LONG BRIDGE PROJECT
Connecting North and South Through our Nation's Capital

Appendix D1:

Methodology Report

LONG BRIDGE PROJECT

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Long Bridge Project

Environmental Impact Statement (EIS)

Impact Methodologies

January 31, 2018

District Department of Transportation

U.S. Department of Transportation
Federal Railroad Administration

Long Bridge Project EIS
Impact Methodologies

Table of Contents

List of Tables

List of Figures

List of Acronyms

AAI	All Appropriate Inquiries
AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisory Council on Historic Preservation
ACM	Asbestos Containing Material
ACS	American Community Survey (ACS
ADA	Americans with Disabilities Act
AHERA	Asbestos Hazard Emergency Response Action
AIRFA	The American Indian Religious Freedom Act
APE	Area of Potential Effects
ART	Arlington Transit
ASTM	American Society for Testing Materials
BA	Biological Assessment
BGEPA	Bald and Golden Eagle Protection Act
BID	Business Improvement District
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CBLAD	Chesapeake Bay Local Assistance Department
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFA	Commission of Fine Arts
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide

CORRACTS	Resource Conservation and Recovery Act Corrective Actions
CSXT	CSX Transportation
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	A-weighted decibel
dBV	Vibration levels express in decibel notation
DC SHPO	District of Columbia State Historic Preservation Office
DC	District of Columbia
DCEPA	District of Columbia Environmental Policy Act
DCMR	DC Municipal Regulations
DCOP	District of Columbia Office of Planning
DDOT	District Department of Transportation
DEQ	Department of Environmental Quality
DHS	Department of Homeland Security
District	District of Columbia
DNH	Division of Natural Heritage
DOEE	District Department of Energy and Environment
DOEE	District of Columbia Department of Environment and Energy
DOT	Department of Transportation
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
FAA	Federal Aviation Administration

FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIS	Flood Insurance Study
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GEMS	Geospatial Educational Mapping System
GHG	Greenhouse Gas
GIS	Geographic Information System
GSA	General Services Administration
HAP	Hazardous Air Pollutant
HCS	Hazardous Communication Standard
HHS	U.S. Department of Health and Human Services
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
IECC	International Energy Conservation Code
IPaC	Information, Planning and Conservation
IPCC	Intergovernmental Panel on Climate Change
IRIS	Integrated Risk Information System
L_{dn}	A-weighted average day-night sound level
$L_{eq}(h)$	A-weighted hourly equivalent sound level
LID	Low Impact Development
Lmax	Maximum A-weighted level
LOD	Limits of Disturbance
LWCF	U.S. Land and Water Conservation Fund
MARC	Maryland Area Regional Commuter
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emissions Simulator
MOVES2014	2014 Motor Vehicles Emission Simulator
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MSW	Municipal Solid Waste
MWAQC	Metropolitan Washington Air Quality Committee
MWCOG	Metropolitan Washington Council of Governments
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NCHRP	National Cooperative Highway Research Program
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NHDE	Natural Heritage Data Explorer
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	Oxides of Nitrogen
NPDES	EPA National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NPSOA	National Park Service Organic Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places

NS	Norfolk Southern
NVC	U.S. National Vegetation Classification
NVTC	Northern Virginia Transportation Commission
NWI	National Wetlands Inventory
NWS	National Weather Service
O_3	Ozone
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
Pb	Lead
PCBs	Polychlorinated Biphenyls
PM	Particulate Matter
PM_{10}	Particulate matter sized 10 micrometers or less
$PM_{2.5}$	Particulate matter sized 2.5 micrometers or less
PPV	Peak Particle Velocity
PSD	Prevention of Significant Deterioration
PWD	Professional Wetland Delineators
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RPA	Resource Protection Area
SDWA	Safe Drinking Water Act
SEDS	State Energy Data System
SEL	Sound Exposure Level
SFHAs	Special Flood Hazard Areas
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOF	Statement of Findings
SO_X	Sulfur Oxides
SPCC	Spill Prevention, Control and Countermeasure
STB	Surface Transportation Board

SWRv	Stormwater Retention Volume
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TNM	Traffic Noise Model
TPB	Transportation Planning Board
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSDF	RCRA Treatment, Storage & Disposal Facility
UCR	National Uniform Crime Reporting
URAA	Uniform Relocation Assistance and Real Property Acquisition Policies Act
USACE	US Army Corps. of Engineers
USC	United States Code
USCG	United States Coast Guard
USCG	US Coast Guard
USDOT	United States Department of Transportation
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VA DEQ	Virginia Department of Environmental Quality
VA DRPT	Virginia Department of Rail and Public Transport
VAC	Virginia Administrative Code
VaFWIS	Virginia Department of Game and Inland Fisheries Fish and Wildlife Information Service
VCP	Voluntary Cleanup Program
V-CRIS	Virginia Cultural Resource Information System
VDAC	Virginia Department of Agriculture and Consumer Service
VdB	Vibration Decibels
VDCR DNH	Virginia Department of Conservation and Recreation Division of Natural Heritage
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality

VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VIMS	Virginia Institute of Marine Science
VLR	Virginia Landmarks Register
VOC	Volatile Organic Compound(s)
VRE	Virginia Railway Express
VRP	Voluntary Remediation Program
WAP	Wildlife Action Plan
WMATA	Washington Metropolitan Area Transit Authority
WSR	Wild and Scenic River

1.0 Overview

1.1. Introduction

The Federal Railroad Administration (FRA) is preparing an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Long Bridge Project (the Project) jointly with the District Department of Transportation (DDOT). The Long Bridge Project consists of potential improvements to the bridge and related railroad infrastructure located between Rosslyn (RO) Interlocking near Long Bridge Park in Arlington, Virginia and L'Enfant (LE) Interlocking near 10th Street SW in Washington, DC. The Long Bridge Project connects logical termini, has independent utility even if no additional transportation improvements in the area are made; and does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements in the area.

The purpose of the Proposed Action is to provide additional long-term railroad capacity and to improve the reliability of railroad service through the Long Bridge Corridor. Currently, there is insufficient capacity, resiliency, and redundancy to accommodate the projected demand in future railroad services. The Proposed Action is needed to address these issues and to ensure the Long Bridge Corridor continues to serve as a critical link connecting the local, regional, and national transportation network.

On August 26, 2016, FRA issued a Notice of Intent (NOI) in the Federal Register to prepare an EIS. After initiation of the EIS, the concepts introduced from the Phase I study were presented for interagency and public comment during the Project Scoping process (August 26, 2016, to October 14, 2016).

1.2. Purpose of This Report

The purpose of this report is to describe the methodologies that will be used to describe the Affected Environment and assess the Project's potential environmental impacts. This report has been prepared by FRA and DDOT for Cooperating and Participating Agency review to ensure that the proposed methodologies meet requirements and expectations.

The EIS will describe the Affected Environment of the Project Area, including key physical, biological, cultural, social, and economic resources. Environmental consequences of the Proposed Action and its alternatives (including the No Action Alternative) will also be evaluated. The environmental resources included in the EIS analysis are based on FRA requirements, review of pertinent Federal and state regulations, and scoping comments.

The methodology for describing the Affected Environment and the Project's environmental impacts is flexible to accommodate the scoping, technical analysis, agency coordination, and comment periods. This flexibility also allows for incorporation of input from regulators and cooperating agencies, and adjustment for new and emerging information as it becomes available. For each resource, this report describes:

- An overview and definition of the resource category;
- The regulatory context, including related Federal, state, and local regulations and agency consultation;
- The limits of the Study Area(s) for that environmental category;

- Information that provides guidance and/or data (such as plans, Federal/state/local documents, etc.);
- Data to be collected for the EIS;
- The method for documenting the affected environment;
- The models or analysis techniques that will be used to identify potential direct, indirect, and cumulative impacts.
- The method for evaluating environmental impacts in the EIS;
- The method for evaluating construction impacts from the project; and
- The method for identifying potential mitigation measures.

1.3. Regulatory Context

The NEPA (42 United States Code [USC] 4321-4355) and the Council on Environmental Quality (CEQ) implementing regulations for NEPA (40 Code of Federal Regulations [CFR] parts 1500-1508) set the procedures through which Federal agencies must evaluate the potential effects of major Federal actions on the human and natural environment. The CEQ implementing regulations outline what Federal agencies must do to achieve the goals of the act. To comply with NEPA and CEQ regulations, the EIS will evaluate the potential effects of the proposed Project. In addition, 23 USC 139 *Efficient Environmental Reviews for Project Decisionmaking* will be adhered to during the NEPA process. FRA is the lead Federal agency for the Long Bridge Project. The FRA *Procedures for Considering Environmental Impacts* define the FRA's policies and procedures for reviewing projects in compliance with NEPA.[1]

1.4. Study Areas

The Long Bridge Corridor is illustrated in Figure 1-1. Once the Build Alternatives are developed, the Project Area will be defined to include all areas that will be disturbed during construction. Study Areas are larger areas potentially affected directly and indirectly by the Project and boundaries will vary by environmental resource. The extent of the Study Area is a function of the characteristics of a given resource and the potential scope of impacts on the resource from the Proposed Action and its alternatives. Depending on the resource, a local Study Area and a larger regional Study Area may be defined.

[1] U.S. Department of Transportation, Federal Railroad Administration (FRA). May 26, 1999. *Procedures for Considering Environmental Impacts (64 FR 28545)*. https://www.gpo.gov/fdsys/pkg/FR-1999-05-26/pdf/99-13262.pdf. Accessed June 5, 2017.

Figure 1-1 | Long Bridge Corridor Map

1.5. General – Analysis Years

The impact analysis will analyze a No Action and the Build Alternatives. A single time frame will be analyzed for each alternative: Planning Year 2040. It is assumed that 2017 will be the baseline year used to assess the Affected Environment.

1.6. General – Affected Environment

The Affected Environment is the existing natural, cultural, and social conditions of an area that are subject to change, both directly and indirectly, as a result of a proposed Federal action. The EIS will use a wide range of data sources to describe the Affected Environment within the Study Area of each resource. The data sources used to describe the Affected Environment are summarized in the methodology description for each resource.

Evaluating and documenting the Affected Environment is a multi-step process that includes:

- **Regulation Review:** Identifying Federal, state, and local regulations relevant to the scope and focus of the assessment of baseline conditions. Pertinent regulations are identified and described in each resource section of the EIS.
- **Data Review:** Reviewing the available data sources for the Study Area for each environmental resource to develop an understanding of environmental conditions.
- **Description of Affected Environment:** Describing the Affected Environment within the Study Area for each resource.

1.7. General – Evaluation of Impacts

The impact analysis will evaluate post-construction (operational) and construction impacts for each resource. The analysis will also consider direct, indirect, and cumulative impacts for each resource. The CEQ regulation (40 CFR parts 1500-1508) provides the following definitions:

- **Direct effects** are caused by the action and occur at the same time and place. Direct effects are analyzed in each resource chapter.
- **Indirect effects** are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems. Indirect effects are analyzed in each resource chapter.
- **Cumulative impact** is the full impact on the environment that results from the compilation of 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 actions. Cumulative impacts are analyzed in a separate Cumulative Impacts chapter of the EIS.

As noted in Section 1.3, the Study Area for direct and indirect effects will vary by resource. The Study Area for direct effects will generally be proximate to the Build Alternatives, while the Study Area for indirect effects can be more regional and incorporate systems or transportation networks.

The duration, significance, and outcome of potential effects related to the Long Bridge Project will vary based on the environmental consequences of constructing and operating the Project. For each resource, the analysis will consider the duration and significance of the effects, and whether effects are beneficial or adverse, as defined below:

- **Duration:** Short-term effects are those that may occur only during a specific phase of the Project; such as during construction or commissioning activities. Long-term effects are those that would occur over a longer duration, such as the lifetime of Project operation.
- **Significance:** Minor effects are those that may be perceptible but are of very low intensity and may be too small to measure. Moderate effects are those that are more perceptible and typically are more amenable to quantification or measurement. Major effects are those that, in their context and due to their intensity, have the potential to meet the thresholds for significance set forth in the CEQ regulations (40 CFR part 1508.27).

  Significance requires consideration of both 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, and the locality. Intensity refers to the severity of impact and includes consideration of beneficial and adverse impacts, and 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 threatens to violate other laws, and other considerations.
- **Beneficial or Adverse:** A beneficial effect may cause positive outcomes to the natural or human environment. In turn, an adverse effect may cause unfavorable or undesirable outcomes to the natural or human environment.

1.7.1. Evaluation of Mitigation Measures

Depending on the impact assessment results for each resource area, the need for mitigation will be evaluated and preliminary mitigation recommendations may be provided. Mitigation measures will be identified and discussed for any unavoidable impacts associated with the Project. Means to avoid or minimize impacts will be evaluated prior to proposing mitigation measures, and will be documented.

1.8. Alternatives and Key Assumptions

The EIS will evaluate the environmental effects of each of the Project alternatives, including the No Action Alternative. A summary of the alternatives addressed in the EIS and the assumptions used in the alternatives analyses follow below.

1.8.1. No Action Alternative

Analysis of the No Action Alternative is required pursuant to the CEQ regulations for implementing NEPA (40 CFR part 1502.14). The No Action Alternative presents the conditions that will likely exist in the analysis year of 2040 if a proposed action is not implemented. The No Action Alternative serves as a baseline against which the potential impacts of the Action Alternatives can be compared.

The No Action Alternative for the Long Bridge EIS consists of the existing transportation network, plus all projects within the Project Area that are planned and predictable in the planning year of 2040. The Project Area consists of the area within one-quarter mile of the existing Long Bridge Corridor. The one-quarter mile radius was chosen because it encompasses projects that could affect operations within the corridor. Planned and predictable projects include independently planned and funded projects likely to be implemented by 2040 and maintenance projects necessary to keep the existing bridge and corridor in service. The No Action Alternative does not include the Long Bridge Project.

Projects that are part of the No Action Alternative include:

- **VA Avenue Tunnel** (under construction): Replace existing tunnel with two new tunnels, capable of accommodating double-stack intermodal freight trains. This project is planned for completion by 2019 by CSXT.
- **VRE L'Enfant Station North and South Storage Track**: Convert existing side tracks at VRE L'Enfant Station to storage tracks while permanent Midday Storage Facility is being constructed. Storage tracks will be converted to 4th mainline track after Midday Storage Facility is built. This project is planned for completion in 2017 by VRE.
- **VRE L'Enfant Station Improvements**: Create an island platform and allow for simultaneous boarding of two tracks at L'Enfant Station, and extend and widen platform to accommodate eight-car trains and a future fourth track. This project is planned for completion by 2024 by VRE.
- **Fourth Track from L'Enfant to Virginia (VA) Interlocking**: Provide additional main track between the LE and VA Interlockings in the District of Columbia (District). This project is planned for completion by 2021 by VRE.
- **Fourth Track from Alexandria-Franconia (AF) to Rosslyn (RO) Interlocking**: Add a fourth track from AF to RO Interlockings as part of corridor-wide upgrades to support higher operating speeds. This project is included in the DC2RVA Tier II EIS currently underway and is planned for completion by 2025 by DRPT.
- **VRE Crystal City Station Improvements**: Construct new island platform with two platform edges near the existing station, with two grade-separated access points between the platform and Crystal Drive. This project is planned for completion by 2023 by VRE.
- **Crystal City-Potomac Yard Transitway Extension**: Extend Transitway from Crystal City Metrorail to Pentagon City Metrorail and install stations along the new route, including at Crystal Drive and 18th Street. This project is planned for completion by 2021 by Arlington County.
- **Crystal City, Pentagon City, Potomac Yard Streets:** Transform streets from auto-centric to multimodal complete streets in support of the Crystal City Sector Plan, including bike lanes, pedestrian facilities, accommodations for Transitway, on-street parking, lighting and traffic signals, and Americans with Disabilities Act (ADA) facilities. This project is planned for completion by 2021 by Arlington County.
- **Crystal City Metro Station East Entrance**: Construct new entrance at the east end of the Crystal City Metrorail Station to provide easier access to Crystal Drive and VRE Crystal City Station located at the Transitway station at Crystal Drive and 18th Street South. This project is planned for completion by 2022 by Arlington County.

- **Project Journey:** New commuter concourse and security checkpoint at the Ronald Reagan Washington National Airport (Reagan National), Arlington, VA. This project is planned for completion by 2021 by the Metropolitan Washington Airports Authority.
- **Arlington Complete Streets:** Transform streets (Army Navy Drive, Crystal Drive, Clark Bell Street, 12th Street South, 18th Street South, 23rd Street South, and 27th Street South) from auto-centric to multimodal complete streets, including bike lanes, pedestrian facilities, accommodations for Transitway, on-street parking, lighting, traffic signals, and ADA facilities. This project is planned for completion by 2037 by Arlington County.
- **Boundary Channel Drive Interchange:** Redesign and reconstruction of Long Bridge Park Drive interchange with I-395 and Boundary Channel Drive to increase safety and better accommodate multimodal transportation. This project is planned for completion by 2021 by Arlington County.
- **I-395 HOT (High Occupancy Toll) Express Lanes**: Convert High Occupancy Vehicle (HOV) 3+ lanes to HOT 3+ (high occupancy/toll) lanes. This project is planned for completion by 2020 the Virginia Department of Transportation (VDOT).

1.8.2. Build Alternatives

Impacts of each Build Alternative will be compared to the No Action Alternative.

2.0 Natural Ecological Systems and Endangered Species

2.1. Overview and Definitions

2.1.1. Natural Ecological Systems

This section will describe the Study Area's natural and ecological systems (terrestrial and aquatic biological resources, and habitats), including ecologically sensitive areas. Resources that are not present in the Study Area will be stated early in the chapter, and a no impact assessment will occur.

Ecologically sensitive areas refer to natural areas that the state or Federal government has designated for conservation purposes. At the Federal level, ecologically sensitive areas include designated National Wildlife Refuges and "critical habitat" areas. At the state level, ecologically sensitive areas include those designated by the Virginia Department of Conservation and Recreation (VDCR) as Natural Area Preserves and Natural Community Areas.

For the purposes of this methodology, natural ecological systems within the Study Area will include: wetlands; ecologically sensitive areas; critical habitats; Federal and state-listed rare, threatened, and endangered species; water resources; and biological diversity. The portion of the Potomac River overreached by the Study Area is not a designated Wild and Scenic River (WSR); therefore, WSR status will not require review under Natural and Ecological Systems. However, the river bottom is under the ownership of the U.S. National Park Service (NPS). Therefore, environmental studies would follow NPS policies and guidelines specified in the NPS Director's Orders to comply with NPS requirements.

2.1.2. Endangered Species

This section describes the methodology for evaluating the presence of Federally listed threatened and endangered (T&E) species in the Study Area, and methods for evaluating the potential effects of the proposed project on these species. The Federal Endangered Species Act of 1973 (ESA) defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." The ESA also defines a threatened species as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Although the Study Area includes a highly-urbanized reach of the Potomac River and environs, there is potential for listed species to occur within the region. The August 2016 *Preliminary Data Collection Report* indicates that the National Oceanic and Atmospheric Administration (NOAA) Endangered Species Maps indicate the potential for Atlantic sturgeon and shortnose sturgeon within the Study Area. The Virginia Department of Game and Inland Fisheries (VDGIF) Fish and Wildlife Information Service also indicates the potential for northern long-eared bat to occur within two miles of the Long Bridge.

2.2. Regulatory Context

2.2.1. Natural Ecological Systems

Federal Laws, Regulations, and Other Guidance

Multiple Federal agencies play a role in the regulation of ecological systems, including the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), NOAA, and the U.S. Fish and Wildlife Service (USFWS). Each agency plays a role in the permitting, monitoring, restoring, and mapping of natural ecological systems nationwide.

Relevant Federal laws, regulations, and Executive Orders (EOs):

- U.S. Fish and Wildlife Coordination Act (16 USC 661 et seq.)
- Anadromous Fish Conservation Act (16 USC 757a-757g; 79 Stat. 1125)
- Chesapeake Bay, EO 13508
- Clean Water Act (CWA) (33 USC 1251)
- Coastal Zone Management Act (CZMA) (16 USC 1451)
- ESA (16 USC 1531)
- Invasive Species, EO 13112
- Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 USC 1801)
- Migratory Bird Treaty Act (MBTA) (16 USC 703-712; 50 CFR part 10.13)
- National Wildlife Refuge System Administration Act of 1966 (16 USC 668)
- Protection of Wetlands, EO 11990
- Section 4(f) of the Department of Transportation Act of 1966 (80 Stat. 931)
- Wild and Scenic Rivers Act of 1994 (16 USC 1271)
- Wilderness Act (16 USC 1131)
- Rivers and Harbors Act of 1899 (33 USC 403; 33 CFR part 322)

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

States are given the responsibility of 'Chief Stewards' for wildlife within their borders (per USFWS). With guidance from the ESA, states may suggest species for listing, monitor species, assess habitats, and designate critical habitat regarding any threatened, endangered, or candidate species. The District acts in the role of a state as well as a local government. The regulations below are enforced by the District of Columbia Department of Energy and Environment (DOEE), the Virginia Department of Agriculture and Consumer Services (VDAC) and VDGIF, respectively. During the data collection phase of the Project, if

any other applicable state laws and regulations related to biological resources are identified, they will be documented accordingly.

Relevant state and local laws and regulations:

State

- District of Columbia Municipal Regulations Chapter 10-A6 (Environmental Protection)
- District of Columbia Municipal Regulations Chapter 19-15 (Fish and Wildlife)
- District of Columbia Municipal Regulations Chapter 21-14 (Submerged Aquatic Vegetation Regulations).
- Virginia Endangered Plant and Insect Species Act (Code of Virginia Section 3.2-1000 et seq.)
- Endangered Species provisions under the Virginia Wildlife and Fish Laws (Code of Virginia Section 29.1-563 et seq.)
- Virginia Natural Area Preserves Act (Code of Virginia 10.1-209 through 217)

Local

- Municipal Code of Arlington County includes ordinances that pertain to ecological resources under two primary headings: Chesapeake Bay Preservation Ordinance (Chapter 61), and Trees and Shrubs (Chapter 67; Urban Forest Act [50 DC REG. 888]).

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

2.2.2. Endangered Species

Federal Laws, Regulations and Other Guidance

Relevant Federal laws, regulations, and EOs

- The primary Federal statute regulating activities that could affect T&E within the Study Area is the ESA of 1973 (16 USC 1531).
- Other potentially applicable laws include:
    - Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668-668d)
    - Marine Mammal Protection Act (MMPA) (16 USC 1361 et seq.)

The U.S. Fish and Wildlife Service (USFWS) is the Federal agency responsible for administration of the ESA, the BGEPA, and the MBTA. The primary Federal legislation regulating threatened and endangered species, however, is the ESA. The NOAA National Marine Fisheries Service (NMFS) is the regulatory agency with oversight of the Endangered Species Act for marine mammals and fishes.

Relevant Federal guidance:

- USFSWS Section 7 Handbook. [2]

State and Local Laws, Regulations, and Other Guidance

Relevant State and Local Laws and Regulations:

With guidance set by the ESA, states can propose species for listing, monitor species, and designate critical habitat regarding any threatened, endangered, or candidate species. Requirements or applicable regulation for state-listed rare, threatened, or endangered species are addressed under the methods review for Natural and Ecological Systems (Section 2.1.2).

The VDAC is the regulatory authority for the conservation and preservation of threatened and endangered plant and insect species. The VDGIF has legal authority for preservation of vertebrate and other invertebrate endangered and threatened species. The VDCR's Division of Natural Heritage (DNH) is responsible for the identification, protection, and stewardship of Virginia's rare, threatened, or endangered plant and animal species habitat.

The District does not have a specific ordinance addressing listed T&E species, nor does Arlington County does have a specific provision for rare species protection within its municipal code.

Relevant state and local guidance:

The District addresses listed species indirectly through its adoption of the 2015 Wildlife Action Plan (WAP), which is overseen by the DOEE.

2.3. Study Area

2.3.1. Natural Ecological Systems

The Study Area will include the immediate project footprint and lands and waters within 500 feet of the Project Area. The Study Area will also include waters connected to resources within the project footprint as well as resources that may be affected, directly or indirectly, by the Project. The analysis of existing conditions will focus on resources where the Project would be physically placed over a water resource (such as, the Potomac River and related water bodies), the presence or absence of state-listed species, and the presence or absence of any unique natural habitats.

2.3.2. Endangered Species

The Study Area will include the immediate footprint of the proposed Project. For the portion of the Project over the Potomac River, the Study Area will also include a distance of approximately 2,000 feet upstream and downstream to address the potential for scour and deposition to affect habitat for listed species.

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[2] U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. *Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.* https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf. Accessed October 18, 2017.

2.4. Data Sources

Analyses will be based on a review of available reports and data (for example, Federal and state statutes, resource agency, local, and regional agency policies and ordinances), Geographic Information Systems (GIS) databases, maps, reports, modeling, fieldwork, and professional judgment.

2.4.1. Natural Ecological Systems

Data sources include:

- USFWS list of National Wildlife Refuges
- VDGIF WAP for Virginia (2005, updated 2015)
- District of Columbia WAP (2005, 2015 update pending approval)
- VDCR Natural Heritage Database
- VDGIF Fish and Wildlife Information Service (VaFWIS)
- Aerial imagery
- Field observations
- U.S. National Vegetation Classification (NVC)
- Digital Atlas of the Virginia Flora
- NOAA Essential Fish Habitat Mapper

Field investigations will be completed by agency-approved, qualified personnel to conduct surveys or natural resource inventories for target species or habitats. Different field methods are required for each ecological resource; these methods are identified below with appropriate references.

Essential Fish Habitat

Essential fish habitat will be identified primarily by the NOAA web-tool. It is assumed that field surveys to assess habitat quality, mating pairs, and abundance will not be necessary. However, if preliminary analysis determines field surveys are required, field methods will be approved by NOAA, USFWS, or the applicable state agency. The methodology for field surveys will follow the NOAA guidance, *Preparing Essential Fish Habitat Assessments: A Guide for Federal Action Agencies.*[3]

State Threatened and Endangered Species

Fieldwork will be conducted with guidance from the VDCR DNH to determine the presence of state-listed species within the Project Area. Surveys will be completed by scientists designated by those agencies as approved surveyors for target species. Fieldwork will determine presence/absence, the

[3] NOAA. 2004. *Preparing Essential Fish Habitat Assessments: A Guide for Federal Action Agencies, Version 1.* http://www.habitat.noaa.gov/pdf/preparingefhassessments.pdf. Accessed on October 18, 2017.

abundance of species present, and if the species will be adversely affected by the project and alternatives.

2.4.2. Endangered Species

Data sources include:

- USFWS Information, Planning, and Conservation (IPaC) system
- NOAA Fisheries Greater Atlantic Region Endangered Species Maps
- VaFWIS
- VDCR DNH Data Explorer (NHDE)
- WAP for Virginia (2005, updated 2015)
- District of Columbia WAP (2005, 2015 update pending approval)

2.5. Affected Environment

2.5.1. Natural Ecological Systems

The Affected Environment section will:

- Identify key species and habitats in the Study Area
- Identify Study Area ecosystems through aerial imagery and field observations.
- Identify wildlife and waterfowl preserves or refuges, or parkland with the primary purpose of protecting wildlife habitat.
- Assess Study Area ecosystems using findings from the Project's water resources and wetlands analyses and other relevant studies of natural resources in the Study Area.
- The Affected Environment section will include a map to illustrate the locations of these features, including:
    - Relevant water resources;
    - Wetlands within the project corridor;
    - Any critical habitat of state-listed T&E species; and
    - Essential Fish Habitat (EFH).

2.5.2. Endangered Species

The Affected Environment section of the EIS will be based on a review of available reports and data, GIS databases, USFWS maps, and reports, and will include:

- Mapping to indicate location within the Study Area of habitat suitable for listed species, specifically with respect to life cycle, reproductive phenology, and other relevant habitat provisions. This analysis will consider known population loci and demography within the vicinity of the Study Area.

- Verification of T&E species presence, with relevant mapping to illustrate target species locations (if applicable) or suitable habitat for listed species. This information can then be used to compare alternatives and develop mitigation measures. Mapping will be of sufficient scale to show the geographical relationship between the alternatives and critical habitats, with any major features immediately adjacent to the habitat boundary clearly depicted.

2.6. Environmental Consequences

2.6.1. Natural Ecological Systems

The evaluation of Environmental Consequences for this project will:

- Determine whether sensitive habitats or ecosystems will be affected by the proposed alternatives.
- Identify mitigation measures.

Impact evaluation will include both qualitative and quantitative methods for both direct and indirect impacts. These impacts will be considered for both temporary (construction staging) and permanent impacts. For further discussion related to construction impacts, see the Construction Period Impacts methodology, Section 2.7.

Impacts will be presented by alternative, separating operational impacts from construction impacts. Environmental consequences will differ substantially based on the intensity and duration of impact. Operational or service impacts result from ongoing, routine, and occasional activities associated with the project and related services.

The analysis will primarily focus on determining:

- Whether the project would cause changes in migration patterns and accessibility of habitat to fish, wildlife, or sensitive species.
- Current conditions of natural habitats and their proximity to the project or alternatives and how that could change important habitat characteristics (for example, water and air quality, noise and vibration, and water resources).
- The type and amount in the area of habitat and potential impacts by direct removal, filling, hydrological interruption, or other means.
- Sensitivity of ecological conditions that may rely on soil type, quality, or characteristics specific to the area.

2.6.2. Endangered Species

Evaluation of impacts will include both qualitative and quantitative methods for both direct and indirect impacts. These impacts will be considered for both temporary (construction) and permanent (permanent structures) impacts. For further discussion related to construction impacts, see the Construction Impacts methodology (Section 2.7).

The analysis will primarily focus on evaluating the impacts of the proposed Project's structures and operations on endangered species by determining:

- Whether the Project would directly impact habitat or designated critical habitats (for example, by placing structures within habitat or removing trees and vegetation).
- Whether the Project would change the current condition of habitats used by listed species due to their proximity to the project or alternatives (for example, changes to water and air quality, noise and vibration, and water resources).
- Whether the Project has the potential to affect areas of seasonal importance for T&E species (such as breeding grounds [aquatic and terrestrial] and important stopovers sites).[4]
- Whether the project has the potential to cause changes in migration patterns and accessibility of habitat to T&E species.

Compliance with the ESA will be documented in the EIS. Initial scoping for T&E species will include review of all relevant databases (see Data Sources above), particularly the IPaC database. IPaC review constitutes an initiation of the USFWS consultation process outlined under Section (7) of the ESA (Interagency Cooperation). If it is determined that a listed T&E plant or animal species could be affected by the project, then qualified scientists will be engaged to conduct presence/absence surveys for those listed species within the Study Area. If listed species are found to be present within the Study Area, an effect determination will be rendered via a Biological Assessment (BA). If it is determined that the project is *likely to adversely affect* a listed species, the BA will be used as a basis for formal Section (7) consultation to solicit a Biological Opinion (BO) from the USFWS. Federal agencies must also consult with NOAA/National Marine Fisheries Service (NMFS) under Section (7) of the ESA on activities that may affect listed species. If an action is determined to adversely affect EFH, NMFS must also be consulted and an EFH Assessment must be conducted.

2.7. Construction Impacts

2.7.1. Natural Ecological Systems

Construction impacts are those temporary impacts resulting from building the project, its associated infrastructure, and related physical changes. The analysis will:

- Identify construction techniques and equipment to be used for understanding the temporary impacts from disturbances.
- Identify potential areas of construction staging, with an understanding that the exact limits of staging areas are unknown and are dependent on construction techniques and equipment used.
- Identify likely construction phasing scenarios.
- Identify potential short-term impacts to natural and ecological systems.

[4] The place where a migratory bird pauses between migratory flights is called a *stopover site.*

2.7.2. Endangered Species

To assess potential construction impacts to T&E species, the analysis will identify limits of construction staging, likely construction phasing scenarios, and likely construction methods. Based on this information, the analysis will assess:

- Whether the project would directly impact habitats (for example, by placing temporary structures within habitat or removing trees and vegetation for construction access or staging).
- Whether the project would result in short-term changes to the current condition of habitats. Whether the habitats would be affected due to their proximity to the Project alternatives (for example, changes to water and air quality, noise and vibration, and water resources).

2.8. Mitigation

2.8.1. Natural Ecological Systems

Mitigation for ecological resources within the Project Area will be considered in the context of the relevant regulations cited above and the type and extent of impacts. Potential mitigation measures include:

- Returning disturbed areas to natural ecological systems;
- Preserving important natural systems in an urbanized environment for aesthetics, wildlife habitat, and greenspace; and/or
- Enhancing or restoring wetland functions such as nutrient/sediment filtration, aquatic species habitat, public recreation and aesthetics, floodplains, wildlife usage, or invasive species control.

2.8.2. Endangered Species

If the potential for adverse impacts to listed species is identified, mitigation measures will be proposed to avoid or minimize impacts. Mitigation for construction impacts can include:

- Construction methods to reduce noise, vibration, sedimentation, or turbidity; and
- Time-of-year restrictions to protect areas of seasonal importance.

The USFWS has finalized its ESA Compensatory Mitigation Policy[5] and provides guidance on mitigation programs for developing proposed actions that compensate for adverse impacts to affected species. NMFS will make recommendations for reasonable and prudent alternatives in the event an action is determined to jeopardize a species or adversely modify critical habitat.

[5] *ESA Implementation, ESA Compensatory Mitigation Policy*. https://www.fws.gov/endangered/improving_esa/cmp.html

3.0 Water Resources and Water Quality

3.1. Overview and Definitions

This chapter will focus on four water resource categories: 1) water quality; 2) wetlands and other waters of the U.S.; 3) floodplains, and 4) coastal zone management. This section provides an overview and key definitions for each of the water resource categories analyzed in this chapter.

3.1.1. Water Quality

This section will focus on water quality and infrastructure impacts resulting from Project Area stormwater runoff. This section will include information on:

- Existing surface and groundwater resources;
- Existing drainage infrastructure;
- Regulatory requirements and permits;
- Impacts from stormwater to the quality and quantity of surface water and groundwater; and
- Proposed measures to mitigate for any short-term (construction-phase) or long-term (operational) impacts to water quality.

3.1.2. Wetlands and Other Waters of the U.S.

Wetlands include "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." All wetlands and other waters of the U.S. defined in the 33 CFR part 328 and identified using the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0),* and National Park Service (NPS) methodologies and policy will be identified within the Study Area and classified based on the Cowardin classification system.[6] Impacts to wetlands and other waters of the U.S. will be evaluated for each alternative, and a Statement of Findings (SOF) will be prepared pursuant to the NPS Director's Order 77-1 detailing impacts to wetlands for the preferred alternative.

3.1.3. Flood Hazards and Floodplain Management

This section will identify floodplains within the Study Area and assess impacts from the project alternatives. Impact assessment will comply with the NPS Director's Order #77-2. A floodplain is defined as any land area susceptible to being inundated by floodwaters from any water source (44 CFR part 59). The Federal Emergency Management Agency (FEMA) identifies the 100-year floodplain as the area with a 1-percent chance of being inundated by a flood event in any given year. Similarly, FEMA also identifies

[6] Cowardin, L.M., Carter, V., Golet, F.C. and LaRoe, E.T., 1979. *Classification of wetlands and deepwater habitats of the United States*. U.S. Department of the Interior, U.S. Fish and Wildlife Service.

the 500-year floodplain as the area with a 0.2-percent chance of being inundated by a flood event in any given year. The 100-year and 500-year flood elevations as determined by FEMA will be the baseline for assessing impacts to floodplains for each alternative.

3.1.4. Coastal Zone Management

This section will:

- Identify areas within the coastal zone that may warrant special consideration due to their environmental, cultural, economic, or recreational value;
- Examine the consistency of the Project with Federal and state coastal zone policies; and
- Assess potential impacts.

Because the District does not participate in the National Coast Zone Management Program, assessment of coastal zone consistency will focus on portions of the project in Virginia.

The Coastal Zone is defined in Section 304 of the CZMA of 1972. Coastal zones are defined as coastal waters (including the lands therein and thereunder) and the adjacent shorelands, strongly influenced by each other and in proximity to the shorelines of the coastal states. Designated coastal zones include islands, transitional and intertidal areas, wetlands, salt marshes, and beaches. CZMA protects coastal areas and the surrounding habitat by defining inland coastal areas and the protection of these buffer zones within CZMA (Section 304.2). A vital feature to coastal resources are coastal wetlands, which are regulated by the USACE. Wetlands are considered earlier in this section.

3.2. Regulatory Context

This section describes the regulatory context for each of the water resource categories analyzed in this chapter.

3.2.1. Water Quality

The Long Bridge crosses jurisdictional areas for the Federal government, District of Columbia, Commonwealth of Virginia, and Arlington County, VA. The EIS will consider laws, regulations, and guidance documents from each regulatory authority, as described below.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- CWA/Water Quality Act of 1987 (33 USC 1251-1376) Sections 401 and 402
- Federal Water Pollution Control Act (CWA) of 1972 (33 USC 1251-1376) as amended by the CWA (1977) and the Water Quality Act (1987)
- U.S. Safe Drinking Water Act (SDWA) of 1974 (42 USC 300f)
- U.S. Ground Water Rule (71 Fed. Reg. 65574)
- U.S. EPA National Pollutant Discharge Elimination System (NPDES) Construction General Permit
- EO 13508 Chesapeake Bay Protection and Restoration

- Stormwater Management for Federal Facilities under Section 438 of the 2007 Energy Independence and Security Act (EISA)[7]

Relevant Federal guidance:

- 2009, EPA Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of EISA[8]

State and Local Laws, Regulations, and Other Guidance

Water quality is enforced at the state level, based on standards set by both state and the EPA. States can choose to adopt national water quality standards (SDWA and CWA) or revise and adopt state specific standards. NPDES permits are issued by states with EPA approval.

Relevant State, Local Laws, and Regulations:

State

- Virginia Stormwater Management Act (VA Code 62.1 Section 62.1-44.15:24 to 62.1-44.15:50)
- Virginia Chesapeake Bay Preservation Act (VA Code 62.1 Section 62.1-44.15:67 to 62.1-44.15:79)
- Virginia Erosion and Sediment Control Law (VA Code 62.1 Section 62.1-44.15:51 to 62.1-44.15:66)
- Virginia Water Quality Standards (VA Code 62.1 Section 62.1-44.15(3a))
- Virginia Erosion and Sediment Control Regulations
- District of Columbia Water Pollution Control Act of 1984, as amended (DC Law 5-188)
- District of Columbia Storm Water Permit Compliance Amendment Act of 2000 (DC Law 13-311)
- District of Columbia Soil Erosion and Sedimentation Control Act of 1977 (DC Law 2-2)

Local

- Arlington County Code, Erosion and Sediment Control (Chapter 57)
- Arlington County Code, Stormwater Management Ordinance (Chapter 60)
- Arlington County Code, Chesapeake Bay Preservation Ordinance (Chapter 61)
- District of Columbia Municipal Regulations, Title 21 Water and Sanitation
- District of Columbia Municipal Regulations, Water Quality Standards (DCMR 21-11)

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[8] EPA. 2009. *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects Under Section 438 of the Energy Independence and Security Act.* Accessed from https://www.epa.gov/sites/production/files/2015-09/documents/eisa-438.pdf. Accessed on December 13, 2017.

- District of Columbia Municipal Regulations, Water Quality and Pollution (DCMR 21-5)

Relevant state and local guidance:

- District Department of Energy and Environment (DOEE) *Stormwater Management Guidebook*
- Virginia Stormwater Management Handbook
- Arlington County Stormwater Manual: Guide to Stormwater Requirements for Land Disturbing Activities in Arlington County.
- DCMR 21-18 Well Construction, Maintenance, and Abandonment Standards (Well Regulations)[9]

3.2.2. Wetlands and Other Waters of the U.S.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- Section 401/404 of the CWA of 1972 (33 USC parts 1251 and 1344; 33 CFR parts 320 through 330 and 40 CFR part 230)
- Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403; 33 CFR part 322)
- NPS Director's Order 77-1
- NPS Director's Order 77-2
- EO 11990, Protection of Wetlands (42 FR 26961)
- U.S. Department of Transportation (USDOT) Order 5660.1A, Preservation of the Nation's Wetlands
- USACE Final Rule, Compensatory Mitigation for Losses of Aquatic Resources ("Mitigation Rule") (33 CFR part 332)

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- Title 62.1, Code of Virginia

[9] DCMR 21-18, Well Construction, Maintenance, and Abandonment Standards. Accessed from http://dcrules.elaws.us/dcmr/t21_ch21-18. Accessed on December 12, 2017.

- Title 28.2 (Chapters 12, 13, and 14), Code of Virginia
- DCMR Chapter 21-5, Water Quality and Pollution
- DCMR, Chapter 21-6, Riparian Rights and Water Privileges

Relevant state and local guidance:

- District of Columbia Wetland Conservation Plan (1997)[10]
- DDOE Water Quality Division, Interim Policy on Wetlands in the District[11]

3.2.3. Flood Hazards and Floodplain Management

Project work proposed within the Special Flood Hazard Areas (SFHAs) will be evaluated for compliance with the regulations set forth by Federal, state, and municipal entities.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- FEMA National Flood Insurance Program
- CFR, Title 44, Chapter 1, Subchapter B, Part 60 – Criteria for Land Management Use
- Executive Order 11988, Floodplain Management (1977)
- USDOT Order 5650.2, Floodplain Management and Protection (1979)
- NPS Director's Order 77-2

Relevant Federal guidance:

- FEMA Eight-Step Planning Process for Floodplains and Wetlands[12]
- FEMA Guidelines and Standards for Flood Risk Analysis and Mapping[13]

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[10] Center for Watershed Protection. 1997. District of Columbia Wetland Conservation Plan. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/District%20of%20Columbia%20Wetland%20Conservation%20Plan_1997.pdf. Accessed on December 12, 2017.

[11] District Department of the Environment, Water Quality Division. *Interim Policy on Wetlands in the District.* Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Interim%20Policy%20on%20Wetlands.pdf. Accessed on December 12, 2017.

[12] FEMA. *Eight-steps planning process for floodplains and wetlands*. https://www.fema.gov/media-library-data/20130726-1642-20490-7647/8_step.pdf . Accessed on October 18, 2017.

[13] FEMA. *Guidelines and Standards for Flood Risk Analysis and Mapping*. https://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping. Accessed on October 18, 2017

- FEMA Federal Interagency Floodplain Management Task Force Guidance on Unwise Use of Floodplains[14]

State and Local Laws, Regulations, and Other Guidance

State

- Commonwealth of Virginia Department of Conservation and Recreation
    - Code of Virginia Section 10.1-602 – Floodplain Code
- Washington DC Department of Energy and the Environment
    - DC Register Title 20, Environment, Chapter 20-31 – Flood Hazard Rules
    - Flood Risk Management in the District of Columbia[15]

Local

- Arlington County Department of Environmental Services
- Arlington County (Virginia) Code, Chapter 48, Floodplain Management

3.2.4. Coastal Zone Management

Coastal resources are governed by the CZMA and are also regulated by Virginia laws and regulations. Any Federal activities conducted within the coastal zone are required to be consistent with the criteria set forth in the approved state plan or program. In order to be in compliance with the CZMA, activities that would affect the coastal zone, including development projects, must be identified by the Federal agency and reviewed for consistency with the state-specific coastal zone management plan.

Federal Laws, Regulations, and Other Guidance

The CZMA was created to preserve, protect, develop, and, where possible, restore or enhance coastal zones. Several Federal laws, regulations, and EOs outline acceptable processes that occur within and around coastal zones and coastal wetlands.

- **Relevant Federal laws, regulations, and EOs:** CZMA (16 USC 1451)
- CWA (33 USC 1251)
- Rivers and Harbors Act of 1899 (33 USC 401)
- Protection of Wetlands (Executive Order [EO] 11990)
- SDWA of 1974 (42 USC 300)

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[14] FEMA. Guidance on unwise use of floodplains. https://www.fema.gov/media-library/assets/documents/27666 . Accessed on October 18, 2017

[15] Flood Risk Management in the District of Columbia. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2011_03_24%20Flood%20Risk%20Management%20in%20DC.pdf. Accessed on December 12, 2017.

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Virginia participates in the National Coastal Zone Management Program and has a state management plan that includes Arlington County.

Relevant State, Local Laws, and Regulations:

State

- Virginia Executive Order 35 (2014), Continuation of the Virginia Coastal Zone Management Program
- Chesapeake Bay Preservation Act of 1988 (Title 62.1, Chapter 3.1, Article 2.5 of the Code of Virginia)
- Chesapeake Bay Preservation Area Designation and Management Regulations (VA Code Section 830)
- Virginia Tidal Wetlands Act Section 28.2-1300 of the Virginia State Code
- Virginia Submerged Lands Section 28.2-1200 of the Virginia State Code

Local

- Arlington County adopted the Chesapeake Bay Preservation Ordinance (Arlington County Code, Chapter 61) to protect local streams and the Chesapeake Bay from pollution due to land use and development. All of Arlington County's water drains into the Potomac River and ultimately the Chesapeake Bay. To protect and improve the quality of these waterways, the ordinance establishes a 100-foot buffer to restrict development around tributaries, the shoreline, and delineated wetlands.

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

3.3. Study Area

3.3.1. Water Quality

The Study Area boundary will extend 500 feet from the Project footprint, to allow for evaluation of stormwater impacts to surface and groundwater resources and infrastructure both within and adjacent to the Project Area. While the assessment will focus on the Project Area and adjacent water resources, it will also characterize potentially affected water resources and infrastructure outside the Study Area, including receiving waterbodies and drinking water sources.

3.3.2. Wetlands and Other Waters of the U.S.

The Study Area will include the immediate project footprint and any temporary construction easements associated with the alternatives. This will include the immediate railroad corridor, bridge superstructure

and pilings, abutments, and a corridor width of 500 feet on either side of the footprint of the alternatives.

3.3.3. Flood Hazards and Floodplain Management

Project activities will span the Potomac River and may include impacts to the east and west banks of the river. The west bank of the Potomac River is located in Arlington County, VA. The east bank and the river itself are located in Washington, DC. The project may affect special Flood Hazard Areas (SFHA) associated with the Potomac River including:

- AE Zones (100-year floodplain with a defined base flood elevation)
- X Zones
    - Areas within the 500-year floodplain
    - Areas with reduced flood risk due to levee
    - Areas of minimal flood hazard

The Study Area will encompass all project impacts to areas that fall within these SFHAs.

3.3.4. Coastal Zone Management

The Study Area will extend 500 feet from the project footprint of the Build Alternatives, including areas that may be affected by the construction or operation of the Build Alternatives.

3.4. Data Sources

3.4.1. Water Quality

The analysis will be based on a review of available reports and data (such as Federal and state statutes, resource agency, local, and regional agency policies and ordinances), discussions with agency representatives in the region, applicable field investigation, and professional judgment.

In addition to the regulatory sources listed in Section 3.2.4, the analysis will draw on reports and data.

Data sources include:

- Virginia Water Quality Assessment 305(b)/303(d) Integrated Report, 2014
- District of Columbia NPDES Permit Number DC0000221 - Authorization to Discharge under the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit, Effective October 7, 2011
- DC DOEE *Water Quality Assessment 2016 Integrated Report* to U.S. EPA, Sections 305(b) and 303(d) CWA
- Chesapeake Bay Total Maximum Daily Load (TMDL) for Nitrogen, Phosphorus and Sediment. Issued by U.S. EPA, December 29, 2010
- Final Total Maximum Daily Loads (TMDLs) for Potomac River and tributaries. Issued by U.S. EPA in 2004 and 2014
- Arlington County Stormwater Master Plan, September 2014

- Arlington County Authorization to Discharge under the Virginia Stormwater Management Program and the Virginia Stormwater Management Act (MS4 Permit). Permit No. VA0088579, Effective June 26, 2013 through June 25, 2018
- Geographic Information System (GIS) maps from United States Geologic Service (USGS), Natural Resource Conservation Service (NRCS), District of Columbia GIS, Arlington County GIS, Virginia GIS, and other sources
- EPA Enviromapper
- Reports from past geotechnical investigations in the Project Area and vicinity, if available
- As-built plans of Project Area stormwater infrastructure, including connections to DC Water and Arlington County infrastructure
- DC Water and Arlington County record plans of stormwater infrastructure
- Existing Project permits related to water resources
- Reports and/or qualitative assessments from DC Water and Arlington County regarding existing stormwater infrastructure capacity and deficiencies
- DOEE. 2016. Municipal Separate Storm Sewer System, NPDES Permit No. DC0000221. *2016 MS4 Annual Report*[16]

3.4.2. Wetlands and Other Waters of the U.S.

Data sources include:

- District of Columbia and Arlington County GIS Data
- USFWS National Wetlands Inventory (NWI)
- Potomac River gauge data (NOAA, USACE, Virginia Marine Resources Commission)
- Submerged Aquatic Vegetation Mapping, Virginia Institute of Marine Science (VIMS)
- Topographic mapping
- Web Soil Survey
- Field survey and delineation (see Section 3.5.2)

[16] DOEE. 2016. Municipal Separate Storm Sewer System, NPDES Permit No. DC0000221, *2016 MS4 Annual Report*. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/0%202016%20MS4%20Annual%20Report%20-Full%20Report_0.pdf. Accessed on December 12, 2017.

3.4.3. Flood Hazards and Floodplain Management

Data sources include:

- FEMA Flood Insurance Study (FIS) Reports including:
  - 51013CV000A, Arlington County, VA, 8/19/2013
  - 110001V000A, District of Columbia, Washington DC, 9/27/2010
  - Letter of map revision (LOMR) 15-03-2388P, Washington, DC, 9/14/2016 17th street levee
- FEMA FIS Rate Maps including:
  - 1100010018C (Washington, DC) 9/27/2010*
  - 1100010019C (Washington, DC) 9/27/2010
  - 1100010056C (Washington, DC) 9/27/2010*
  - 1100010057C (Washington, DC) 9/27/2010
  - 51013C0081C (Arlington, VA) 8/19/2013*
- FEMA FIS Technical Supporting Data including:
  - The effective hydraulic model of the Potomac River (assumed format HEC-RAS v 3.3.1) updated as described in the 2010 FIS (110001V000A)
  - Digital Flood Insurance Rate Map and National Flood Hazard Layer (GIS)
- DC Office of the Chief Technology Officer Geospatial Topographic contour and elevation data
- Field survey to supplement topographic contour and elevation data with high-resolution site-specific data as needed

3.4.4. Coastal Zone Management

Data sources include:

- District of Columbia and Arlington County GIS Data
- Arlington County Chesapeake Bay Preservation Area Overlay District Map
- Arlington County Resource Protection Area Maps
- Virginia Institute of Marine Science (VIMS) GIS Data
- Virginia Marine Resources Commission GIS Data
- Virginia Department of Environmental Quality Coastal Geospatial and Educational Mapping System (GEMS)

- Anacostia Waterfront Development Zone (AWDZ)[17]

3.5. Affected Environment

3.5.1. Water Quality

Drawing from the data sources described above and coordination with relevant agencies, the analysis will include a comprehensive description and mapping of existing water resources. The water resources affected environment description will include:

- Existing stormwater collection, treatment, and conveyance systems;
- Drainage area delineations by receiving water in ArcGIS for the Study Area, with detailed information on area, impervious cover, hydrologic soil group, water table, and stormwater hotspots for each drainage area;
- Receiving waterbodies for stormwater and/or combined-sewer overflows, as applicable;
- Water quality standards and exceedances for waterbodies potentially affected;
- Water quality impairments and TMDLs for potentially affected waterbodies;
- Groundwater characterization; and
- Surface and groundwater water supply protection zones, as applicable.

3.5.2. Wetlands and Other Waters of the United States

The Long Bridge Corridor includes the Potomac River and associated waterbodies, including Roaches Run, the Washington Channel, and the Tidal Basin. As part the Affected Environment documentation, wetland scientists will perform an inventory of wetlands and other waters of the U.S. using approved methodologies in coordination with the USACE, the NPS, the Virginia Department of Environmental Quality (VDEQ), and the District DOEE. The inventory will begin with a preliminary evaluation of existing mapping and online sources such as the National Wetlands Inventory (NWI), soil survey data, topographic surveys, existing reports, gauge data, and aerial imagery prior to field investigations. Submerged aquatic vegetation information will be obtained from VIMS. Staff certified in Virginia as Professional Wetland Delineators (PWD) will demarcate the landward limits of jurisdictional wetlands and other waters of the U.S. using sequentially numbered flagging tape, and flagged stations will be located using GPS technology with sub-meter accuracy. Wetland scientists will identify and map all wetland types per the Cowardin classification system. Data will be collected to support the delineation to include dominant vegetation, soil descriptions, and evidence of wetland hydrology. A request will be prepared and submitted to the USACE to inspect and confirm the limits of wetlands and other waters of the U.S. as delineated in the field.

[17] Anacostia Waterfront Development Zone Map. Accessed from https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Map%20of%20Anacostia%20Waterfront%20Development%20Zone.pdf. Accessed on December 13, 2017.

Following completion of the delineation effort, a wetland delineation report will be prepared in a format consistent with NPS policies and following NPS Director's Order 77-1. The report will characterize and quantify the number of wetlands and other Waters of the U.S. within the Study Area, and will include a discussion of the functions and values provided by the various wetland systems.

3.5.3. Flood Hazards and Floodplain Management

Project activities will span the Potomac River and may include impacts to the east and west banks of the river. The west bank of the Potomac River is located in Arlington County, VA. The east bank and the river itself are located in Washington, DC. The Affected Environment section will describe SFHAs associated with the Potomac River including:

- AE Zones (100-year floodplain with a defined base flood elevation)
- X Zones
    - Areas within the 500-year floodplain
    - Areas with reduced flood risk due to Levee
    - Areas of minimal flood hazard

The 100-year and 500-year flood zones within the Study Area, including the areas protected by the 17th Street Levee, will be mapped using the National Flood Hazard Data Layer available for download from the FEMA Map Services Center. A quantitative inventory of natural communities and manmade infrastructure within the flood zones will be performed with an emphasis on identifying any nearby features potentially affecting the extent and intensity of flooding such as bulkheads and flood gates. The functional value of the floodplains will be qualitatively assessed based on a literature review and professional judgement.

3.5.4. Coastal Zone Management

The documentation of the Affected Environment will list and map Arlington County Resource Protection Areas (RPAs) within the Study Area. As defined in the Arlington County Chesapeake Bay Preservation Ordinance (Chapter 61.5), RPAs "consist of sensitive lands adjacent to water bodies with perennial flow that have intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may cause significant degradation to the quality of State waters." RPAs include tidal wetlands, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, tidal shores, a buffer area not less than 100 feet adjacent to and landward of these water bodies, and such other lands considered by the Arlington County Board to meet some or all the criteria described above.

3.6. Environmental Consequences

3.6.1. Water Quality

The water quality impact analysis will evaluate the Project's direct and indirect impacts on water quality during construction and operation of the Project. The relative impacts of each alternative will be compared based on the following information and indicators:

- Total area of land disturbance;

- Proposed stormwater collection, treatment, and conveyance system;
- Proposed mitigation strategies such as Best Management Practices (BMPs) for short-term (construction) and post construction long-term impacts, including Low Impact Development (LID) measures;
- Stormwater- and water quality–related permit requirements;
- Drainage area delineations by receiving water in ArcGIS for the Project Area, with detailed information on area, impervious cover, hydrologic soil group, water table, and stormwater hotspots for each drainage area;
- Spreadsheet calculation of regulated Stormwater Retention Volume (SWRv) per DOEE Stormwater Management Guidebook;
- Capacity of interconnected municipal stormwater system, if applicable, based on qualitative assessment and consultation with DC Water and Arlington County;
- Receiving waterbodies for stormwater and/or combined-sewer overflows, as applicable;
- Surface and groundwater protection zones, and each alternative's compliance with water quality and groundwater recharge requirements, as applicable; and
- Water quality impairments and TMDL requirements for receiving waterbodies, and a qualitative assessment of the alternative's compliance with those requirements and potential impact on receiving waterbodies.
- Existing water quality impairments will be based on VA and DC 303(d) lists. Water quality impacts will be compared using stormwater retention volume per the DOEE stormwater management guidebook, proposed mitigation strategies, and qualitative assessment of each alternative's compliance with NPDES/TMDL requirements.

3.6.2. Wetlands and Other Waters of the U.S.

The mapping results of the wetland and submerged aquatic vegetation inventory will be merged with the limits of disturbance (LOD) in GIS for each alternative. The amount of impacts will be determined for each alternative in terms of permanent impacts from dredge and fill activities, shading impacts to emergent wetlands and submerged aquatic vegetation, and temporary impacts due to construction. (Impacts to water quality will be discussed in the *Water Quality* section). The impacts analysis will also evaluate loss of wetland functions and values.

3.6.3. Flood Hazards and Floodplain Management

Quantitative impacts to floodplain areas identified in the Affected Environment section will be determined for each alternative. The impact to the floodplain will be evaluated using methods consistent with the specifications for a FEMA Letter of Map Revision Process. Specifically, this process includes:

- Requesting and obtaining the effective flood insurance study hydraulic model from the FEMA Technical Data Library.

- Producing a proposed conditions model for each alternative by incorporating proposed changes to grading, structures, and obstruction footprints into the model.
- The proposed impacts to the floodplain will be quantified by comparing the 100- and 500-year flood elevation profiles calculated for each alternative proposed condition model to the 100- and 500-year flood elevation profiles calculated for the existing condition model. Alternatives that do not meet the minimum criteria for modifications or improvements to the 100- and 500-year floodplains (AE and X Zones) pursuant to Federal, state, county, or District requirements will be identified. The magnitude of the impact of each alternative on the flood elevation profiles will be reported.

3.6.4. Coastal Zone Management

To assess impacts to Resource Protection Areas (RPA) and other coastal features, GIS mapping will be used to identify those resources that overlap with the permanent limits of disturbance for the Build Alternatives. The evaluation of impacts will rely on the analyses conducted for impacts to wetlands, ecological systems, and water quality. To evaluate project consistency with the CZMA, a Coastal Zone Consistency Determination for the project will be prepared and submitted to the VADEQ. The EIS will include a summary of the Consistency Determination.

3.7. Construction Impacts

3.7.1. Water Quality

Temporary construction-phase impacts to water quality and stormwater infrastructure will be assessed for each alternative. The evaluation will qualitatively assess potential impacts resulting from construction phasing, staging location, and techniques for each alternative, including:

- Location of construction staging and stockpile areas;
- Potential for water-based transport of construction equipment and materials;
- Potential for use of coffer dams;
- Type and duration of in-water work;
- Likely construction phasing scenarios;
- Proposed construction-phase spill prevention and waste-management practices; and
- Proposed construction-phase erosion and sediment control BMPs.

3.7.2. Wetlands and Other Waters of the U.S.

The type of construction equipment, location of staging and stockpile areas, use of cofferdams, etc., will be important factors in quantifying temporary impacts caused by construction activities. Specific construction areas will be identified during the alternatives development phase of the project, and brought forward for impacts analysis.

3.7.3. Flood Hazards and Floodplain Management

Qualitative impacts to floodplain areas identified in the Affected Environment section will be determined for impacts including, but not limited to, the use of coffer dams or conveyance diversions. Temporary impacts to floodplain area and functions resulting from construction would be determined by first identifying the LOD for the selected alternative and overlaying the LOD with the GIS floodplain layer. The LOD within floodplains would then be quantified by area, and impacts to flooding caused by construction activities would be assessed.

3.7.4. Coastal Zone Management

To assess impacts to coastal resources, GIS mapping will be used to identify the portion of those resources that overlap with the temporary limits of construction for the Build Alternatives. The evaluation of impacts will rely on the analyses conducted for impacts to wetlands, ecological systems, and water quality. To evaluate project consistency with the CZMA, a Coastal Zone Consistency Determination for the project will be submitted to the VADEQ. The EIS will include a summary of the Consistency Determination.

3.8. Mitigation

3.8.1. Water Quality

Based on the results of the impact assessment, the need for mitigation will be evaluated and preliminary mitigation recommendations will be provided. Recommended construction-phase mitigation measures will include BMPs to control erosion and sedimentation, and to prevent contamination of surface water and groundwater. Post-construction mitigation measures will include source-control measures to minimize the generation of pollutants and runoff, and stormwater treatment facilities to manage runoff from the Project. Mitigation for potential impacts to drainage infrastructure will be identified through collaboration with Arlington County and DC Water. The recommended mitigation measures will be in accordance with EPA's 2017 NPDES *Construction General Permit*, Virginia Erosion and Sediment Control Regulations, DDOE *Stormwater Management Guidebook*, the Anacostia Waterfront Development Zone, and Arlington County Stormwater Manual.

3.8.2. Wetlands and Other Waters of the U.S.

The mitigation section of this chapter will evaluate, for each alternative, avoidance and minimization options in accordance with USACE's "Mitigation Rule."[18] Compensatory mitigation alternatives for unavoidable impacts to wetlands and other waters of the U.S. will be evaluated under the applicable Federal, state, and local guidelines. Temporary impacts to be restored will be quantified by area, and descriptions of mitigation or restoration methods will be provided such as erosion and sedimentation control measures during restoration efforts to protect adjacent wetlands, removal of temporary fill, soil amendments, planting of wetland vegetation, and control of invasive species. Other potential mitigation elements designed to offset impacts to coastal resources (submerged aquatic vegetation, tidal wetlands,

[18] 33 CFR part 332, Compensatory Mitigation for Losses of Aquatic Resources. https://www.gpo.gov/fdsys/pkg/CFR-2012-title33-vol3/pdf/CFR-2012-title33-vol3-part332.pdf

submerged lands) will be closely coordinated with the associated resource agencies that regulate those areas and resources as described in this section.

3.8.3. Flood Hazards and Floodplain Management

If a proposed alternative will not meet the Federal, state, county, or District requirements, floodplain mitigation will be required. The EIS process will serve to satisfy the 8-step process outlined in FEMA regulations 44 CFR Chapter 9 to include an evaluation of floodplain and wetland mitigation requirements described in Chapter 9.11 (minimization of impacts and restoration/preservation of floodplain values). The mitigation will be based on the severity of the impacts on the natural and built environment.

3.8.4. Coastal Zone Management

Any required mitigation for RPA impacts will be developed in accordance with VDEQ *Riparian Buffers Modification and Mitigation Manual* planting recommendations or other mitigation deemed appropriate by the Arlington County Director of Environmental Services.

4.0 Geologic Resources

4.1. Overview and Definitions

This section describes the methodology used to evaluate impacts to geologic and soil resources within the Study Area. Geologic and soils resources include geologic formations or features such as point bar deposits, creek/river channels, sediments, and banks, and other coastal plain sediments that comprise the foundation upon which the Project will be constructed.

4.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- CWA/Water Quality Act of 1987 (33 USC 1251-1376) Sections 401 and 402
- Federal Water Pollution Control Act (Clean Water Act) of 1972 (33 USC 1251-1376) as amended by the Clean Water Act (1977) and the Water Quality Act (1987)
- U.S. SDWA of 1974 (42 USC 300f)
- U.S. EPA NPDES Construction General Permit
- EO 13508 Chesapeake Bay Protection and Restoration

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are no state, local laws and regulations for this resource.

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

4.3. Study Area

The Study Area will be based on the actual boundaries of the considered alternatives. For the river crossing, the study area will extend upstream and downstream for a distance that would be supported by the hydrologic and hydraulic study and scour analysis, as well as any areas identified for construction access or staging. The Study Area for the alternatives impacting lands outside the river crossing would be evaluated based on the construction footprint, including temporary construction access and staging, and downslope areas that may receive runoff from the project. The limits of the upland Study Area would also be supported by hydrologic and hydraulic studies that would be performed to analyze stormwater runoff from the proposed alternatives.

4.4. Data Sources

The analysis will be based on a review of available reports and data, such as subsurface investigations completed for the project or nearby projects, Natural Resources Conservation Service Soil Surveys, geologic mapping, reports, local GIS data, and hydrologic and hydraulic studies of the Project that will be produced as part of the engineering analysis.

4.5. Affected Environment

The Affected Environment section will describe the geologic and soil resources within the Study Area, including the features, location, and condition (wooded, grassed, denuded, steep slopes, etc.), and the total area (acres) within the Study Area. Estimates of the size and extent of the resources will be presented in tables and mapped using GIS. Defining the Affected Environment provides the foundation for developing and evaluating project alternatives, and identifying mitigation strategies. Key features of the resources will be further described and quantified by:

- Upland soil types, texture, percent slope, erodibility;
- Estuarine sediment types, texture, slope conditions, erodibility;
- Geomorphic features such as bars, channels, river banks, etc.; and
- Geological hazards such as faults or potential earthquake zones.

4.6. Environmental Consequences

Evaluation of direct and indirect impacts will identify and determine the likelihood that a proposed alternative for the Project would affect or impact geologic and soil resources. These impacts will be considered for both temporary and permanent impacts. Definitive determination of whether geologic and soil resources will be impacted using preliminary design information presents some unique challenges. For this reason, the EIS will clearly state the assumptions used to inform the assessment and outline what additional information would be used to address any unresolved questions about resource impacts, if necessary.

The following key topics will be considered and addressed in the analysis of geologic and soil resource impacts:

- Cut and fill activities and conditions that could lead to soil instability/erosion.
- Impervious surface increases and the resulting increased runoff and potential for downslope soil erosion.
- Structure installation (including piers) or temporary construction measures within the river that could lead to river scour, erosion/deposition, or alteration of existing river features (will require input from the flooding and hydrodynamic modeling).

4.7. Construction Impacts

To identify and evaluate the potential impacts of temporary construction activities and staging, the EIS will include the following information:

- Construction access, temporary staging, and stockpiling on unpaved surfaces that could lead to soil erosion and compaction.
- Construction activities in the river that could lead to alterations of the existing geomorphology of river sediments.

4.8. Mitigation

Based on the results of the impact assessment, the need for mitigation will be evaluated and recommendations will be provided. By evaluating the proposed grading plans and associated 3-D terrain models, recommendations will be made to ensure slope stability by placing, for example, temporary and permanent slope stabilization measures like biodegradable matting. Other tools that will be used for evaluating the need for mitigation include the results from the hydrologic and hydraulic modeling that could identify areas where concentrated flows may occur, locations of increased runoff velocities, and changed riverine conditions that could lead to scour or accretion within the river. Potential mitigation measures for these types of impacts could include installation of permanent velocity dissipaters and scour protection within receiving channels and the river. Mitigation measures will be identified and discussed for any unavoidable adverse impacts associated with the Proposed Action.

5.0 Solid Waste Disposal and Hazardous Materials

5.1. Overview and Definitions

The Project has the potential to encounter contaminated soils or groundwater, or to require the removal of waste material such as railroad ties, creosote-treated timbers, or demolition material. Refuse can also be generated from construction processes. Therefore, it will be necessary to identify and assess the potential impacts that solid waste and hazardous materials will have on the Project.

5.1.1. Solid Waste

Solid waste is the broader regulatory term that encompasses Resource Conservation and Recovery Act (RCRA) hazardous waste. The term solid waste does not imply the waste is non-hazardous. **Non-hazardous solid waste** is defined in the RCRA Section 4001 of Subtitle D as any "garbage or refuse, sludge for a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities."[19] Solid waste also includes construction debris and excavated soils. At a Federal level, non-hazardous industrial solid waste and municipal solid waste (MSW) are managed under the Solid Waste Program (RCRA Subtitle D), which sets criteria for municipal solid waste landfills and other solid waste facilities, and prohibits the open dumping of solid waste.[20] Ensuring that solid waste products and sites are managed in an environmentally sound manner is crucial to the protection of the environment and human health. Methods specific to hazardous waste are described in the section 5.1.2, Hazardous Materials.

As it relates to the Project, the FRA *Procedures for Considering Environmental Impacts,* under the topic of solid waste disposal, states, "The alternatives should be assessed with respect to State and local standards for sanitary landfill and solid waste disposal."[21] Under the topic of public safety, it states, "The EIS should assess the transportation or use of any hazardous materials which may be involved in the alternatives, and the level of protection afforded residents of the affected environment from construction period and long-term operations associated with the alternatives."

5.1.2. Hazardous Materials

The term **hazardous materials** will collectively be used to describe hazardous substances, as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); hazardous wastes, as defined by the RCRA; asbestos; and petroleum products. Occupational Safety and Health Administration (OSHA) also defines hazardous materials as any substance or chemical which is a "health hazard" or "physical hazard" as defined by 29 CFR part 1910.1200. The Project has the potential to encounter contaminated soils or groundwater during construction activities including but not limited to

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19 RCRA Laws and Regulations, https://www.epa.gov/rcra

20 United States Environmental Protection Agency. Undated. *Regulatory Information by Topic: Waste*. http://www2.epa.gov/regulatory-information-topic/waste#solid. Accessed June 5, 2017.

21 U.S. Department of Transportation, Federal Railroad Administration (FRA). 1999. *Procedures for Considering Environmental Impacts (64 FR 28545)*. https://www.gpo.gov/fdsys/pkg/FR-1999-05-26/pdf/99-13262.pdf. Accessed June 5, 2017.

trenching, excavation, and dewatering. There is also the potential that pre-existing waste materials, such as railroad ties, creosote-treated timbers, or demolition material, will require removal and proper disposal.

Transportation projects that include the purchase of new right-of-way, excavation, or structure demolition or modification have the potential to encounter hazardous materials. The presence or release of hazardous material on construction site can expose workers, residents, and other environmental media to contaminants. Hazardous materials encountered during the Project should be properly management to avoid cross contamination with uncontaminated media and the surrounding environment. In addition, failure to properly identify and assess hazardous material prior to and during construction can lead to project delays, injuries, facilities, costly clean-ups, and/or financial penalties.

The Hazardous Materials Transportation Act (49 USC 5101 et seq.) is applicable to the transportation of hazardous materials in commerce, including interstate and intrastate carriers. Hazardous materials in railroad cars can only be shipped by persons registered by the USDOT and the hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment. OSHA's Hazardous Communication Standard (HCS) also provides standards for hazardous material classification, labeling, and worker training.

5.2. Regulatory Context

5.2.1. Solid Waste

Federal Laws, Regulations, and Other Guidance

At a Federal level, non-hazardous industrial solid waste and MSW are managed under the Solid Waste Program (RCRA Subtitle D), which sets criteria for municipal solid waste landfills and other solid waste facilities, and prohibits the open dumping of solid waste.[22]

Relevant Federal laws, regulations, and EOs:

- RCRA of 1976 (42 USC 6901 et seq.; 40 CFR parts 239 - 282)
- CERCLA of 1980 (42 USC 9601 et seq.; 40 CFR parts 300 - 374)
- Emergency Planning and Community Right-to-Know Act (EPCRA) (42 USC 11001 et seq.; 40 CFR parts 350 - 372)
- Small Business and Liability Relief and Brownfields Revitalization Act of 2002 (42 USC 9601 et seq.)
- Solid Waste Disposal Act of 1965 (42 USC 9601 et seq.)
- Energy Policy Act of 2005 (42 USC 13201)
- American Recovery and Reinvestment Act of 2009 (Public Law 111-5)

[22] United States Environmental Protection Agency. Undated. *Regulatory Information by Topic: Waste*. http://www2.epa.gov/regulatory-information-topic/waste#solid. Accessed June 5, 2017.

- Toxic Substances Control Act (TSCA), 15 USC 2601-2692 including the Asbestos Hazard Emergency Response Action (AHERA)
- OSHA Lead in Construction Standard (29 CFR part 1926.62)
- RCRA and Superfund Amendments and Reauthorization Action, 42 USC 6901 et seq.
- Standards for the Use or Disposal of Sewage Sludge (40 CFR part 503) under the Clean Water Act (CWA) [23]
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Under RCRA, District of Columbia, and Virginia statutes, the District and Virginia have the authority to ensure safe and effective hazardous waste management and to establish a program of regulation over the generation, storage, transportation, treatment, and disposal of hazardous waste under DC Law 2-64, DC Code 8-1301 to 8-1322, and Virginia Code 10.1-1400 et seq. The District's Green Construction Code sets forth specific requirements related to solid waste diversion during construction projects.

Regional and local governments have been given the regulatory power to enact their own ordinances and develop regulations regarding solid waste management. Municipalities can control local solid waste sites and recycling centers.[24]

The Arlington County solid waste ordinances govern the storage, collection, transportation, processing, and disposal of solid waste as well as the recovery of recyclable materials and other resources from solid waste within Arlington County. The Fire Prevention Code indicates procedures for waste storage and handling.

Relevant State, Local Laws, and Regulations:

State

- District of Columbia Illegal Dumping Enforcement Amendment Act of 1994 (DC Law 10-117, DC Official Code § 8-901 et. seq.)
- Green Construction Code, Sections 406 and 503 of Title 12K of the District of Columbia Municipal Regulations (12K DCMR 406, 503)
- District of Columbia Hazardous Waste Regulations (20 DCMR Chapters 40-54)

[23] Pertains to land application (and biosolids composting), surface disposal, and combustion of biosolids (sewage sludge). Standards in this rule are also applicable to municipal solid waste compost.

[24] For more information, see https://www.epa.gov/landfills/municipal-solid-waste-landfills#whatis

- Government of the District of Columbia Department of Environment and Energy (DOEE) Control of Asbestos (Title 20 DCMR 800)
- Virginia Solid Waste Management Regulations (9 VAC 20-80-10 et seq.)
- Virginia Waste Management Act (Code of Virginia§ 10.1-1400 et seq.)

Local

- Fire Prevention Code (Arlington County Code 8.1, Ord No. 09-03)
- Garbage, Refuse and Weeds (Arlington County Code 10, Ord No. 93-22)

Relevant state and local guidance:

- Asbestos Notification Form, DOEE, Air Quality Division 10
- Asbestos Notification Form (Labor Laws of Virginia 4.01-51.0)

5.2.2. Hazardous Materials

Federal Laws, Regulations, and Other Guidance

The U.S. EPA is the Federal agency responsible for overseeing hazardous waste generation, storage, treatment, and disposal. The Hazardous Materials Transportation Act is applicable to the transportation of hazardous materials in commerce, including interstate and intrastate carriers. Hazardous materials in railroad cars can only be shipped by persons registered by the USDOT and the hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment.

Relevant Federal laws, regulations, and EOs:

- Clean Water Act (CWA) (33 USC 1251)
- Clean Air Act (CAA) (42 USC 7401)
- CERCLA of 1980 CERCLA (42 USC 1906)
- Spill Prevention, Control and Countermeasure (SPCC) Regulation (40 CFR part 112)
- RCRA (42 USC 6901)
- Hazardous Materials Transportation Act (49 USC 5101 et seq.)
- OSHA Standard for Hazardous Materials (Title 29 CFR part 1910 and part 1926)
- RCRA and Superfund Amendments and Reauthorization Action, 42 USC 6901 et seq
- US EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations, 40 CFR part 61

Relevant Federal guidance:

- FRA Operating Practices Compliance Manual (2012) [25]

State and Local Laws, Regulations, and Other Guidance

The DC Voluntary Cleanup Program (VCP) and the Virginia Voluntary Remediation Program (VRP) provide a framework for conducting the cleanup of any brownfield or site contaminated by hazardous substances that is not listed in the EPA National Priority List during property development in the event that the property owner, developer, or other entity did not cause or contribute to the contamination. In addition, under RCRA and District statutes, the District has the authority to ensure safe and effective hazardous waste management and to establish a program of regulation over the generation, storage, transportation, treatment, and disposal of hazardous waste under DC Law 2-64, DC Code 8-1301 to 8-1322.

Relevant State, Local Laws, and Regulations:

State

- Underground Storage Tank Management Act of 1990 (Title 20, DC Code § 8-113.01)
- District of Columbia Hazardous Waste Management Act of 1977, as amended (DC Law 2-64; DC Code §§ 8-1301 to 8-1322)
- District of Columbia Brownfields Revitalization Amendment Act of 2010 (DC Law 18-369; DC Official Code § 8-631 et seq.)
- Pesticide Operations Act of 1977 (DC Law 2-70; 20 DCMR Chapters 22-25)
- Virginia Hazardous Waste Management Regulations (9 VAC 20-60)
- Virginia Aboveground Storage Tank Regulations (9 VAC 25-91-10 to 25-91-220)
- Virginia Underground Storage Tanks: Technical Standards and Corrective Action Requirements (9 VAC 25-580 et seq.)
- Virginia Voluntary Environmental Assessment (Code of Virginia § 10.1-1198 et seq.)
- Virginia Brownfield Restoration and Land Renewal Act (Code of Virginia § 10.1-1230 et seq.)

Local

- The Arlington County Fire Prevention Code (Arlington County Code 8.1, Ord No. 09-03) contains hazardous materials permit requirements, spill notification procedures, and hazardous materials handling, storage, and transportation requirements.

5.3. Study Area

The analysis will be focused on the location of the project, the solid waste generated by the project or alternatives, properties that have the potential to impact construction activities, and solid waste

[25] For more information, see http://www.fra.dot.gov/Elib/Document/15640

disposal sites within the study area. The study area boundary consists of mostly public and government land within the 379-acre corridor surrounding the proposed bridge improvements and railroad infrastructure. However, hazardous waste generated from the Project will require disposal at regional disposal facilities that would be selected based on the type of solid waste requiring disposal, the landfill capacity, and waste characterization requirements. The study area is sufficient in size to:

- Capture the proposed Project elements detailed in the alternatives, which would include all aspects of construction;
- Evaluate related resources (for example, waterbodies that supply drinking water, critical habitats for endangered species, and high-density residential areas);
- Evaluate adjacent land uses to the Project or alternative footprint and construction areas, and identify land uses that could be particularly sensitive to impacts from solid wastes; and
- Identify regional disposal facilities where solid waste (including hazardous waste) generated within the Project Area will be disposed of.

5.4. Data Sources

5.4.1. Solid Waste

The analysis for solid waste is based on a review of available reports and data (for example, Federal and state statutes; resource agency, local, and regional agency policies and ordinances), GIS databases, maps, reports, modeling, fieldwork, and professional judgment. Fieldwork will be conducted as needed to validate GIS data, investigate data gaps, and verify impacts on resources on- and off-site. Information gained from fieldwork could include past and current uses of the site or inspection of the site and adjacent properties. Applicable site-specific agency coordination will be conducted when making decisions regarding fieldwork, for example, determining the preferred methods of gathering data.

Data sources include:

- National Priorities List (NPL);[26]
- EPA Cleanups in My Community online GIS tool;[27]
- RCRA Corrective Actions (CORRACTS);[28]
- RCRA Treatment, Storage, and Disposal Facilities (TSDFs);
- Site-specific topographic maps and hydrologic features maps for groundwater flow directions; and
- Construction phases and interim build conditions/transitions for project and ancillary improvements and stations.

[26] Available at https://www.epa.gov/superfund/national-priorities-list-npl-sites-state

[27] EPA, Cleanups in My Community Map. Accessed from https://ofmpub.epa.gov/apex/cimc/f?p=cimc:73::::71

[28] EPA, Corrective Action Sites Around the Nation. Accessed from https://www.epa.gov/hwcorrectiveactionsites

5.4.2. Hazardous Materials

An Environmental Data Collection Report, prepared in August 2016, reviewed available online information.

Data sources included:

- EPA Enviromapper;
- VDEQ Environmental GIS;
- DC Atlas;
- Virginia DEQ Voluntary Remediation Program (VRP);
- DC DOEE Voluntary Cleanup Program (VCP)
- EPA's Toxic Release Inventory (TRI)

The Environmental Data Collection Report identified 24 registered tanks, three TRI facilities, and three voluntary remediation sites within the Study Area. To evaluate properties within the Study Area that have the potential to impact the Project, further assessments will be conducted to evaluate impacts from off-site sources of hazardous materials. The standard environmental record sources provided in American Society for Testing and Materials (ASTM) 1527-13 *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* will be searched in proximity to the Study Area using the ASTM 1527-13 approximate minimum search distances (up to one mile for certain databases). From this research, off-site releases or hazardous materials-related listings with the potential to impact the Study Area within this search radius will be identified. Additional data sources (historical aerial photographs and topographic maps) may be used as necessary to supplement the database search. Should a property need to be acquired to facilitate the Project, a full ASTM Phase I Environmental Site Assessment will be conducted in accordance with ASTM 1527-13 for these properties prior to property acquisition.

A visual inspection of relevant properties within the Study Area will be conducted as needed to verify GIS data, investigate areas where data is lacking, identify any evidence of a release or threat of release of hazardous material in the environment, or monitor resources for potential impacts from construction activities.

Data sources include:

- Applicable Federal and state general plans and regulations
- Federal, state and local GIS databases
- Construction phases and interim build conditions/transitions for the Project and ancillary improvements, and stations

5.5. Affected Environment

5.5.1. Solid Waste

Solid waste disposal sites within the study area will be identified based on available data sources. A summary describing areas of importance within the Study Area will be generated and field work will be

conducted to address any data gaps. The Affected Environment section of the EIS will address all relevant past, current, and future solid waste disposal sites identified within the Study Area.

5.5.2. Hazardous Materials

The Affected Environment section of the EIS will document the following:

- The locations of potentially sensitive areas near the Study Area (such as schools, health care facilities, dependent care facilities, places of worship, etc.).
- A database search report purchased from a third-party data collection service and reviewed by the Project team for known contaminated sites and for sites containing or generating hazardous substances. As noted above, the records search will include databases that are generally consistent with ASTM 1527-13 *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. Additional data sources may be called upon as necessary to supplement the database search.
- A review of historical documentation, including historical aerial photographs and historical topographic maps.
- Potential sites located within the Study Area that may be impacted by hazardous and contaminated materials.

5.6. Environmental Consequences

5.6.1. Solid Waste

Evaluation of solid waste impacts will include both qualitative and quantitative methods for both direct and indirect impacts. Impacts will be presented by alternative, separating service or operational impacts from construction impacts. Environmental consequences will differ substantially based on the intensity and duration of impact. The analysis will include how the Project would manage solid waste and evaluate the impacts from solid waste disposal sites. Key topics and issues that will be considered, evaluated, and addressed in the analysis of solid waste include:

- The generation of new types solid waste during operations; and
- The relative sensitivity of existing areas and areas within the Study Area or alternatives to solid waste arising from operations, or maintenance.

5.6.2. Hazardous Materials

Evaluation of impacts will include qualitative and quantitative methods for direct and indirect impacts. Key topics that will be considered and addressed in the analysis of construction period impacts include:

- New sources of hazardous materials that would be introduced, such as potential contaminants associated with the operation of the alternative and hazardous materials stored or used at or along the Project Area (railroad greasers, traction power stations, etc.);
- Existing resources identified near the Project alternatives, which will be evaluated for potential impacts during construction; and

- Hazardous materials requiring disposal in railroad cars, which will be shipped by persons registered by the USDOT. Hazardous material will be properly classed, described, packaged, marked, labeled, and in condition for shipment.

5.7. Construction Impacts

5.7.1. Solid Waste

Construction impacts are those permanent impacts resulting from building the project, its associated infrastructure, and related physical changes. Construction processes that have the potential to generate solid waste will be identified and safety procedures to mitigate safety hazards associated with these processes will be summarized. Solid waste disposal impacts during the construction phase will be evaluated by:

- Determining LOD and evaluating the locations where solid waste mitigation will be required;
- Characterizing and quantifying solid waste to be disposed of by type, such as soil, construction debris, asbestos containing material (ACM), or any additional hazardous material, to the extent possible;
- Identifying processes being conducted in association with construction activities that will generate solid waste will be identified. A timeline will be compiled depicting when solid waste will be generated and where specifically it will occur during the construction and operations; and
- Performing hazardous building assessments for any building or structure that will be renovated or demolished as part of the Project, if possible, and depending on facility access. This includes the collection and analysis of samples. It also includes an inventory of the types, conditions, and quantities of potentially hazardous material and universal wastes, including, but not limited to, polychlorinated biphenyls (PCBs); lead paint; fluorescent light tubes; light ballasts; chlorofluorocarbons (CFCs) and refrigerants associated with heating, ventilation, and air conditioning (HVAC) systems; mercury switches; emergency light batteries; and exit signs.

5.7.2. Hazardous Materials

Hazardous material impacts during the construction phase will be evaluated as follows:

- LOD will be determined by developing a detailed plan outlining the planned construction staging areas. All mapping will be sufficient in scale to show the geographical relationship between the alternatives and construction impacts. The map will also depict major features immediately adjacent to the boundary.
- A detailed description of construction methods will be provided for the bridge construction and additional railroad infrastructure.
- Areas close to potential construction activities where the occupants or site workers are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants (in other words, sensitive receptors) will be identified. Examples of sensitive receptors include a potential drinking water aquifer, schools, hospitals, and residents.

- Types of hazardous materials likely to be encountered during construction will be characterized. Documented hazardous waste sites that have the potential to be encountered during construction will be noted, including the types of contaminants likely to be encountered.
- Best practices to properly address any spills that may occur during construction will be documented to minimize exposure to hazardous materials during construction.

5.8. Mitigation

Following the results of the impacts assessment, the need for solid waste and hazardous materials mitigation will be evaluated in association with construction activities, and preliminary mitigation recommendations will be provided to reflect all applicable regulations. If contaminated soils or groundwater, or hazardous vapors, are anticipated to be encountered during construction of the Project, appropriate site remediation techniques or other measures to prevent exposure will be proposed. For instance, preparation of a Health and Safety Plan will be recommended to protect construction workers and the public from potential exposure. Additionally, a hazardous waste contingency plan will be recommended in the event that solid or hazardous waste are encountered during construction.

To supplement, whenever possible, additional best practices to properly manage solid wastes (including hazardous waste and Universal Wastes) generated during construction will be implemented to mitigate impacts to nearby properties, residents, site occupants, and on-site workers. These mitigation strategies may include personal protective equipment (PPE), administrative controls, special handling procedures, dust and particulate control, and management and disposal of contaminated soil and groundwater in compliance with Federal and local regulations. State hazardous waste regulations will be adhered to prevent release during transport and proper disposal in a landfill or incinerator permitted to receive or treat the waste. All mitigation measures will be developed to prevent construction delays and to provide adequate protection to workers and any nearby sensitive receptors.

6.0 Transportation

6.1. Overview and Definitions

The transportation analysis will analyze potential operational and construction-period impacts to the existing transportation system from the Project alternatives. Impacts will be analyzed across all transportation modes in the Study Area, including passenger and freight railroad (Amtrak, VRE, Maryland Area Regional Commuter [MARC], CSX Transportation [CSXT], and Norfolk Southern [NS]), the surrounding road network, the pedestrian and bicycle system, the marine transportation system, and the transit system (Metrorail and local bus operations).

This section includes the methodology used to evaluate impacts to navigation within the Study Area. Federal regulations define navigable waterways as "waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 CFR part 329.4). In addition, there is a Federal channel within the Study Area and any proposed alterations of a USACE Federally authorized civil works project must be approved by the USACE (33 USC 408).

6.2. Regulatory Context

Major modes of transportation in this assessment have a primary Federal agency responsible for the development, evaluation, and environmental review specific to that mode. These Federal agencies fall under the USDOT, which is responsible for transportation across the U.S. These Federal agencies include the:

- FRA, which has regulatory oversight over passenger (intercity and commuter) and freight railroad services (infrastructure, operations and equipment);
- Federal Transit Administration (FTA), which manages transportation funding for the various state and local transit agencies (including commuter rail);
- Federal Highway Administration (FHWA), which manages highways, bridges, and tunnels and provides research and technical assistance to transportation agencies;
- United States Coast Guard (USCG), which oversees navigable waterways29; and
- Federal Aviation Administration (FAA), which regulates the travel of people and goods through the air and airports.

[29] USCG. 2014. *Memorandum of Understanding between the U.S. Coast Guard, the Federal Highway Administration, the Federal Transit Administration, and the Federal Railroad Administration to Coordinate and Improve Bridge Planning and Permitting.*

- National Park Service (NPS) controls certain roadways within the Study Area; NPS also has applicable regulations for this review.

Federal Laws, Regulations, and Other Guidance

The *FRA Procedures for Considering Environmental Impacts* (64 CFR part 101) require that an EIS evaluate "impacts on transportation: of both passengers and freight; by all modes, including the bicycle and pedestrian modes; in local, regional, national, and international perspectives; and including impacts on traffic congestion."[30] As mentioned previously, NPS also has regulations pertaining to transportation within national parks.

Relevant Federal laws, regulations, and EOs:

- Section 9 of the Rivers and Harbors Act of 1899 (33 USC 403; 33 CFR part 321)
- Section 14 of the River and Harbors Act of 1899 (33 USC 408)
- General Bridge Act of 1906 (33 USC 491 – 498)
- Regulations for Drawbridges (33 USC 499)
- Truman-Hobbs Act (33 USC 511 – 524)
- General Bridge Act of 1946 (33 USC 525 – 533)
- International Bridge Act of 1972 (33 USC 535 – 535i)
- Coast Guard Aids to Navigation (14 USC 81 and 85)
- National Park Service Regulations (36 CFR parts 4 and 5)
- National Park Service Management Policies 2006, Section 9.2 (Transportation Systems and Alternative Transportation)
- Act of April 25, 1808, ch 15 Stat. 1. *An Act authorizing the erection of a bridge over the river Potomac within the District of Columbia*[31]
- Act of June 21, 1870, ch 141, 142 Stat. 1. An Act supplementary to an Act entitled "An Act to authorize the Construction, Extension (Extension, Construction) and Use of a lateral Branch of the Baltimore and Potomac Railroad Company into and within the District of Columbia," approved February five, eighteen hundred and seventy (sixty-seven).[32]

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30 Federal Railroad Administration, *Procedures for Considering Environmental Impacts* (64 F.R. 101, 28545 (10)(b)(13).

31 Tenth Congress, Session I, Chapter 15. 1808. An Act authorizing the erection of a bridge over the river Potomac within the District of Columbia. https://www.loc.gov/law/help/statutes-at-large/10th-congress/c10.pdf. Accessed on October 23, 2017.

32 1870, An Act supplementary to an Act entitled "An Act to authorize the Construction, Extension (Extension, Construction) and Use of a lateral Branch of the Baltimore and Potomac Railroad Company into and within the District of Columbia". https://www.loc.gov/law/help/statutes-at-large/41st-congress/session-2/c41s2ch142.pdf. Accessed on October 23, 2017.

- 1901, An Act To provide for eliminating certain grade crossings on the line of the Baltimore and Potomac Railroad Company, in the city of Washington, District of Columbia, and requiring said company to depress and elevate its tracks and to enable it to relocate parts of its railroad therein, and for other purposes. Fifty-sixth Congress Session II, Chapter 353[33]

Relevant Federal guidance:

- Act of February 12, 1901, ch 353 Stat. 1. Federal and Local Legislation Relating to Canals and Steam Railroads in the District of Columbia[34]

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- Arlington County Code, Title 22, Street Development and Construction[35]

Relevant state and local guidance:

State

- DDOT *Design and Engineering Manual*[36]
- DDOT *Pedestrian Safety and Work Zone Standards – Covered and Open Walkways*[37]
- DDOT *Public Realm Manual*[38]
- DDOT *DC Temporary Traffic Control Manual*[39]

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[33] 1901, An Act To provide for eliminating certain grade crossings on the line of the Baltimore and Potomac Railroad Company, in the city of Washington, District of Columbia, and requiring said company to depress and elevate its tracks and to enable it to relocate parts of its railroad therein, and for other purposes. Fifty-sixth Congress Session II, Chapter 353. https://www.loc.gov/law/help/statutes-at-large/56th-congress/session-2/c56s2ch353.pdf. Accessed on October 23, 2017.

[34] U.S. Government Printing Office. 1903. Federal and Local Legislation Relating to Canals and Steam Railroads in the District of Columbia, 1802-1903. https://play.google.com/books/reader?id=vEkEAAAAMAAJ&printsec=frontcover&output=reader&hl=en&pg=GBS.PA3. Accessed on October 23, 2017.

[35] Arlington County Code. Title 22- Street Development and Construction. https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/22/2016/04/Chapter-22-STREET-DEVELOPMENT-AND-CONSTRUCTION.pdf

[36] District Department of Transportation. 2009. *Design and Engineering Manual.* https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_design_and_engineering_manual_04-2009.pdf. Accessed June 6, 2017.

[37] District Department of Transportation. 2007. *Pedestrian Safety and Work Zone Standards – Covered and Open Walkways.* https://dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/pedestrian_safety_and_work_zone_standards_covered_and_open_walkways_july_2010.pdf. Accessed June 6, 2017.

[38] District Department of Transportation. 2011. Public Realm Manual. https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_public_realm_design_manual_2011.pdf. Accessed June 6, 2017.

[39] District Department of Transportation. 2006. DC Temporary Traffic Control Manual – Guidelines and Standards. https://comp.ddot.dc.gov/Documents/Temporary%20Traffic%20Control%20Manual.pdf. Accessed June 6, 2017.

- DDOT *Comprehensive Transportation Review Guidelines*[40]
- Virginia Department of Transportation (VDOT) *Traffic Engineering Design Manual*[41]

Local

- WMATA Adjacent Construction Project Manual[42]

Regional and Local Laws and Regulations

Regional and local governments have been given the regulatory power to enact their own ordinances and regulations regarding transportation. Metropolitan Planning Organizations (MPOs) are Federally mandated organizations comprised of government and local officials that set transportation priorities. The local MPO in the Project Area is the MWCOG.

6.3. Study Area

The Study Area for impacts to the transportation network will be sufficient to assess potential physical impacts to roads, railroad and transit lines, and trails in proximity to the proposed alternatives, as well as potential operational impacts. These impacts will be considered both for the long term and during construction.

6.3.1. Project Area

The Project Area includes the tracks, signals, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way owned by CSXT from the Rosslyn (RO) Interlocking in Arlington, VA, to the L'Enfant (LE) Interlocking in the District. All affected infrastructure in the Project Area is owned by CSXT.

6.3.2. Local Study Area

The local Study Area will include the Project Area and one-half mile immediately adjacent to the construction footprint. It will include the tracks, signals, bridges, and related railroad infrastructure being modified by the Project as described above. In addition, it will also include roads, intersections, trails, sidewalks, and waterways that would be impacted by the construction activities of the project. The local Study Area for transportation impacts will likely require adjustment depending on the alternative being assessed.

The Study Area will be based on the actual boundaries of the considered alternatives. For considering navigational impacts, the Study Area will extend upstream and downstream for a distance of 1000 feet

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[40] District Department of Transportation. 2012. DDOT Guidelines for Comprehensive Transportation Review (CTR) Requirements. https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/ddot_comprehensive_transportation_review_requirements_2012.pdf. Accessed June 6, 2017.

[41] Virginia Department of Transportation. 2014. Traffic Engineering Design Manual. http://www.virginiadot.org/business/resources/LocDes/VDOT_Traffic_Engineering_Design_Manual/TEDM_TOC.pdf. Accessed June 19, 2017.

[42] Washington Area Metropolitan Transit Authority, Adjacent Construction Project Manual. Accessed from https://www.wmata.com/business/adjacent-construction/upload/ACPM-Rev-5a-09-21-15.pdf. Accessed on December 15, 2017.

from the upstream and downstream limits of the alternatives, since the proposed bridge work has the potential to alter existing navigational corridors due to modified span openings, pile fendering systems, and localized current alterations. For the purposes of evaluating boat traffic, marinas outside the Study Area will also be identified.

6.3.3. Regional Study Area

The regional Study Area includes the jurisdictions covered within the MWCOG that are considered for that MPO's Constrained Long Range Plan.

6.4. Data Sources

The data necessary to understand railroad operations will be collected and evaluated, from CSXT, Amtrak, VRE, Virginia Department of Rail and Public Transport (DRPT), and DDOT:

Data sources include:

- Existing and future capacity of the Long Bridge (incorporating current and future passenger railroad, commuter railroad, and freight railroad traffic);
- Train control and signaling systems present in the Study Area;
- Current station dwell times within the Study Area;
- Current service stopping patterns;
- Passenger loading levels during the peak hour of service;
- Any operational railroad issues within the Study Area; and
- Forecasted growth and capacity using appropriate analysis tools.

To understand operations, data will be collected and evaluated related to the surrounding transportation network, including roadway operations, trail usage, and future transportation capacity improvements. This analysis will include reviewing available reports (for example, long-range transportation plans, state railroad plans, and system plans), GIS databases, maps, travel modeling, historical data, and professional judgment.

Data sources include:

- Arlington County Geographic Information Systems (GIS) Data
- District of Columbia GIS Data
- NPS GIS Data
- DDOT daily bicycle counts
- NPS daily bicycle counts
- Arlington County daily bicycle counts
- DDOT vehicle counts (volume and turning movement for 2017)
- Arlington County vehicle counts (volume and turning movement for 2017)

- Metropolitan Washington Council of Governments (MWCOG) Transportation Planning Board (TPB) MWCOG TPB Version 2.3 Travel Model
- MWCOG Constrained Long Range Plan
- I-395 Express Lanes microsimulation model
- moveDC (District of Columbia Long Range Transportation Plan)
- District of Columbia Vision Zero Action Plan
- TransAction 2040 (Northern Virginia Long Range Transportation Plan)
- Arlington County Transportation Master Plan
- NPS National Capital Region Comprehensive Long Range Transportation Plan
- NPS National Capital Region Paved Trail Plan
- Virginia State Rail Plan
- District of Columbia State Rail Plan
- VRE System Plan 2040
- MARC Growth and Investment Plan
- CSXT National Gateway Plan
- Southeast High-Speed Rail Corridor Tier 1 EIS
- United States Coast Guard navigable waterway data
- Railroad schedules (Amtrak, VRE, CSXT, Norfolk Southern, and MARC)
- Maryland Avenue Transportation Study[43]
- WMATA's as-builts and ridership data

Field-collected data may be necessary depending on the alternatives assessed and potential for impacts. These could include turning movement counts, volume data (auto, bike, pedestrian, or boat), parking regulations, or path observations.

The navigation analysis will be based on a review of available surveys and charts, including the National Oceanic and Atmospheric Association (NOAA) nautical chart 12289, USACE hydrographic survey, and other relevant data or surveys.

An understanding of the type of vessels that navigate this portion of the river and the frequency of use will be important in evaluating the level of impacts on navigation. This information will be gathered through discussions with local waterway law enforcement officials, including the USCG, District of Columbia DC Harbor Patrol, and game and fish officials that patrol these waters.

[43] Maryland Avenue Transportation Study. Accessed from https://ddot.dc.gov/page/maryland-avenue-sw-transportation-study. Accessed on December 14, 2017.

6.5. Affected Environment

The Affected Environment section will identify current transportation facilities and services based on GIS data, field reviews, and transportation plans. The transportation analysis will address the various modes of travel within the study and how those modes affect the surrounding road network, sidewalks, bike system, transit system, and railroad.

A summary describing the existing resource conditions and areas of importance within the study area will be developed using the data sources listed above. This section will:

- Document the existing railroad infrastructure and operations, identifying different services and the number of trains;
- Document the existing roadway network, highlighting important transportation corridors;
- Perform an operational analysis of the existing roadway network within the Study Area and report the level of service at both signalized and unsignalized intersections;
- Identify current parking areas (on- and off-street) within the Study Area, and the type of parking provided (for example, metered, time-restricted, no parking);
- Document the existing pedestrian and bicycle facilities, including sidewalks, crosswalks, bike lanes, bike routes, cycletracks, bikeshare locations, and trails;
- Identify and document the existing transit routes, including both infrastructure (stations, stops, tracks, etc.) and operations;
- Document existing commercial and recreational marine activity; and
- Document established local, MPO, and regional policies, goals, and objectives.

Navigational conditions within the Study Area will be delineated graphically using the USACE survey and mapping that define the Federal channel limits, existing depths, and design depths. Additional information will be added to the condition map regarding nearby navigational obstructions including current bridge clearances, both horizontal and vertical, published on NOAA nautical chart 12289. Other details that will be considered include river currents, flood levels, and normal tide fluctuations, all of which is data available from NOAA.

6.6. Environmental Consequences

Based on the Long-Range Service Plan(s) for Amtrak, CSXT, VRE, MARC, and NS, the analysis will determine the potential impacts of the Build Alternatives on future railroad operations in the build year (2040). The analysis will also identify operational issues outside the Study Area that may impact existing conditions, opening, and design year operations. As necessary, the analysis will update the Long-Range Service Plan(s) with any changes in service provider plans or other conditions that have occurred between the previous studies and NEPA development. It will also evaluate impacts from alternatives to the roadway network, marine travel, sidewalks, bicycle system, and transit system.

Evaluation of transportation impacts will include qualitative and quantitative methods for both direct and indirect impacts. These impacts will be considered for both temporary (for example, construction staging) and permanent (permanent structures) impacts.

The multimodal task may involve multiple, parallel analyses that will be developed based on the assessment of impacts associated with each alternative. Those alternatives that do not impact the roadway, sidewalk, or bicycle networks may not require more than a qualitative review of how the alternatives impacts those systems. Alternatives that would have more substantial impacts to specific intersections or roadway and trail networks would necessitate a higher level of assessment. The level of assessment—macro versus micro—would need to be determined based on the scale of the impact (for example, impacting a ramp from the 14th Street Bridge would likely require both a macro and a micro assessment using VISSIM to understand the impacts, while temporarily losing a lane on a street may only require SimTraffic and Synchro).[44,45]

Each Build Alternative will be compared to the No Action Alternative in the build year (2040). Future demand for traffic of all modes must be considered for the build year. In accordance with FRA Environmental Procedures, the EIS will assess the impacts of each alternative on local and regional transportation networks. Impacts to both system operations (such as, new or increased congestion) and physical infrastructure (such as, closure or a street or trail) will be determined. The scale and duration of the impact will also be determined. These impacts may include indirect effects as a result of the Project. Indirect impacts include impacts on the transportation system as a result of development pattern changes that indirectly result from the Project. Where the potential for adverse impacts on transportation is identified, mitigation to avoid or minimize these impacts will be discussed. Mode-specific impacts will be assessed for:

- Passenger and freight railroad infrastructure and operations
- Roadway network within the LOD
- Vehicular circulation/operations
- Marine traffic
- Pedestrian and bicycle facilities within the LOD
- Pedestrian and bicycle activity
- Parking
- Public transit infrastructure and operations

Potential benefits to the transportation network in terms of enhanced multimodal connectivity, safety, and impacts to the railroad network will also be analyzed.

The analysis of impacts to navigation will be conducted in accordance with the *Memorandum of Understanding (MOU) between the U.S. Coast Guard and Federal Highway Administration and Federal Transit Administration and Federal Railroad Administration to Coordinate and Improve Bridge Planning and Permitting*, signed January 14, 2014. The MOU requires that FRA, concurrent with the NEPA

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[44] Synchro and SimTraffic are a traffic analysis, optimization, and simulation software produced by Trafficware. Synchro is used to perform macroscopic analyses and optimization of both signalized and unsignalized intersections. SimTraffic is a microsimulation program suitable for corridor or small network traffic simulations.

[45] VISSIM is a multimodal microsimulation program developed by PTV. The program simulates the individual movements of cars, trains, persons, bicycles and the interactions between each to assess impacts to traffic operations.

alternatives analysis, analyze the navigational impacts of bridge design alternatives and, based on this analysis, prepare a navigational impact report.

Evaluation of impacts for the EIS will identify and determine the likelihood that a Proposed Alternative for the Project would affect or impact navigation within the Project Area. These impacts will be considered for both temporary (such as construction staging) and permanent (for example, permanent structures) impacts.

The following key topics will be considered and addressed in the analysis of navigational impacts:

- Changes to the navigational opening of the bridge;
- Whether navigational access will be reduced or restricted by the alternatives as compared to current levels of navigational access; and
- Size and types of vessel that will be impacted.

6.7. Construction Impacts

Construction impacts for the local transportation analysis will focus on the change in travel conditions from construction activities, specifically, road, sidewalk, and trail closures as well as altered public transportation schedules or operations, and impacts to railroad operations. These impacts will be broadly discussed in terms of location, duration, and type of activity (both transportation and construction activity).

Each Build Alternative will be assessed for the construction period impacts on transportation networks, including the railroad network. The assumptions for how existing infrastructure and operations will be maintained during the construction period will be documented. Construction phasing assumptions, including construction staging, impacts to railroad operations, and road closures, will be developed as part of the engineering analysis. Based on these assumptions, impacts to railroad operations, construction-related traffic volumes, potential lane closures, and traffic pattern changes will be assessed. Impacts on existing and future transportation modes in the Study Area will be discussed, including vehicular circulation and parking, pedestrian and bicycle activity, and public transportation services. Specific methodological steps include:

- Estimating truck trips during the construction period based on construction methods and schedules determined during the Project's constructability analysis;
- Assessing traffic closures and required detours during construction;
- Identifying and assessing truck traffic routes serving the construction site and for hauling construction materials;
- Assessing changes to multimodal transportation patterns due to the impacts of different phases of the construction;
- Identifying impacts to marine travel from water-based construction activities; and
- Determining whether temporary construction barges or work area closures could result in temporary navigational impacts, the duration of any impacts, and the size or type of vessel(s) potentially impacted.
- Determining potential temporary construction impacts to air navigation.

6.8. Mitigation

The mitigation will be based on the results of the impact assessment. If adverse impacts are identified, mitigation to the extent practicable will be developed that will account for the severity (scale and duration) of the impacts on the multimodal transportation network. Mitigation will be considered for vehicular, pedestrian, bicycle, marine, transit, and railroad modes, as appropriate. Potential mitigations measures may include the replacement or construction of new transportation facilities to address the permanent closure or reduction in capacity to segments of the transportation network, modifications to signal systems or other operational changes, and improvements to wayfinding. Transportation measures that mitigate Project impacts while minimizing their own environmental impacts will be prioritized.

Potential mitigation measures for impacts to navigation include an improved system of navigational aids and lighting along with pile fendering system(s). Mitigation measures will be identified and discussed for any unavoidable adverse impacts associated with the Proposed Action.

7.0 Air Quality

7.1. Overview and Definitions

This section defines the air quality resource category set forth by the U.S. EPA and the Clean Air Act (CAA), and introduces the methodology for determining existing conditions and assessing impacts. The air quality assessment quantifies and summarizes the National Ambient Air Quality Standards (NAAQS) criteria pollutants and hazardous air pollutants (HAP) emissions resulting from the construction and operation of the Project and the corresponding effect on ambient air. **Air pollution** is a general term that refers to one or more substances determined to degrade the quality of the atmosphere. Seven main air pollutants have been identified by the EPA as being of nationwide concern, based on their potential effect on human health:

- Carbon monoxide (CO)
- Sulfur oxides (SOx), including sulfur dioxide (SO_2)
- Nitrogen oxides (NOx)
- Ozone (O_3)
- Particulate matter sized 10 micrometers or less (PM_{10})
- Particulate matter sized 2.5 micrometers or less ($PM_{2.5}$)
- Lead (Pb)

These pollutants (NOx in the form of NO_2 and SOx in the form of SO_2) may be referred to collectively as Criteria Pollutants.

7.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

The CAA and Conformity Rule are the primary legislation regulating air quality; both play a role in setting the nation's air quality standards for pollutants and adopting emission control programs. The CAA authorizes the EPA to "protect public health by regulating emissions of harmful pollutants." NEPA also requires the analysis of potential impacts in terms of the project's context, intensity, and duration. The FRA *Procedures for Considering Environmental Impacts* states that an environmental document should consider possible impacts on air quality.[46] These regulations and the regulatory agencies associated with each are outlined in the following sections.

[46] U.S. Department of Transportation, Federal Railroad Administration (FRA). May 26, 1999. *Procedures for Considering Environmental Impacts (64 FR 28545)*. https://www.gpo.gov/fdsys/pkg/FR-1999-05-26/pdf/99-13262.pdf. Accessed June 5, 2017.

Criteria Pollutants

Under authority of the CAA, EPA has established NAAQS for criteria pollutants to protect the public health and welfare. **Ambient air** is generally defined as the portion of the atmosphere, external to buildings, to which the general public has access. The criteria pollutants which are of significance to the transportation sector include CO, NO_2, O_3, PM_{10}, and $PM_{2.5}$. The criteria pollutants which are not of significance to the transportation sector include SO_2 and Pb. These pollutants are generally not emitted in substantial quantities by the transportation sector since regulations have limited the amount of sulfur and lead allowed in the composition of fuels. The NAAQS are summarized in Table 7-1.

Table 7-1 | National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary Standard	Secondary Standard	Form
Carbon Monoxide (CO)	8-hour	9 ppm	-	Not to be exceeded more than once per year
	1-hour	35 ppm	-	
Nitrogen Dioxide (NO_2)	1-hour	100 ppb	-	98th percentile of daily maximum concentrations, averaged over 3 years
	1-year[a]	53 ppb	53 ppb	Annual Mean
Ozone	8-hour[b]	0.070 ppm	0.070 ppm	Annual 4th highest daily maximum concentration, averaged over 3 years
Particulate Matter 2.5 (PM2.5)	1-year	12 µg/m^3	15 µg/m^3	Annual mean, averaged over 3 years
	24-hour	35 µg/m^3	35 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter 10 (PM10)	24-hour	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	1-hour[c]	75 ppb	-	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	3-hour	-	0.5 ppb	Not to be exceeded more than once per year
Lead (Pb)	Rolling 3-month average[d]	0.15 µg/m^3	0.15 µg/m^3	Not to be exceeded

Source: EPA 2016a

a The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

b Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

c The previous SO2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO2 standards or is not meeting the requirements of a SIP call under the previous SO2 standards (40 CFR part 50.4(3)). A SIP call is an USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

d In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
(ppm) – parts per million; (ppb) – parts per billion; (µg/m3) – micrograms per cubic meter

The EPA assesses an area's attainment of the NAAQS by classifying the area under four designations: Attainment, Nonattainment, Maintenance, and Unclassifiable. An Attainment designation occurs when an area's ambient air concentrations are below the respective NAAQS. Nonattainment areas have ambient air concentrations of criteria pollutants that are greater than the NAAQS. A Maintenance designation indicates that an area has recently achieved Attainment after being previously designated as a Nonattainment area. An Unclassifiable designation specifically refers to an area where insufficient data exists to decide as to Attainment or Nonattainment. Unclassifiable areas are generally treated as Attainment areas.

Should an area be designated as Nonattainment, a State Implementation Plan (SIP) is required to demonstrate a pathway back to NAAQS compliance. A SIP identifies how the state will attain and/or maintain the primary and secondary NAAQS, including federally-enforceable requirements. There is a SIP for the District of Columbia and the Commonwealth of Virginia. The Long Bridge Project is in the District of Columbia and Arlington County, which have been designated as Nonattainment areas for 8-hour ozone and Maintenance areas for CO and $PM_{2.5}$.

Projects that are proposed in a Nonattainment or Maintenance area must show conformity with the SIP. Conformity is showing agreement to a SIP's purpose of reducing the severity of or eliminating the NAAQS violation(s) in the area. Conformity requires that a project will not:

- Cause or contribute to any new violation of the NAAQS;
- Increase of the frequency or severity of any existing violation of the NAAQS; or
- Delay the attainment of the NAAQS.

EPA promulgated the final General Conformity regulations at 40 CFR part 93 Subpart B for all Federal activities except those covered under Transportation Conformity. FRA activities are not covered under Transportation Conformity as Transportation Conformity only addresses air pollution from on-road mobile sources and projects that are exempt include specific projects under the categories of safety, mass transit, air quality.[47] Therefore, General Conformity regulations apply to the Long Bridge Project. Federal conformity for projects being reviewed by the FRA is subject to "General Conformity." The EPA has established *de minimis* thresholds to help determine whether a General Conformity determination is required. These thresholds are presented in Table 7-2.

[47] U.S. Department of Transportation, Federal Highway Administration, Transportation Conformity, https://www.fhwa.dot.gov/environment/air_quality/conformity/, Accessed July 25, 2017.

Table 7-2 | General Conformity De Minimis Emission Levels

Pollutant	Tons per Year	Area Type
Ozone (Volatile Organic Compound [VOC] or NOx)	50	Serious Nonattainment
	25	Severe Nonattainment
	10	Extreme Nonattainment
	100	Other Areas Outside an Ozone Transport Region
Ozone (NOx)	100	Marginal and Moderate Nonattainment Inside an Ozone Transport Region
	100	Maintenance
Ozone (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
Carbon Monoxide (CO), Sulfur Dioxide (SO_2) and Nitrogen Dioxide (NO_2)	100	All Nonattainment and Maintenance
Particulate Matter 10 (PM_{10})	70	Serious Nonattainment
	100	Moderate Nonattainment and Maintenance
Particulate Matter 2.5 ($PM_{2.5}$)[a]	100	All Nonattainment and Maintenance
Lead (Pb)	25	All Nonattainment and Maintenance

Source: EPA 2016b

A Direct emissions, SO_2, NOx, (unless determined not to be a significant precursor), VOC or ammonia (if determined to be a significant precursor)

An analysis of the estimated potential emissions (described in Section 7.5) of the Build Alternatives will be compared to the *de minimis* emissions levels of Table 7-2. If annual direct emissions are less than the *de minimis* thresholds, then the Project complies with General Conformity. The applicability of General Conformity only considers the pollutants in nonattainment and maintenance areas for the District of Columbia and Arlington County.

Mobile Source Air Toxics

Most air toxics originate from human-made sources, including onroad- mobile sources, non-road mobile sources such as combustion engines used in vehicles, locomotives, and construction equipment. Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants.

The EPA assessed this expansive list in its rule on the *Control of Hazardous Air Pollutants from Mobile Sources,* and identified a group of 93 compounds emitted from mobile sources that are part of EPA's

Integrated Risk Information System (IRIS).[48] In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the *2011 National Air Toxics Assessment* (NATA).[49] These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics (MSAT), the list is subject to change and may be adjusted in consideration of future EPA rules.

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. Neither the EPA nor the FRA have released guidelines for quantitatively assessing the air toxics emissions of railroad sources. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA. For this Project, MSAT analysis will be based on interim guidance released by FHWA.

Relevant Federal laws, regulations, and EOs:

- CAA (42 USC 7401)
- Conformity Rule (40 CFR parts 51 and 93)
- NAAQS (40 CFR part 50)
- Control of Hazardous Air Pollutants from Mobile Sources 2007 (72 FR 8427)[50]
- Council on Environmental Quality, Regulations for Implementing the Procedural Provision of the Nation Environmental Policy Act (40 CFR parts 1500-1508)

Relevant Federal guidance:

- FHWA Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents[51]

State and Local Laws, Regulations, and Other Guidance

The District DOEE enforces the District's air quality regulations. The purpose of the regulations is to prevent or minimize emissions into the atmosphere to protect and enhance the quality of the District's air resources. These regulations apply to:

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[48] U.S. Environmental Protection Agency. February 26, 2007. *Control of Hazardous Air Pollutants from Mobile Sources (72 FR 8430).* https://www.gpo.gov/fdsys/pkg/FR-2007-02-26/pdf/E7-2667.pdf. Accessed June 7, 2017 and U.S. Environmental Protection Agency. *Integrated Risk Information System.* https://www.epa.gov/iris. Accessed June 6, 2017.

[49] U.S. Environmental Protection Agency. *National Air Toxics Assessment.* https://www.epa.gov/national-air-toxics-assessment. Accessed June 6, 2017.

[50] U.S. Environmental Protection Agency. 2007. *Final Rule for Control of Hazardous Air Pollutants from Mobile Sources.* https://www.epa.gov/mobile-source-pollution/final-rule-control-hazardous-air-pollutants-mobile-sources. Accessed June 6, 2017.

[51] Federal Highway Administration (FHWA). October 18, 2016. *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.* Memorandum.

- Controlling emissions from both stationary sources and mobile sources to the extent allowed by Federal regulations and the CAA.
- Controlling fugitive dust or non-point particulate matter emission into the atmosphere that results from a mechanical disturbance such as dust blown into the air from a dirt pile by the wind, or particles becoming airborne as a result of vortexes created by tires of passing vehicles (re entrained). Fugitive dust is typically of concern during construction activities and, per the regulation, must be controlled for unpaved roads, unpaved parking lots, transport of dusty material, demolition, and other scenarios likely to involve fugitive dust emissions.
- Controlling on-road engine and non-road diesel engine idling.

Virginia's ambient air quality standards are reflective of the NAAQS outlined in **Error! Reference source not found.**. VDOT has developed extensive guidance for conducting air quality analysis related to mobile source emissions at a project-level to demonstrate Transportation Conformity. Since FRA is generally not subject to Transportation Conformity, the Long Bridge Project will demonstrate compliance with the District and Virginia's State Implementation Plans (SIPs) and budgets by demonstrating General Conformity.

Arlington County does not have regulations or ordinances that govern air pollutant emissions. Air quality is instead primarily regulated at the state level.

Relevant State, Local Laws, and Regulations:

- DC DCMR at Title 20, *Environment,* Chapters 1 through 15
- 20 DCMR 605, *Control of Fugitive Dust*
- 20 DCMR 900, *Onroad Engine Idling and Nonroad Diesel Engine Idling*
- 20 DCMR 1501, *General Conformity*
- District of Columbia State Implementation Plan
- 9 VAC 5-30, Virginia's Ambient Air Quality Standards
- 9 VAC 5-160, *Regulation of General Conformity*
- Virginia State Implementation Plan

Relevant state and local guidance:

- *Project-Level Air Quality Analysis Resource Document*, Version 1.0, VDOT, April 2016

7.3. Study Area

The Study Area is the area in which all environmental investigations specific to air quality are conducted to determine the resource characteristics and potential impacts of the Project segment. The documentation of existing conditions will include a definition of the Study Area with regard to air quality, the attainment status for each pollutant in that area, state or local plans as well as agencies responsible for addressing air quality where necessary, and data on existing ambient air quality. Determining the exact boundaries of a study area will depend on the size of a project, resource mobility, public safety and habitat. The Study Area will be sufficient in size to incorporate:

- Project description, including linear and sited facilities, stations, operations, and ancillary improvements;
- Regional context, including air quality attainment plans and SIP status;
- The proposed project elements of each alternative, which would include all aspects of construction;
- EPA modeling guidance on typical screening distances[52]; and
- Local context, including hotspots and sensitive receptors.

7.3.1. Local Study Area

The local component will focus on the area immediately surrounding the Long Bridge Project limits and sensitive receptor locations accessible by the public. An assessment will consider local receptors such as pedestrians and cyclists on the Mount Vernon Trail, the Rock Creek Park Trails, and the potential shared-used path that may be included in the Project. Potential traffic congestion locations that may be alleviated through the Project alternatives will be identified, which will in turn alleviate air quality conditions. Other publicly accessible sidewalks and parks at the northern and southern ends of the Project in the developed areas will be included.

7.3.2. Regional Study Area

The regional study area will be used for all regional mesoscale air quality analyses conducted for the Project. The regional study area is typically defined as the county or counties a project is located in. For the Long Bridge Project, the regional study area will be defined as the District of Columbia and Arlington County, VA. This agrees with the methodology used by the EPA to regulate air attainment status for the area.

7.4. Data Sources

The existing conditions analysis will be based on a review of available reports and data, EPA databases, modeling (where applicable), and professional judgment. These databases will be investigated for any past or ongoing monitoring studies of air quality within the Study Area. A review of Federal and District policies and agency requirements will help determine if or when field investigations are necessary.

Data sources include:

- Meteorological conditions from regional or Federal sources, such as, NOAA National Weather Service (NWS) data;
- Air quality monitoring reports and transportation network plans from DOEE and VDEQ;
- EPA AirData Air Quality Monitoring Database;
- EPA Greenbook;

[52] https://www3.epa.gov/scram001/guidanceindex.htm

- Aerial maps and GIS maps (for land use identification and approximate distances to receptors); and
- Metropolitan Washington Air Quality Committee (MWAQC) through the MWCOG.

7.5. Affected Environment

The regional climate and metrological conditions in the Study Area will be determined based on publicly available data from NOAA and NWS. This information will include data on historical temperatures, precipitation, wind speeds, and distributions.

The existing ambient air quality conditions will be obtained from DOEE, VDEQ, and EPA air quality monitoring data. This information will be retrieved from the Ambient Air Monitoring Network Plans and the EPA AirData Database. The design value concentrations, which are used to determine whether an area is attaining (meeting) NAAQS for Ozone will be determined for the Project's criteria pollutants as regulated by the NAAQS.

The current attainment status of the Study Area is confirmed based on the EPA Federal Register Notices. This information is also available from the EPA's *Greenbook*. The attainment status for the criteria pollutants regulated by the NAAQS will be confirmed for the District and Arlington County. The Long Bridge Project is located in the District and Arlington County, which have been designated as Nonattainment Areas for 8-hour ozone and Maintenance Areas for carbon monoxide (CO) and particulate matter 2.5 ($PM_{2.5}$). In addition, the Air Quality Index (AQI) for ozone and PM will be summarized for the study area[53].

Existing conditions related to mobile sources will be determined (and described in more detail in Section 7.6). The Regional Assessment/General Conformity analysis will include VOCs, NOX, CO and $PM_{10}/_{2.5}$ emissions inventories that include the existing diesel locomotive emissions within the regional Study Area.

7.6. Environmental Consequences

The air quality impact analysis will evaluate the Project's direct and indirect impacts on air quality because of post-construction operations for mobile sources and for construction emissions. The analysis will be conducted following the procedures and guidance outlined in the *DDOT Environmental Manual*[54]. Transportation analysis (post-construction and construction-period) is a key input to Air Quality impact analyses. A mobile source analysis will evaluate impacts from Existing, No Action, and Build railroad emission sources.

7.6.1. Local Assessment

A qualitative local emissions assessment will consider the potential relative concentrations of air pollutants during the Existing, No Action, and Build conditions for each alternative. The assessment will be based on railroad operations, emission source location and heights, and receptor location and

[53] The AQI will be based on the AirNow website at airnow.gov.

[54] "Environmental Manual" 2nd Edition. *District Department of Transportation*. June 20,2012.

heights for each analysis scenario. Local receptors are typically not subject to impact from railroad sources since locomotive pass-bys are typically short, resulting in minor exposure periods. As a result, quantitative analysis of pollutant concentrations is typically not warranted. The air quality emissions resulting from changes in the traffic conditions assessed as part of this Project for each alternative (likely near the stations) will be documented, as appropriate.

7.6.2. Regional Assessment/General Conformity

Emissions inventories will be prepared for VOC, NOx, CO, and $PM_{10}/PM_{2.5}$ for the air quality study area. The emissions inventories will include emissions from the diesel locomotives in the air quality study area. Daily and annual emissions inventories will be prepared for each pollutant. Railroad emissions will be developed based on EPA guidance *Emission Factors for Locomotives* (EPA-420-F-09-025). The regional pollutant burden analysis will be compared to *de minimis* criteria to show General Conformity with the State Implementation Plan. If the *de minimis* criteria are exceeded, then mitigation strategies will be explored (see Section 7.8) Emissions will be compared in terms of trends over time, and emissions from the Build Alternatives will be compared with the No Action Alternative. Inventories will be prepared for the existing conditions, the No Action, and the Build Alternatives in the Project's design year (2040). In addition, a qualitative discussion of the Project's impacts on future Ozone and PM AQI will be presented.

7.6.3. Mobile Source Air Toxics (MSAT) Assessment

A qualitative assessment of MSATs will be prepared following FHWA's guidelines on air toxics, the *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.*[55] The MSATs of concern will be identified, and the trends of MSAT emissions for both the Build and No Action Alternatives will be described. For the screening-level analysis, a review of the proposed Project's conceptual engineering plans, profiles, and project description will be used to identify new or modified air toxic emissions sources.

7.7. Construction Impacts

The assessment will conduct a two-step analysis for local construction impacts. Construction impacts are first considered at a qualitative level, describing planned phasing and construction activities. If the planned duration exceeds five years, a second step is conducted that involves quantitative modeling of potential emissions.

Construction by definition is temporary and transitory. A qualitative analysis of the construction air quality impacts from the Project will consider the duration and intensity of the anticipated construction activities. The analysis will include best practice mitigation measures to minimize pollutant emissions during the construction period. The anticipated construction duration will be confirmed. It is likely that the construction period will not exceed five years; therefore, a qualitative assessment of the air quality impacts will be conducted. The qualitative assessment will provide a summary of the on-site and off-site construction vehicles, construction equipment, and fugitive source activities. Potential mitigation measures will be identified to reduce the air quality impacts during construction.

[55] Biondi, Emily. "Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA" *Federal Highway Administration*. October 18, 2016.

If the construction duration is expected to exceed five years, a quantitative air quality analysis will be completed. The analysis of the potential impacts from on-site and off-site activities at the construction site will include estimating emissions generated by diesel-powered construction equipment, dust-generating activities, and additional vehicles and, if necessary, the evaluation of emission control measures that may be necessary to mitigate potential air quality impacts. Fugitive dust will be considered in accordance with 20 DCMR §605. The quantitative construction air quality analysis will include the evaluation of on-site and off-site construction vehicles (worker cars and construction trucks), stationary construction equipment, and fugitive source activities. The analysis will consider the worst-case scenario, to be determined based on phasing schedules, location, and activities occurring during the phase of construction. The analysis will identify nearby sensitive land uses with the greatest potential for construction-phase air quality impacts. Emission factors for the sources will be determined using a combination of EPA's Non-Road, Motor Vehicle Emission Simulator 2014a (MOVES2014a) and Air Pollutants Emissions Factors (AP-42) models, where appropriate. Dispersion modeling will be conducted using the latest version of EPA's AERMOD model to determine pollutant concentrations.

Pollutant levels will be estimated at each analysis site for future No-Build and Build (construction) conditions. The aggregate (on-site and off-site) modeling results of the Project's construction impacts at each analysis site will be compared to the NAAQS for each applicable pollutant and a compliance determination made.

7.8. Mitigation

Should exceedances of the NAAQS be predicted, possible mitigation measures that could be undertaken to reduce these values will be identified. A list of best management practices related to construction air quality will be provided to minimize pollutant emissions through industry standard measures.

8.0 Greenhouse Gas Emissions and Resilience

8.1. Overview and Definitions

This section identifies regulatory requirements for assessing post-construction and construction-period greenhouse gas (GHG) emissions and resilience impacts. The outline of the anticipated environmental consequences related to GHG emissions and resilience follows the applicable regulatory criteria.

GHGs are gases that trap heat in the atmosphere. Pollutants that are considered greenhouse gases affect air quality and climate change. Some major GHGs include carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and fluorinated gases (hydrofluorocarbons, perfluorocarbons, etc.). The precise sources of these pollutants, their effects on human health and general welfare, and their final disposition in the atmosphere vary considerably.

8.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- Consolidated Appropriations Act of 2008/Public Law 110-161/GHG Reporting Program; Final Mandatory Reporting of GHG Gas Rule (2009) (40 CFR part 98);
- EO 13783, Promoting Energy Independence and Economic Growth (2017);
- U.S. Environmental Protection Agency (EPA) Greenhouse Gas Endangerment Finding (2009) Final Rule, Federal Register: Rules and Regulation;[56]
- EPA and U.S. Department of Transportation (USDOT) Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (2011);[57,58] and
- Prevention of Significant Deterioration (PSD)/Title V Greenhouse Gas Tailoring Rule (2010).[59]

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[56] U.S. Environmental Protection Agency. December 15, 2009. *Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act (74 F.R. 66495).* https://www.epa.gov/sites/production/files/2016-08/documents/federal_register-epa-hq-oar-2009-0171-dec.15-09.pdf. Accessed June 8, 2017.

[57] U.S. Environmental Protection Agency, U.S Department of Transportation. May 7, 2010. *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards (75 F.R. 25324).* https://www.gpo.gov/fdsys/pkg/FR-2010-05-07/pdf/2010-8159.pdf. Accessed June 8, 2017.

[58] U.S. Environmental Protection Agency, U.S Department of Transportation. October 15, 2012. *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (77 F.R. 62624).* https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf. Accessed June 8, 2017.

[59] U.S. Environmental Protection Agency. June 3, 2010. *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (75 F.R. 31514).* https://www.gpo.gov/fdsys/pkg/FR-2010-06-03/pdf/2010-11974.pdf. Accessed June 8, 2017.

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are currently no relevant state laws or regulations related to GHGs and resilience within the District, and Virginia.

Relevant state and local guidance:

- There have been several plans developed providing guidance and direction. These include multiple plans to reach GHG reduction goals and sustainability objectives such as The Sustainable DC Plan and the Climate Ready DC Plan.[60]
- The Commonwealth of Virginia has also developed plans to reach GHG reduction goals and sustainability objectives such as The Virginia Energy Plan, which aims increase the share of renewable energy sources in the State's energy portfolio.[61]
- There currently are no relevant local laws or regulations related to greenhouse and resilience, however, locally, Arlington County has developed the *Community Energy Plan* to reduce GHG emissions.[62]

8.3. Study Area

Discussion of impacts related to GHG emissions is characterized using a regional study area. The Project's resilience to extreme weather events (for example, extreme heat days, more frequent and intense heavy rain events) will be considered locally.

8.3.1. Local Study Area

The state of dispersion science and health effects of GHG emissions have not sufficiently advanced to accurately consider this resource area at a microscale level. For this reason, the EIS will not consider a local study area for GHG emissions. The GHG assessment will focus on the regional study area.

The local study area for resilience includes the Project Area and the surrounding area within one-half mile. Impacts, such as extreme storm events, could affect not only Long Bridge but immediately adjacent infrastructure.

8.3.2. Regional Study Area

GHGs are unique from other resource areas and topics considered in the EIS in that the concerns about GHG emissions are primarily related to climate change, which is regional and global in nature. This

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[60] Department of Energy and Environment, District Office of Planning, and Office of the Mayor. 2016. *The Sustainable DC Plan.* http://www.sustainabledc.org/wp-content/uploads/2017/03/SDC_Plan_2016_compressed2.pdf. Accessed June 8, 2017.

[61] *The Virginia Energy Plan* Department of Mines, Minerals, and Energy, Commonwealth of Virginia. October 1, 2014.

[62] *Community Energy Plan* Arlington County, Virginia. June, 2013.

analysis considers the regional Study Area for GHGs for mobile sources only on a regional scale, not local. For the Long Bridge Project, the regional Study Area will be defined as the area of 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.

8.4. Data Sources

The discussion of global, national, and regional trends in GHG emissions and resilience relies on the following primary sources, and others as appropriate:

Data sources include:

- International Energy Agency analyses and projections of global energy use;
- *IPCC, 5th Assessment Report*[63] and other reports. Current global assessment of climate change including scientific information on causes of climate change, GHG emissions, and projections of impacts;
- NOAA and Oak Ridge National Laboratory, *Recent Greenhouse Gas Concentrations;*[64]
- U.S. Energy Information Administration, *Annual Energy Outlook.*[65] Assessment of GHG emissions and projects based on energy sectors;
- U.S. Global Change Research Program, *U.S. National Climate Assessment.*[66] Assessment of climate change and potential impacts in the United States, including potential climate change impacts by region;
- EPA, *U.S. Greenhouse Gas Inventory.*[67] Assessment of GHG emissions in the United States and trends by GHGs and economic sector;
- DC Department of Energy and Environment (DOEE), *District of Columbia Greenhouse Gas Inventory;*[68]

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63 Intergovernmental Panel on Climate Change (IPCC), September 2013 to November 2014, *Intergovernmental Panel on Climate Change, 5th Assessment Report (AR5),* http://www.ipcc.ch/activities/activities.shtml. Accessed June 6, 2017.

64 Blasing, T.J. Oak Ridge National Laboratory. April 2016. *Recent Greenhouse Gas Concentrations*. http://cdiac.ornl.gov/pns/current_ghg.html. Accessed June 6, 2017.

65 U.S. Energy Information Administration. January 5, 2017. *Annual Energy Outlook 2017*. https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf. Accessed June 8, 2017.

66 U.S. National Climate Assessment, U.S. Global Change Research Program. 2014. *Climate Change Impacts in the United States.* http://www.globalchange.gov/browse/reports/climate-change-impacts-united-states-third-national-climate-assessment-0. Accessed June 8, 2017.

67 U.S. Environmental Protection Agency. 2017. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015*. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks. Accessed June 8, 2017.

68 DC Department of Energy and Environment. *Greenhouse Gas Inventories*. https://doee.dc.gov/service/greenhouse-gas-inventories. Accessed June, 8, 2017.

- DOEE Climate Ready DC Plan and supporting technical documents;
- DOEE Climate Projections & Scenario Development, Climate Change Adaptation Plan for the District of Columbia;[69]
- *The Virginia Energy Plan*, Energy plan to increase renewable energy reduction and reduce GHG emissions by 30 percent in 2025; and
- Arlington County's *Community Energy Plan*. Energy plan to increase local renewable energy reduction and reduce carbon footprint 75 percent by 2050.

8.5. Affected Environment

This section will summarize the baseline GHG emissions and climate change information for the Project Area and regional trends. Since GHG and climate change are inherently regional issues, the existing conditions of this resource is established on a regional scale. The affected environment will be defined based on evaluation of global, national, and regional trends. Existing climate change effects will be described on a local and regional scale.

Global, national, and regional trends in GHG emissions and climatic changes are used to characterize the affected environment. Existing GHG emissions associated with the mobile sources will be characterized using a methodology described in Section 7.0, *Air Quality*.

The Affected Environment discussion also provides context for the evaluation of potential climate change effects on the Project. Existing climate change effects will be described and will provide the baseline for assessing future climate change effects on the Project.

8.6. Environmental Consequences

The GHG impact analysis will evaluate the Project's direct and indirect impacts on regional air quality because of post-construction operations for both mobile sources and for construction emissions. Transportation analysis (post-construction and construction-period) and energy consumption is a key input to the GHG impact analyses. The analysis will include a discussion that focuses on the potential climate change effects that could occur within the general region where the Proposed Action will be constructed and operated.

8.6.1. Mobile Source

The mobile source analysis will consider impacts from railroad emission sources for direct and indirect effects. Annual GHG emissions will be evaluated at a mesoscale level and will include emissions from the diesel locomotives in the air quality study area using the operating conditions developed in the Transportation analysis. Annual emissions inventories will be prepared for the emitted GHGs. Railroad emissions will be developed based on EPA guidance *Emission Factors for Locomotives* (EPA-420-F-09-025). Each Build Alternative will be compared to the No Action Alternative in the planning year (2040).

[69] DC Department of Energy and Environment. June 2015. *Climate Projections & Scenario Development, Climate Change Adaptation Plan for the District of Columbia.* https://doee.dc.gov/publication/climate-projections-scenario-development. Accessed June 8, 2017

8.6.2. Resilience

The impacts of climate change on the Project will be assessed in the context of resilience. Documents to review include the *Climate Ready DC Plan*, IPCC 5th Assessment Report, U.S. National Climate Assessment, and DOEE *Climate Change Adaptation Plan*.

8.7. Construction Impacts

Construction is temporary and transitory. A qualitative analysis of the construction GHG impacts from the Project will consider the duration and intensity of the anticipated construction activities. The analysis will include best practice mitigation measures to minimize pollutant emissions during the construction period.

Each Build Alternative will be compared based on the proposed design and its associated construction requirement to assess the variations in construction energy use and corresponding GHG emissions.

8.8. Mitigation Measures

Should impacts to GHGs and resilience be identified, measures will be identified to avoid, minimize, or mitigate these impacts. Mitigation measures will be evaluated within the context of any regulatory requirements to reduce GHG emissions. Resilience strategies will be reviewed and assessed based on applicability to the Long Bridge Project.

9.0 Energy Resources

9.1. Overview and Definitions

Energy is an important resource for the nation's economy, and the conservation of energy is vital to the USDOT goals of environmental sustainability, clean air, and the reduction of greenhouse gases (GHG). This section will assess any irreversible or irretrievable commitments of energy resources likely to be involved in each Build Alternative and any potential energy conservation measure that could be employed, especially efficiency measures that reduce the use of petroleum or natural gas. Energy use, as it will be discussed in this section, is divided into operational and construction energy consumption. **Operational energy consumption** is defined, for this project, to be a function of the following operational characteristics:

- The operational energy used by the bridge itself including lighting, transportation sensors, communications equipment, and other related energy-consuming train and bridge equipment.
    - Energy sources considered include electricity, and fuels (if applicable) such as natural gas, gasoline, diesel fuel and propane.
- The energy required to maintain the bridge.

Construction energy consumption consists of the non-recoverable, one-time energy expenditures associated with the construction of the physical infrastructure associated with a project. The energy considered in an analysis of energy consumption includes electricity, and fuels (if applicable) such as natural gas, gasoline, diesel fuel, and propane. Fuel use includes use related to construction vehicles, construction equipment, and mobile generators used on the construction site.

9.1. Regulatory Context

Federal Laws and Regulations

The Council of Environmental Quality (CEQ) regulations for implementing NEPA require consideration of energy efficiency.

Several executive orders and laws have been promulgated over the years that require or promote the consideration of energy efficiency in Federal actions.

Relevant Federal laws, regulations, and EOs:

- EO 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (EOP 2001b)
- EO 13783, Promoting Energy Independence and Economic Growth (2017)
- EISA 2007[70]

[70] Energy Independence and Security Act of 2007. Accessed from https://www.congress.gov/bill/110th-congress/house-bill/6. Accessed on December 14, 2017.

- Sections of 42 USC address energy conservation, decreased dependence on foreign oil, the use of alternative fuels, and increased efficiency in energy use (such as improved gas mileage in motor vehicles)
    - Chapter 71, Solar Energy
    - Chapter 73, Development of Energy Resources
    - Chapter 74, Nonnuclear Energy Research and Development
    - Chapter 77, Energy Conservation
    - Chapter 81, Energy Conservation and Resource Renewal
    - Chapter 91, National Energy Conservation Policy
    - Chapter 96, Biomass Energy and Alcohol Fuels
    - Chapter 100, Wind Energy Systems
    - Chapter 149, National Energy Policy and Programs
    - Chapter 152, Energy Independence and Security

Relevant Federal guidance:

- Five strategic goals for America's transportation system are laid out in USDOT's latest Strategic Plan: Safety; State of Good Repair; Economic Competitiveness; Livable Communities; and Environmental Sustainability. With regards to environmental sustainability, USDOT cites the need to improve the energy and environmental performance of the transportation sector.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- Building Energy Code for the District of Columbia, 2012 International Energy Conservation Code (IECC) with Amendments, includes the DC Energy Conservation Code as the code applies to the construction of buildings and structures.[71]

- Code of Virginia, Title 67. Virginia Energy Plan

Relevant state and local guidance:

- *Sustainable DC Initiative* is the District's overarching sustainability framework and includes municipal operations' greenhouse gas reduction and energy savings goals. The initiative describes strategies for various policy areas including energy, climate and environment, transportation, and the built environment.[72]

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[71] U.S. Department of Energy, Energy Efficiency and Renewable Energy, Building Energy Codes Program, Washington, DC. Undated. The DC Energy Conservation Code. http://www.energycodes.gov/adoption/states/washington-dc. Accessed June 29, 2017.

[72] Washington DC City Government, DC.Gov. Undated. Sustainable DC Initiative. https://sustainable.dc.gov/. Accessed June 29, 2017.

- The 2014 Virginia Energy Plan, updated in 2016, provides a strategic vision for energy policy in the Commonwealth of Virginia.[73] The four focus areas in the plan are: diversify the economy by strategically growing the energy sector; innovate to reduce greenhouse gas emissions and lower energy consumption; strengthen the business climate by investing in reliable and resilient energy infrastructure; and prepare Virginia's workforce to drive the energy economy of the future.

- Arlington County Community Energy Plan[74] to reduce GHG emissions.

9.2. Study Area

The Study Area will include the area along the No Action and Build Alternatives.

9.3. Data Sources

Data sources will be used to gather historic energy use and estimates of future energy use in the Study Area.

Data sources include:

- U.S. Energy Information Administration (EIA) State Energy Data System (SEDS)[75]
- U.S. EPA MOVES model parameters and guidance[76]
- EIA, Annual Energy Outlook.[77] Assessment of GHG emissions and projects based on energy sectors
- FRA data on energy and fuel usage

The analysis does not consider energy use by trains, as the train volumes through the Long Bridge Corridor are assumed to be the same in the No Action and Build conditions.

9.4. Affected Environment

The Affected Environment section will describe the existing 2017 direct energy use profile. Energy use will be measured using the data sources above, with the FRA energy and fuel use data being the primary data source. It would be preferable to have a minimum of one year of FRA energy and fuel use data and as many years as possible to establish trends and patterns in energy use that will be useful in addressing energy use as it relates to the Environmental Consequences. If there are multiple electricity and fuel meters with individual accounts, it will be important to have the data from all such accounts. The more

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[73] *The Virginia Energy Plan* Department of Mines, Minerals, and Energy, Commonwealth of Virginia. October 1, 2014.

[74] *Community Energy Plan* Arlington County, Virginia. June, 2013.

[75] U.S. Energy Information Administration, U.S. State Profiles and Energy Estimates. Undated. The State Energy Data System. https://www.eia.gov/state/seds/. Accessed August 2, 2017.

[76] U.S. Environmental Protection Agency. Undated. Motor Vehicle Emissions Simulator (MOVES). https://www.epa.gov/moves. Accessed on August 2, 2017

[77] U.S. Energy Information Administration. January 5, 2017. Annual Energy Outlook 2017. https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf. Accessed June 8, 2017.

granular the data, the more detailed the analysis can be in terms of determining the amount of energy used by particular classes of equipment, such as lighting, or for particular equipment, like a backup generator.

9.5. Environmental Consequences

The Environmental Consequences section will assess the direct energy use direct and indirect impacts of the Build Alternatives in the Study Area and the direct energy use of the No Action Alternative. By analyzing the energy use in the Affected Environment as described above, a profile of direct energy use can be established for the No Action Alternative. The direct energy use of each Build Alternative will be established based on the Federal and local regulations related to construction and energy efficiency for new projects.

9.6. Construction Impacts

Each Build Alternative will be compared based on the proposed design and its associated construction requirements to assess the construction energy use. To measure energy use in the construction phase, the EIA State Energy Data System and EPA MOVES model parameters and guidance resources will be critical in establishing estimates of energy and fuel use based on the details of the proposed construction for each build alternative. The details of importance will include:

- The construction equipment that will be used in each Build Alternative including construction vehicles, generators, and power/mechanical tools, and job site lighting;
- Vehicles may include boats or barges if they are scoped in the construction process.
- The prime energy source for the construction equipment;
- Estimates of the amount of time the construction equipment will be used in each build alternative; and
- An associated energy use baseline profile for each piece of construction equipment attained from the data sources listed above.

9.7. Mitigation

Mitigation measures will focus on identifying ways to reduce energy use through refinement of construction methods or choices of materials.

10.0 Land Use and Property

10.1. Overview and Definitions

The existing and planned land use analysis will evaluate the Project's potential impacts to existing and planned land use in the Study Area. This section includes the use of terminology specific to land-use planning as it pertains to the NEPA process.

Land use is characterized by the arrangements, activities, and inputs people undertake in a certain land cover type to produce, change, or maintain it.[78] Land use, maintained and determined by local agencies, focuses on a property-specific level of detail and is specific to the parcel. Examples of land use include residential and commercial development, transportation planning, resource management, and agricultural lands.

Land cover is the observed physical cover on the earth's surface.[79] Land cover provides a high-level classification of general characteristics of a given area, and is classified by remote sensing data through the U.S. Geologic Survey (USGS).

When conducting a land use analysis, properties or businesses may need to be acquired as a result of the Project, resulting in **displacements**. The term displacement is used to represent property acquisition of a parcel or structure(s), while the term relocation is used to represent finding new properties for displaced residents, businesses, and organizations.

10.2. Regulatory and Planning Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- Uniform Relocation Assistance and Real Property Acquisition Policies Act (URAA) of 1970 (49 CFR part 24)
- Federal Land Policy and Management Act (FLPMA) (43 USC 1701)

Relevant Federal guidance:

- NCPC Monumental Core Framework Plan[80]

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[78] Natural Resources Management and Environment Department. Land Cover Classification System (LCCS). http://www.fao.org/docrep/003/X0596E/x0596e01e.htm

[79] National Land Cover Database 2011. http://www.mrlc.gov/nlcd11_leg.php

[80] NCPC, *Monumental Core Framework Plan.* https://www.ncpc.gov/plans/framework/

- NPS, NEPA Handbook (2015)[81]
- NPS, National Mall Plan (2010)
- NPS, George Washington Memorial Parkway Foundation Document (2014)
- NCPC Comprehensive Plan for the National Capital – Federal Elements
- DCOP Comprehensive Plan for the National Capital – District Elements
- NCPC Memorials and Museums Master Plan (2M Plan)[82]
- NCPC SW Ecodistrict Plan[83]

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

State

- Commonwealth of Virginia, Code of Virginia, §15.2, Chapter 22: Planning, Subdivision of Land and Zoning
- District of Columbia, DCMR, Title 11, Zoning Regulations of 2016
- District of Columbia, DC Code §§ 8-109.01 – 8.109.12, Subchapter V: Environmental Impact Statements

Local

- Arlington County Zoning Ordinance (2017)

Relevant state and local guidance:

- District of Columbia, Office of Planning, Comprehensive Plan – District Elements (amended 2011)
- District of Columbia, Office of Planning, Southwest Neighborhood Small Area Plan (2014)
- Commonwealth of Virginia, DEQ, Procedure Manual: Environmental Impact Review of Major State Facilities (July 2013)
- Arlington County General Land Use Plan (amended 2016)
- Crystal City Sector Plan (2010)
- Potomac Yard Phased Development Site Plan (2000)

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81 National Park Service. *NEPA Handbook.* 2015. https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

82 National Capitol Planning Commission. Memorials and Museums. Accessed from https://www.ncpc.gov/plans/memorials/. Accessed on December 14, 2017.

83 National Capitol Planning Commission, SW Ecodistrict Plan. Accessed from www.ncpc.gov/plans/swecodistrict/. Accessed on December 15, 2017.

10.3. Study Area

As land use impacts likely will not be limited to just the Project Area—meaning the tracks, bridges, and adjacent land, water, and infrastructure associated with the Project—the Study Area for land use will consist of a one-half mile buffer surrounding the Project Area. This Study Area will be sufficient to capture proposed project elements associated with all aspects of construction as well as land uses that extend beyond the Project Area itself but have the potential to be affected by the Project.

10.4. Data Sources

The Land Use chapter will rely on a variety of data sources in establishing existing land use conditions and No Action scenario land use conditions, including:

- District of Columbia GIS Data
- Arlington County GIS Data
- Aerial photographs
- Field survey
- NCPC Comprehensive Plan for the National Capital – Federal Elements
- DCOP Comprehensive Plan for the National Capital – District Elements
- NCPC Monumental Core Framework Plan
- NCPC Southwest Ecodistrict Plan
- Arlington County General Land Use Plan
- Crystal City Sector Plan
- Southwest Neighborhood Small Area Plan
- Developer plans
- MWCOG Cooperative Land Use Forecasts (Round 9.0)
- District of Columbia Office of Tax and Revenue
- Arlington County Office of the Treasurer
- Interviews with local and regional planning officials as needed
- Construction phasing data as available

10.5. Affected Environment

The Affected Environment section will identify and document all existing and planned land uses in the Study Area. Using the information provided from the above data sources, a land use profile will be created for the Study Area. If data readily available are not sufficient, fieldwork or site visits will be used to close gaps in data. The Study Area profile will document the nature of land use and land ownership in the Study Area, and will identify potentially sensitive areas such as schools, health care facilities, dependent care facilities, places of worship, community centers, and other community support service providers. The profile will identify other land uses that provide important local or regional functions.

10.6. Environmental Consequences

This section will identify direct and indirect impacts of land use changes or conversions to a different type of land use that might occur as a result of each alternative. These changes or conversions could result from acquisitions necessary to complete the Project, or conversion of existing transportation right-of-way.

Each Build Alternative will be compared to the No Action Alternative in each milestone year. In accordance with FRA Environmental Procedures, the EIS will qualitatively assess the impacts of each alternative on local land use, land use controls, and comprehensive regional planning as well as on development within the affected environment, by comparing the alternatives to existing land use planning and ownership information, as well as planned land use changes. The EIS will quantitatively assess the impacts on development in terms of square footage developed or otherwise affected within the Study Area. Where inconsistencies or conflicts exist, this section will describe the extent of reconciliation and the reason for proceeding notwithstanding the absence of full reconciliation. This section also will document established local and regional land use policies, goals, and objectives and assess whether the Project's goals align with these plans.

This section will identify any properties that would need to be acquired and relocated as a result of the Project. If the Project would displace existing structures or acquire enough of a property to affect the property's intended use, this property will be considered for acquisition. In the case of acquisition, residences and businesses on the parcel are assumed displaced and offered relocation assistance in accordance with the Uniform Relocation Act (49 CFR part 24).

This section will also include an assessment of any impacts to Federal facilities and land use.

Impacts will be presented by alternative, separating service or operational impacts from construction impacts. Should the impact assessment indicate that one or more negative social or economic impacts may be generated as a result of the Project, preliminary mitigation recommendations will be provided.

All mapping will be sufficient in scale to show the geographical relationship between the alternatives and the existing land uses. Mapping will show the Project elements and footprints in sufficient detail to complete environmental impact assessment of service and operational impacts. The map will clearly show major features immediately adjacent to the boundary.

10.7. Construction Impacts

Land use impacts from construction will be evaluated based on whether any construction activities in the Project Area cause modifications or delays to existing or planned land uses in the Study Area. Any acquisition or extended use of property to facilitate construction activities will be identified. This section also will identify the limits of construction staging, to the extent that such information is available. Construction impacts will be presented by year and in aggregate.

10.8. Mitigation

Potential mitigation recommendations appropriate to the intensity and duration of the potential impacts will be identified. The mitigation recommendations will include measures intended to avoid, minimize, or reduce the impact or to compensate for an impact through replacement or substitution of resources. Potential mitigation of land use, development, and zoning impacts will be developed in accordance with Federal guidelines and evaluated based on their effectiveness in mitigating the impacts

of the alternatives. The need for land use mitigation is most compelling in situations where the impacts to land use directly or indirectly would:

- Physically divide an established community;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project adopted for the purposes of avoiding or mitigating an environmental effect;
- Result in displacement of businesses and residences; and
- Result in a physical change in the environment that would be substantially incompatible with existing land uses.

Potential mitigation measures will be assessed for their ability to:

- Retain connections between established communities, or reduce the impacts from a division if connections cannot be maintained;
- Bring the alternatives closer into conformity with applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project adopted for the purposes of avoiding or mitigating an environmental effect to the extent possible;
- Prevent displacement of businesses and residences, or provide adequate compensation for such displacement; and
- Bring the alternatives into greater compatibility with existing land uses to the extent possible.

11.0 Noise and Vibration

11.1. Overview and Definitions

The noise and vibration impact assessment will consider the potential for the Project to affect people within the Study Area. Improvements to the railroad infrastructure may increase noise and vibration which could affect sensitive receptors. Noise- and vibration-sensitive uses typically include places where people sleep such as residences, hotels, and hospitals, and institutions with daytime and evening use such as schools, libraries, museums, and parks. The proposed Project would introduce new sources and modify existing sources of noise and vibration during the construction period and future operational conditions, which could result in potential impacts. This section defines noise, vibration, and ground-borne noise resources and summarizes the regulatory context of the assessment. This chapter presents the impact assessment methodology including the process to define the noise and vibration Study Areas, identify sensitive locations, characterize existing noise and vibration conditions, predict future conditions, assess potential impact, and evaluate the need for and prepare the preliminary design of potential mitigation.

Noise is typically defined as unwanted or undesirable sound. Noise is evaluated based on its potential to cause human annoyance. Because humans can hear certain frequencies or pitches of sound better than others, sound levels are measured and reported using a descriptor called the "A-weighted sound level." A-weighted sound levels weight different frequencies of sound to correspond to human hearing and are expressed in decibel notation as "dBA."

Because sound levels fluctuate from moment to moment, it is important to characterize the range of levels that may exist over a period. This is commonly done by using sound level metrics such as the hourly energy-equivalent level (Leq) or the day-night average level (Ldn). Further information on these metrics are presented in the noise impact criteria section (Section 11.6.1).

Trains also generate **ground-borne vibration** (defined as the oscillatory motion of the ground), when forces associated with the wheel-rail interaction are transmitted through the track structure into the ground and into adjacent buildings. Vibration may be perceptible and disturb people or sensitive activities in nearby buildings. Vibration levels are expressed in decibel notation as "dBV" to differentiate them from sound decibels. Humans generally respond to vibration in a low frequency range between approximately 4 and 80 hertz (Hz).

Ground-borne noise is generated when vibration propagates into a room and causes the walls, ceilings, and floor to vibrate and generate a low frequency rumble. Ground-borne noise is generally only perceptible in buildings where airborne paths (such as paths through windows or openings) are not present. Ground-borne noise is of particular concern for special-use buildings such as theatres and recording studios. Similar to airborne noise, ground-borne noise is expressed in A-weighted sound level decibels. Because ground-borne noise is generated by ground-borne vibration, it is most prevalent in a low audible frequency range between approximately 20 and 500 Hz.

Because sound levels fluctuate from moment to moment, it is important to characterize the range of levels that may exist over a period. This is commonly done by using the following sound level metrics:

- The *Maximum A-weighted Level* (Lmax) represents the highest sound level generated by a source. For mobile sources, the maximum level typically occurs when the source is closest to the measurement or analysis location.
- The *Energy-average Level* (Leq) is a single value that is equivalent in sound energy to the fluctuating levels over a period. The Leq accounts for how loud events are during the period, how long they last, and how many times they occur. Typically, Leq sound levels are used to describe the time-varying sound level over a 1-hour period and may be denoted as $Leq_{1h.}$ Leq is commonly used to describe environmental noise and relates well to human annoyance.
- The *Day-night Average Level* (Ldn) is a single value that represents the sound energy over a 24hour period with a 10-decibel (dB) penalty applied to sound that occurs between 10:00 PM and 7:00 AM when people are more sensitive to noise. Ldn accounts for how loud events are, how long they last, how many times the occur, and whether they occur at night. Ldn- is commonly used to describe environmental noise and relates well to human annoyance at places people sleep.
- The *Sound Exposure Level* (SEL) describes the cumulative noise exposure from a single noise event over its entire duration. In calculating SEL the noise exposure is normalized to a time-duration of 1 second so that events with different durations can be evaluated in terms of their sound energy.

11.2. Regulatory Context

The following section summarizes the regulatory requirements (Federal and local) for assessing construction-period and operational condition noise and vibration impacts for the proposed Project.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- 40 CFR parts 1500-1508, *CEQ Regulations for Implementing the Procedural Provisions of NEPA*
- 64 FR 28545, FRA's *Procedures for Considering Environmental Impacts*

  23 CFR part 771, *Environmental Impact and Related Procedures*, FTA and FHWA prescribe that an EIS should assess potential noise and vibration effects.
- U.S. National Park Service (NPS) – Director's Order #47: Soundscape Preservation and Noise Management

Relevant Federal guidance:

- FRA's High-Speed Ground Transportation Noise and Vibration Impact Assessment (FRA guidance manual)[84]
- FTA's - Transit Noise and Vibration Impact Assessment (FTA guidance manual)[85]

The FRA guidance manual and the FTA guidance manual describe the technical approach for assessing noise and vibration for railroad and transit projects in the United States. These guidance manuals address how to identify and categorize noise- and vibration-sensitive land uses, criteria thresholds, methods to measure and predict noise and vibration, and the process for evaluating the need for and effectiveness of potential mitigation. While the FRA and FTA manuals are very similar, the FRA manual is intended for projects with passenger train speeds above 90 miles per hour (mph) that include unique noise sources and for projects with freight railroad sources. The FTA manual provides guidance for projects with passenger train speeds below 90 mph. Consequently, the FTA guidance manual will be used to assess noise and vibration conditions.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- DCMR Chapters 20-27, Noise Ordinance, to promote public health, safety, welfare, and the peace and quiet of the inhabitants of the District, and to facilitate the enjoyment of the natural attraction of the District. Sound generated by trains, other than the Washington Metropolitan Area Transit Authority (WMATA) railcars, is exempt from this ordinance. This ordinance applies primarily to construction-period activities and sound generated by stationary equipment such as ventilation equipment and rooftop mechanical equipment.

Relevant state and local guidance:

- *Arlington County Noise Control Code, Chapter 15* was developed to protect the health, welfare and quality of life of its citizens with regards to noise level.

11.3. Study Area

The Study Areas for noise and vibration include the physical limits of the proposed project (the Project Area) and noise and vibration-sensitive locations near the Project. The Study Areas for noise and vibration must extend sufficiently far from the Project limits to include all locations where substantial noise and vibration effects, potential impacts, and benefits from potential mitigation may occur.

As a preliminary indication of the Study Area extents, the FTA guidance manual provides noise and vibration screening distances for different railroad and transit projects. These screening distances can be used to determine where there is potential for impact to occur and, consequently, the Study Area limits.

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[84] Federal Railroad Administration. September 2012. *High-Speed Ground Transportation Noise and Vibration Impact Assessment*. Report DOT/FRA/ORD-12/15. https://www.fra.dot.gov/eLib/Details/L04090. Accessed June 6, 2017.

[85] Federal Transit Administration. May 2006. *Transit Noise and Vibration Impact Assessment*. Report FTA-VA-90-1003-06. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed June 6, 2017.

If there are sensitive uses within these screening distances, then there is the potential for impact and further evaluation is necessary to verify whether there would be impact, the context and intensity of the impact, and the need for mitigation.

The FTA noise screening distances are based on typical operational conditions for a range of railroad projects and whether there are intervening buildings between the project and sensitive receptors. To define the specific noise Study Area for the Project, the screening distance will be adjusted for the specific project conditions using the FTA's General Noise and Vibration Assessment methods. The estimated noise Study Area is up to 300 feet from the Project Area limits.

The FTA vibration screening distances depend on the type of sensitive land use and the type of railroad project. For commuter railroad operations, the vibration screening distance is 200 feet for residential uses, 120 feet for institutional uses, and up to 600 feet for particularly sensitive receptors such as research facilities with vibration-sensitive equipment, theatres, and recording studios. The EIS will include a detailed evaluation of the land use surrounding the proposed Project. Based on the results of the land use evaluation, the vibration Study Area will be defined. The vibration Study Area will extend 200 feet from the Project Area footprint and potentially farther if particularly sensitive uses are identified.

11.4. Data Sources

The analysis will be based on a review of available reports and data, GIS databases, maps, reports, modeling, fieldwork, and professional judgment.

Data sources include:

- Aerial mapping (2016), Arlington County and District of Columbia GIS database, and field observations of nearby sensitive uses;
- Project description information including track alignments;
- Railroad operations;
- Construction staging locations, equipment, methods, and schedules;
- Noise and vibration measurements conducted in the Study Areas; and
- Well-documented noise and vibration measurements conducted in support of other projects or studies. These studies may be of general ambient noise or vibration conditions in the Project Area or reference measurements of Amtrak and Virginia Railway Express trains (for example, *Virginia Railway Express Midday Storage Facility Noise and Vibration Technical Report*, *DC to Richmond Southeast High Speed Rail DEIS Noise and Vibration Technical Report,* and *Crystal City Station Relocation Noise and Vibration Study*, in progress).

11.5. Affected Environment

The process to evaluate the Affected Environment for noise and vibration includes identifying noise- and vibration-sensitive receptors, understanding the predominant sources of noise and vibration, and characterizing existing noise and vibration conditions through measurements and modeling.

Existing sensitive noise and vibration receptors in the Study Areas will be determined based on a review of aerial photography, Arlington County GIS database, and field investigation. Receptors will be categorized based on their use as defined by the FTA (see Table 11-1). Receptors where quiet is an essential element of their use (such as amphitheaters or certain historic landmarks) are considered to be FTA Noise Category 1. Category 2 receptors include locations where people sleep such as residences, hospitals, and hotels. Category 3 receptors are typically daytime institutional uses where noise could interfere with their intended use, such as schools, places of worship, libraries, and museums.

Table 11-1 | FTA Land Use Categories and Metrics for Transit Noise Impact Criteria

FTA Land-Use Category	**Noise Metric (dBA)**	**Description of Land-Use Category**
1	Outdoor Leq*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, and museums can also be considered to be in this category. Certain historical sites, parks, campgrounds, and recreational facilities are also included.

*** Leq for the noisiest hour of related activity during hours of noise sensitivity.**

The FTA methods for characterizing existing conditions recommend that measurements are not conducted at each receptor location in a Study Area, but rather, that measurements are conducted at locations that are representative of a cluster of sensitive uses. Existing noise and vibration conditions can also be predicted at receptors locations based on measurements and FTA modeling procedures.

Noise and/or vibration monitoring will be conducted at up to eight key locations to characterize the existing conditions. Most noise and vibration measurements will be conducted for 1-hour periods with simultaneous observations and counts of train activity and traffic conditions (volumes and speeds), as applicable. Long-term (24-hour) noise measurements will be conducted at selected locations to determine the relationship of short-term (1-hour Leq) and long-term (24-hour Ldn) noise levels. A noise and vibration measurement plan will be prepared that identifies measurement locations and whether any approval to access the necessary locations is required.

All noise measurements will be conducted with equipment that meets American National Standards Institute Type I accuracy and will include overall A-weighted and 1/3-octave band sound levels.

Vibration measurements will primarily be conducted at exterior ground-level locations to determine the maximum vibration levels from train pass-bys. Interior vibration levels will be predicted based on typical outdoor-to-indoor coupling factors.

11.6. Environmental Consequences

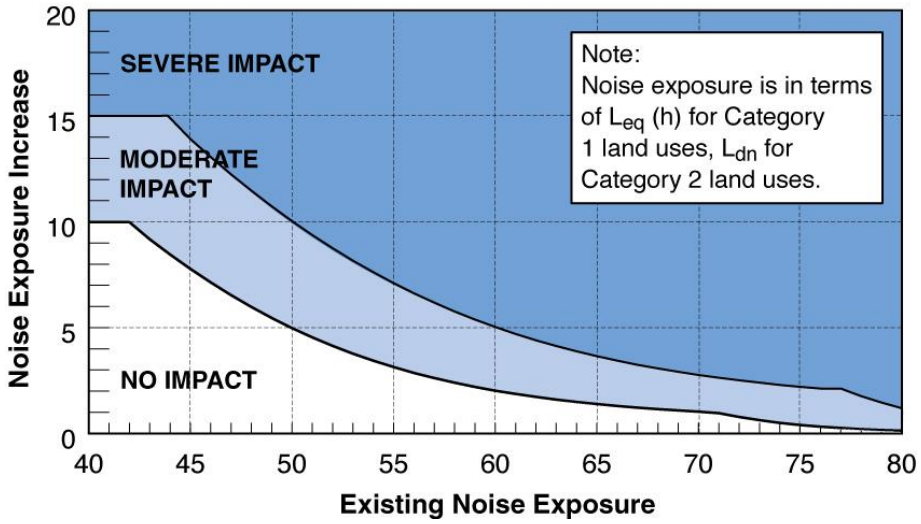
The environmental consequences analysis will include an evaluation of direct and indirect impacts of the Project's noise and vibration effects, an assessment of the potential for impact, and an evaluation of the need for mitigation. The impact analysis will evaluate construction-period and operational conditions for the existing, No Action, and future Build alternatives.

The following section describes the noise and vibration impact criteria and the methods to predict future noise and vibration conditions, assess potential impact for the Project alternatives, and evaluate mitigation.

11.6.1. Noise Impact Criteria

FTA noise impact criteria are what are known as "ambient-based" criteria, which evaluate the impact of a change in the noise environment due to the introduction of new noise sources and/or modification of existing sources. The noise impact criteria for human annoyance, presented in Figure 11-1, compare the existing outdoor Ldn for residential (Category 2) land use or peak transit hour Leq for institutional (Category 3) land use and the potential increase in future noise due to the proposed Project. Impacts are categorized as no impact, moderate impact, or severe impact. Severe impact is where a significant percentage of people would be highly annoyed by a project's noise. Moderate impact is where the change in the cumulative noise level would be noticeable to most people, but may not be sufficient to generate strong, adverse reactions.

Figure 11-1 | FTA Noise Impact Criteria



The District of Columbia noise ordinance (Municipal Regulations Chapter 20-27) is intended to promote public health, safety, welfare, and the peace and quiet of the inhabitants of the District, and to facilitate the enjoyment of the natural attraction of the District. Sound generated by trains, other than WMATA railcars, is exempt from this ordinance. The local noise ordinance prohibits construction sound levels above 80 dBA (Leq) (except for pile driving) between 7:00 AM and 7:00 PM unless a variance is granted. From 7:00 PM to 7:00 AM, construction activities may be limited to 65 dBA (Lmax) for noise originating in an industrial zone.

Construction noise is regulated in the Arlington noise ordinance by the zoning of the receiving property. Any noise from construction activity which produces sound greater than the limits in Table 11-2 is permitted only during daytime hours (7:00 AM to 9:00 PM on weekdays and 10:00 AM to 9:00 PM on weekends and legal holidays). The ordinance also requires that all feasible procedures and measures customarily used in the industry shall be implemented to minimize noise. At no time can construction noise exceed 90 dBA when measured at the curb of any property adjacent to a built street, a common area of any multi-unit structure, or an individual unit of any multi-unit structure, so long as the measurement is at least 50 feet from the noise source. Since the local noise ordinances include construction noise limits, FTA guideline criteria will not be implemented for the proposed Project.

The proposed Project is not expected to meet the criteria of a Type I highway project. A project is considered to be Type I if it is funded by or otherwise approved by the FHWA and includes construction of a new highway on new locations, substantial horizontal or vertical alteration of existing roadways, addition of through traffic lanes to increase capacity, addition of an auxiliary lane, or addition or relocation of ramps. Highway noise is analyzed for Type I projects and potential noise abatement is considered according to the DDOT Noise Policy.[86]

Table 11-2 | Arlington County Maximum Permissible Noise Levels

[86] District Department of Transportation. January 10, 2011. *DDOT Noise Policy.* https://comp.ddot.dc.gov/Documents/Highway%20Noise%20Policy.pdf. Accessed June 6, 2017.

Receiving Zoning District	Time of Day	Continuous Noise (dBA)	Impulsive Noise (dB)	Center Octave Frequency (Hz)	Center Octave dBA
M-1	All	70	120	31.5	85
M-2				63	84
P-S				125	79
				250	74
				500	68
				1,000	62
				2,000	57
				4,000	53
				8,000	50
C-O	All	65	100	31.5	80
C-O-CC				63	79
C-O-1.5				125	74
				250	69
				500	63
				1,000	57
				2,000	52
				4,000	48
				8,000	45

Source: ***Arlington County Code, Chapter 15***

11.6.2. Vibration Impact Criteria

FTA vibration criteria are based on maximum levels for a single event and depend on the type of land use and the frequency of events. Additionally, for projects in an existing railroad corridor the vibration impact assessment depends on existing vibration conditions in the Study Area.

FTA has different vibration impact criteria depending on whether an FTA General Vibration Assessment or Detailed Vibration Assessment method is used. If vibration measurements and/or prediction provide only overall vibration level results, then the FTA Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Assessment, as shown in Table 11-3, are used. FTA categorizes receptors according to their use similar to noise. These vibration criteria are defined in terms of human annoyance for different land-use categories such as high sensitivity (Category 1), residential (Category 2), and institutional (Category 3). In general, the threshold of human perceptibility of vibration is 65 Vibration Decibels (VdB).

Table 11-3 | FTA Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Assessment[1]

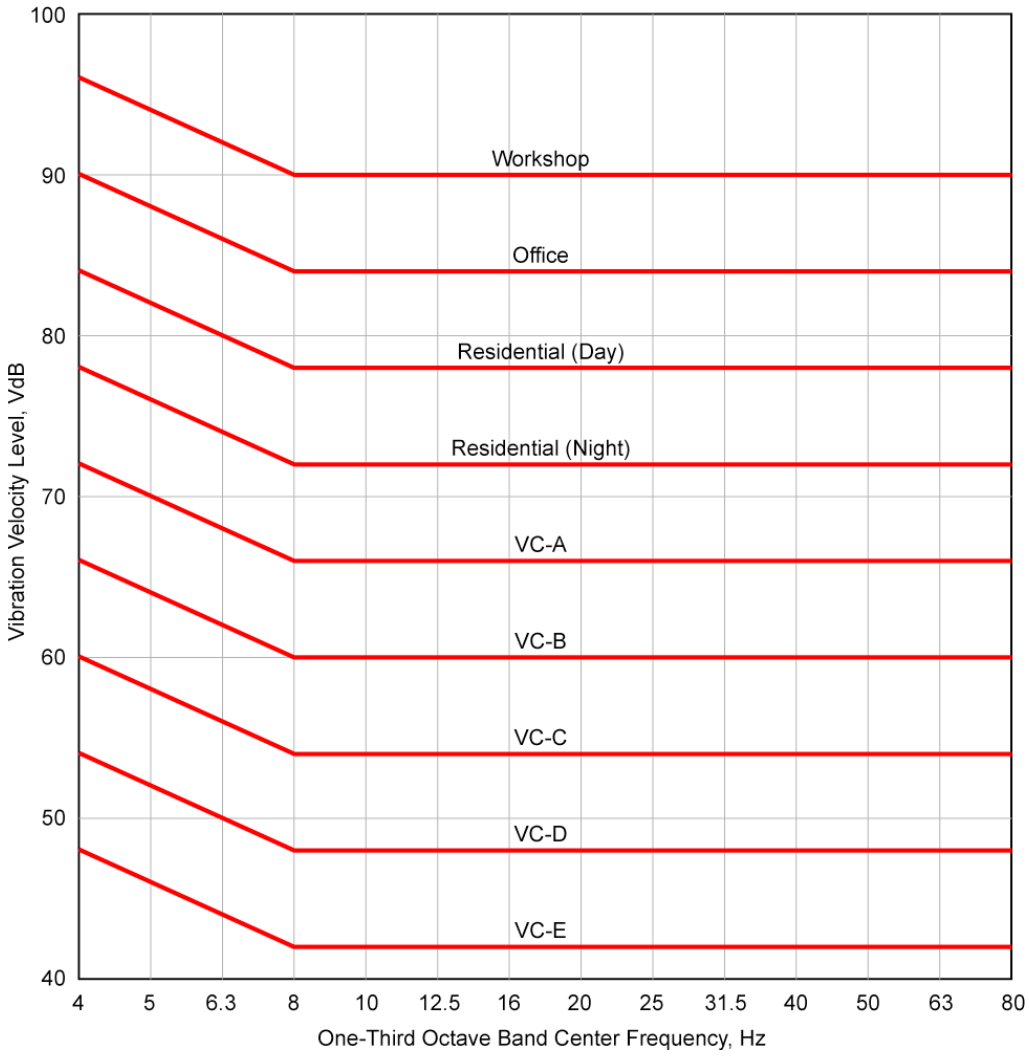
Land Use Category	Ground-Borne Vibration Levels (VdB)[1]			Ground-Borne Noise Levels (dBA)[2]		
	Frequent Events[3]	Occasional Events[4]	Infrequent Events[5]	Frequent Events[3]	Occasional Event[4]	Infrequent Event[5]
Category 1: **Buildings where low vibration is essential for interior operations.**	65	65	65	N/A[6]	N/A[6]	N/A[6]
Category 2: **Residences and buildings where people normally sleep.**	72	75	80	35	38	43
Category 3: **Institutional buildings with primarily daytime use.**	75	78	83	40	43	48

1. RMS vibration velocity levels are reported in VdB referenced to 1 micro inch per second (ips).
2. Ground-Borne noise levels are reported in dBA referenced to 20 micro Pascals.
3. "Frequent Events" is defined as more than 70 vibration events per day.
4. "Occasional Events" is defined as between 30 and 70 vibration events per day.
5. "Infrequent Events" is defined as less than 30 vibration events per day.
6. N/A means "not applicable." Vibration-sensitive equipment is not sensitive to ground-borne noise.

The FTA criteria for Detailed Vibration Analysis, as shown in Figure 11-2, are used when a Detailed Vibration Assessment is conducted which provides the frequency content of vibration in 1/3-octave band levels. These detailed vibration criteria apply to residential uses, institutional uses and vibration-sensitive equipment. If there are special-use buildings such as concert halls, recording studios, auditoriums or theatres, then specific vibration and ground-borne noise criteria would apply.

The vibration criteria also depend on existing conditions. For projects in existing railroad corridors (more than 12 trains per day), a project will cause impact if vibration levels were to exceed the FTA criteria and the project were to significantly increase the number of vibration events (approximately doubling the number of events) or if the project would increase vibration levels by 3 VdB or more. If a project moves existing tracks, there would be impact only if the track relocation results in vibration levels exceeding the FTA criteria and increasing more than 3 VdB.

Figure 11-2 | FTA Detailed Ground-Borne Vibration Criteria



During certain construction activities, there is the potential for structural damage to nearby buildings. Structural damage is typically limited to impact-type construction equipment such as impact-pile driving used at very close distances to buildings (within 25 feet). Potential damage from vibration depends on the specific construction activity and how the building is constructed. FTA criteria for potential structural damage are shown in Table 11-4. The criteria are presented in both vibration level (VdB) and peak-particle velocity (PPV) (in/s).

Table 11-4 | FTA Criteria for Potential Structural Damage

Building Category	Vibration Criteria for Potential Damage to Structures	
	Vibration Level (VdB)	Peak-Particle Velocity (in/s)
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

11.6.3. Impact Assessment Methodology

Noise and vibration impact will be assessed by measuring and predicting noise and vibration conditions for the existing and future build alternatives and comparing to applicable criteria. Accurately evaluating impact is important for future decisions regarding alternatives, mitigation measures, and commitments.

A Detailed Noise Assessment will be conducted based on Chapter 6 of the FTA Manual to predict future noise conditions from mobile sources. For any changes in roadway noise sources, either FTA prediction methods or the latest version of the FHWA's traffic noise model (TNM) will be used.

A Detailed Vibration Assessment will be conducted based on Chapter 8 of the FTA Manual to predict future vibration conditions from trains. Since the Project already has existing railroad infrastructure and the same trains would be operating, vibration can be predicted based primarily on measurements of existing trains. Vibration propagation conditions can be determined through measurement of existing sources at a range of distances. Typical adjustments will be included, as needed, such as outdoor-to-indoor vibration attenuation, changes in vibration due to train speeds, and track condition or type.

11.7. Construction Impacts

The construction noise and vibration assessment will evaluate typical equipment and methods used during different phases of the proposed Project such as track re-construction, foundation work, pile driving, superstructure, and finish/interior fit out. Impact will be assessed using the methods described in the FTA manual (Chapter 12), FHWA Roadway Construction Noise Model, EPA construction noise data, a combination of these methods, or an equivalent method, supplemented as necessary by professional judgment.

11.8. Mitigation

Depending on the impact assessment results, the need for noise and vibration mitigation will be evaluated and preliminary mitigation recommendations will be provided. Potential mitigation of noise and vibration will be evaluated according to the FTA guidance methods. FTA guidance states that the need for noise mitigation is most compelling if there would be significant (severe) noise impact. If there would be moderate noise impact, the need for mitigation should be evaluated considering factors such

as the absolute future noise level, the acoustical and cost effectiveness of mitigation options, the sensitivity of the receptors, and where noise levels would be within the range of the moderate impact criteria.

The FTA and FRA do not have specific guidance on how to address locations that do not currently have sensitive uses, but would introduce such uses with future development. Therefore, consistent with FHWA regulation 23 CFR part 772, potential existing noise and vibration conditions will be characterized, impact will be assessed, and the eligibility for mitigation will be considered at developments that would introduce new sensitive uses only if they have been permitted for sensitive use prior to the Date of Public Notice, which is the date of the approved Record of Decision.

12.0 Aesthetics

12.1. Overview and Definitions

Visual and aesthetic resources include features of both the built and natural environment that together make the visual environment. Examples of these resources surrounding Long Bridge include parks, natural areas, trails, parkways, scenic features, open vistas, terrain, and water bodies. Historic or urban core districts are also considered visual resources. These visual resources create visual and aesthetic qualities that define specific locations in the District and in Northern Virginia. To identify all visual and aesthetic resources, other resource area assessments will be referenced, including Parks and Recreation Areas, Cultural Resources, Natural and Ecological Systems, and Water Resources.

The visual and aesthetic quality impact analysis will evaluate the Long Bridge Project's short- and long-term impacts caused by the change in the visual environment resulting from the Project. It will include diagrammatic views from specific viewpoints for neighbors and travelers, and an assessment of alternatives compared to the No Action Alternative. The analysis will be consistent with the assessment of effects conducted for the Section 106 process.

- **Viewers:** Neighbors who can see the proposed Project and travelers who would use it.
    - **Neighbors:** Viewers who occupy, or will occupy, land adjacent or visible to the Project.
    - **Travelers:** Viewers who use the existing transportation infrastructure, or would use the transportation infrastructure resulting from the proposed Project.
- **Visual Resource:** Component of the natural, cultural, or Project environments that is capable of being seen.
    - **Natural Visual Resources:** The land, geologic features, water, vegetation, and animals that compose the natural environment.
    - **Cultural Visual Resources:** The buildings, structures, objects, site, districts, and artifacts that compose the cultural environment.
    - **Project Visual Resources:** The geometrics, structures, and fixtures that compose the Project environment.
- **Visual Quality:** An assessment of what viewers like and dislike about visual resources that compose the visual character of a particular scene. Different viewers may evaluate specific visual resources differently based on their interests. Elements of visual quality include:
    - **Natural Harmony:** What a viewer likes and dislikes about the natural environment. The viewer labels the visual resources of the natural environment as being either harmonious or inharmonious.
    - **Cultural Order:** What a viewer likes and dislikes about the cultural environment. The viewer labels the visual resources of the cultural environment as being either harmonious or inharmonious.

  - **Project Coherence:** What the viewer likes and dislikes about the Project environment. The viewer labels the visual resources of the Project environment as being either coherent or incoherent.

- **Viewshed:** All surface area visible from a particular location or sequence of locations like a trail.[87]
- **Area of Visual Effect:** The area in which views of the Project would be visible as influenced by the presence or absence of intervening topography, vegetation, and structures.
- **Key Viewpoints:** A location from which a viewer can see either iconic or representative landscapes.
- **Viewer Sensitivity:** The degree to which viewers are sensitive to changes in the visual character of visual resources. It is the consequence of two factors, viewer exposure and viewer awareness.
- **Viewer Exposure:** Viewer exposure is a measure of proximity (the distance between viewer and the visual resource being viewed), extent (the number of viewers viewing), and duration (the length of time visual resources are viewed). The greater the exposure, the more viewers will be concerned about visual impacts.
- **Viewer Awareness:** Viewer awareness is a measure of attention (level of observation based on routine and familiarity), focus (level of concentration), and protection (legal and social constraints on the use of visual resources). The greater the attention, the more viewers will be concerned about visual impacts.
- **Visual Character:** The description of the visible attributes of a scene or object typically using artistic terms such as form, line, color, and texture.

12.2. Regulatory Context

NEPA offers guidelines to help ensure aesthetically pleasing surroundings for all Americans. The following laws, regulations and planning documents apply to visual resources:

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- National Scenic Byways (23 USC 162)
- U.S. Department of Transportation Act (Section 4(f)) (49 USC 303)
- U.S. DOT EO 5610.4
- U.S. Commission of Fine Arts EO 1862
- National Historic Preservation Act (NHPA) (16 USC 470)
- Federal Land Policy and Management Act (43 USC 1701)

[87] Federal Highway Administration 1988

- NPS, Forests, and Public Property (36 CFR parts 1 to 199)
- EO 11593, Protection and Enhancement of the Cultural Environment
- Shipstead-Luce Act (40 USC 121)
- National Capital Planning Act of 195288
- The Height of Buildings Act of 1910

Relevant Federal guidance:

- Federal Elements of the Comprehensive Plan for the National Capital, National Capital Planning Commission
- Monumental Core Framework Plan, National Capital Planning Commission
- Southwest Ecodistrict Plan, National Capital Planning Commission
- Memorials and Museums Master Plan, National Capital Planning Commission[89]
- Legacy Plan, National Capital Planning Commission[90]
- National Mall Plan, National Park Service
- FHWA's Guidelines for the Visual Impact Assessment of Highway Projects (FHWA-HEP-15-029) will also be used as guidance in this analysis.[91] The FHWA is not a regulatory body for railroad projects, but is considered an expert resource regarding visual impact assessments due to their extensive documentation of visual resources, impacts, and mitigation measures.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

State

- District of Columbia Municipal Regulations, Zoning Regulations Special Purpose Zones, 11-K DCMR § 305
- The Historic Landmark and Historic District Protection Act of 1978 (DC Law 2-144, as amended through October 1, 2016)

Local

- Arlington County Code

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88 National Capital Planning Act of 1952. Accessed from https://www.gpo.gov/fdsys/pkg/STATUTE-66/pdf/STATUTE-66-Pg781.pdf. Accessed on December 15, 2017.

89 NCPC. National Memorials and Museums Master Plan. Accessed from https://www.ncpc.gov/plans/memorials/. Accessed on December 14, 2017.

90 NCPC. Legacy Plan. Accessed from https://www.ncpc.gov/plans/legacy/. Accessed on December 14, 2017.

91 FHWA. 2015. *Guidelines for the Visual Impact Assessment of Highway Projects.* https://www.environment.fhwa.dot.gov/guidebook/documents/VIA_Guidelines_for_Highway_Projects.asp

Relevant state and local guidance:

- District Elements of the Comprehensive Plan for the National Capital
- Maryland Avenue SW Small Area Plan, DC Office of Planning
- Assessing Visual Effects on Historic Properties, Virginia Department of Historic Resources

12.3. Study Area

The Study Area for aesthetics and visual quality will extend beyond the Long Bridge Project footprint encompassing the viewsheds and viewpoints, and areas of Project visibility. The analysis will focus on the visual impacts of the alternatives in relation to existing and future visual quality and character, scenic resources, and types of viewers. The Study Area will also subdivide viewers into their respective *type* based on criteria in Section 5.3.1 and 5.3.2 in FHWA *Guidelines for the Visual Impact Assessment of Highway Projects.*[92]

The Study Area will be sufficient in size to:

- Capture the proposed Project elements outlined in the alternatives, including all aspects of construction.
- Include areas of visual effect that have the potential to be affected by the Project, including NPS land.
- Encompass all viewers that could be impacted from the Long Bridge Project, including motorized, bicycle, boat, and pedestrian travelers.
- Cooperating and Participating Agencies including the NPS, the Commission of Fine Arts (CFA), the National Capital Planning Commission (NCPC), the Washington DC State Historic Preservation Office (DC-SHPO), the Virginia Department of Historic Resources (VDHR), and the Washington DC Office of Planning (DCOP) will have an opportunity to comment on the Study Area and its specific resources to be evaluated.

12.4. Data Sources

Data sources include:

- Background information will be summarized including relevant documents and data, GIS databases, and maps;
- Agencies will be asked to provide aerial maps or imagery that demonstrate important visual and aesthetic information; and
- The Library of Congress will also be a resource for historic view imagery.

[92] FHWA. 2015. *Guidelines for the Visual Impact Assessment of Highway Projects.* https://www.environment.fhwa.dot.gov/guidebook/documents/VIA_Guidelines_for_Highway_Projects.asp#chap53

- Following a review of background information, field observations will be conducted to more fully understand the Project and its visual and aesthetic context, as described in Section 12.5, *Affected Environment*.

12.5. Affected Environment

The following methods will be used to document the Affected Environment, as identified in the FHWA Visual Impact Guidebook.[93]

An annotated visual impact analysis map will be developed indicating the general locations of the alternatives. Resources will be clearly labeled, with accompanying viewshed and viewpoint locations for various types of viewers. Where appropriate, continuous viewpoints will be identified, for example along the George Washington Memorial Parkway. An initial list of resources to be included in the annotated map include:

- East and West Potomac Park
- Potomac River
- Washington Channel
- L'Enfant Plan
- McMillan Plan
- National Mall Monuments and Memorials
- Topographic Bowl
- George Washington Memorial Parkway
- The Pentagon
- Reagan National Airport
- Joint Base Anacostia-Bolling
- Fort McNair

A Consulting Parties or Interagency meeting will be held with NPS, NCPC, CFA, DC-SHPO, and VDHR to confirm resources for evaluation. At the meeting, viewshed and viewpoint locations will be reviewed for various viewers, along with locations that require nighttime or seasonal conditions. Background information, imagery, and "street views" will be organized to help facilitate the conversation.

Following the Consulting Parties or Interagency meeting with NPS, NCPC, CFA, DC-SHPO, and VDHR confirming resources and viewpoints, a series of field visits will be conducted to document the area of visual impact. The existing visual character will be documented through:

- Description of viewers and viewer sensitivity;

[93] FHWA. 2015. *Guidelines for the Visual Impact Assessment of Highway Projects.* https://www.environment.fhwa.dot.gov/guidebook/documents/VIA_Guidelines_for_Highway_Projects.asp

- Annotated visual impact analysis map with viewshed and viewpoint locations, including field observations. Travel speeds may also be documented to help determine the cone of vision;
- Photographs showing views at locations from which the Project will be visible, especially those that represent viewsheds that are visually, naturally, or culturally significant;
- Photographs showing resources within the area of visual impact, and a description of their relationship to the Project; and
- Photographs and written description of existing light sources, and a description of levels in the Study Area

Additional needed background information or agency questions will also be identified.

12.6. Environmental Consequences

Evaluation of visual, natural, and cultural resources will include both qualitative and quantitative methods for both direct and indirect impacts. The analysis will focus on determining the compatibility of the impact, the sensitivity of the viewers, and the degree of the impact to resources. Impact analysis will be based on background information, field observations, and visual simulations. The analysis will compare the No Action Alternative and the proposed Build Alternatives in 2040.

The following definitions are provided for compatibility, degree, and sensitivity:

- **Compatibility of Impact:** Defined as the ability of environment to absorb the proposed project because of the project and the environment having compatible visual characters. The proposed project can be considered compatible or incompatible. By itself, compatibility of the impact should not be confused or conflated with the value of the impact. The Long Bridge structure will be considered compatible or incompatible based on its form.
- **Sensitivity to Impact:** Defined by the ability of viewers to see and care about a project's impacts. The sensitivity to impact is based on viewer sensitivity to changes in the visual character of visual resources. Viewers are either sensitive or insensitive to impacts. By itself, the sensitivity of the impact should not be confused or conflated with the value of the impact.
- **Degree of Impact:** Defined as either a beneficial, adverse, or neutral change to visual quality. A proposed project may benefit visual quality by either enhancing resources or by creating better views of those resources and improving the experience of visual quality by viewers. Similarly, a project may adversely affect visual quality by degrading visual resources or obstructing or altering desired views.

Assessing visual and aesthetic impacts will include:

- Illustrating or describing the visual character related to the No Action Alternative and proposed Build Alternatives;
- Performing visual simulations to assess visual and aesthetic impacts for the No Action Alternative and the proposed Build Alternatives;
    - Selecting viewpoints at locations from which the alternatives will be visible, especially those where there is a high-level of viewer exposure and awareness, and where viewsheds have been identified.

  - Simulating the visual impact by superimposing the built forms of the alternatives onto existing conditions photographs of identical views using a 3D modeling or perspective rendering program. These diagrams are meant to illustrate form, elevation, color, and texture to quantitatively assess visual character.

- Characterizing and assessing visual and aesthetic effects of each alternative and identifying significant changes to the affected environment. The compatibility of the overall change will be compared to the affected environment and the degree of the impact on resources will be summarized. Viewer sensitivity will be determined. Visual and aesthetic impacts will be assessed through coordination with the Section 106 process of the NHPA. Agency knowledge of the historic significance of key resources, viewsheds, and viewpoints will be incorporated into the evaluation process;
- Discussion and evaluation of impacts to landscaping and trees; and
- Describing nighttime conditions and the potential for light spillage caused by the No Action Alternative and the proposed Build Alternatives.

Visual impacts will be summarized based on the FHWA Visual Impact Guidebook (Table 6-2 and Table 6-3).[94] The purpose will be to document visual quality and viewer sensitivity for the affected environment, the No Action Alternative, and the proposed Build Alternatives. Nighttime conditions will also be summarized for the No Action Alternative and the proposed Build Alternatives.

12.7. Construction Impacts

Construction impacts will be assessed based on viewsheds, nighttime lighting conditions, urban design context, and changes in the visual character of the Study Area compared to existing conditions. Short-term impacts that may affect the visual and aesthetic quality of the environment may include construction lighting, and the presence of desired or required construction screening walls that conceal the staging area for construction equipment and materials. River barges may also be used for stockpiling and construction access. Typical bridge construction includes foundation work, suspension or pier construction, superstructure construction, drainage, and deck work. Scaffolding and cranes may be used depending on the type and staging of construction. Steps for evaluating construction impacts include:

- Describing likely constructability phases and processes of the alternatives. Identify the construction equipment that would likely be used in each phase;
- Summarizing potential nighttime light sources and describe the potential for light spillage during nighttime construction;
- Describing the visual impacts related to construction activity and describe how the visual character or visual quality could be impacted; and
- Characterizing the visual and aesthetic impact of construction effects based on the change in viewsheds, nighttime lighting conditions, urban design context, and changes in the visual

[94] FHWA. 2015. *Guidelines for the Visual Impact Assessment of Highway Projects.* https://www.environment.fhwa.dot.gov/guidebook/documents/VIA_Guidelines_for_Highway_Projects.asp

character of the Study Area compared to the condition today. The analysis will consider the compatibility of the impact, the viewer sensitivity of the impact, and the degree of the impact to identified resources.

12.8. Mitigation

Mitigation measures will be identified and discussed for any unavoidable adverse impacts associated with the Proposed Action. If adverse impacts cannot be avoided, mitigation measures will be developed to minimize visual impacts. Enhancements may also be considered. Steps for identifying and proposing possible mitigation measures include assessing the degree to which mitigation measures:

- Comply with the regulatory context; and
- Avoid and minimize adverse effects.

Mitigation measures could include the use of vegetation to screen views, or the use of bridge design or materials to limit potential visual impacts or enhance vistas. Interpretive and wayfinding opportunities may also be identified as potential mitigation measures.

13.0 Cultural Resources

13.1. Overview and Definitions

This section will describe the results of investigations that identify and evaluate the potential impacts the alternatives will have on cultural resources. According to NEPA regulations, FRA must consider unique characteristics of the geographic area such as proximity to historic and cultural resources and the degree to which the action may adversely affect those properties and resources.[95] The term "cultural resources" includes all resources included within the NHPA Section 106 definitions of "historic properties", as well as additional resources such as sacred sites, cultural landscapes, traditional cultural properties (TCPs), archaeological sites not eligible for listing in the National Register of Historic Places (NRHP), and archaeological collections. Cultural resources also include significant local and state monuments, properties listed in local and state historic registers, and other sites of cultural significance that are not otherwise eligible for NRHP listing. Additional regulations and the regulatory agencies associated with sites of cultural and historical significance are outlined in the following sections.

13.2. Regulatory Context

The following laws, regulations, and agency jurisdiction and management guidance are pertinent to evaluating impacts to historic and cultural resources. Key regulations that are most relevant to the proposed Project are listed below.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- NHPA (16 USC 470 et seq.)
- Archaeological and Historic Preservation Act (16 USC 469 - 469(c)-2)
- Archaeological Resources Protection Act (16 USC 470aa-mm)
- Native American Graves Protection and Repatriation Act (31 USC 3001 et seq.)
- The American Indian Religious Freedom Act (AIRFA)
- Federal Antiquities Act of 1906 (16 USC 431 et seq.)
- Advisory Council on Historic Preservation (36 CFR 800)

[95] 40 CFR part 1508.27(b)(3)

Relevant Federal guidance:

- NEPA and NHPA, A Handbook for Integrating NEPA and Section 106[96]
- The Secretary of the Interior's Guidelines for Treatment of Historic Properties[97]

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

State

- Virginia Antiquities Act (Section 10.1-2300 Code of Virginia)
- District of Columbia Historic Landmark and Historic District Protection Act of 1978 (DC Law 2-144)

Local

- The Arlington County Historic Preservation Program is prescribed by Part 11.3 (Historic Preservation Overlay District) of the Arlington County Zoning Ordinance.

The District of Columbia Historic Preservation Office undertakes the role of a State Historic Preservation Office (SHPO) for the District in addition to overseeing its local historic preservation program. Similarly, the Virginia Department of Historic Resources (VDHR) serves as the State Historic Preservation Office for Virginia. In addition to their consultative role during Federal Section 106 review, SHPOs administer the national historic preservation program at the state level, administer state historic register programs, review NRHP nominations, and maintain data on historic properties that have been identified but not yet nominated for listing in the NRHP.

Relevant state and local guidance:

- Guidelines for Conducting Historic Resources Survey in Virginia (2011)
- Guidelines for Archaeological Investigations in the District of Columbia (1998)

13.3. Study Area

The study area for the identification of historic and cultural resources is referred to as an Area of Potential Effects (APE). Section 106 implementing regulations define the APE as "… the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."[98] The APE will be defined in consultation with VDHR, DC SHPO, and other consulting parties as part of the Section 106 process.[99] The APE will be sufficient in scope to encompass historic and cultural resources that may be affected by the Project. At the first

96 http://www.achp.gov/docs/NEPA_NHPA_Section_106_Handbook_Mar2013.pdf

97 https://www.nps.gov/tps/standards.htm

98 36 CFR part 800.15(d).

99 The Virginia Department of Historic Resources (VDHR) provides guidance on APE development, requiring projects to include all locations where the project will cause ground disturbance and all locations from which the project may be visible or audible. The DC Historic Preservation Office (DCSHPO) does not offer comparable guidance.

consulting parties meeting for the Project held on April 25, 2017, attendees provided preliminary guidance for the development of an APE in the context of the preliminary Project concepts. The comments received indicated a preference for a single, comprehensive APE that will be inclusive of all possible Project Alternatives and elements (including potential options for bicycle and pedestrian access that follow the trajectory of the Long Bridge Corridor); considers multiple types of effects (direct and indirect); and is sufficiently sized to accommodate the expansive and uninterrupted views along the Potomac River to the Long Bridge Corridor. There is a possibility to expand or adjust the boundaries of the APE in the future to consider the comments of the consulting parties and/or accommodate new or changes to Project Alternatives.

In consideration of this guidance and initial feedback from consulting parties, the APE for the Long Bridge Project will be developed using windshield-level survey to identify and document the areas from which the Project will be reasonably visible or audible. The identification of the Section 106 APE will be coordinated with the Study Area for the analysis of aesthetic impacts as described in Section 12, *Aesthetics*. This area will intrinsically include direct effects, including potential ground-disturbing activities. Development of the APE will also:

- Utilize digital mapping and aerial photography to guide and supplement field data;
- Consider the impact of topographic and other vertical changes, and their effect on potential views and viewsheds, which may include sightlines from various locations in and surrounding the National Mall and wider viewsheds in areas along the banks of the Potomac River;
- Consider potential changes to the vertical height of the Long Bridge structure and associated infrastructure; and
- Incorporate seasonal changes, particularly the effects of foliage in obscuring views.

The APE will be mapped two dimensionally, although it will be assumed that the boundaries will evaluate both above-ground and below-ground resources, including potential underwater resources.

Changes to views and viewsheds will have the greatest potential to result in indirect adverse effects. Therefore, although other indirect effects (such as audial changes) will be considered, there is a lesser potential for these effects to influence the outer boundaries of the APE. At the time in the Section 106 process when adverse effects are identified, it will be necessary to utilize engineering data to quantify and evaluate the potential adverse effects associated with temporary and permanent impacts resulting from the Project.[100]

100 Temporary impacts may include construction noise and vibrations; permanent impacts may include increased railroad traffic noise and vibration.

13.4. Data Sources

Once an APE has been defined, the Federal agency must "… make a reasonable and good faith effort …" to identify historic properties within its boundaries (36 CFR part 800.4(b)(1)).

Data sources include:

- In August 2016, FRA and DDOT completed the *Long Bridge Project, Environmental Data Collection Report* (Data Collection Report), which included a preliminary identification of historic properties within and in the vicinity of a designated study area. The study area for that report was defined by a 1,000-foot buffer along the length of the Long Bridge Corridor.[101] Historic properties were identified using the following information sources:

    - Geographic Information Systems (GIS) mapping data provided by the District of Columbia and Arlington County
    - DC SHPO Inventory of Historic Sites
    - National Register of Historic Places (NRHP) database
    - General Services Administration (GSA) *Historic Buildings* website
    - Virginia Landmarks Register (VLR)
    - Virginia Cultural Resource Information System (V-CRIS)

  The *Data Collection Report* was shared with several consulting parties, including VDHR and DC SHPO in September 2016, and the findings related to historic properties were again presented at the first consulting party meeting in April 2017. If the APE extends beyond this study area, these sources will be reexamined to identify additional historic properties within the APE. The identification effort will also be expanded to include the following additional sources of information:

    - Properties that are pending or have been recently listed in the NRHP, which were not listed in the August 2016 *Data Collection Report;*
    - Properties that have been formally determined eligible for NRHP listing;
    - Potential archaeological resources within the LOD;
    - Properties at or greater than 45 years of age that have not been previously evaluated for NRHP eligibility;
    - Contributing streets and avenues, views and vistas, reservations, and other contributing components listed in the Plan of the City of Washington (L'Enfant Plan; L'Enfant-McMillan Plan) NRHP Documentation;

101 A 1000-foot buffer was uniformly selected for all environmental resources in the Data Collection Report. This buffer was selected in order to compile preliminary existing data on environmental resources within the vicinity of the Long Bridge Corridor; but it is not an indication that FRA has made any determination that effects would only occur within this 1000-foot buffer zone.

- Existing Cultural Landscape Inventories and Cultural Landscape Reports prepared by the National Park Service and others;
- Existing reports from other Federal agencies in the area, including the General Services Administration (GSA); and
- Consultation with SHPOs, Tribal Historic Preservation Offices (THPOs), and consulting parties

Although the scope for this Project does not include drafting formal determinations of eligibility, properties located within the APE that are at least 45 years of age will be evaluated against the NRHP Criteria for Evaluation. These properties will be identified using a range of documentation resources including real property and building permit data, historic maps and photographs, and aerial photographs. A preliminary evaluation of each property's potential historic significance and integrity will be provided as a tool for future, more detailed evaluation.

The findings of this data collection effort will be provided in a stand-alone technical report appended to the EIS.

13.5. Affected Environment

The Affected Environment section will document historic properties and cultural resources within the APE, identified using the data sources described above. In accordance with Section 106 of the NHPA, the Long Bridge EIS will identify all properties that are listed in, or are eligible for listing in, the NRHP that are located within the APE. The Affected Environment section will also narratively describe the historically significant characteristics of each resource and its specific historic designation and will graphically illustrate the appearance and location of each resource. It is not anticipated that FRA will seek concurrence with any Determinations of Eligibility as part of this effort.

Additionally, for historic properties and cultural resources within the APE, the Affected Environment section will:

- Document information about the current eligibility or listing of each resource for the NRHP;
- Identify properties that appear to meet one or more of the NRHP Criteria for Evaluation and that have been constructed or have achieved significance within the past 45 years. This could potentially include historic districts, sites, buildings, structures, and objects that:
  - Are associated with a significant person, event, or broad pattern of history,
  - Exemplify a particular style or method of construction,
  - Possess high artistic or aesthetic value,
  - Are the work of a recognized master, and/or
  - Have the potential to yield information important in prehistory or history;
- Identify properties that have been listed in the DC Inventory of Historic Sites or the Virginia Landmarks Register, or have been designated as Arlington County Local Historic Districts, but are not otherwise listed in, or determined eligible for listing in, the NRHP;

- Document previously recorded archaeological sites located within the study area that had been previously determined to be eligible for the NRHP through methods such as close-interval shovel testing, test unit excavation, and archival research, where applicable;
- Identify additional previously recorded archaeological sites, cemeteries, state archaeological landmarks, and historical markers within the study area;[102]
- Construct a predictive model of potential archaeological site locations by querying modern topographic and soil datasets to assess where prehistoric and historic-age settlement is most likely to have occurred and to have been preserved in surface, shallow subsurface, and deep subsurface contexts;
- Integrate analyzed data from studies previously undertaken in the study area to determine whether additional archaeological investigation, surface survey, or deep testing (for example, trenching/coring) would need to be completed;
- Obtain existing environmental information on physiography, topography, geology, geomorphology, hydrology, and soils, which is necessary for interpretation by a geoarchaeologist to assess probability and integrity potential of buried archaeological sites;
- Identify the potential traditional cultural properties and cultural landscapes located within the study area following the methods outlined in National Register Bulletin 38;[103] and
- Use GIS to map the boundaries of each individual resource within the study area.

13.6. Environmental Consequences

As stated previously, Section 106 regulations require Federal agencies to consider the effects of their undertakings on historic properties. An effect is considered adverse when it alters, directly or indirectly, any of the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Impacts to cultural resources attributed to the Project will be assessed in comparison to the Affected Environment within the APE. This will serve as a baseline for which to compare the impacts of the No Action and Build Alternatives.

Types of effects that will be considered will include direct (such as physical destruction, damage, relocation, or alteration of a property), indirect (such as introduction of visual, atmospheric, or audible elements that diminish the integrity of a property's significant historic features), temporary, future, and cumulative effects on historic properties. The Section 106 regulation defines visual, atmospheric, or audible elements as adverse when they diminish the integrity of a property's significant historic features. Examples of these elements may include changes to historic views and viewsheds, noise, and ground-borne vibration. Changes to views and viewsheds will be considered adverse when they

[102] Consult with the appropriate SHPO/THPO to determine whether it is suitable to release the location of an archaeological site to the public in the EIS.

[103] According to the National Park Service (NPS) Office of Policy, a cultural landscape refers to either a historic site, historic designed landscape, historic vernacular landscape, or ethnographic landscape. For more information, see the NPS Cultural Resource Management Guideline (Appendix A) at https://www.nps.gov/parkhistory/online_books/nps28/28appena.htm

permanently remove or impede views that have been identified as contributing elements to the historic significance of a property, or when they diminish a property's integrity of setting, feeling, or association. If necessary, these will be evaluated by comparing existing views against rendered images of the proposed alternatives, as described in Chapter 12, *Aesthetics*. Changes to views and viewsheds, noise, and ground-borne vibration have the potential to occur both during the construction and operational periods. The process to evaluate the environmental consequences for noise and vibration includes identifying noise and vibration-sensitive receptors, understanding the predominant sources of noise and vibration, and characterizing existing noise and vibration conditions through measurements and modeling.

13.6.1. General Methodology

Impacts to cultural resources attributed to the Project will be assessed in comparison to the No Action in the APE. For each Build Alternative under consideration in the EIS, FRA will apply the criteria of adverse effect as found in 36 CFR part 800. In the Final EIS, there will be documentation of consultation concerning the impacts of the Proposed Action on historic properties with VDHR, DC SHPO, and consulting parties. In the event that FRA, in consultation with VDHR and DC SHPO, finds that the Proposed Action will have an adverse effect on such properties, there will be documentation in the Final EIS of subsequent consultation with the Advisory Council on Historic Preservation (ACHP).

Evaluation of impacts will identify and determine the likelihood that a proposed alternative for a project would affect or impact significant historic or cultural resources. These impacts will be considered for both temporary (such as construction staging) and permanent impacts. For further discussion related to construction impacts, see the Construction Impacts methodology. Definitive determination of whether properties will be impacted using preliminary design information presents some unique challenges. For this reason, to the EIS will clearly state the assumptions that were used to inform the assessment and outline what additional information would be used to address any unresolved questions about resource impacts, if necessary.

In addition to the written summary of effects, a matrix will be created to describe the impacts to each cultural resource. Ground disturbance, visual impacts, vibration impacts, noise disturbance, and economic impacts are examples of adverse impacts that may affect cultural resources. The following questions will be asked to assess whether an impact will occur:

- Will the Project alternative alter any of the characteristics of the property that make it eligible for the NRHP?
- Will the Project alternative cause the neglect, damage, destruction, or removal of cultural resources? Which cultural resources will be affected in this way?
- Will the Project alternative cause the alteration of a cultural resource including the restoration, rehabilitation, repair, maintenance, stabilization, or modification that is not consistent with the *Secretary's Standards for the Treatment of Historic Properties*? Which cultural resources will be affected in this way?
- Will the Project alternative cause a change in use or access to cultural resources? Which cultural resources will be affected in this way?
- Will the Project alternative introduce audible, visual, or atmospheric changes to the setting of cultural resources? Which cultural resources will be affected in this way?

- It is possible for many cultural resources to be affected by atmospheric changes. To assess if the impact will diminish the integrity of the property's significant historic features the resource's significance and character-defining features will be identified.
- Visual impact studies, noise and vibration studies, and traffic studies will also be used to assess atmospheric impact to cultural resources. Viewshed analysis or visual impact analysis will be consistent with the visual impact analysis conducted for the Section 106 process.

13.6.2. Methodology for Evaluating the Build Alternatives

Effects will be assessed by asking the questions provided above and will be considered for the short-term and long-term duration of the Project. Effects will be assessed for all cultural resources within the APE. Adverse effects will occur when the integrity, and thus significance, of the property's character-defining features is diminished. FRA and DDOT will identify proposed mitigation commensurate with the degree of impact in consultation with VDHR, DC SHPO, and other consulting parties.

13.7. Construction Impacts

To identify and evaluate the potential impacts of temporary construction activities and staging, the EIS will identify the limits of construction staging, likely construction phasing scenarios, and potential temporary impacts. Construction impacts could include demolishing the existing Long Bridge, demolishing and replacing tracks and bridges on each of the approaches to the existing Long Bridge, and visual and physical impacts from staging of equipment or materials on each side of the Potomac River or in the river as part of the construction. In addition to Long Bridge itself, the NRHP-listed park and parkway land on both sides of the Long Bridge have the potential to be adversely affected by temporary construction activities.

13.8. Mitigation

If FRA identifies adverse effects on historic properties resulting from the Long Bridge Project, FRA will continue consultation with VDHR, DC SHPO, and other consulting parties to develop and evaluate alternatives to avoid, minimize, or mitigate such effects. These measures would be documented in a legally-binding resolution document, either a Memorandum of Agreement (MOA) or Programmatic Agreement (PA). The draft MOA or PA would be included in the Draft Environmental Impact Statement. The Final MOA or PA would be attached to the Record of Decision. Potential mitigation commitments could include documentation of historic properties affected by the undertaking, interpretation, or funding to support historic preservation projects and advocacy.

14.0 Recreation and Parks

14.1. Overview and Definitions

The parks and recreation areas impact assessment will consider the Project's potential to affect parks and outdoor recreational facilities, bird sanctuaries, wildlife preserves, resource management areas, and similar resources that are publicly owned or have public access. Potential effects could result from changes to accessibility, physical impacts to parks and recreation areas property, or other external impacts that could affect the use and enjoyment of parks and recreation areas, such as increased noise and vibration or visual obstruction.

There are no Wild and Scenic Rivers or Outstanding National Resource Waters in the vicinity of the Long Bridge Project; therefore, this methodology will not address assessment of impacts to those resources.

14.2. Regulatory Context

This section identifies regulatory requirements for assessing post-construction and construction period impacts to parks and recreation areas.

Federal Laws, Regulations, and Other Guidance

Parks and recreation areas are subject to regulation by multiple Federal agencies and multiple legislative and regulatory vehicles.

Relevant Federal guidance:

- National Park Service Organic Act (NPSOA) (16 USC 1 - 4)
- NPS Director's Order 12 (DO-12)
- Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 USC 303
- U.S. Land and Water Conservation Fund (LWCF) Act of 1965 (16 USC 4601-4)
- National Capital Planning Act (40 USC 8701 – 8737)
- National Trails System Act (Public Law 90-543)

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are no relevant state and local laws and regulations for this resource.

Relevant state and local guidance:

State

District departments with jurisdiction over parks and recreation areas in the vicinity of Long Bridge include the DC Department of Parks and Recreation, the DC Office of Planning, and the DC Office of Zoning. Parks and recreation areas are managed by these departments through the development and implementation of plans. Plans and studies applicable to parks and recreation areas in the vicinity of Long Bridge include:

- *DC Parks and Recreation Master Plan* (2015); and
- *Southwest Neighborhood Plan* (2015).

Local

The Arlington County Department of Parks and Recreation and the Arlington County Department of Community Planning, Housing, and Development have jurisdiction over parks and recreation areas in the vicinity of Long Bridge. Parks and recreation areas are managed by these departments through the development and implementation of plans. County plans and studies applicable to parks in the vicinity of the Long Bridge include:

- *Master Plan for the North Tract Park and Recreational Facilities and the Surrounding Area* (2004), which provides the blueprint for continuing development of Long Bridge Park;
- *General Land Use Plan*, which establishes policy for land-use decisions and development in Arlington, including open space; and
- *Public Spaces Master Plan* (2005, currently being updated), which identifies the major public space needs of the community.

14.3. Study Area

The Study Area will generally include properties within 500 feet of the Build Alternatives, in order to adequately assess impacts due to physical occupation of parklands. However, this Study Area may be expanded to assess air quality, noise and vibration, or aesthetic impacts to parks and recreation areas, based on the analysis of impacts to these resources as described in Sections 7.0, 11.0, and 12.0.

14.4. Data Sources

Data sources include:

- Arlington County GIS Data
- District of Columbia GIS Data
- Consultation with the National Park Service
- Local and regional parks and open space plans, including:
    - NPS National Mall Plan (2010)
    - NCPC *Capital Space Plan* (2010) and 2012 Progress Report
    - NCPC *SW Ecodistrict Plan* (2013) and 2014 Addendum
    - DC Parks and Recreation Master Plan (2015)
    - DC Southwest Neighborhood Plan (2015)

- Arlington County Master Plan for the North Tract Park and Recreational Facilities and the Surrounding Area (2004)
- Arlington County Public Spaces Master Plan (2005)
- National Trails System Map[104]

14.5. Affected Environment

The Affected Environment section will document publicly accessible parks and recreation areas within the Study Area by identifying:

- Parklands located within the Study Area, and providing the name, location, and ownership. The total area (acres) within the Study Area will be estimated, and acres of parklands will be presented in tables and in maps using GIS. The intended purpose of the parkland (active or passive recreation) will be noted if that information is available.
- Areas sensitive to noise and vibration, and visual and aesthetic changes to natural landscape.
- Potentially sensitive areas (such as conservation land, resource management areas, and public recreational facilities).

14.6. Environmental Consequences

The impact analysis will evaluate direct and indirect impacts on parks and recreation areas, for both the post-construction and construction periods, for the No Action and Build alternatives. The following key topics will be considered, addressed, and evaluated in the analysis of impacts to parks and recreation areas:

- Whether a portion or all the parks and recreation areas identified within the Study Area overlaps with the Build Alternatives limits of disturbance;
- Evaluation of impacts to related resources, for example, water quality at current recreational facilities potentially causing harm to people;
- Evaluation of the removal of trees or vegetation (permanent or temporary) as it relates to a park or recreation area impact (street tree removal would not be covered unless the street was specifically within a park/recreation area). Discussion and evaluation of impacts to landscaping and trees will be discussed in Section 12, Aesthetic Resources.
- Whether the Project would cause changes in accessibility or connectivity;
- Whether the Project fragments any existing conservation lands or wildlife refuges; and
- Whether a portion or all the total acreage of parks or recreation areas identified within the Study Area is considered to be affected by noise and vibration threshold exceedances or

[104] National Trails Maps. NPS. https://www.nps.gov/nts/maps/National%20Trails%20map.pdf

changes in the visual or aesthetic quality as a result of the Build Alternatives; or if a land cover conversion is identified within parkland.

14.7. Construction Impacts

This section will describe potential temporary impacts for each alternative during the construction period on recreation areas, including ground disturbing activities, limitations in access or use, noise and vibration, or other construction impacts.

14.8. Mitigation

Depending on the potential for the Build Alternatives to affect parks and recreation areas, the need for mitigation measures will be evaluated and preliminary mitigation recommendations will be provided. Potential mitigation measures will be developed based on the anticipated impacts, the function of the affected site, the value of the affected site (as determined through coordination with the official with jurisdiction), and input from the official with jurisdiction.

15.0 Social and Economic

15.1. Overview and Definitions

The social and economic assessment will consider the Project's potential to impact the socioeconomic environment, including community disruption or cohesion; demographic shifts; impacts to existing commerce and new commercial activity; job creation; and tax revenues. This section will provide an overview of existing community structure and demographic profiles within the Study Area, assess potential impacts from the Project, and identify possible measures to mitigate negative impacts.

15.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs

- FRA Procedures for Considering Environmental Impacts (64 CFR part 28545)
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19883, April 23, 1997)

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations

- District of Columbia, DC Code §§ 8-109.01 – 8.109.12, Subchapter V: Environmental Impact Statements
- Commonwealth of Virginia, Department of Environmental Quality, Procedure Manual: Environmental Impact Review of Major State Facilities (July 2013)

15.3. Study Area

Since the northern and southern portions of the Project are located in relatively dense, urban areas, the Study Area will include the Project Area itself—which spans from the VA Interlocking in Washington, DC, to the Crystal City VRE Station in Arlington County, Virginia—as well as the 2010 U.S. Census blocks within one-half mile of the Project Area. No social or economic impacts are anticipated for the portion of the Project that passes over the Potomac River.

15.4. Data Sources

Existing social, demographic, and economic characteristics of the Study Area will be identified.

Data sources include:

- U.S. Census Bureau, 2010 Decennial Census
- U.S. Census Bureau, American Community Survey, 2011 – 2015 5-year Estimates
- MWCOG Cooperative Land Use Forecasts (Round 9.0)

- District of Columbia Office of Tax and Revenue
- Arlington County Office of the Treasurer
- District of Columbia Geographic Information Systems (GIS) Data
- Arlington County GIS Data
- Field Review

15.5. Affected Environment

This section will identify existing social, demographic, and economic characteristics of the Study Area using data from the 2010 Census, the 2011–2015 American Community Survey (ACS) 5-year Estimates, the District of Columbia Office of Tax and Revenue, and the Arlington County Office of the Treasurer. This section will draw from these data sources to build a socioeconomic profile and establish a baseline for existing social, demographic, and economic conditions in the Study Area.

These socioeconomic profiles will include the following indicators:

- Demographics, including total population and population by age, sex, race, and median income;
- Community facilities in the Study Area, including libraries, schools, community centers, place of worship, and emergency response facilities;
- Community facilities that would be expected to serve high concentrations of children, such as schools, community/recreational facilities, and daycare centers;
- Jobs by type and location;
- Taxes and other public revenues;
- Current economic conditions of the neighborhood(s);
- Commercial activity and locations and types of businesses; and
- Other local government services.

This section will include Study Area maps displaying baseline conditions for one or more socioeconomic indicators. Maps will be developed using ArcGIS.

15.6. Environmental Consequences

The communities and demographics analysis will evaluate the Project's direct and indirect impacts on the communities adjacent to the Project Area in both the District, and in Arlington County, Virginia. This section will evaluate potential impacts to:

- Demographics, including age, sex, race, and median income
- Jobs, including types and locations of jobs
- Tax and other public revenues
- Potential for community disruption and additional demographic shifts
- Commercial activity

- Local government services

The analysis will include discussion of the potential for community disruption resulting from the Project, and impacts on livability in the Study Area. In identifying potential impacts to communities, the communities and demographics analysis will draw from the results of the analyses for air quality, noise and vibration, visual impacts, economic impacts, and traffic. The analysis also will determine potential physical impacts in the Study Area by comparing the proposed limits of disturbance and limits of construction to mapped community facilities

The social conditions analysis will identify the potential need for any property acquisition and displacement, and will assess the need for and availability and adequacy of relocation housing. Both positive and negative potential impacts will be identified and discussed, and the duration and intensity of these impacts will be identified as feasible and appropriate.

The social and economic impacts of the Project will be discussed using both quantitative and qualitative methods, and where feasible and applicable, will be identified with a particular component of the Project.

15.7. Construction Impacts

The assessment of impacts during the construction phase will identify the limits of construction staging and likely construction phasing scenarios. Social and economic impacts during the construction phase will be evaluated based on the following indicators: job creation, direct and indirect construction spending, potential disruptions to commercial activity, and potential disruptions to community cohesion and continuity. Construction impacts will be presented by year and in aggregate.

15.8. Mitigation

Should the impact assessment indicate that one or more adverse social or economic impacts may be generated as a result of the Project, preliminary mitigation recommendations will be provided. Potential mitigation recommendations appropriate to the intensity and duration of the potential impacts will be identified. The mitigation recommendations will include measures intended to avoid, minimize, or reduce the impact or to compensate for an impact through replacement or substitution of resources.

Potential mitigation measures will be assessed for their ability to:

- Avoid or limit adverse impacts to economic activity, jobs, and tax revenues;
- Avoid or limit adverse impacts to multimodal connectivity, neighborhood continuity, and provision of or access to services;
- Avoid or limit community disruption; and
- Prevent displacement of businesses and residences, or provide adequate compensation for such displacement.

16.0 Safety and Security

16.1. Overview and Definitions

Assessments of public safety, and security, for purposes of this methodology, include the resources and crucial issues or concerns relating to human safety. It is vital to ensure that impacts to public safety and security are adequately identified and evaluated within the vicinity of the Project.

The following common definitions are related to public safety and security:

- **Operational Safety**: Operational safety relates to the issues needed to keep railroad operations performed safely. The intercity, regional, and commuter services operate along a corridor with different equipment types, at different speeds, and with different stopping patterns. The mix of operators with separate operating practices together contributes to the overall safety of the railroad. Train collisions or derailments are representative of the type of incident related to operating practices.
- **Infrastructure Safety**: The practices to prevent accidents or incidents caused by the failure of existing railroad infrastructure due to natural events or human activity. Infrastructure failures can contribute to either train-related or station-related incidents involving operating personnel and passengers.
- **Community Safety:** Vehicular safety, railroad and airports, pedestrian and bicycle safety, educational facilities, child-care facilities, nursing homes, police stations, emergency medical services, fire stations, ambulance squads, prisons and behavioral correctional facilities, places of worship, businesses, community centers, and municipal government facilities are institutions and activities included in community safety.
- **Construction Safety:** Potential impacts and exposures to structures, construction workers, passengers, employees, the general public, and emergency services from construction activities. Any increased risk of loss, injury, or death during construction and operation of the project.
- **High-Risk Facilities:** Locations of hazardous materials (for example, high-pressure pipelines, fuel storage tanks, vertical storage silos and refinery distillation columns, refineries, chemical plant facilities) in close proximity to the alternatives.
- **Fall Hazards:** Potential structures that pose risks of falls and are in the Study Area.
- **Emergency Services:** Emergency response capabilities, response times, and access across railroad rights-of-way would be keys to successful response in the event of an accident or incident requiring emergency response. Resources such as water supply, roadway, communications, and emergency transportation should be considered, as well.
- **Security:** Protection from intentional acts, including protection of people and property from such deliberate acts and the foreseeable effects of these acts. Security can be proactive (in the forms of patrols or monitoring cameras) or reactive (in the form of police investigation).

- **Security Threats:** Potential threats or significant security concerns encompass incidents, suspicious activities, and threat information related to passenger and freight railroad infrastructure.

16.2. Regulatory Context

There is a substantial Federal regulatory context for the issues of public security, and safety. Safety and security issues for railroad stations and travel are overseen by the FRA, the Transportation Security Administration, the Department of Homeland Security, and Amtrak (including Amtrak Police). At the local level, public health issues are considered by the District Departments of Health and Energy and the Environment. Safety and security issues are enforced through local code requirements. The DC Fire and Emergency Medical Services Department, Metropolitan Police Department, and Homeland Security and Emergency Management Agency are the local agencies responsible for safety and security issues.

Compliance with Federal, state, or local laws and regulations requires coordination with the applicable agency or agencies.

Federal Laws, Regulations, and Other Guidance

FRA's *Procedures for Considering Environmental Impacts* states: "The EIS should assess the transportation or use of any hazardous materials which may be involved in the alternatives, and the level of protection afforded residents of the affected environment from construction period and long-term operations associated with the alternatives."[105]

Relevant Federal laws, regulations, and EOs:

- FRA Safety Standards (49 CFR parts 200 – 299)
- Rail Safety Improvement Act of 2008 (Public Law 110-432)
- U.S. Code on Railroad Safety (49 USC20101 et seq.)
- Emergency Planning and Community Right-to-Know Act (42 CFR part 116)
- Architectural Barriers Act of 1968 (42 USC)
- ADA of 1990 (42 USC 504)
- Department of Homeland Security/Transportation Security Administration (49 CFR part 1580)

[105] Federal Railroad Administration. 1999. *Procedures for Considering Environmental Impacts.* https://www.fra.dot.gov/eLib/Details/L02710. Accessed June 1, 2017.

- Transportation Security Administration— Security Directive RAILPAX-04-01 and RAILPAX-04-02[106]

Relevant Federal guidance:

- High-Speed Passenger Rail Safety Strategy[107]
- U.S. Department of Transportation Climate Adaptation Plan: Ensuring Transportation Infrastructure and System Resilience[108]

State and Local Laws, Regulations, and Other Guidance

Rules, regulations, and standards that Virginia and the District have adopted that impact public safety and security include health and safety codes, emergency management, crime control, pedestrian policies, and hazardous materials regulations.

Pursuant to the CEQ and FRA procedures, inconsistencies or conflicts of the Build Alternatives with regional or local plans and laws will be discussed. Where inconsistencies or conflicts exist, CEQ and FRA require a description of the extent of reconciliation and the reason for proceeding if full reconciliation is not feasible (40 CFR part 1506.2(d) and 64 Fed. Reg. 28545, 14(n) (15)).

Relevant State, Local Laws, and Regulations:

State

- District of Columbia Fire Code[109]
- District of Columbia Construction Codes Supplement[110]
- DCMR, Title 24, Public Space and Safety[111]

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106 Department of Homeland Security, Office of the Inspector General. 2010. *TSA's Preparedness for Mass Transit and Passenger Rail Emergencies.* https://www.oig.dhs.gov/assets/Mgmt/OIG_10-68_Mar10.pdf. Accessed June 7, 2017.

107 U.S. Department of Transportation, Federal Railroad Administration. 2009. *High-Speed Passenger Rail Safety Strategy.* https://www.fra.dot.gov/eLib/Details/L03624. Accessed June 7, 2017.

108 U.S. Department of Transportation. 2014. *Climate Adaptation Plan 2014: Ensuring Transportation Infrastructure and System Resilience.* https://www.transportation.gov/sites/dot.gov/files/docs/2014-%20DOT-Climate-Adaptation-Plan.pdf. Accessed June 7, 2017.

109 District of Columbia. DC Municipal Regulations. Title 12-H Fire Code Supplement of 2013. http://www.dcregs.dc.gov/Gateway/TitleHome.aspx?TitleNumber=12-H. Accessed June 7, 2017.

110 District of Columbia. "Construction Codes Supplement of 2008," *District of Columbia Register* 55.52 (2008): 13905-13493. https://dcra.dc.gov/sites/default/files/dc/sites/dcra/publication/attachments/02%20-%202008%20Construction%20Codes%2012-17-08.pdf

111 District of Columbia. DC Municipal Regulations. Title 24 Public Space and Safety. http://www.dcregs.dc.gov/Gateway/TitleHome.aspx?TitleNumber=24

- DCMR, Title 22-B, Public Health and Medicine[112]
- The *District of Columbia Building Code*[113] includes a chapter (Chapter 11) on accessibility and notes that facilities should be designed and constructed with accessibility considerations for persons with physical disabilities.
- Virginia Public Water Supply Law[114]
- Virginia Administrative Code, Title 19, Public Safety
- Virginia Code, Title 9.1, Commonwealth Public Safety
- Virginia Uniform State Building Code[115]
- Virginia Statewide Fire Prevention Code[116]

Local

- Arlington County Fire Prevention Code[117]
- Arlington County Code, Chapter 58, Emergency Management[118]

Relevant state, local, and other guidance:

State

- Many state and local safety requirements refer to the NFPA Codes and Standards. The NFPA develops, publishes and disseminates over 300 consensus codes and standards intended to eliminate death, injury, property and economic loss due to fire, electrical, and related hazards. *NFPA 130-2010: Standard for Fixed Guideway and Passenger Rail Systems* specifies guidance on incorporating passenger safety in system design; egress routes in the event of an emergency;

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112 District of Columbia. DC Municipal Regulations. Title 22-B Public Health and Medicine. http://www.dcregs.dc.gov/Gateway/TitleHome.aspx?TitleNumber=22-B

113 International Code Council and District of Columbia. 2014. *District of Columbia Building Code – Chapter 11, Accessibility.* https://codes.iccsafe.org/public/chapter/content/9182/. Accessed June 1, 2017.

114 Commonwealth of Virginia. "Virginia Public Water Supply Law." Title 32.1-167-176 (2014). http://www.vdh.virginia.gov/content/uploads/sites/14/2016/04/Virginia-Public-Water-Supply-Law-32.1-167-to-176.pdf

115 Commonwealth of Virginia. *Virginia Uniform State Building Code.* http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/uniform-statewide-building-code-usbc.html. Accessed June 13, 2017.

116 Commonwealth of Virginia. *Virginia Statewide Fire Prevention Code.* http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/statewide-fire-prevention-code-sfpc.html. Accessed June 13, 2017.

117 Arlington County Code. Chapter 8.1 Fire Protection Code. https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/22/2016/11/Ch08.1_FirePreventionCode.pdf

118 Arlington County Code. Chapter 58 Emergency Management. https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/22/2016/04/Chapter-58-EMERGENCY-MANAGEMENT.pdf

emergency response planning, training, and operations; and fire and smoke prevention and suppression. [119]

Local

- Arlington County Elderly Readiness Implementation Plan[120]

Other

- Amtrak safety and security procedures[121]
- CSX safety procedures[122]

16.3. Study Area

16.3.1. Project Area

The Project Area includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way owned by CSXT from the Crystal City VRE Station in Arlington, VA, to the VA Interlocking in southwest Washington, DC.

16.3.2. Local Study Area

Unless otherwise noted, the local Study Area will include the Project Area and one-half mile immediately adjacent to the construction footprint. It will include the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. Analysis will be performed for safety and security impacts within the local Study Area.

16.3.3. Regional Study Area

The regional Study Area for safety and security will include service boundaries for fire, law enforcement, and emergency services in the District of Columbia and Arlington, VA. These service boundaries will include specific forces relevant to the Project Area and the District of Columbia, including Amtrak Police, Metropolitan Police, Arlington Police, Metro Transit Police, U.S. Park Police, and U.S. Capitol Police. Unless otherwise noted, the regional Study Area for public health will cover the District and Arlington, VA.

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[119] National Fire Protection Association. 2014. *NFPA 130-2010. http://www.nfpa.org/Assets/files/AboutTheCodes/130/ProposedTIA1080NFPA130.pdf*

[120] Arlington County. *Elderly Implementation Plan.* December 18, 2007. https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/24/2013/12/Elder-Readiness-Implementation-Plan-2007.pdf

[121] Amtrak is responsible for assessing and implementing safety and security measures for the NEC and its trains in the Study Area and commuter services, in collaboration with Amtrak, are responsible for assessing and implementing safety and security measures for their trains in the Study Area

[122] https://www.csx.com/index.cfm/about-us/safety/

16.4. Data Sources

Various data sources will be considered in developing the impact assessment on public health, security and safety. In addition, the analysis will refer to related content in other sections of the EIS that influence or are influenced by the Safety and Security impact analysis and supportive and associated technical documents. Related resource data will be used during analysis to overlay and aid in establishing existing conditions and potential consequences. Input from these related resources will be identified for how these resource data are incorporated into the Safety and Security assessment.

Data sources include:

Safety

- National Uniform Crime Reporting (UCR) Program for crime statistics for local Study Area
- NFPA Codes and Standards, as applicable
- Police and fire mutual aid agreements
- DC, Virginia, and Arlington County emergency service and operation plans
- Accident statistics reports and railroad car maintenance reports from Amtrak and FRA

Security

- Department of Homeland Security (DHS) preparedness information
- Local transit providers (WMATA, Arlington Transit [ART], and DDOT) emergency and safety plans
- Adopted District of Columbia, Arlington, VA, and regional security operating procedures

16.5. Affected Environment

A concise summary will describe existing emergency services, law enforcement, emergency response plans, and community safety features, such as vehicular safety, railroad, pedestrian and bicycle safety, schools in the Project Area and local Study Area, and the identification of high-risk facilities, accessibility barriers, and fall hazards in the Project Area. The affected environment for the regional Study Area will include high-level safety and security planning issues.

The description of the Affected Environment in the local Study Area will include:

- The location of government facilities, police stations, Fire/EMS stations, and where public services are provided);
- Descriptions of vehicular safety, railroad, pedestrian and bicycle safety, schools, high-risk facilities, and fall hazards;
- A general description of security and law enforcement services in the Study Area;
- District and regional policies concerning the provision of emergency services, law enforcement, and emergency response planning;
- Stakeholder issues, based on from personal contact with local agencies;
- Data on crime statistics in the Project Area and local Study Area; and

- Railroad line access points and the security concerns associated with railroad yards within the Study Area.

16.6. Environmental Consequences

The evaluation of impacts will include both qualitative and quantitative methods for both direct and indirect impacts. These impacts are considered for both temporary (for example, construction staging) and long-term (permanent structures) impacts to public safety and security.

The methodology used to evaluate public safety and security impacts takes direction from the sources listed above.

The analysis will include a qualitative description of how the Project could affect health based on a literature review approach, followed by a discussion of avoidance and minimization measures if needed. The direct and indirect impacts related to public safety and security will be analyzed through qualitative analysis based on the local and Federal guidelines for public safety and security assessment, for each alternative for both temporary (construction period) and permanent impacts. Impacts may also be beneficial, if the project design includes safety or security improvements. Impacts will be considered for both passenger and commuter rail users and people within the Study Areas, as appropriate.

- Security Post-Construction Analysis
    - Identify impacts to security elements (if any) associated with the proposed Project elements;
    - Assess the potential for temporary removal of established safety features during construction activities and the resulting impacts;
    - Identify hazards that affect future operations of or improvements to the project.
    - Identify potential for vulnerabilities related to terrorist acts and criminal activity;
    - Identify potential for increase in hazards to people or structures as a result of Project alternative features or as a result of changes in proximity, construction, and operations of Project alternatives;
    - Identify changes, including improvements, to the security practices in the Project Area; and
    - Identify any changes in access to security facilities.
- Public Safety Post-Construction Analysis
    - Identify any public safety benefits of each alternative;
    - Identify impacts to access for emergency services/first responders;
    - Identify any changes in access to public safety facilities;
    - Evaluate operational safety impacts to residences, schools, and other adjacent facilities;
    - Evaluate exposures of workers and passengers to hazards related to operational safety;
    - Assess the potential for dangerous conditions around the railroad facilities that could lead to an increase in vehicle, pedestrian or cyclist accidents;

- Identify any increase in demand for emergency response that could result in a need for new or altered facilities to maintain acceptable service ratios, response times, or other performance objectives for public services, including fire protection, police protection, and emergency services;
- Assess potential effects and changes in response time of emergency services as well as access to community health care facilities;
- Evaluate potential for temporary or permanent removal of established safety features;
- Evaluate future railroad system operations for impacts to railroad operational safety (including from unauthorized entry on tracks);
- Evaluate the effects to operational and infrastructure safety in relation to proposed improvements to infrastructure, changes in equipment, or changes in operating practices; and
- Identify any public safety benefits of each alternative.

The analysis will apply the same impact criteria in opening and built out Project timelines. The analysis will consider relevant aspects of context (for example, existing resource conditions, resource sensitivity) and appropriate factors of intensity (such as, extent of change, duration of change) for determining impact significance. The analysis will also consider Project actions that improve or otherwise benefit resource values in the evaluation of impact significance.

16.7. Construction Impacts

Construction impacts for public security and safety construction analysis are provided below.

- Security Construction Analysis:
  - Identify impacts to public safety associated with construction operations;
  - Identify any changes in security practices (both human and technological);
  - Identify any changes in access to security elements; and
  - Identify any appropriate mitigation measures.
- Public Safety Construction Analysis
  - Identify impacts to public safety (if any) associated with construction operations;
  - Identify any changes in access to public safety facilities and emergency response services;
  - Assess the potential for temporary removal of established safety features during construction activities and the resulting impacts;
  - Assess the potential for dangerous conditions that could lead to an increase in vehicle, pedestrian or cyclist accidents;
  - Assess the potential for vulnerabilities related to terrorist acts and criminal activity aboard trains, at or near stations, and at or near platforms;

- Identify any increase in demand for emergency response that could result in a need for new or altered facilities to maintain acceptable service ratios, response times, or other performance objectives for public services, including fire protection, police protection, and emergency services;
- Assess potential affects and changes in response time of emergency services as well as access to community health care facilities;
- Evaluate potential for temporary removal of established safety features to facilitate construction;
- Evaluate the effects to operational and infrastructure safety in relation to proposed construction practices, changes in equipment, or changes in operating practices;
- Evaluate operational safety impacts to residences, schools, and other adjacent facilities;
- Evaluate exposures of workers and passengers to hazards related to operational safety;
- Evaluate the potential for security impacts to the Project Area during the construction period, related to the movement of workers and goods in and out of the Project Area; and
- Identify any appropriate mitigation measures.

16.8. Mitigation

Depending on the impact assessment results, the need for public safety and security mitigation will be evaluated and recommendations will be provided for each alternative. Potential mitigation, including the screening of people and goods for safety and security reasons, will be assessed based on the significance of the impacts identified. More rigorous mitigation measures will be identified for impacts that pose larger and more serious threats to public health and public safety and security or greater challenges for members of the elderly and disabled community.

Specific aspects of the evaluation of mitigation measures for the different areas under this section are defined below.

Safety and security elements of the Project will be planned and designed at the Preliminary Engineering level to minimize impacts on the public, police, other security services, fire, and emergency, and medical services to the maximum extent possible. The design and engineering for the Project and associated infrastructure is being developed to incorporate long-term resilience considerations, including design elements aimed against evolving security threats, in order to help minimize the potential for future impacts. If there are inconsistencies with safety and security requirements and procedures, protocols and infrastructure will be defined for inclusion in the Build Alternative(s).

17.0 Public Health, Elderly, and Persons with Disabilities

17.1. Overview and Definitions

Assessments of public health for purposes of this methodology, include the resources and crucial issues or concerns relating to human safety, health, and welfare. This section also considers the impacts of the Project on the elderly and people with disabilities. It is vital to ensure that impacts to public health, are adequately identified and evaluated for the short term and long-term health of people and businesses within the vicinity of the Project. The FRA's *Procedures for Considering Environmental Impacts* state that the "Environmental Impact Statement (EIS) shall assess impacts of the alternatives on the transportation and general mobility of the elderly and handicapped." [123]

17.2. Regulatory Context

There is a substantial Federal regulatory context for the issues of public health. The U.S. Environmental Protection Agency is principally responsible for issues of public health caused by environmental factors. The U.S. Department of Health and Human Services is the lead public health agency in the country. Different Executive Orders outline the Federal government's interest in accounting for public health issues in Federal actions. For example, Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that agencies must "make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and … shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." [124] And, as noted above, FRA's regulations require consideration of impacts to the elderly and those with disabilities.

Compliance with Federal, state, or local laws and regulations requires coordination with the applicable agency or agencies. It is important to note that FRA's *Procedures for Considering Environmental Impacts* includes the topic of public health as part of the contents of an EIS. [125] NEPA regulations do not require quantitative analysis regarding public health; however, environmental, social, demographic, and economic conditions drive the health and well-being of communities and will be considered as part of this analysis.

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[123] Federal Railroad Administration. 1999. *Procedures for Considering Environmental Impacts.* https://www.fra.dot.gov/eLib/Details/L02710. Accessed June 1, 2017.

[124] U.S. Environmental Protection Agency. Summary of Executive Order 13045 - Protection of Children From Environmental Health Risks and Safety Risks. https://www.epa.gov/laws-regulations/summary-executive-order-13045-protection-children-environmental-health-risks-and. Accessed June 2, 2017.

[125] Federal Railroad Administration. 1999. *Procedures for Considering Environmental Impacts.* https://www.fra.dot.gov/eLib/Details/L02710. Accessed June 1, 2017.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- NAAQS (40 CFR part 50)
- SDWA (42 USC 300 f)
- CWA (33 USC 1251)
- Federal Water Pollution Control Act (CWA) of 1972 (33 USC 1251-1376) as amended by the U.S. CWA (1977) and the Water Quality Act (1987)
- OSHA Lead in Construction Standard: 29 CFR part 1926.62
- The U.S. EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations (40 CFR part 61)
- 40 CFR part 312, Standards and Practices for All Appropriate Inquiries (AAI) under the Federal CERCLA (42 USC 9601)
- Americans with Disabilities Act of 1990 (42 USC 504)
- Transportation Services for Individuals with Disabilities (49 CFR part 37)

Relevant Federal guidance:

- U.S. EPA Memorandum. "Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act[126]
- Federal Transit Administration (FTA) Americans with Disabilities Act Guidance (FTA Circular 4710.1).

State and Local Laws, Regulations, and Other Guidance

Rules, regulations, and standards that Virginia and the District have adopted that impact public health include health codes, emergency management, and hazardous materials regulations.

Relevant State, Local Laws, and Regulations:

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126 U.S. Environmental Protection Agency. 2015. "Promoting the Use of Health Impact Assessment to Address Human Health in Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act." https://www.epa.gov/sites/production/files/2016-03/documents/hia_memo_from_bromm.pdf

- District of Columbia Municipal Regulations, Title 22-B, Public Health and Medicine[127]
- The *District of Columbia Building Code*[128] includes a chapter (Chapter 11) on accessibility and notes that facilities should be designed and constructed with accessibility considerations for persons with physical disabilities.
- Virginia Public Water Supply Law[129]

Relevant state and local guidance:

- Arlington County Elderly Readiness Implementation Plan[130]

17.3. Study Area

17.3.1. Project Area

The Project Area includes the tracks, interlockings, bridges, and related railroad infrastructure being modified by the Project. This area runs along the railroad right-of-way owned by CSXT from the Crystal City VRE Station in Arlington, VA, to the VA Interlocking in southwest Washington, DC.

17.3.2. Local Study Area

Unless otherwise noted, the local Study Area will include the Project Area and one-half mile immediately adjacent to the construction footprint. Analysis will be performed for public health and the elderly and persons with disabilities.

17.3.3. Regional Study Area

Unless otherwise noted, the regional Study Area for public health will cover the District of Columbia and Arlington, VA. Analysis will be performed for public health and the elderly and persons with disabilities. Data Sources

127 District of Columbia. DC Municipal Regulations. Title 22-B Public Health and Medicine. http://www.dcregs.dc.gov/Gateway/TitleHome.aspx?TitleNumber=22-B

128 International Code Council and District of Columbia. 2014. *District of Columbia Building Code – Chapter 11, Accessibility.* https://codes.iccsafe.org/public/chapter/content/9182/. Accessed June 1, 2017.

129 Commonwealth of Virginia. "Virginia Public Water Supply Law." Title 32.1-167-176 (2014). http://www.vdh.virginia.gov/content/uploads/sites/14/2016/04/Virginia-Public-Water-Supply-Law-32.1-167-to-176.pdf

130 Arlington County. *Elderly Implementation Plan.* December 18, 2007. https://arlingtonva.s3.dualstack.us-east-1.amazonaws.com/wp-content/uploads/sites/24/2013/12/Elder-Readiness-Implementation-Plan-2007.pdf

17.4. Data Sources

Data sources include:

- U.S. EPA Human Health Risk Assessment Tools and Databases, and Guidelines[131]
- U.S. EPA EPCRA existing Tier I and Tier II reports and other requirements under that law[132]
- U.S. Department of Health and Human Services health data
- District Department of Health, Arlington Department of Human Services, and Virginia Department of Health data
- Census data pertaining to the elderly/senior and disabled populations
- Available information on existing accessibility and ADA compliance features (for example, ramps or elevators)

17.5. Affected Environment

A concise summary will describe existing emergency medical services and accessibility barriers. The assessment will consider existing populations of users within the Project Area and the local Study Area that may face impacts from public health factors related to the Project. This section will also describe the existing elderly and disabled population in the local Study Area, as well as those who may use the existing infrastructure. The affected environment for the regional Study Area will include high-level public health planning issues.

The description of the Affected Environment in the local Study Area will include:

- The location of government facilities, hospitals, police stations, Fire/EMS stations, and where public services are provided);
- District and regional policies concerning the provision of emergency medical services;
- Stakeholder issues, based on from personal contact with local agencies;
- Railroad line access points and the security concerns associated with railroad yards within the Study Area.

17.6. Environmental Consequences

The evaluation of impacts will include both qualitative and quantitative methods for both direct and indirect impacts. These impacts are considered for both temporary (for example, construction staging) and long-term (permanent structures) impacts to public health and elderly and disabled persons.

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131 U.S. Environmental Protection Agency. *Human Health Risk Assessment.* https://www.epa.gov/risk/human-health-risk-assessment. Accessed June 2, 2017.

132 U.S. Environmental Protection Agency. *Emergency Planning and Community Right-to-Know Act.* https://www.epa.gov/epcra Accessed July 27, 2017.

The analysis will include a qualitative description of how the Project could affect health based on a literature review approach, followed by a discussion of avoidance and minimization measures if needed. The direct and indirect impacts related to public health will be analyzed through qualitative analysis based on the local and Federal guidelines for public health assessment, for each alternative for both temporary (construction period) and permanent impacts. Impacts may also be beneficial, if the Project design includes accessibility improvements. Impacts will be considered for both passenger and commuter rail users and people within the Study Areas, as appropriate.

On the issue of elderly and people with disabilities, the analysis will identify impacts and benefits to accessibility (if any) associated with the proposed Project elements.

- Public Health Post-Construction Analysis
    - Identify impacts to public health (if any) associated with air quality, water quality, solid waste, hazardous materials, noise or vibration impacts;
    - Identify any changes in access to emergency health facilities and emergency response services; and
    - Identify any public health benefits of each alternative.
- Elderly and Disabled Persons Post-Construction Analysis
    - Identify any changes in access to platforms, and pedestrian entrances to stations;
    - Evaluate effects of those changes on elderly and disabled users of the railroad; and
    - Identify any access benefits to elderly and disabled persons for each alternative.

The analysis will apply the same impact criteria in opening and built out Project timelines. The analysis will consider relevant aspects of context (for example, existing resource conditions, resource sensitivity) and appropriate factors of intensity (such as, extent of change, duration of change) for determining impact significance. The analysis will also consider Project actions that improve or otherwise benefit resource values in the evaluation of impact significance.

17.7. Construction Impacts

Construction impacts for public health construction analysis and elderly and disabled construction analysis are provided below.

- Public Health Construction Analysis for Each alternative:
    - Identify impacts to public health (if any) associated with air quality, noise, or vibration impacts[133] and
    - Identify any changes in access to emergency health facilities.
- Elderly and Disabled Population Analysis

[133] Please see *Air Quality* and *Noise and Vibration* for more information on these topic areas.

- Evaluate temporary changes to accessibility (including potential impacts to ADA issues, as possible) for railroad users;
- Evaluate effects of those changes on elderly and disabled users of the station; and
- Document accessibility code compliance as feasible.

17.8. Mitigation

Depending on the impact assessment results, the need for public health will be evaluated and preliminary mitigation recommendations will be provided for each alternative. Potential mitigation will be assessed based on the significance of the impacts identified. More rigorous mitigation measures will be identified for impacts that pose larger and more serious threats to public health or greater challenges for members of the elderly and disabled community.

Public Health

Measures will be evaluated for their effectiveness in:

- Reducing air quality public health risks as identified in that chapter;
- Reducing water quality public health risks as identified in that chapter; and
- Reducing public health risks associated with solid waste and hazardous materials as identified in that chapter.

Measures to address other public health issues not identified in other chapters will be assessed for their ability to improve public health, while balancing the need for the successful operation of the future railroad.

Measures to reduce transportation-related pollution through strategies identified in the transportation chapter will be considered.

Techniques to reduce and eliminate building material contaminants will be considered.

Elderly and People with Disabilities

Members of these groups have susceptibility to the public health issues that are being evaluated in this chapter and in related chapters noted above. Mitigation for these groups will depend on an assessment of a more stringent threshold level of exposure. Any issues that prevent universal access and use of stations by people with disabilities will be evaluated for mitigation.

18.0 Environmental Justice

18.1. Overview and Definitions

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse environmental effects of Federal agency actions (including transportation projects) on minority and low-income populations.

The USDOT *Order to Address Environmental Justice in Minority Populations and Low-Income Populations* (USDOT Order 5610.2(a), May 2, 2012) sets forth the USDOT policy to consider Environmental Justice (EJ) principles in all USDOT programs, policies, and activities. It describes how the objectives of EJ are integrated into planning and programming, rulemaking, and policy formulation. USDOT Order 5610.2(a) also requires that any activities that will have a disproportionately high and adverse effect on populations protected by Title VI ("protected populations") will only be carried out if:

1) A substantial need for the activity exists, based on the overall public interest; and
2) Alternatives that would have less adverse effects on protected populations (and that still satisfy the need identified in item 1 above), either
    a) Would have other adverse social, economic, environmental or human health impacts that are severe; or
    b) Would involve increased costs of extraordinary magnitude.

Minority populations, as defined in FTA Circular 4703.1, are any readily identifiable group or groups of minority persons who live in geographic proximity and, if circumstances warrant, geographically dispersed or transient persons, such as migrant workers or Native Americans, who will be similarly affected by the proposed project. Minority population includes persons who are American Indian or Alaskan Native, Asian American, Native Hawaiian or Other Pacific Islander, African American (not of Hispanic Origin), and Hispanic or Latino. This environmental justice analysis also considers minority to include persons identified as being either “some other race” or “two or more races” in the census data.

A low-income person, as defined in FTA Circular 4703.1, is one whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. A low-income population is any readily identifiable group or groups of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed or transient persons who will be similarly affected by a proposed USDOT, program, policy, or activity.

18.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, February 11, 1994)

- EO 12948, *Amendment to EO No. 12898* (January 30, 1995)
- U.S. Civil Rights Act Title VI
- U.S. USDOT Order 5610.2(a), *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- Federal Transit Laws, 49 USC 53

Relevant Federal guidance:

- CEQ, *Environmental Justice – Guidance under the National Environmental Policy Act* (December 10, 1997)
- EPA, *Promising Practices for Environmental Justice Methodologies in NEPA Reviews*[134]
- FTA Circulars
    - 4702.1A, *Title VI and Title VI-Dependent Guidelines for FTA Recipients*
    - 4703.1, *Environmental Justice Policy Guidance for Federal Transit Administration Recipients*

Because the FTA is a Cooperating Agency, the environmental justice analysis for the Project must also be consistent with FTA guidance. FTA Circular 4703.1, *Environmental Justice Policy Guidance for Federal Transit Administration Recipients* (FTA, 2012), provides guidance for incorporating environmental justice principles into plans, projects, and activities subject to adoption of or approval by FTA. FTA includes incorporation of environmental justice and non-discrimination principles into transportation planning and decision-making processes and project specific environmental reviews.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are no relevant state and local laws and regulations for this resource.

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

18.3. Study Area

In general, the Study Area for the environmental justice extends beyond the Project Area, to not only include the physical limits of the proposed alternatives, but also to account for effects that may be felt outside the area of direct impacts, such as air quality, noise, vibration, and land uses that may adversely or disproportionately affect low-income or minority communities. The Study Area for the EJ analysis will include the census blocks or block-groups that are within one-half mile of the Project Area. Each census block or block group that is completely within or intersects the half-mile buffer will be included in the

[134] Promising Practices for Environmental Justice Methodologies in NEPA Reviews. Accessed from https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf. Accessed on December 15, 2017002E

Study Area. The one-half-mile radius is intended to capture the extent of indirect impacts that may be noticeable. If the impact analysis shows impacts extending beyond a one-half mile, this Study Area would be adjusted accordingly.

18.4. Data Sources

The data source for the identification of low-income populations will be the U.S. Census Bureau's ACS five-year average data for 2011–2015. Low-income populations will be quantified at the block group level, which is the smallest geographic unit for which low-income population data are available. The ACS is an ongoing survey that provides data on age, sex, race, family and relationships, income and benefits, health insurance, education, veteran status, disabilities, where people work and how they get there, and where people live and how much people pay for essentials. The purpose of the ACS is to provide an annual data set that enables communities, state governments, and Federal programs to plan investments and services. ACS provides period estimates that describe the average characteristics of population and housing over a period of data collection. The ACS is administered continually and is a random sampling of people from all counties and county-equivalents in the United States.

The data source for the identification of minority populations will be the Year 2010 U.S. Census. Minority populations will be quantified at the block level, which is the smallest geographic unit for which race and ethnicity data are available. The U.S. Census takes place every 10 years and is intended to account for every resident in the United States. The Census also collects information on home ownership, sex, age, race, and ethnicity.

Additional data sources will be used to confirm the location of minority and low-income populations; data sources will include the DC Office of Planning, and Business Improvement Districts (BIDs), including the Crystal City BID and the Southwest BID.

The actual number of residences and businesses in the Study Area is smaller than indicated by census block data; therefore, the number of minority and low-income individuals in the Study Area is smaller as well. However, because EJ impacts can also include impacts on residences, businesses, community facilities, parks, historic resources, land use, or transportation modes, additional data sources will be pursued to ascertain the full impacts of the Project. Additional sources may include data from government assisted housing programs, DDOT and DCOP ward planners, the Arlington County Department of Planning, Housing and Development, and a review of redevelopment projects within the Project Study Area.

Additional data sources beyond the ACS five-year average data for 2011–2015 and the 2010 U.S. Census will be consulted to identify demographic changes since the data were collected and to identify distinct low-income or minority communities within the Study Area. Interviews with representatives of BIDs within the Study Area, as well as DDOT and DCOP ward planners, will be used to identify:

- More recent data sources for minority and low-income populations in the Study Area;
- Recent redevelopment projects that have resulted in changes to the demographic characteristics of the residents;
- The location of public housing in the Study Area; and
    - Available data for individuals receiving housing assistance in the Study Area.

18.5. Affected Environment

Using the data sources described above, the Affected Environment section will determine the characteristics of the general population and describe the characteristics of the potentially impacted population within the Study Area (defined in Section 17.2 above). The Affected Environment section will identify the racial characteristics and median income of the Study Area by block group, and will also identify distinct minority or low-income communities using additional data sources and outreach (see Section 17.9). As noted in FTA Circular 4703.1, "while the minority or low-income population in an area may be small, this does not eliminate the possibility of a disproportionately high and adverse effect of a proposed action. EJ determinations are made based on effects, not population size." Therefore, this analysis will not use the traditional CEQ thresholds to identify the presence of minority communities, Instead, the minority populations in the Study Area will be identified using the data described above, and the potential for disproportionately high and adverse effects will be identified using the methodology described below in Section 17.6*, Environmental Consequences*.

Household median income census data, used for comparison with the national poverty guidelines, are available only at the block group level in ACS 5-year estimate format. As such, 2011–2015 ACS 5-Year Estimates, Median Income in the Past 12 Months (in 2015 Inflation-Adjusted Dollars), will be used to generate median household income data for each of the localities within the Study Area. As set forth in EO 12898, an area is identified as containing a low-income population when the median household income for the area is below the HHS poverty threshold, which was $24,250 for a family of four in 2015. Because the average household size of the city range between two and three people, a family of four was used as the threshold to be conservative.[135] Because the HHS poverty guidelines are nationwide and median incomes are higher in the DC region than nationally, the percentage of households below 150 percent of the HHS poverty guidelines will also be identified for each block group.

18.6. Environmental Consequences

The EJ analysis will evaluate both the No Action and the Build Alternatives to determine whether the respective alternatives would result in disproportionately high and adverse direct and indirect impacts to minority and low-income populations.

Under USDOT Order 5610.2(a), and adverse effect include, but are not limited to:

- Bodily impairment, infirmity, illness, or death;
- Air, noise, and water pollution and soil contamination;
- Destruction or disruption of man-made or natural resources;
- Destruction or diminution of aesthetic values;
- Destruction or disruption of community cohesion or a community's economic vitality;
- Destruction or disruption of the availability of public and private facilities and services;

[135] U.S. Census Bureau. 2011–2015 American Community Survey 5-Year Estimates. Undated. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table. Accessed July 31, 2017.

- Vibration;
- Adverse employment effects;
- Displacement of persons, businesses, farms, or non-profit organizations;
- Increased traffic congestion, isolation, exclusion or separation of individuals within a given community or from the broader community; and
- The denial of, reduction in, or significant delay in the receipt of benefits of dot programs, policies, or activities.

Based on FTA guidance, the evaluation will consider the following criteria in determining whether the activity will result in a "disproportionately high and adverse effect on human health or the environment":

- Would the alternative's adverse impacts be predominantly borne by minority or low-income populations? This will be determined by identifying whether adverse impacts are concentrated in minority or low-income communities.
- Would adverse impacts to minority or low-income populations be appreciably more severe or greater in magnitude than those suffered by non-minority or low-income populations?
- Does the Project affect a resource that is especially important to an EJ population? For example, does the Project affect a resource that serves an especially important social, religious, or cultural function for an EJ population?
- What would be the effect of the alternative's offsetting benefits when considering these impacts?
- What would be the effect of mitigation measures that would be incorporated into the alternative and any other enhancements or betterments that would be provided in lieu of mitigation when considering these impacts?

All environmental categories will be reviewed to identify those that will not result in any adverse effects. The environmental categories with no adverse effects identified will not be considered for additional EJ analysis due to no potential for disproportionately high and adverse effects to minority or low-income populations.

Environmental categories that would result in adverse effects will be retained to determine if and to what extent these adverse effects would have the potential to be disproportionately high and predominately borne by minority or low-income populations. The analysis will include consideration of mitigation measures that would be incorporated into the alternatives, as well as the benefits of the alternatives that may offset impacts.

18.7. Construction Impacts

For any adverse effects identified based on construction activities, the analysis described above will be performed to determine if and to what extent the adverse effects would have the potential to be disproportionately high and predominately borne by minority or low-income populations. The analysis would include identification of the limits of construction staging as well as identifying likely construction phasing scenarios.

18.8. Mitigation

Under USDOT Order 5610.2(a), where it is found that activities are expected to have a disproportionately high and adverse effect on minority populations or low-income populations, those activities will only be carried out if further mitigation measures or alternatives that would avoid or reduce the disproportionately high and adverse effect are not practicable. In determining whether a mitigation measure or an alternative is "practicable," the social, economic (including costs), and environmental effects of avoiding or mitigating the adverse effects will be considered.

The assessment of the potential for disproportionately high and adverse effects to minority or low-income populations will include an analysis of the mitigation proposed for each environmental category where adverse impacts are anticipated. Any appropriate additional mitigation measures will be identified. If there are no additional mitigation measures proposed, this section will describe the reasons for not proposing any further mitigation to avoid, minimize, or reduce the impacts or to compensate for an impact through replacement or substitution of resources.

18.9. Outreach

As noted in FTA's Environmental Justice Circular, a key component of environmental justice is engaging environmental justice populations as part of the transportation planning process. This allows project sponsors to understand the needs and priorities of environmental justice populations and to balance the benefits of a proposed project against its adverse effects. The team will develop and use public engagement efforts to encourage environmental justice populations to participate during the planning and implementation of this Project.

The Long Bridge Agency and Public Coordination Plan describes outreach targeted to Environmental Justice communities. The plan notes that EJ communities identified within the Study Area will be included in the public outreach process to ensure they can participate meaningfully in review of the Project. Principles of public outreach for the Project include:

- Documents, notices, and meetings will be made concise, understandable, and readily accessible to the public;
- Informational material will be made available through a variety of outlets;
- All public events will be scheduled at convenient and accessible locations and times; and
- Various community leaders and groups will be contacted to increase public participation of constituent communities.

19.0 Cumulative Impacts

19.1. Overview and Definitions

The CEQ regulations implementing the provisions of NEPA, set forth in 40 CFR part 1508.7, define a **cumulative impact** 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."

19.2. Regulatory Context

The CEQ's regulations for implementing NEPA require Federal agencies to consider the potential for cumulative effects from a project. The cumulative impact analysis will be consistent with CEQ and other agency guidance documents.

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- There are no relevant Federal laws and regulations documents for this resource.

Relevant Federal guidance:

- Considering Cumulative Effects Under the National Environmental Policy Act[136]
- Guidance on the Consideration of Past Actions in Cumulative Effects Analysis[137]
- Consideration of Cumulative Impacts in EPA Review of NEPA Documents[138] American Association of State Highway and Transportation Officials (AASHTO), Practitioner's Handbook 12, Assessing Indirect Effects and Cumulative Impacts under NEPA[139]

[136] Council on Environmental Quality (CEQ). 1997a. *Considering Cumulative Effects Under the National Environmental Policy Act*. https://ceq.doe.gov/publications/cumulative_effects.html. Accessed September 5, 2017.

[137] Council on Environmental Quality (CEQ). 2005b. *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*. Memo to Heads of Federal Agencies, issued June 24, 2005.

[138] Environmental Protection Agency (EPA). 1999. *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*. EPA 315-R-99-002/May 1999.

[139] American Association of State Highway and Transportation Officials (AASHTO). 2016. Practitioner's Handbook 12, Assessing Indirect Effects and Cumulative Impacts under NEPA.

- FHWA's Secondary and Cumulative Impact Assessment in the Highway Project Development Process[140]
- FHWA's Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process[141]
- National Cooperative Highway Research Program (NCHRP) Report 403: Guidance for Estimating the Secondary Effects of Proposed Transportation Projects[142]
- NCHRP's Indirect and Cumulative Impact Analysis[143]

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are no relevant state and local laws and regulations for this resource.

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

19.3. Study Area

While the spatial boundaries for analysis will vary by resource, in general, the Study Area for cumulative impacts may include a broader Study Area to encompass regional actions for which effects could incrementally add to the impacts of the Proposed Action. The Study Area for the cumulative effects analysis will:

- Include logical boundaries for evaluating cumulative effects on resources of the natural and built environment.
- Encompass past, present, and reasonably foreseeable future actions that may also contribute to cumulative effects to the same resources as are affected by the Proposed Action and actively affecting those resources within the timeframe impacts being considered (see Section 1.3, *General – Evaluation of Impacts*).
- Account for transportation network characteristics of the transportation system.

For cumulative impacts, setting temporal boundaries can also be useful. Prior changes will generally be evaluated for the period from 2007 to 2017. This time period captures changes that have taken place

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[140] Federal Highway Administration (FHWA). 1992. *Secondary and Cumulative Impact Assessment in the Highway Project Development Process.* Position Paper. https://www.environment.fhwa.dot.gov/guidebook/content/Secondary_Cumulative_Impact_Assessmt.asp. Accessed June 7, 2017.

[141] Federal Highway Administration (FHWA). 2003. *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process.* https://www.environment.fhwa.dot.gov/guidebook/qaimpact.asp. Accessed June 7, 2017.

[142] National Cooperative Highway Research Program (NCHRP). 1998. *Report 403: Guidance for Estimating the Secondary Effects of Proposed Transportation Projects.* National Academy Board, Washington DC

[143] National Cooperative Highway Research Program (NCHRP). 2006. *Indirect and Cumulative Impact Analysis: A review and synthesis of the requirements for indirect and cumulative impact analysis and mitigation under major environmental laws and regulations.*

within the last 10 years, which is generally considered a reasonable temporal boundary for past actions. For each resource, future impacts will be considered in the timeframe of the Planning Year (2040).

19.4. Data Sources

Data sources will be used to establish past, present, and future trends regarding the condition of a resource and to identify those transportation and non-transportation projects that are reasonably foreseeable future actions for the cumulative effects analysis. Data sources for cumulative actions will include planning documents, local master plans, development applications, municipal planning departments, GIS data, and other EIS analyses.

Data sources include:

- Readily available information regarding past and future trends (for example, EPA website on trends in water quality)
- Section 404/10 Permits issued by the USACE
- Information from local, regional, and federal planning organizations
- Environmental documentation for past, present, and reasonably foreseeable future actions

19.5. Relevant Projects and Actions

Following a review of the data sources described in the preceding section, a list of other planned and developed activities in the affected area that are interrelated to the proposal and/or that would produce cumulative impacts will be described. Projects identified for consideration within the cumulative impacts analysis will be included in the analysis if they meet one or more of the following criteria:

- Projects of similar size and scope or other key characteristics with potential for environmental impacts that can be measured or be expected to occur.
- Projects with environmental impacts that do, or are likely to, act in a cumulative fashion with the impacts of other past or future projects and activities that are likely to occur.
- The project's contribution to cumulative impacts can be reasonably expected to affect the viability or sustainability of the resource or value such as a regulatory "threshold" or standard.
- Projects which are connected actions, if they are not addressed as part of the Proposed Action.

19.6. Environmental Consequences

The evaluation of Environmental Consequences will describe the cumulative effects of the alternatives on key resource areas for both the construction and post-construction periods. Key resource areas selected for analysis will be limited to those resources which would experience adverse impacts as a result of the Build Alternatives. These key resources will be identified and confirmed during analysis of Build Alternative effects in the Environmental Impact Statement. These could include, but are not limited to:

- Natural and Ecological Systems
- Water Resources and Water Quality

- Transportation
- Air Quality
- Land Use
- Noise and Vibration
- Aesthetic Resources
- Cultural Resources
- Recreation and Parks
- Social and Economic Resources
- Environmental Justice

The cumulative impact analysis will determine areas where the Long Bridge Project alternatives exacerbate the environmental impacts of other actions, and would include the following steps:

- Estimate the potential effects of past, present, and reasonably foreseeable actions on key resource areas. Combine this effect with the potential effect of the alternatives for the potential cumulative effect.
- Qualitatively describe the potential contribution of effects of each alternative to the cumulative effects on each resource. The degree of confidence in or current level of understanding of effects of future related actions will be highlighted, particularly where future actions are less well understood or where data to inform this analysis is not available. Quantitative effects will be included where appropriate.
- Prepare a summary matrix of all effects and map areas of identified sensitivity, if relevant to the resource upon which cumulative impacts are being assessed.

19.7. Mitigation

If the Proposed Action is determined to cause adverse cumulative effects, efforts will be undertaken to mitigate these impacts. Work with other local and Federal agencies may be required to develop measures appropriate to offset impacts associated with area-wide concerns and future development.

20.0 Section 4(f) Evaluation

20.1. Overview and Definitions

Section 4(f) of the USDOT Act (49 USC 303(c)) provides protection for publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic properties eligible for or listed in the NRHP. The Section 4(f) Evaluation chapter of the EIS will summarize FRA's identification of protected properties and potential impacts to those properties, describe Section 4(f) resources that would be used by the alternatives under consideration for the Proposed Action, provide an analysis of potential feasible and prudent alternatives to the use of Section 4(f) resources, and identify mitigation measures that would be employed to minimize harm to Section 4(f) resources resulting from use. The Section 4(f) Evaluation will be a "stand-alone" section that, where necessary and applicable, duplicates information from other relevant sections of the EIS.

20.2. Regulatory Context

Federal Laws, Regulations, and Other Guidance

Relevant Federal laws, regulations, and EOs:

- Section 4(f) of the USDOT Act (49 USC 303(c))
- FHWA regulations (23 CFR part 774) to the extent practicable to guide FRA's interpretation and implementation of Section 4(f)
- FRA *Procedures for Considering Environmental Impacts*
- NEPA (42 United States Code [USC] 4321-4355)

Relevant Federal guidance:

- There are no additional relevant Federal guidance documents for this resource.

State and Local Laws, Regulations, and Other Guidance

Relevant State, Local Laws, and Regulations:

- There are no additional relevant state and local laws and regulations for this resource.

Relevant state and local guidance:

- There are no additional relevant state and local guidance documents for this resource.

20.3. Study Area

The Study Area will generally include properties within 1,000 feet of the Build Alternatives, to adequately assess impacts due to physical occupation (use) of Section 4(f) properties. However, this Study Area may be expanded in order to assess air quality, noise and vibration, or aesthetic impacts to Section 4(f) properties that may constitute "constructive use," based on the analysis of impacts to these resources as described in Sections 7.0, 11.0, and 12.0.

20.4. Data Sources

The Section 4(f) Determination relies on the identification of public parks, recreation areas, wildlife refuges, and historic properties presented in the respective sections of the Affected Environment and Environmental Consequences chapters of the EIS.

20.5. Chapter Organization

The EIS Chapter, Section 4(f) Determination, will include the following sections:

- Introduction
- Section 4(f) Applicability
- Project Purpose and Description
- Section 4(f) Protected Properties
- Use of Section 4(f) Properties
- Indirect Effects
- Alternatives Analysis
- Planning Undertaken to Minimize Harm
- Consultation
- Findings

The following subsections describe the contents of each section and any analyses that may be required.

20.5.1. Introduction

The introduction will discuss Section 4(f) and the contents of the Section 4(f) Determination chapter.

20.5.2. Section 4(f) Applicability

This section will provide a detailed description of Section 4(f), the methods for evaluating alternatives, and the FHWA regulations.

20.5.3. Project Purpose and Description

This section will summarize the Project Purpose and provide a succinct description of the Proposed Project.

20.5.4. Section 4(f) Protected Properties

This section will describe all the historic properties, public parks, public recreation areas, and wildlife refuges identified in the Affected Environment chapter of the EIS. Where possible, information will be presented in tabular format.

20.5.5. Use of Section 4(f) Properties

This section will identify uses of Section 4(f) properties, based on the analyses presented in the Environmental Consequences chapter of the EIS, for each alternative. As defined in the Section 4(f) statute and regulations, a "use" would occur when:

- Land is permanently incorporated into a transportation facility.
- There is a temporary occupancy of land that is adverse in terms of the statute's preservationist purposes.
    - There is a constructive use of a Section 4(f) property.

This section will identify all direct uses of Section 4(f) properties, including permanent incorporation into a transportation facility or temporary occupancy of a Section 4(f) property.

20.5.6. Indirect Effects

This section will evaluate potential constructive uses of Section 4(f) properties resulting from proximity impacts from the Project. A constructive use can occur when a transportation project does not incorporate land from a Section 4(f) resource but the project's effects on the surrounding area are so severe that the protected activities, features or attributes that qualify the resource for protection under Section 4(f) are substantially impaired. Substantial impairment is determined to occur when there is substantial diminishment of the activities, features or attributes of the Section 4(f) resources. The evaluation will focus on the potential proximity impacts to Section 4(f) resources from the Project's potential air quality, noise, vibration, aesthetics, and access impacts.

20.5.7. Alternatives Analysis

For each Section 4(f) Resource that is adversely affected by the proposed Project, this section will provide an alternatives analysis consistent with FRA's NEPA Procedures, which require that the Section 4(f) Determination include "a similarly detailed description of each reasonable alternative location, routing or design to the one proposed, including the alternative of 'no action.' Each description should analyze, as appropriate, the technical feasibility, cost estimates, the possibility of community or ecosystem disruption, and other significant environmental impacts of each alternative so as to evidence that the financial, social or ecological costs or adverse environmental impacts of each alternative other than that proposed would present unique problems or reach extraordinary magnitudes."

For each affected resource, this section will provide a description of the resource and its significance, the proposed use, design alternatives that would avoid or minimize the use, and the rationale for determining that the proposed action is compliant with Section 4(f).

20.5.8. Planning Undertaken to Minimize Harm

This section will describe all planning efforts undertaken to minimize harm to Section 4(f) resources, including (as appropriate) the results of consultation with SHPO and any Section 106 documents such as a Memorandum of Agreement or Programmatic Agreement.

20.5.9. Consultation

This section will document FRA's consultation as required by FRA's NEPA Procedures, which includes consultation with the Department of Interior and public officials in the District of Columbia, Commonwealth of Virginia, and Arlington County having jurisdiction over the Section 4(f) resources.

20.5.10. Findings

The Findings section will provide FRA's determination that there is no feasible and prudent alternative to the Proposed Action and that the Project includes all possible planning to minimize harm.