts		
Senate Parks, Underground Garage and Fountains	Minor adverse	Negligible adverse
Capitol Hill Historic District	Minor adverse	Negligible adverse
Dirksen and Hart Senate Office Building	Negligible adverse	No impact
U.S. Dome Viewshed	Moderate adverse	No impact
L'Enfant-McMillan Plan	Moderate adverse	Negligible adverse

5.12.4.6 Alternative E

Direct Operational Impacts

Physical Impacts

Relative to existing conditions, Alternative E would have major physical adverse direct operational impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

Alternative E's physical impacts on WUS would be the same as Alternative A's as the source of these impacts, such as the column removal work and the demolition of the Claytor Concourse and its replacement with Concourse A and a new train hall, would be the same in both alternatives. Impacts are described in **Table 5-144** above.

Similarly, Alternative E's physical impacts on the WUS Historic Site would be the same as those of Alternative A, described in **Table 5-144** above. Additionally, construction of the access ramp to the below-ground parking facility in Alternative E would require opening a large portal in the retaining wall (Burnham Wall) under the K Street Bridge. The wall is a contributing feature of the historic site.

The potential adverse physical impact of Alternative E on the REA Building would be the same as described for Alternative A in **Table 5-144** above.

Visual Impacts

Relative to existing conditions, visual changes in Alternative E would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and the REA Building; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two cultural resources. They would also result in beneficial direct operational impacts on two resources.

The direct operational visual impacts of Alternative E are presented in **Table 5-161**.

Table 5-161. Direct Operational Visual Impacts on Cultural Resources, Alternative E

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ The bus facility and train hall behind the historic station building would be highly visible from First Street and 2nd Street NE. ▪ These changes would alter the visual environment of WUS in a manner that would alter its integrity of setting, feeling, and association ▪ Demolition of the existing parking garage would be highly visible, but removal would not adversely affect WUS since existing garage is incompatible. **WUS Historic Site** ▪ Reconstruction of railroad terminal and construction of the bus facility and train hall would change the appearance of historic site south of H Street Bridge. ▪ From the north, the train hall would hide the rail terminal and back of historic station building. ▪ Highly visible changes would likely compromise character-defining features and integrity of setting, feeling, and association. **REA Building** ▪ Reconstruction of the rail terminal would change the character of visual connection with the tracks. ▪ New train hall and bus facility would be visible to the southwest. ▪ Changes in visual environment would be highly noticeable and the REA Building's sensitivity to these changes is high.
Minor Adverse	**Thurgood Marshall Federal Judiciary Building; Woodward Lothrop Service Warehouse** ▪ Project elements would be moderately to highly visible from these resources. ▪ Resources have low sensitivity to such changes.
Negligible Adverse	**Square 750 Rowhouse Development; St. Joseph's Home (Former)** ▪ Project element just visible. ▪ Low sensitivity would not affect the resources' integrity.
Beneficial	**GPO; GPO Warehouse No. 4** ▪ Less visibility of WUS elements from these resources.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative E would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 cultural resources. Increased traffic volumes in Alternative E have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The noise and vibration impacts of Alternative E on cultural resources would be the same as those of Alternative A (see **Table 5-146** above). Everywhere operational noise impacts in Alternative E would be within 0.2 dBA of those predicted for Alternative A, an imperceptible difference. Because of the entrance of the below-ground parking facility on K Street NE, more traffic would travel along K Street and L Street NE and less traffic along H Street NE and North Capitol Street than in Alternative A. The operational noise analysis showed that this would not result in noticeably different ambient noise levels along those roadways.

Potential traffic impacts on the Capitol Hill Historic District would also be as in Alternative A. While the exact volumes of traffic that would travel along K Street NE and H Street NE may differ slightly between Alternative E and Alternative A, the difference would not be great enough to result in measurably greater or less impacts on the historic district.

Indirect Operational Impacts

Relative to existing conditions, with the potential Federal air-rights development, visual changes in Alternative E would have the following indirect operational impacts on cultural resources in addition to the alternative's direct impacts: moderate adverse visual impacts on one cultural resource; minor adverse visual impacts on three cultural resources; and negligible adverse visual impacts on six cultural resources.

In Alternative E, the Federal air rights where the existing parking garage stands would potentially be developed consistent with the anticipated zoning. The structure would have the same height as in Alternative A, with similar impacts. Because the east-west train hall would push the potential Federal air-rights development further back from the station than under that alternative, it would be less visible from some resources. With the potential Federal air-rights development, Alternative E would have the additional visual impacts described in **Table 5-162**.

Table 5-162. Indirect Operational Visual Impacts on Cultural Resources, Alternative E

Impact	Resources and Summary Description
Moderate Adverse	**U.S. Capitol Dome Viewshed** ▪ Potential Federal air-right development visible from the dome. ▪ Would not rise above the horizon or block or disrupt any views. ▪ Viewshed is moderately sensitive to these changes.
Minor Adverse	**L'Enfant-McMillan Plan** ▪ Potential Federal air-right would affect several street corridors that are part of the plan. ▪ Out of 19 evaluated views, major visual impacts to two, moderate impacts to three, minor impacts to four, negligible impacts to three, beneficial impacts to one. ▪ In the aggregate, visual changes would have limited visibility and would not affect the plan's integrity. **Senate Parks, Underground Garage and Fountains; Capitol Hill Historic District** ▪ Low to moderately visible visual changes due to the potential Federal air-rights development. ▪ Resources have low to moderate sensitivity to these changes.
Negligible Adverse	**Dirksen and Hart Senate Office Buildings; Library of Congress Thomas Jefferson Building; St. Joseph's Home (Former); Russel Senate Office Building; Uline Ice Company Plant and Arena Complex** ▪ The potential Federal air-rights development would be visible from these resources. ▪ Because of the distance, and intervening buildings and vegetation, the change would barely be noticeable and would not compromise integrity of setting, feeling, or association. **City Post Office/Postal Museum** ▪ The potential Federal air-rights development would be visible from it but would occupy almost the same space as the existing parking garage. ▪ The resource's sensitivity to the change would be low.

Construction Impacts

Alternative E's construction would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on one cultural resource; and negligible adverse impacts on 14 cultural resources. Noise and vibration from construction activities would result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on three cultural resources; and negligible adverse impacts on nine cultural resources.

The construction impacts of Alternative E on cultural resources are presented in **Table 5-163**.

Table 5-163. Construction Impacts on Cultural Resources, Alternative E

Impact	Resources and Summary Description
Physical	
Potential Adverse	**WUS Historic Site** ▪ Same as Alternative A (**Table 5-148**).
Visual	
Moderate Adverse	**WUS; WUS Historic Site; REA Building** ▪ Construction would occur within or directly adjacent next to these resources over the entire construction period of 14 years and 4 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Minor Adverse	**U.S. Capitol Dome Viewshed** ▪ Same as Alternative A (**Table 5-148**).
Negligible Adverse	**City Post Office/Postal Museum; Dirksen and Hart Senate Office Buildings; GPO; GPO Warehouse No. 4; Library of Congress, Thomas Jefferson Building; Russell Senate Office Building; Senate Parks, Underground Garage, and Fountains; Square 750 Rowhouse Development; St. Joseph's Home (former); Thurgood Marshall Federal Judiciary Building; Uline Ice Company Plant and Arena Complex; Woodward and Lothrop Service Warehouse; Capitol Hill Historic District; L'Enfant-McMillan Plan** ▪ Construction would take place in phases over a duration of approximately 14 years and 4 months. ▪ Otherwise, same as Alternative A (**Table 5-148**).
Traffic, Noise, and Vibration	
Major Adverse	**WUS; REA Building** ▪ Same as Alternative B (**Table 5-11**).
Moderate Adverse	**City Post Office/Postal Museum; GPO Warehouse No.4; St. Joseph's Home (Former); Square 750 Rowhouse Development (917-923 2nd Street NE; 208-224, 226-242, and 219-231 Parker Street NE); 901 Second Street NE.** ▪ Same as Alternative A (**Table 5-148**).
Minor Adverse	**C&P Telephone Company Warehouse; Topham's Luggage Factory (Former); Capitol Hill Historic District (northwestern edge)** ▪ Same as Alternative A (**Table 5-148**), except that excavation operations in Phase 4 would last for approximately 2 years and 7 months out of a total duration of 4 years and 11 months.
Negligible Adverse	**Capitol Press Building (Former); Holodomor Ukrainian Holocaust Memorial; St. Aloysius Catholic Church; St. Phillip's Baptist Church; Thurgood Marshall Federal Judiciary Building; Uline Ice Company and Arena Complex; Columbus Plaza; Woodward and Lothrop Service Warehouse; Union Market Historic District.** ▪ Same as Alternative A (**Table 5-148**).

Comparison to the No-Action Alternative

The physical and noise and vibration-related operational impacts of Alternative E on cultural resources relative to the No-Action Alternative would be the same as those relative to existing conditions for the same reasons as explained for Alternative A (**Section 12.5.2.4**, *Comparison to the No-Action Alternative*). Differences in traffic impacts on the Capitol Hill Historic District would also be as described for Alternative A.

Visual impacts on cultural resources relative to the No-Action Alternative would generally be less than relative to existing conditions. The mass of the private air-rights development above the rail terminal would mask Project elements from certain locations. In Alternative E relative to the No-Action Alternative, all visual impacts would be the same with exception of those listed in **Table 5-164**.

Table 5-164. Comparison of Alternative E Operational Visual Impacts on Cultural Resources Relative to the No-Action Alternative and Existing Conditions

Cultural Resource	Relative to Existing Conditions	Relative to No-Action Alternative
Direct Impacts		
WUS Historic Site	Major adverse	Minor adverse
REA Building	Major adverse	No impact
Woodward and Lothrop Service Warehouse	Minor adverse	No impact
Thurgood Marshall Federal Judiciary Building	Minor adverse	No impact
St. Joseph's Home (Former)	Negligible adverse	No impact
Square 750 Rowhouse Development	Negligible adverse	No impact
Indirect Impacts		
Senate Parks, Underground Garage and Fountains	Minor adverse	Negligible adverse
Uline Ice Company Plant and Arena Complex	Negligible adverse	No impact
Capitol Hill Historic District	Minor adverse	Negligible adverse
Dirksen and Hart Senate Office Building	Negligible adverse	No impact
U.S. Dome Viewshed	Moderate adverse	No impact
L'Enfant-McMillan Plan	Minor adverse	Negligible adverse

5.12.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Physical Impacts

Relative to existing conditions, Alternative A-C would have major adverse direct operational physical impacts on WUS and the WUS Historic Site. It would have a potential adverse direct operational physical impact on the REA Building.

Alternative A-C would have the same major adverse direct impacts on WUS and the WUS Historic Site as Alternative A. It would also have the same potential adverse impact on the REA Building as Alternative A. These impacts are described in **Table 5-144** above.

Visual Impacts

Relative to existing conditions, visual changes in Alternative A-C would result in major adverse direct operational impacts on WUS, the WUS Historic Site, and the REA Building; minor adverse direct operational impacts on two cultural resources; and negligible adverse direct operational impacts on two cultural resources. They would also result in beneficial direct operational impacts on one cultural resource.

The direct operational visual impacts of Alternative A-C are presented in **Table 5-165**.

Table 5-165. Direct Operational Visual Impacts on Cultural Resources, Alternative A-C

Impact	Resources and Summary Description
Major Adverse	**WUS** ▪ The top of new parking facility would be visible above historic station's roofline from Delaware Avenue and Louisiana Avenue, introducing noticeable asymmetry in the view of the station. ▪ Visual changes would be highly noticeable and the sensitivity of WUS is high. **WUS Historic Site** ▪ Reconstruction of the rail terminal and construction of the train hall, bus facility, and parking facility would change the appearance of the historic site and alter visual connections. ▪ From the north, train hall and new parking facility would partially hide the rail terminal and back of historic station building. ▪ Highly visible changes would likely compromise character-defining features and integrity of setting, feeling, and association. **REA Building** ▪ Reconstruction of the rail terminal would change the character of visual connection with the tracks. ▪ New bus facility and parking facility would be visible to the southwest. ▪ Changes in visual environment would be highly noticeable and the REA Building's sensitivity to these changes is high.
Minor Adverse	**Thurgood Marshall Federal Judiciary Building; Woodward Lothrop Service Warehouse** ▪ Same as Alternative A (**Table 5-145**).
Negligible Adverse	**Square 750 Rowhouse Development; St. Joseph's Home (Former)** ▪ Same as Alternative A (**Table 5-145**).
Beneficial	**GPO Warehouse No. 4** ▪ Less visibility of WUS elements from this resource.

Traffic, Noise, and Vibration Impacts

Relative to existing conditions, noise and vibration in Alternative A-C would result in minor adverse direct operational impacts on three cultural resources and negligible adverse direct operational impacts on 15 other cultural resources. Increased traffic volumes in Alternative A-C have the potential to further result in an adverse direct operational impact on the Capitol Hill Historic District from visual impacts, conflicts with pedestrians and bicyclists, and disturbances affecting access to homes and businesses.

The traffic, noise, and vibration-related impacts of Alternative A-C on cultural resources would be the same as those of Alternative A, presented in **Table 5-146** above.

Indirect Operational Impacts

With the potential Federal air-rights development, relative to existing conditions, Alternative A-C would have the following additional indirect operational impacts on cultural resources: minor adverse visual impacts on two resources and negligible adverse visual impacts on two resources.

In Alternative A-C, the remaining Federal air rights above and next to the bus facility and parking facility would potentially be developed, to a height not exceeding the 130-foot height limit allowing by the anticipated zoning for the area. The change would be small relative to the scale of the entire structure and the volume of space occupied by the entire structure would be similar to what would occur in Alternative A. Therefore, the indirect visual impacts of Alternative A-C would be the same as those of Alternative A: see **Table 5-147** above.

Construction Impacts

Alternative A-C's construction would potentially result in an adverse impact on unidentified archaeological resources within the WUS rail terminal. Visual changes during construction would result in moderate adverse impacts on three cultural resources; minor adverse impacts on one; and negligible adverse impacts on 15. Noise and vibration from construction activities would result in major adverse impacts on WUS and the REA Building; moderate adverse impacts on five cultural resources; minor adverse impacts on two cultural resources; and negligible adverse impacts on ten cultural resources.

Construction of Alternative A-C would involve activities similar to those of Alternative A and would take the same amount of time. Impacts to cultural resources would be the same. These impacts are presented in **Table 5-148** above.

Comparison to No-Action Alternative

Because the impacts of Alternative A-C relative to existing conditions would be the same or similar to those of Alternative A, impacts relative to the No-Action Alternative would also be the same. These impacts are addressed in **Section 5.12.4.2**, *Alternative A, Comparison to the No-Action Alternative* above.

5.12.5 Comparison of Alternatives

Section 12.6 of the *Washington Union Station Expansion Project, Environmental Consequences Technical Report, Comparison of Alternatives* (**Appendix C3**) presents a detailed comparison of the impacts of the No-Action Alternative and the Action Alternatives on each of the 55 cultural resources in the Study Area. A summary is below.

All Action Alternatives would result in major adverse direct operational physical impacts on WUS and the WUS Historic Site and a potential adverse operational physical impact on the REA Building.

All Action Alternatives would involve the removal of the Claytor Concourse and construction of various Project elements (Concourse A, bus facility, train hall) adjacent to the historic station building as well as partial demolition and replacement of the floor structure in the Retail and Ticketing Concourse to allow for the removal of columns from the underlying First Street Tunnel. All Action Alternatives would also involve excavating and reconstructing the rail terminal, as well as placing overbuilt Project elements within portions of the terminal that are currently open. Finally, all Action Alternatives would also require using land within the REA Building historic property parcel to build the H Street Concourse and modifying or eliminating the connection between the H Street Tunnel and the building.

In all Action Alternatives as well, excavation could result in the destruction or damage of archaeological resources if any are present. The depth of excavation would vary depending on the Action Alternative (least deep in Alternatives A and A-C, most deep in Alternatives B and E). However, any archaeological resources, if present, would be just below the fill that underlies the existing rail terminal. Even the less deep excavation in Alternatives A and A-C would disturb this potentially sensitive layer. Deeper excavation in the other Alternatives would not increase the likelihood of encountering archaeological remnants.

All Action Alternatives would also have adverse direct and indirect operational visual impacts on several cultural resources, as shown in **Table 5-166**. All Action Alternatives would result in major adverse direct visual impacts on WUS, the WUS Historic Site, and the REA Building because the reconstruction of the rail terminal and construction of above-ground project elements would substantially alter the visual environment of these resources and alter significant visual connections.

Table 5-166. Summary of Direct and Indirect Visual Impacts on Cultural Resources by Action Alternative[1]

	Number of Affected Resources						
Impact	Alternative A	Alternative B	Alternative C, East Option	Alternative C, West Option	Alternative D	Alternative E	Alternative A-C (Preferred)
Beneficial	1 (0)	1 (0)	2 (0)	2 (0)	2 (0)	2 (0)	1 (0)
Negligible Adverse	2 (6)	2 (6)	1 (6)	2 (6)	2 (5)	2 (6)	2 (6)
Minor Adverse	2 (5)	2 (5)	5 (3)	2 (3)	2 (2)	2 (3)	2 (5)
Moderate Adverse	0 (1)	0 (1)	0 (1)	0 (1)	1 (2)	0 (1)	0 (1)
Major Adverse	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)

1. First number is direct impacts; number in parentheses is indirect impacts.

All Action Alternatives would result in similar impacts from noise and vibration. There would be differences in traffic patterns between the alternatives with only below-ground parking accessed via K Street NE in Alternatives B and E; both below-ground parking accessed via K Street NE and above-ground parking accessed via H Street NE in Alternatives C and D; and only above-ground parking accessed via H Street NE in Alternatives A and A-C. However, noise impact analysis showed that the resulting differences in ambient noise levels would be too small to be perceptible. In all Action Alternatives, construction vibration could exceed the threshold for structural damage at WUS and the REA Building and to result in major adverse impacts. However, this would depend on the sensitivity of the buildings, which has not been determined.

All Action Alternatives would generate additional traffic along the northwestern edge of the Capitol Hill Historic District (2nd Street NE and H Street NE) and create a ramp connecting the deck to F Street NE eastbound. Congestion near WUS could potentially also result in some traffic seeking alternative routes through the historic district. The potential for such impacts to affect the Capitol Hill Historic District's integrity of setting or feeling would be the same in all Action Alternatives.

As explained in the impact analysis above, the Action Alternatives would all result in greater physical impacts on WUS than the No-Action Alternative. They also would have greater potential to affect undiscovered archaeological resources because they would involve much more excavation in the rail terminal.

Visual impacts would be smaller in all Action Alternatives than in the No-Action Alternative. This is because in the No-Action Alternative, the private air-rights development project would cover the entirety of the rail terminal south of K Street NE with highly visible structures. Additionally, the existing WUS parking garage, a structure incompatible with the historic character of WUS, would remain in place in the No-Action Alternative. In the Action Alternatives, it would be either replaced with a new structure or removed.

5.12.6 Avoidance, Minimization, and Mitigation Evaluation

Adverse impacts would be avoided, minimized, or mitigated through the Section 106 process. Resources on which the Action Alternatives would have a major adverse impact (WUS, WUS Historic Site, and REA Building) are those that would experience an adverse effect under Section 106. Per 36 CFR 800.6, a finding of adverse effect requires that Section 106 consultation continue to avoid, minimize, or mitigate effects to historic properties that would alter the characteristics that qualify the properties for inclusion in the NRHP.

Because the design of the Project is in its early stages, FRA anticipates preparing a Programmatic Agreement (PA) to establish a process to resolve the known adverse effects of the Project in accordance with 36 C.F.R. § 800.14(b)(1)(ii). This would include the exploration of avoidance and minimization measures. In addition, the PA would establish a process for on-going consultation and review as the level of design progresses following the Final EIS and a Record of Decision (and subject to funding) to ensure that form, materials, architectural features, and connections (visual and physical) to surrounding development are considered. FRA anticipates the PA would outline coordinated design review in the context of Federal and District regulations and guidelines.

FRA would develop the PA in consultation with the DC SHPO and the Section 106 Consulting Parties. Members of the public and the Consulting Parties are being invited to comment on the adverse effects to historic properties documented in the Draft AOE and the impacts on cultural resources presented in this DEIS. They are also invited to express their views on resolving adverse effects.

5.12.7 Permits and Regulatory Compliance

Following the Record of Decision (ROD) and execution of the PA, Project design will proceed and undergo further review by the National Capital Planning Commission and the Commission of Fine Arts in the context of Federal and District of Columbia regulations and guidelines, including:

- National Capital Planning Commission, *The Comprehensive Plan for the National Capital Urban Design Element* and *Historic Preservation Element*;
- EO 1259, *Commission of Fine Arts Review of Public Buildings in the District of Columbia Proposed by the Federal or DC governments*;
- EO 1862, *CFA Review of New Structures and Matters of Art Proposed by the Federal Government in DC*;
- EO 11593, *Protection and Enhancement of the Cultural Environment*;
- The Historic Landmark and Historic District Protection Act of 1978 (D. Law 2-144, as amended through October 1, 2016);
- The Height of Buildings Act of 1910; and
- District of Columbia Municipal Regulations, Zoning Regulations Special Purpose Zones, 11-K DCMR 305.

5.13 Parks and Recreation Areas

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on parks and recreation areas. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies relevant permitting and regulatory compliance requirements.

5.13.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to cultural resources are listed in **Section 4.13.1**, *Regulatory Context and Guidance*.

5.13.2 Study Area

As defined in **Section 4.13.2**, *Study Area*, the Local Study Area for parks and recreation areas includes the Project Area and the areas immediately adjacent to WUS and to the tracks within one to two city blocks (**Figure 4-28**). Impacts on a regional scale were not anticipated and no Regional Study Area was defined.

5.13.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on parks and recreation areas. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 13.4**, *Methodology,* provides a description of the analysis methodology. A summary is below.

Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.13.3.1 Operational Impacts

Potential operational impacts on parks and recreation areas were qualitatively assessed by reviewing how changes in activities and land use at WUS would affect these resources. The assessment considered physical integrity, usage, access, and visitor experience.

5.13.3.2 Construction Impacts

Construction impacts were assessed by reviewing the potential for activities associated with the construction of the alternatives to affect the use of a park or recreation area. Such activities include ground-disturbing work; use of park areas for staging or parking; limitations in use or access; and other factors that may interfere with user experience or the physical integrity of the park.

5.13.4 Impact Analysis

This section presents the impacts of the No-Action Alternative and the Action Alternatives on parks and recreation areas.

No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, the No-Action Alternative would have no direct operational impacts on parks and recreation areas.

The projects included in the No-Action Alternative would all take place within the Project Area, which contains no parks or recreation areas. Therefore, there would be no direct operational impacts on these resources.

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail due to increased usage.

In the No-Action Alternative, WUS would continue to serve as a transportation hub for District residents and visitors. Although the station would not be expanded, the annual number of train and bus passengers would increase from approximately 16.3 million to approximately 20.7 million. WUS is also a major touristic attraction, with approximately 8 million tourists visiting it every year. Visits would likely continue to grow. The private air-rights development would bring approximately 2,150 new residents and 6,300 new workers to the Project Area.[1]

An adverse impact on nearby parks and recreation areas is anticipated because the greater number of people passing through or residing in the Project Area would likely lead to an increase in the number of visitors to these parks and areas. Columbus Plaza and the Upper and Lower Senate Parks would likely see the greatest increase in visits due to their proximity to WUS and because they lie between the station and the U.S. Capitol complex. The Metropolitan Branch Trail may also see an increase in users if WUS commuters or the residents and employees of the private air-rights development use it for local travel or recreation. Private resources open to the public, such as the Plaza at 899 North Capitol Street NE and the Plaza at 750 First Street NE, may also experience some increase in users, as could the planned Plaza at Storey Park, when completed. The planned NoMA Green is too far from the station to be affected. Access to the Capitol Hill Montessori Playground is controlled by the school.

[1] See **Appendix C3**, **Section 5.14**, *Washington Union Station Expansion Project Environmental Consequences Technical Report, Social and Economic Conditions.*

More visits and greater foot traffic would result in accelerated wear and tear of pavements and landscaped areas in the affected parks and would increase maintenance costs. This impact would be minor for the following reasons. Although it is not possible to reliably quantify the increase in park usage that would occur because of the No-Action Alternative, it would be much smaller than the increase in the number of WUS users and private air-rights development residents and employees. This is because most new WUS users would be commuters or travelers passing through the station on their way to another destination and only a portion of the few thousands new residents and employees in the Study Area would likely make use of the local parks and recreation areas at any given time. In the context of the millions of people who visit the District and its parks every year, the contribution of the No-Action Alternative would be small.[2]

Construction Impacts

The No-Action Alternative would result in minor adverse construction impacts on the Metropolitan Branch Trail.

Though the Project would not be constructed in the No-Action Alternative, other projects would be built at various times and on different schedules that are currently unknown. These projects are all located within the Project Area and their construction would not physically affect, or completely block access to, any parks or recreation areas. Construction-related traffic and sidewalk closures may have minor adverse impacts on part of the Metropolitan Branch Trail along 2nd Street NE during construction of the private air-rights development or replacement of the H Street Bridge. Minimization or mitigation of the potential impacts would be the responsibility of the projects' respective owners.

5.13.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A would have a minor beneficial direct operational impact on Columbus Plaza due to improved access from Columbus Circle.

Alternative A would have no adverse direct operational impacts on parks and recreation areas. It would not physically affect or require using or taking any part of such resources. The First Street NE cycle track to K Street, which connects to the Metropolitan Branch Trail, would be reconstructed along its existing alignment up to K Street. Improvements, such as a railing to separate the track from the new pick-up and drop-off medians, would be included to minimize potential conflicts with pedestrians crossing to or from the new H Street Concourse

[2] For instance, 3 to 5 million people visit the U.S. Capitol every year (https://www.aoc.gov/capitol-buildings/about-us-capitol-building. Accessed on April 13, 2020), many of whom may be reasonably assumed to visit or walk through the Upper and Lower Senate Parks as well.

entrance. This reconstruction would not reduce or otherwise affect the overall connectivity or functionality of the trail. It would not have an adverse impact.[3]

Alternative A would have a minor beneficial impact on Columbus Plaza are a result of the improvements to Columbus Circle included in this alternative. These improvements would include eliminating the ramp connecting southbound First Street NE and Massachusetts Avenue. As a result, pedestrians and bicyclists would only have to cross one lane of traffic instead of two, as would be the case in the No-Action Alternative. The removal of the ramp would generally make Columbus Plaza feel more accessible and integrated with WUS, enhancing visitor experience.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

In Alternative A, approximately 35 million passengers would travel through WUS, against approximately 20.7 million in the No-Action Alternative. The number of visitors may also increase due to additional retail that would be available in the various concourses.

Like in the No-Action Alternative, this may result in more people using or passing through nearby parks, especially Columbus Plaza and the Upper and Lower Senate Parks. It may also generate additional traffic along the Metropolitan Branch Trail if visitors or commuters use it for local travel. Additional Bikeshare capacity and bike storage spaces may further encourage use of the trail for local travel to and from WUS. Private resources open to the public, such as the Plaza at 899 North Capitol Street NE and the Plaza at 750 First Street NE, may also experience some increase in users, as could the planned Plaza at Storey Park, when completed. The planned NoMA Green is too far from the station to be affected. Access to the Capitol Hill Montessori Playground is controlled by the school.

Increased use would result in accelerated wear and tear of pavements and landscaped areas in the affected parks and in increased maintenance costs. For the same reasons as explained for the No-Action Alternative, this adverse impact would be minor (**Section 5.13.4.1**, *No-Action Alternative, Indirect Operational Impacts*). Most new WUS passengers and visitors would only transit through WUS toward other destinations in and outside the District. Alternative A would be a small contributor to visits to parks and recreation area in the Study Area in the context of the millions of people who visit the District and its parks every year.[4]

[3] Impacts pertaining to bicycle safety are addressed in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*.

[4] For instance, 3 to 5 million people visit the U.S. Capitol every year (https://www.aoc.gov/capitol-buildings/about-us-capitol-building. Accessed on April 13, 2020), many of whom may be reasonably assumed to visit or walk through the Upper and Lower Senate Parks as well.

In Alternative A, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

In Alternative A, it is assumed for the purposes of the DEIS impact analyses that the Federal air rights above the new parking facility would potentially be developed as additional parking. This could encourage more people to visit WUS and nearby parks and recreational areas. The increase in park visitors that would result from this development cannot be determined but is likely to be very small as it can be reasonably assumed that only a portion of parkers would visit Study Area parks as part of their trip. In the context of the millions of annual visits to the District and its parks, the adverse impact from these additional visitations would be negligible. [5]

Construction Impacts

Construction of Alternative A would have moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

In Alternative A, construction-related traffic and sidewalk or lane closures 2nd Streets NE would affect the Metropolitan Branch Trail and may lead to temporary closures or rerouting of the trail at this location, diminishing its connectivity to the front of WUS and points south. These disruptions would adversely affect the experience of users at the south end of the trail. Closure of the First Street cycle tract during its reconstruction would also reduce connectivity. However, these impacts would occur at different times, with those along 2nd Street concentrated in Phase 1 (first 2 years and 5 months of construction) and those along First Street concentrated in Phase 4 (last 3 years and 1 month of construction). When one of the two facilities would be closed, the other could provide an alternative route. Only a small portion of the eight-mile trail would be affected. Between Phases 1 and 4 (approximately 6 years), disruptions would be minimal, though adjacent construction traffic and activities may detract from user experience. Overall, the anticipated disruptions would be a moderate adverse impact.

Alternative A would include realigning the Columbus Circle roadways in front of WUS, adjacent to Columbus Plaza. This would result in a moderate adverse impact. While Columbus Plaza itself would not be physically affected, construction would temporarily limit pedestrian access from the front of WUS to the park. In general, construction activities on the adjacent roadways would make Columbus Plaza less attractive to visit and diminish visitor experience. Although it has not been established how long the construction of the Columbus Circle improvements would take, it would be much less than the entire construction period. All other construction activities associated with Alternative A would take place north of the historic station building and would not cause impacts on Columbus Plaza.

[5] For instance, 3 to 5 million people visit the U.S. Capitol every year (https://www.aoc.gov/capitol-buildings/about-us-capitol-building. Accessed on April 13, 2020), many of whom may be reasonably assumed to visit or walk through the Upper and Lower Senate Parks as well.

Comparison to Existing Conditions

The impacts of Alternative A relative to existing conditions would be the same as those relative to the No-Action Alternative**.** The increase in visitors or users of Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail would be proportionately larger relative to existing conditions but the total number would remain small and the resulting adverse impacts would be negligible. The beneficial impact on Columbus Plaza would be the same because there is no difference between the two baselines with respect to this impact.

5.13.4.3 Alternative B

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a minor beneficial direct operational impact on Columbus Plaza due to improved access across Columbus Circle.

The direct operational impacts of Alternative B would be the same as those of Alternative A (**Section 5.13.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

The indirect operational impacts of Alternative B from the increase in visitors or users of parks and recreation areas would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Indirect Operational Impacts*).

Relative to the No-Action Alternative, in Alternative B, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

In Alternative B, it is assumed for the purposes of the DEIS impact analyses that the potential development of the Federal air rights would consist of approximately 917,420 square feet of office space. This would bring an additional 3,670 employees to the Project Area.[6] Some of them may make use of nearby parks and recreation areas during the day. However, at any given time, the number of additional visitors attributable to the development would be a fraction of the few thousands new workers in the Project Area and any adverse impacts would be negligible in the context of the millions of visits to District and its Parks. [7]

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[6] Assumes one employee per 250 square feet of office space.

[7] For instance, 3 to 5 million people visit the U.S. Capitol every year (https://www.aoc.gov/capitol-buildings/about-us-capitol-building. Accessed on April 13, 2020), many of whom may be reasonably assumed to visit or walk through the Upper and Lower Senate Parks as well.

Construction Impacts

Construction of Alternative B would cause moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

The impacts of constructing Alternative B would generally be the same as those of constructing Alternative A (**Section 5.13.4.2**, *Alternative A, Construction Impacts*). Impacts would be moderate adverse for the reasons explained for Alternative A, although timing and duration would be slightly different. Disruptions along 2nd Street would be concentrated during parts of Phase 1 (first 2 years and 5 months of construction, as in Alternative A and the other Action Alternatives) and impacts along First Street concentrated during Phase 4 (last 4 years and 11 months of construction). Disruptions would be minimal between Phases 1 and 4 (approximately 7 years), though adjacent construction traffic and activities may detract from user experience. The Columbus Circle improvements would be the same as in Alternative A and take the same time to construct. Impacts on Columbus Plaza would be as described for Alternative A.

Comparison to Existing Conditions

Alternative B would compare to existing conditions like Alternative A (**Section 5.13.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.13.4.4 Alternative C (Either Option)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative C would have a minor beneficial direct operational impact on Columbus Plaza due to improved access across Columbus Circle.

The direct operational impacts of Alternative C would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

The indirect operational impacts of Alternative C from the increase in visitors or users of parks and recreation areas would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Indirect Operational Impacts*).

Relative to the No-Action Alternative, in Alternative C, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

In Alternative C, it is assumed for the purposes of the DEIS impact analyses that the potential development of the Federal air rights would consist of approximately 952,600 square feet of office space. This would bring an additional 3,800 employees to the Project Area.[8] For the same reasons as explained for Alternative B (**Section 5.13.4.3**, *Alternative B, Indirect Impacts*), adverse impacts would be negligible.

Construction Impacts

Construction of Alternative C would cause moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

The impacts of constructing Alternative C would generally be the same as those of constructing Alternative A (**Section 5.13.4.2**, *Alternative A, Construction Impacts*). Impacts would be moderate adverse for the reasons explained for Alternative A, although timing and duration would be slightly different. Disruptions along 2nd Street would be concentrated during parts of Phase 1 (first 2 years and 5 months of construction, as in Alternative A and the other Action Alternatives) and impacts along First Street concentrated during Phase 4 (last 4 years of construction). Disruptions would be minimal between Phases 1 and 4 (approximately 5 years and 10 months), though adjacent construction traffic and activities may detract from user experience. The Columbus Circle improvements would be the same as in Alternative A and take the same time to construct. Impacts on Columbus Plaza would be as described for Alternative A.

Comparison to Existing Conditions

Alternative C would compare to existing conditions like Alternative A (**Section 5.13.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.13.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a minor beneficial direct operational impact on Columbus Plaza due to improved access across Columbus Circle.

The direct operational impacts of Alternative D would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

The indirect operational impacts of Alternative D from the increase in visitors or users of parks and recreation areas would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Indirect Operational Impacts*).

[8] Assumes one employee per 250 square feet of office space.

In Alternative D, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

In Alternative D, it is assumed for the purposes of the DEIS impact analyses that the potential development of the Federal air rights would consist of approximately 688,050 square feet of office space. This would bring an additional 2,800 employees to the Project Area.[9] Some of them may use nearby parks and recreation areas during the day. For the same reasons as explained for Alternative B (**Section 5.13.4.3**, *Alternative B, Indirect Impacts*), adverse impacts would be negligible.

Construction Impacts

Construction of Alternative D would cause moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

The construction-related impacts of Alternative D would be the same as those of Alternative C (**Section 5.13.4.4**, *Alternative C, Construction Impacts*). Construction activities and durations would be the same.

Comparison to Existing Conditions

Alternative D would compare to existing conditions like Alternative A (**Section 5.13.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.13.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would have a minor beneficial direct operational impact on Columbus Plaza due to improved access across Columbus Circle.

The direct operational impacts of Alternative E would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would have a negligible adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

The indirect operational impacts of Alternative E from increased visitors or users of parks and recreation areas would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Indirect Operational Impacts*).

[9] Assumes one employee per 250 square feet of office space.

Relative to the No-Action Alternative, in Alternative E, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

The impact from the potential development of the Federal air rights would be the same as in Alternative D (**Section 5.13.4.5**, *Alternative D, Indirect Operational Impacts*). The developable envelope would be the same in both alternatives.

Construction Impacts

Construction of Alternative E would cause moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

The impacts of constructing Alternative E would be the same as those of constructing Alternative B (**Section 5.13.4.3**, *Alternative B, Construction Impacts*). Construction activities and durations would be the same.

Comparison to Existing Conditions

Alternative E would compare to existing conditions as would Alternative A (**Section 5.13.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.13.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a minor beneficial direct operational impact on Columbus Plaza due to improved access across Columbus Circle.

The direct operational impacts of Alternative A-C would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a minor adverse indirect operational impact on parks and recreation areas, including Columbus Plaza, the Upper and Lower Senate Parks, and the Metropolitan Branch Trail.

The indirect operational impacts of Alternative A-C from the increase in visitors or users of parks and recreation areas would be the same as Alternative A's (**Section 5.13.4.2**, *Alternative A, Indirect Operational Impacts*).

In Alternative A-C, the potential development of the Federal air rights would have a negligible adverse indirect operational impact on parks and recreation areas.

In Alternative A-C, it is assumed for the purposes of the DEIS impact analyses that the potential development of the Federal air rights would consist of approximately 380,000 square feet of office space. This would bring an additional 1,520 employees to the Project

Area.[10] Some of them may use nearby parks and recreation areas during the day. For the same reasons as explained for Alternative B (**Section 5.13.4.3**, *Alternative B, Indirect Impacts*), adverse impacts would be negligible.

Construction Impacts

Construction of Alternative A-C would cause moderate adverse impacts on Columbus Plaza and the Metropolitan Branch Trail.

The construction-related impacts of Alternative A-C would be the same as those of Alternative A (**Section 5.13.4.2**, *Alternative A, Construction Impacts*). Construction activities and durations would be the same.

Comparison to Existing Conditions

Alternative A-C would compare to existing conditions like Alternative A (**Section 5.13.4.2**, *Alternative A, Comparison to Existing Conditions*).

5.13.5 Comparison of Alternatives

With regard to impacts on parks and recreation areas, all the Action Alternatives would generally have the same level of impacts (**Table 5-167**) because these impacts would arise from features common to all Action Alternatives, including the increase in WUS passengers and visitors, and the improvements to Columbus Circle. The Action Alternatives would also have similar construction-related impacts, with impacts on the Metropolitan Branch Trail varying slightly depending on the duration of the construction period but remaining moderate.

Table 5-167. Comparison of Alternatives, Parks and Recreation Areas

<table>
<tr><th>Type of Impact</th><th>No-Action Alternative</th><th>Alternative A</th><th>Alternative B</th><th>Alternative C (Either Option)</th><th>Alternative D</th><th>Alternative E</th><th>Alternative A-C (Preferred)</th></tr>
<tr><td>Direct Operational</td><td>No impacts</td><td colspan="6">Minor beneficial impacts on Columbus Plaza. No impacts on other parks</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">Minor adverse impacts from increased number of visitors; Negligible adverse impacts from the potential Federal air-rights development.</td></tr>
<tr><td>Construction</td><td>Minor Adverse Impacts</td><td colspan="6">Moderate adverse impacts on Columbus Plaza and Metropolitan Branch Trail</td></tr>
</table>

[10] Assumes one employee per 250 square feet of office space.

The No-Action Alternative primarily differs from the Action Alternatives in that it would not provide improvements to Columbus Circle and would have fewer construction impacts. In the No-Action Alternative, WUS passengers and visitors would also be less numerous than in the Action Alternatives, resulting in slightly smaller impacts on nearby parks.

5.13.6 Avoidance, Minimization and Mitigation Evaluation

To avoid or minimize construction impacts on Columbus Plaza and the Metropolitan Branch Trail, FRA is considering the following measures:

- The Project Proponents would coordinate with NPS during construction planning to develop measures to maintain as much as possible access to Columbus Plaza during the construction of the Columbus Circle improvements.
- The Project Proponents would prohibit the construction contractor from using Columbus Plaza as a staging area during construction.
- The Project Proponents would coordinate with DDOT to plan and maintain alternative routes for users of the Metropolitan Branch Trail when parts of the trail would be closed.
- The Project Proponents would work with DDOT to appropriately advertise construction-related closures of the Metropolitan Branch Trail and establish alternative routes, as needed.

5.13.7 Permits and Regulatory Compliance

The Project is subject to Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966, which require avoiding or minimizing effects to public park and recreation lands, wildlife and waterfowl refuges, and public or private historic properties, during the planning and design of transportation projects. A draft Section 4(f) evaluation is included in this DEIS (**Chapter 6**, *Draft Section 4(f) Evaluation*).

Section 6(f) of the Land and Water Conservation Act requires that the conversion to anything other than public outdoor recreational use of lands or facilities acquired with Land and Water Conservation Act (LWCA) funds under the State Assistance program be coordinated with NPS.[11] The Project would not require the conversion of any land, including land acquired with LWCA funds. Therefore, a Section 6(f) evaluation is not required.

[11] 16 U.S.C 460-4 to 460-11.

5.14 Social and Economic Conditions

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on social and economic conditions. If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies relevant permitting and regulatory compliance requirements.

5.14.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to cultural resources are listed in **Section 4.14.1**, *Regulatory Context and Guidance*.

5.14.2 Study Area

As defined in **Section 4.14.2***, Study Area* the Local Study Area for social and economic conditions (**Figure 4-29**) includes the Project Area and the twenty-one 2010 U.S. Census block groups within one-half mile of the Project Area. The Regional Study Area consists of the District.

5.14.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on social and economic conditions. **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 14.4**, *Methodology* provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.14.3.1 Operational Impacts

Social and economic impacts were assessed by considering how the No-Action and Action Alternatives would affect: demography; community disruption and benefits; employment; WUS revenue; and other economic measures, as applicable. Operational impacts on demography and employment were quantitatively assessed based on planning multipliers for specific land uses (1 employee per 250 square feet of office space; 3 employees per 1,000 square feet of retail use; and 1 employee per 2.67 hotel rooms). Impacts on WUS revenues were assessed using order-of-magnitude estimates based on anticipated changes in the amount of revenue-generating retail and parking at WUS. Other operational impacts were assessed qualitatively.

5.14.3.2 Construction Impacts

Construction impacts on socioeconomic factors other than employment were assessed qualitatively. Impacts on employment were assessed quantitatively using IMPLAN, an economic input-output model software system.

IMPLAN analysis of construction employment generation encompassed the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan statistical area.[1] Construction employment, wages, and economic output were based on estimated construction costs and calculated from multipliers and datasets for various industries. Outputs included direct jobs; indirect jobs; and induced jobs. Also modeled were total wages from generated jobs; combination of labor income, other property type income and indirect business taxes; and value of production. [2]

5.14.4 Impact Analysis

This section presents the potential impacts of the No-Action Alternative and the Action Alternatives on social and economic conditions.

5.14.4.1 No-Action Alternative

Direct Operational Impacts

Demographics

Relative to existing conditions, in the No-Action Alternative, there would be a minor direct operational impact on demographic conditions from the private air-rights development. [3]

The private air-rights development above the WUS rail terminal would include approximately 1,050,000 square feet of residential uses. It would add approximately 2,150 residents to the

[1] This area includes: The District of Columbia; Frederick, Montgomery, Calvert, Charles, and Prince George's Counties in Maryland; Arlington, Clarke, Culpeper, Fairfax, Fauquier, Loudoun, Prince William, Rappahannock, Spotsylvania, Stafford, and Warren Counties, and Alexandria City, Fairfax City, Falls Church City, Fredericksburg City, Manassas City, and Manassas Park City in Virginia; and, Jefferson County in West Virginia. These jurisdictions make up the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan statistical area as defined by the U.S. Office of Management and Budget and used by the U.S. Census Bureau.

[2] Construction-impact modeling was performed on the basis of the rough-order-of magnitude combined construction cost estimates developed by Amtrak, which are the only estimates available at the phase level (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum;* the combined estimates include costs associated with the private air-rights development deck and potential Federal air-rights development deck.)

[3] This demographic impact is not characterized as adverse or beneficial because a proportionately small change in residential population does not in itself represent a favorable or unfavorable outcome.

Local Study Area. [4] This would amount to a minor impact on local demography for the following reasons. According to the 2011-2015 American Community Survey (ACS) 5-Year Estimates, the total population of the Local Study Area in 2015 was 34,895.[5] The residents of the private air-rights development would increase this total by approximately six percent over 20 years, a minor change. The private air-rights development population would represent a minute fraction of the District's population, projected to be approximately 941,000 by 2040. [6]

Community Disruption and Other Social Benefits or Impacts

Relative to existing conditions, the No-Action Alternative would have moderate beneficial direct operational impacts on local communities.

The projects in the No-Action Alternative would result in a beneficial impact on local communities because they would improve connectivity between WUS and the surrounding neighborhoods. The Amtrak and USRC-led projects to address ADA compliance and other issues at WUS would improve access to transportation facilities and retail (**Section 3.3.1**, *Near-term Station and Track Improvements at WUS*). WUS would become better integrated with the surrounding areas. None of the projects would reduce access between neighborhoods; erect permanent barriers among communities; or result in any other condition that would permanently disrupt neighborhoods and communities around WUS. The private air-rights development would create new connections between the areas on either side of the rail terminal as well as provide new retail opportunities and other urban amenities.

The beneficial impact would be moderate because the No-Action Alternative would leave many existing access and connectivity issues unresolved. Pedestrian connections to WUS from the surrounding neighborhoods are currently inadequate and would remain so. This would also be the case for the private air-rights development, which would not have direct connections to the station. Entrances would remain concentrated on or near the south side of the station. The only entrance from H Street NE would continue to be through the parking garage, making it difficult for travelers to access adjacent neighborhoods and employment centers to the northwest and east of WUS.

4 Calculated by deducting square footage for mechanical shafts, articulation and massing, applying a ratio of 950 sf per unit, and using a multiplier of 2.10 persons per household (weighted average of average household size of the census tracts in the Local Study Area based on 2011-2015 ACS 5-year estimates).

5 **Section 4.14.4.1**, *Demographics, Total Population*.

6 DCOP. *Forecasting the District's Growth. 2015-2045. Results and Methodology*. November 2016. Accessed from https://planning.dc.gov/node/1212966. Accessed on April 3, 2020.

Employment

Relative to existing conditions, the No-Action Alternative would have a moderate beneficial direct operational impact on employment.

The new office, retail, and hotel space in the private air-rights development would support approximately 8,500 jobs in the Local Study Area, a beneficial impact. WUS-based employment (currently, there are approximately 400 Amtrak employees working at WUS and 624 employees working in the existing retail and commercial space in WUS) would likely remain the same.[7]

The beneficial impact on employment would be moderate. As of 2015, there were an estimated 120,032 jobs in the Local Study Area.[8] The increase attributable to the No-Action Alternative would represent 7 percent of this number.

DCOP projections show an estimated 1,012,000 jobs in the District by 2040, with an average growth of 8,995 jobs per year from 2015 to 2035. The jobs associated with the private air-rights development would be equivalent to just under an average year of projected average growth but only 0.8 percent of the total projected 2040 employment.

Washington Union Station Revenue

Relative to existing conditions, the No-Action Alternative would have no direct operational impact on WUS Revenue.

USRC, which manages WUS, obtains its revenue from the Union Station Investco (USI) sublease for retail space and from the parking garage, operated by Union Station Parking Garage LLC. In the No-Action Alternative, there would be no change in the amount of retail or parking at WUS relative to existing conditions. Existing leases would continue and there would be no changes in WUS's revenue from those leases other than normal fluctuations or adjustments.

Other Direct Economic Impacts

Relative to existing conditions, the No-Action Alternative would have a minor beneficial direct operational impact on retail and parking at WUS.

In the No-Action Alternative, neither the amount of retail nor the number of parking spaces at WUS would change. However, larger numbers of passengers and visitors would likely benefit WUS's retail outlets through sales growth and potentially generate higher demand and rates for the WUS parking garage. Persons living or working in the private air-rights development would also provide an expanded customer base for retail outlets at WUS. This beneficial impact is not readily quantifiable. However, it would be minor because the amount

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[7] Email Correspondence. September 27, 2017. Amtrak to VHB.

[8] **Section 4.14.4.3**, *Employment*.

of both retail and parking at WUS would remain as it is currently. This would put a limit on the potential growth in revenue for the lease holders.

Indirect Operational Impacts

Demographics

Relative to existing conditions, the No-Action Alternative would have negligible indirect operational impacts on demographic conditions. [9]

The private air-rights development project may encourage further development in the Local Study Area, as explained in **Section 5.9.4.1**, *No-Action Alternative, Indirect Impacts*. Some of that development may be residential and result in an increase in the population of the Local Study Area and the District. The population increase would be very small relative to the District's growth through 2040 and the resulting impact negligible.

Community Disruption and Other Social Benefits or Impacts

Relative to existing conditions, the No-Action Alternative would have no indirect operational impacts on local communities, including impacts related to gentrification.

A potential indirect adverse impact of an influx of residential population in an urban area is gentrification. Although gentrification can have benefits, including improved amenities and public services as well as rehabilitated housing, the process is also often associated with displacement of long-time residents out of an area they can no longer afford to live in.

One approach to assess potential gentrification impacts involves first determining if an area is eligible to gentrify, based on census tract-level data. A census tract is eligible to gentrify if: (1) it has a population of at least 500 residents; (2) its median household income is in the bottom 40th percentile compared to all tracts of the reference area; and (3) its median home value is in the bottom 40th percentile compared to all tracts of the reference area.[10] The private air-rights development would be in Census Tract (CT) 106 of the District. Based on 2013-2017 American Community Survey (ACS) data, and using the District as the reference area, neither CT 106 nor the adjacent CTs meet all three criteria (**Table 5-168)**. On this basis, the private air-rights development is not in an area where it could induce gentrification.

[9] This demographic impact is not characterized as adverse or beneficial because a proportionately small change in residential population does not in itself represent a favorable or unfavorable outcome.

[10] Freeman, L. "Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods." *Urban Affairs Review*, 463-491. 2005; Maciag, M. *Gentrification in America Report*. Accessed from https://www.governing.com/gov-data/census/gentrification-in-cities-governing-report.html. Accessed on January 30, 2019.

Table 5-168. Eligibility for Gentrification of Census Tracts in Local Study Area

Census Tract	At least 500 Residents?	Median Household Income in Bottom 40th Percentile ($67,171.4)?	Median Home Value in Bottom 40th Percentile ($438,460)?
106	Yes: 7,167	No: $110,469	No: $599,300
47.01	Yes: 4,888	Yes: $40,378	No: $513,900
47.02	Yes: 3,144	No: $101,891	No: $478,700
59	Yes: 2,682	No: $101,553	No: $455,200
62.02[1]	No: 72	N/A	N/A
82	Yes: 3,056	No: $115,742	No: $989,800
83.01	Yes: 2,423	No: $147,989	No: 798,300

Source: American FactFinder, 2013-2017 ACS.
1. This census tract consists of the National Mall and U.S. Capitol grounds.

Employment

Relative to existing conditions, the No-Action Alternative would have a minor beneficial indirect operational impact on employment in the Local Study Area.

A beneficial indirect impact on employment would result from the private air-rights development. New residents and employees would support new jobs in the Local and Regional Study Areas through typical household spending and business-to-business spending. Additionally, the private air-rights development and increased ridership and visits to WUS may encourage further development near WUS, with a similar beneficial impact. This beneficial impact cannot be readily quantified but would be minor in the context of the current and projected future employment in the Local Study Area and the District.

Washington Union Station Revenue

Relative to existing conditions, the No-Action Alternative would have a negligible beneficial indirect operational impact on WUS Revenue.

The No-Action Alternative would have a beneficial impact on WUS revenue if greater activity in the Project Area (due to both ridership increase and the private air-rights development) results, in the long term, in an increase in demand for services that generate revenue for WUS such as retail and parking. This potential impact cannot be quantified but can be considered to be negligible in the context of WUS's total revenues.

Other Indirect Economic Impacts

Relative to existing conditions, the No-Action Alternative would have a moderate beneficial indirect operational impact on tax revenues in the District.

The private air-rights development would generate new revenue for the District through new property taxes from newly developed parcels, income tax from new residents, and sales tax revenue from new retail and increased patronage at existing retail. Induced residential and economic growth in the Local Study Area and the District at large would generate further increases in revenue.

While the net increase in tax revenue that would result cannot be estimated, it is likely to amount to a moderate beneficial impact in the context of the District as a whole, whose total tax revenue in fiscal year 2018 was $7.5 billion.[11] Property taxes from the private air-rights development would be new but income taxes may not be if residents moved to the new development from elsewhere in the District. Also, increases in the number of visitors or residents would create new demands on municipal services, whose cost would partially offset the increase in tax revenue.

Construction Impacts

Demographics

Construction of the projects included in the No-Action Alternative would not have impacts on demography.

The construction of the No-Action Alternative projects would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Construction of the No-Action Alternative projects would have minor adverse impacts on local communities.

Construction of the No-Action Alternative projects would create various degrees of disruption within the Local Study Area with adverse impacts on the local communities. Impacts would be minor because they would be spread across several years and varying schedules. They are not likely to keep significant numbers of people from using WUS or to force businesses or residents to relocate.

The most noticeable disruption would be from the partial closures of sidewalks and roadways due to various projects. The H Street Bridge replacement would have the most impact, as it would make travel between the east and west sides of the Local Study Area more difficult during the construction period. DDOT would likely implement measures to minimize this impact. The private air-rights development construction would likely require temporary sidewalk and roadway closures along First Street NE (north of H Street) and 2nd Street NE and generate construction vehicle traffic along those streets. No sufficient information is available to assess the intensity and duration of those impacts but they would be those typical of medium- to large-scale urban construction projects.

Construction of the private air-rights development and VRE Midday Storage Replacement Facility would take place within the rail terminal and may affect railroad operations. Travelers and commuters may experience delays and increased commuting times. Amtrak must

[11] Government of the District of Columbia, Office of Chief Financial Officer, Office of Revenue Analysis. *D.C. Tax Facts. 2018*. Accessed from https://cfo.dc.gov/node/1351591. Accessed on April 3, 2019.

authorize work in the rail terminal; this process would help minimize impacts to rail operations.

Construction Employment

Construction of the No-Action Alternative projects would have minor beneficial impacts on employment.

Construction of the No-Action Alternative projects would beneficially affect employment and support construction jobs. Construction workers would likely support business establishments in the Local Study Area. Businesses throughout the District and metropolitan area would also benefit through additional household spending supported by construction wages and the purchase of construction materials, with a spin-off effect on job generation. This beneficial impact, which would be spread over many years through 2040, would be minor in the context of overall employment and economic activity in the District.

Washington Union Station Revenue

Construction of the projects included in the No-Action Alternative would have minor adverse impacts on WUS revenue.

There would be minor adverse impacts on WUS revenue. Construction activities that would modify parking garage access (such as the H Street Bridge replacement) would likely result in a loss of revenue due to fewer cars using the garage. However, the garage would remain open with alternative access points, limiting the loss of revenue. Construction activities could also adversely affect WUS's retail and service establishments if they led to a reduction in visitors and a decrease in spending at the station. Such short-term fluctuations do not affect WUS's revenue from retail, however. Construction activities in the No-Action Alternative are not likely to result in long-term or permanent store closures.

Other Economic Benefits or Impacts

Construction of the project included in the No-Action Alternative would have a moderate beneficial impact on the regional economy.

Construction of the various projects included in the No-Action Alternative would have a beneficial economic impact at the regional level from the spending of the income generated by the construction of each project and other jobs it would generate. A quantitative estimate is not possible, but given the scale of several of the projects, especially the private air-rights development and replacement of the H Street Bride, a moderate beneficial impact is likely.

5.14.4.2 Alternative A

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative A would have no direct operational impact on demographic conditions.

Alternative A would not directly add or displace any residents in the Local or Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative A would have major beneficial direct operational impacts on local communities.

Relative to the No-Action Alternative, Alternative A would have a major beneficial impact by improving community cohesion and providing new pedestrian connections between WUS and the surrounding neighborhoods. The new First Street NE, 2nd street NE, and H Street Bridge pedestrian entry points would make WUS easier to access from both the east and west sides while also improving connectivity between neighborhoods on either side of the station and connectivity with the private air-rights development.

Alternative A would also provide approximately 72,000 square feet of new retail space in WUS. Additional shopping opportunities and services located in WUS would benefit neighborhood residents, travelers, and commuters. The access improvements described above would also make it easier for local residents to access these new amenities.

At the regional level, expanded and improved multimodal connections at WUS would make travel in and out of the District easier and more efficient, benefiting all District residents and visitors.

Employment

Relative to the No-Action Alternative, Alternative A would have a minor beneficial direct operational impact on employment.

Alternative A would beneficially impact employment by adding an estimated 1,445 jobs at WUS relative to the No-Action Alternative. The approximately 72,000 square feet of retail space that would be added to WUS would generate approximately 216 new jobs, for a total of approximately 840 WUS retail jobs. The expanded Amtrak support area would be staffed with approximately 1,629 persons, representing a 1,229-employee increase over the No-Action Alternative.[12]

[12] Amtrak. 2018. *WUS-TI Space Program*.

This beneficial impact would be minor because it would be small in the larger context of the District. The 1,445 jobs generated would be a 141 percent increase in WUS jobs relative to the No-Action Alternative but only represent about 0.15 percent of the total projected 2040 employment in the District (1,012,000 jobs).[13]

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative A would have a moderate adverse direct operational impact on WUS revenue.

Alternative A would reduce the number of revenue-generating parking spaces at the station from approximately 2,205 in the No-Action Alternative to approximately 1,750, a 21 percent reduction. Assuming a proportional reduction in revenue, this would cause a loss of approximately $1.79 million (2017 dollars) to WUS.[14] Revenue from retail would remain approximately the same as or be less than in the No-Action Alternative. The new retail in Alternative A would be outside the WUS lease area and would generate no additional revenue for the station. Revenue from existing retail could decrease if some of the outlets displaced during construction (see **Section 5.14.4.2**, *Alternative A, Construction Impacts*) do not return after completion of the work and are not replaced. How this would affect WUS' revenue from retail would depend on current and future lease conditions.

Overall, Alternative A would cause a net diminution of WUS revenue. The loss would be a moderate adverse impact because all parking, which is the main source of income for WUS, would continue to generate revenue while the permanent loss of retail, if it occurs, would likely be small.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative A would have a minor beneficial direct operational impact on the local and regional economy.

Alternative A would add approximately 72,000 square feet of retail at WUS. This would generate revenue for retail operators as well as new jobs and sales taxes, driving further economic activity. Existing retail and services at WUS would benefit from increased sales due to greater ridership: relative to the No-Action Alternative, approximately 50,700 additional passengers would transit through WUS daily, likely resulting in increased activity and spending. This in turn would stimulate demand for retail space and potentially drive up rents. These beneficial impacts would be minor in the context of the local and regional economy.

[13] DC Office of Planning. 2017. DC Forecasts. Accessed from https://planning.dc.gov/publication/dc-forecasts. Accessed on February 15, 2019.

[14] In fiscal year 2016, WUS revenue from the parking garage operations was $8,532,403: *USRC Annual Report* 2016. Accessed from https://www.usrcdc.com/wp-content/uploads/2017/02/usrc_annual_report_2016_final_spreads.pdf. Accessed on April 3, 2020.

Indirect Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative A would have a negligible indirect operational impact on demography.[15]

As explained in **Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts*, the improved connectivity and activity at WUS promoted by Alternative A, and increased employment opportunities, may indirectly encourage medium- or high-density development near WUS, in addition to what would occur under the No-Action Alternative. This would result in an increase in the population of the Local Study Area and the District. This impact is not readily quantifiable but likely would be very small and negligible relative to the anticipated demographic growth of the District through 2040.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative A would have no adverse indirect operational impacts on local communities.

Alternative A may indirectly encourage development near WUS. As explained in **Section 5.9.4.2**, *Alternative A, Indirect Operational Impacts,* the District's zoning regulations and applicable plans would continue to guide the density and character of potential future development, including the development of the Federal air rights into parking space, as assumed for the purposes of the DEIS. This would avoid developments that could disrupt or dislocate local communities.

Employment

Relative to the No-Action Alternative, Alternative A would have a minor beneficial indirect operational impact on employment.

New retail and workers at WUS as well as more passengers and visitors would increase consumer demand for goods and services in the Local and Regional Study Areas. This would support employment both locally and regionally. This beneficial indirect operational impact is not readily quantifiable but it likely would be minor in the context of current and projected future employment in the Local Study Area and the District.

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative A would have no indirect operational impact on WUS Revenue.

Alternative A would have no indirect operational impacts on WUS revenue. The loss of parking and retail revenue described above in **Section 5.14.4.2**, *Alternative A, Direct*

[15] This demographic impact is not characterized as adverse or beneficial because a proportionately small change in residential population does not in itself represent a favorable or unfavorable outcome.

Operational Impact would cancel out any marginal increase in revenue that greater activity at the station could generate.

Other Indirect Economic Impacts

Relative to the No-Action Alternative, Alternative A would have a minor beneficial indirect operational impact on tax revenues in the District.

The additional retail uses at WUS in Alternative A would generate new sales and new sales tax revenues. Income from jobs directly and indirectly created by Alternative A would likely be spent in the District, also generating sales tax revenue. Some of the employees at WUS may move to the city from other jurisdictions, increasing the District's income tax base.

More generally, Alternative A would contribute to expanding tourism and economic activity in the Regional Study Area by allowing WUS to overcome existing capacity constraints and resolve operational inefficiencies. WUS would continue to be a major transportation hub supporting the local and regional economy with attendant tax benefits.

The net benefit in tax revenue is not quantifiable but it is likely to amount to a minor beneficial impact compared to the No-Action Alternative. It also would be small in the larger context of the District as a whole, whose total tax revenue in fiscal year 2018 was $7.5 billion.[16]

Potential Federal Air-rights Development

Relative to the No-Action Alternative, in Alternative A, the potential development of the Federal air rights as additional parking would result in no indirect operational impacts on demography, local communities. It would have a negligible beneficial indirect operational impact on employment and the regional economy, and a beneficial indirect operational impact on WUS revenue.

The assumed provision of additional parking space would not affect demography in the Local or Regional Study Area. It would not cause disruption to local communities, as it would occur within the footprint of a pre-existing facility. It would support a small number of maintenance and management jobs but this would be a negligible beneficial impact in the context of the Local and Regional Study Areas. The development of the remaining Federal air rights would have a beneficial impact on WUS revenue through the lease of the space (or other mechanism through which development would be achieved). This impact cannot be quantified at this time but it would at least partially offset the loss of revenue from the reduction in parking capacity.

[16] Government of the District of Columbia, Office of Chief Financial Officer, Office of Revenue Analysis. *D.C. Tax Facts. 2018*. Accessed from https://cfo.dc.gov/node/1351591. Accessed on January 30, 2019.

Construction Impacts

Demographics

Construction of Alternative A would have no impacts on demography.

The construction of Alternative A would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area**.**

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative A would have moderate adverse impacts on local communities.

Construction of Alternative A would take place over approximately 11 years and 5 months (including the 12-month Intermediate Phase when only column removal work would be performed). Throughout, to accommodate construction activities, there would be periods of rerouting passengers, closing off sections of WUS, and closing some retail space. The column removal component of the Project would close part of the Retail and Ticketing Concourse. Retail outlets located within this part of the concourse and the mezzanine above would have to close for at least the duration of the work, which is anticipated to take place over approximately 2 years and 6 months, overlapping with Phases 1 and 2 of construction.[17] Parking and bus loading and unloading activities would be displaced between the demolition of the existing garage and the completion of the new bus and parking facilities. Construction traffic and noise as well as partial closures of sidewalks and traffic lanes would adversely affect residents, commuters, and workers. These impacts are described in greater detail in other sections of this DEIS including: **Section 5.5**, *Transportation*, **Section 5.9**, *Land Use, Land Planning and Property*, **Section 5.10**, *Noise and Vibration*, **Section 5.13**, *Parks and Recreation Areas*, and **Section 5.16**, *Public Health, Elderly and Persons with Disabilities*.

The resulting adverse impact on local communities would be moderate. Although various disruptive activities would occur during the entire construction period, most would last for only a part of it. Disruptions would also be localized. The displacement of parking and bus service would occur only in Phase 4 (last 3 years and 1 month of construction). Outside of WUS, disruptions would largely concentrate along 2nd Street NE (south of K Street) during Phase 1 of construction (lasting approximately 2 years and 5 months) and along First Street NE (also south of K Street) during Phase 4. Although adversely affected, access to WUS would remain available throughout the construction period and the phased construction would help minimize reductions in rail operations. While the various inconveniences construction of Alternative A would create would be highly noticeable and would make WUS and the parts of the Local Study Area closest to WUS less attractive to new residents or businesses while construction is ongoing, the directly affected areas would be small and the adverse impacts would decrease quickly with distance.

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[17] The retail outlets that would be impacted include UNIQLO, Victoria's Secret, Comfort One Shoes, Verizon, Hudson News, America!, Kashmir, Einstein Bros. Bagels, and Jamba Juice.

Construction Employment

Construction of Alternative A would have a minor beneficial impact on regional employment.

Construction of Alternative A would support numerous jobs during the entire construction period. While this would be a beneficial impact, it would be minor in the context of regional employment in the Washington-Arlington-Alexandria Metropolitan Statistical Area, where most of the jobs are likely to be located.

Construction activities and costs would vary over the course of construction. Therefore, the number of jobs supported by construction would vary depending on the year of the construction period. **Table 5-169** shows the estimated annual number of jobs construction of Alternative A would support by phase.[18] Direct jobs would occur within the construction, architecture and engineering, and related services industries while the indirect and induced jobs would occur in a wider range of industries such as wholesale trade; restaurants; real estate; architectural; hospitals; retail; and physicians.

Table 5-169. Construction Employment Estimates, Alternative A

Phase	Construction Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1	3,466	324	1,138	4,928
1	2	3,466	324	1,138	4,928
1 and 2	3	4,247	401	1,395	6,043
2	4	4,377	415	1,439	6,231
2 and 3	5	4,256	402	1,398	6,055
3	6	3,708	346	1,217	5,271
3	7	3,704	350	1,217	5,271
3	8	5,607	563	1,852	8,022
3 and 4	9	6,535	647	2,156	9,338
4	10	6,547	635	2,156	9,338
4	11	2,784	214	900	3,898
Annual Average		**4,614**	**418**	**1,511**	**6,543**

Construction Year 11 is a partial year and not included in the annual average.
Intermediate Phase not included.

On average, Alternative A would support annually approximately 4,614 direct jobs and 1,929 indirect and induced jobs, for a total of 6,543 jobs. For purposes of comparison, the total annual average number of direct jobs that Alternative A would support for the duration of the construction period represent approximately 0.6 percent of total employment in the two

[18] As noted above, the modeling of construction impacts was based on Amtrak's rough-order-of magnitude combined estimates, which include the private and potential Federal overbuild deck but exclude the column removal work (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*).

relevant sectors in the Washington-Arlington-Alexandria Metropolitan Statistical Area as of early 2019.[19]

Washington Union Station Revenue

Construction of Alternative A would have a major adverse impact on WUS revenue.

Construction of Alternative A would affect the two main sources of WUS revenue: retail and parking. The retail closures due to the column removal work would affect the revenue derived from the USI retail lease. At this stage, it is not possible to quantify the resulting financial impact on the affected retail outlets, USI, and USRC. However, given the duration of the anticipated closure (at least approximately 2 years and 6 months overlapping with Phases 1 and 2 of construction), it is likely to be major.

Construction-related disruptions in WUS access and the existing parking garage demolition would further cause a major reduction in revenue from parking operations. During the first three phases of construction, parking would remain fully or partially available but changes in access, rerouting, and reduced capacity in Phase 3 would reduce the number of users and the revenue generated. During Phase 4, which would last for approximately 3 years and 1 month, parking would not be available. Based on fiscal year 2016 revenue from parking, this would represent a loss of approximately $25.5 million for WUS.

Other Economic Benefits or Impacts

Construction of Alternative A would have a moderate beneficial impact on the regional economy.

Income generated by construction jobs of the Project are shown in **Table 5-170**. Depending on the year, Alternative A construction would produce from $254 to $609 million in estimated annual labor income. Annual value added (labor income, other property type income and indirect business taxes), would range from $355 million to $851 million depending on the year. Annual total output (value of production), would range from $586 to $1,405 million depending on the year. These economic outputs would spread benefits throughout the Washington DC metropolitan region. The impact would be moderate in the context of the Washington-Arlington-Alexandria Metropolitan Area, which had a 2017 gross domestic product of approximately $17.5 trillion.[20]

[19] Bureau of Labor Statistics. *Economy at a Glance. Washington-Arlington-Alexandria, DC-VA-MD-WV.* Accessed from https://www.bls.gov/eag/eag.dc_washington_md.htm. Accessed on April 13, 2019. The two sectors taken into account in the comparison are Mining, Logging, and Construction (122,800 persons as of January 2019) and Professional and Business Services (632,400 persons as of January 2019).

[20] U.S. Bureau of Economic Analysis. *Gross Domestic Product by Metropolitan Area, 2017.*Accesssed from https://www.bea.gov/data/gdp/gdp-metropolitan-area. Accessed on February 4, 2019.

Table 5-170. Construction Annual Labor Income, Value and Output, Alternative A

Phase	Construction Year	Annual Labor Income	Annual Value	Annual Total Output
1	1	$321,467,648	$449,408,225	$741,851,819
1	2	$321,467,648	$449,408,225	$741,851,819
1 and 2	3	$394,174,196	$551,051,176	$909,636,928
2	4	$406,458,676	$568,224,743	$937,985,858
2 and 3	5	$395,012,574	$552,223,220	$911,571,657
3	6	$343,877,491	$480,736,938	$793,567,078
3	7	$343,877,491	$480,736,938	$793,567,078
3 and 4	8	$523,276,372	$731,534,593	$1,207,566,392
4	9	$609,145,078	$851,578,096	$1,405,725,852
4	10	$609,145,078	$851,578,096	$1,405,725,852
4	11	$254,249,209	$355,437,588	$586,731,632

Values presented in 2019 dollars.
Intermediate Phase not included.

Comparison to Existing Conditions

The impacts of Alternative A on socioeconomic conditions would generally be the same relative to existing conditions as they would be relative to the No-Action Alternative. Because the District's economy would grow between the present and 2040, the impacts of Alternative A would be relatively greater when compared to existing conditions than they would be when compared to No-Action Alternative conditions. But given the respective size of the existing economy and the impacts, the difference would be small.

5.14.4.3 Alternative B

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative B would have no direct operational impact on demographic conditions.

Alternative B would not directly add or displace any residential populations in the Local Study Area or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative B would have major beneficial direct operational impacts on local communities.

The impacts of Alternative B would be the same as those of Alternative A. They are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Employment

Relative to the No-Action Alternative, Alternative B would have a minor beneficial direct operational impact on employment.

The impacts of Alternative B would be the same as those of Alternative A. They are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative B would have a major adverse operational direct impact on WUS revenue.

Alternative B would eliminate the station's revenue stream from parking, which represent the majority of its revenue. In Alternative B, all parking would be in two below-ground levels, outside the station's lease area. Therefore, WUS would not receive any revenue from the new parking. Based on fiscal year 2016 data, this would represent a loss of approximately $8.5 million. In that year, parking revenue represented 59 percent of the station's total revenue. [21]

Revenue from retail would remain approximately as or be less than in the No-Action Alternative for the same reasons a explained for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*. Altogether, Alternative B would cause a net loss in revenue for WUS. The loss would be major, as it would represent more than half the station's total revenue.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative B would have a minor beneficial direct operational impact on the local and regional economy.

The impact of Alternative B on the local and regional economy from additional retail at WUS would be the same as that of Alternative A. These impacts are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts.*

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a negligible indirect operational impact on demography; no adverse indirect operational impact on local communities; a minor beneficial indirect operational impact on employment; no indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on tax revenues in the District.

[21] In fiscal year 2016, WUS revenue from the parking garage operations was $8,532,403 out of a total revenue of $14,381,916: *USRC Annual Report* 2016. Accessed from https://www.usrcdc.com/wp-content/uploads/2017/02/usrc_annual_report_2016_final__spreads.pdf. Accessed on April 3, 2020.

The indirect operational impacts of Alternative B would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Indirect Operational Impacts* with the exception of the impacts associated with the potential Federal air-rights development, described below.

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, in Alternative B, the potential development of the Federal air right as office space would result in a negligible indirect operational impact on demography; no indirect operational impact on local communities; a moderate beneficial indirect operational impact on employment; a beneficial indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on District tax revenue.

The development of the remaining Federal air rights as approximately 917,420 square feet of office space, as assumed for the purposes of the impact analysis, would have a beneficial impact on WUS revenue through the lease of the space (or other mechanism through which development would be achieved). This impact cannot be quantified at this time but it would at least partially offset the loss of revenue from the reduction in parking capacity.

The provision of this office space would have a small and negligible impact on demography in the Local Study Area if some employees move to the area to be closer to their workplace. Given WUS's accessibility by transit and the moderate number of employees at the site, this impact would be small and negligible. Development of the Federal air rights into office space would not cause disruptions to local communities, as it would occur within the footprint of a pre-existing facility. It would bring approximately 3,670 additional new jobs to the Local Study Area, a moderate beneficial impact in the context of the Local and Regional Study Areas. These jobs would generate tax revenue for the District. The beneficial impact on tax revenue would be minor in the context of the District as a whole.

Construction Impacts

Demographics

Construction of Alternative B would have no impacts on demography.

Like the construction of Alternative A and the other Action Alternatives, the construction of Alternative B would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area**.**

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative B would have moderate adverse impacts on local communities.

Construction of Alternative B would take place over approximately 14 years and 4 months (including the 12-month Intermediate Phase when only column removal work would be performed). Throughout, to accommodate construction activities, there would be periods of rerouting passengers, losing off sections of WUS, and closing some retail outlets. As in all Action Alternatives, the column removal component of the Project would close part of the Retail and Ticketing Concourse and displace the retail outlets located there for at least the duration of the work (approximately 2 years and 6 months, overlapping with Phases 1 and 2 of construction).[22] Parking and bus loading and unloading activities would be displaced between the demolition of existing garage and the completion of the new bus and parking facilities. Construction traffic and noise as well as partial closures of sidewalks and traffic lanes would adversely affect residents, commuters, and workers. These impacts are described in greater detail in other sections of this DEIS including: **Section 5.5**, *Transportation*, **Section 5.9**, *Land Use, Land Planning and Property*, **Section 5.10** *Noise and Vibration*, **Section 5.13**, *Parks and Recreation Areas*, and **Section 5.15**, *Public Health, Elderly, and Persons with Disabilities*.

The resulting adverse impact on local communities would be moderate. Although various disruptive activities would take place over the entire construction period, most would last for a shorter time and be localized. The displacement of the parking and bus service would occur only in Phase 4 (last 4 years and 11 months of construction). Outside of WUS, disruptions would largely concentrate along 2nd Street NE (south of K Street) during Phase 1 of construction (lasting approximately 2 years and 5 months as in all Action Alternatives) and along First Street NE (also south of K Street) during Phase 4. There would also be disruptions on K Street NE to construct the below-ground parking facility access ramp in the underpass below the rail terminal. Although adversely affected, access to WUS would remain available throughout the construction period and the phased construction would help minimize reductions in rail operations. While the various inconveniences construction of Alternative B would create would be highly noticeable and would make the parts of the Local Study Area closest to WUS less attractive to new residents or businesses while construction is ongoing, the affected areas would be small and the adverse impacts would fade quickly with distance.

Construction Employment

Construction of Alternative B would have a minor beneficial impact on employment.

Construction of Alternative B would support numerous jobs during the entire construction period. As shown in **Table 5-171**, on average annually, Alternative B would support approximately 4,282 direct jobs and 1,806 indirect and induced jobs, for a total of 6,088 jobs.[23]

[22] The retail outlets that would be impacted includes UNIQLO, Victoria's Secret, Comfort One Shoes, Verizon, Hudson News, America!, Kashmir, Einstein Bros. Bagels, and Jamba Juice.

[23] As noted above, the modeling of construction impacts was based on Amtrak's rough-order-of magnitude combined estimates, which include the private and potential Federal overbuild deck but exclude the column removal work (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*).

Table 5-171. Construction Employment Estimates, Alternative B

Phase	Construction Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1	3,439	321	1,129	4,889
1	2	3,439	321	1,129	4,889
1 and 2	3	4,030	376	1,323	5,729
2	4	4,055	379	1,331	5,766
2	5	4,055	379	1,331	5,766
2 and 3	6	3,743	350	1,229	5,322
3	7	3,510	328	1,152	4,990
3	8	3,510	328	1,152	4,990
3 and 4	9	4,608	431	1,513	6,552
4	10	5,320	497	1,746	7,563
4	11	5,320	497	1,746	7,563
4	12	5,320	497	1,746	7,563
4	13	5,320	497	1,746	7,563
4	14	1,787	167	586	2,540
Annual Average		**4,282**	**400**	**1,406**	**6,088**

Construction year 14 is a partial year and not included in the annual average.
Intermediate Phase not included.

While beneficial, the impact would be minor as the annual average number of direct jobs that Alternative B would support for the duration of the construction period represents approximately 0.57 percent of total employment in the two relevant sectors in the Washington-Arlington-Alexandria Metropolitan Statistical Area as of early 2019.

Washington Union Station Revenue

Construction of Alternative B would have a major adverse impact on WUS revenue.

In Alternative B as in Alternative A (See **Section 5.14.4.2**, *Alternative A, Construction Impacts*) construction-related disruptions, including retail closures during column removal work and the demolition of the parking garage during Phase 4 would reduce WUS revenue. As in all Action Alternatives, retail closures would at least last for approximately 2 years and 6 months overlapping with Phases 1 and 2 of construction. While parking would remain available during the first three phases of construction, limited access and rerouting may reduce the number of users and parking revenue. During Phase 4, approximately 4 years and 11 months, parking would not be available. Based on fiscal year 2016 parking revenue, this would be a loss of approximately $42.5 million for WUS.

Other Economic Benefits or Impacts

Construction of Alternative B would have a moderate beneficial impact on the regional economy.

Construction of Alternative B would have a moderate regional beneficial economic impact from the spending of the income generated by the jobs the construction of the Project would support. **Table 5-172** shows annual estimates of this income. The impact would be moderate in the context of the Washington-Arlington-Alexandria Metropolitan Area. In 2017, the gross domestic product of this area was approximately $17.5 trillion.

Table 5-172. Construction Annual Labor Income, Value and Output, Alternative B

Phase	Construction Year	Annual Labor Income	Annual Value	Annual Total Output
1	1	$318,900,192	$445,818,949	$735,926,892
1	2	$318,900,192	$445,818,949	$735,926,892
1 and 2	3	$373,754,159	$522,504,189	$862,513,550
2	4	$376,123,473	$525,816,465	$867,981,224
2	5	$376,123,473	$525,816,465	$867,981,224
2 and 3	6	$347,174,782	$485,346,514	$801,176,246
3	7	$325,502,052	$455,048,276	$751,162,024
3	8	$325,502,052	$455,048,276	$751,162,024
3 and 4	9	$427,422,286	$597,531,639	$986,363,643
4	10	$493,368,671	$689,723,957	$1,138,548,305
4	11	$493,368,671	$689,723,957	$1,138,548,305
4	12	$493,368,671	$689,723,957	$1,138,548,305
4	13	$493,368,671	$689,723,957	$1,138,548,305

Values presented in 2019 dollars.
Intermediate Phase not included.

Comparison to Existing Conditions

Alternative B impacts on socioeconomics relative to existing conditions would be generally the same as relative to the No-Action Alternative. The District's economy would grow between the present and 2040 and the impacts of Alternative B would be relatively greater when compared to existing conditions than compared to No-Action Alternative conditions. Given the respective size of the existing economy and impacts, the difference would be small.

5.14.4.4 Alternative C

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative C (either option) would have no direct operational impact on demographic conditions.

Alternative C would not directly add or displace any residential populations in the Local Study Area or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have major beneficial direct operational impacts on local communities.

The impacts of Alternative C would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Employment

Relative to the No-Action Alternative, Alternative C (either option) would have a minor beneficial direct operational impact on employment.

The impacts of Alternative C would be the same as those of Alternative A. They are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative C (either option) would have a major adverse operational direct impact on WUS revenue.

Like Alternative B, and for the same reason (**Section 5.14.4.3**, *Alternative B, Direct Operational Impacts*), Alternative C would eliminate the station's revenue stream from parking. Revenue from retail would remain approximately as or be less than in the No-Action Alternative for the same reasons a explained for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*. The loss in revenue would be a major adverse impact as parking represents the majority of WUS's revenue.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have a minor beneficial direct operational impact on the local and regional economy.

The impact of Alternative C on the local and regional economy from additional retail at WUS would be the same as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have a negligible indirect operational impact on demography; no adverse indirect operational impact on local communities; a minor beneficial indirect operational impact on employment; no indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on tax revenues in the District.

The indirect operational impacts of Alternative C would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Indirect Operational Impacts* except for the indirect impacts associated with the potential development of the Federal air rights, described below.

Potential Federal Air-rights Development

Relative to the No-Action Alternative, in Alternative C (either option), the potential development of the Federal air right as office space would result in a negligible indirect operational impact on demography; no indirect operational impact on local communities; a moderate beneficial indirect operational impact on employment; a beneficial indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on District tax revenue.

The development of the remaining Federal air rights as approximately 952,600 square feet of office space, as is assumed for the purposes of the impact analysis, would have a beneficial impact on WUS revenue through the lease of the space (or other mechanism through which development would be achieved). This impact cannot be quantified at this time but it would at least partially offset the loss of revenue from the reduction in parking capacity. The provision of this office space would have an impact on demography in the Local Study Area if some employees move to the area to be closer to their place of work. Given WUS's accessibility by transit and the moderate number of employees at the site, this impact would be small and negligible. Development of the Federal air rights into office space would not cause disruptions to local communities, as it would occur within the footprint of a pre-existing facility. It would bring approximately 3,810 additional new jobs to the Local Study Area, a moderate beneficial impact in the context of the Local and Regional Study Areas. These jobs would generate tax revenue for the District. The beneficial impact on tax revenue would be minor in the context of the District as a whole.

Construction Impacts

Demographics

Construction of Alternative C (either option) would have no impacts on demography.

Like the construction of all Action Alternatives, the construction of Alternative C would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative C would have moderate adverse impacts on local communities.

Construction of Alternative C would take place over approximately 12 years and 3 months (including the 12-month Intermediate Phase when only column removal work would be performed). Throughout, to accommodate construction activities, there would be periods of rerouting passengers and closing off sections of WUS. As in all Action Alternatives, column removal work would close part of the Retail and Ticketing Concourse and displace the retail outlets located there for the duration of the work (approximately 2 years and 6 months, overlapping with Phases 1 and 2 of construction).[24] Parking and bus loading and unloading activities would be displaced between the demolition of the existing garage and the completion of the new bus and parking facilities. Construction traffic and noise as well as partial closures of sidewalks and traffic lanes would adversely affect residents, commuters, and workers. These impacts are described in greater detail in other sections of this DEIS including: **Section 5.5**, *Transportation*, **Section 5.9**, *Land Use, Land Planning and Property*, **Section 5.10** *Noise and Vibration*, **Section 5.13**, *Parks and Recreation Areas*, and **Section 5.15**, *Public Health, Elderly, and Persons with Disabilities*. The resulting adverse impact on local communities would be moderate for the same reasons as explained in **Section 4.14.4.3**, *Alternative B, Construction Impacts*.

The resulting adverse impact on local communities would be moderate. Although various disruptive activities would take place over the entire construction period, most would last for a shorter time and would be localized. The displacement of the parking and bus facility would occur only in Phase 4 (last 4 years of construction). It would be total under the West Option but partial under the East Option, as the new bus facility and above-ground parking facility would be operational by the time the existing structures are demolished. Outside of WUS, disruptions would largely concentrate along 2nd Street NE (south of K Street) during Phase 1 of construction (lasting approximately 2 years and 5 months, as in all Action Alternatives) and along First Street NE (also south of K Street) during Phase 4. There would also be disruptions on K Street NE to construct the below-ground parking facility access ramp in the underpass below the rail terminal. Although adversely affected, access to WUS would remain available throughout the construction period and the phased construction would help minimize reductions in rail operations. While the various inconveniences construction of Alternative C would create would be highly noticeable and would make WUS and the parts of the Local Study Area closest to WUS less attractive to new residents or businesses while construction is ongoing, the affected areas would be small and the adverse impacts would fade quickly with distance.

Construction Employment

Construction of Alternative C (either option) would have a minor beneficial impact on employment.

Construction of Alternative C would support numerous jobs during the entire construction period. As shown in **Table 5-173**, on average annually, Alternative C would support approximately 4,483 direct jobs and 1,891 indirect and induced jobs, for a total of 6,374 jobs. [25] While beneficial, the impact would be minor as the annual average number of direct jobs

[24] The retail outlets that would be impacted includes UNIQLO, Victoria's Secret, Comfort One Shoes, Verizon, Hudson News, America!, Kashmir, Einstein Bros. Bagels, and Jamba Juice.

[25] As noted above, the modeling of construction impacts was based on Amtrak's rough-order-of magnitude combined estimates, which include the private and potential Federal overbuild deck but exclude the column removal work (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*).

that Alternative C would support represent approximately 0.6 percent of total employment in the two relevant sectors in the Washington-Arlington-Alexandria Metropolitan Statistical Area as of early 2019.

Table 5-173. Construction Employment Estimates, Alternative C

Phase	Construction Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1	3,251	304	1,067	4,621
1	2	3,251	304	1,067	4,621
1 and 2	3	4,219	394	1,385	5,999
2	4	4,476	418	1,469	6,364
2 and 3	5	4,254	397	1,396	6,048
3	6	3,624	339	1,190	5,153
3	7	3,624	339	1,190	5,153
3 and 4	8	5,288	494	1,736	7,517
4	9	5,777	539	1,896	8,212
4	10	5,777	539	1,896	8,212
4	11	5,777	539	1,896	8,212
4	12	1,427	133	468	2,028
Annual Average		**4,483**	**419**	**1,472**	**6,374**

Intermediate Phase not included.

Washington Union Station Revenue

Construction of Alternative C (either option) would have a major adverse impact on WUS revenue.

In Alternative C as in the other Action Alternatives, construction-related disruptions, including retail closures during column removal work and the demolition of the existing parking garage during Phase 4 would reduce WUS revenue. As in all Action Alternatives, the retail closures would last at least for approximately 2 years and 6 months, overlapping with Phases 1 and 2 of construction. While parking would remain available during the first three phases of construction, limited access and rerouting may reduce the number of users and parking revenue. During Phase 4 (approximately 4 years), parking would not be available (West Option) or would be partially available in the new above-ground parking facility but outside the lease area (East Option). Based on fiscal year 2016 parking revenue, this would be a loss of approximately $42.5 million.

Other Economic Benefits or Impacts

Construction of Alternative C (either option) would have a moderate beneficial impact on the regional economy.

Construction of Alternative C would have a moderate regional beneficial economic impact from the spending of the income generated by the jobs the construction of the Project would support. **Table 5-174** shows annual estimates of this income. The impact would be moderate in the context of the Washington-Arlington-Alexandria Metropolitan Area. In 2017, the gross domestic product of this area was approximately $17.5 trillion.

Table 5-174. Construction Annual Labor Income, Value and Output, Alternative C

Phase	Construction Year	Annual Labor Income	Annual Value	Annual Total Output
1	1	$301,451,404	$421,425,735	$695,660,273
1	2	$301,451,404	$421,425,735	$695,660,273
1 and 2	3	$391,306,342	$547,041,947	$903,018,773
2	4	$415,145,901	$580,369,388	$958,033,393
2 and 3	5	$394,509,551	$551,519,998	$910,410,827
3	6	$336,127,161	$469,902,061	$775,681,618
3	7	$336,127,161	$469,902,061	$775,681,618
3 and 4	8	$490,353,323	$685,508,534	$1,131,589,778
4	9	$535,730,191	$748,944,895	$1,236,306,107
4	10	$535,730,191	$748,944,895	$1,236,306,107
4	11	$535,730,191	$748,944,895	$1,236,306,107
4	12	$132,271,189	$184,913,662	$305,242,604

Values presented in 2019 dollars.
Intermediate Phase not included.

Comparison to Existing Conditions

The impacts of Alternative C (either option) on socioeconomic conditions would generally be the same relative to existing conditions as they would be relative to the No-Action Alternative. As the District's economy would grow between the present and 2040, Alternative C's impacts would be greater when compared to existing conditions than when compared to the No-Action Alternative conditions. Given the respective size of the existing economy and the impacts, the difference would be small.

5.14.4.5 Alternative D

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative D would have no direct operational impact on demographic conditions.

Alternative D would not directly add or displace any residential populations in the Local Study Area or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative D would have major beneficial direct operational impacts on local communities.

The impacts of Alternative D would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Employment

Relative to the No-Action Alternative, Alternative D would have a minor beneficial direct operational impact on employment.

Alternative D would beneficially impact employment by adding 1,529 jobs at WUS relative to the No-Action Alternative. The approximately 100,000 additional square feet of WUS retail would generate approximately 300 new jobs. Alternative D would also provide approximately 297,400 square feet of expanded Amtrak support area, which would be staffed with approximately 1,629 persons, an approximately 1,229-employee increase over the No-Action Alternative.

This beneficial impact would be minor in the larger context of the District. The 1,529 jobs Alternative D would support would represent an increase of 149 percent in WUS jobs relative to the No-Action Alternative but only a 0.15 percent of the total projected 2040 employment in the District (1,012,000 jobs).

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative D would have a major adverse operational direct impact on WUS revenue.

Like Alternative B and for the same reason (**Section 5.14.4.3***, Alternative B, Direct Operational Impacts*), Alternative D would eliminate the station's revenue stream from parking and may eliminate revenue from retail. This would be a major adverse impact. Parking represents the majority of WUS's revenue.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative D would have a minor beneficial direct operational impact on the local and regional economy.

Alternative D would add approximately 100,000 square feet of retail at WUS. This would generate revenue for retail operators as well as new jobs and sales taxes, driving further economic activity. Existing WUS retail and services would benefit from increased sales due to greater Amtrak, MARC, VRE, and intercity bus ridership (approximately 50,700 additional daily passengers relative to the No-Action Alternative). These beneficial impacts would be minor in the context of the local and regional economy.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a negligible indirect operational impact on demography; no adverse indirect operational impact on local communities; a minor beneficial indirect operational impact on employment; no indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on tax revenues in the District.

The indirect operational impacts of Alternative D would be the as described for Alternative A in **Section 5.14.4.2***, Alternative A, Indirect Operational Impacts* except for the indirect impacts associated with the potential development of the Federal air rights, described below.

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, in Alternative D, the potential development of the Federal air right as office space would result in a negligible indirect operational impact on demography; no indirect operational impact on local communities; a moderate beneficial indirect operational impact on employment; a beneficial indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on District tax revenue.

The development of the remaining Federal air rights in Alternative D as approximately 688,000 square feet of office space, as is assumed for the purposes of the impact analysis, would have a beneficial impact on WUS revenue through the lease of the space (or other mechanism through which development would be achieved). This impact cannot be quantified at this time but it would at least partially offset the loss of revenue from the reduction in parking capacity. The provision of this office space would have an impact on demography in the Local Study Area if some employees move to the area to be closer to their workplace. Given WUS's accessibility by transit and the moderate number of employees at the site, this impact would be small and negligible. Development of the Federal air rights into office space would not cause disruptions to local communities, as it would occur within the footprint of a pre-existing facility. It would bring approximately 2,752 additional new jobs to the Local Study Area, a moderate beneficial impact in the context of the Local and Regional Study Areas. These jobs would generate tax revenue for the District. The beneficial impact on tax revenue would be minor in the context of the District as a whole.

Construction Impacts

Demographics

Construction of Alternative D would have no impact on demography.

Like in all Action Alternatives, the construction of Alternative D would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area**.**

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative D would have moderate adverse impacts on local communities.

The impacts of constructing Alternative D would be the same as those of constructing Alternative C with the West Option. They are described in **Section 5.14.4.4**, *Alternative C, Construction Impacts*.

Construction Employment

Construction of Alternative D would have a minor beneficial impact on employment.

Construction of Alternative D would support numerous jobs during the entire construction period. As shown in **Table 5-175**, on average, Alternative D would support annually approximately 4,513 direct jobs and 1,902 indirect and induced jobs, for a total of 6,416 jobs.[26]

Table 5-175. Construction Employment Estimates, Alternative D

Phase	Construction Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1	3,193	298	1,048	4,539
1	2	3,193	298	1,048	4,539
1 and 2	3	4,157	388	1,364	5,909
2	4	4,416	413	1,450	6,278
2	5	4,213	393	1,383	5,989
3	6	3,639	340	1,195	5,174
3	7	3,639	340	1,195	5,174
3 and 4	8	5,407	505	1,775	7,687
4	9	5,929	554	1,946	8,429
4	10	5,929	554	1,946	8,429
4	11	5,929	554	1,946	8,429
4	12	1,464	137	481	2,081
Annual Average		**4,513**	**421**	**1,481**	**6,416**

Intermediate Phase not included

While beneficial, the impact would be minor. The total annual average number of direct jobs that Alternative D would support for the duration of the construction period would represent approximately 0.6 percent of total employment in the two relevant sectors in the Washington-Arlington-Alexandria Metropolitan Statistical Area as of early 2019.

Washington Union Station Revenue

Construction of Alternative D would result in a major adverse impact on WUS revenue.

[26] As noted above, the modeling of construction impacts was based on Amtrak's rough-order-of magnitude combined estimates, which include the private and potential Federal overbuild deck but exclude the column removal work (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*).

The impact of constructing Alternative D on WUS revenue would be as described in **Section 5.14.4.4**, *Alternative C, Construction Impacts* for Alternative C.

Other Economic Benefits or Impacts

Construction of Alternative D would have a moderate beneficial impact on the regional economy.

Construction of Alternative D would have a moderate regional beneficial economic impact from the spending of the income generated by the jobs the construction of the Project would support. **Table 5-176** shows annual estimates of this income. The impact would be moderate in the context of the Washington-Arlington-Alexandria Metropolitan Area. In 2017, the gross domestic product of this area was approximately $17.5 trillion.

Table 5-176. Construction Annual Labor Income, Value and Output, Alternative D

Phase	Construction Year	Annual Labor Income	Annual Value	Annual Total Output
1	1	$296,124,478	$413,978,752	$683,367,312
1	2	$296,124,478	$413,978,752	$683,367,312
1 and 2	3	$385,485,783	$538,904,871	$889,586,654
2	4	$409,525,993	$572,512,819	$945,064,315
2	5	$390,679,191	$546,165,198	$901,571,496
3	6	$337,542,771	$471,881,069	$778,948,426
3	7	$337,542,771	$471,881,069	$778,948,426
3 and 4	8	$501,439,798	$701,007,304	$1,157,174,068
4	9	$549,865,677	$768,706,148	$1,268,926,608
4	10	$549,865,677	$768,706,148	$1,268,926,608
4	11	$549,865,677	$768,706,148	$1,268,926,608
4	12	$135,761,225	$189,792,694	$313,296,570

Values presented in 2019 dollars.
Intermediate Phase not included

Comparison to Existing Conditions

The impacts of Alternative D on socioeconomic conditions would generally be the same relative to existing conditions as they would be relative to the No-Action Alternative. The District's economy would grow between the present and 2040. Alternative D's impacts would be greater when compared to existing conditions than when compared to the No-Action Alternative conditions but, given the respective size of the existing economy and the impacts, the difference would be small.

5.14.4.6 Alternative E

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative E would have no direct operational impact on demographic conditions.

Like Alternative A and the other Action Alternatives, Alternative E would not directly add or displace any residential populations in the Local or Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative E would have major beneficial direct operational impacts on local communities.

The impacts of Alternative E would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Employment

Relative to the No-Action Alternative, Alternative E would have a minor beneficial direct operational impact on employment.

The impact of Alternative E on employment would be the same as those of Alternative D. They are described in **Section 5.14.4.5**, *Alternative D, Direct Operational Impacts*.

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative E would have a major adverse operational direct impact on WUS revenue.

Like Alternative B and for the same reason (**Section 5.14.4.3***, Alternative B, Direct Operational Impacts*), Alternative E would eliminate the station's revenue stream from parking and may eliminate some revenue from retail. The loss of revenue would be a major adverse impact. Parking represent the majority of WUS's revenue.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative E would have a minor beneficial direct operational impact on the local and regional economy.

Alternative E would result in the same minor beneficial adverse direct operational impact on the economy as Alternative D (**Section 5.14.4.5**, *Alternative D, Direct Operational Impacts*).

Indirect Impacts

Relative to the No-Action Alternative, Alternative E would have a negligible indirect operational impact on demography; no adverse indirect operational impact on local communities; a minor beneficial indirect operational impact on employment; no indirect

operational impact on WUS revenue; and a minor beneficial indirect operational impact on tax revenues in the District.

The indirect operational impacts of Alternative E would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Indirect Operational Impacts* except for the indirect impacts associated with the potential development of the Federal air rights, which are addressed below.

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, in Alternative E, the potential development of the Federal air right as office space would result in a negligible indirect operational impact on demography; no indirect operational impact on local communities; a moderate beneficial indirect operational impact on employment; a beneficial indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on District tax revenue.

In Alternative E, the potential Federal air-rights development would be the same as in Alternative D. Associated indirect operational impacts would be the same. They are described in **Section 5.14.4.5**, *Alternative D, Indirect Operational Impacts*.

Construction Impacts

Demographics

Construction of Alternative E would have no impact on demography.

Like the construction of all Action Alternatives, the construction of Alternative E would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area**.**

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative E would have moderate adverse impacts on local communities.

The impacts of constructing Alternative E would be the same as those of constructing Alternative B. They are described in **Section 5.14.4.3**, *Alternative B, Construction Impacts*.

Construction Employment

Construction of Alternative E would have a minor beneficial impact on employment.

Construction of Alternative E would support numerous jobs during the entire construction period. As shown in **Table 5-177**, on average, Alternative E would support approximately 4,314 direct jobs and 1,818 indirect and induced jobs annually, for a total of 6,132 jobs. [27]

[27] As noted above, the modeling of construction impacts was based on Amtrak's rough-order-of magnitude combined estimates, which include the private and potential Federal overbuild deck but exclude the column removal work (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*).

Table 5-177. Construction Employment Estimates, Alternative E

Phase	Construction Year	Direct Employment	Indirect Employment	Induced Employment	Total Employment
1	1	3,448	322	1,132	4,902
1	2	3,448	322	1,132	4,902
1 and 2	3	4,105	384	1,348	5,836
2	4	4,142	387	1,359	5,888
2	5	4,142	387	1,359	5,888
2 and 3	6	3,815	357	1,252	5,424
3	7	3,553	332	1,166	5,052
3	8	3,553	332	1,166	5,052
3 and 4	9	4,623	431	1,517	6,572
4	10	5,312	496	1,744	7,552
4	11	5,312	496	1,744	7,552
4	12	5,312	496	1,744	7,552
4	13	5,312	496	1,744	7,552
4	14	1,784	166	586	2,536
Annual Average		**4,314**	**402**	**1,416**	**6,132**

Intermediate Phase not included.

While beneficial, the impact would be minor. The total annual average number of direct jobs that Alternative E would support for the duration of the construction period would represent approximately 0.57 percent of total employment in the two relevant sectors in the Washington-Arlington-Alexandria Metropolitan Statistical Area as of early 2019.

Washington Union Station Revenue

Construction of Alternative E would result in a major adverse impact on WUS revenue.

The impact of constructing Alternative E on WUS revenue would be as described for Alternative B in **Section 5.14.4.3**, *Alternative B, Construction Impacts*.

Other Economic Benefits or Impacts

Construction of Alternative E would have a moderate beneficial impact on the regional economy.

Construction of Alternative E would have a moderate beneficial impact on the regional economy from the spending of the income generated by the jobs the construction of the Project would support. **Table 5-178** shows annual estimates of this income. The impact would be moderate in the context of the Washington-Arlington-Alexandria Metropolitan Area. In 2017, the gross domestic product of this area was approximately $17.5 trillion.

Table 5-178. Construction Annual Labor Income, Value and Output, Alternative E

Phase	Construction Year	Annual Labor Income	Annual Value	Annual Total Output
1	1	$319,748,726	$447,005,190	$737,885,056
1	2	$319,748,726	$447,005,190	$737,885,056
1 and 2	3	$380,720,570	$532,243,155	$878,589,957
2	4	$384,085,970	$536,947,947	$886,356,300
2	5	$384,085,970	$536,947,947	$886,356,300
2 and 3	6	$353,840,002	$494,664,417	$816,557,592
3	7	$329,529,172	$460,678,146	$760,455,421
3	8	$329,529,172	$460,678,146	$760,455,421
3 and 4	9	$428,693,711	$599,309,077	$989,297,713
4	10	$492,675,830	$688,755,374	$1,136,949,434
4	11	$492,675,830	$688,755,374	$1,136,949,434
4	12	$492,675,830	$688,755,374	$1,136,949,434
4	13	$492,675,830	$688,755,374	$1,136,949,434
4	14	$165,431,905	$231,271,978	$381,767,684

Values presented in 2019 dollars.
Intermediate Phase not included.

Comparison to Existing Conditions

The impacts of Alternative E on socioeconomic conditions would generally be the same relative to existing conditions as they would be relative to the No-Action Alternative. The District's economy would grow between the present and 2040, and Alternative D's impacts would be greater when compared to existing conditions than when compared to the No-Action Alternative conditions. Given the respective size of the existing economy and the impacts, the difference would be small.

5.14.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Demographics

Relative to the No-Action Alternative, Alternative A-C would have no direct operational impact on demographic conditions.

Alternative A-C would not directly add or displace any residential populations in the Local Study Area or the Regional Study Area.

Community Disruption and Other Social Benefits or Impacts

Relative to the No-Action Alternative, Alternative A-C would have major beneficial direct operational impacts on local communities.

The impacts of Alternative A-C would be the same as those of Alternative A. They are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Employment

Relative to the No-Action Alternative, Alternative A-C would have a minor beneficial direct operational impact on employment.

The impacts of Alternative A-C would be the same as those of Alternative A. They are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Washington Union Station Revenue

Relative to the No-Action Alternative, Alternative A-C would have a moderate adverse direct operational impact on WUS revenue.

Alternative A-C would reduce the number of revenue-generating parking spaces at the station from approximately 2,205 in the No-Action Alternative to about 1,600, a reduction of approximately 27 percent. Based on USRC's revenue from parking in fiscal year 2016, this would amount to approximately $2.3 million (2017 dollars) in lost revenue. This order-of-magnitude estimate does not account for the fact that decreasing the total number of spaces may increase the revenue generated by each space due to reduced supply and steady or increasing demand.

Revenue from retail would remain approximately the same as or be less than in the No-Action Alternative for the same reasons as explained for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*.

Altogether, Alternative A-C would cause a net loss in revenue for WUS. The loss would be a moderate adverse impact because all parking, which is the main source of income for WUS, would continue to generate revenue while the permanent loss of retail, if it occurs, would likely be small.

Other Direct Economic Impacts

Relative to the No-Action Alternative, Alternative A-C would have a minor beneficial direct operational impact on the local and regional economy.

The impact of Alternative A-C on the local and regional economy from additional retail at WUS would be the same as that of Alternative A. These impacts are described in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts.*

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a negligible indirect operational impact on demography; no adverse indirect operational impact on local

communities; a minor beneficial indirect operational impact on employment; no indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on tax revenues in the District.

The indirect operational impacts of Alternative A-C would be as described for Alternative A in **Section 5.14.4.2**, *Alternative A, Indirect Operational Impacts* with the exception the impacts associated with the potential Federal air-rights development, described below.

Potential Federal Air-Rights Development

Relative to the No-Action Alternative, in Alternative A-C, the potential development of the Federal air right as office space would result in a negligible indirect operational impact on demography; no indirect operational impact on local communities; a moderate beneficial indirect operational impact on employment; a beneficial indirect operational impact on WUS revenue; and a minor beneficial indirect operational impact on District tax revenue.

The development of the remaining Federal air rights in Alternative A-C as approximately 380,000 square feet of office space, as assumed for the purposes of the impact analysis, would have a beneficial impact on WUS revenue through the lease of the space (or other mechanism through which development would be achieved). This impact cannot be quantified at this time but it would at least partially offset the loss of revenue from the reduction in parking capacity. The provision of this office space would have a small and negligible impact on demography in the Local Study Area if some employees move to the area to be closer to their workplace. Given WUS's accessibility by transit and the moderate number of employees at the site, this impact would be small and negligible. Development of the Federal air rights into office space would not cause disruptions to local communities, as it would occur within the footprint of a pre-existing facility. It would bring approximately 1,520 additional new jobs to the Local Study Area, a moderate beneficial impact in the context of the Local and Regional Study Areas. These jobs would generate tax revenue for the District. The beneficial impact on tax revenue would be minor in the context of the District as a whole.

Construction Impacts

Demographics

Construction of Alternative A-C would have no impacts on demography.

Like the construction of the other Action Alternatives, the construction of Alternative A-C would cause neither an influx nor a displacement of residential populations in the Local or the Regional Study Area**.**

Community Disruption and Other Social Benefits or Impacts

Construction of Alternative A-C would have moderate adverse impacts on local communities.

The adverse impacts of the construction of Alternative A-C on local communities would be the same as those of Alternative A (see **Section 5.14.4.2**, *Alternative A, Construction Impacts*).

Construction Employment

Construction of Alternative A-C would have a minor beneficial impact on employment.

Alternative A-C would generate approximately the same number of jobs as Alternative A (see **Section 5.14.4.2**, *Alternative A, Construction Impacts*) as total cost estimates for both alternatives are approximately the same.

Washington Union Station Revenue

Construction of Alternative A-C would have a major adverse impact on WUS revenue.

The impacts of constructing Alternative A-C on WUS revenue would be the same at those of constructing Alternative A. These impacts are described in **Section 5.14.4.2**, *Alternative A, Construction Impacts*.

Other Economic Benefits or Impacts

Construction of Alternative A-C would have a moderate beneficial impact on the regional economy.

Alternative A-C would cost almost the same to construct as Alternative A. Therefore, the economic benefits and impacts of this alternative would be the same as those of Alternative A, described in **Section 5.14.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

Alternative A-C impacts on socioeconomics relative to existing conditions would be generally the same as relative to the No-Action Alternative. The District's economy would grow between the present and 2040 and the impacts of Alternative A-C would be relatively greater when compared to existing conditions than compared to No-Action Alternative conditions. Given the respective size of the existing economy and the impacts, the difference would be small.

5.14.5 Comparison of Alternatives

Table 5-179 presents a comparison of the impacts of the No-Action Alternative and six Action Alternatives on social and economic conditions. **Table 5-180** summarizes the impacts of each alternative in greater detail.

For all alternatives, operational impacts would be beneficial with the exception of impacts on WUS revenue in the Action Alternatives, due the partial (Alternatives A and A-C) or total (other Action Alternatives) loss of parking. In all Action Alternatives, the potential development of the Federal air rights could offset this loss. In general, excepting employment in the Project Area, the beneficial operational impacts of the Action Alternatives would be greater than those of the No-Action Alternative.

Among the Action Alternatives, the primary differentiator would be the employment and economic impacts from construction, which would be a function of cost and duration. Taking both factors into account, Alternatives B and E would support the most jobs and Alternatives A and A-C the fewest, with Alternatives C and D in the middle. Similarly, Alternatives B and E would generate the greatest total economic output and Alternatives A and A-C the smallest, with Alternative C and D generating a little more than Alternatives A and A-C.

Constructing any of the Action Alternatives would cause disruptions to surrounding neighborhoods, but these impacts would remain moderate because of the focus of construction activities on the rail terminal and immediately adjacent areas. Based on duration, Alternatives A and A-C would have the smallest impact and Alternatives B and E the greatest one. In all Action Alternatives, column removal work would displace some existing retail at WUS for approximately 2 years and 6 months at least, overlapping with Construction Phases 1 and 2.

5.14.6 Avoidance, Minimization and Mitigation Evaluation

All Action Alternatives would result in a permanent loss of revenue for WUS due to a partial or complete loss of parking. All Action Alternatives except Alternatives A and A-C would eliminate all parking revenue since the new parking would be outside WUS's lease area and generate no revenue for the station under current leasing agreements. Additionally, in all Action Alternatives, construction of the Project would displace some existing retail outlets during column removal work (approximately 2 years and 6 months overlapping with construction Phases 1 and 2) and eliminate parking revenue during Phase 4.

Mitigation that FRA is considering for these major impacts on revenue includes extending WUS's lease area to encompass part or all of the new parking and retail areas, which then would generate new revenue for the station. The scope and financial dimension of the impacts from the column removal work on existing retail, and the need for amending existing lease agreements, would need to be evaluated among FRA, USRC, USI, and the affected businesses.

5.14.7 Permits and Regulatory Compliance

There are no compliance efforts or permits applicable to socioeconomic conditions.

Table 5-179. Comparison of Alternatives, Social and Economic Conditions

Impact Category	Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C (Either Option)	Alternative D	Alternative E	Alternative A-C (Preferred)
Demographics	**Direct Operational**	Minor impact	No impact					
	Indirect Operational	Negligible impact						
	Federal Air-Rights Development	N/A	No impact	Negligible impact				
	Construction	No impact						
Community Disruption and Other Social Benefits	**Direct Operational**	Moderate beneficial impact	Major beneficial impact					
	Indirect Operational	No impacts						
	Federal Air-Rights Development	N/A	No impact					
	Construction	Minor adverse impacts	Moderate adverse impact					
Employment	**Direct Operational**	Moderate beneficial impact	Minor beneficial impact					
	Indirect Operational	Minor beneficial impact						
	Federal Air-Rights Development	N/A	Negligible beneficial impact	Moderate beneficial impact				
	Construction	Minor beneficial impact						

Impact Category	Type of Impact	No-Action Alternative	Alternative A	Alternative B	Alternative C (Either Option)	Alternative D	Alternative E	Alternative A-C (Preferred)
WUS Revenue	**Direct Operational**	No impact	Moderate adverse impact	Major adverse impact				Moderate adverse impact
	Indirect Operational	Negligible beneficial impact	No impact					
	Federal Air-Rights Development	N/A	Beneficial					
	Construction	Minor adverse impacts	Major adverse impact					
Other Economic Impacts	**Direct Operational**	Minor beneficial impact	Minor beneficial impact					
	Indirect Operational	Moderate beneficial impact	Minor beneficial impact					
	Federal Air-Rights Development	N/A	Negligible beneficial impact	Minor beneficial impact				
	Construction	Moderate beneficial impact						

Table 5-180. Social and Economic Conditions Summary of Impacts

Alternative	Social Impacts	Employment	WUS Revenue	Construction Social Impacts	Construction Employment[1]	Construction Economic Impacts[1]
No-Action	Moderate benefits to community cohesion, connectivity and station circulation.	8,500 new jobs from office, retail, and hotel development.	No change.	Minor community disruption in and around WUS due to construction.	N/A	N/A
Alternative A	Major benefits to community cohesion, connectivity and station circulation.	1,445 new jobs from retail and Amtrak expansion; no jobs from potential Federal air-rights development.	Partial loss of parking revenue (order of magnitude: $1.79 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (3 years 1 month).	An annual average of 6,543 jobs supported for 10 years 5 months.	Total construction cost of $7.23 billion would spur economic output of $586 to $1,405 million annually to the region.
Alternative B	Major benefits to community cohesion, connectivity and station circulation.	1,445 new jobs from retail and Amtrak expansion; 3,670 jobs from potential Federal air-rights development.	Total loss of parking revenue (order of magnitude: $8.5 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (4 years 11 months).	An annual average of 6,088 jobs supported for 13 years 4 months.	Total construction cost of $8.63 billion would spur economic output of $382 to $1,139 million annually to the region.

Alternative	Social Impacts	Employment	WUS Revenue	Construction Social Impacts	Construction Employment[1]	Construction Economic Impacts[1]
Alternative C	Major benefits to community cohesion, connectivity and station circulation.	1,445 new jobs from retail and Amtrak expansion; 3,810 jobs from potential Federal air-rights development.	Total loss of parking revenue (order of magnitude: $8.5 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (4 years).	An annual average of 6,374 jobs supported for 11 years 3 months.	Total construction cost of $7.55 billion would spur economic output of $305 to $1,236 million annually to the region.
Alternative D	Major benefits to community cohesion, connectivity and station circulation.	1,529 new jobs from retail and Amtrak expansion; 2,752 jobs from potential Federal air-rights development.	Total loss of parking revenue (order of magnitude: $8.5 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (4 years).	An annual average of 6,416 jobs supported for 11 years 3 months.	Total construction cost of $7.61 billion would spur economic output of $313 to $1,269 million annually to the region.
Alternative E	Major benefits to community cohesion, connectivity and station circulation.	1,529 new jobs from retail and Amtrak expansion; 2,752 jobs from potential Federal air-rights development.	Total loss of parking revenue (order of magnitude: $8.5 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (4 years 11 months).	An annual average of 6,132 jobs supported for 13 years 4 months.	Total construction cost of $8.69 billion would spur economic output of $382 to $1,137 million annually to the region.

Alternative	Social Impacts	Employment	WUS Revenue	Construction Social Impacts	Construction Employment[1]	Construction Economic Impacts[1]
Alternative A-C	Major benefits to community cohesion, connectivity and station circulation.	1,445 new jobs from retail and Amtrak expansion; 1,520 jobs from potential Federal air-rights development.	Partial loss of parking revenue (order of magnitude: $2.3 million based on fiscal year 2016 revenue).	Moderate community disruption in and around WUS due to construction. Concentrated in Phases 1 (2 years 5 months) and 4 (3 years 1 month).	An annual average of 6,543 jobs supported for 10 years 5 months.	Total construction cost of $7.24 billion would spur economic output of $586 to $1,405 million annually to the region.

1. Intermediate Phase not included. Note that construction-economic impact modeling was performed on the basis of the rough-order-of magnitude combined construction cost estimates developed by Amtrak, which are the only estimates available at the phase level (see **Appendix A8**, *Action Alternatives Cost Estimates Memorandum*; the combined estimates include costs associated with the private air-rights development deck and potential Federal air-rights development deck.)

5.15 Public Safety and Security

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on public safety and security conditions. If applicable, it also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies permitting and regulatory compliance requirements.

5.15.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to safety and security are listed in **Section 4.15.1**, *Regulatory Context and Guidance*.

5.15.2 Study Area

As defined in **Section 4.15.2**, *Study Area,* the Local Study Area for safety and security is the same as the Local Study Area for socioeconomic conditions (**Figure 4-30**). The Regional Study Area includes the relevant service boundaries for fire, law enforcement, and emergency services in the District (**Figure 4-31**).

5.15.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on public safety and security. **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 15.4**, *Methodology* provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.15.3.1 Operational Impacts

To assess the operational impacts of the alternatives on public safety and security, the relevant aspects of each alternative were reviewed to determine how each would potentially create new or heightened risks (adverse impact) or reduce or eliminate risks (beneficial impact). Relevant considerations included: changes in the number of persons or vehicles that would be able to gain access to WUS; changes in security procedures; changes in or modification of security and safety features; design considerations; and changes in potential demand for police and emergency services.

5.15.3.2 Construction Impacts

Assessing potential construction impacts on public safety and security involved reviewing the security and safety risks that construction operations at WUS would potentially create.

Factors considered included: changes in access opportunities; changes in security procedures; removal or addition of security and safety features; closures of roads and sidewalks; and construction-related traffic.

5.15.4 Impact Analysis

This section presents the potential impacts of the No-Action Alternative and the Action Alternatives on public safety and security.

5.15.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, in the No-Action Alternative, there would be major adverse direct operational impacts on public safety and security.

In the No-Action Alternative, existing safety and security practices at WUS would remain in place. **Section 4.15**, *Public Safety and Security* describes these practices. They include Amtrak Police Department (APD) canine patrols, security cameras, and random screening and searches.

Impacts on safety and security would result from the increase in WUS passengers across all modes of transportation. Average daily passenger numbers would grow from approximately 58,400 to 77,500, a 33 percent increase over existing conditions. The number of visitors would also increase and the private air-rights development above the rail terminal would also generate access activity. This would generate additional car and truck traffic next to and above the rail terminal.[1] This would increase the risk of vehicle-related crashes and vehicle-based attacks (such as vehicle-borne improvised explosive devices [VBIED]). Unscreened bus and freight movements would also increase.

The private air-rights deck would have to comply with Amtrak's vertical clearance requirements. Amtrak would review and approve plans to ensure that applicable clearances are met. Based on this requirement, no adverse impacts are anticipated on the safety of rail operations.

With regard to security, based on currently available concepts, the private air-rights development would include vehicular parking within the overbuild deck structure, above WUS's tracks and platforms. [2] Public access to areas inside the structural deck for parking would create new VBIED risks at a sensitive location. Such risks have been identified and

1 Traffic and other transportation impacts are addressed in **Section 5.5**, *Transportation*.

2 Akridge. November 15, 2017. *Burnham Place and Washington Union Station. Concept Level Podium Structural Systems for 30'x55' Column Grid Areas*.

considered in a Threat and Vulnerability Risk Assessment (TVRA).[3] This would be a major adverse impact on security at WUS. It is anticipated that FRA, USRC, and Amtrak would work with the private air-rights developer to address such risks consistent with the recommendations of the TVRA including consideration of solutions that would not place parking in the deck.

Larger volumes would result in greater potential demands on security and emergency services at WUS. ADP would likely need to add staff to continue effectively policing the station. The local units of the Metropolitan Police Department (MPD) and DC Fire and Emergency Medical Services (EMS) would likely have to respond to a greater number of incidents at and near WUS than currently. The adverse impact would be moderate because the affected services would be able to plan for and evaluate future demand and incorporate it in their respective staffing and operations plans. Minimization or mitigation of the potential impacts would be the responsibility of the Projects' respective owners.

Indirect Operational Impacts

Relative to existing conditions, the No-Action Alternative would result in minor adverse indirect operational impacts on public safety and security.

Increases in passenger, visitor, and vehicle volumes would require updating emergency operations plans. They would also likely require hiring new emergency responders such as medical personnel. In the context of the District's growth over the new two decades, the specific impacts of the projects included in the No-Action Alternative would be minor.

Construction Impacts

Construction activities in the No-Action Alternative would result in moderate adverse impacts on public safety and security.

Construction of the projects included in the No-Action Alternative would take place according to different schedules and using construction methods currently unknown. In general, each project would have adverse impacts on security to the extent that it would require granting access to WUS or the rail terminal to workers and vehicles during the construction period. Specific security risks would depend on the size of each construction site and the type and duration of construction operations. It would be the responsibility of the respective project owners and their contractors to minimize security risks. Adverse impacts would be moderate based on the size of the projects and because they would not all take place at the same time.

Construction activities would have adverse impacts on public safety because construction inherently poses safety risks on and adjacent to the construction site. Impacts on public safety in the No-Action Alternative would be moderate based on the size and location of the projects. On site, work would have to comply with applicable Occupational Safety and Health

[3] The TVRA was developed by FRA and the Project Proponents in collaboration with multiple agencies and stakeholders. It was completed in July 2016.

Administration (OSHA) requirements and guidelines. Construction activities within the rail terminal would also be subject to Amtrak's authorization. Construction occurring within 25 feet of any track or overhead catenary system requires Amtrak approval and the use of track protection personnel.

5.15.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A would have a major beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative A could potentially have adverse impacts on security at WUS due to the increase in passenger and visitor volumes. Relative to the No-Action Alternative, combined average daily passenger volumes for Amtrak, MARC, VRE, and intercity buses would increase from 77,500 to 128,200, or a 65 percent growth. Relative to the No-Action Alternative, this would generate more car and truck traffic next to and above the rail terminal, increasing the risk of vehicle-related crashes and vehicle-based attacks.

This potential impact would be offset by the security improvements that would result from Alternative A, resulting in a net impact that would be beneficial and major. The Project Proponents and FRA coordinated and would continue to coordinate with the Federal Protective Service (FPS) and Department of Homeland Security when planning concourses, new loading dock, and new bus facility. During the early stages of planning for the Project, the Project Proponents completed a TVRA to identify threats to WUS. At a minimum, the design of Alternative A would incorporate recommended safety and security principles, such as clear sightlines, adequate and intuitive access for emergency responders, and spatial flexibility for future security measures. The design of Alternative A would allow for the screening of passengers and their luggage when entering the ticketed area to board trains.

The same security risks associated with the potential use of the deck structure for private air-rights development parking identified for the No-Action Alternative (see **Section 5.15.4.1***, No Action Alternative, Direct Operational Impacts* above) would occur in Alternative A. While these risks would not be an impact of Alternative A relative to the No-Action Alternative, coordination between FRA, the Project Proponents, and the private developer would be needed to address them in a manner consistent with the recommendations of the TVRA, including consideration of solutions that do not place parking in the deck.

In contrast to the No-Action Alternative, in which no pre-screening of the goods delivered through the WUS loading docks would occur, FPS would provide screening services at an existing or to-be-constructed screening facility.[4] Bus operations would be subject to some level of screening through authentication and passenger screening practices, though not through physical screening of buses at WUS. Bus or train maintenance activities would not be affected, as they take place outside the Project Area at facilities owned by the bus and train operators.

Increased activity at WUS would also result in greater demands on emergency services at WUS, with potential increases in personnel and equipment maintenance costs. ADP would likely need to add staff in order to continue effectively policing the station. Emergency responders would need to allocate additional resources to firehouses and police service areas to cover the additional passengers. Additionally, medical responders would have to deal with changing traffic patterns and additional entry/exit points. Additional resources would need to be allocated to training personnel in navigating this new geography. While this would adversely affect emergency services, the adverse impact would be moderate because growth would take place over time and the various affected services would have time to plan to avoid personnel shortages or a significant deterioration of response times.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would have minor adverse indirect operational impacts on public safety and security.

Development of the Federal air rights as parking space would cause minor adverse impacts because it would encourage more vehicle trips to WUS. This would further increase the risk of vehicle-based crashes and attacks and potential demand on emergency services. Alternative A may also have a minor adverse indirect operational impact on FPS if demand exceeded FPS’s available capacity. FPS would then potentially need to establish a new facility for WUS with attendant staffing and operating costs.

Construction Impacts

Construction of Alternative A would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative A would have major adverse impacts on security because construction operations would require access to WUS and the rail terminal by a large number of workers and vehicles for approximately 11 years and 5 months. Physical access to the construction site may make it a target for terrorism and criminal activity. Access to construction information, such as scheduling dates, storage locations, and management activities may also make the site vulnerable to criminals.

Construction would also affect operational station security. Vehicles and workers may have access to internal station areas not normally accessible to them. Construction vehicles and

[4] Loading dock deliveries includes those for the Commissary (food and beverage for Amtrak trains), retail (including restaurants), and Package Express, a service that ships packages via Amtrak trains.

large construction equipment such as cranes may disrupt video monitoring and patrolling of select areas of WUS, leading to diminished security monitoring.

All these security risks would be compounded by the size of the construction site, the sensitivity of WUS as a major transportation hub and potential target, and the duration of the construction, which would involve large numbers of workers on multiple shifts for more than 11 years.

Construction of Alternative A would also have adverse impacts on public safety because construction inherently poses safety risks. Adverse impacts on safety may arise from the physical disturbance associated with construction. Examples include the excavation of open trenches or pits; the movement and operation of large motorized equipment and trucks; or the closure of sidewalks, disruption of well-used pathways, and changes in traffic patterns. The impacts on public safety would be moderate because most activities would take place within the Project Area, members of the public would not have access to the construction zone, and measures such as those described in **Section 5.15.6**, *Avoidance, Minimization and Mitigation Evaluation*, would be implemented.

On site, work would need to comply with applicable OSHA requirements and guidelines for general and construction industries. Construction activities within the rail terminal would also be subject to Amtrak's requirements and authorization. Construction occurring within 25 feet of any rail track or overhead catenary system requires Amtrak approval and the use of track protection personnel. Specific clearances to active track and catenary must be maintained during construction. Crane operations are subject to strict policies when operating over live tracks. Construction work in the vicinity of the DC Streetcar would require contractors to comply with the safety training requirements of the DC Streetcar Track Allocation Program.

Within WUS, the First Street Tunnel column removal work would potentially involve the demolition of existing flooring and structural elements within parts of the Retail and Ticketing Concourse. As explained in **Section 5.15.6**, *Avoidance, Minimization and Mitigation Evaluation*, Physical risks to persons (for instance trip and fall accidents) would be avoided by closing off the area and ensuring it is only accessible to authorized personnel.

Outside the construction site, construction of Alternative A would require operating and moving equipment and other materials on public streets. The movement of heavy trucks and material would pose safety risks and could cause conflicts and accidents with other vehicles, pedestrians, and bicyclists. Sidewalk, bike lane, and road closures as well as the use of temporary drop-off and pick-up areas may cause confusion for drivers, bicyclists and pedestrians, increasing the risk of conflicts. Construction may diminish lines of sight and road closures may affect emergency response services. These risks would be minimized and mitigated as described in **Section 5.15.6**, *Avoidance, Minimization and Mitigation Evaluation.*

Hazardous materials (such as fuel, lubricants, or solvents among others) and hazardous waste would be stored on the construction site. These would be managed in accordance with occupational health and safety regulations. Spills or leaching of hazardous materials can be dangerous to people and property nearby (see **Section 5.4.4**, *Solid Waste Disposal and Hazardous Materials, Impact Analysis*). Emergency and security personnel could encounter such materials if they respond to an emergency at WUS during construction.

Comparison to Existing Conditions

Relative to existing conditions, Alternative A would have a moderate beneficial direct operational impact on security and moderate adverse direct operational impacts on public safety. Although the increase in passenger and visitor volumes at WUS in Alternative A would be greater when compared to existing conditions than when compared to the No-Action Alternative (from 58,400 to 128,200, or a 120 percent growth instead of 65 percent), the security features included in the alternative would still improve security conditions, as would be the case relative to the No-Action Alternative.

The potential increase in demand on police and emergency services would be proportionately greater when compared to existing conditions than when compared to the No-Action Alternative, since existing conditions do not include the private air-rights development and its residential and working population. The adverse impact would be moderate as affected services would have ample time to plan for the increase.

5.15.4.3 Alternative B

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative B would have a major beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative B would have the same beneficial and adverse direct operational impacts as described for Alternative A (**Section 5.15.4.2**, *Alternative A, Direct Operational Impacts*). In addition, the two levels of below-ground parking under the rail terminal included in Alternative B would create a new security risk by making WUS and parts of the private air-rights development potentially susceptible to a VBIED attack from underneath the rail terminal. This would be taken into account when planning and designing security measures. Net impacts on security would be beneficial and major.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would have moderate adverse indirect operational impacts on public safety and security.

In Alternative B, the potential Federal air-rights development would consist of approximately 917,420 square feet of office space. It would cause a moderate adverse impact on safety and security because of the working population it would add to the Project Area (an estimated 3,670 employees) and the presence of a large, commercial development above WUS' tracks and platforms. The additional working population and associated vehicular activity would increase the risk of vehicle-based crashes and attacks. It would also potentially generate additional demand on emergency services. These impacts would be moderate in the context of the expanded station and the adjacent private air-rights development.

like the other Action Alternatives, Alternative B would potentially result in a minor adverse indirect operational impact on FPS if vehicle screening demand exceeded FPS's available capacity. In such a case, FPS would potentially need a new facility for WUS with attendant staffing and operating costs.

Construction Impacts

Construction of Alternative B would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative B would take place over approximately 14 years and 4 months. Potential impacts on public safety and security would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Construction Impacts*).

Comparison to Existing Conditions

The impacts of Alternative B on safety and security relative to existing conditions would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.15.4.4 Alternative C

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have a moderate beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative C would have the same beneficial and adverse direct operational impacts as described for Alternative B (**Section 5.15.4.3**, *Alternative B, Direct Operational Impacts*).

Alternative C would create an additional risk to WUS by placing a bus pick-up and drop-off area between the historic station building and the train hall. A VBIED or vehicle ramming attack at this location could cause damage to the adjacent Retail and Ticketing Concourse. Alternative C would also adversely affect the private air-rights development because it would place the bus facility and above-ground parking facility north of H Street NE, within the private air rights. The air-rights owner may develop the unused air rights above the facilities. The presence of buses and parking below this development would create safety risks for persons accessing the development and security risks from VBIED for the structure above the parking facility. Although the security features that would be incorporated in Alternative C would result in net beneficial impacts, these two security issues would keep these impacts moderate.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have moderate adverse indirect operational impacts on public safety and security.

The indirect operational impacts of Alternative C would be as described in **Section 5.15.4.3**, *Alternative B, Indirect Operational Impacts* for Alternative B. In Alternative C, the Federal air-rights development would be a little larger than in Alternative B, consisting of approximately 952,600 square feet of office space and an estimated 3,810 employees, but this would not substantially change the associated impacts.

Construction Impacts

Construction of Alternative C (either option) would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative C would take place over approximately 12 years and 3 months. Impacts on public safety and security would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

Relative to existing conditions, Alternative C would have a moderate beneficial direct operational impact on security and moderate adverse direct operational impacts on public safety. Although the increase in passenger and visitor volumes at WUS in Alternative C be greater when compared to existing conditions than when compared to the No-Action Alternative (from 58,400 to 128,200, or a 120 percent growth instead of 65 percent), the security features included in the alternative would offset this increase and improve conditions, as would be the case relative to the No-Action Alternative, and to the same degree. The potential increase in demand on police and emergency services would also be proportionately greater when compared to existing conditions than when compared to the No-Action Alternative, since existing conditions do not include the private air-rights development and its residential and working population. The adverse impact would be moderate as affected services would have ample time to plan for the increase.

5.15.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative D would have a moderate beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative D would have the same direct operational impacts on public safety and security as Alternative C (**Section 5.15.4.4**, *Alternative C, Direct Operational Impacts*). In this alternative, the parking facility would be within the private air rights north of H Street NE, just south of K Street NE. This would create the same risk to the private air-right development above the facility as in Alternative C. The bus facility integrated with the train hall would create the same risk for WUS as Alternative C's bus pick-up and drop-off area.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would have moderate adverse indirect operational impacts on public safety and security.

The indirect operational impacts of Alternative D would be as described for Alternative B in **Section 5.15.4.3**, *Alternative B, Indirect Operational Impacts*). In Alternative D, the Federal air-rights development would be smaller than in Alternative B, with approximately 688,050 square feet of office space and an estimated 2,752 employees. With regard to public safety and security impacts, this would not make a measurable difference.

Construction Impacts

Construction of Alternative D would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative D would take place over approximately 12 years and 3 months. Impacts on public safety and security would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative D on public security and safety relative to existing conditions would be as described for Alternative C in **Section 5.15.4.4**, *Alternative C, Comparison to Existing Conditions*.

5.15.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would have a moderate beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative E would have the same major adverse and moderate beneficial direct operational impacts on public safety and security as Alternative B (**Section 5.15.4.3**, *Alternative B, Direct Operational Impacts*). In addition, the integrated bus facility-train hall would create a VBIED risk similar to Alternative C's with the bus drop-off and pick-up area (**Section 5.15.4.4**, *Alternative C, Direct Operational Impacts*). Although the security features that would be incorporated in Alternative E would result in net beneficial impacts, this additional security issue would keep these impacts moderate.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would have moderate adverse indirect operational impacts on public safety and security.

The adverse indirect operational impacts of Alternative E on public safety and security would be as described for Alternative D in **Section 5.15.4.5**, *Alternative D, Indirect Operational Impacts*. The potential Federal air-rights development would be the same in both alternatives.

Construction Impacts

Construction of Alternative E would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative E would take place over approximately 14 years and 4 months. Impacts on public safety and security would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative E on public security and safety relative to existing conditions would be as described for Alternative C in **Section 5.15.4.4**, *Alternative C, Comparison to Existing Conditions*.

5.15.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have a major beneficial direct operational impact on public security and a moderate adverse direct operational impact on public safety.

Alternative A-C would have the same direct operational impacts on public safety and security as Alternative A (**Section 5.15.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have moderate adverse indirect operational impacts on public safety and security.

The indirect operational impacts of Alternative A-C would be as described for Alternative B in **Section 5.15.4.3**, *Alternative B, Indirect Operational Impacts*). In Alternative A-C, the Federal air-rights development would be smaller than in Alternative B, with approximately 380,000 square feet of office space and an estimated 1,520 employees. With regard to public safety and security impacts, this would not make a measurable difference.

Construction Impacts

Construction of Alternative A-C would have major adverse impacts on security and moderate adverse impacts on public safety.

Construction of Alternative A-C would take place over approximately 11 years and 5 months. Impacts on public safety and security would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

The impacts of Alternative A-C on public security and safety relative to existing conditions would be as described for Alternative A in **Section 5.15.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.15.5 Comparison of Alternatives

Table 5-181 summarizes the impacts of the alternatives. The main differences among the Action Alternatives concern security impacts. Because all Action Alternatives would incorporate enhanced security features, all would result in net beneficial impacts on security in spite of the risks born of greater activity at the station. However, because Alternatives C through E include bus access between the train hall and historic station building, their net beneficial impacts would be moderate rather than major.

Table 5-181. Comparison of Alternatives, Public Safety and Security

<table>
<tr><th>Resource Category</th><th>Type of Impact</th><th>No-Action Alternative</th><th>Alternative A</th><th>Alternative B</th><th>Alternative C (Either Option)</th><th>Alternative D</th><th>Alternative E</th><th>Alternative A-C (Preferred)</th></tr>
<tr><td rowspan="3">Security</td><td>Direct Operational</td><td>Major adverse impacts</td><td colspan="2">Major beneficial impacts</td><td colspan="3">Moderate beneficial impacts</td><td>Major beneficial impacts</td></tr>
<tr><td>Indirect Operational</td><td>Minor adverse impacts</td><td>Minor adverse impacts</td><td colspan="5">Moderate adverse impacts</td></tr>
<tr><td>Construction</td><td>Moderate adverse impacts</td><td colspan="6">Major adverse impact</td></tr>
<tr><td rowspan="3">Safety</td><td>Direct Operational</td><td colspan="7">Moderate adverse impacts</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">Minor adverse impacts</td></tr>
<tr><td>Construction</td><td colspan="7">Moderate adverse impacts</td></tr>
</table>

Alternatives C and D would also create more security risks than the other Action Alternatives because they would mix station elements (bus facility and/or parking facility) with private air-rights development buildings north of H Street.

Conversely, Alternatives A and A-C would be the only Action Alternatives without below-ground parking and, therefore, without an associated risk of VBIED attack from below. In the No-Action Alternative, impacts on security would be adverse, as risks from increased activity and passenger volumes would not be offset by security enhancements.

With regard to public safety, all alternatives would have similar impacts, as these impacts would be the result of increased activity at WUS over time.

5.15.6 Avoidance, Minimization and Mitigation Evaluation

Based on the determination of impacts relative to the No-Action Alternative, FRA is considering the following minimization and mitigation measures:

- **Safety and Security Staffing Levels due to Increased Passenger Volumes (All Action Alternatives):** The growth in use of WUS would have a major impact on the safety and security of the traveling public. To address the increased risks due to increased passenger volumes, FRA and the Project Proponents, in coordination with relevant Federal agencies, would develop a safety and security operations plan**.** The plan would identify procedures appropriate to the level of passenger activity; evaluate appropriate passenger screening practices; and identify funding for these purposes.
- **Increased Safety Risks and Threats due to Increased Vehicular Volumes (All Action Alternatives):** Growth in the use of WUS would likely result in a proportional growth of vehicular travel in and around WUS which would increase the risk of vehicle-based attacks, traffic accidents, and vehicle-pedestrian accidents. To address this risk, FRA and the Project Proponents, in coordination with Federal law enforcement and security agencies, would identify security features that the Project design would incorporate, including measures recommended in the TVRA, as appropriate.
- **Public Safety and Security Threats Impacts from Construction (All Action Alternatives):** Construction activities would pose risks to public safety due to the general nature of construction and WUS's operational constraints. Security threats would arise from the movement of goods, equipment, and people throughout the Project Area. FRA and the Project Proponents would develop a construction safety and security plan for the Project. This plan would include procedures to screen people, equipment, and goods, and to reduce the risk of injury to workers, passengers, and passers-by from construction activities. It may also include background checks for contractors and their employees.
- **Public Safety Risks from Construction Traffic (All Action Alternatives):** Risks to the public would be minimized by requiring the construction contractor to ensure that the movement of heavy motorized equipment and trucks in and out of the

construction site is through designated access points and designated truck routes only. The construction contractor would be required to use flaggers as needed to prevent conflicts between trucks and street traffic. The construction contractor would ensure that construction-related traffic proceeds in compliance with applicable speed limitations and other District traffic laws.

- **Public Safety Risks from Column Removal Work (All Action Alternatives)**: The construction contractor would put in place temporary walls and partitions to close off the portions of the historic station building where the column removal work would be conducted from the areas remaining accessible to the public or to station or Amtrak employees. These walls and partitions would be sufficient to provide fire protection at least equal to that provided by the existing floor and walls. Only authorized personnel would have access to the closed off area.
- **Potential Risks to WUS from Private Air-rights Development Parking within the Deck Structure**: FRA and the Project Proponents would work with the private air-rights developer to address such risks consistent with the recommendations of the TVRA including consideration of solutions that would not place parking in the deck.
- **Potential Risks to Private Air-rights Development (Alternatives C and D):** The construction of the bus facility and parking facility would pose security risks if the private air-rights owner develops the remaining air rights above the parking facility. In that case, the Project Proponents would refine the facilities' design to reduce risks to the private development.
- **Indirect Impacts of Federal Air-Rights Development on Safety and Security (All Action Alternatives):** To mitigate the impacts of the potential Federal air-rights development, FRA would require that any sale, transfer, or lease of the air rights would include the requirement that the new owner, transferee, or lessee develop a safety and security plan that Amtrak and FRA would review and approve.

5.15.7 Permits and Regulatory Compliance

Table 5-182 below summarizes the regulatory requirements and processes that would apply to the Project.

Table 5-182. Permits and Regulatory Compliance for Safety and Security

Permitting Entity	Description and Laws/Regulations	Potential Permits and Processes
FRA	FRA is responsible for the safety of the railroad system. ▪ FRA Safety Standards (49 CFR 200 – 299) ▪ US Code on Railroad Safety (49 USC 20101 *et seq*.)	▪ Compliance with safety standards and railroad safety statute. FRA may inspect the Project for adherence to these regulations.
Amtrak	Amtrak is responsible for assessing and implementing safety and security measures for its trains in the Study Area. Commuter services, in collaboration with Amtrak, are responsible for assessing and implementing safety and security measures for their trains in the Study Area.	▪ Meeting Amtrak Safety and Security Regulations. Amtrak would have approval authority over measures taken to address the safety of the railroad operations and Station activity as identified.
Transportation Security Administration	TSA oversees the security of the transportation system. ▪ Department of Homeland Security/Transportation Security Administration Regulations concerning Rail Transportation Security (49 CFR 1580)	▪ TSA may perform inspections of WUS for compliance with Federal law

5.16 Public Health, Elderly and Persons with Disabilities

This section describes and characterizes the potential direct and indirect impacts of the No-Action Alternative and the six Action Alternatives on public health and the welfare of the elderly and persons with disabilities. In accordance with the FRA's *Procedures for Considering Environmental Impacts*, it also considers the impacts of the alternatives on the transportation and general mobility of the elderly and persons with disabilities.[1] If applicable, this section also recommends measures to avoid, minimize, or mitigate potential adverse impacts and identifies permitting and regulatory compliance requirements.

5.16.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to public health, elderly, and persons with disabilities are listed in **Section 4.16.1**, *Regulatory Context and Guidance*.

5.16.2 Study Area

As defined in **Section 4.16.2**, *Study Area,* the Local Study Area includes the Project Area and a half-mile buffer (**Figure 4-33**). There is no Regional Study Area because impacts on a regional level are not anticipated.

5.16.3 Methodology

This section summarizes the methodology for evaluating the potential impacts of the alternatives on public health, safety, and persons with disabilities. **Appendix C3**, *Washington Union Station Expansion Project, Environmental Consequences Technical Report,* **Section 16.4**, *Methodology*, provides a description of the analysis methodology. A summary is below. Impacts were assessed as major, moderate, minor, or negligible based on the intensity scale defined in **Section 5.1.1**, *Definitions.*

5.16.3.1 Operational Impacts

Potential operational impacts on public health were assessed qualitatively. Operational impacts as described elsewhere in this chapter were reviewed to determine whether they may affect public health or the health of sensitive populations. Impacts may occur via exposure to potentially harmful substances such as ingestion (swallowing), inhalation (breathing), and absorption (penetration through a barrier such as the skin). Potential impacts on the transportation and general mobility of the elderly and persons with disabilities were assessed through a review of the changes in the transportation

[1] FRA. 1999. *Procedures for Considering Environmental Impacts*. 64 Federal Register (FR) 28545, Section 12, May 26, 1999 as updated by 78 FR 2713, January 14, 2013.

infrastructure (including WUS) that would result from the Project and how they would affect these persons' movements within and near WUS.

5.16.3.2 Construction Impacts

The analysis of construction impacts was conducted using a similar approach to that used for the operational impacts. It included a review of construction impacts and an analysis of how they would affect public health. The analysis also considered how construction activities would affect the way the elderly and persons with disabilities would be able to access WUS and move in and around the station during the construction period.

5.16.4 Impact Analysis

This section presents the potential impacts of the No-Action Alternative and the Action Alternatives on public health and the transportation and mobility of the elderly and persons with disabilities.

5.16.4.1 No-Action Alternative

Direct Operational Impacts

Relative to existing conditions, in the No-Action Alternative, there would be no direct operational impacts on public health. There would be moderate beneficial direct operational impacts on the transportation and mobility of the elderly and persons with disabilities.

In the No-Action Alternative, the Project would not take place. Several other public and private projects would be implemented in the Project Area. None of these projects would create conditions that would adversely affect public health. They would support activities and functions typical of a multimodal transportation facility and dense urban environment.

Increases in localized air pollutant concentrations due to increased train, bus, and car traffic would not result in adverse public health impacts. As documented in **Section 5.6.4.1**, *No-Action Alternative, Direct Operational Impacts*, growth in train and vehicular traffic would generate local increases in CO and $PM_{2.5}$ concentrations. In the No-Action Alternative, emissions of CO and $PM_{2.5}$ would not exceed the NAAQS applicable to those pollutants even in places where they would be most concentrated (such as near the WUS parking garage). The purpose of the NAAQS is in part to provide public health protection and protect the health of sensitive populations such as asthmatics, children, and the elderly. Increases in pollutant concentrations that do not exceed the NAAQS would not result in adverse health impacts, even on the most sensitive populations.

The No-Action Alternative would have beneficial impacts on the transportation and mobility of the elderly and persons with disabilities. These beneficial impacts would be moderate because, while they would make noticeable improvements, they would still leave some known deficiencies unaddressed.

WUS has a number of accessibility issues and some station elements do not meet the current standards. Several of the station improvement projects included in the No-Action Alternative would help remedy a few of the known issues. Examples of such projects include the installation of new ADA-compliant elevators to Track 27-28 and the raising of Platform 15-16 to 48 inches above track to meet level-boarding ADA requirements. Other projects, such as the Concourse Modernization Project, would improve access for all passengers. However, several of WUS's shortcomings, such the lack of level boarding and excessive gaps between platforms and trains, or the insufficient number of van-accessible spaces in the parking garage, would not be remedied under the No-Action Alternative.

Indirect Operational Impacts

Relative to existing conditions, in the No-Action Alternative, there would be no indirect operational impacts on public health and negligible adverse indirect operational impacts on the transportation and mobility of the elderly and persons with disabilities outside WUS.

As explained above in **Section 5.6.4.1**, *No-Action Alternative, Indirect Operational Impacts*, regional emissions of several criteria pollutants would decrease over the coming decades. Emissions of PM_{10} would increase but would remain below the *de minimis* threshold. Reduction in air emissions may have a global beneficial effect in the long-term but would likely not be noticeable in the Study Area by 2040.

There would be no noise-related impacts on public health. The primary public health concern associated with noise is noise-induced hearing loss (NIHL) from long-term exposure to elevated noise levels. Risk of hearing loss becomes a consideration with long and repeated exposure to noise levels of 85 dBA and higher.[2] There would be no risk of such exposure in the No-Action Alternative. Noise and vibration analysis (**Section 5.10.4.1,** *No-Action Alternative, Direct Operational impacts*) shows that in this alternative, anticipated noise levels near WUS would not exceed 60 to 75 dBA. In areas nearer the station, noise levels would decrease relative to existing conditions following the construction of the private air-rights development.

Impacts on transportation and mobility of the elderly and persons with disabilities outside WUS would be negligible. Increased roadway traffic may create a perceived barrier to circulation because of the greater potential for conflict between pedestrians and vehicles. However, most intersections near WUS have high visibility sidewalks across major approaches, with wheelchair ramps and detectable warning surfaces to aid visually impaired individuals. Most intersections also have accessible pedestrian signal (APS) equipment. Those

[2] National Institute on Deafness and Other Communication Disorders. *Noise-Induced Hearing Loss.* Accessed from https://www.nidcd.nih.gov/health/noise-induced-hearing-loss. Accessed on April 3, 2020.

that do not currently have such equipment are expected to be rebuilt or retrofitted in a few years.

Construction Impacts

In the No-Action Alternative, there would be minor adverse construction impacts on public health and moderate adverse construction impacts on the transportation and mobility of the elderly and persons with disabilities.

Construction of the various projects included in the No-Action Alternative, such as the private air-rights development, would inherently generate public health-related risks. Direct impacts may arise from the physical disturbance associated with construction, such as excavation of open trenches or pits; the movement and operation of large motorized equipment and trucks, and associated emissions of air pollutants and dust; or the closure of sidewalks, disruption of well-used pathways, and changes in traffic patterns.

Potential adverse impacts on public health from these activities would be minor because best management practices that minimize risks from physical disturbance are a standard feature of all large construction sites. These include, for instance, fencing, clear separation of storage and staging area from the public way; and warning signs and alternative pathways during sidewalk closures.

Public health impacts may also arise from accidental spills of fuel or hazardous material. As explained in **Section 5.4.4.1**, *No-Action Alternative, Construction Impacts*, compliance with applicable regulatory requirements would minimize the risk of spilled materials that could adversely affecting the public.

Construction activities would have moderate adverse impacts on the transportation and mobility of elderly persons and persons with disabilities. During the replacement of the H Street Bridge, walking across the bridge would not be possible or would be challenging because of sidewalk closures and the proximity of construction activities. Construction of the various WUS improvement projects included in the No-Action Alternative would close parts of the station or make it challenging to navigate. Installation of the columns supporting the private air-rights deck in the rail terminal may reduce platform space and make the platforms narrower and more crowded. These impacts would occur at different locations and on different schedules and, as such, would be moderate. The majority of WUS would remain accessible most of the time.

5.16.4.2 Alternative A

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A would have no adverse direct operational impact on public health. It would have a major beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

Alternative A would not introduce functions or activities in the study area that could adversely affect public health. It would include an air conditioning strategy that isolates areas within which fumes, heat, and noise associated with operating diesel trains occur from areas where passengers and visitors wait or remain for any significant amount of time. Emissions from increased railroad operations, combined with emissions from greater vehicular traffic on the adjacent roadways, would result in higher localized concentrations of CO and $PM_{2.5}$. However, concentrations of these two pollutants would not exceed the applicable NAAQS see **Section 5.6.4.2**, *Alternative A, Direct Operational Impacts*). Therefore, anticipated increases would not result in health-related impacts, even on the most sensitive populations.

Alternative A would make WUS easier to access and navigate. It would bring the station into full compliance with applicable accessibility codes and regulations. It would remedy shortcomings that the No-Action Alternative would not address. Elevators and wheelchair ramps would be provided as required. The new parking facility would contain sufficient handicapped and van space (at least 28 accessible parking spaces, five of which are van-accessible). The new platforms would be wider and would allow for level boarding. By making boarding and alighting easier and reducing congestion in transitional spaces such as concourses, Alternative A would reduce trip and fall risks, a benefit for all users especially the elderly and persons with disabilities.

New entrances into WUS on First, 2nd, and H Streets NE would reduce the distance many persons have to travel within WUS to reach their trains or buses. Improved private pick-up and drop-off areas in front of WUS as well as new ones on First and 2nd Streets NE and adjacent to the train hall would also facilitate access.

The new concourses and train hall would provide climate-controlled and more spacious transitional spaces than the existing Claytor Concourse (which would remain in the No-Action Alternative). The new bus facility would provide better waiting spaces and other amenities than the existing one, which the No-Action Alternative would keep in its current condition. Because the new bus facility and parking facility would be at the same approximate location as the existing ones, improvements would be a net benefit: the distance to the other elements of the station would not significantly change.

Increased accessibility at WUS would also provide better access to the Kaiser Permanente Capitol Hill Medical Center on 700 2nd Street, NE at the corner of 2nd Street NE and H Street

NE. The new H Street entrance to the station would provide the public, the elderly, and persons with disabilities using public transportation a new access to the medical center.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A would have no adverse indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly and persons with disabilities outside WUS.

Alternative A would cause additional regional emissions of all criteria pollutants relative to the No-Action Alternative (**Section 5.6.4.2**, *Alternative A, Indirect Operational Impacts*). However, Alternative A-related emissions would remain below the applicable *de minimis* levels. As such, there would be no public health impacts. Reduction in region-wide traffic would sufficiently reduce emissions of MSAT to offset any increases due to Alternative A.

Relative to the No-Action Alternative, ambient noise levels would increase at several locations under Alternative A (**Section 5.10.4.2**, *Alternative A, Direct Operational Impacts*). However, increases would not exceed three dBA and would be barely perceptible if at all. Nowhere would noise levels reach levels that could cause NIHL.

Increased roadway traffic may create a perceived barrier to the transportation and mobility of the elderly and persons with disabilities near WUS because of the greater potential for conflict between pedestrians and vehicles. This would occur in the No-Action Alternative as well but Alternative A would generate more traffic and potentially greater impacts, especially along H Street NE, 2nd Street NE, North Capitol Street, and the north side of Columbus Circle (traffic impacts are addressed in **Section 5.5.4.2**, *Direct Operational Impacts, Vehicular Traffic*).

As in the No-Action Alternative, existing and likely future accessibility features (see **Section 5.16.4.1**, *No-Action Alternative, Indirect Operational Impacts*) would reduce this risk. Additionally, Alternative A has several features that would contribute to offsetting the risk. These features include additional access points (on First, 2nd, and H Streets, NE), which would reduce the distance some persons would have to walk on public streets to reach the station. Also, the reconfiguration of the multiple pick-up and drop-off lanes in front of WUS and the realignment of First Street NE as a one-way street would facilitate access to WUS, with fewer roadways to cross. The removal of hop-on hop-off and tour bus traffic from that area would also make access to the front of WUS easier.

Currently, Gallaudet University runs a shuttle for students between WUS and the campus. In Alternative A, this shuttle would be discontinued because the new bus facility would be unable to accommodate it. This impact would be minor because it would not preclude Gallaudet University from finding another pick-up and drop-off location near WUS for its shuttle. Also, the Gallaudet campus shuttle is a standard service many universities offer rather than a special accommodation required to meet the specific needs of Gallaudet's hearing-impaired students.

Construction Impacts

Construction of Alternative A would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

Construction of Alternative A would take approximately 11 years and 5 months to complete and include four phases moving from east to west plus an Intermediate Phase between Phases 1 and 2 when only First Street Tunnel column removal work would be conducted. Direct impacts may arise from the physical disturbance associated with construction such as: the excavation of open trenches or pits; the movement and operation of large motorized equipment and trucks; or the closure of sidewalks, disruption of well-used pathways, and changes in traffic patterns.

Potential adverse impacts on public health from these activities would be minor because best management practices implemented on all large-scale construction site would minimize risks. All areas under construction would be fenced, screened, and inaccessible to the public.

Public health impacts may arise from the air pollution and noise caused by construction work or if a large spill of fuel or hazardous material occurred. Such impacts would be minor. As explained in **Section 5.4.4.1**, *No-Action Alternative, Construction Impacts*, compliance with applicable regulations would minimize the risk of spilled materials migrating outside the Project Area and coming into contact with the public. While construction activities would cause air pollutant emissions, the amount of emissions would vary with, and within, each construction phase and with the type of activity. Quantitative estimates of construction-related criteria pollutant emissions in Alternative A are presented in **Section 5.6.4.2**, *Alternative A, Construction Impacts*. The analysis showed that there would be no construction year during which emissions of criteria pollutants would exceed the applicable *de minimis* levels. Therefore, these emissions would not adversely affect public health.

During column removal work, when part of the Retail and Ticketing Concourse would be demolished and the tunnel underneath exposed, there is potential for fumes from train engines to enter the station – both public areas and back of house areas – because several tracks would remain active at all times to minimize impacts on train service. These impacts would be avoided by closing off the construction area as described in **Section 5.16.6**, *Avoidance, Minimization and Mitigation Evaluation*.

Construction of Alternative A would also cause noise (**Section 5.10.4.2**, *Alternative A, Construction Impacts*). Construction workers who are exposed to noise as part of their occupation have an increased NIHL risk when there is a time-weighted average (TWA) noise exposure of 85 dBA or greater over 8-hours, 83 dBA for 12-hours, and 81 dBA for 20-hours, according to the Occupational Safety and Health Administration (OSHA). Above these noise thresholds, OSHA requires implementation of a hearing conservation program, annually testing employees, sound monitoring, and hearing protection or other engineering noise controls. These requirements would ensure that workers are protected from NIHL if they are exposed to noise above the relevant thresholds. The public would not be at risk of exposure to noise levels capable of causing NIHL. Non-authorized persons would not be allowed within the construction site or near noisy equipment, nor would they be exposed to noise for periods over the NIHL thresholds. The partitions used to close off the part of the station where the column removal work would take place from the rest of the building would be designed to provide an adequate level of noise shielding. There would be no impacts on public health from noise.

Construction of Alternative A would have major adverse impacts on the transportation and mobility of elderly persons and persons with disabilities. WUS would continue to operate throughout the construction period of approximately 11 years and 5 months. Depending on the phase of construction, parts of WUS would be closed to the public resulting in congested conditions during periods of peak passenger activity. Areas that would remain publicly open may have to be temporarily reconfigured. Access to and from train platforms, bus facility, and parking facility would be relocated as construction proceeds. The disruption of usual pathways within WUS may be confusing to commuters and may make WUS more challenging to navigate for occasional users. Combined with increased congestion, it could pose a risk for trip and fall accidents or make access by elderly persons or persons with disabilities more difficult. During Phase 4 of construction (approximately 3 years and 1 month), the unavailability of parking and intercity bus service at WUS would restrict regional options for access to WUS. It may be more difficult or costly for the elderly and persons with disabilities than for general users to switch to alternative modes of access such as transit or for-hire vehicles.

Temporary sidewalk and lane closures would occur at various times during construction. Temporary relocation of bus stops and rerouting may be necessary. During Phase 1 of construction (approximately 2 years and 5 months), sidewalk or lane closures may make access to the Kaiser Permanente Medical Building (700 2nd Street NE) more challenging. Access to and from WUS during construction, as well as internal circulation, would also be more challenging than normal for the elderly and persons with disabilities. **Section 5.16.6**, *Avoidance, Minimization, and Mitigation Evaluation* identifies potential measures to mitigate this major adverse impact.

Comparison to Existing Conditions

The operational impacts of Alternative A relative to existing conditions would generally be similar to the impacts relative to the No-Action Alternative. Alternative A would have no adverse direct operational impact on public health and a major beneficial direct operational impact on the transportation and mobility of the elderly and persons with disabilities. This beneficial impact would be greater relative to existing conditions than relative to the No-Action Alternative.

Relative to existing conditions, Alternative A would also have no adverse indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly or persons with disabilities outside WUS.

Differences between the No-Action Alternative and existing conditions in this respect are not meaningful.

5.16.4.3 Alternative B

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative B would have no adverse direct operational impact on public health. It would have a moderate direct beneficial operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

Alternative B would have no adverse direct operational impacts on public health for the same reasons as Alternative A (**Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*). With regard to the transportation and mobility of the elderly or persons with disabilities, Alternative B's impacts would also generally be as described in **Section 5.16.4.2** but with one notable difference. Alternative B's parking would be in two below-ground levels along the west side of the rail terminal, between K Street NE and the back of the historic station building. The walking distance from parking spaces to the back of the historic station building would increase by up to approximately 1,000 feet relative to the No-Action Alternative. Navigating the parking facility to the nearest WUS access point could be more challenging to persons with reduced mobility than in the No-Action Alternative. While Alternative B would generally improve conditions at WUS for the elderly and persons with disabilities, resulting in a net beneficial impact, the parking facility location would offset some of the benefits, making the impact moderate.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative B would have no adverse indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly or persons with disabilities outside WUS.

The indirect operational impacts of Alternative B would be as described in **Section 5.16.4.2**, *Alternative A, Indirect Operational Impacts* for Alternative A.

Construction Impacts

Construction of Alternative B would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

The construction impacts of Alternative B on public health would be similar to those of Alternative A, described in **Section 5.16.4.2**, *Alternative A, Construction Impacts*. Although Alternative B would cause higher noise levels during the early phase of construction due to the type of cut-off wall used, the potential for members of the public to be exposed to levels that could cause NIHL would be as limited as in Alternative A. Similarly, construction-related air pollutant emissions in Alternative B would remain below *de minimis* levels. Construction of Alternative B would have the same major adverse impacts on the transportation and mobility of the elderly and persons with disabilities as Alternative A (**Section 5.16.4.2**, *Alternative A, Construction Impacts*) but impacts would occur over approximately 14 years and 4 months. Phase 4, during which parking and intercity bus service would be unavailable at WUS would last for approximately 4 years and 11 months in Alternative B.

Comparison to Existing Conditions

The operational impacts of Alternative B relative to existing conditions would be similar to impacts relative to the No-Action Alternative. Alternative B would have no adverse direct operational impact on public health and a moderate beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities. Alternative B would represent a greater improvement relative to existing conditions than relative to the No-Action Alternative, but the beneficial impact would remain moderate because of the relocation of parking to a two-level, below-ground facility. Indirect impacts relative to existing conditions would be as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.16.4.4 Alternative C

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have no adverse direct operational impact on public health. It would have a moderate beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

Alternative C (either option) would not have adverse direct operational impacts on public health for the same reasons as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*. Beneficial impacts on the transportation and mobility of the elderly or persons with disabilities would generally be the same as those described for Alternative A (**Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*), with two notable differences.

In Alternative C, the bus and above-ground parking facility would be located north of H Street NE, either on the west side (West Option) or east side (East Option) of the rail terminal. More than half the total number of parking spaces would be on one below-ground level along the west side of the rail terminal between K Street and the back of the historic station building. Relative to the No-Action Alternative, this layout would increase the maximum walking distance from the bus facility and a majority of the parking spaces to other parts of WUS. Bus passengers would have to walk approximately an additional 1,100 feet in the East Option and an additional 250 feet in the West Option to reach the back of the historic station building. The connection would be through the new concourses, which would be ADA-compliant but could still represent a challenge for persons with reduced mobility. Persons parking in the below-ground facility could have to walk an additional approximate 1,000 feet to reach the back of the historic station building. As described for Alternative B, navigating the large parking facility to the nearest WUS access point could be challenging for persons with reduced mobility.

Alternative C with either option would generally improve conditions at WUS with regard to the transportation and mobility of the elderly and persons with disabilities, resulting in a net beneficial impact. The location of the bus facility and parking facility would offset some of the benefits, making the beneficial impact moderate.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative C (either option) would have no adverse indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly or persons with disabilities outside WUS.

The indirect operational impacts of Alternative C would be the same as those described for Alternative A in **Section 5.16.4.2**, *Alternative A, Indirect Operational Impacts*.

Construction Impacts

Construction of Alternative C (either option) would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

The construction impacts of Alternative C on public health would be similar to those of Alternative A (**Section 5.16.4.2**, *Alternative A, Construction Impacts*). The same measures that would minimize risks from physical disturbances, traffic, and hazardous materials in Alternative A would apply to Alternative C. Although Alternative C would cause higher noise levels during the early phase of construction due to the type of cut-off wall used, the potential for members of the public to be exposed to levels that could cause NIHL would be as limited as in Alternative A. Similarly, construction-related air pollutant emissions in Alternative C would remain below *de minimis* levels.

The impacts of constructing Alternative C on the transportation and mobility of the elderly and persons with disabilities would be the same as those of Alternative A (**Section 5.16.4.2**, *Alternative A, Construction Impacts*). They would occur over a longer period of approximately 12 years and 3 months. Phase 4, during which parking and intercity bus service would be unavailable at WUS would last for approximately 4 years in Alternative C with the West Option. In Alternative C with the East Option, because of the availability of the new bus facility and above-ground parking during Phase 4 of construction, the reduction in accessibility for the elderly and persons with disabilities would not be as great. However, as explained in **Section 5.16.4.4**, *Alternative C, Direct Operational Impacts*, the distance to the front of the station would increase relative to existing conditions.

Comparison to Existing Conditions

The operational impacts of Alternative C (either option) relative to existing conditions would be similar to its impacts relative to the No-Action Alternative. Alternative C would have no direct adverse operational impact on public health and a moderate direct beneficial operational impact on the transportation and mobility of the elderly or persons with disabilities. Alternative C would represent a greater improvement relative to existing conditions than relative to the No-Action Alternative, but the beneficial impact would remain moderate. Indirect impacts relative to existing conditions would be as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.16.4.5 Alternative D

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative D would have no adverse direct operational impact on public health. It would have a moderate beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

Alternative D's impacts would generally be the same as those described for Alternative A (**Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*), with two notable differences. In Alternative D, the above-ground parking facility would be in the north end of the rail terminal, south of K Street NE. Persons parking in the above-ground parking facility would need to use surface streets to reach the nearest access point to WUS on H Street NE, approximately 600 feet away. This would require them to be outside and exposed to weather conditions. This may present a challenge to people with reduced mobility. Once within WUS, they would need to walk another 900 feet or so to reach the back of the historic station building, though this would be in air conditioned concourses. Also, more than half of the parking spaces would be one below-ground level on the west side of the rail terminal between K Street NE and the back of the historic station building. Some parkers would need to walk approximately 1,000 feet to reach the back of the station.

The second difference would be the lack of private pick-up and drop-off area adjacent to the train hall. However, by placing the bus facility next to the train hall and the historic station building, Alternative D would also make moving between buses and other modes of transportation easier than in the No-Action Alternative.

Overall, like the other Action Alternatives, Alternative D would generally improve conditions at WUS for the transportation and mobility of the elderly and persons with disabilities, resulting in a net beneficial impact. The remote location of the parking facility and lack of private pick-up and drop off area next to the train hall would offset some of the benefits, making the impact moderate.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative D would have no adverse indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly or persons with disabilities outside WUS.

The indirect operational impacts of Alternative D would be the same as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Indirect Operational Impacts.*

Construction Impacts

Construction of Alternative D would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

The construction impacts of Alternative D on public health would be similar to Alternative A's, described in **Section 5.16.4.2**, *Alternative A, Construction Impacts*. Impacts on the transportation and mobility of the elderly and persons with disabilities would be the same as Alternative C's (**Section 5.16.4.4**, *Alternative C, Construction Impacts*).

Comparison to Existing Conditions

The operational impacts of Alternative D relative to existing conditions would be similar to its impacts relative to the No-Action Alternative. Alternative D would have no adverse direct operational impact on public health and a moderate beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities. Alternative D would represent a greater improvement relative to existing conditions than relative to the No-Action Alternative, but the beneficial impact would remain moderate because of the relocation of parking to a location just south of K Street NE or to a below-ground, one-level facility. Indirect impacts relative to existing conditions would be as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Comparison to Existing Conditions.*

5.16.4.6 Alternative E

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative E would have no adverse direct operational impact on public health. It would have a moderate beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

Alternative E would have no adverse direct operational impact on public health for the same reasons as Alternative A (**Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*). It would generally have the same moderate beneficial operational impact on the transportation and mobility of the elderly or persons with disabilities as Alternative B (**Section 5.16.4.3**, *Alternative B, Direct Operational Impacts*) with two differences. The integration of the new bus facility with the train hall would facilitate the movement of people, including the elderly and persons with disabilities, between the various transportation modes at WUS. There would be no room for a private pick-up and drop-off area next to the train hall. This, and the location and layout of the parking facility would offset some of the benefits (see **Section 5.16.4.2**, *Alternative A, Direct Operational Impacts*).

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative E would have no adverse indirect operational impact on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly or persons with disabilities outside WUS.

The indirect operational impacts of Alternative E would be the same as those of Alternative A. They are described in **Section 5.16.4.2**, *Alternative A, Indirect Operational Impacts*.

Construction Impacts

Construction of Alternative E would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

The construction impacts of Alternative E on public health would be similar to Alternative A's, described in **Section 5.16.4.2**, *Alternative A, Construction Impacts*. Alternative E's construction impacts on the transportation and mobility of the elderly and persons with disabilities would be the same as in Alternative B (**Section 5.16.4.3**, *Alternative B, Construction Impacts*).

Comparison to Existing Conditions

The operational impacts of Alternative E relative to existing conditions would be similar to its impacts relative to the No-Action Alternative. Alternative E would have no adverse direct operational impact on public health and a moderate beneficial direct operational impact on the transportation and mobility of elderly or persons with disabilities. Alternative E would represent a greater improvement relative to existing conditions than relative to the No-Action Alternative, but the beneficial impact would remain moderate because of the relocation of all parking to a two-level, below-ground facility. Indirect impacts relative to existing conditions would be as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Comparison to Existing Conditions.*

5.16.4.7 Alternative A-C (Preferred Alternative)

Direct Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have no adverse direct operational impact on public health. It would have a major beneficial direct operational impact on the transportation and mobility of the elderly or persons with disabilities within WUS.

The direct operational impacts of Alternative A-C would be the same as those of Alternative A, described in **Section 5.16.4.2**, *Alternative A*, *Direct Operational Impacts*.

Indirect Operational Impacts

Relative to the No-Action Alternative, Alternative A-C would have no indirect operational impacts on public health and minor adverse indirect operational impacts on the transportation and mobility of the elderly and persons with disabilities outside WUS.

The indirect operational impacts of Alternative A-C would be the same as those of Alternative A, described in **Section 5.16.4.2**, *Alternative A*, *Indirect Operational Impacts*.

Construction Impacts

Construction of Alternative A-C would result in minor adverse impacts on public health and major adverse impacts on the transportation and mobility of the elderly and persons with disabilities.

The construction impacts of Alternative A-C on public health would be the same as those of Alternative A, described in **Section 5.16.4.2**, *Alternative A, Construction Impacts*.

Comparison to Existing Conditions

The operational impacts of Alternative A-C relative to existing conditions would generally be similar to its impacts relative to the No-Action Alternative. Alternative A-C would have no adverse direct operational impact on public health and a major beneficial direct operational impact on the transportation and mobility of elderly or persons with disabilities. Alternative A-C would represent a greater improvement relative to existing conditions than relative to the No-Action Alternative. Indirect impacts relative to existing conditions would be as described for Alternative A in **Section 5.16.4.2**, *Alternative A, Comparison to Existing Conditions*.

5.16.5 Comparison of Alternatives

With regard to public health and the transportation and mobility of elderly and persons with disabilities, all Action Alternatives would have similar impacts, as shown in **Table 5-183**.

Table 5-183. Comparison of Alternatives, Public Health, Elderly and Persons with Disabilities

<table>
<tr><th>Impact Category</th><th>Type of Impact</th><th>No-Action Alternative</th><th>Alternative A</th><th>Alternative B</th><th>Alternative C (Either Option)</th><th>Alternative D</th><th>Alternative E</th><th>Alternative A-C (Preferred)</th></tr>
<tr><td rowspan="3">Public Health</td><td>Direct Operational</td><td colspan="7">No impact</td></tr>
<tr><td>Indirect Operational</td><td colspan="7">No impact</td></tr>
<tr><td>Construction</td><td colspan="7">Minor adverse impact</td></tr>
<tr><td rowspan="3">Transportation and Mobility of Elderly and Persons with Disabilities</td><td>Direct Operational</td><td>Moderate beneficial impact</td><td>Major beneficial impact</td><td colspan="4">Moderate beneficial impact</td><td>Major beneficial impact</td></tr>
<tr><td>Indirect Operational</td><td>Negligible adverse impact</td><td colspan="6">Minor adverse impact</td></tr>
<tr><td>Construction</td><td>Moderate adverse impact</td><td colspan="6">Major adverse impact</td></tr>
</table>

The Action Alternatives would have no adverse operational impacts and minor adverse construction impact on public health. They would all include the same air conditioning strategy to maintain temperature and air quality within WUS. Outside WUS, increases in air pollutant emissions from more railroad operations and vehicular traffic would remain below the applicable NAAQS.

All Action Alternatives would have beneficial impacts on the transportation and mobility of the elderly and persons with disabilities relative to the No-Action Alternative, as they would all fully bring WUS to applicable ADA standards and facilitate access to the station for all. **Table 5-184** shows how the No-Action and the Action Alternatives compare with each other in this respect.

In all Action Alternatives except Alternatives A and A-C, average walking distances from and to the bus facility, parking, or both would increase relative to the No-Action Alternative, which may adversely affect users with reduced mobility. This is most evident in Alternative C with the East Option, followed by Alternative C with the West Option. Conversely, Alternatives D and E would integrate the bus facility with the train hall, facilitating movements between the various transportation modes. Alternatives A, B, and A-C would also facilitate these movements by keeping the bus facility approximately at the same location as in the No-Action Alternative.

Table 5-184. Comparison of Impacts on the Transportation and Mobility of the Elderly and Persons with Disabilities

Alternative	ADA-Compliance	Parking Location	Bus Facility Location and Distance	Pick-up/Drop-off next to Train Hall?
No-Action	Partial	No change	No change	N/A
A	Full	All above ground at existing location. No change in distance	No change	Yes
B	Full	All below ground between K Street NE and historic station building. Increased distance (by up to approximately 1,000 feet).	No change	Yes
C	Full	Part below-ground between K Street NE and historic station building and part above ground just north of H Street NE. Increased distance (below-ground: by up to approximately 1,000 feet; above-ground: by up to approximately 1,100 feet [East Option] or 250 feet [West Option]).	Just north of H Street NE. Increased distance (by up to approximately 1,100 feet [East Option] or 250 feet [West Option]).	Yes
D	Full	Part below-ground between K Street NE and historic station building and part above ground just south of K Street NE. Increased distance (below-ground: by up to approximately 1,000 feet; above-ground: by up to approximately 1,500 feet).	Integrated with train hall.	No
E	Full	All below ground between K Street NE and historic station building. Increased distance (by up to approximately 1,000 feet).	Integrated with train hall.	No
A-C	Full	All above ground at existing location. No change in distance	No change	Yes

With regard to parking, Alternative D would increase walking distances most, requiring users of the above-ground parking facility to walk outside for approximately 600 feet before reaching the closest WUS access point at H Street NE. Alternatives A and A-C would keep all parking closest to the concourse and historic station building. Alternatives B and C would be in-between.

Alternatives D and E, unlike the other Action Alternatives, would have no room for pick-up and drop-off areas next to the train hall. This is because of the integrated bus facility, which would wrap around the train hall.

5.16.6 Avoidance, Minimization, and Mitigation Evaluation

To avoid or minimize operational impacts on the transportation and mobility of the elderly or persons with disabilities, FRA is considering the following measures:

- In Alternatives B, C, D, and E, USRC would ensure parking reserved for persons with disabilities is located near the southern end of the below-ground parking facility to minimize the distance between parking spaces and Concourse A.
- In Alternatives B and E, such parking would further be located on the first level of the parking facility.
- In all Action Alternatives, the Project Proponents would ensure that the most direct path from the parking facility or bus facility to the nearest WUS entrance is clearly identified. Adequate signage, lighting, and safety features would be provided. Everywhere, access to elevators, escalators, and emergency exits would be clearly marked. Signs and maps would be clear and concise, with large, high-contrast, and raised lettering for those who rely on tactile capabilities for information. Where possible, audible directions would be incorporated. Joints in walkways and transitions from ramps to walks would be closed and flush to prevent tripping and reduce the risks of canes or small wheels getting trapped in gaps or spaces. Walkways would have a continuous detectable edge to help users navigate paths safely.
- Amtrak would ensure that its Red Cap service remains available and is adequately staffed to assist elderly passengers and passengers with physical, visual, and auditory disabilities in navigating and traversing the station and bus or parking facilities.

To avoid, minimize, or mitigate major adverse impacts on public health and transportation and mobility of the elderly or persons with disabilities during construction, the following measures are being considered:

- The Project Proponents would require the construction contractor to install temporary walls and partitions to close off the portions of the Retail and Ticketing Concourse where the column removal work would be conducted from the areas remaining accessible to the public or to station or Amtrak employees. These walls and partitions would be sufficient to prevent the fumes from train operations in the tunnel, as well as dust from the demolition or construction work and emissions from construction equipment, from entering these areas. They would also provide adequate shielding from noise.

- The Project Proponents would ensure that within WUS, accessibility is maintained during construction in compliance with ADA requirements and DDOT *Pedestrian Safety and Work Zone Standards*.[3] Narrow passages, bottlenecks, or areas otherwise difficult for persons with disabilities or elderly persons with reduced mobility to navigate would be avoided or minimized.
- Outside of WUS, the construction contractor would be required to provide alternative protected pedestrian passages, along with appropriate signage. Signs would be clear and concise and designed to communicate information to visually impaired persons. Where possible, audible direction would be incorporated. Pedestrian pathways would be kept clear of debris and obstructions, adequately drained, and with adequate passing spaces. They would also have detectable edges or channelizing equipment. Pedestrians would be protected from vehicular traffic with crash-worthy barriers. Barriers would use reflective material to delineate the traffic-side.
- The construction contractor would be required to ensure that lane closures, detours, alternative parking access, or use of metal plates to cover temporary trenches across roadways are appropriately advertised.
- The construction contractor would be required to notify the owners and occupants of the Kaiser Permanente Medical Building of any planned road or sidewalk closures sufficiently in advance to allow them to publicize these disruptions to their patients and customers as appropriate. Temporary entrances or pathways would be clearly marked and advertised. ADA-compliant access to the building would be maintained at all times.

5.16.7 Permits and Regulatory Compliance

In terms of accessibility and mobility for the elderly and persons with disabilities, the Project must comply with ADA regulations, as well as meet standards set forth by the Transportation Services for Individuals with Disabilities (49 CFR 37) and the U.S. Access Board's ADA Accessibility Guidelines (ADAAG) adopted by the U.S. Department of Transportation in 2006. The Project must also meet the District of Columbia Building Code, which includes requirements for accessibility and indoor environmental quality, and is enforced through the building permitting process administered by the District Department of Consumer and Regulatory Affairs.

[3] District Department of Transportation. 2010. *Pedestrian Safety and Work Zone Standards: Covered and Open Walkways*. Accessed from https://ddot.dc.gov/page/pedestrian-safety-and-work-zone-standards-covered-and-open-walkways. Accessed on April 3, 2020.

5.17 Environmental Justice

This section evaluates the potential of the No-Action Alternative and the six Action Alternatives to cause disproportionately high and adverse impacts on environmental justice (EJ) populations in accordance with EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. EO 12898 requires that Federal agencies identify and address disproportionately high and adverse impacts resulting from Federal projects on minority and low-income communities.

If applicable, this section also describes measures to avoid, minimize, or mitigate potential disproportionately high and adverse impacts and identifies permitting and regulatory compliance requirements.

5.17.1 Regulatory Context and Guidance

Relevant Federal policies, regulations and guidance that pertain to transportation are listed in **Section 4.17.1**, *Regulatory Context and Guidance.*

5.17.2 Study Area

Only a Local Study Area was defined for EJ. As explained in **Section 4.17.2**, *Study Area,* EJ communities exist at the local level and are generally identified in Census block groups. The Local Study Area includes the Census block groups that are wholly or partially within one-half mile of the Project Area. **Figures 4-34, 4-35**, **and 4-36** show the Local Study Area and the distribution of minority and low-income populations within it. Census block groups with at least 50 percent minority residents or 27 percent of the population below 150 percent of the poverty line were considered areas of EJ concern. Resources and facilities specifically serving minority or low-income populations were also considered.

5.17.3 Methodology

This section summarizes the methodology for evaluating the potential effects of the alternatives on environmental justice populations. **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report*, **Section 17.4**, *Methodology*, provides a description of the analysis methodology. A summary is below.

The EJ analysis evaluated whether the No-Action Alternative and Action Alternatives would result in disproportionately high and adverse impacts on minority and low-income populations by considering whether:

- Adverse impacts would be predominantly borne or concentrated in minority or low-income populations.

- Adverse impacts to EJ populations would be appreciably more severe or greater in magnitude than those on non-EJ populations.
- Alternatives would affect resources especially important to EJ population (such as social, religious, or cultural functions).
- Any benefits would be accompanied by impacts to environmental justice populations.
- Mitigation measures, enhancements, and betterments are needed.

All resource categories considered in this DEIS were reviewed to identify those with potential to result in disproportionately high and adverse effects on EJ populations. Resource categories with no impacts or negligible impacts were dismissed from analysis as, by definition, they would not disproportionately affect EJ populations. Resource categories that would result in more than negligible impacts were then screened to determine whether these impacts had potential to result in disproportionately high and adverse effects on EJ populations. The results of this screening are presented **Table 17-4** of **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report***,** **Section 17.4,** *Methodology*. The following resource categories were identified as having potential to cause disproportionately high and adverse effects and therefore requiring further analysis: Transportation (Metrorail, Intercity Buses, City and Commuter Buses, and Vehicular Traffic); Noise and Vibration; and Social and Economic Conditions (Community Disruption). These categories are the focus of the following sections.[1]

5.17.4 Impact Analysis

This section describes the impacts of the No-Action Alternative and the Action Alternatives with regard to EJ populations.

5.17.4.1 No-Action Alternative

Operational Impacts

Relative to existing conditions, in the No-Action Alternative, not expanding WUS would have a disproportionately high and adverse operational impacts on EJ communities because of projected increase in bus facility operations with no improvements to the facility and overcrowding on some city buses.

[1] No distinction is made between direct and indirect operational impacts because the character of the impacts does not affect whether they would affect some populations more than others. Also, for both the No-Action Alternative and the Action Alternatives, EJ determinations were made based on existing demographic and economic conditions (based on 2010 Census data). It is not possible to predict the demographic and economic make-up of the Study Area in 2040.

Transportation

WMATA Metrorail

In the No-Action Alternative, there would be an increase in Metrorail ridership at WUS, resulting in capacity exceedances and a moderate adverse operational impact (see **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, WMATA Metrorail*). This adverse impact is not anticipated to be predominantly borne by EJ communities or to be appreciably more severe or greater in magnitude for EJ populations than for non-EJ populations. It would affect all Metrorail riders equally and available data indicate that minorities or low-income persons do not account for a disproportionate number of riders. Based on a 2012 Metrorail passenger survey, minorities (non-white or Hispanic) made up approximately 43 percent of Metrorail riders. Persons with household incomes less than S30,000 a year accounted for 11 percent of passengers.[2]

Intercity Buses

The No-Action Alternative would result in a major adverse operational impact on bus passenger facilities' ability to accommodate projected increases in users at WUS (see **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses*). Based on a *Northeast Corridor Intercity Travel Study* published in 2015, minorities and low-income persons rely on the bus for intercity travel much more than other demographics.[3] The 2015 study found that while racial minorities make up only 4 percent of intercity travelers by car, they make up 45 percent of bus passengers. Similarly, people with household incomes less than $25,000 represent 2 percent of drivers but 22 percent of bus passengers. On this basis, the major adverse operational impact on intercity bus operations would represent a disproportionately high and adverse impact on EJ populations, as it would be appreciably greater in magnitude for these populations than for the non-EJ population.

City and Commuter Buses

In the No-Action Alternative, anticipated increases in ridership and traffic volumes would cause a moderate adverse direct operational impact on city buses due to overcrowding of some buses and likely decreases in average bus speeds and reliability (see **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, City and Commuter Buses*). According to a 2014 Metrobus passenger survey, minorities represent 81.5 percent of Metrobus users and

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[2] Washington Metropolitan Area Transit Authority (WMATA). January 25, 2013. *2012 Metrorail Passenger Survey*. Accessed from http://www.mwcog.org/asset.aspx?id=committee-documents/ZF1cV1Zb20130125141114.pdf. Accessed on April 23, 2020.

[3] Northeast Corridor Infrastructure and Operations Advisory Commission. 2015. *Northeast Corridor Intercity Travel Study*. Accessed from https://nec-commission.com/app/uploads/2018/04/2015-09-14_NEC-Intercity-Travel-Summary-Report_Website.pdf. Accessed on April 15, 2020.

low-income persons 52 percent.[4] On this basis, the moderate adverse operational impact on city bus operations would be a disproportionately high and adverse impacts on EJ populations, as it would be borne predominantly by members of EJ populations.

Vehicular Traffic

In the No-Action Alternative, roadway traffic near WUS would increase because of greater activity at WUS, local developments, and district-wide population and economic growth. As shown by the traffic impact analysis (**Section 5.5.4.1**, *No-Action Alternative, Vehicular Traffic*), this would cause a degradation of operational conditions at multiple intersections. These adverse traffic impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities. Of the 35 study intersections for the No-Action Alternative, 13 (37 percent) are adjacent to Census blocks or block groups with more than 50 percent minority population or more than 27 percent low-income residents. [5] Of these 13 intersections of EJ concern, ten would experience a major impact for at least one of the three factors considered in the traffic analysis. This would be half or less of all the intersections that would experience major impacts: 3 out of 6 for degradation to Level of Service [LOS] F; 10 out of 21 for increase in queue length of more than 150 feet; and 7 out of 18 for delay increases of more than 5 seconds. Additionally, none of the ten intersections is located entirely within an EJ community or is of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of commuter traffic.

Noise and Vibration

As explained in **Section 5.10.4.1**, *No-Action Alternative, Direct Operational Impacts*, ambient noise near WUS and the rail terminal would decrease in the No-Action Alternative because the private air-rights development would mask train noise. Farther away, small increases in noise would occur because of greater traffic. Slightly greater increases in noise levels would occur near New York Avenue due to the new Virginia Railway Express (VRE) Midday Storage Replacement Facility, but nowhere would increases exceed 3 dBA, which is the threshold of perception. Such changes in noise levels have no potential to result in disproportionately high and adverse impacts on EJ communities.

[4] WMATA. March 22, 2018. *G9 Title VI Evaluation*. *Table One. Metrobus Ridership Bus Demographic Profile*. Accessed from https://www.wmata.com/about/board/meetings/board-pdfs/upload/9A-201959-G9-Title-VI-Evaluation.pdf. Accessed on April 23, 2020.

[5] These intersections are : North Capitol Street and K Street; North Capitol Street and H Street; 3rd Street and H Street NE; North Capitol Street and G Street; North Capitol Street and Massachusetts Avenue; North Capitol Street and E Street; 4th Street and H Street NE; First Street and D Street NW; 2nd Street and D Street NW; 3rd Street and E Street NW; 3rd Street, Massachusetts Avenue, and H Street; North Capitol Street (southbound ramp) and New York Avenue; and North Capitol Street (northbound ramp) and New York Avenue.

Social and Economic Conditions

Of the No-Action Alternative projects, the private air-rights development has the most potential to disproportionately affect EJ communities. This project would bring approximately 2,150 new residents to the area. This may raise concerns related to gentrification and the involuntary displacement of long-standing minority or low-income residents.[6] However, the Census tracks around WUS currently do not currently meet key social and demographic criteria commonly used to define areas liable to gentrification.[7] The private air-rights development would not replace or eliminate any existing housing or other land uses since it would be in what is now open space above the rail terminal.

Construction Impacts

Not constructing the Project has no potential to cause disproportionately high and adverse impacts on EJ communities. Construction of the projects included in the No-Action Alternative may displace homeless persons.

In the No-Action Alternative, the Project would not take place, which has no potential to generate construction-related disproportionately high and adverse impacts on EJ communities. Construction of the various No-Action Alternative projects would generate transportation and noise impacts. While it is not possible to assess the intensity and duration of these impacts, they would generally be most noticeable immediately adjacent to the respective project sites.

The projects with the potential to cause the greatest construction-related impacts are the private air-rights development and the replacement of the H Street Bridge. These would take place within and adjacent to Census blocks with no permanent EJ populations. However, these blocks currently have a homeless population and may have one when these projects begin. For safety and security reasons, it may be necessary to displace homeless persons during the construction of the No-Action projects, or they may leave because of construction-related disturbances. Displaced homeless persons may relocate to nearby areas but it is not possible to predict where they would go and how many would be affected. Nearby homeless assistance resources would remain available to homeless persons. The project owners would have the option to work with these resources if and when it is necessary to remove homeless encampments.

[6] The US Department of Housing and Urban Development defines gentrification as “the process by which a neighborhood occupied by lower-income households undergoes revitalization or reinvestment through the arrival of upper-income households.”

[7] Freeman, L. “Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods.” *Urban Affairs Review*, 463-491. 2005. For further analysis, see **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report*, **Section 14.5.1.2**, *Indirect Operational Impacts*.

5.17.4.2 Alternative A

Operational Impacts

Alternative A would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

Transportation

WMATA Metrorail

In Alternative A, there would be an increase in Metrorail ridership at WUS due to capacity exceedances (see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail*), resulting in a moderate adverse operational impact. This adverse impact is not anticipated to be predominantly borne by EJ communities or to be appreciably more severe or greater in magnitude for EJ populations than for non-EJ populations for the same reason as explained for the No-Action Alternative in **Section 5.17.4.1**, *No-Action Alternative, Operational Impacts*, *Transportation* above.

Intercity Buses

Alternative A would have a moderate adverse direct operational impact on intercity bus operations because of the new 30-minute time limit for buses at WUS, as explained in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*, *Intercity, Tour/Charter, and Sightseeing Buses*. This would result in more trips in and out of the bus facility and may create additional delays for bus operators; buses may also need to lay over at other locations in the District or the region. Although, as explained above for the No-Action Alternative, available, data suggest that EJ populations rely on the bus for intercity travel appreciably more than non-EJ populations do (see **Section 5.17.4.1**, *No-Action Alternative, Operational Impacts*, *Transportation* above), Alternative A's adverse impacts would predominantly bear on bus operators rather than bus passengers. Passengers would benefit from a new facility with enhanced accommodations and connectivity. The moderate adverse operational impacts on intercity bus operations would not be a disproportionately high and adverse impact on EJ populations.

City and Commuter Buses

As explained in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts*, *City and Commuter Buses*, Alternative A would have a minor adverse direct operational impact on city and commuter buses, as increases in WUS-generated ridership would incrementally contribute to the overcrowding of some city buses and increases in traffic congestion would incrementally contribute to delays experienced by all city and commuter buses. This would not amount to a disproportionately high and adverse impact on EJ communities. While the impacts would affect members of EJ populations, who make up a large proportion of bus passengers (as noted in **Section 5.17.4.1**, *No-Action Alternative, Operational Impacts*, *Transportation* above), the increase attributable to the Project in Alternative A would be small relative to No-Action

Alternative conditions and the same bus lines would be affected as in the No-Action Alternative.

Vehicular Traffic

In Alternative A, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Vehicular Traffic*). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would be a major operational adverse impact during at least one peak period at nine of the 13 study intersections (out of 35) of EJ concern. The nine intersections account for less than half the intersections that would experience a major adverse impact under one of the three factors considered in the traffic impact analysis (2 out of 7 for degradation to LOS F; 7 out of 16 for increase in queue length of more than 150 feet; and 8 out of 20 for delay increases of more than 5 seconds). Additionally, none of the nine intersections is located entirely within an EJ community or is of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of commuter traffic and would continue to do so under the No-Action Alternative.

Noise and Vibration

Alternative A's operational noise and vibration impacts are described in **Section 5.10.4.2**, *Alternative A, Direct Operational Impacts*. Operational vibration impacts would be negligible with no potential to disproportionately affect EJ populations.

Adverse noise impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities. Increased traffic and rail operations would cause increases in operational noise throughout the Local Study Area. Everywhere, including along North Capitol Street and H Street, noise levels would not change by more than 3 dBA, which is generally not perceptible. These small increases would bring noise levels up to the FTA threshold for moderate noise impacts at 14 modeled receptor locations. Noise levels would also increase at 10 planned development locations. Of those receptors, none are within majority minority Census blocks or are of special significance to minority communities. Only two existing receptors and four planned ones are located within a Census block with more than 27 percent of the residents under 150 percent of the poverty threshold.

Social and Economic Conditions

Relative to the No-Action Alternative, Alternative A would have a major beneficial impact on local communities by improving community cohesion and providing new pedestrian connections between WUS and the surrounding neighborhoods. Alternative A would result in more and improved bus and train service at WUS. It would provide enhanced connections between the neighborhoods to the east and west of WUS as well as make the station more accessible to pedestrians, bicycles, and persons with reduced mobility. Alternative A would also have positive economic impacts through the addition of new retail space at WUS and the intensification of train operations (see **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts*, *Community Disruption and Other Social Benefits or Impacts*). Together, this would support an estimated 1,445 jobs over the No-Action Alternative. Minority and low-income persons would enjoy these benefits as much as the general population.

Construction Impacts

Construction of Alternative A would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

Transportation

WMATA Metrorail

Similar to operational impacts and for the same reason, construction impacts on WMATA Metrorail in Alternative A (see **Section 5.5.4.2**, *Alternative A, Construction Impacts, WMATA Metrorail)* would not be predominantly borne by minorities or low-income persons or be appreciably more severe or greater in magnitude for EJ populations than for non-EJ populations.

Intercity Buses

As explained in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Intercity, Tour/Charter, and Sightseeing Buses*, in Alternative A, intercity bus service would not be available at WUS during Phase 4 of construction. As explained in **Section 5.17.4.1**, *No-Action Alternative, Operational Impacts, Transportation* above, data indicate that EJ populations rely on the bus for intercity travel appreciably more than non-EJ populations. Therefore, the displacement of intercity bus service in Phase 4 of construction would be a disproportionately high and adverse impact on EJ populations, as it would be appreciably greater in magnitude for these populations than for the non-EJ population.

In Alternative A, Phase 4 would last for approximately 3 years and 1 month. Measures to avoid, minimize, and mitigate this impact are identified in **Section 5.17.6**, *Avoidance, Minimization, and Mitigation Evaluation*.

City and Commuter Buses

Construction of Alternative A would have negligible adverse impacts on city and commuter bus operations, as there would only be intermittent and limited disruptions (see **Section 5.5.4.2**, *Alternative A, Construction Impacts, City and Commuter Buses*). There would be no potential for disproportionately high and adverse impacts on EJ communities.

Vehicular Traffic

As explained in **Section 5.5.4.2**, *Alternative A, Construction Impacts, Vehicular Traffic*, construction activities at WUS would generate traffic to and from the Project Area throughout the day during the entire construction period, although the volume and nature of this traffic would vary depending on the construction phase and type of activities being conducted. It would be greatest during excavations activities, when up to 120 trucks per 20-hour day could be traveling to and from the site. This is a maximum, conservative estimate that assumes that no work trains would be used to haul spoils away. Trucks would only travel along designated truck routes, with the exception of short stretches of First and 2nd Streets NE to reach the nearest designated route. Trucks would not travel through neighborhoods in a manner that could result in disproportionately high and adverse impacts on EJ communities.

Noise and Vibration

Construction of Alternative A would cause noise and vibrations. Construction noise levels in EJ communities would not be consistently higher in EJ communities than in non-EJ communities. As described in **Section 5.10.4.2**, *Alternative A, Construction Impacts*, there would be major stationary- and mobile-source construction noise impacts at up to 33 receptors where noise levels would exceed the FTA criteria for moderate or severe (major) impacts during support of excavation (SOE) construction or at the beginning of excavation.

Most of these 33 receptors are located close to the edge of the rail terminal along First and 2nd Streets NE south of L Street and west of 3rd Street NE. Three of the affected receptors are in a Census block with more than 50 percent minority population: 1111-1139 3rd Street NE (severe impact) and 300 L Street NE (moderate impact) in Block 2017; and 907-913 3rd Street NE in Block 2043 (severe impact). All three receptors are residential uses. Outside those two blocks, two receptors that would experience moderate adverse noise impacts during excavation activities are Station House Apartments (701 2nd Street NE), an affordable housing complex; and 301-319 K Street NE, close to a predominantly African-American place of worship (Community Holiness, 305 K Street NE). Thus, some minority or low-income persons and locations of significance to EJ populations would experience severe or moderate noise impacts. However, as shown by the total number of locations affected, these impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities. Measures that would be implemented to avoid, minimize, or mitigate noise impacts (see **Section 5.10.6**, *Avoidance, Minimization, and Mitigation Evaluation*) would reduce impacts at EJ as well as non-EJ locations.

The greatest levels of stationary-source vibrations would be experienced along the eastern side of the Project Area (affecting the REA Building and the Kaiser Permanente Medical Center; see **Section 5.10.4.2**, *Alternative A, Construction Impacts*). Vibration from truck traffic is expected to generate annoyance at 12 locations close to New York Avenue, North Capitol

Street and 2nd Street NE. These locations are not in Census blocks or block groups with more than 50 percent minority or more than 27 percent low-income populations.

Social and Economic Conditions

There is currently a substantial homeless population near WUS and along First Street NE and such a population may still be present when construction of Alternative A begins. If so, construction would displace these homeless persons and make areas currently used by the homeless inhospitable for many years. Due to the transient, mobile, and changing character of the homeless population, as well as evolving District policies with regard to homeless encampments,[8] it is not possible to estimate how many people this would affect and whether it would amount to a disproportionately high and adverse impacts on EJ communities. Some homeless persons may relocate to nearby areas while other may travel farther. Nearby homeless assistance resources would remain available to help the area's homeless. The steps described in **Section 5.17.6**, *Avoidance, Minimization, and Mitigation Evaluation* would minimize impacts on this population.

5.17.4.3 Alternative B

Operational Impacts

Alternative B would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Operational Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; and Social and Economic Conditions also apply to Alternative B and are not repeated here. The adverse operational impacts of Alternative B on noise and vibration (see **Section 5.10.4.3**, *Alternative B, Direct Operational Impacts*) would vary slightly from those of Alternative A but not in a manner that would change their distribution across the Study Area or their potential to affect EJ communities. Therefore, the same analysis applies to Alternative B as well. It is not repeated here.

Transportation

Vehicular Traffic

In Alternative B, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.3,** *Alternative B, Direct Operational Impacts, Vehicular*

[8] In January 2020, the District enacted and implemented a policy to permanently remove all homeless encampments from the K Street NE underpass. However, the removal policy did not apply to L Street encampments. Heim, Joe and Moyer, Justin Wm., "No Room on the Street: D.C. Orders Homeless out of Underpass in Fast-Developing Neighborhood," *Washington Post*, January 10, 2020. Accessed from https://www.washingtonpost.com/local/no-room-on-the-street-dc-orders-homeless-out-of-underpass-in-fast-developing-neighborhood/2020/01/10/1704d604-319c-11ea-9313-6cba89b1b9fb_story.html. Accessed on April 24, 2020.

Traffic). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would be a major operational adverse impact during at least one peak period at seven of the 13 intersections (out of 36) of EJ concern. These seven intersections account for less than half the intersections that would experience a major adverse operational impact under one of the three factors considered in the traffic impact analysis (1 out of 4 for degradation to LOS F; 7 out of 15 for increase in queue length of more than 150 feet; and 7 out of 21 for delay increases of more than 5 seconds). None of the intersections is located entirely within an EJ community or of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of traffic and would continue to do so in the No-Action Alternative.

Construction Impacts

Construction of Alternative B would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for WMATA Metrorail; Intercity Buses; Vehicular Traffic; and Social and Economic Conditions also apply to Alternative B and are not repeated here. In Alternative B, Phase 4 of construction, during which intercity bus service would not be available at WUS would last for approximately 4 years and 11 months.

Transportation

City and Commuter Buses

Construction of Alternative B would have minor adverse impacts on city and commuter bus operations from lane closures on K Street NE (see **Section 5.5.4.3**, *Alternative B, Construction Impacts, City and Commuter Buses*). This would not amount to a disproportionately high and adverse impact on EJ communities. While the impacts would affect members of EJ populations, who make up a large proportion of city bus passengers (see **Section 5.17.4.1**, *No-Action Alternative, Operational Impacts, Transportation* above), only one Metrobus line (D4) out of 13 that serve WUS and its surrounding, would be affected and one lane of traffic would remain open in each direction during the day.

Noise and Vibration

Construction of Alternative B would cause noise and vibrations, as described in **Section 5.10.4.3**, *Alternative B, Construction Impacts*. Construction noise levels in EJ communities would not be consistently higher in EJ communities than in non-EJ communities. In Alternative B, there would be major stationary- and mobile-source construction noise impacts at 38 receptors. Noise levels at these locations would exceed the FTA criteria for moderate or severe (major) impacts during SOE construction or at the beginning of excavation. This would be five more receptors than in Alternative A but none of these additional five would be in areas of EJ concern; therefore, with respect to EJ, the noise impacts of Alternative B would be as described for Alternative A in **Section 5.17.4.2**, *Alternative A, Construction Impacts, Noise and Vibration*.

5.17.4.4 Alternative C

Operational Impacts

Alternative C (either option) would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Operational Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; and Social and Economic Conditions also apply to Alternative C (either option). They are not repeated here. The adverse operational impacts of Alternative C (either option) on noise and vibration (see **Section 5.10.4.4**, *Alternative C, Direct Operational Impacts*) would vary slightly from those of Alternative A but not in a manner that would change their distribution across the Study Area or their potential to affect EJ communities. Therefore, the same analysis applies to Alternative C as well. It is not repeated here.

Transportation

<u>**Vehicular Traffic**</u>

In Alternative C, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.4,** *Alternative C, Direct Operational Impacts, Vehicular Traffic*). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would cause a major operational adverse impact during at least one peak period at ten (East Option) or six (West Option) of the 13 intersections (out of 36) of EJ concern. In Alternative C with the East Option, the ten intersections of EJ concern affected account for less than or just over half the intersections that would experience a major adverse operational impact under one of the three factors considered in the traffic impact analysis (2 out of 5 for degradation to LOS F; 9 out of 21 for increase in queue length of more than 150 feet; and 10 out of 19 for delay increases of more than 5 seconds). In Alternative C with the West Option, the six affected intersections of EJ concern account for less than half the total affected intersections regardless of the factor (1 out of 4 for degradation to LOS F; 6 out of 15 for increase in queue length of more than 150 feet; and 6 out of 20 for delay increases of more than 5 seconds).

Additionally, regardless of the option, none of the affected intersections is located entirely within an EJ community or of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of traffic and would continue to do so in the No-Action Alternative.

Construction Impacts

Construction of Alternative C with the East Option would not have disproportionately high and adverse impacts on EJ communities. Construction of Alternative C with the West Option would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for WMATA Metrorail; Vehicular Traffic; and Social and Economic Conditions also apply to Alternative C and are not repeated here. The analysis presented in **Section 5.17.4.3**, *Alternative B, Construction Impacts* for City and Commuter Buses also applies to Alternative C and is not repeated here.

Transportation

Intercity Buses

The analysis presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for Intercity Buses also applies to Alternative C with the West Option. It is not repeated here. In Alternative C, Phase 4 of construction, during which intercity bus service would be unavailable at WUS, would last for approximately 4 years.

In Alternative C with the East Option, however, intercity bus service would remain available throughout the construction period because the new bus facility (on the east side of the Project Area) would be operational by the time the existing one is demolished. Therefore, construction of Alternative C with the West Option would not result in a disproportionately high and adverse impact on EJ communities.

Noise and Vibration

Construction of Alternative C (either option) would cause noise and vibrations as described in **Section 5.10.4.4**, *Alternative C, Construction Impacts*. Construction noise levels in EJ communities would not be consistently higher in EJ communities than in non-EJ communities. There would be major stationary- and mobile-source construction noise impacts at 32 receptors where noise levels would exceed FTA criteria for moderate or severe (major) impacts during SOE construction or at the beginning of excavation. The number of affected receptors in areas of EJ concern would be the same as in Alternative A. Therefore, with respect to EJ, the noise impacts of constructing Alternative C would be as described for Alternative A in **Section 5.17.4.2**, *Alternative A, Construction Impacts*. While some minority or low-income persons and locations of significance to EJ populations would experience severe or moderate noise impacts, such impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities. Measures that would be implemented to avoid, minimize, or mitigate noise impacts (see **Section 5.10.6**, *Avoidance, Minimization, and Mitigation Evaluation*) would reduce impacts at EJ as well as non-EJ locations.

5.17.4.5 Alternative D

Operational Impacts

Alternative D would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Operational Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; and Social and Economic Conditions also apply to Alternative D. They are not repeated here. The adverse operational impacts of Alternative D on noise and vibration (see **Section 5.10.4.5**, *Alternative D, Direct Operational Impacts*) would vary slightly from those of Alternative A but not in a manner that would change their distribution across the Study Area or their potential to affect EJ communities. Therefore, the same analysis applies to Alternative D as well. It is not repeated here.

Transportation

Vehicular Traffic

In Alternative D, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.5,** *Alternative D, Direct Operational Impacts, Vehicular Traffic*). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would be a major operational adverse impact during at least one peak period at six of the 13 intersections (out of 36) of EJ concern. These six intersections account for less than half the intersections that would experience a major adverse operational impact under one of the three factors considered in the traffic impact analysis (1 out of 4 for degradation to LOS F; 6 out of 14 for increase in queue length of more than 150 feet; and 6 out of 20 for delay increases of more than 5 seconds).

Additionally, regardless of the option, none of the affected intersections is located entirely within an EJ community or of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of traffic and would continue to do so in the No-Action Alternative.

Construction Impacts

Construction of Alternative D would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for WMATA Metrorail; Intercity Buses; Vehicular Traffic; and Social and Economic Conditions also apply to Alternative D and are not repeated here. In Alternative D, Phase 4 of construction, during which intercity bus service would be unavailable at WUS, would last for approximately 4 years. The analysis presented in **Section 5.17.4.3**, *Alternative B, Construction Impacts* for City and Commuter Buses also applies to Alternative D and is not repeated here.

The analysis presented in **Section 5.17.4.4**, *Alternative C, Construction Impacts* for Noise and Vibration also applies to Alternative D. Both alternatives would use the same SOE method and involve the same amount of excavation. Construction duration would be the same.

5.17.4.6 Alternative E

Operational Impacts

Alternative E would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Operational Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; and Social and Economic Conditions also apply to Alternative E. They are not repeated here. The adverse operational impacts of Alternative E on noise and vibration (see **Section 5.10.4.6**, *Alternative E, Direct Operational Impacts*) would vary slightly from those of Alternative A but not in a manner that would change their distribution across the Study Area or their potential to affect EJ communities. Therefore, the same analysis applies to Alternative E as well. It is not repeated here.

Transportation

Vehicular Traffic

In Alternative E, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.6,** *Alternative E, Direct Operational Impacts, Vehicular Traffic*). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would be a major operational adverse impact during at least one peak period at seven of the 13 intersections (out of 36) of EJ concern. These intersections account for less than half the intersections that would experience a major adverse operational impact under one of the three factors considered in the traffic impact analysis (1 out of 4 for degradation to LOS F; 7 out of 16 for increase in queue length of more than 150 feet; and 7 out of 20 for delay increases of more than 5 seconds). Additionally, regardless of the option, none of the affected intersections is located entirely within an EJ community or of special significance to the well-being of any such community. All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of traffic and would continue to do so in the No-Action Alternative.

Construction Impacts

Construction of Alternative E would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for WMATA Metrorail; Intercity Buses; Vehicular Traffic; and Social and Economic Conditions also apply to Alternative E and are not repeated here. In Alternative E, Phase 4 of construction, during which intercity bus service would be unavailable at WUS, would last for approximately 4 years and 11 months. The analysis presented in **Section 5.17.4.3**, *Alternative B, Construction Impacts* for City and Commuter Buses also applies to Alternative E and is not repeated here.

The analysis presented in **Section 5.17.4.3**, *Alternative B, Construction Impacts* for Noise and Vibration also applies to Alternative E. Both alternatives would use the same SOE method and involve the same amount of excavation. Construction duration would be the same.

5.17.4.7 Alternative A-C (Preferred Alternative)

Operational Impacts

Alternative A-C would not have disproportionately high and adverse impacts on EJ communities relative to the No-Action Alternative.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Operational Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; Noise and Vibration; and Social and Economic Conditions also apply to Alternative A-C. They are not repeated here.

Transportation

Vehicular Traffic

In Alternative A-C, roadway traffic in the Local Study Area would increase, resulting in a degradation of operational conditions at multiple intersections near WUS relative to the No-Action Alternative (see **Section 5.5.4.7,** *Alternative A-C, Direct Operational Impacts, Vehicular Traffic*). These adverse impacts would not be predominantly borne by EJ populations or be appreciably more severe for these populations than for non-EJ communities.

There would be a major operational adverse impact during at least one peak period at seven of the 13 intersections (out of 35) of EJ concern. These seven intersections account for less than half the intersections that would experience a major adverse operational impact under one of the three factors considered in the traffic impact analysis (2 out of 5 for degradation to LOS F; 7 out of 19 for increase in queue length of more than 150 feet; and 7 out of 22 for delay increases of more than 5 seconds).

Additionally, regardless of the option, none of the affected intersections is located entirely within an EJ community or of special significance to the well-being of any such community.

All border major thoroughfares (such as North Capitol Street and H Street) that already carry large amounts of traffic and would continue to do so in the No-Action Alternative.

Construction Impacts

Construction of Alternative A-C would have a disproportionately high and adverse impact on EJ communities from the unavailability of intercity bus service at WUS during Phase 4 of Construction.

The analyses presented in **Section 5.17.4.2**, *Alternative A, Construction Impacts* for WMATA Metrorail; Intercity Buses; City and Commuter Buses; Vehicular Traffic; Noise and Vibration; and Social and Economic Conditions also apply to Alternative A-C.

5.17.5 Comparison of Alternatives

In all Action Alternatives except Alternative C with the East Option, the unavailability of intercity bus service at WUS during Phase 4 of construction would constitute a disproportionately high and adverse effect on EJ communities. Phase 4 would last for approximately 3 years and 1 month in Alternatives A and A-C; 4 years in Alternatives C and D; and approximately 4 years and 1 month in Alternatives B and E.

Additionally, all alternatives would likely require the displacement of any homeless persons who would be using the area around WUS when construction begins.

5.17.6 Avoidance, Minimization, and Mitigation Evaluation

In all Action Alternatives except Alternative C with the East Option, to mitigate the disproportionately high and adverse impact on EJ communities during Phase 4 of construction due to the displacement of intercity bus service, FRA is considering the following measure:

- In coordination with the District, USRC would identify a location for an adequately-sized interim bus facility or bus loading zones as close to WUS as possible for use during Phase 4 of construction.

To minimize potential adverse impacts on the homeless population. FRA is considering the following measure:

- If and when construction contractors encounter homeless persons when staging construction activities and need to relocate these persons, they would be required to contact and coordinate with the appropriate authorities and organizations to ensure the displaced persons are given access to available public and private assistance services, including opportunities for shelter as well as health and mental health care; that they are not deprived of their belongings or otherwise mistreated; and that neither they nor the workers interacting with them are put at risk of harm.

5.17.7 Permits and Regulatory Compliance

There are no formal permits required to demonstrate regulatory compliance for EJ. Compliance with local noise and construction ordinances would occur through the construction permitting process, which would minimize noise impacts. Per DOT Order 5610.2(a), it must be determined whether transportation activities would have an adverse effect on minority and low-income populations and whether that adverse effect would be disproportionately high.

Activities that have a disproportionately high and adverse impact on minority and low-income populations may only be implemented if further mitigation measures or alternatives to avoid or reduce these impacts are not practicable. Effective, meaningful involvement of low-income and minority populations must be undertaken in project planning and development and EJ populations must have fair and equal access to information.

5.17.8 Outreach to Environmental Justice Populations

One of the guiding principles of environmental justice is ensuring full and fair access to meaningful involvement by minority and low-income populations in project planning and development. A robust, sustained, and transparent engagement process is essential through the life of the Project.

The public participation process for the Project and DEIS focused on engaging potentially affected residents through public meetings and materials, social media, and a Community Communications Committee (CCC). The purpose of the CCC was to improve community engagement during the NEPA process and during the Project planning and development process. The CCC includes representatives of the communities potentially affected by the Project (**Section 8.3.2**, *Key Constituents for the Engagement Process*). CCC meetings convened at logical points throughout the NEPA process, such as prior to public meetings.

Per FTA Circular 4703.1, *Environmental Justice Policy Guidance for Federal Transit Administration Recipients*,[9] public outreach has occurred and will continue to occur through interactive public meetings that communicate information about the Project in a manner that is user-friendly, clear, and concise. To date, four public meetings have been held (**Section 8.3.1**, *Public Meetings*). The meetings were advertised in several newspapers and news websites, including the *Washington Informer*, which serves the African-American community. Translation services were offered at all the public meetings.

A public hearing will be held after the Draft EIS is released to present the findings of the impact analysis and received public comment (See **Section 8.5**, *Public Review of the DEIS,* for more information). **Appendix C3**, *Washington Union Station Expansion Project Environmental*

[9] Available at https://www.transit.dot.gov/regulations-and-guidance/fta-circulars/environmental-justice-policy-guidance-federal-transit. Accessed on July 8, 2019.

Consequences Technical Report, **Section 17.9,** *Outreach to Environmental Justice Populations* and **Section 8.3***, Public Involvement During Preparation of the DEIS* provide more details on public engagement activities to date.

5.18 Cumulative Impacts

The cumulative impact analysis assesses the incremental impacts of the Project when considered in conjunction with past, present, and reasonably foreseeable future actions. Under NEPA, a cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

5.18.1 Regulatory Context and Guidance

Guidance documents pertaining to cumulative impacts are listed in **Appendix C3**, Washington Union Station Expansion Project Environmental Consequences Technical Report, **Section 18.2**, *Regulatory Context*.

5.18.2 Study Area

The geographic area across which cumulative impacts are considered varies depending on the resource. **Table 18-1** in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* identifies the study area corresponding to each resource. In most cases, the area is either the District as a whole or the Local Study Area for the resource, as shown in **Table 5-185**.

Table 5-185. Study Areas for Cumulative Impacts

Resource	Cumulative Impact Study Area	Resource	Cumulative Impact Study Area
Natural Ecological Systems	Resource Study Area	**Noise and Vibration**	Resource Study Area
Water Resources and Water Quality	District; Resource Study Area (groundwater)	**Aesthetics and Visual Quality**	Resource Study Area
Solid Waste and Hazardous Materials	District (solid waste); Resource Study Area (Hazardous Materials)	**Cultural Resources**	Resource Study Area
Transportation	Resource Study Area	**Parks and Recreation Areas**	Resource Study Area
Air Quality	District-Virginia-Maryland air quality region	**Social and Economic Conditions**	District, Resource Study Area, WUS
Greenhouse Gas Emissions and Resilience	Global and District (greenhouse gas); District and Resource Study Area (Resilience)	**Public Safety and Security**	Resource Study Area

Resource	Cumulative Impact Study Area	Resource	Cumulative Impact Study Area
Energy Resources	District	**Public Health, Elderly, and Persons with Disabilities**	Resource Study Area
Land Use, Planning, and Property	Resource Study Area	**Environmental Justice**	Resource Study Area

5.18.3 Methodology

5.18.3.1 Analysis

The potential cumulative impacts of the Action Alternatives were analyzed for the resources listed in **Table 5-185**. For each resource, past, present, and reasonably foreseeable future impacts without the Project were considered. In general, the impacts of past projects are included in the existing conditions described in Chapter 4 of this DEIS. To minimize redundancy, these descriptions are not repeated in this section. For each resource, the discussion focuses on present and future impacts using the projects summarized in **Section 5.18.3.2** below (**c**umulative projects) as an illustration or benchmark. Whenever possible, quantitative estimates were developed using the same methods as used to quantify the impacts of the alternatives on the resource under consideration. This is followed by a description of what the Project would add to present, past, and foreseeable future impacts and an assessment of the resulting cumulative impacts.

5.18.3.2 Cumulative Projects

The cumulative projects were selected to include present and foreseeable future projects that met the following conditions: having the potential to result in measurable environmental impacts because of their size, scope, or other key characteristics; having environmental effects that could cause a cumulative impact; being potentially capable of generating cumulative impacts that could reasonably be expected to affect the viability, sustainability, or value of a given resource; undergoing or having completed permitting actions or NEPA reviews, or being programmed for construction.

Refer to **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 18.3***, Study Area* for a map (**Figure 18-1**) and descriptions of the cumulative projects, which include:

- Various station and track improvements at WUS.

- The following transportation projects: [1]
    - DC Streetcar extension;
    - H Street Bridge Replacement; and
    - WMATA Union Station Metrorail station enhancements
- Fifty-three private development projects, including:
    - 15,200 residential units;
    - 1.13 million square feet of retail;
    - 6.9 million square feet of office space;
    - 1,400 hotel rooms; and
    - 3.2 million square feet of mixed-use space.

5.18.4 Impact Analysis

5.18.4.1 Introduction

This section presents the cumulative long-term, operational impacts of the Project when added to those of past, present, future projects. For each resource, the cumulative impacts of the Project are summarized in bold lettering, followed by a more detailed analysis.

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[1] For the stated reasons, the following transportation projects are not included in the cumulative impact analysis:

Baltimore-Washington SCMAGLEV Project - In 2016, FRA, jointly with the Maryland Department of Transportation, initiated the preparation of an Environmental Impact Statement (EIS) to evaluate the potential impacts of constructing and operating a high-speed superconducting magnetic levitation (SCMAGLEV) system between the District and Baltimore, MD. After a pause, preparation of the EIS resumed in spring 2020. An Alternative Report completed in late 2018 (available from http://www.bwmaglev.info/index.php/project-documents/reports, accessed on March 18, 2020) retained two potential locations for an underground terminus station in the District, both under New York Avenue and west of 5th Street NW, near Mount Vernon Square. Because of the distance to the Project Area and anticipated station access modes (no parking is proposed and the station would be close to the Mount Vernon Square/7th Street-Convention Center Metrorail Station; it is not likely to generate substantial additional traffic near the Project Area), the SCMAGLEV station, considered with the Project, has no potential to generate cumulative impacts that could reasonably be expected to affect the viability, sustainability, or value of the resources considered in this DEIS.

Washington DC to Baltimore Loop Project, Proposed by the Boring Company – The Federal Highway Administration (FHWA) issued a Draft Environmental Assessment (EA) for this project in April 2019 (available from https://www.dcbaltimoreloop.com/DraftLoopEA.pdf, accessed on March 18, 2020). The project would consist of an underground system transporting passengers in autonomous, high-speed electric vehicles. The District terminus station would be located near the intersection of New York and Florida Avenues. Although it would be a relatively short distance from the WUS Project Area, the potential Loop station, considered with the Project, is not likely to generate cumulative impacts that could reasonably be expected to affect the viability, sustainability, or value of the resources considered in this DEIS. It would be underground, have limited capacity (no more than 1,000 passengers per day in each direction). The terminus station would be close to the NoMA-Gallaudet U.-New York Avenue Metrorail station and include no parking, which would minimize any traffic the project would generate. The Draft EA does not identify adverse impacts from traffic.

5.18.4.2 Natural Ecological Systems

The Project would have no cumulative impacts on natural ecological systems.

There are no natural ecological systems (such as wetlands, natural vegetative communities, or wildlife habitat) in the Study Area. The Study Area consists entirely of transportation and building infrastructure; dense urban uses such as commercial and residential buildings or row houses; and maintained urban parks. Construction of the Project would require the removal of approximately 26 ornamental trees along First Street NE. These trees would be replaced in accordance with District's policies on urban forestry. The Project would not affect natural ecological systems and would result in no cumulative impacts on those resources.

5.18.4.3 Water Resources and Water Quality

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Surface Waters

The impacts of past actions in the District generally have had an adverse impact on surface waters. Based on current improving trends and the continued enforcement of and compliance with the District's water quality regulations and policies, the reasonably foreseeable adverse impacts of present and future actions, including the cumulative projects, on surface waters are anticipated to be negligible.

The Project Area is located within the subwatershed of the Lower Anacostia River, a tidal river which flows into the Potomac River and ultimately the Chesapeake Bay. In the 2016 Water Quality Integrated Report, DOEE lists the Lower Anacostia River as a Category 4A for multiple pollutants. Water quality within this segment of the Anacostia River does not support the river's designated uses.

The District has regulations and policies in place to address water quality issues. DOEE's Water Quality Division and the Inspection and Enforcement Division implement the water quality standards established under the authority of the Clean Water Act and the District of Columbia Water Pollution Control Act of 1984. The Watershed Protection Division and Regulatory Review Division manage sediment and stormwater control. The District also conducts stream restoration activities to improve habitat and implements a RiverSmart program that provides financial incentives to help property owners install green infrastructure to reduce polluted runoff. The District also coordinates with the District of Columbia Water and Sewer Authority (DC Water) for the construction of the Anacostia River segment of the stormwater storage tunnel under the Clean Rivers Project. Overall, the quality of the District's waters has been improving.

Groundwater

The impacts of past and present actions in the District generally have had an adverse impact on groundwater in the District. The reasonably foreseeable adverse impacts of future actions, including the cumulative projects, on surface waters are anticipated to be negligible both at the District and local level.

As reported in 2018, data indicated declines in hydraulic pressure at several wells in the Patuxent Aquifer although some recovery was measured at certain locations, including on the eastern bank of the Anacostia River. The declines were most likely due to several large DC Water Long Term Control Plan (Clean Rivers) dewatering projects underway along the Anacostia River. Dewatering rates for these projects and other construction sites along the Potomac and Anacostia Rivers typically exceed one million gallons per day at each location.

Future actions involving large-scale dewatering may continue to affect global groundwater levels but most urban development projects have no potential to have such effects. However, they may result in local impacts if dewatering is sufficient to create a risk of soil subsidence from local reductions in groundwater pressure. In this regard, the local, adverse impacts of the cumulative projects on groundwater would be negligible. In the vicinity of WUS, the cumulative projects may adversely affect groundwater to the extent that their foundations reach below groundwater levels and cause groundwater displacement or require short-term (construction) or long-term pumping and disposal of groundwater to keep basements or underground parking garages dry. Because these projects are located within a part of the District that is almost entirely developed, they have no potential to measurably affect groundwater recharge. While the impacts of each project would vary depending on its location, size, and design, it can be anticipated that each would be engineered to avoid and minimize the need for costly short-term and long-term groundwater withdrawal as much as possible.

Stormwater

The impacts of past and present actions in the District generally have had an adverse impact on stormwater from the large amount of impervious surface typical of an urban environment (43 percent of the District is impervious). Through the enforcement of, and compliance with, District stormwater regulations, the adverse impacts of present and reasonably foreseeable future actions, including the cumulative projects, are expected to be minor.

The District manages stormwater through its NPDES permit and the 2013 Stormwater Rule. The 2013 Stormwater Rule applies to major land-disturbing activities and major substantial improvement activities. Major land-disturbing activities must retain the first 1.2 inches of rainfall on site or through a combination of on-site and off-site retention. For major substantial improvement activities, the amount is 0.8 inches of rainfall. Regulated sites have the option to provide off-site retainage for half the amount to be retained under the regulation. The District's *Stormwater Management Guidebook* identifies best management practices that can be used to meet on- and off-site retainage requirements, including green roofs, rainwater harvesting, and permeable pavement systems, among others. [2]

The cumulative projects would occur in a densely developed and mostly impervious area of the District. If currently pervious areas are made impervious, this could result in increased stormwater runoff flows depending on the number of projects subject to the 2013 Rule and the intensity of the storm event. This increase may be offset if regulated project replaced impervious land uses to which the regulation does not apply. Altogether, through the application of the District's stormwater regulations, adverse impacts are anticipated to be minor.

Wastewater

The impacts of past actions in the District generally have had an adverse impact on wastewater generation through many decades of growth and development. These impacts have been managed through the development and maintenance of an extensive collection and treatment system. Based on the current condition of this system, the impacts of present and reasonably foreseeable actions are anticipated to be minor.

DC Water collect the wastewater produced in the District and treats it at Blue Plains. Altogether, DC Water operates 1,900 miles of sanitary and combined sewers and other conveyance facilities. Blue Plains has an average design capacity of 384 million gpd and peak wet weather capacity of more than one billion gpd. Currently, it treats an average of approximately 290 million gpd.

In this context, the reasonably foreseeable adverse impacts of future actions, including the cumulative projects, would be minor. District growth will increase the amount of wastewater produced, mostly through residential and commercial development. Currently, Blue Plains operates at 75 percent of capacity on average, which leaves ample capacity to accommodate regional and District growth. As an illustration of the scale of impact from development projects, based on their size, the cumulative projects would generate approximately 3,722,670 gallons of wastewater per day. This order-of-magnitude estimate was developed using the same method used to assess the direct impact of the No-Action Alternative (**Section 5.3.4.1**, *No-Action Alternative, Direct Operational Impacts, Wastewater*) and is detailed in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 18.5.3.1**, *Impacts of Past, Present, and Foreseeable Future Actions (without the Project), Wastewater*). The wastewater generated by the cumulative projects would represent approximately 0.97 percent of Blue Plains' average daily capacity of 384 million gallons per day (gpd). [3]

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[2] District Department of Energy and Environment. 2018. *The District of Columbia's Stormwater Management Regulations*. Accessed from https://doee.dc.gov/service/offv. Accessed on April 3, 2020.

[3] DC Water. *Blue Plains Advanced Wastewater Treatment Plant brochure*. Accessed from https://www.dcwater.com/sites/default/files/Blue_Plains_Plant_brochure.pdf. Accessed on April 3, 2020.

Drinking Water

The impacts of past actions in the District generally have had an adverse impact on drinking water demand through many decades of growth and development. These impacts have been addressed through the development and maintenance of an extensive water treatment and distribution system. Based on the current condition of this system, the impacts of present and reasonably foreseeable actions are anticipated to be minor.

DC Water operates the drinking water distribution network in the District, including 1,350 miles of pipes, four pumping stations, and five reservoirs. In fiscal year 2016, DC Water pumped an average of 99 million gpd of water, in addition to storing 61 million gallons. DC Water purchases water from the Washington Aqueduct, which withdraws water from the Potomac River and treats it at two drinking water treatment plants in the District. The Aqueduct produces an average of 155 million gpd and serves approximately one million persons in the District and neighboring jurisdictions. [4]

District and regional growth will increase demand for drinking water, mostly through residential and commercial development. A 2015 study forecasting demand and resource availability to 2040 estimated that regional demand would increase by 12 percent between 2015 and 2040. Recommendations included evaluating potential new storage facilities.

In this context, the reasonably foreseeable adverse impacts of future actions, including the cumulative projects, would be minor. Assuming a drinking water consumption amounting to the amount of wastewater generated plus 10 percent, the cumulative projects would generate a daily demand of 4,094,937 gpd. This would represent approximately 2.6 percent of the daily production of the Washington Aqueduct.

Cumulative Impacts of the Project

Surface Waters

In all Action Alternatives, when considered with past, present, and reasonably foreseeable future projects, the Project would have negligible adverse cumulative impacts on surface waters.

In all Action Alternatives, the Project would generate more wastewater that would be conveyed through DC Water's combined sewer system to either Blue Plains or, during larger storms, CSO outfalls in the Anacostia River. This could result in a slightly greater risk of untreated wastewater being released into the Anacostia River relative to what the cumulative projects would cause. However, the contribution of the Project would be very small and the risk would be substantially reduced by the completion of the Clean Rivers Project. Any adverse cumulative impacts on surface waters would be negligible.

[4] U.S. Army Corps of Engineers. *Washington Aqueduct*. Accessed from http://www.nab.usace.army.mil/Missions/Washington-Aqueduct/. Accessed on April 3, 2020.

Stormwater

In all Action Alternatives, when considered with past, present, and reasonably foreseeable future projects, the Project would have no cumulative impacts on stormwater runoff.

Because the Project Area is already impervious, the Project would not add to the amount of stormwater runoff it generates. There would be no cumulative impacts.

Groundwater

In Alternatives A and A-C, when considered with past, present, and reasonably foreseeable future projects, the Project would have minor adverse cumulative impacts on groundwater. In Alternatives B through E, the Project would have moderate adverse cumulative impacts on groundwater.

The Project would add to the adverse impacts of the cumulative projects on groundwater because of the construction-related and operational dewatering that would occur under all Action Alternatives. The scale of the dewatering would vary according to the depth of excavation and support of excavation method. Estimated amounts per alternative are summarized in **Table 5-13**. Alternatives A and A-C would involve the smallest amount (less than 10 gallons per minute [gpm] during both construction and operation). Adverse cumulative impacts under this alternative would be minor.

The rate of dewatering in Alternatives C and D would be an estimated 220 to 280 gpm during construction and an estimated 20 to 30 gpm in the long term (operational phase). In Alternatives B and E, the rate of construction-phase dewatering would be 260 to 430 gpm and the operational phase rate would be less than 10 gpm. Locally, these four Action Alternatives have the potential to aggravate the risk of ground settlement in the area near WUS once their impacts are added to those of past, future, and reasonably foreseeable future projects. Based on preliminary analysis, the features at greatest risk for drawdown induced settlement would be shallow utility infrastructure such as sewer lines, gas lines, and water lines in the Project Area and along adjoining public roadways; the WMATA Red Line station; and the adjoining neighborhoods or buildings that are supported by shallow foundation systems. The larger adjacent buildings around WUS likely stand on deep foundations and are therefore unlikely to experience settlement from drawdown, although this may warrant further study.[5] This increased, but localized, risk of settlement would be a moderate adverse cumulative impact.

[5] Wood Environment & Infrastructure Solutions. February 19, 2019. *Preliminary Report of Aquifer Pumping Test and Seepage Analysis, Union Station Washington, D.C.*

Wastewater

In all Action Alternatives, when considered with past, present, and reasonably foreseeable future projects, the Project would have minor adverse cumulative impacts on wastewater generation.

In all Action Alternatives, the Project would generate wastewater because of greater passenger and visitor activity at WUS and the potential development of the Federal air rights above the rail terminal. This wastewater would be conveyed through DC Water's sewer infrastructure. As summarized in **Table 5-13,** the Project would generate from approximately 104,530 gpd to approximately 219,030 gpd of wastewater, depending on the Action Alternative. This would be a small addition to the volume the cumulative projects would generate (approximately 3,722,670 gpd or around 0.97 percent of Blue Plains' average daily capacity of 385 million gpd), resulting in a total volume ranging from approximately 3,827, 200 gpd to 3,941,700 gpd, or around 1 percent of Blue Plains' current average daily capacity. The adverse cumulative impact of the Project on wastewater flows would be minor in all Action Alternatives.

Drinking Water

In all Action Alternatives, when considered with past, present, and reasonably foreseeable future projects, the Project would have minor adverse cumulative impacts on drinking water demand.

In all Action Alternatives, the Project would generate demand for drinking water from greater passenger and visitor activity at WUS and from the potential development of the Federal air rights above the rail terminal. As shown in **Table 5.3-13,** projected water demand from the Project would range from approximately 99,143 gpd to approximately 193,443 gpd, depending on the Action Alternative. This would be a small addition to the demand the cumulative projects would generate and result in a total demand ranging from approximately 4,194,080 gpd to 4,288,380 gpd, or approximately 2.70 to 2.76 percent of the Washington Aqueduct's average daily production. The adverse cumulative impact of the Project on drinking water demand would be minor in all Action Alternatives.

5.18.4.4 Solid Waste Disposal and Hazardous Materials

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Municipal Solid Waste

The impacts of past actions in the District generally have had an adverse impact on solid waste generation through decades of growth and development. These impacts have been addressed through the development and maintenance of a collection and disposal system managed by both private and public operators. Based on the current condition of this system and the District's waste diversion goals and policies, the impacts of present and reasonably foreseeable actions on municipal solid waste are anticipated to be minor.

In fiscal year 2016, District-owned waste transfer stations processed approximately 480,000 tons of MSW, including refuse, recyclables, and compostables. Of this total, 56 percent (approximately 271,000 tons) was exported to landfills. In fiscal year 2017, the District's transfer stations processed a total of approximately 464,000 tons of waste, 76 percent of which were landfilled. The majority (74 percent) of the landfilled waste was disposed of at facilities in Virginia. At the end of calendar year 2017, total sanitary landfill capacity in Virginia was just under 248 million tons, with an average remaining permitted life of 23.1 years.

The District has a goal of diverting 80 percent of its waste stream away from landfills and waste-to-energy facilities. Thus, while future growth in the District may increase the quantity of municipal waste it produces, the amount of it that would be landfilled will likely decrease, reducing the impact on regional sanitary landfills. As an illustration, it can be estimated that the cumulative projects would generate approximately 97,143 tons of solid waste. This order-of-magnitude estimate was developed using the same method used to assess the direct impact of the No-Action Alternative (**Section 5.4.4.1**, *No-Action Alternative, Direct Operational Impacts, Municipal Solid Waste*) and is detailed in **Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 18.5.4.1**, *Impacts of Past, Present, and Foreseeable Future Actions (without the Project), Municipal Solid Waste*. Assuming the District achieves its 80 percent diversion goal, less than 20,000 tons would go to sanitary landfills. Adverse impacts from this amount would be minor.

Hazardous Materials and Waste

The area around WUS has been impacted by petroleum and hazardous material releases in the past and contain properties that generate small quantities of hazardous waste. The Project Area, in particular, has included an active railroad right-of-way since 1907. Railroad rights-of-way are often impacted with residual hazardous materials, including metals and pesticides, and with petroleum constituents. Depending on their age, some of the buildings in the Study Area may contain ACM or lead-based paint. The cumulative projects may have a beneficial impact on these conditions to the extent that new construction provides the opportunity to address legacy issues from past land uses through compliance with current regulatory requirements (such as the prohibition of ACM or lead-based paints) but this impact would likely be very limited. None of the cumulative projects would introduce new land uses making use of significant amounts of petroleum products or hazardous materials. Rather, they consist of land uses that would only involve the storage and use of the type of hazardous materials found in residential and commercial buildings such as batteries, solvents, paints, or detergents, which are already in common use in the Study Area. If larger quantities of these materials are used or stored than is now the case, it would represent an adverse impact, but given the type of materials involved, this adverse impact would be negligible.

Cumulative Impacts of the Project

Municipal Solid Waste

In all Action Alternatives, when considered along with past, present, and reasonably foreseeable future projects, the Project would have minor adverse cumulative impacts on municipal solid waste generation.

In all Action Alternatives, the Project would generate MSW from increased numbers of passengers and visitors at WUS as well as from the potential development of the Federal air rights above the rail terminal. As shown in **Table 5-15**, the amount of MSW generated by the Project would range from approximately 2,744 tons per year to approximately 7,447 tons per year, depending on the Action Alternative. This amount would be a small addition to the MSW produced by the cumulative projects (for a total of approximately 99,887 to 104,590 tons per year) and the District as a whole. It is not likely to cause capacity problems at disposal facilities. Adverse cumulative impacts would be minor.

Hazardous Materials and Waste

In all Action Alternatives, when considered along with past, present, and reasonably foreseeable future projects, the Project would have minor adverse and beneficial cumulative impacts on hazardous materials and waste.

All Action Alternatives would involve excavating the rail terminal and disposing of soil that is likely to be contaminated. The amount of spoil would vary according to the alternative, with Alternative A requiring the least excavation and Alternatives B and E the most. The removal and disposal of potentially contaminated soils in accordance with applicable regulations would positively contribute to the cumulative removal or cleaning up of legacy hazardous material issues in the Study Area. This beneficial cumulative impact would be minor because of the likely limited level of contamination that would be encountered and removed.

In all Action Alternatives, the Project would increase the amount of hazardous materials stored and used at WUS, in addition to what would be stored and used by the cumulative projects. While this increase would be an adverse cumulative impact, the storage, utilization, and disposal of hazardous materials would continue to be performed in compliance with applicable laws, regulations, and policies. The adverse cumulative impacts would be minor.

5.18.4.5 Transportation

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Past and present actions have shaped the current conditions of the transportation system as it exist in the Transportation Study Area, including WUS. The following paragraphs focus on the reasonably foreseeable impacts of future actions, including the cumulative projects.

Commuter and Intercity Railroads

The reasonably foreseeable future impacts of the cumulative projects on commuter and intercity railroad would be adverse and major. These adverse impacts would be partially offset by minor beneficial impacts. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased demand for commuter and intercity train service at WUS. Without the Project, rail operators and WUS would not be able to adequately meet this demand and there would be a major deterioration of passenger service and experience and major adverse impacts. The beneficial impacts from the station improvements included in the cumulative projects would contribute to ameliorate these conditions but their scope is limited and they would not address capacity issues.

WMATA Metrorail

The reasonably foreseeable future impacts of the cumulative projects on WMATA Metrorail at WUS would be adverse and major. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased demand for Metrorail service at WUS. This would create capacity issues on trains and in the station, as described in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, WMATA Metrorail*.

DC Streetcar

The reasonably foreseeable future impacts of the cumulative projects on the DC Streetcar would be beneficial and moderate. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased demand for DC Streetcar service at WUS. As explained in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, DC Streetcar*, there would be no capacity exceedances. The increase in ridership would be a moderate beneficial impact, as unused capacity would remain.

Intercity, Tour/Charter, and Sightseeing Buses

The reasonably foreseeable future impacts of the cumulative projects on intercity buses would be adverse and major. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased demand for intercity bus service. While this demand could be accommodated, without the Project, existing bus facilities would become overtaxed and passenger experience would degrade, as described in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Bus*es, resulting in a major adverse impact.

Loading

There are no reasonably foreseeable future impacts on loading capacity or activities at WUS. Increased activities at WUS may cause an increase in deliveries but loading facilities are anticipated to be able to accommodate any likely increase.

Pedestrians

The reasonably foreseeable future impacts of the cumulative projects on pedestrian activity would be adverse and minor outside WUS. They would be adverse and major within WUS. The cumulative projects, along with District and regional growth and resulting greater numbers of WUS passenger and visitors would result in increased pedestrian volumes in the Study Area, both in and outside WUS. Outside WUS, resulting adverse impacts would be minor. While sidewalks and pedestrian crossings may experience some congestion, maintenance of the existing infrastructure and continued consideration of pedestrian needs in DDOT's planning can reasonably be anticipated to minimize the risk of significant deterioration. Inside WUS, although the station improvement projects included in the cumulative projects would improve circulation in the station, they likely would not be sufficient to prevent frequent congestion in the concourses and access points to the station. This would be a major adverse impact.

Bicycle Activity

The reasonably foreseeable future impacts of the cumulative projects on bicycle activity would be adverse and moderate. The cumulative projects, along with the increasing popularity of this mode of transportation and District and regional growth, would result in increased bicycle activity in the Study Area. As explained in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Bicycle Activity*, this may result in a moderate adverse impact due to a shortage of storage spaces or Bikeshare docking stations.

City and Commuter Buses

The reasonably foreseeable future impacts of the cumulative projects on city and commuter buses would be adverse and moderate. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased demand on city and commuter buses, as would greater passenger numbers at WUS. As explained in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, City and Commuter Buses*, bus ridership would increase in the Study Area and a total of 16 Metrobus routes would be over capacity. This overcrowding would be a moderate adverse impact.

Vehicular Parking and Rental Cars

The cumulative projects would have no foreseeable future impacts on parking at WUS. They would have a minor adverse impact on rental cars. While some of the developments included among the cumulative projects may not include parking due to District zoning restrictions, most would. Therefore, it is not anticipated that increased parking demand from the growth in residential and working population in the Study Area would create a parking shortage at WUS. The WUS parking facility could continue to accommodate WUS-related demand. Local growth, including the cumulative projects and greater WUS ridership, may lead to greater demand for rental cars at the station. This may result in a minor adverse impact on rental car operations at the station because of their already constrained operations (see **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Vehicular Parking and Rental Cars*).

For-hire Vehicles

The reasonably foreseeable future impacts of the cumulative projects on for-hire vehicles at WUS would be adverse and major. Increased activity at WUS would generate greater demand for for-hire vehicles to and from the station. As explained in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, For-hire Vehicles*, without the Project, this WUS-related demand would create congested conditions and queuing in front of the station, resulting in a major adverse impact. The various developments included in the cumulative projects would also create additional demand for the services of for-hire vehicles, though to a lesser degree than WUS. This demand would be dispersed across the Study Area. All projected demand for for-hire vehicles was incorporated in the vehicular traffic impact analysis (**Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Vehicular Traffic*).

Private Pick-up and Drop-off

The reasonably foreseeable future impacts of the cumulative projects on private pick-ups and drop-offs at WUS would be adverse and major. As with for-hire vehicles, increased activity at WUS would generate greater private pick-up and drop-off activity at the station. As explained in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Private Pick-up and Drop-off*, this WUS-related activity would create congested conditions and queuing in front of the station, resulting in a major adverse impact. The various developments included in the cumulative projects would also create additional private pick-up and drop-off activity, though to a much lesser degree than WUS. This activity would be dispersed across the Study Area. All projected vehicular trips generated by private pick-ups and drop-offs were incorporated in the vehicular traffic impact analysis (**Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Vehicular Traffic*).

Vehicular Traffic

The reasonably foreseeable future impacts of the cumulative projects on traffic operations would be adverse and major. The growth in residential and working population that would result from the cumulative projects, along with general District and regional growth, would generate increased traffic in the Study Area. Foreseeable future conditions without the Project are those described for the No-Action Alternative in **Section 5.5.4.1**, *No-Action Alternative, Direct Operational Impacts, Vehicular Traffic*.

Cumulative Impacts of the Project

Commuter and Intercity Railroads

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a major beneficial cumulative impact on commuter and intercity railroads.

All Action Alternatives would allow Amtrak, MARC, and VRE to increase service and accommodate planned growth in ridership through 2040 and beyond, as described in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Commuter and Intercity Railroad*. This would fully address the reasonably foreseeable adverse impacts the cumulative projects would cause. Therefore, when added to the impacts of past, present, and reasonably foreseeable projects, the Project would result in a major beneficial cumulative impact.

WMATA Metrorail

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a moderate adverse cumulative impact on Metrorail.

The impact analyses presented in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail* and corresponding sections for the other Action Alternatives, show that in all Action Alternatives, the Project would have a moderate adverse impact on Metrorail ridership at WUS relative to the No-Action Alternative. The No-Action Alternative incorporates growth anticipated to result from past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts analyzed in the referenced sections are cumulative impacts of the Project.

DC Streetcar

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a minor beneficial cumulative impact on the DC Streetcar.

The impact analysis presented in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, WMATA Metrorail* shows that the Project would have a minor beneficial impact on DC Streetcar ridership when compared to the No-Action Alternative. All Action Alternatives would have the same impact. The No-Action Alternative incorporates growth anticipated to result from past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts analyzed in the referenced sections are cumulative impacts.

Intercity, Tour/Charter, and Sightseeing Buses

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a moderate adverse cumulative impact on intercity, tour/charter, and sightseeing bus operations.

As explained above (**Section 5.18.4.5**, *Transportation, Impacts of Past, Present, and Foreseeable Future Actions (without the Project)*, *Intercity, Tour/Charter, and Sightseeing Buses)*, there would be reasonably foreseeable major adverse impacts on intercity bus operations at WUS from the cumulative projects because the bus facility would not adequately accommodate increased ridership. When added to past, present, and reasonably foreseeable projects, the Project, in all Action Alternatives, would remedy this condition by providing a new bus facility. However, the use of an "active management" approach at the bus facility may create additional delays for bus operators and buses may need to lay over at other locations in the District or the region, resulting in a moderate adverse impact, as described in **Section 5.5.4.2**, *Alternative A*, *Direct Operational Impacts, Intercity, Tour/Charter, and Sightseeing Buses* (the same analysis applies to the other Action Alternatives). Because the No-Action Alternative incorporates growth anticipated to result from past, present, and foreseeable future projects, including the cumulative projects, the impacts analyzed in the referenced section are cumulative impacts of the Project.

Loading

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in no cumulative impact on loading.

As stated above (**Section 5.18.4.5**, *Transportation, Impacts of Past, Present, and Foreseeable Future Actions (without the Project)*, *Loading*), the cumulative projects would have no impacts on loading at WUS. As explained in **Section 5.5.4.2**, *Alternative A*, *Direct Operational Impacts, Loading*, the Project (in all Action Alternatives) would have no impact on loading. Therefore, there would be no cumulative impacts.

Pedestrians

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a minor adverse cumulative impact on pedestrian circulation outside of WUS and a major (Alternatives A, B, and A-C) or moderate (Alternatives C through E) beneficial cumulative impacts on pedestrian circulation within WUS.

As explained in **Section 5.5.4.2**, *Alternative A*, *Direct Operational Impacts, Pedestrians*, the Project would generate additional pedestrian trips relative to the No Action Alternative both inside and outside WUS. This would be the case in all Action Alternatives and result in a major or moderate beneficial impact inside WUS and a minor adverse impact outside WUS. The No-Action Alternative incorporates growth in pedestrian traffic anticipated to result from past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts analyzed in the referenced section are cumulative impacts.

Bicycle Activity

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a minor beneficial (Alternatives A and A-C) or minor adverse (Alternatives B through E) cumulative impact on bicycle circulation.

As explained in **Section 5.5.4.2**, *Alternative A*, *Direct Operational Impacts, Bicycle Activity*, the Project would generate additional bicycle trips to and from WUS. The new storage and Bikeshare facilities the Project would provide would accommodate these new trips, resulting in a beneficial impact relative to the No-Action Alternative. Increased conflicts with pedestrians and vehicles would partially offset this benefit, resulting in a minor beneficial net impact. In Alternatives B through E, increased vehicular activity on K Street NE due to the new parking facility entrance would further diminish the benefit of added storage without canceling it, resulting in a net impact that would be adverse but minor. The No-Action Alternative incorporates growth in bicycle activity anticipated to result from past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts analyzed in **Section 5.5.4**, *Impact Analysis* for each alternative are cumulative impacts.

City and Commuter Buses

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would cause a minor adverse cumulative impact on city and commuter buses.

In All Action Alternatives, the Project would generate additional bus rides. As explained in **Section 5.5.4.2**, *Alternative A, Direct Operational Impact, City and Commuter Buses*, in the aggregate, city buses serving the Study Area would continue to operate below capacity. While sixteen Metrobus routes would operate over capacity, this also be the case without the Project. The No-Action Alternative incorporates growth in city and commuter bus ridership anticipated to result from past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts analyzed in the referenced section are cumulative impacts.

Vehicular Parking and Rental Cars

When considered with other past, present, and reasonably foreseeable projects, the Project would cause a minor (Alternatives B and E) or moderate (all other Action Alternatives) adverse cumulative impact on vehicular parking at WUS. It would have minor beneficial cumulative impacts on rental car operations.

In all Action Alternatives, the Project would result in fewer parking spaces at WUS while the number of WUS passengers and visitors would increase. The reduction in WUS parking spaces, and resulting adverse impact, would vary from minor in Alternatives B and E (450 spaces) to moderate in the other Action Alternatives (700 to 850 spaces: see **Table 5-62**). Because the cumulative projects would have no adverse impact on parking at WUS, the Project's adverse impacts are also cumulative impacts. All Action Alternatives would provide a new rental car facility as part of the new parking facility. This new facility would be designed to accommodate anticipated demand and address the issues that would occur without the Project. This beneficial cumulative impact would be minor because it would be partially offset by the increased number of rental car operations at WUS.

For-hire Vehicles

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would cause a moderate beneficial cumulative impact on for-hire vehicles at WUS because of the provision of new locations for pick-ups and drop offs. It would also cause a major (Alternatives A and B) or moderate (other Action Alternatives) adverse cumulative impact due to queuing.

The impact analyses presented in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, For-Hire Vehicles* for Alternative A and in the corresponding sections for the other Action Alternatives show that in all Action Alternatives, the Project would generate additional for-hire vehicle trips from increased activity at WUS. These would contribute to adverse cumulative impacts on traffic operations and, as such, were incorporated in the *Vehicular Traffic* impact analysis, addressed below. In all Action Alternatives, the Project would result in a beneficial cumulative impact by providing for new pick-up and drop-off locations at and near WUS and an adverse cumulative impact by increase queuing on H Street NE. This adverse impact would be major in Alternatives A and B and moderate in the other Action Alternatives because Alternatives A and B would have less deck-level queuing space due to the north-south train hall.

Private Pick-up and Drop-off

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would cause a moderate beneficial cumulative impact on private pick-up and drop-off operations at WUS. It would also cause a major (Alternatives A and B) or moderate (other Action Alternatives) adverse cumulative impact due to queuing.

The impact analyses presented in **Section 5.5.4.2**, *Alternative A, Direct Operational Impacts, Private Pick-up and Drop-off* for Alternative A and in the corresponding sections for the other Action Alternatives show that in all Action Alternatives, the Project would generate additional vehicular trips from increased activity at WUS. Along with the trips generated by the cumulative projects, WUS-related trips would contribute to adverse cumulative impacts on traffic operations. As such, they were addressed as part of the *Vehicular Traffic* impact analysis. In all Action Alternatives, the Project would result in a beneficial cumulative impact by providing for new pick-up and drop-off locations at and near WUS and an adverse cumulative impact by increase queuing on H Street NE. This adverse impact would be major in Alternatives A and B and moderate in the other Action Alternatives because Alternatives A and B would have less deck-level queuing space due to the north-south train hall.

Vehicular Traffic

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in major adverse cumulative impacts on traffic operations.

In all Action Alternative, the Project would generate additional vehicular trips and impacts on the operation of the street and roadway system relative to the No-Action Alternative. The operational intersection analyses performed for the Action Alternatives and presented in **Section 5.5.4.2**, *Alternative A, Direct Operational Impact, Vehicular Traffic* for Alternative A and corresponding sections for the other Action Alternatives, incorporate the impacts of past, present, and foreseeable future projects, including the cumulative projects. Therefore, the impacts presented in the referenced sections are cumulative impacts.

5.18.4.6 Air Quality

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

The impacts of past and present actions in the District generally have had an adverse impact on air quality due to pollutant emissions associated with decades of urban development. Based on current improving trends and continued enforcement of air quality regulations, the reasonably foreseeable adverse impacts of future actions, including the cumulative projects, are anticipated to be minor.

The District attainment status describes the impacts of past and present action on the area's air quality. As explained in **Section 5.6.3.1**, *Criteria Pollutants and General Conformity*, the District is a Marginal Nonattainment area for the 8-hour O_3 standard in an Ozone Transport Region and a Moderate Maintenance area for CO and $PM_{2.5}$. The District is an attainment for all other criteria pollutants. Foreseeable future projects, including the cumulative projects, would have negligible adverse impacts on regional air quality provided they comply, as applicable, with the State Implementation and Maintenance Plans in place for the District, and associated emission control programs.[6]

Locally, near WUS, the primary source of air emissions is and would remain mobile sources (vehicular traffic). A quantitative estimate of future mobile-source air pollutant emissions excluding the Project is presented in **Section 5.6.4.1**, *No-Action Alternative*. The analysis consisted of a hotspot analysis for CO and $PM_{2.5}$. It showed that anticipated annual emissions would be well below the NAAQS. A mesoscale analysis of annual criteria pollutant emissions indicated that emissions of CO, $PM_{2.5}$, PM_{10}, VOC, and NO_X (VOC and NO_x are precursors to ozone) would be below the applicable *de minimis* thresholds for those pollutants. In general, future emissions of VOC, NO_X, CO, and $PM_{2.5}$ would decrease relative to existing conditions because of regulation and improved technology in vehicles and locomotives. PM_{10} emissions

[6] District Department of Energy and Environment. *Air Quality Planning*. Accessed from https://doee.dc.gov/service/air-quality-planning. Accessed on April 3, 2020.

would increase compared to existing conditions because of greater traffic causing brake- and tire-wear emissions, but this adverse impact would be minor.

Cumulative Impacts of the Project

In all Action Alternatives, considered with other past, present, and reasonably foreseeable projects, the Project would cause a minor adverse cumulative impact on regional air quality.

As explained in the air quality impact analysis presented in **Section 5.6.4.2**, *Alternative A* for Alternative A, and corresponding sections for the other Action Alternatives, the Project would generate additional emissions of criteria pollutants relative to the No-Action Alternative. The No-Action Alternative air quality analysis incorporated emissions associated with mobile sources (vehicular and rail traffic) associated with past, present, and reasonably foreseeable future projects, including the cumulative projects. Therefore, for each Action Alternative, cumulative impacts would consist of the emissions attributable to the alternative added to those of the No-Action Alternative.

Locally (hot-spot analysis), emissions would remain well below the NAAQS and cumulative impacts would be negligible. Regionally (mesoscale analysis), the greatest cumulative impact would be on CO emissions, as cumulative traffic within the study area for transportation would generate up to 104.6 tons per year of CO emissions, which is above the 100 ton-per-year *de minimis* threshold applicable to a CO Maintenance Area. While this has no regulatory implication since *de minimis* thresholds apply to individual projects, it suggests a relatively high level of cumulative CO emissions. The most recent available emission inventory for the region (2011) reports CO emissions of 617,710.29 tons per year.[7] By comparison, cumulative CO emissions from the transportation study area would be minor. Cumulative emissions of all other criteria pollutants would be much less than the corresponding *de minimis* and would also be minor.

5.18.4.7 Greenhouse Gas Emissions and Resilience

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Greenhouse Gas Emissions

GHG emissions and their effect on climate are a global concern that is not adequately described at a local or regional level. Every activity anywhere that directly or indirectly generates GHG emissions has cumulatively contributed, and continues to contribute, to the accumulation of such gases in the Earth's atmosphere and resulting adverse impacts on

[7] District Department of Energy and Environment *et al*. July 2014. *2011 Base Year Emissions Inventory for the Washington DC-MD-CA 2008 Ozone NAAQS Nonattainment Area*. Accessed from https://mde.maryland.gov/programs/Air/AirQualityPlanning/Documents/SIPDocuments/BY2011%20EI%20Document.pdf. Accessed on August 19, 2019.

climate conditions. The primary utility of regional, local, or project-level inventories is to provide a baseline against which efforts to reduce current and future GHG emissions can be measured and the impacts of individual actions comparatively assessed.

The most recent inventory for the District of Columbia (for 2017) shows total GHG emissions of approximately 7.3 million metric tons of CO_2e.[8] This represents a 30 percent reduction since the first inventory in 2006. The District has set a goal of reducing District-wide GHG emissions by half between 2006 and 2032 and to be carbon-neutral by 2050. As of 2016, DC had met 56 percent of its 2032 emissions reduction goal. The District's *Clean Energy DC* plan, finalized in 2018, calls for cutting energy use in buildings, shifting to clean energy sources, and changing the way residents, employees, and goods move across the District. [9]

Foreseeable future projects, including the cumulative projects, will contribute additional GHG emissions from both stationary and mobile sources. Based on a conservative order-of-magnitude estimate of stationary- and mobile-source emissions (**Appendix C3**, *Washington Union Station Expansion Project Environmental Consequences Technical Report,* **Section 18.5.7.1** for details), total annual CO_2 emissions associated with the cumulative projects would be approximately 298,125 metric tons. This would amount to approximately 4 percent the District's 2017 GHG emissions and approximately 5.9 percent of the District's 2032 annual target (5.05 million metric tons of CO_2e). This order-of-magnitude estimate does not account for reductions in energy consumption and GHG emissions that would result from the implementation of the strategies presented in the District's *Climate and Energy Action Plan*.[10] Taking this into consideration, the adverse GHG impact of the cumulative projects would be minor and unlikely to threaten the District's ability to achieve its 2032 GHG goal.

Resilience

The District released *Resilient DC. A Strategy to Thrive in the Face of Change* in April 2019. [11]. *Resilient DC* sets forth four goals (Inclusive Growth; Climate Action; Smarter DC; and Safe and Healthy Washingtonians); 16 objectives; and 68 initiatives. In general, with the implementation of the Strategy, the District's ability to withstand change, including change from evolving climate conditions, can be expected to increase in the mid and long term.

[8] District Department of Energy and Environment. *2006-2017 Greenhouse Gas Inventory*. Accessed from https://doee.dc.gov/service/greenhouse-gas-inventories. Accessed on August 20, 2019.

[9] District Department of Energy and Environment. August 2018. *Clean Energy DC. The District of Columbia Climate and Energy Action Plan*. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-%20Full%20Report_0.pdf. Accessed on August 20, 2019.

[10] District Department of Energy and Environment. August 2018. *Clean Energy DC. The District of Columbia Climate and Energy Action Plan*. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-%20Full%20Report_0.pdf. Accessed on August 20, 2019.

[11] Available at: https://resilient.dc.gov/. Accessed on April 3, 2020.

In the vicinity of WUS, future actions, including the cumulative projects, may contribute to this improvement to the extent that they incorporate features that support the plan's goals either through regulatory compliance or on a volunteer basis. For instance, the Strategy's Initiatives include "[ensuring] that all new buildings [are] climate-ready by 2032" and "retrofitting all at-risk buildings by 2050." Overall, the cumulative projects can be expected to have a beneficial impact on resilience in the District, though this impact would likely be minor in the context of the District and the District's resilience strategy as a whole.

Cumulative Impacts of the Project

Greenhouse Gas Emissions

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a negligible adverse cumulative impact on GHG emissions.

As explained in **Section 5.7.4.2**, *Alternative A, Indirect Operational Impacts* for Alternative A, and corresponding sections for the other Action Alternatives, the Project would generate additional CO_2 emissions from both stationary and mobile sources relative to the No-Action Alternative ranging approximately from 17,370 to 26,453 metric tons, depending on the alternative. This would add to District-wide emissions, increasing the study area's contribution approximately from 298,125 metric tons to up to 324,578 metric tons, or about 4.4 percent of the District's 2017 GHG emissions and 6.4 percent of its annual emission target for 2032. These are conservative estimates, which do not take into account reductions to be achieved under the District's GHG policies. Even on this basis, in the context of the global impact on climate of GHG emissions, the difference made by Project-related emissions, when added to those from past, present, and foreseeable future actions in District, would be negligible.

Resilience

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a major beneficial cumulative impacts on resilience.

The Project, when added to past, present, and foreseeable future actions, would increase District-wide resilience, resulting in a major beneficial cumulative impact. Specifically, it would directly contribute to fulfilling one of *Resilient DC*'s initiatives, which is to "call on regional transit providers […] to improve regional integration (such as coordinated schedule, *increased Union Station capacity and frequency*, fare integration, free transfers) and expand night and weekend service for key residential and employment zones."[12] To the extent that

[12] District Department of Energy and Environment. August 2018. *Clean Energy DC. The District of Columbia Climate and Energy Action Plan*. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-%20Full%20Report_0.pdf. Accessed on August 20, 2019. Page 73, emphasis added.

the design of the Project incorporates features that enhance its ability to withstand climate change-related events, it would also cumulatively contribute to improving local resiliency.

5.18.4.8 Energy Resources

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

The impacts of past actions in the District generally have had an adverse impact on energy demand and consumption through many decades of growth and development. These impacts have been addressed through the development and maintenance energy production, acquisition, and distribution systems. Based on the current condition of these systems, and the District's energy goals and policies, the impacts of present and reasonably foreseeable actions can be anticipated to be minor.

In 2017, total energy consumption in the District was 168 billion kBTUs. [13] Most of this energy was produced outside the District. The District has no electrical plants with the exception of the General Services Administration's Central Heating Plant, which supplies various Federal facilities, including WUS, with electricity, steam, and chilled water. Most electricity used in the District comes from outside and is supplied by the local electric utility, Pepco. The *Clean Energy DC* plan aims to reduce energy consumption in the District by 50 percent in 2032 through efficient building design and operations; modernized renewable energy supply; and vehicle electrification and fuel switching. [14]

Future development in the District both has the potential to increase total energy consumption and offers opportunities for improving efficiency and reducing per unit consumption. As an illustration, an order-of-magnitude consumption estimate can be developed for the cumulative projects based on land use. Altogether, without taking into account any future improvements in energy efficiency, the cumulative projects would consume approximately 1.95 billion kBTUs or about approximately 1.16 percent of the total amount of energy consumed in the District in 2017. In the context of the District, this is not likely to cause shortages or other supply issues.

Cumulative Impacts of the Project

In all Action Alternatives, the Project, when considered with other past, present, and reasonably foreseeable projects, would cause a minor adverse cumulative impact on energy resources.

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[13] U.S. Energy Information Administration. *District of Columbia Energy Profile*. https://www.eia.gov/state/print.php?sid=DC. Accessed on August 21, 2019.

[14] District Department of Energy and Environment. August 2018. *Clean Energy DC. The District of Columbia Climate and Energy Action Plan*. Accessed from: https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Clean%20Energy%20DC%20-%20Full%20Report_0.pdf. Accessed on August 20, 2019.

The Project would expand WUS and WUS operations and, as such, increase the amount of energy consumed by the station. Depending on the Action Alternative, the contribution of the Project to the District's total energy consumption would range from approximately 41 million kBtus (Alternative A) to approximately 104 million kBtus (Alternative B). This would represent a very small increment (approximately 0.06 percent in Alternative B) relative to the District's total energy consumption in 2017. As such, the cumulative adverse impact of the Project on energy resources would be minor.

5.18.4.9 Land Use, Land Planning, and Property

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Past and present actions have shaped current land use, planning, and property conditions in the Land Use Study Area. The following paragraphs focus on the reasonably foreseeable impacts of future actions, including the cumulative projects.

Zoning, Land Use, and Development

Future actions, including the cumulative projects, would likely have major beneficial impacts on land use. The multiple residential and commercial developments included in the cumulative projects would be subject to District zoning and land use regulations. Compliance with these requirements, as applicable, would ensure that new land uses are compatible with the existing urban fabric and approved city-wide and local plans. The greatest anticipated change in land use in the Study Area would result from the private air-rights development above the WUS rail terminal. This would replace what is currently an open space dominated by railroad infrastructure and the H Street Bridge with a dense mixed-use neighborhood and would improve connectivity between the neighborhoods on either side of WUS.

Property Ownership, Land Acquisitions, and Displacements

The cumulative projects would have no impacts on property ownership, land acquisition, or displacement.

Consistency with Local and Regional Plans

The reasonably foreseeable future impacts of the cumulative projects on local and regional plans would be beneficial.[15] These projects would be subject to District zoning and land use regulations and permitting requirements. Compatibility with applicable city-wide and local plans would be ensured through these processes. Therefore, it can be anticipated that the cumulative projects would contribute to implementing, or at least would not preclude, the successful implementation of the relevant plans' goals and objectives.

[15] This beneficial impact is not assigned an intensity because how much the cumulative projects would support the goals and objectives of the relevant plans is difficult to assess in the aggregate.

Cumulative Impacts of the Project

Zoning, Land Use, and Development

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a major beneficial cumulative impact on land use.

The expansion of WUS in all Action Alternatives would enhance WUS's functionality as a multimodal facility and improve connectivity among the neighborhoods on either side of the rail terminal. The expanded station would accommodate increased intercity and commuter train service, which in turn would support nearby existing and future residential and commercial developments by making the area more accessible. The Project would also make available for potential development between approximately 323,720 and 952,600 square feet of Federal air rights within the footprint of the existing WUS garage and existing Federal Property, depending on the Action Alternative. This would further enhance land use in the Study Area. The Project would contribute and add to the beneficial impacts on land use that would result from the cumulative projects. Cumulative impacts would be major and beneficial.

Property Ownership, Land Acquisitions, and Displacements

When considered with other past, present, and reasonably foreseeable projects, the Project would result in a moderate (Alternatives A, B, D, E, and A-C) or major (Alternative C) adverse cumulative impact on private property.

As noted above, the cumulative projects would have no impact on property ownership, land acquisition, or displacement. Therefore, the Project's cumulative impacts on these factors are the impacts of the Project. These are described in **Section 5.9.4.2**, *Alternative A, Direct Operational Impacts, property ownership, land acquisition, or displacement* for Alternative A and corresponding sections for the other Action Alternatives.

Consistency with Local and Regional Plans

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a beneficial cumulative impact on local and regional plans.

As explained for Alternative A in **Section 5.9.4.2**, *Alternative A*, *Direct Operational Impacts*, *Consistency with Local and Regional Plans* and corresponding sections for the other Action Alternatives, the Project would be consistent with and support many of the relevant plans' goals and objectives, especially those pertaining to transportation and connectivity. These beneficial impacts, when added to those of past, present, and foreseeable future projects, including the cumulative projects, would result in beneficial cumulative impacts.

5.18.4.10 Noise and Vibration

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Current noise and vibration levels near WUS reflect the impacts of past and present actions. In the foreseeable future, the cumulative projects are anticipated to result in major beneficial or negligible adverse impacts depending on the location. None of the cumulative projects involve the establishment and operation of a significant stationary source of noise and vibration. Any changes in noise and vibration levels in the Study Area would mostly be the result of changes in noise from trains and motor vehicles. **Section 5.10.4.1,** *No-Action Alternative* presents an analysis of future noise levels in the Noise and Vibration Study Area without the Project. Overall, ambient noise levels would range from 60 to 75 A-weighted dBA (Ldn) at most locations. This is typical of a dense urban area and similar to current noise levels. Near WUS, noise and vibration from train operations would decrease because the private air-rights development would be constructed above the rail terminal and cover the tracks that are currently in the open. Noise levels are, and would remain, highest along the non-covered parts of the rail terminal and corridor (north of K Street), New York Avenue, Florida Avenue, North Capitol Street, K Street, H Street, and Massachusetts Avenue.

Cumulative Impacts of the Project

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would cause negligible adverse impacts on noise and vibrations in the Noise and Vibration Study Area, except at 14 modeled locations, where it would result in moderate adverse cumulative impacts on noise.

In all Action Alternatives, the Project would generate additional noise and vibration in the Study Area because of the associated increase in train and motor vehicle traffic. The noise analysis presented in **Section 5.10.4.2**, *Alternative A, Direct Operational Impacts* for Alternative A, and in the corresponding sections for the other Action Alternative, is cumulative in that it incorporates noise from past, present, and foreseeable future activities along with that associated with the Project. The analysis showed that noise levels in the Study Area would generally be within 1 to 3 dBA of No-Action Alternative levels, which is an imperceptible difference. Noise levels would continue to range from 60 to 75 dBA (Ldn), typical of an urban environment. Therefore, the cumulative adverse impacts of the Project would be negligible expect at 14 modeled locations where this slight increase would bring noise levels above the threshold for a moderate impact (these locations are shown in **Figure 5-36** of this DEIS). At these locations, cumulative adverse impacts would be moderate.

5.18.4.11 Aesthetics and Visual Quality

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

The appearance of the District in the vicinity of WUS is the result of multiple past and present actions that have shaped the neighborhoods on either side of the station. In the foreseeable future, the cumulative projects may have adverse or beneficial, major to negligible impacts on this appearance, depending on location and point of view. Continued development in the Study Area through 2040 will affect the aesthetic and visual environment visual environment will continue to change as a result. Because the Study Area is an already densely developed urban area, future developments mostly will fill in existing gaps in the urban fabric or replace older land uses.

The project with the greatest visual impact would be the private air-rights development. By replacing what is now empty space above the tracks with several city blocks, it would change several views and vistas toward WUS. The visual impact analysis presented in **Section 5.11.4.1**, *No-Action Alternative, Direct Operational Impacts*, indicates that this project has the potential to adversely impact 20 out of 27 views analyzed. Because the project has not been designed, this analysis is based only on the massing, heights, and densities permitted by the applicable zoning regulations. How the private air-rights development, as well as the other cumulative projects being planned, would actually affect the visual quality of the Study Area depends on their actual design, height, and density. They have the potential to result in beneficial as well as adverse impacts, for instance through the creation or recreation of continuous street walls or the replacement of visually incompatible land uses with visually compatible ones. New developments are subject to the District's zoning regulations, including height and density limits, and can generally be expected to by visually compatible with their immediate environment

Cumulative Impacts of the Project

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have potential negligible to moderate cumulative adverse and beneficial impacts on aesthetics and visual quality, depending on the location.

In general, the Project, when added to past, present, and future reasonably foreseeable actions, would introduce new visual elements in the Project Area, such as a new train hall, bus facility, and, in all but two Action Alternatives (B and E), a new above-ground parking facility in the Project Area. While these elements would be visible from areas near WUS, the private air-rights development would surround, obscure, encompass, or balance them, reducing their visibility.

The visual impact analysis presented in **Section 5.11**, *Aesthetics and Visual Quality*, is cumulative in that it considers the private air-rights development when assessing anticipated changes in views. The analysis, the findings of which are summarized in **Table 5-140**, showed that, depending on the Action Alternative, the Project would adversely affect from 5 to 10 of the 28 views and vistas considered. Adverse impacts would range from moderate to negligible, with no view suffering a major impact.

Most of the visual impacts are conservatively described as adverse because the assessment is based only on massing and visibility. At this stage of design, there is not enough information on materials and specific architectural features to allow for a more refined evaluation.

However, the Project Proponents are committed to a Project design that is compatible with the design of the historic station building and makes the expanded WUS into a grand gateway into the Nation's capital. Additionally, the Project would be subject to review and approval by the Commission of Fine Arts (CFA) and the National Capital Planning Commission, which would help ensure that it is in keeping with its visual and cultural environment.

5.18.4.12 Cultural Resources

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Cultural resources near WUS reflect the history of the neighborhoods on either side of the station. The foreseeable impacts of the cumulative projects on these resources have the potential to be adverse and major to negligible. Some of these projects, such as private air-rights development or the various improvement project at WUS, have the potential to have physical and visual adverse impacts on WUS itself, the WUS Historic Site, and the Railway Express Agency (REA) Building. The risk of such impacts would be minimized through compliance with historic preservation regulations. Federally funded projects are subject to review under Section 106 of the National Historic Preservation Act (Section 106). Although the private air-rights development is not a Federal Project, it is subject to review and approval by the District State Historic Preservation Office and CFA.

Most of the cumulative projects are private projects and, as such, not subject to Section 106. These projects could result in adverse impacts to cultural resources if they involve the demolition or alteration of a cultural resource such as a historic building; or if they sufficiently change the visual or aural setting of a resource to diminish its integrity of setting, feeling, or association. The risk of impacts on cultural resources would be minimized through compliance with the District's historic preservation laws and regulations, including review by the Historic Preservation Review Board of projects that may affect cultural resources.

Cumulative Impacts of the Project

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have potential major cumulative adverse impacts on WUS and the WUS Historic Site.

In all Action Alternatives, the Project, when added to past, present, and future reasonably foreseeable actions, would result in major direct adverse impacts on WUS because of the removal of the Claytor Concourse, column removal in the Retail and Ticketing Concourse, and construction of Project elements adjacent to the historic station building. Because of the reconstruction of the rail terminal and column removal work, the Project would also increase the risk of major potential adverse impacts on archaeological resources if any are present. As much as possible, these impacts would be avoided, minimized, or mitigated through the Section 106 process. The Project would also contribute visual and noise-related impacts on multiple cultural resources in the Cultural Resources Study Area additional to those of past, present, and reasonably foreseeable actions. These impacts would range from negligible to moderate, as summarized in **Section 5.12.5**, *Comparison of Alternatives*.

5.18.4.13 Parks and Recreation Areas

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

The current condition of parks and recreation areas near WUS incorporates the impacts of past and present actions. The foreseeable future impacts of the cumulative projects on these resources likely would be adverse and moderate. There are multiple parks and recreation areas in the Park and Recreation Areas Study Area, including neighborhood and community parks, school recreational facilities, memorials, plazas, and other open areas accessible to the public. The cumulative impact projects would not directly adversely affect these areas, which would remain available to the public. However, growth of the local residential and working population may result in increased use, which may cause accelerated wear and tear of pavements and landscape elements and increase maintenance costs.

Cumulative Impacts of the Project

In All Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have minor cumulative adverse impacts on parks and recreation areas.

In all Action Alternatives, the Project would generate more activity at WUS, bringing more people to the area. Some of these people may make use of local park and recreation areas, leading to accelerated wear and tear and increased maintenance costs. The increase in visit and foot traffic attributable to the Project would likely be small, however, and cumulative adverse impacts would be minor.

5.18.4.14 Social and Economic Conditions

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Demographics

The current demographic make-up of the District is the result of past and present actions. In the foreseeable future, the cumulative projects would have a moderate impact on demography. The population of the District would grow through 2040. District of Columbia Office of Planning (DCOP) projections show a total population of approximately 941,000 in 2040, with an average growth of 11,000 a year.[16] The cumulative projects would add 15,200 residential units to the District. Assuming an average of 2.1 persons per household, this

[16] District of Columbia Office of Planning. *Forecasting the District's Growth. Results and Methodology*. November 2016. Accessed from https://planning.dc.gov/node/1212966. Accessed on January 30, 2019.

would provide housing for 31,920 persons.[17] This number does not include the residential units that would be constructed as part of the 3.2 million square feet of mixed-use development included in the cumulative projects. The job opportunities created by the cumulative projects may also encourage more people to move to the District. Based on projected 2040 population size and average annual growth, this would represent a moderate impact. [18]

Community Disruption and Other Social Benefits or Impacts

Current conditions in the neighborhoods around WUS are the result of multiple past and present actions. In the foreseeable future, the cumulative projects may have both adverse and beneficial impacts but these impacts would be moderate. The cumulative projects are part of and continue a long-term trend of densification and redevelopment across the Socioeconomic Study Area. This trend has had beneficial impacts on local communities such as increased employment opportunities; more and better urban amenities; better connectivity among neighborhoods and sub-neighborhoods. The cumulative projects, including the private air-rights development, would contribute to these positive trends. These same projects may also have adverse community impacts to the extent that they would cause an influx of new population and higher housing costs, which may result in the displacement of long-time residents, especially low-income and minority residents, a process generally referred to as gentrification. Because redevelopment and gentrification are long-term trends that the cumulative projects would continue but did not create, their impacts, both beneficial and adverse, can be considered moderate.

Employment

Existing levels and types of employment in the District incorporate the impacts of numerous past and present actions. The foreseeable future impacts of the cumulative projects on employment would be beneficial and moderate. Based on the square footage of commercial development, the cumulative projects would support 31, 515 jobs. [19] This number does not include the jobs that would be supported by the commercial uses that would be part of the 3.2 million square feet of mixed-use development included in the cumulative projects. According to the 2017 District's Economic Strategy report, as of October 2016, there were an estimated 783,200 jobs in the District.[20] The jobs associated with the cumulative projects approximately represent at least 4 percent of this total. They would represent at least 3.1 percent

[17] Household size assumption based on the weighted average of average household size of the census tracts in the Social and Economic Conditions Local Study Area as derived from 2011-2015 ACS 5-year estimates.

[18] This demographic impact is not characterized as adverse or beneficial because a change in residential population does not in itself represent a favorable or unfavorable outcome in the context of the District.

[19] Assumes 1 employee per 250 square feet of office space, 3 employees per 1,000 square feet of retail use, and 1 employee per 2.67 hotel rooms.

[20] *DC's Economic Strategy* report, March 2017. Accessed from http://dceconomicstrategy.com/wp-content/uploads/2017/03/Econ-Strategy_Full-Report-for-Distribution_03.07.17-1-1.pdf. Accessed on April 3, 2020.

the 1,012,000 jobs projected by DCOP for 2040. Thus, although beneficial, the impacts would be moderate.

Washington Union Station Revenue

Current WUS revenue is the result of past and present action at the station. The reasonably foreseeable future impacts of the cumulative projects on WUS revenue would likely be beneficial but negligible. The cumulative projects would have a beneficial impact on WUS revenue to the extent that the activity they generate results in an increase in demand for services, such as parking, from which WUS derives a revenue. While this potential impact cannot be quantified, it is likely to be small and negligible in the context of WUS's total revenues.

Other Economic Impacts

Other reasonably foreseeable future economic impacts of the cumulative projects would be beneficial and moderate. The cumulative projects would create and support economic activity that would generate economic benefits through worker's wages and profit from commercial operations. The spending of private and commercial income would in turn generate more economic activity both locally and regionally. This activity would generate revenue for the District through sales, property, and income taxes. While these economic and fiscal benefit cannot be estimated, they are likely to amount to a moderate beneficial impact in the context of the District as a whole.

Cumulative Impacts of the Project

Demographics

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a negligible cumulative impact on demography.

As explained for Alternative A in **Section 5.14.4.2**, *Alternative A, Indirect Operational Impacts, Demographics*, and corresponding sections for the other Action Alternatives, the Project, by improving connectivity and increasing activity at WUS may indirectly cause more people to move to the Socioeconomic Study Area, in addition to the increase in population associated with the cumulative projects. While not quantifiable, this impact would likely be negligible in the context of the District and Study Area. [21]

Community Disruption and Other Social Benefits or Impacts

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would result in a major beneficial cumulative impact with regard to community disruption and other social benefits.

[21] The demographic impact is not characterized as adverse or beneficial because a small change in residential population does not in itself represent a favorable or unfavorable outcome.

In all Action Alternatives, the Project, when added to past, present, and reasonably foreseeable actions, would have a major beneficial impacts by providing more and better intermodal connectivity that would benefit both the Socioeconomic Study Area and the District as a whole. It would make the Study Area more accessible, providing residents and employees with improved commuting options. This would support ongoing and future development and contribute to addressing the consequences of this development on transportation system. The Project would also directly contribute additional economic activity through new retail at WUS, from 72,000 to 100,000 square feet, depending on the Action Alternative. In all Alternative except Alternative A, the Project would also potentially lead to the development of the remaining Federal air rights above the rail terminal, further contributing to the economic development of the Study Area and the District.

Employment

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a minor beneficial cumulative impact on employment.

As explained for Alternative A in **Section 5.14.4.2**, *Alternative A, Direct Operational Impacts, Employment*, and corresponding sections for the other Action Alternatives, the Project would add to the number of jobs the cumulative projects would support. Depending of the Action Alternative, the Project would support from 1,445 to 5,255 jobs. While this would be a beneficial cumulative impact, it would be minor compared to the jobs supported by the cumulative projects as well as to present and future employment in the District as a whole.

Washington Union Station Revenue

When considered with other past, present, and reasonably foreseeable projects, the Project would have a moderate (Alternatives A and A-C) or major (other Action Alternatives) adverse cumulative impact on WUS revenue.

In Alternatives A and A-C, the Project would reduce the number of parking spaces at WUS (**Section 5.14.4.2**, Alternative A, Direct Operational Impacts, Washington Union Station Revenue and **Section 5.14.4.7,** Alternative A-C (Preferred Alternative), Direct Operational Impacts, Washington Union Station Revenue), thereby reducing the revenue the station derives from parking. In the other Action Alternatives, all parking would be located outside the station’s lease area, eliminating the parking revenue stream altogether. Adding these adverse impacts to the negligible beneficial impacts of the cumulative projects would result in a moderate adverse cumulative impact in Alternatives A and A-C, and in a major adverse cumulative impact in the other Action Alternatives.

Other Economic Impacts

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have a minor beneficial cumulative impact on economic conditions.

The Project would have beneficial cumulative impacts on the economy through the economic activity it would support and promote at WUS and in the Study Area, including the provision of new retail at WUS and support of 1,445 to 5,255 jobs, in addition to the activity supported by the cumulative projects. The spending of Project-generated private and commercial income would in turn generate more economic activity both locally and regionally. This activity would generate revenue for the District through sales, property, and income taxes. While these economic and fiscal benefit cannot be estimated, they likely would be proportionately small and minor compared to the benefits of the cumulative projects.

5.18.4.15 Public Safety and Security

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Conditions pertaining to public safety and security at and near WUS are the result of multiple past and present actions. The future foreseeable impacts of the cumulative projects on public safety and security would be adverse and moderate. Development and growth in the Study Area would result in increased demands on police and emergency services. It would also create security risks by offering new targets to potential terrorist attacks. A notable source of risk would be the provision of parking within the private air-rights development deck above the WUS rail terminal. Greater vehicular traffic and pedestrian circulation would increase the risk of conflicts or accidents. In general, however, these are impacts that commonly occur in active urban areas and near large public facilities such as WUS. None of cumulative projects would generate special or unusual public safety concerns. Emergency services would have time to plan for increases in personnel and equipment needs. Adverse impacts would be moderate.

Cumulative Impacts of the Project

In all Action Alternatives, when considered with other past, present, and reasonably foreseeable projects, the Project would have moderate beneficial impacts on security and moderate adverse impacts on public safety.

In all Action Alternatives, the Project would create new security risks at WUS but also provide the opportunity to enhance security measures at the station, as described in **Section 5.15.4.2**, *Alternative A*, *Direct Operational Impacts*. At WUS, this would result in net beneficial impacts on security that would be major (Alternatives A, B, and A-C) or moderate (other Action Alternatives). When added to the impacts of the cumulative projects, given the prominence of WUS as a potential target of terrorist attacks, this would result in a beneficial cumulative impact, although a moderate one, as it would only affect WUS and its immediate surroundings.

The Project would also have an adverse cumulative impact on safety, as it would add further to the demand for emergency services that the cumulative projects would generate. For the same reason as for the cumulative projects (see previous section), this adverse cumulative impact would be moderate.

5.18.4.16 Public Health, Elderly and Persons with Disabilities

Impacts of Past, Present, and Foreseeable Future Actions (without the Project)

Current conditions pertaining to public health, the elderly, and persons with disabilities at WUS and nearby incorporate the impacts of past and present actions. In the foreseeable future, the cumulative projects would have no impacts on public health. They may have negligible adverse impacts on the mobility of the elderly and persons with disabilities. None of the cumulative projects would create public health concerns. They are development projects typical of an active urban environment. Emissions of criteria air pollutants would remain below the NAAQS (See **Section 5.18.4.6**, *Impacts of Past, Present, and Foreseeable Future Actions (without the Project)*). Greater density and vehicular circulation may create challenges to the mobility of the elderly and persons with disabilities. However, it can be anticipated that such issues would be alleviated through continuing improvements and upgrades to the transportation system, such as provision of high-visibility sidewalks with wheelchair ramps and detectable warning surfaces to aid visually impaired individuals and accessible pedestrian signal equipment. Projects would also have to comply with ADA requirements, as applicable. Any adverse impacts would be negligible.

Cumulative Impacts of the Project

When considered with other past, present, and reasonably foreseeable projects, the Project would have a negligible adverse cumulative impact on public health in all Action Alternatives. It would have a major (Alternatives A and A-C) or moderate (other Action Alternatives) cumulative beneficial impacts on the transportation and mobility of the elderly and persons with disabilities at WUS. Outside of WUS, it would have a minor adverse impact in all Action Alternatives.

The Project would not create conditions that would directly threaten or diminish public health when considered with other past, present, and reasonably foreseeable projects. As explained in **Section 5.18.4.6**, *Cumulative Impacts of the Project*, above, the Project would result in relatively high cumulative emissions of CO. The potential for this air quality impact to affect public health is minimal because it would occur at a regional scale. Microscale emission analysis (**Section 5.6.4.2**, *Alternative A, Direct Operational Impacts, Microscale Analysis: CO Hotspot* for Alternative A and corresponding sections of this report for the other Action Alternatives) shows that localized emissions of CO near roadways, which is where potential adverse health effects from outdoor CO generally occur,[22] would remain well below the NAAQS under all Action Alternatives.

[22] U.S. Environmental Protection Agency. July 2010. *Quantitative Risk and Exposure Assessment for Carbon Monoxide – Amended*. *Section 2.2, Exposure Pathways and Important Microenvironments*. Accessed from https://www3.epa.gov/ttn/naaqs/standards/co/data/CO-REA-Amended-July2010.pdf. Accessed on April 3, 2020. Individual exposure to CO primarily occurs indoors, in near-traffic microenvironments, and inside vehicles.

In all Action Alternatives, the Project would have a major cumulative beneficial impact on the mobility of the elderly and persons with disabilities at WUS in Alternatives A and A-C, and a moderate cumulative beneficial impact in the other Action Alternatives for the reasons explained in **Section 5.16.4.2**, *Alternative A, Direct Operational Impacts* and corresponding sections of this report for the other Action Alternatives. The Project would also contribute to increasing pedestrian, bicycle, and vehicular activity that would result in adverse impacts on the mobility of the elderly and persons with disabilities outside of WUS, but it would also include improvement that would partially offset these impacts, as described in **Section 5.16.4.2**, *Alternative A, Indirect Operational Impacts.* Therefore, cumulative adverse impacts on circulation outside of WUS would be minor.

5.18.4.17 Environmental Justice

As explained in **Section 5.17**, *Environmental Justice*, the Project would not result in disproportionately high and adverse impacts on EJ communities, nor would EJ communities be denied any benefits from the Project. Therefore, the Project has no potential to result in high and adverse cumulative impacts on EJ communities.

5.18.5 Avoidance, Minimization and Mitigation Evaluation

The sections of this chapter covering the individual resource areas document measures being considered to avoid, minimize, and mitigate the impacts of the Project. These measures would also serve to avoid, minimize, and mitigate cumulative impacts.

5.19 Commitment of Resources

In accordance with NEPA, the CEQ Implementing Regulations for NEPA, and FRA's Procedures for Considering Environmental Impacts, this section includes an analysis of any irreversible or irretrievable commitment of resources that would occur due to implementation of the Project under any of the Action Alternatives. This section also considers the relationship between the Project's potential short-term uses of the human environment and the maintenance and enhancement of long-term productivity throughout the life of the Project.

5.19.1 Irreversible and Irretrievable Commitment of Resources

An irreversible or irretrievable commitment of resources results from the use of a resource that cannot be replaced or recovered and causes the permanent loss of the resource for any future or alternate use. Chapter 7 of this DEIS lists the measures that FRA is considering avoid, minimize, and mitigate adverse impacts to the various resources affected by the Project.

Construction of any Action Alternative would require a greater commitment of natural, human, and monetary resources than the No-Action Alternative. Generally, these resources would be committed irreversibly and irretrievably. Because Alternatives B and E would involve the most extensive and lengthy construction of all Action Alternatives, with excavation of the rail terminal to build two levels of below-ground parking and a duration of approximately 14 years and 4 months, they would require a greater commitment of resources, such as energy, than the other Action Alternatives. Conversely, construction of Alternatives A and A-C, which would involve minimal excavation below the concourse level and have the shortest construction period (approximately 11 years and 5 months) would require a smaller commitment of resources than the other Action Alternatives.

Construction materials such as concrete, steel, cement, and glass would be irretrievably expended during construction of all Action Alternatives in addition to what would be used in the No-Action Alternative. Although these materials would be largely irretrievable when used, they are not in short supply and some could be recycled for other projects in the long term, if and when they no longer meet WUS needs. Any of the Action Alternatives would also consume a greater amount of energy in the form of fossil fuels and electricity during construction than the No-Action Alternative. These resources are readily available and their use for construction and operation of any Action Alternative would not affect their continued availability for other purposes.

In addition to materials and energy, a greater investment of funds and human labor would be needed to design and construct any of the Action Alternatives than for the No Action Alternative. The funds are irretrievable and would not be available for other projects but the benefits of allowing WUS to better support greater rail and bus activity both locally and along the entire Northeast Corridor is anticipated to outweigh the commitment of monetary resources.

5.19.2 Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Short-term impacts on the environment typically result from construction impacts. Long-term impacts generally relate to the operation and maintenance of a project, including consistency of a project with local and regional economic, social, planning, and sustainability objectives. This section compares the Action Alternatives' short-term uses of the environment with their long-term productivity.

5.19.2.1 Short-term Uses

Construction of any Action Alternative would have greater short-term impacts on the environment than the No Action Alternative. Alternatives B and E would have greater short-term impacts than Alternatives C and D, which in turn would have greater short-term impacts than Alternatives A and A-C. This is due to the differences among those alternatives in excavation depth and total construction duration. Although they would occur over a long period (from approximately 14 years and 4 months in Alternatives B and E to approximately 11 years and 5 months in Alternatives A and A-C), the intensity of construction impacts would vary over time. It would be lowest during the 12-month Intermediate Phase, during which only column removal work inside WUS would be conducted, and generally greatest during periods of excavation. The shortest excavation period would be during Construction Phase 1 (approximately 5 months in all Action Alternatives) and the longest one during Construction Phase 4 (from approximately 1 year and 5 months in Alternatives A and A-C to approximately 2 years and 7 months in Alternatives B and E). All construction-related environmental impacts would cease when construction is complete and would be avoided, minimized, and mitigated wherever practicable as discussed in the other sections of this chapter.

5.19.2.2 Long-term Productivity

The No-Action Alternative would result in adverse impacts to long-term productivity because it would not address most of the issues that currently make WUS inadequate to meet current or anticipated future passenger and station needs. Cumulative train ridership across Amtrak, MARC, and VRE is anticipated to more than double by 2040. Without the Project, this growth would push WUS beyond its capacity. The No-Action Alternative would constrain future growth in rail operations locally and along the entire Northeast Corridor. Without the Project, only 50 percent of Amtrak's 2040 unconstrained service levels and 68 percent of its unconstrained ridership levels would be realized. Only 42 percent of MARC's service and 53 percent of MARC's ridership would be achieved as well as only 37 percent of VRE's service and 36 percent of VRE's ridership.

All Action Alternatives would result in benefits to long-term productivity. By providing new tracks and platforms that would support simultaneous boarding of trains, quicker turnaround times for trains, and double berthing, all Action Alternatives would adequately support the anticipated growth in service and ridership at WUS, including future low-cost intercity service (the "Metropolitan") and MARC's through-running trains to Virginia. All Action Alternatives would address congestion issues inside WUS by providing more concourse space, more access points, and more amenities, including more retail, for both rail and intercity bus passengers and visitors.

The Project would also improve WUS's accessibility through full ADA compliance; offer opportunities to improve WUS's resilience; and enhance the connections between the neighborhoods on either side of the rail terminal.

5.19.2.3 Short-Term Uses Versus Long-Term Productivity

The short-term impacts that would result from construction of any Action Alternative would vary substantially over the entire period of construction and would cease when construction is complete. They would be offset by the benefits from greater rail and bus capacity at WUS and improved passenger and visitor amenities that would result from the Project. When reviewed in the overall context of the Project and taken in total, the benefits the Project offers are greater than the short-term impacts of construction.