INTERSTATE 395 EXPRESS LANES NORTHERN EXTENSION

INDIRECT & CUMULATIVE EFFECTS

TECHNICAL REPORT | SEPTEMBER 2016

VDOT

U.S. Department of Transportation Federal Highway Administration

395 ExpressLanes

INTERSTATE 395 EXPRESS LANES

NORTHERN EXTENSION

Indirect and Cumulative Effects Technical Report

City of Alexandria, and Arlington and Fairfax Counties
Project Number: 0395-969-205, P101; UPC: 108313
Federal Project Number: NHPP-395-4(189)

September 14, 2016 Errata
to
Interstate 395 Express Lanes Northern Extension
Indirect and Cumulative Effects Technical Report

Technical corrections to the *Interstate 395 Express Lanes Northern Extension Indirect and Cumulative Effects Technical Report* include:

Page	Location	Change
43	Table 3-9 Historic Resources	"Historic Resources Properties (acres) – Estimated Direct Impact – 2.41"
43	Table 3-9 Footnote	"Currently, 5.91 acres of potential impact is estimated for the construction of noise barriers, with 2.41 acres outside of the VDOT right of way and within historic districts (3.50 acres of potential impact are within VDOT right of way). The 2.41 acres of impact would be considered a Section 4(f) use. "

TABLE OF CONTENTS

1. Introduction 1
1.1 Description of the Study Area 1
1.2 Background 2
1.3 Existing Conditions 3
1.4 Purpose and Need 3
1.5 Description of Alternatives 4
2. Methodology 4
2.1 Regulatory Context 4
2.2 Indirect Effects 6
2.3 Cumulative Effects 7
3. Indirect Effect Analysis 7
3.1 Step 1: Scoping 7
3.2 Step 2: Identify Study Area Direction and Goals 9
3.2.1 Study Areas 9
3.2.2 Directions and Goals 9
Historic Land Use 13
Land Use Patterns and Local Plans 19
Future Population Projections 19
Economic Development and Employment 19
Natural Resources Protection/Ecosystems 21
3.3 Step 3: Inventory of Sensitive Resources in the Study Area 21
3.3.1 Socioeconomic Resources 22
Land Use 22
Community Facilities, Parks, Recreational Facilities, Open Space 22
Environmental Justice 22
Poverty 31
3.3.2 Natural Resources 32
Waters, Wetlands, and Water Quality 32
Floodplains 32
Wildlife Habitat 34
Threatened, Endangered, and Special Status Species 37
3.3.3 Historic Resources 42
3.4 Step 4: Identify Impact Causing Activities of The Build Alternative 42
3.5 Step 5: Identify Indirect Effects for Analysis 43

3.6 Step 6: Analyze Indirect Effects and Evaluate Analysis Results for the No Build and Build Alternatives 47
3.6.1 No Build Alternative 47
Effects to Socioeconomic Resources 47
Effects to Natural Resources 47
Effects to Historic Resources 47
Induced Growth 47
Effects Related to Induced Growth 47
3.6.2 Build Alternative 47
Effects to Socioeconomic Resources 47
Effects to Natural Resources 48
Effects to Historic Resources 49
Induced Growth 49
Effects Related to Induced Growth 49
3.7 Step 7: Assess Consequences and Develop Mitigation 49
3.7.1 Socioeconomic Resources 49
3.7.2 Natural Resources 50
3.7.3 Historic Resources 50
4. Cumulative Effects 51
4.1 Study Area and Geographic Scope 51
4.2 What Are the Temporal Boundaries for the Study? 51
4.3 What Are the Resources Affected by the Study? 51
4.4 What Are Other Past, Present, and Reasonably Foreseeable Actions That Have Impacted Or May Impact These Resources? 51
4.4.1 Past Actions 51
4.4.2 Present and Reasonably Foreseeable Future Actions 52
4.5 What Were Those Impacts? 57
4.5.1 Socioeconomic Resources 58
4.5.2 Natural Resources 58
4.5.3 Historic Resources 59
4.6 What is the Overall Impact on These Various Resources From the Accumulation of the Actions? 62
5. References 63

LIST OF TABLES

Table 3-1: Historic Populations 13
Table 3-2: Future Population Growth Projections 19
Table 3-3: Business Environment for the Study Area Localities 20
Table 3-4: Study Area Racial and Ethnic Characteristics by Locality 26
Table 3-5: Median Household Income by Census Block Group for the Socioeconomic ICE Study Area 29
Table 3-6: Poverty Characteristics for the Census Block Groups within the Socioeconomic Resources ICE Study Area 31
Table 3-7: Land Cover within the Natural Resources ICE Study Area 34
Table 3-8: Listed Species within the Natural Resources ICE Study Area 37
Table 3-9: Direct Impacts of the Build Alternative 43
Table 3-10: Potentially Substantial Indirect Effects of the Project Meriting Analysis 45
Table 4-1: Present and Reasonably Foreseeable Future Transportation Projects within the Socioeconomic Resources and Natural Resources ICE Study Areas 53
Table 4-2: Present and Reasonably Foreseeable Future Non-Transportation Projects within the Socioeconomic Resources and Natural Resources ICE Study Areas 54
Table 4-3: Activities with Potential Cumulative Effects on Identified Resources 57
Table 4-4: Cumulative Effects to Resources Resulting from the Alternatives 60

LIST OF FIGURES

Figure 1-1: Study Area 2
Figure 2-1: Direct vs. Indirect Environmental Impact 5
Figure 2-2: Cumulative Impacts 5
Figure 3-1: Socioeconomic Resources ICE Study Area 10
Figure 3-2: Natural Resources ICE Study Area 11
Figure 3-3: Historic Properties ICE Study Area and Resources 12
Figure 3-4: 1945 USGS Historic Topographic Map 14
Figure 3-5: 1956 USGS Historic Topographic Map 15
Figure 3-6: 1965 USGS Historic Topographic Map 16
Figure 3-7: 1979 USGS Historic Topographic Map 17
Figure 3-8: 1983 & 88 USGS Historic Topographic Map 18
Figure 3-9: Public Facilities in the Socioeconomic Resources ICE Study Area 23
Figure 3-10: Environmental Justice Populations in the Socioeconomic Resources ICE Study Area 25
Figure 3-11: Floodplains within the Natural Resources ICE Study Area 33
Figure 3-12: Land Use Classifications for the Natural Resources ICE Study Area 35
Figure 3-13: Highway Investment on Typical Progress of Urbanization 44

List of Acronyms

ACS	American Community Survey
ADA	Americans with Disabilities Act
APE	Area of Potential Effect
ART	Arlington Transit
CBPA	Chesapeake Bay Preservation Act
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CWA	Clean Water Act
DC SHPO	District of Columbia State Historic Preservation Office
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FWIS	Fish and Wildlife Information Service
GIS	Geographic Information System
HHS	Health and Human Services
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HUC	Hydrologic Unit Code
I-395	Interstate 395
ICE	Indirect and Cumulative Effect
IPaC	Information for Planning and Conservation

LMI	Labor Market Information
NAWB	National Association of Workforce Boards
NB	Northbound
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NHS	National Highway System
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OMB	Office of Management and Budget
PCB	Polychlorinated Biphenyl
PIM	Public Information Meeting
PPTA	Public-Private Transportation Act
RMA	Resource Management Area
RPA	Resource Protection Area
SB	Southbound
SOV	Single Occupancy Vehicle
STAG	Stakeholder Technical Advisory Group
STRAHNET	Strategic Highway Network
SYIP	Six Year Improvement Program
TMDL	Total Maximum Daily Load
TRB	Transportation Research Board
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

V-CRIS	Virginia Cultural Resources Information System
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation Department of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VEZ	Virginia Enterprise Zone
WNS	White Nose Syndrome

1. INTRODUCTION

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), has initiated a study for the Interstate 395 (I-395) Express Lanes Project (Northern High Occupancy Toll [HOT] Lanes) to extend the I-95 Express Lanes in the City of Alexandria, and Arlington and Fairfax Counties, Virginia. Pursuant to the National Environmental Policy Act of 1969, as amended (NEPA), and in accordance with FHWA regulations, an Environmental Assessment (EA) has been prepared to analyze and document the potential social, economic, and environmental effects associated with the proposed transportation improvements.

The purpose of this Technical Report is to identify and assess the indirect and cumulative effects (ICE) within and close to the study area. Information in this Report, described below, will support discussions presented in the EA.

- **Section 1** provides an overview of the study;
- **Section 2** summarizes the methods used to identify the ICE resources for the project;
- **Section 3** summarizes the analysis for indirect effects;
- **Section 4** summarizes the cumulative effects; and,
- **Section 5** provides the references used within the Technical Report.

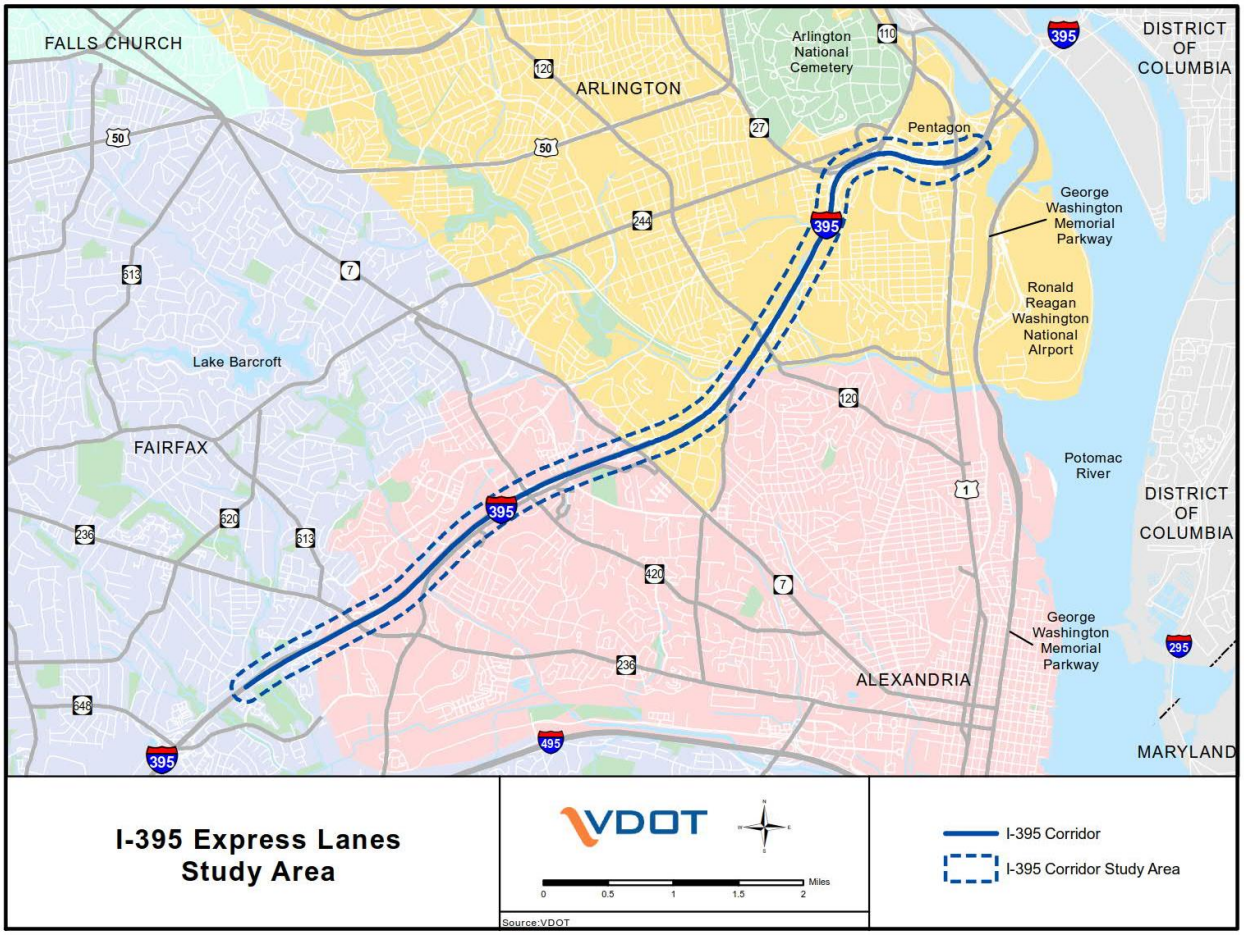
1.1 DESCRIPTION OF THE STUDY AREA

The study area encompasses approximately eight miles of the I-395 corridor from Turkeycock Run in Fairfax County to the vicinity of Eads Street near the Pentagon in Arlington County, as shown in **Figure 1-1**. Transition areas extending slightly beyond these termini are included in order to connect the proposed improvements with the existing facility on either end. Additional signage, maintenance of traffic, and noise barrier activities are anticipated to occur beyond the study area. Crossroads and interchange areas also are included in the study area, as well as lands adjacent to the corridor[1]. The following interchanges along I-395 are located within the study area, moving south to north:

- Turkeycock Run;
- Duke Street/Little River Turnpike (Route 236);
- Seminary Road (Route 420);
- King Street (Route 7);
- Shirlington Road;
- Glebe Road (Route 120);
- Washington Boulevard (Route 27); and,
- Eads Street near the Pentagon.

[1] The study area is approximately 600 feet to either side of the existing corridor for a distance of eight miles. The study area was established to identify the full extent of environmental resources and their relevance to the project. Specific potential environmental consequences resulting from the expansion and conversion of the two existing reversible High Occupancy Vehicle (HOV) lanes on I-395 to three managed HOT lanes are documented in **Chapter 3.0, Environmental Consequences** of the EA.

Figure 1-1: Study Area



1.2 BACKGROUND

In 1995, the Public-Private Transportation Act (PPTA) was signed into law and was amended and re-enacted in 2005. PPTA allows for private entities to solicit VDOT to develop and/or operate and maintain transportation facilities that VDOT determines demonstrate a need. In November 2005, the conceptual proposal submitted by Fluor and Transurban was selected by the PPTA Advisory Panel. As proposed at that time, the project improvements would expand the High Occupancy Vehicle (HOV) system in the I-95/I-395 corridor and apply the HOT concept. As a result of this action, VDOT, in cooperation with FHWA, initiated an environmental analysis on the following proposal:

- Convert the existing two-lane HOV facility to three HOT lanes along I-395 from Eads Street to just south of Route 234 Interchange near Dumfries;
- Construct two new HOT lanes in the median from the existing terminus south of Route 234 to just north of Route 610 (Garrisonville Road);
- Add new entry/exit points between the general purpose lanes and the HOT lanes and modify existing entry/exit points; and
- Build new structures associated with the Lorton Bus-rail transfer station, flyovers, and replace existing structures at Telegraph Road over I-95 and the Franconian-Springfield pedestrian bridge.

In January 2009, FHWA issued a Categorical Exclusion (CE) for the project. In February 2011, VDOT reduced the project scope by eliminating approximately six miles of HOT lanes on I-395 including modifications to the existing interchanges, instead, focusing traffic improvements on the I-95 corridor. VDOT then announced plans for a new I-95 HOT Lanes Project and prepared an EA and then a Revised EA to assess HOT lanes on I-95 from Garrisonville Road in Stafford County to I-395 at Edsall Road in Fairfax County and link those lanes directly to the new I-495 HOT lanes already under construction. In December 2011, upon review of the Revised EA and supporting documentation, FHWA issued a Finding of No Significant Impact.

In 2012, VDOT and 95 Express Lanes, LLC (95 Express) entered into a Comprehensive Agreement for the development of the I-95 Express Lanes. The I-95 Express Lanes project was completed in December 2014. The Comprehensive Agreement allows for the future development of the extension of the I-95 Express Lanes along the I-395 corridor similar to the limits originally proposed in 2005. In 2015, the VDOT signed a Development Framework Agreement with 95 Express to extend the I-395 Express Lanes as a Concessionaire's Enhancement under the Comprehensive Agreement. The Development Framework Agreement outlines the responsibilities of both VDOT and the Concessionaire. The Agreement notes that improvements would be built largely within VDOT's existing right of way, VDOT and 95 Express would work together to finalize the scope, finance plan and agreement, and 95 Express would fund an annual transit payment.

1.3 EXISTING CONDITIONS

The I-395 corridor begins at the I-95 / I-495 Capital Beltway Interchange and ends at the New York Avenue NW (Route 50) intersection in northwest Washington, D.C, an approximate distance of 14 miles. I-395 is part of the National Highway System (NHS)[2] and the Strategic Highway Network (STRAHNET)[3]. Additionally, I-395 is the primary north-south interstate into Washington, D.C. from Virginia serving local, commuter, and regional traffic. The existing I-395 facility within the study limits generally includes four northbound (NB) and four southbound (SB) general purpose lanes and two reversible HOV lanes between the NB and SB general purpose lanes. The HOV lanes operate in the NB direction between 2:30 AM and 11:00 AM with HOV 3+ restrictions in effect from 6:00 AM to 9:00 AM. The HOV lanes operate in the SB direction from 1:00 PM to 12:00 AM with HOV 3+ restrictions in effect from 3:30 PM to 6:00 PM. During the summer months, the midday closure of the reversible HOV lanes to reverse the lanes from NB to SB travel occurs one hour earlier, beginning at 10:00 AM to accommodate higher traffic demands in both the general purpose, HOV, and Express Lanes. Nighttime closures remain the same during the summer months.

1.4 PURPOSE AND NEED

The Purpose and Need includes consideration of both the base year 2015 and future year 2040 conditions along the I-395 corridor. Based on the background information discussed above, information gathered

[2] NHS consists of major roadways important to the nation's economy, defense, and mobility. The NHS includes the interstate highway system as well as other roads connecting to major ports, airports, public transportation facilities, or other intermodal transportation services (http://www.fhwa.dot.gov/planning/national_highway_system/).

[3] STRAHNET is a system of highways important to the United States' strategic defense policy providing defense access, continuity and emergency capabilities for defense purposes (http://www.fhwa.dot.gov/planning/national_highway_system/).

during public and agency meetings, and the analysis of recent data collected for this study, the following transportation needs have been identified for the study area:

- Reduce congestion;
- Provide additional travel choices;
- Improve travel reliability; and,
- Improve roadway safety.

1.5 DESCRIPTION OF ALTERNATIVES

VDOT and 95 Express have been involved in discussions, reviews, and decisions related to HOT Lanes proposals in the I-95/I-395 corridor since 2004. The alternatives development process for this project was shaped by this early coordination between VDOT and 95 Express, the initial project proposal concept and previously completed NEPA documentation and technical studies. The No Build Alternative and the Build Alternative are under consideration for the EA.

No Build Alternative

The No Build Alternative would retain the existing I-395 interstate and associated interchanges in their present configurations, and allow for routine maintenance and safety upgrades, but assumes no major improvements to the I-395 corridor with the exception of the previously committed projects.

Build Alternative

The Build Alternative extends eight miles along I-395 beginning at Turkeycock Run, just north of Edsall Road Interchange, to the vicinity of Eads Street Interchange and converts the two existing reversible HOV lanes to three HOT lanes within the median area between the northbound and southbound I-395 general purpose lanes. Modifications proposed to the Eads Street Interchange are to address existing capacity deficiencies and improve transit access to the Pentagon Transit Center and Pentagon Reservation. All other access points to the proposed HOT lanes along the study corridor would remain in their current configuration, but would be converted to HOT access with the exception of the south facing Seminary Road ramp. The south facing Seminary Road ramp will remain an HOV ramp at all times.

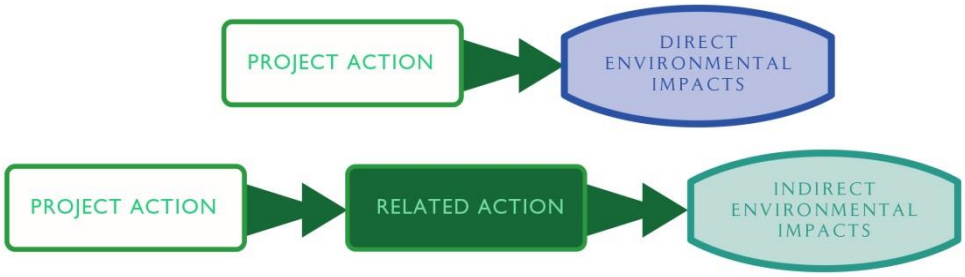
2. METHODOLOGY

2.1 REGULATORY CONTEXT

The NEPA legislation does not mention indirect or cumulative impacts; however, the Council on Environmental Quality (CEQ) regulations for implementing NEPA address federal agency responsibilities applicable to indirect and cumulative considerations, analysis, and documentation (40 CFR 1508.25) in the content requirements for the environmental consequences section of an Environmental Impact Statement (EIS) (40 CFR 1502.16) (FHWA, 2014).

CEQ defines indirect effects as "…effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 1508(a)). 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" (40 CFR 1508(a)). These induced actions are those that may or may not occur without the implementation of the proposed project, as illustrated in in **Figure 2-1**.

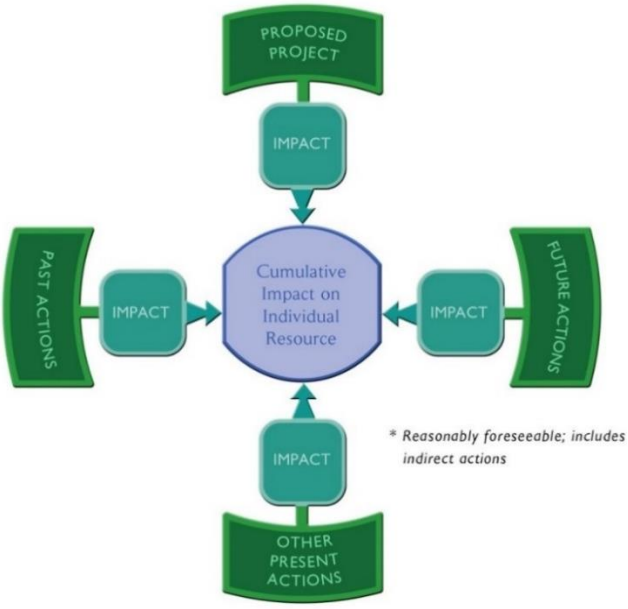
Figure 2-1: Direct vs. Indirect Environmental Impact



Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2014.

CEQ defines cumulative effects (or impacts) 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 effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Cumulative effects include the total of all impacts, direct and indirect, experienced by a particular resource that have occurred, are occurring, and/or would likely occur as a result of any action or influence, including effects of a federal activity (EPA, 1999), as illustrated in **Figure 2-2**.

Figure 2-2: Cumulative Impacts



Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2014.

Because indirect and cumulative effects may be influenced by actions including those taken by others outside of the immediate study area, assumptions must be made to estimate the result of these actions. The CEQ regulation, cited above, states that the analysis must include all the indirect effects that are known, and make a good faith effort to explain the impacts that are not known but which are "reasonably foreseeable". NEPA does not define what constitutes "reasonably foreseeable actions." Court decisions on this topic indicate that indirect impact analyses should consider impacts that are sufficiently "likely" to

occur (FHWA, 2014). CEQ has provided guidance on how to define reasonably foreseeable actions based upon court opinions. CEQ is clear that actions that are probable should be considered while actions that are merely possible, conceptual, or speculative in nature are not reasonably foreseeable and need not be considered in the context of cumulative effects (CEQ 1981, FHWA 2014).

This direction on identifying reasonably foreseeable actions is taken into account in both indirect and cumulative effects analyses described in the following sections. Specific methodologies on how these analyses were conducted are presented below.

2.2 INDIRECT EFFECTS

This section presents an analysis of the potential indirect impacts related to the alternatives described in **Section 1.5**. For the purposes of this Technical Report, the methodology followed for analyzing indirect effects is prescribed in the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB, 2002).

In NCHRP Report 466, the TRB states that indirect effects can occur in three broad categories:

1. Encroachment-Alteration Impacts – Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomics) on the environment;
2. Induced Growth Impacts – Project-influenced development effects (land use); and,
3. Impacts Related to Induced Growth – Effects related to project-influenced development effects (impacts of the change of land use on the human and natural environment).

For the purpose of this analysis, the term "indirect effects" refers to all three of these categories. Transportation improvements often reduce time and cost of travel, as well as provide new access to properties, enhancing the attractiveness of surrounding land to developers and consumers (NCDOT, 2001). Development of vacant land, or conversion of the built environment to more intensive uses, is often a consequence of highway projects. Important characteristics for induced growth are described in North Carolina Department of Transportation's (NCDOT) *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* (NCDOT, 2001). These characteristics include existing land use conditions in the project area, increased accessibility that may result from new transportation improvements, local political and economic conditions, the availability of other infrastructure, and the rate of urbanization in the region. The study area is highly developed and is therefore likely to experience infill development and redevelopment of existing facilities, rather than suburban/urban sprawl (NCDOT, 2001).

The indirect effects analysis focuses on the potential for ecological and socioeconomic impacts that could occur as a result of the proposed alternatives outside of the area of direct impact, as well as the potential impacts of redevelopment. The stepwise process TRB recommends in NCHRP Report 466 for assessing indirect effects has been used as the structure for this analysis, and consists of the following steps:

Step 1 Scoping;
Step 2 Identify Study Area Direction and Goals;
Step 3 Inventory Notable Features in the Study Area;
Step 4 Identify Impact-Causing Activities of the Build Alternatives;
Step 5 Identify Indirect Effects for Analysis;

Step 6 Analyze Indirect Effects and Evaluate Analysis Results; and,
Step 7 Assess Consequences and Develop Mitigation.

To complete these steps, the required analysis relies on planning judgment that is described in the NCHRP 25-25 program, Task 22, *Forecasting Indirect Land Use Effects on Transportation Projects* (TRB, 2007). The direction provided in the TRB document is the basis for the indirect effects analyses presented in this Technical Report.

2.3 CUMULATIVE EFFECTS

To document cumulative effects for this study, the analysis followed the five-part evaluation process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (5th Cir., 1985), as described in FHWA's *Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2014):

1. What is the geographic area affected by the study?
2. What are the resources affected by the study?
3. What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
4. What are those impacts?
5. What is the overall impact on these various resources from the accumulation of the actions?

Each of these parts of the cumulative effects evaluation process is discussed in **Section 4** of this Technical Report.

3. INDIRECT EFFECT ANALYSIS

3.1 STEP 1: SCOPING

The first step in the indirect effects analysis includes scoping activities and the identification of the study area in order to set the stage for the remaining steps. As part of this scoping effort, a number of planning documents prepared by the localities were reviewed, including the Arlington County, Virginia Comprehensive Plan (2016), the Alexandria Master Plan & Citywide Chapters (2016) and the Fairfax County Comprehensive Plan 2013 Edition. These documents illustrate that the proposed improvements have been considered in the local and regional planning processes for some time.

Scoping also included agency coordination. VDOT mailed scoping letters to the following federal, state, and local agencies and organizations to obtain pertinent information and to identify key issues regarding the potential environmental impacts for this study.

- City of Alexandria
- County of Arlington
- City of Fairfax
- District of Columbia
- County of Fairfax
- Metropolitan Washington Council of Governments
- George Washington Memorial Parkway National Park Service
- National Capital Planning Commission
- National Oceanic and Atmospheric Administration, Habitat Conservation Division
- United States Air Force, Air Force Memorial Foundation

- United States Army Corps of Engineers
- United States Department of Agriculture, Natural Resources Conservation Service
- United States Department of Defense, Office of Economic Adjustment
- United States Department of Defense, Integrated Services Division (Pentagon)
- United States Department of Homeland Security, Federal Emergency Management Agency
- United States Department of Homeland Security, United States Coast Guard
- United States Department of Housing and Urban Development
- United States Department of the Interior, Office of Environmental Policy and Compliance
- United States Department of the Interior National Park Service, Northeast Region
- United States Department of the Interior Fish and Wildlife Service
- United States Environmental Protection Agency
- United States Department of Agriculture, Forest Service
- United States Department of Transportation, Federal Railroad Administration
- United States Department of Transportation, Federal Transit Administration
- Virginia Department of Agricultural and Consumer Services
- Virginia Department of Aviation
- Virginia Department of Conservation and Recreation
- Virginia Department of Emergency Management
- Virginia Department of Environmental Quality
- Virginia Department of Forestry
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Health
- Virginia Department of Historic Resources
- Virginia Department of Housing and Community Development
- Virginia Department of Mines, Minerals and Energy
- Virginia Department of Rail and Public Transportation
- Virginia Economic Development Partnership
- Virginia Marine Resources Commission
- Virginia Outdoors Foundation
- Virginia State Police Department
- Washington Metropolitan Area Transit Authority

VDOT held two formal Public Information Meetings (PIM) to provide an opportunity for any person, organization, or agency to express their concerns related to the proposed project and provide comments. The first meeting was held on April 11, 2016 from 6:30 p.m. to 8:30 p.m. at Wakefield High School, 1325 South Dinwiddie Avenue, Arlington, Virginia. The second meeting was held on April 13, 2016 from 6:30 p.m. to 8:30 p.m. (meeting concluded at 8:50 due to the volume of commenters) at Francis C. Hammond Middle School at 4646 Seminary Road, Alexandria, Virginia. Three Stakeholder Technical Advisory Group (STAG) Meetings have also been held with federal, state, and local agencies to review and discuss project specifics and concerns. These meetings occurred on January 12, 2016, March 2, 2016, and July 11, 2016.

The PIM included a formal presentation and display boards depicting general information on the study, including the study schedule and purpose of the study. Comment sheets and informational handouts were provided at the meeting and were made available on the study website. VDOT representatives were available to discuss the study and answer questions. A court reporter was on site for both meetings and

recorded public oral comments in addition to oral comments people wished to make in private. Eighty-four people signed in for the meeting held on April 11, 2016 and 93 people signed in for the meeting held on April 13, 2016 including members of the press and elected officials. Twenty-six comment forms and 36-emailed comments were received during the Public Meetings or during the 10-day comment period following the meetings, and thirty-three oral statements were recorded at the meetings.

Scoping letters were customized to specifically ask appropriate parties questions regarding indirect and cumulative effects. The information obtained through these efforts was used to further inform discussions on the direction and goals of the region, as well as the resources included in the study area.

3.2 STEP 2: IDENTIFY STUDY AREA DIRECTION AND GOALS

The second step in the indirect effects analysis focuses on assembling information about general trends and goals within the study area.

3.2.1 Study Areas

The study area for this analysis, along with input from the scoping process outlined above, was used to inform the identification of resource-specific study areas for this indirect effects analysis. Specific indirect effect study areas were developed for each of the following resource topics:

- **Socioeconomic Resources**: This study area was established to analyze indirect effects to socioeconomics, land use, community facilities, recreational resources, and Environmental Justice (EJ) populations and encompasses a larger area than that of the direct impact study area established for the EA (600 feet to either side of the existing corridor for a distance of eight miles). The Socioeconomic Resources ICE Study Area is 2,600 feet to either side of the existing corridor for a distance of eight miles and is shown in **Figure 3-1**.
- **Natural Resources:** This study area was established to analyze indirect effects to water resources, wildlife habitat, and threatened, endangered, and special status species. The Natural Resources ICE Study Area is based on the Virginia Department of Conservation and Recreation (VDCR) and the Virginia Hydrologic Unit Explorers subwatershed 12-digit Hydrologic Unit Code (HUC) determinations, including all HUCs that are within or partially within the study area (shown in **Figure 3-2**).
- **Historic Properties:** This study area was established to analyze indirect effects to historic properties. This study area is the Area of Potential Effect (APE) as defined for the undertaking. The historic properties ICE study area is shown in **Figure 3-3**. Indirect effects such as altering the setting, feeling and association of archaeological and architectural historic properties are considered under Section 106 of the National Historic Preservation Act (NHPA) as discussed in the ***Cultural Resources Technical Memorandum*** (VDOT, 2016c).

3.2.2 Directions and Goals

The directions and goals considered for the analysis are independent of the transportation alternatives being evaluated in the EA and include social, economic, growth-related, and natural resource-related issues. Evidence indicates that transportation investments result in land use changes only in the presence of other factors. These factors include supportive local land use policies, local development incentives, availability of developable land, and a favorable investment climate (TRB, 2002). An understanding of local goals combined with a thorough knowledge of demographic, economic, and social trends is essential in understanding the potential for project-influenced changes.

Figure 3-1: Socioeconomic Resources ICE Study Area

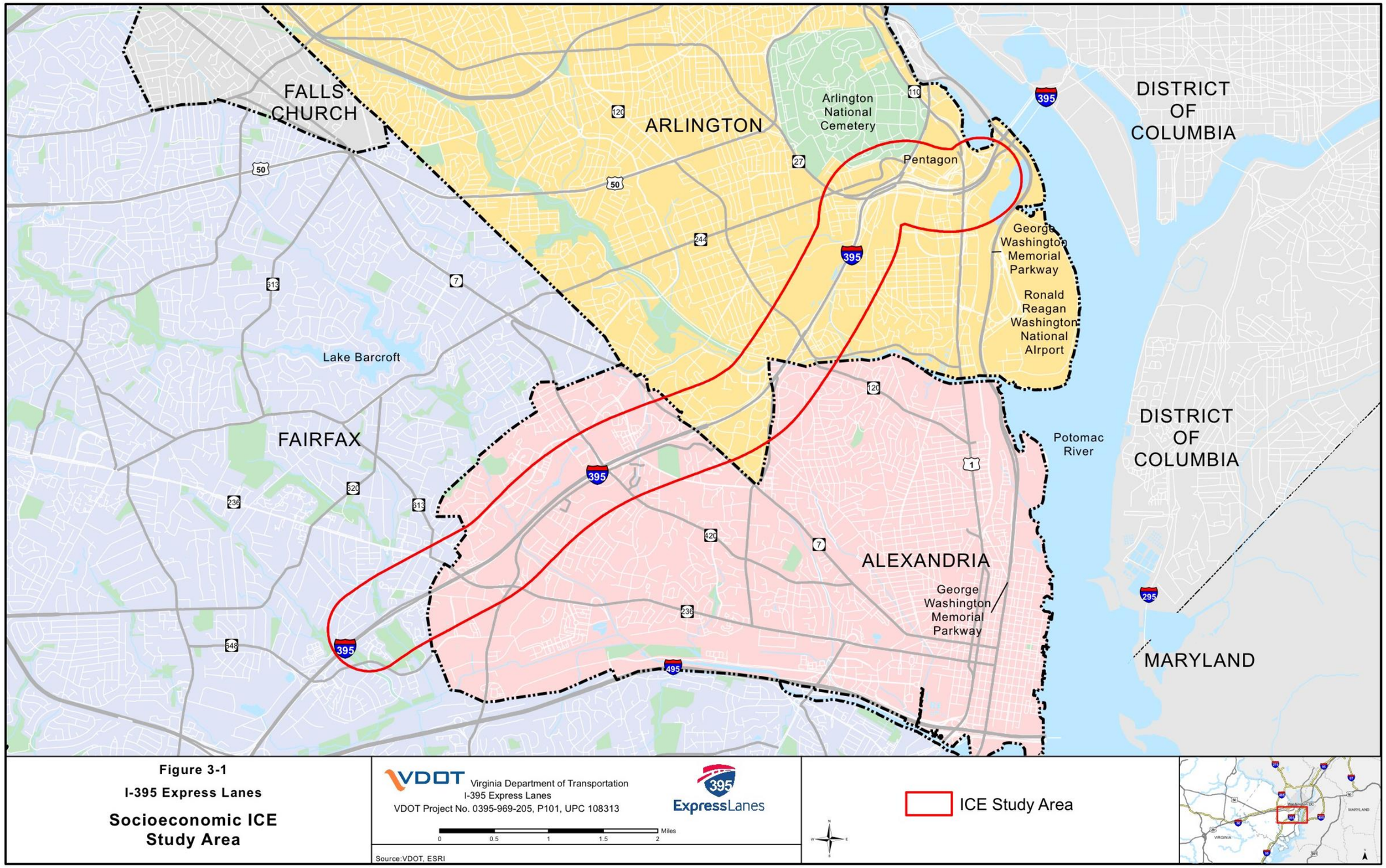


Figure 3-2: Natural Resources ICE Study Area

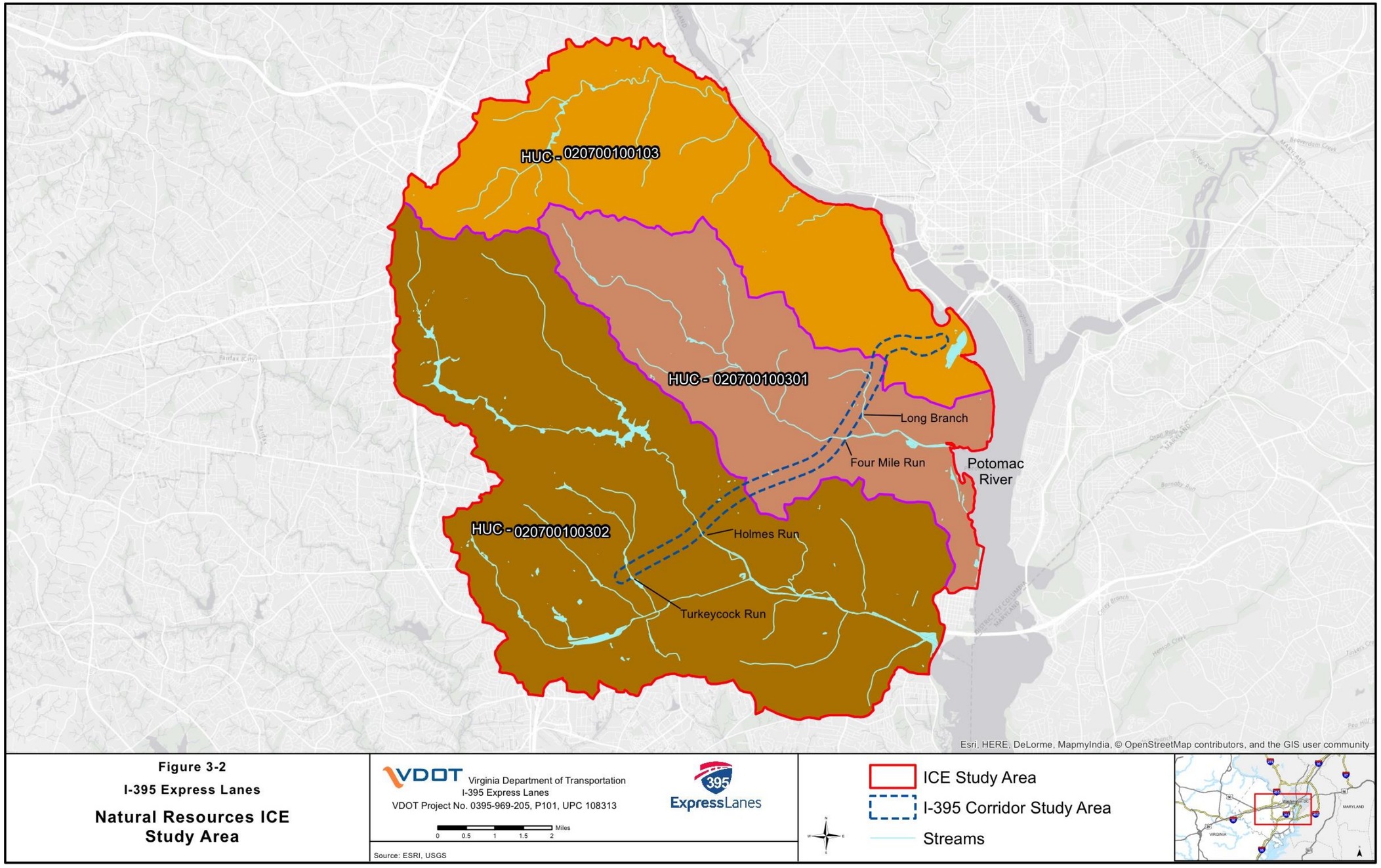
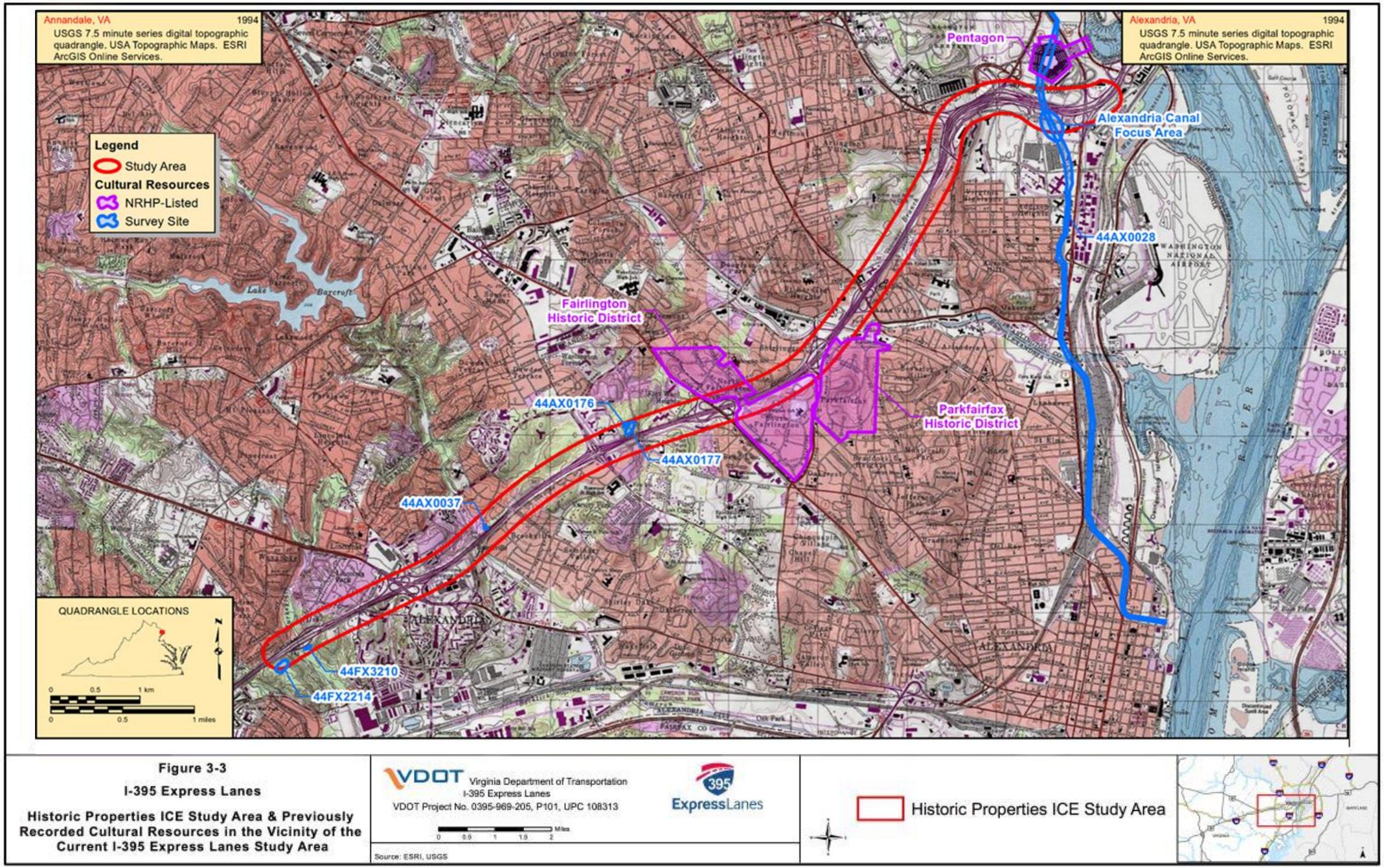


Figure 3-3: Historic Properties ICE Study Area and Resources



Understanding the regional goals is also important for consideration of potential indirect effects to the natural environment and whether potential effects are in line with local goals as a determinant of impact significance and an indicator of effects that merit further analysis. The following sections describe the existing and planned land use and population/employment trends in the ICE study areas in order to provide insight to the direction and goals for the study area.

Historic Land Use

The Socioeconomic Resources ICE Study Area follows the route of the former Henry G. Shirley Memorial Highway (Shirley Highway), which was constructed in stages during the 1940s and 1950s. The first section of Shirley Highway was constructed in 1943 and served the Pentagon, which was also completed in January of the same year. The highway also served the Reagan National Airport that had opened two years earlier in 1941. Historic population data is not available at the study area level; however, as outlined in **Table 3-1**, the 1940 population for the localities was 131,492 (Census, 1940).

Table 3-1: Historic Populations

Locality	1940	1950	1960	1970	1980	1990	2000	2010
Fairfax	40,929	98,557	275,002	454,275	596,901	818,584	969,749	1,081,726
Alexandria	33,523	61,787	91,023	110,927	103,217	111,183	128,283	139,966
Arlington	57,040	134,449	163,401	174,284	152,599	170,936	189,453	207,627
Total Locality	131,492	294,793	529,426	739,486	852,717	1,100,703	1,287,485	1,429,319
10 Year Growth %	--	124%	80%	40%	15%	29%	17%	11%
Virginia	2,644,250	3,318,680	3,966,966	4,651,487	5,346,818	6,187,358	7,078,515	8,001,024
10 Year Growth %	--	20%	16%	15%	13%	14%	13%	12%

Source: U.S. Census Bureau, Historic Population Figures and The Weldon Cooper Center for Public Service, Demographics Research Group.

Based on available historic aerials (Nationwide Environmental Title Research, LLC, 2016) and United States Geological Survey (USGS) Topographic Quadrangles (Quads) from 1945, the Socioeconomic Resources ICE Study Area contained very little housing in the southwest portion, while in the northeast portion, closer to Washington D.C., expansion into suburban neighborhoods was already occurring, as shown on **Figure 3-4**. Engineers who designed the Shirley Highway worked in conjunction with the local planners to design safe and efficient access to neighboring communities being built to house government workers (Kozel, Scott M, 2005). The Shirley Highway opened in 1944 and by 1952 Shirley Highway was a four-lane facility. By 1950, the population of the Socioeconomic Resources ICE Study Area localities had grown by over 124 percent to 294,793. As the Shirley Highway system was updated, the roadway was designated as Interstate 95 (I-95). The 1956 USGS Quad shows significant growth, in the Socioeconomic ICE Study Area, and the localities as a whole, after World War II (see **Figure 3-5**). By the 1960s, plans were underway to include Shirley Highway in the Interstate Highway System, which was authorized by the Federal Aid Highway Act of 1956. By 1960, the population of the localities had grown another 80 percent to 529,426. By 1965, the 71-mile section of I-95 was open, thus completing a connection between the Richmond Petersburg area and Washington, D.C. By 1965, the Capital Beltway had been constructed and continued development was occurring in the entire Socioeconomic Resources ICE Study Area, as shown in **Figure 3-6**. In 1970, the population of the Socioeconomic Resources ICE Study Area localities saw growth of an additional 40 percent. USGS Quads from 1979, 1983, and 1988 and the available online historic aerials illustrate that the Socioeconomic Resources ICE Study Area was urbanized by this time (see **Figures 3-7** and **3-8**).

Figure 3-4: 1945 USGS Historic Topographic Map

Figure 3-4

I-395 Express Lanes

USGS Historic Topographic Maps for the Socioeconomic ICE Study Area

Virginia Department of Transportation
I-395 Express Lanes
VDOT Project No. 0395-969-205, P101, UPC 108313

Source:VDOT, ESRI, USGS

1945

ICE Study Area

0 1.5 3 Miles

Figure 3-5: 1956 USGS Historic Topographic Map

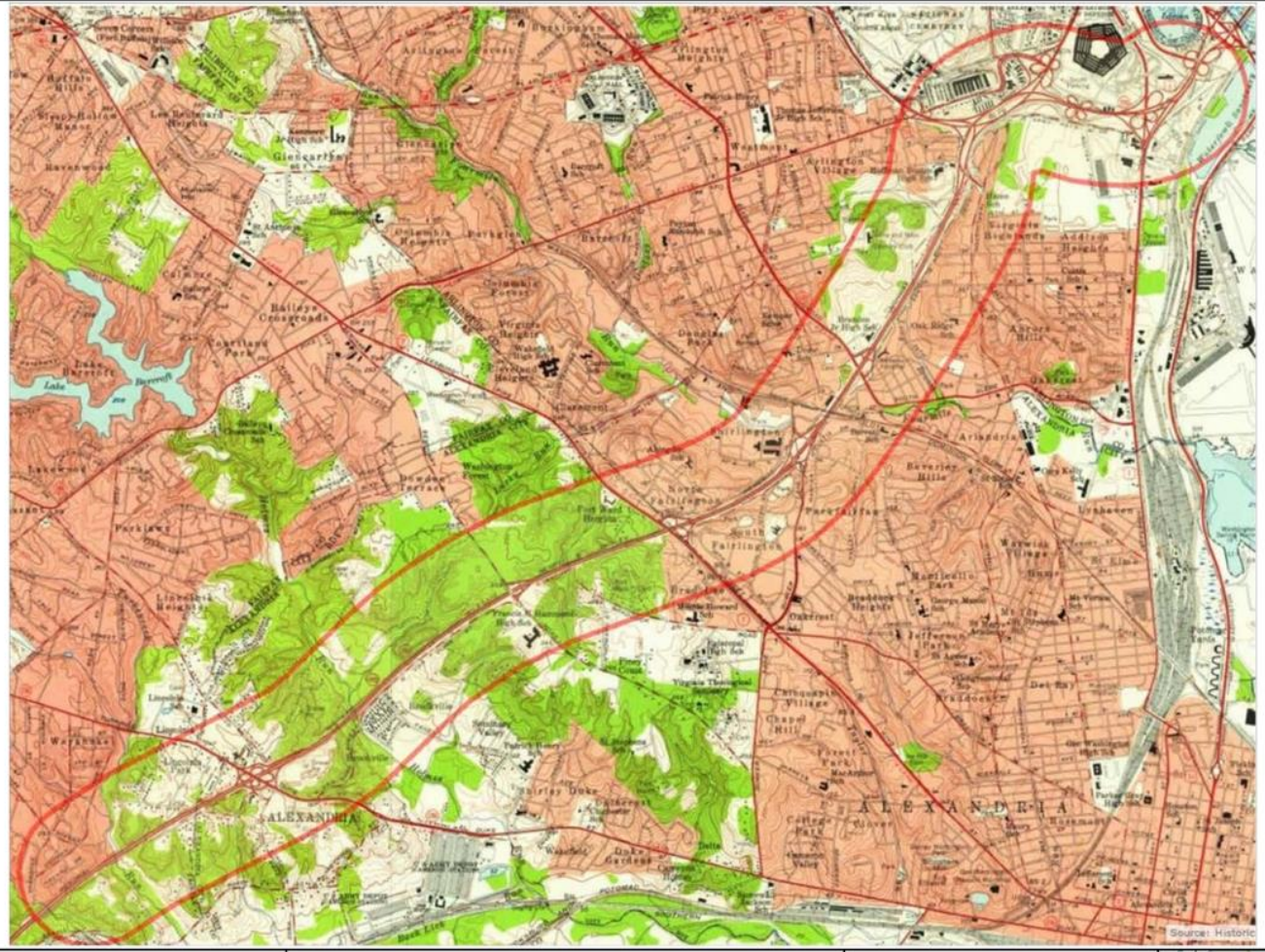


Figure 3-5

I-395 Express Lanes

USGS Historic Topographic Maps for the Socioeconomic ICE Study Area

VDOT Virginia Department of Transportation
I-395 Express Lanes
VDOT Project No. 0395-969-205, P101, UPC 108313

395 ExpressLanes

Source:VDOT, ESRI, USGS

1956

ICE Study Area

0 1.5 3 Miles

Figure 3-6: 1965 USGS Historic Topographic Map

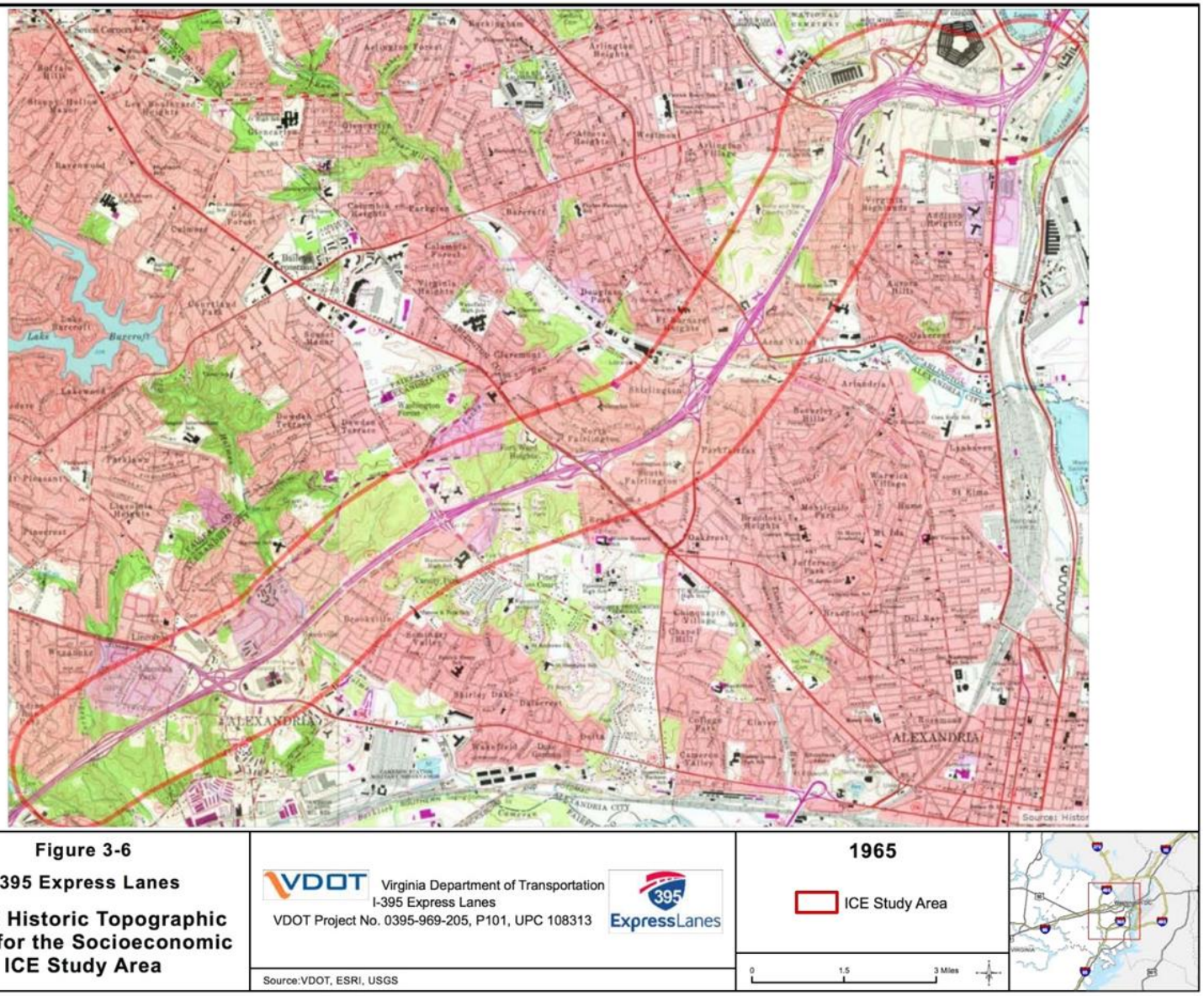


Figure 3-7: 1979 USGS Historic Topographic Map

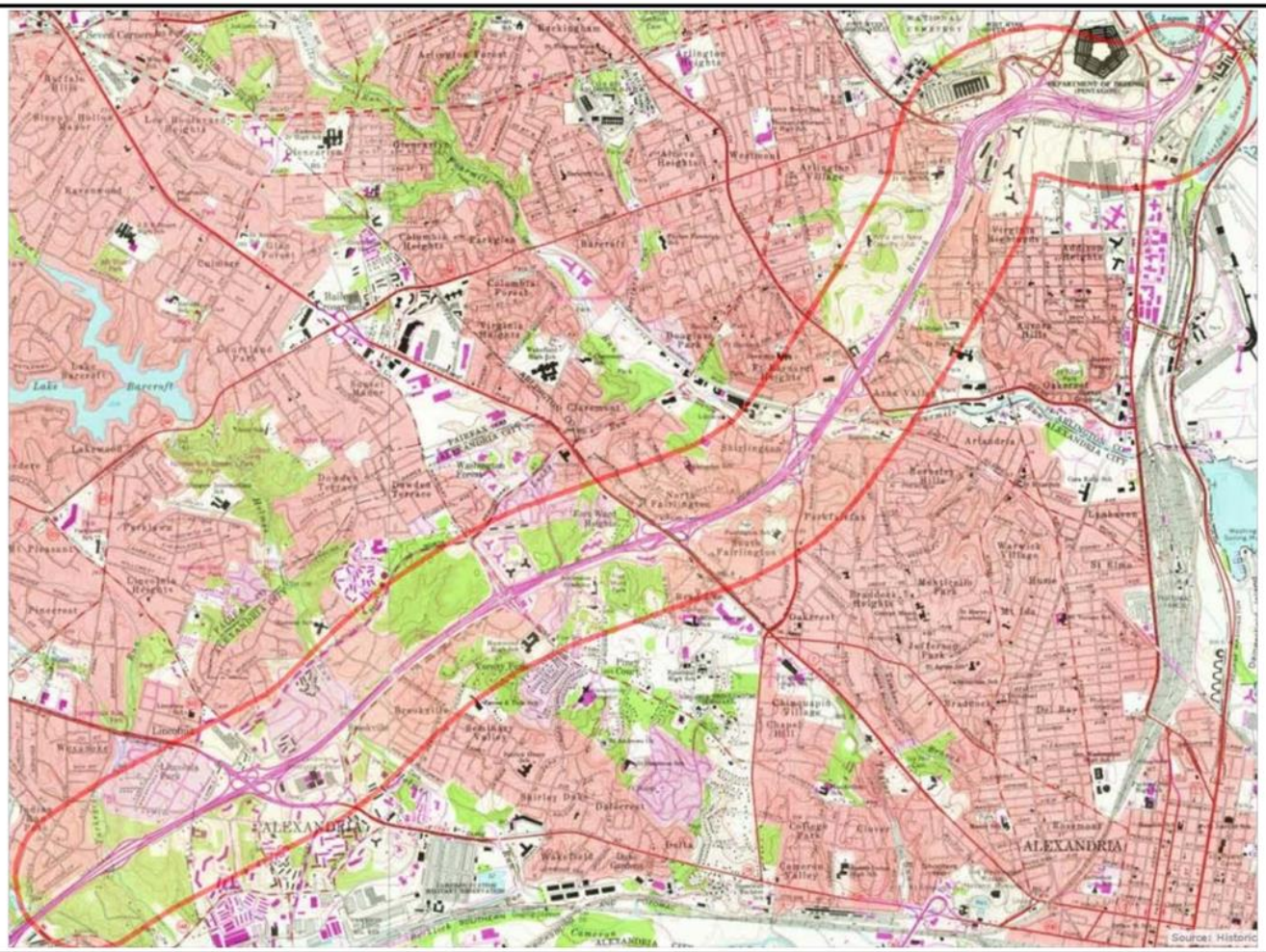


Figure 3-7

I-395 Express Lanes

USGS Historic Topographic Maps for the Socioeconomic ICE Study Area

VDOT Virginia Department of Transportation
I-395 Express Lanes
VDOT Project No. 0395-969-205, P101, UPC 108313

395 ExpressLanes

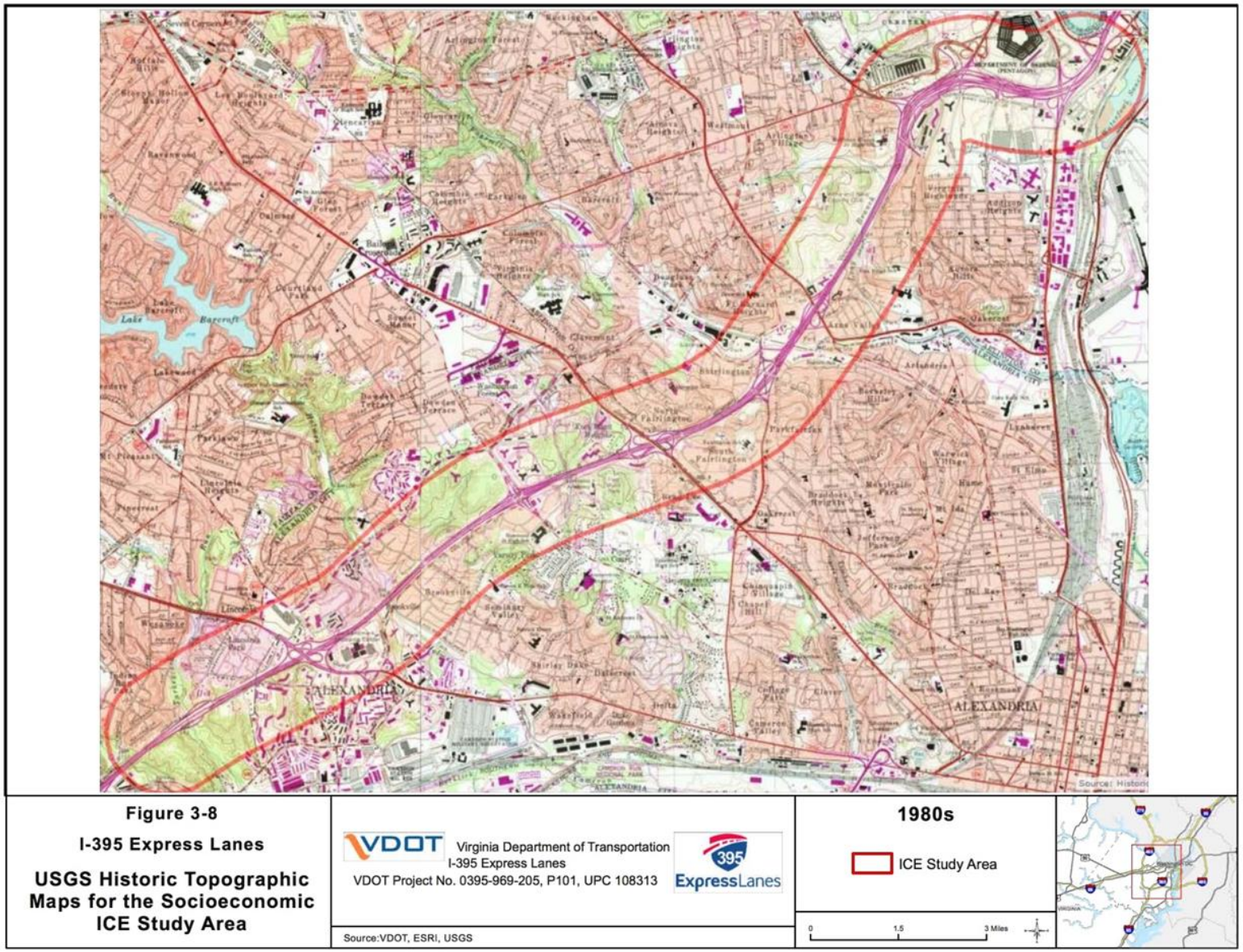
Source:VDOT, ESRI, USGS

1970s

ICE Study Area

0 1.5 3 Miles

Figure 3-8: 1983 & 88 USGS Historic Topographic Map



Land Use Patterns and Local Plans

The following sections describe the local plans that guide the land use patterns and other development in each locality within the Socioeconomic Resources ICE Study Area. Additional information is available in the ***Socioeconomic and Land Use Technical Report*** (VDOT 2016i). Each locality has a general, overarching plan guiding community development.

As stated in the ***Socioeconomic and Land Use Technical Report (***VDOT, 2016i), the localities along the Socioeconomic Resources ICE Study Area are all highly developed. These areas consist of mixed used development including commercial, government, business, public facilities, open space, and residential areas.

The residential areas are comprised of larger multifamily complexes, townhomes, high-density single family neighborhoods (smaller sized lots) and suburban single family neighborhood (larger sized lots). While the potential for new development or infill is significantly limited within the study area, redevelopment is possible throughout all of the localities. Current zoning maps for the localities support the existing land uses and potential redevelopment within the Socioeconomic Resources ICE Study Area. All three localities focus on the improvement and expansion of existing transportation facilities and encourage transportation uses that would ease daily commuter traffic.

Future Population Projections

The Weldon Cooper Center for Public Service, Demographics Research Group produces Virginia locality population projections for three future consecutive decennial years (2020, 2030 and 2040) utilizing past available U.S. Census Bureau (Census) data. As referenced in **Table 3-1**, population for the study area localities started to slow down in the 1980s, although population has still been increasing. As shown in **Table 3-2**, the populations of Fairfax and Alexandria are projected to experience slower paced growth between 2020 and 2040; while Arlington's population is projected to experience a decrease in population over the same period. Based on population data from the Weldon Cooper Center for Public Service, a slowing or even a decrease in population is a typical progression for highly developed areas.

Table 3-2: Future Population Growth Projections

Locality	2010	2020	2030	2040
Fairfax	1,081,726	1,182,809	1,271,995	1,350,245
Alexandria	139,966	145,116	147,706	149,195
Arlington	207,627	206,896	201,699	197,065
Total Study Area Localities	1,429,319	1,534,821	1,621,400	1,696,505
10 Year Growth %	11%	7%	5%	4%
Virginia	8,001,024	8,815,512	9,645,281	10,530,229
10 Year Growth %	12%	9%	9%	8%

Source: The Weldon Cooper Center for Public Service, Demographics Research Group, Virginia Population Projections

Economic Development and Employment

As stated in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2016i), Fairfax is the only study area locality to have a higher positive employment percent change (16 percent) than that of Virginia (12

percent), from 2001-2014. Alexandria and Arlington both have lower employment increases at five and seven percent, respectively. When looking at each locality as a whole, between eight and 28 percent of residents within the study area localities work within the same county as their residence (LMI, 2016). Fairfax has a distinctly higher percentage (28 percent) of residents who work within their residence county than that of Alexandria (9 percent) and Arlington (8 percent). Washington, D.C. is the number one location that residents are commuting to (out-commute) for all three localities. This is likely because I-395 provides a direct route into the southern portion of the D.C. for buses, personal vehicles, and carpooling. While not following the I-395 corridor, the Metrorail also provides a mode of transportation for out-commuting. **Table 3-3** summarizes the top three local business environments and top three largest employers based on National Association of Workforce Boards (NAWB) Labor Market Information (LMI).

Table 3-3: Business Environment for the Study Area Localities

Locality	Local Business Environment	Largest Employers
Fairfax	• Professional, Scientific, and Technical Services (26%) • Retail Trade (9.2%) • Health Care and Social Assistance (8.9%)	• Fairfax County Public Schools • County of Fairfax • U.S. Department of Defense
Alexandria	• Professional, Scientific, and Technical Services (24%) • Federal Government (16%) • Accommodation and Food Services (10%)	• U.S. Department of Commerce • U.S. Department of Defense • City of Alexandria
Arlington	• Professional, Scientific, and Technical Services (19%) • Federal Government (15%) • Other Services (except Public Administration) (11%)	• U.S. Department of Defense • Arlington County School Board • U.S. Department of Homeland Security

Source: LMI, Demographic Profile by county

Employment within the study area is largely dependent on the Professional, Scientific, and Technical Service industry. According to the LMI, the Professional, Scientific, and Technical Services industry ranks as the largest industry in Fairfax, Alexandria, and Arlington with 26 percent, 24 percent, and 19 percent, respectively. Additionally, the Federal Government ranks as the second largest industry in Alexandria and Arlington. Federal, State, and Local government divisions make up the industry: Government Total. While the NAWB LMI data does not include Government Total in the list above, Government Total makes up 13 percent of Fairfax's employment industry and 23 percent of both Alexandria's and Arlington's employment industry, making this industry competitive with non-government industries in the study area. Based on the NAWB LMI data, the U.S. Department of Defense is one of the top three largest employers within each locality in the study area. Within the City of Alexandria and Arlington County, two Federal departments make the top three largest employers of those localities.

There are no Virginia Enterprise Zones (VEZ) located within the Socioeconomic Resources ICE Study Area. Since the Socioeconomic Resources ICE Study Area is highly developed, any economic development goes through rigorous planning processes, including a high degree of public outreach. Economic development initiatives are established to promote smart growth, such as green building policies and sustainable development options.

Natural Resources Protection/Ecosystems

The Natural Resources ICE Study Area encompasses three 12-digit HUC subwatersheds, which drain to the Potomac River, and are a part of the Chesapeake Bay estuary (see **Figure 3-2**). The Study Area underwent a period of rapid urban development from the 1920s to the 1980s, resulting in the loss of the majority of the natural ecosystems that were historically present (Zell, 2011; Fairfax County Park Authority, 2014; City of Alexandria, 2002). The remaining natural areas are now largely restricted to the major stream corridors, which have received higher levels of protection since the 1980s. The Clean Water Act of 1972 (CWA), the Chesapeake Bay Preservation Act (CBPA), and various state and local erosion and sedimentation control, stormwater management, floodplain management, and land disturbance regulations afford current legal protections to the majority of the remaining natural areas.

The CWA provides water quality, wetland, and stream protections, which are administered and enforced by the Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), and Virginia Department of Environmental Quality (VDEQ). The CBPA provides protections for riparian habitats that buffer wetlands and streams through the designation of Resource Protection Areas (RPA) and Resource Management Areas (RMA). The RPA encompasses a 100-foot buffer beyond the wetland or stream boundary, or a stream's major floodplain. Development within the RPA is limited to water dependent activities or redevelopment of existing developed areas. Administration and enforcement of the CBPA protections is carried out by the individual counties or cities that lie within the Chesapeake Bay Preservation Area. The RMA encompasses all additional areas beyond the RPA that have the potential to impact water quality. Allowable development activities in the RMA are not as restrictive as in the RPA; however, coordination with the county or city is still required for activities in these areas prior to development.

Since the majority of the wildlife habitat in the Natural Resources ICE Study Area lies within the stream corridors and their floodplains, wildlife and wildlife habitat also receive protection through the CWA and the CBPA. Threatened, endangered, and special status species, if present, receive direct protection through the federal or state endangered species laws.

Conservation management and protection of the remaining natural areas within the Natural Resources ICE Study Area is guided by the Fairfax County and the Arlington County Natural Resources Management Plans and the City of Alexandria Strategic Master Plan for Open Space, Parks, and Recreation. These plans establish goals for the management, restoration, and protection of the remaining natural areas. Since land available for acquisition and conversion from a developed condition back to a natural condition is very limited, restoration activities are largely focused on managing existing impacted natural resources to improve their overall condition and habitat values. Such activities include invasive species management actions, native plant replanting, and restoration of degraded streams and wetlands.

3.3 STEP 3: INVENTORY OF SENSITIVE RESOURCES IN THE STUDY AREA

Sensitive resources for this study that were considered to be particularly relevant for the analysis of impacts from a transportation project include socioeconomics and land use (including community facilities and parks, and EJ); natural resources (including streams, wetlands, water quality, floodplains, wildlife habitat, and threatened, endangered, and special status species); and historic resources.

3.3.1 Socioeconomic Resources

Land Use

The I-395 study area lies completely within highly urbanized areas of Fairfax, Alexandria, and Arlington. Based on available 2016 Alexandria GIS data, only six percent of lands are vacant in the locality (not including parklands). The Fairfax County Comprehensive plan notes that the County "should have a land use pattern which increases transportation efficiency, encourages transit use, and decreases automobile dependency" (Fairfax, 2016). Fairfax wishes to "concentrate most future development in mixed-use centers, transit station areas and areas of transportation advantage" (Fairfax, 2016). Fairfax also notes that due to rapid growth over the past decades, the amount of available vacant land (currently one percent) is diminishing and redevelopment would be more prevalent in the future. The County supports "a multi-modal transportation system that provides transportation choices, reduces [single occupancy vehicle] [SOV] use" and "provides HOV lanes on freeways and major arterials where substantial travel benefits can be realized" (Fairfax 2016). Alexandria's goals and objectives are to "promote mixed use development in major development and redevelop areas," offering a wide variety of transportation options which encourage uses other than SOV use (Alexandria, 2016). In highly populated areas, traffic congestion is a chief concern to residents; therefore, Alexandria "encourages the use of public transit to reduce the use of motor vehicles" by "promoting mixed use developments in high density areas to provide a balance of residential, shopping and employment options in the same locations" (Alexandria, 2016). Arlington has stated in the Goals and Objectives of their Comprehensive Plan to "limit intense development to defined areas, while maintaining the predominantly residential character of the remaining county areas" (Arlington, 2016).

Community Facilities, Parks, Recreational Facilities, Open Space

Community facilities in the Socioeconomic Resources ICE Study Area were identified through a review of locality Geographic Information System (GIS) data and online mapping. Numerous public facilities occur throughout the Socioeconomic Resources ICE Study Area, as listed below for each locality, and shown on **Figure 3-9**.

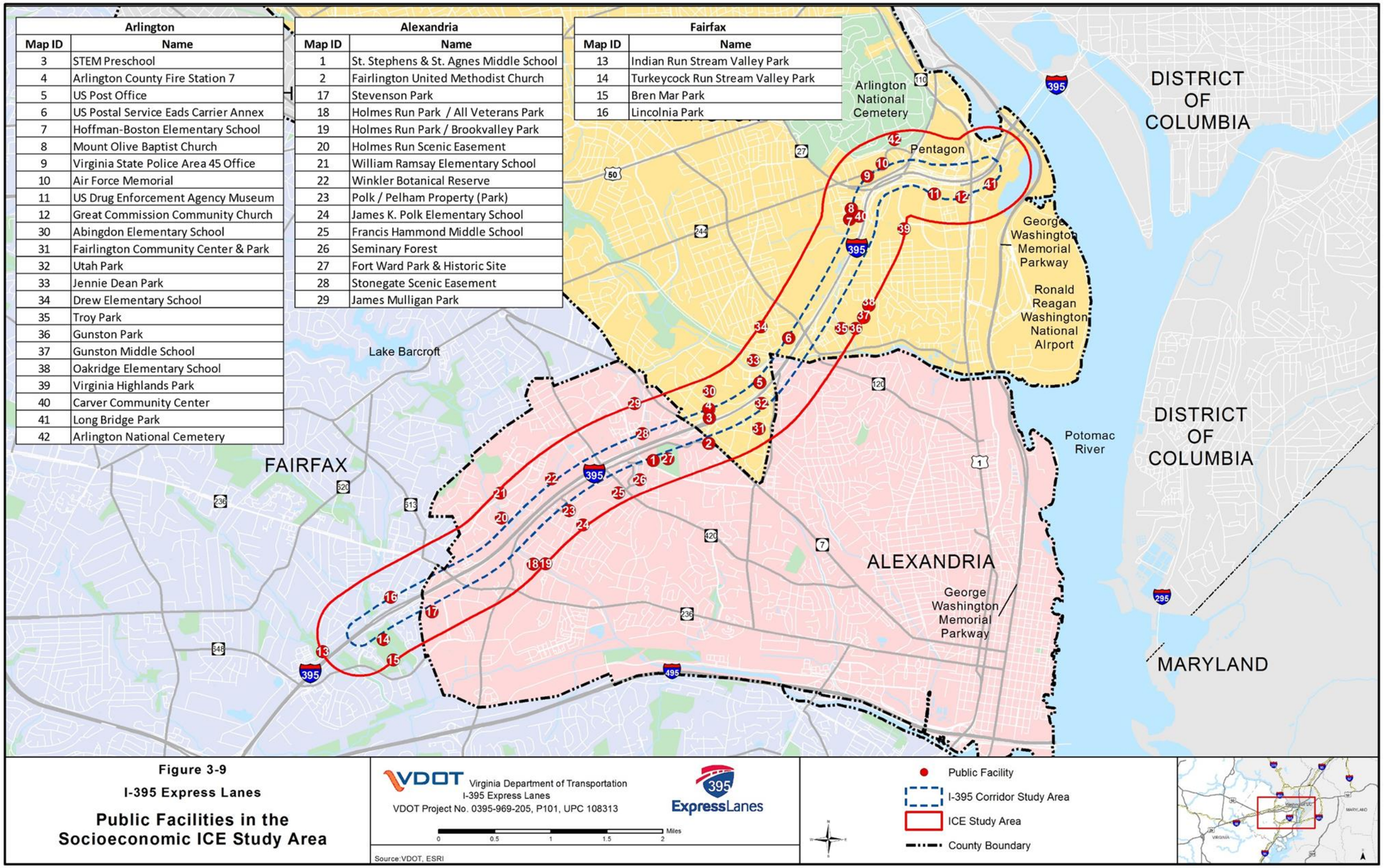
- Fairfax – four parks;
- Alexandria – ten parks, four schools and one church; and,
- Arlington – seven parks, six schools, two post offices, two churches, one police station, one fire station, one community center, one memorial, one museum and one cemetery.

Environmental Justice

Minority Populations

In accordance with the terms of CEQ guidance, *Environmental Justice Guidance under the National Environmental Policy Act* (1997), an area is identified as containing a minority population where either (a) the minority population of the affected area exceeds 50 percent of total population; or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis. The CEQ guidance does not define the specific percentage that should be used for determining if the minority or low-income population is "meaningfully greater" than the average in the surrounding jurisdiction.

Figure 3-9: Public Facilities in the Socioeconomic Resources ICE Study Area



For the purposes of this Technical Report and the associated EA, the minority population for each Census block group was found to be "meaningfully greater" than the surrounding Census block groups if the Census block was greater than the value of the locality with the lowest percentage of minority population (Arlington County with 36.8 percent minority), plus an additional 10 percent of that value (3.7 percent (rounded)). This establishes a "meaningfully greater" threshold of 40.5 percent.

To perform the EJ analysis, Census data were collected on the racial and ethnic composition for each of the local jurisdictions and the 81 Census block groups fully or partially within the Socioeconomic Resources ICE Study Area. Based on the definition of "meaningfully greater" above, 50 out of 81 Census block groups in the Socioeconomic Resources ICE Study Area have a minority population.

Table 3-4 outlines the Socioeconomic Resources ICE Study Area racial and ethnic characteristics by population of each locality in the Socioeconomic Resources ICE Study Area. All Census block groups highlighted in grey in **Table 3-4** are EJ communities in the Socioeconomic Resources ICE Study Area with the areas (based upon the meaningfully greater threshold of 40.5 percent established above) mapped in **Figure 3-10**. Locality and state percentages are depicted as a comparison.

Low-Income Populations

Data from 2010-2014 American Community Survey (ACS) 5-Year Estimates, Median Household Income in the Past 12 Months (in 2014 Inflation-Adjusted Dollars) were used to generate median household income data for each of the localities within the study area. While the 2016 Health and Human Services (HHS) poverty threshold data is available, the 2014 data set is the appropriate data set for a comparison with the Census's median household income data in 2014 inflation-adjusted dollars.

Table 3-5 illustrates income characteristics for the Socioeconomic ICE Study Area Census block groups, as well as the median household income for the localities. The household income within the study area localities is between $77,781 and $102,862, while Virginia's median household income is $64,792.

As highlighted in **Table 3-5** and shown on **Figure 3-10**, two Census block groups (Census tract number 2003.03, block group 02 and Census tract number 1035.02, block group 02) within the Socioeconomic Resources ICE Study Area have a median household income below the threshold of $23,850, as defined in the ***Socioeconomic and Land Use Technical Report*** (VDOT 2016i). Census tract number 2003.03, Census block group 02, with a median household income of $16,222, includes a high rise apartment complex with 302 units, 300 of which are Section 8 assisted living housing. The remaining structures located in the Census block group are not classified as Section 8 housing. Although Census data states that Census tract number 1035.02, block group 02 has a median household income of $23,209, this block group encompasses the Virginia Highlands Park, as well as townhomes and the Claridge House, a senior housing facility, which is classified as Section 8 assisted living housing. Also, while not below the $23,850 threshold, Census tract number 1034.01, block group 01 is much lower than other block groups in the surrounding area; however, this block group is located within the Arlington National Cemetery and likely represents the household income of staff that live on the property.

Figure 3-10: Environmental Justice Populations in the Socioeconomic Resources ICE Study Area

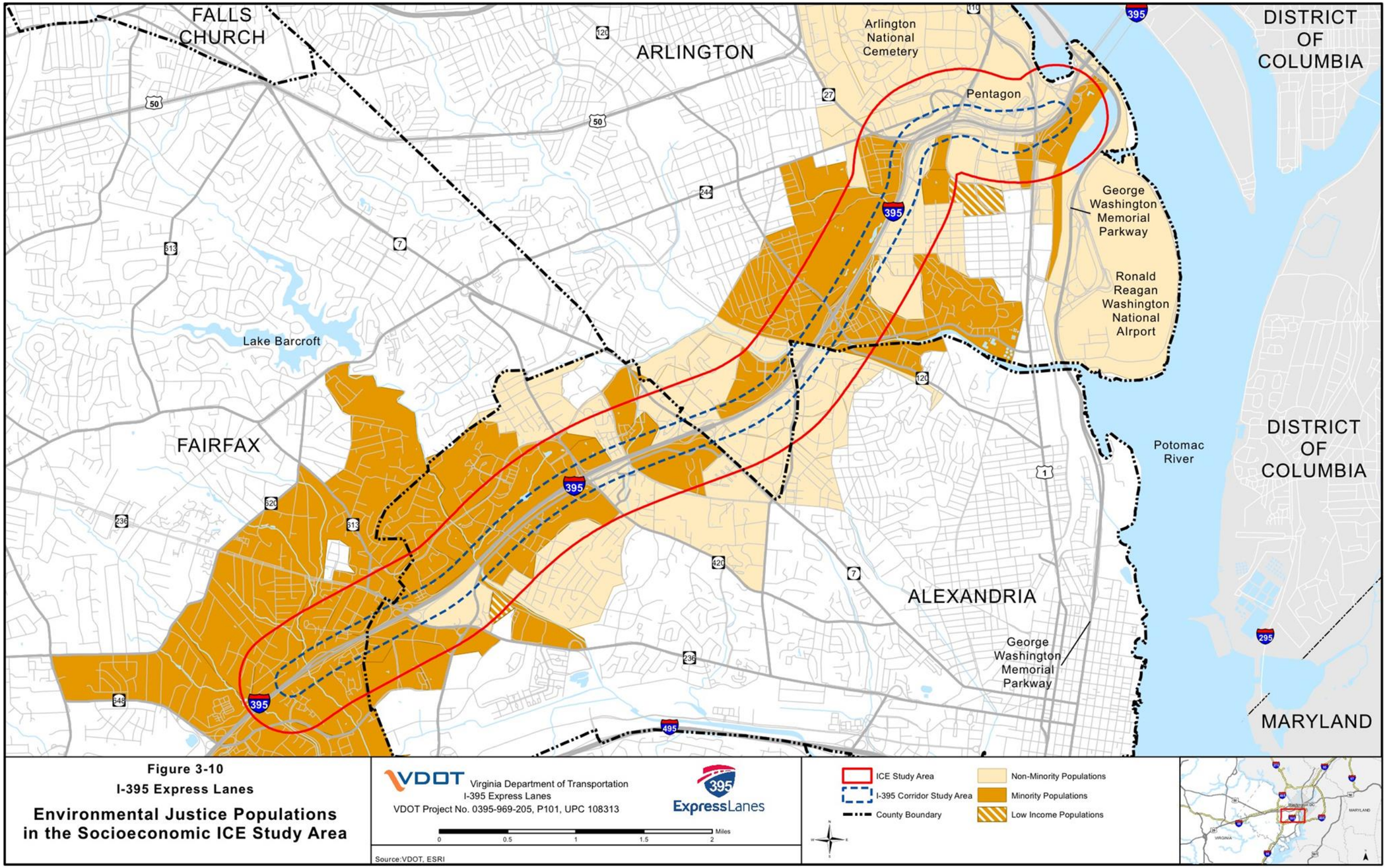


Table 3-4: Study Area Racial and Ethnic Characteristics by Locality

		Total Population	White[1]		Black or African American[1]		American Indian And Alaska Native[1]		Asian[1]		Native Hawaiian And Other Pacific Islander[1]		Some Other Race[1]		Two or More Races[1]		Hispanic or Latino - White[2]		Hispanic or Latino – Other Races[2]		Total Block Group Minority Population[3]	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Fairfax Portion of the Study Area		***17,814***	***8,771***	***49.2%***	***3,415***	***19.2%***	***43***	***0.2%***	***2,841***	***15.9%***	***56***	***0.3%***	***2,104***	***11.8%***	***584***	***3.3%***	***2,540***	***14.3%***	***2,383***	***13.4%***	***11,583***	***65.0%***
Census Tract 4518.00	Block Group 2	1942	1368	70.4%	34	1.8%	0	0.0%	421	21.7%	0	0.0%	0	0.0%	119	6.1%	330	17.0%	59	3.0%	904	46.5%
Census Tract 4519.00	Block Group 1	1147	690	60.2%	244	21.3%	0	0.0%	163	14.2%	0	0.0%	14	1.2%	36	3.1%	157	13.7%	14	1.2%	614	53.5%
Census Tract 4525.01	Block Group 2	2114	1236	58.5%	189	8.9%	0	0.0%	172	8.1%	0	0.0%	446	21.1%	71	3.4%	134	6.3%	477	22.6%	1012	47.9%
	Block Group 3	1222	791	64.7%	22	1.8%	0	0.0%	218	17.8%	35	2.9%	145	11.9%	11	0.9%	330	27.0%	145	11.9%	761	62.3%
Census Tract 4525.02	Block Group 1	714	406	56.9%	32	4.5%	18	2.5%	204	28.6%	0	0%	12	2%	42	5.9%	126	17.6%	44	6.2%	434	60.8%
	Block Group 2	1,801	597	33.1%	729	40.5%	0	0%	370	20.5%	0	0%	59	3%	46	3%	331	18.4%	105	5.8%	1,535	85.2%
	Block Group 3	2,434	764	31.4%	993	40.8%	13	0.5%	396	16.3%	0	0%	268	11%	0	0%	635	26.1%	268	11.0%	2,305	94.7%
Census Tract 4526.00	Block Group 1	3075	1446	47.0%	761	24.7%	0	0.0%	479	15.6%	0	0.0%	201	6.5%	188	6.1%	282	9.2%	263	8.6%	1911	62.1%
	Block Group 2	2,014	998	49.6%	369	18.3%	0	0%	387	19.2%	0	0%	251	12%	9	0.4%	195	9.7%	251	12.5%	1,211	60.1%
	Block Group 3	1351	475	35.2%	42	3.1%	12	0.9%	31	2.3%	21	1.6%	708	52.4%	62	4.6%	20	1.5%	757	56.0%	896	66.3%
Alexandria Portion of the Study Area		***61,929***	***32,413***	***52.3%***	***17,570***	***28.4%***	***85***	***0.1%***	***5,354***	***8.7%***	***24***	***0.04%***	***3,412***	***5.1%***	***3,057***	***4.9%***	***7,690***	***12.4%***	***4,815***	***7.7%***	***37,192***	***60.1%***
Census Tract 2001.02	Block Group 1	770	582	75.6%	100	13.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	88	11.4%	269	34.9%	0	0.0%	457	59.4%
	Block Group 2	2394	1143	47.7%	388	16.2%	20	0.8%	429	17.9%	0	0.0%	339	14.2%	76	3.2%	609	25.4%	426	17.8%	1861	77.7%
	Block Group 3	999	666	66.7%	193	19.3%	0	0.0%	24	2.4%	0	0.0%	0	0.0%	116	11.6%	17	1.7%	0	0.0%	350	35.0%
Census Tract 2001.03	Block Group 1	803	439	54.7%	37	4.6%	0	0.0%	32	4.0%	0	0.0%	295	36.7%	0	0.0%	58	7.2%	295	36.7%	422	52.6%
	Block Group 2	2,493	431	17.3%	1,826	73.2%	0	0%	99	4.0%	0	0%	137	5.5%	0	0%	194	7.8%	229	9.2%	2,256	90.5%
	Block Group 3	2,685	1,125	41.9%	670	25.0%	0	0%	398	14.8%	0	0%	262	9.8%	230	8.6%	523	19.5%	234	8.7%	2,083	77.6%
	Block Group 4	1,773	968	54.6%	662	37.3%	0	0%	139	7.8%	0	0%	0	0%	4	0.2%	490	27.6%	0	0.0%	1,295	73.0%
Census Tract 2001.04	Block Group 1	2,470	1,196	48.4%	695	28.1%	0	0%	356	14.4%	0	0%	70	2.8%	153	6.2%	846	34.3%	66	2.7%	2,120	85.8%
	Block Group 2	1,272	462	36.3%	328	25.8%	0	0%	199	15.6%	0	0%	283	22.2%	0	0%	281	22.1%	272	21.4%	1,091	85.8%
Census Tract 2001.05	Block Group 1	1894	385	20.3%	1187	62.7%	0	0.0%	185	9.8%	0	0.0%	76	4.0%	61	3.2%	14	0.7%	76	4.0%	1523	80.4%
	Block Group 2	2,455	550	22.4%	1,758	71.6%	0	0%	23	0.9%	0	0%	33	1%	91	3.7%	87	3.5%	73	3.0%	1,992	81.1%
Census Tract 2001.06	Block Group 1	233	214	91.8%	19	8.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	19	8.2%
	Block Group 3	2,055	1,352	65.8%	286	13.9%	0	0%	62	3.0%	0	0%	258	12.6%	97	4.7%	54	2.6%	204	9.9%	757	36.8%
Census Tract 2001.07	Block Group 1	2,525	1,892	74.9%	306	12.1%	22	0.9%	230	9.1%	0	0%	14	1%	61	2.4%	306	12.1%	28	1.1%	939	37.2%
	Block Group 2	1405	923	65.7%	226	16.1%	0	0.0%	49	3.5%	0	0.0%	207	14.7%	0	0.0%	176	12.5%	207	14.7%	658	46.8%
	Block Group 3	2,251	1,050	46.6%	548	24.3%	0	0%	553	24.6%	0	0%	33	1%	67	3.0%	46	2.0%	33	1.5%	1,247	55.4%
Census Tract 2002.01	Block Group 1	1,157	692	59.8%	306	26.4%	0	0%	86	7.4%	0	0%	0	0%	73	6.3%	95	8.2%	0	0.0%	560	48.4%
	Block Group 2	1303	1219	93.6%	56	4.3%	0	0.0%	8	0.6%	0	0.0%	12	0.9%	8	0.6%	23	1.8%	12	0.9%	107	8.2%
	Block Group 3	876	626	71.5%	183	20.9%	0	0%	23	2.6%	24	3%	11	1%	9	1.0%	86	9.8%	35	4.0%	336	38.4%
Census Tract 2003.01	Block Group 1	2,343	1,331	56.8%	391	16.7%	0	0%	185	7.9%	0	0%	293	13%	143	6.1%	262	11.2%	309	13.2%	1,274	54.4%
	Block Group 2	932	413	44.3%	386	41.4%	8	1%	102	10.9%	0	0%	0	0%	23	2.5%	32	3.4%	14	1.5%	551	59.1%

		Total Population	White[1]		Black or African American[1]		American Indian And Alaska Native[1]		Asian[1]		Native Hawaiian And Other Pacific Islander[1]		Some Other Race[1]		Two or More Races[1]		Hispanic or Latino - White[2]		Hispanic or Latino – Other Races[2]		Total Block Group Minority Population[3]	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Census Tract 2003.02	Block Group 1	1,816	1,380	76.0%	177	9.7%	0	0%	79	4.4%	0	0%	76	4%	104	5.7%	0	0.0%	76	4.2%	436	24.0%
	Block Group 2	2,274	634	27.9%	1,311	57.7%	0	0%	289	12.7%	0	0%	34	1%	6	0.3%	390	17.2%	128	5.6%	2,030	89.3%
	Block Group 3	891	275	30.9%	211	23.7%	0	0%	181	20.3%	0	0%	153	17.2%	71	8.0%	0	0.0%	180	20.2%	616	69.1%
Census Tract 2003.03	Block Group 1	900	649	72.1%	153	17.0%	8	0.9%	60	6.7%	0	0%	0	0%	30	3.3%	89	9.9%	0	0.0%	340	37.8%
	Block Group 2	684	266	38.9%	249	36.4%	0	0.0%	127	18.6%	0	0.0%	17	2.5%	25	3.7%	0	0.0%	17	2.5%	418	61.1%
	Block Group 4	1,670	830	49.7%	325	19.5%	0	0%	18	1.1%	0	0%	24	1%	473	28.3%	60	3.6%	486	29.1%	900	53.9%
Census Tract 2004.05	Block Group 3	1302	443	34.0%	352	27.0%	0	0.0%	134	10.3%	0	0.0%	26	2.0%	345	26.5%	200	15.4%	293	22.5%	1057	81.2%
Census Tract 2004.06	Block Group 1	1,082	569	52.6%	222	20.5%	0	0%	202	18.7%	0	0%	53	4.9%	36	3.3%	151	14.0%	39	3.6%	664	61.4%
	Block Group 2	2227	286	12.8%	1069	48.0%	27	1.2%	102	4.6%	0	0.0%	596	26.8%	147	6.6%	94	4.2%	717	32.2%	2035	91.4%
	Block Group 3	1842	855	46.4%	787	42.7%	0	0.0%	132	7.2%	0	0.0%	33	1.8%	35	1.9%	117	6.4%	161	8.7%	1104	59.9%
Census Tract 2004.07	Block Group 1	724	114	15.7%	563	77.8%	0	0%	47	6.5%	0	0%	0	0%	0	0%	0	0.0%	0	0.0%	610	84.3%
	Block Group 2	3567	2108	59.1%	829	23.2%	0	0.0%	308	8.6%	0	0.0%	51	1.4%	271	7.6%	305	8.6%	56	1.6%	1764	49.5%
Census Tract 2009.00	Block Group 1	1171	1005	85.8%	44	3.8%	0	0.0%	51	4.4%	0	0.0%	0	0.0%	71	6.1%	0	0.0%	0	0.0%	166	14.2%
Census Tract 2010.00	Block Group 1	1,504	1,248	83.0%	61	4.1%	0	0%	58	3.9%	0	0%	26	2%	111	7.4%	59	3.9%	53	3.5%	315	20.9%
	Block Group 2	1170	1148	98.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	9	0.8%	55	4.7%	13	1.1%	64	5.5%
Census Tract 2011.00	Block Group 1	1042	758	72.7%	71	6.8%	0	0.0%	199	19.1%	0	0.0%	0	0.0%	14	1.3%	73	7.0%	0	0.0%	357	34.3%
Census Tract 2012.03	Block Group 1	2,975	2,186	73.5%	595	20.0%	0	0%	185	6.2%	0	0%	0	0%	9	0%	1,629	54.8%	83	2.8%	2,418	81.3%
Arlington Portion of the Study Area		***43,425***	***29,502***	***67.9%***	***6,928***	***16.0%***	***447***	***1.0%***	***4,108***	***9.5%***	***79***	***0.2%***	***1,223***	***2.8%***	***1,143***	***2.6%***	***3,672***	***8.5%***	***1,603***	***3.7%***	***17,600***	***40.5%***
Census Tract 1025.00	Block Group 1	1,992	1,614	81.0%	260	13.1%	0	0%	86	4.3%	0	0%	0	0%	32	1.6%	127	6.4%	0	0.0%	505	25.4%
Census Tract 1029.01	Block Group 1	931	842	90.4%	11	1.2%	0	0.0%	58	6.2%	0	0.0%	11	1.2%	9	1.0%	27	2.9%	11	1.2%	**116**	12.5%
	Block Group 2	991	791	79.8%	53	5.3%	0	0.0%	135	13.6%	0	0.0%	0	0.0%	12	1.2%	58	5.9%	0	0.0%	**258**	26.0%
	Block Group 3	766	658	85.9%	20	2.6%	12	1.6%	37	4.8%	0	0%	0	0%	39	5.1%	39	5.1%	0	0.0%	147	19.2%
Census Tract 1029.02	Block Group 1	2,454	1,677	68.3%	168	6.8%	250	10%	127	5.2%	53	2.2%	124	5%	55	2.2%	267	10.9%	374	15.2%	1,044	42.5%
	Block Group 2	1874	1590	84.8%	46	2.5%	0	0.0%	62	3.3%	0	0.0%	11	0.6%	165	8.8%	8	0.4%	54	2.9%	**292**	15.6%
Census Tract 1030.00	Block Group 1	1,472	1,279	86.9%	12	0.8%	0	0%	29	2.0%	0	0%	82	6%	70	4.8%	120	8.2%	82	5.6%	313	21.3%
	Block Group 2	752	729	96.9%	0	0%	0	0%	9	1.2%	0	0%	0	0%	14	1.9%	51	6.8%	0	0.0%	74	9.8%
	Block Group 3	1211	1043	86.1%	109	9.0%	0	0.0%	45	3.7%	0	0.0%	0	0.0%	14	1.2%	103	8.5%	0	0.0%	**271**	22.4%
Census Tract 1031.00	Block Group 1	2,826	997	35.3%	1,124	39.8%	19	1%	373	13.2%	16	0.6%	134	4.7%	163	5.8%	157	5.6%	153	5.4%	1,986	70.3%
	Block Group 2	2,460	1,245	50.6%	1,089	44.3%	51	2%	75	3.0%	0	0%	0	0%	0	0%	452	18.4%	51	2.1%	1,667	67.8%
	Block Group 3	1733	610	35.2%	571	32.9%	0	0.0%	15	0.9%	0	0.0%	537	31.0%	0	0.0%	348	20.1%	521	30.1%	**1471**	84.9%
Census Tract 1032.00	Block Group 2	1180	818	69.3%	71	6.0%	0	0.0%	268	22.7%	0	0.0%	0	0.0%	23	1.9%	165	14.0%	0	0.0%	**527**	44.7%
	Block Group 3	1,225	791	64.6%	255	20.8%	56	4.6%	123	10.0%	0	0%	0	0%	0	0%	87	7.1%	0	0.0%	521	42.5%
Census Tract 1033.00	Block Group 1	1,194	230	19.3%	772	64.7%	9	0.8%	148	12.4%	0	0%	5	0.4%	30	2.5%	23	1.9%	5	0.4%	987	82.7%
	Block Group 2	1304	884	67.8%	314	24.1%	0	0.0%	53	4.1%	0	0.0%	0	0.0%	53	4.1%	93	7.1%	6	0.5%	**513**	39.3%

		Total Population	White[1]		Black or African American[1]		American Indian And Alaska Native[1]		Asian[1]		Native Hawaiian And Other Pacific Islander[1]		Some Other Race[1]		Two or More Races[1]		Hispanic or Latino - White[2]		Hispanic or Latino – Other Races[2]		Total Block Group Minority Population[3]	
			Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Census Tract 1034.01	Block Group 1	1027	759	73.9%	98	9.5%	11	1.1%	61	5.9%	0	0.0%	0	0.0%	98	9.5%	133	13.0%	12	1.2%	**401**	39.0%
Census Tract 1034.02	Block Group 1	925	639	69.1%	0	0.0%	0	0.0%	214	23.1%	0	0.0%	0	0.0%	72	7.8%	39	4.2%	0	0.0%	**325**	35.1%
	Block Group 5	1,110	642	57.8%	171	15.4%	0	0%	235	21.2%	10	0.9%	0	0%	52	4.7%	12	1.1%	12	1.1%	480	43.2%
Census Tract 1035.01	Block Group 1	1,004	807	80.4%	53	5.3%	0	0%	131	13.0%	0	0%	0	0%	13	1.3%	26	2.6%	0	0.0%	223	22.2%
	Block Group 2	1,127	736	65.3%	44	3.9%	0	0%	247	21.9%	0	0%	87	8%	13	1.2%	102	9.1%	87	7.7%	493	43.7%
	Block Group 3	909	528	58.1%	11	1.2%	0	0.0%	370	40.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	**381**	41.9%
Census Tract 1035.02	Block Group 1	2,349	1,719	73.2%	253	10.8%	16	0.7%	286	12.2%	0	0%	0	0%	75	3.2%	275	11.7%	0	0.0%	905	38.5%
	Block Group 2	1054	606	57.5%	248	23.5%	0	0.0%	142	13.5%	0	0.0%	58	5.5%	0	0.0%	90	8.5%	34	3.2%	**538**	51.0%
Census Tract 1035.03	Block Group 1	1,672	1,078	64.5%	257	15.4%	0	0%	296	17.7%	0	0%	15	1%	26	1.6%	138	8.3%	15	0.9%	732	43.8%
Census Tract 1036.01	Block Group 1	904	840	92.9%	0	0.0%	0	0.0%	40	4.4%	0	0.0%	15	1.7%	9	1.0%	69	7.6%	0	0.0%	**133**	14.7%
Census Tract 1037.00	Block Group 1	959	900	93.8%	0	0%	0	0%	53	5.5%	0	0%	6	0.6%	0	0%	23	2.4%	0	0.0%	82	8.6%
	Block Group 2	1440	1329	92.3%	30	2.1%	5	0.3%	27	1.9%	0	0.0%	26	1.8%	28	1.9%	211	14.7%	25	1.7%	**327**	22.7%
Census Tract 1038.00	Block Group 1	2,822	1,678	59.5%	733	26.0%	18	0.6%	332	11.8%	0	0%	0	0%	61	2.2%	124	4.4%	0	0.0%	1,268	44.9%
	Block Group 2	778	499	64.1%	135	17.4%	0	0.0%	15	1.9%	0	0.0%	112	14.4%	17	2.2%	157	20.2%	161	20.7%	**436**	56.0%
	Block Group 3	963	927	96.3%	20	2.1%	0	0%	16	1.7%	0	0%	0	0%	0	0.0%	148	15.4%	0	0.0%	184	19.1%
Census Tract 9801.00	Block Group 1	14	14	100.0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0.0%	0	0.0%	0	0.0%
Census Tract 9802.00	Block Group 1	3	3	100.0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0.0%	0	0.0%	0	0.0%
Study Area Total		***123,168***	***70,686***	***57.4%***	***27,913***	***22.7%***	***575***	***0.5%***	***12,303***	***10.0%***	***159***	***0.1%***	***6,739***	***5.5%***	***4,784***	***3.9%***	***13,902***	***11.3%***	***8,801***	***7.1%***	***66,375***	***53.9%***

1 Regardless of Hispanic/Latino designation

2 The U.S. Census Bureau defines Hispanic or Latino as a person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race. Because Hispanic or Latino may be any race, data may overlap for other race categories and percentages were not calculated.

3. Total minority population is the sum of all non-White races plus Hispanic or Latino – White; block groups with percentages of minority and/or Hispanic/Latino greater than the 40.5 percent threshold are highlighted in yellow.

Source: U.S. Census Bureau, ACS 2010-2014 5-Year Estimates, Hispanic or Latino by Race, B03002.

Table 3-5: Median Household Income by Census Block Group for the Socioeconomic ICE Study Area

Locality		Median Household Income
Fairfax		**$93,912**
Census Tract 4518	Block Group 2	$121,607
Census Tract 4519	Block Group 1	$92,891
Census Tract 4525.01	Block Group 2	$105,787
	Block Group 3	$101,953
Census Tract 4525.02	Block Group 1	$146,208
	Block Group 2	$42,188
	Block Group 3	$38,412
Census Tract 4526.00	Block Group 1	$87,763
	Block Group 2	$120,300
	Block Group 3	$82,008
Alexandria		**$77,781**
Census Tract 2001.02	Block Group 1	$44,632
	Block Group 2	$53,097
	Block Group 3	$136,667
Census Tract 2001.03	Block Group 1	$178,036
	Block Group 2	$49,708
	Block Group 3	$42,581
	Block Group 4	$46,691
Census Tract 2001.04	Block Group 1	$60,769
	Block Group 2	$59,464
Census Tract 2001.05	Block Group 1	$52,674
	Block Group 2	$40,867
Census Tract 2001.06	Block Group 1	$63,650
	Block Group 3	$99,750
Census Tract 2001.07	Block Group 1	$98,685
	Block Group 2	$66,119
	Block Group 3	$81,250
Census Tract 2002.01	Block Group 1	$68,482
	Block Group 2	$119,861
	Block Group 3	$71,713
Census Tract 2003.01	Block Group 1	$108,750
	Block Group 2	$77,500
Census Tract 2003.02	Block Group 1	$148,542
	Block Group 2	$90,883
	Block Group 3	$65,625
Census Tract 2003.03	Block Group 1	$75,508
	Block Group 2	$16,222
	Block Group 4	$74,904

Locality		Median Household Income
Census Tract 2004.05	Block Group 3	$46,912
Census Tract 2004.06	Block Group 1	$72,579
	Block Group 2	$57,025
	Block Group 3	$82,750
Census Tract 2004.07	Block Group 1	$68,750
	Block Group 2	$77,253
Census Tract 2009	Block Group 1	$141,591
Census Tract 2010.00	Block Group 1	$88,750
	Block Group 2	$83,906
Census Tract 2011	Block Group 1	$97,222
Census Tract 2012.03	Block Group 1	$46,318
Arlington		**$102,862**
Census Tract 1025.00	Block Group 1	$89,750
Census Tract 1029.01	Block Group 1	$116,141
	Block Group 2	$99,531
	Block Group 3	$112,361
Census Tract 1029.02	Block Group 1	$66,667
	Block Group 2	$113,125
Census Tract 1030.00	Block Group 1	$133,958
	Block Group 2	$128,750
	Block Group 3	$133,077
Census Tract 1031.00	Block Group 1	$101,471
	Block Group 2	$67,679
	Block Group 3	$101,359
Census Tract 1032.00	Block Group 2	$66,016
	Block Group 3	$102,129
Census Tract 1033.00	Block Group 1	$82,344
	Block Group 2	$91,903
Census Tract 1034.01	Block Group 1	$25,375
Census Tract 1034.02	Block Group 1	$118,462
	Block Group 5	$122,222
Census Tract 1035.01	Block Group 1	$100,885
	Block Group 2	$81,923
	Block Group 3	$76,680
Census Tract 1035.02	Block Group 1	$134,236
	Block Group 2	$23,209
Census Tract 1035.03	Block Group 1	$94,750
Census Tract 1036.01	Block Group 1	$214,125
Census Tract 1037.00	Block Group 1	$218,333
	Block Group 2	$178,750
Census Tract 1038.00	Block Group 1	$91,346

Locality		Median Household Income
	Block Group 2	$65,583
	Block Group 3	$102,159
Census Tract 9801.00	Block Group 1	Not Available
Census Tract 9802.00	Block Group 1	Not Available
Virginia		**$64,792**

Source: 2010-2014 ACS 5-Year Estimates, Median Household Income in the Past 12 Months (in 2014 Inflation-Adjusted Dollars)

Poverty

Following the Office of Management and Budget's (OMB) Directive 14, the Census uses a set of monetary income thresholds that vary by family size and composition to detect poverty. If a family's total income is less than the family's threshold, then that family and every individual in the family, is considered poor. The poverty thresholds do not vary geographically but are updated annually for inflation. The Census determines persons below the poverty level by:

- The income of the householder;
- The age of the householder;
- The number of related individuals within the household (unrelated members such as roommates are excluded); and,
- The number of children within the household.

Poverty guidelines are issued annually in the Federal Register and are a "simplified version of the poverty thresholds that the Census uses to prepare the estimates of the number of the individuals and families in poverty." **Table 3-6** describes the poverty characteristics of the Census block groups within the Socioeconomic Resources ICE Study Area.

Table 3-6: Poverty Characteristics for the Census Block Groups within the Socioeconomic Resources ICE Study Area

Locality	Persons for Whom Poverty Level is Determined[1]	People Below Poverty Level	Percent of People Below Poverty Level
Fairfax Portion of the Study Area	17,727	2,330	13%
Alexandria Portion of the Study Area	49,719	6,563	13%
Arlington Portion of the Study Area	54,074	3,897	7%
Socioeconomic Resources ICE Study Area Total	121,521	12,790	11%
Virginia	7,939,332	914,237	12%

Source: U.S. Census Bureau, ACS 2010-2014 5-Year Estimate, Poverty Status of Individuals in the Past 12 Months by Living Arrangement, B17021

1U.S. Census poverty status is determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old

As outlined in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2016i), all of the localities have less than nine percent of people below poverty level for each entire locality. As shown in **Table 3-6**, the block groups within the Socioeconomic Resources ICE Study Area, Fairfax and Alexandria have the highest percentage of people below poverty level with 13 percent, while Arlington is seven percent. The Socioeconomic Resources ICE Study Area average is 11 percent, while the Virginia is higher at 12 percent.

3.3.2 Natural Resources

Waters, Wetlands, and Water Quality

The Natural Resources ICE Study Area contains a large number of named and unnamed perennial and intermittent streams (refer to **Figure 3-2**). Four named perennial streams pass beneath I-395 along the project length; Four Mile Run, Turkeycock Run, Holmes Run, and Long Branch. Of these, Four Mile Run and Turkeycock Run are two of the longest and most prominent stream corridors in the Natural Resources ICE Study Area. All of the streams in the Study Area ultimately flow to the Potomac River.

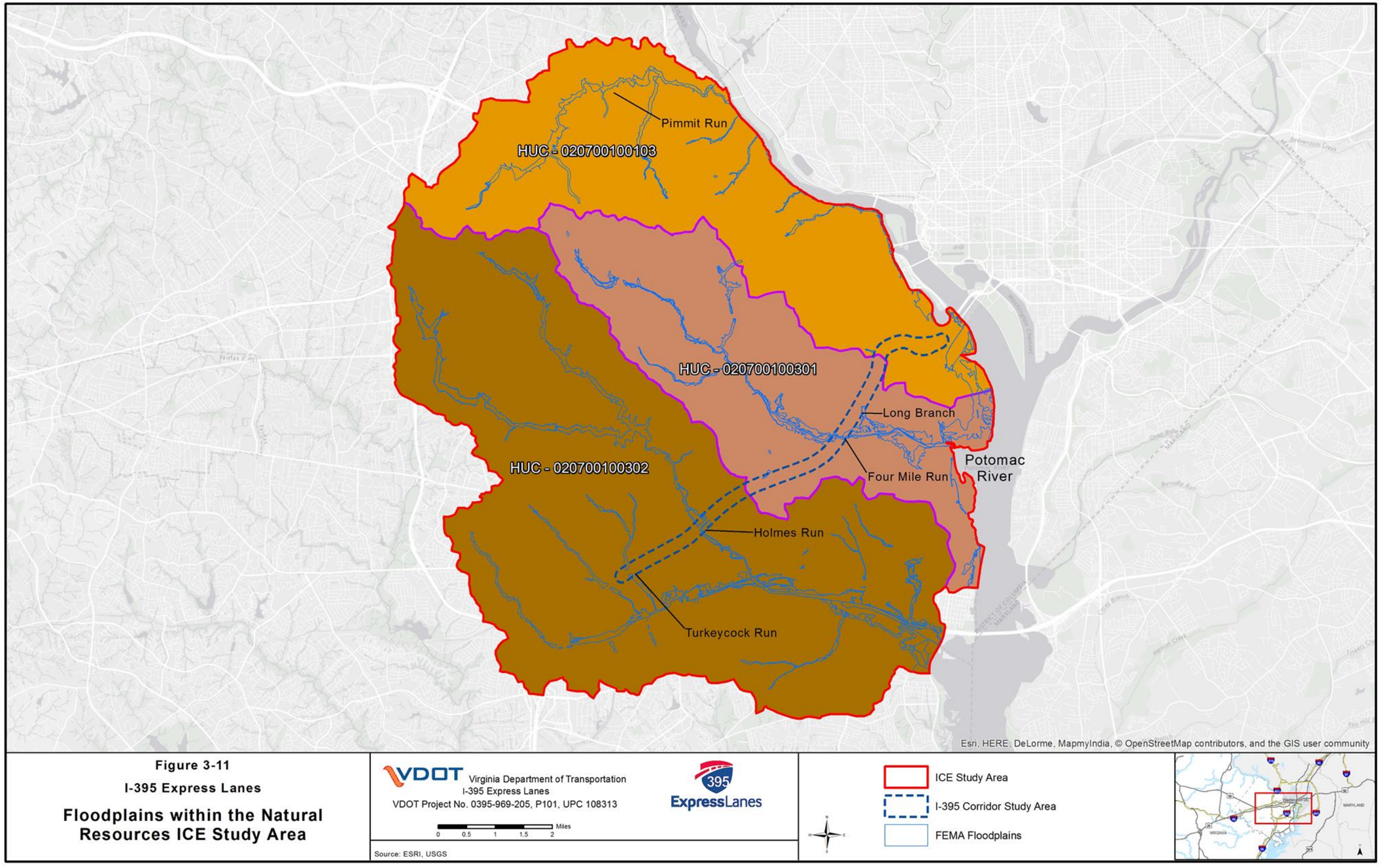
The National Wetlands Inventory (NWI) approximates 17,611 acres of wetlands are in the Natural Resources ICE Study Area; and of these, approximately 409 acres (approximately two percent) are palustrine vegetated wetlands (emergent, scrub-shrub, and forested) and 17,202 acres (approximately 98 percent) are classified as open water (including freshwater ponds, lakes, and riverine open waters). These wetlands and waters are interspersed within the industrial, commercial, and residential areas, and are frequently remnants of larger ecosystems within the floodplains. Often, the wetlands and other aquatic sites directly abut the impervious and semi-impervious developed surfaces within the floodplain with little or no buffer.

Many surface waters in the Natural Resources ICE Study Area fail to meet state water quality standards and are designated as "impaired waters" under Section 303(d) of the Clean Water Act. According to the Final 2014 VDEQ 305(b)/303(d) Integrated Report (VDEQ, VDCR, and VDH, 2014), there are approximately 74 miles of streams located within the Natural Resources ICE Study Area. Of those, approximately 43.95 miles are listed as impaired. The most common cause of impairment is fecal coliform (11 of 12 impaired stream segments are impaired in part due to fecal coliform). Other causes of impairment of these streams and surface waters include macrobenthic bioassessments (three segments), Polychlorinated Biphenyl (PCB) in fish tissue (3 segments), Chlordane (one segment) and Heptachlor Epoxide (1 segment). The major suspected sources of the impairments include nonpoint sources, municipal/industrial point source discharges, and unknown sources (VDEQ, VDCR, and VDH, 2014).

Floodplains

The Federal Emergency Management Agency (FEMA)-regulated floodways within the Natural Resources ICE Study Area occur along Four Mile Run, Backlick Run, Cameron Run, Turkeycock Run, Holmes Run, Pimmit Run, Indian Run, Windy Run, Tripps Run, Donaldson Run, Hooff Run, Spout Run, Little Pimmit Run, Long Branch, and Gulf Branch. These floodways experienced a relatively high level of development encroachment historically, but are now generally well-protected (Zell, 2011). An estimated 3,461 acres of 100-year floodplains and 1,430 acres of 500-year floodplains exist within the Natural Resources ICE Study Area (refer to **Figure 3-11**).

Figure 3-11: Floodplains within the Natural Resources ICE Study Area



Wildlife Habitat

The Natural Resources ICE Study Area contains a number of different kinds of land cover including, but not limited to, developed land, parks and open space, forest lands, agricultural lands, scrub/shrub and grasslands, and wetlands (see **Figure 3-12**). The composition of land cover directly affects the natural communities, wildlife, and biodiversity found within a given environment. **Table 3-7** show the acreage and percentage of each land cover within the Natural Resources ICE Study Area.

The wildlife in the study area primarily consists of species that are adapted to urban environments; however, some of the major riparian corridors contain forested habitat that supports fauna more typically found in less disturbed floodplain forests, including neotropical migrant birds. These riparian corridors with native vegetation can serve as wildlife corridors, linking wildlife habitats that might otherwise be separated by human development (NWF, 2016).

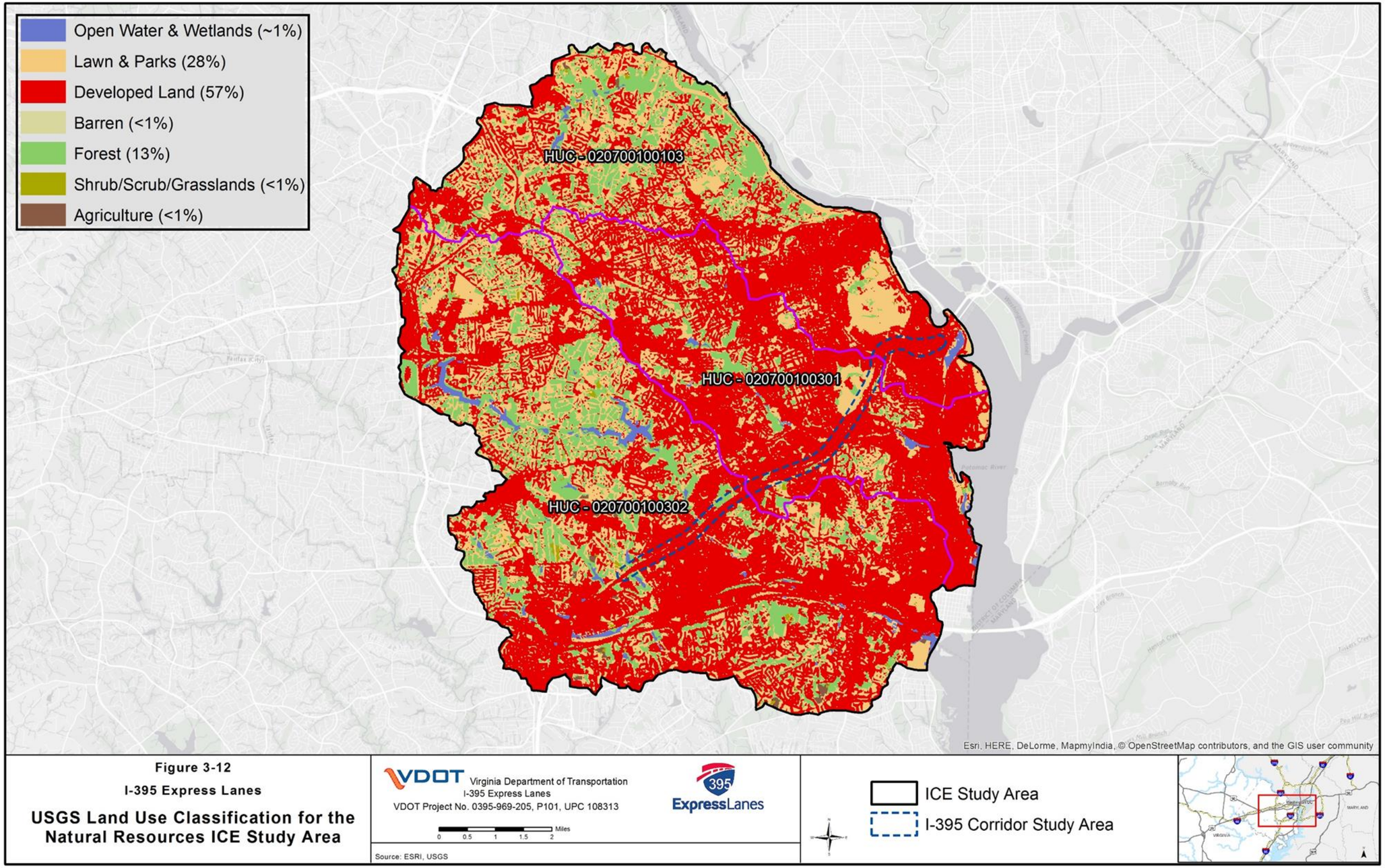
The study area includes three urban wildlife corridors associated with the riparian habitat along Turkeycock Run, Holmes Run, and Four Mile Run. These corridors are intersected by numerous secondary roads, which fragment the corridor, but do not prevent the continued use of the corridors. Urban wildlife species using these wildlife corridors currently can pass beneath I-395 through the existing culverts or bridges. None of these wildlife corridors would be modified by the project. In addition, the project would not add impediments to their utilization by wildlife. Noise barriers may be placed adjacent to the road and wildlife corridors, but would not impede wildlife movement any more than the existing highway and culverts.

Table 3-7: Land Cover within the Natural Resources ICE Study Area

Land Cover	Acres within Natural Resources ICE Study Area	Percent of Natural Resources ICE Study Area
Developed	32,276	57%
Lawn/Parkland/Recreation Areas	15,985	28%
Barren Land	7	<1%
Forest	7,596	13%
Agriculture	112	<1%
Shrub/Scrub/Grasslands	141	<1%
Wetlands (including open water)	755	~1%

Source: NLCD, 2011

Figure 3-12: Land Use Classifications for the Natural Resources ICE Study Area



The Arlington County Department of Parks, Recreation, and Cultural Resources has developed a Natural Heritage Resource Inventory of the Wildlife of Arlington County (Zell, 2011) which extensively documents the historic and current wildlife and wildlife habitat found within the area.

Common mammal species include the following:

- white-tailed deer (*Odocoileus virginianus*)
- red fox (*Vulpes vulpes*)
- gray fox (*Urocyon cinereoargenteus*)
- raccoon (*Procyon lotor*)
- Virginia opossum (*Didelphis virginiana*)
- striped skunk (*Mephitis mephitis*)
- woodchuck (*Marmota monax*)
- gray squirrel (*Sciurus carolinensis*)
- eastern chipmunk (*Tamias striatus*)
- northern white-footed mouse (*Peromyscus leucopus*)
- eastern cottontail rabbit (*Sylvilagus floridanus*)

A number of bat species also likely use these forested areas along the stream courses for summer roosting and foraging habitat.

Common reptiles and amphibians include the following:

- eastern rat snake (*Elaphe obsolete*)
- northern watersnake (*Nerodia sipedon*)
- northern brown snake (*Storeria dekayi*)
- eastern garter snake (*Thamnophis sirtalis*)
- snapping turtle (*Chelydra serpentina*)
- eastern painted turtle (*Chrysemys picta*)
- eastern box turtle (*Terrapene carolina*)
- northern dusky salamander (*Desmognathus fuscus*)
- northern green frog (*Lithobates clamitans*)
- American bullfrog (*Lithobates catesbeianus*).

Common bird species include the following:

- mallard (*Anas platyrhynchos*)
- great blue heron (*Ardea herodias*)
- black vulture (*Coragyps atratus*)
- turkey vulture (*Cathartes aura*)
- osprey (*Pandion haliaetus*)
- Cooper's hawk (*Accipiter cooperii*)
- sharp-shinned hawk (*Accipiter striatus*)
- ring-billed gull (*Larus delawarensis*)
- rock pigeon (*Columba livia*)
- mourning dove (*Zenaida macroura*)
- chimney swift (*Chaetura pelagica*)
- red-bellied woodpecker (*Melanerpes carolinus*)
- downy woodpecker (*Picoides pubescens*)
- hairy woodpecker (*Picoides villosus*)
- pileated woodpecker (*Dryocopus pileatus*)
- eastern phoebe (*Sayornis phoebe*)
- great-crested flycatcher (*Myiarchus crinitus*)
- red-eyed vireo (*Vireo olivaceous*)
- bluejay (*Cyanocitta cristata*)
- American crow (*Corvus brachyrhynchos*)
- fish crow (*Corvus ossifragus*)
- Carolina chickadee (*Parus carolinensis*)
- tufted titmouse (*Parus bicolor*)
- white-breasted nuthatch (*Sitta carolinensis*)
- brown creeper (*Certhia Americana*)
- Carolina wren (*Thryothorus ludovicianus*)
- house wren (*Troglodytes aedon*)
- winter wren (*Troglodytes troglodytes*)
- golden-crowned kinglet (*Regulus satrapa*)
- American robin (*Turdus migratorius*)
- gray catbird (*Dumetella carolinensis*)
- northern mockingbird (*Mimus polyglottos*)
- European starling (*Sturnus vulgaris*)
- yellow-rumped warbler (*Dendroica coronata*)
- black and white warbler (*Mniotilta varia*)
- American redstart (*Setophaga ruticilla*)
- eastern towhee (*Pipilo erythrophthalmus*)
- chipping sparrow (*Spizella passerina*)
- song sparrow (*Melospiza melodia*)
- white-throated sparrow (*Zonotrichia albicollis*)
- dark-eyed junco (*Junco hyemalis*)
- northern cardinal (*Cardinalis cardinalis*)
- red-winged blackbird (*Agelaius phoeniceus*)

- common grackle (*Quiscalus quiscula*)
- brown-headed cowbird (*Molothrus ater*)
- house finch (*Carpodacus mexicanus*)
- American goldfinch (*Carduelis tristis*)
- house sparrow (*Passer domesticus*)

Threatened, Endangered, and Special Status Species

U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC), the Virginia Department of Game and Inland Fisheries (VDGIF) Fish and Wildlife Information Service (FWIS), and the Virginia Department of Conservation and Recreation Division of Natural Heritage (VDCR-DNH) databases were queried to identify any documented threatened, endangered, or special status species within the Natural Resources ICE Study Area, as well as those species that have potential habitat in the Natural Resources ICE Study Area. Identified species are listed in **Table 3-8**. One stream in the Natural Resources ICE Study Area, Pimmit Run, has been designated as a Threatened and Endangered Waters for the wood turtle, and another stream, Four Mile Run, has been designated as an Anadromous Fish Use Stream due to documented use by the blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*).

Table 3-8: Listed Species within the Natural Resources ICE Study Area

Common Name	Scientific Name	Status
Brook Floater	*Alasmidonta varicosa*	SE
Dwarf Wedgemussel	*Alasmidonta heterodon*	FE, SE
Little Brown Bat	*Myotis lucifugus*	SE
Northern Long-Eared Bat	*Myotis septentrionalis*	FT, ST
Tri-Colored Bat	*Perimyotis subflavus*	SE
Wood Turtle	*Glyptemis insculpta*	ST
Peregrine Falcon	*Falco peregrinus*	ST
Loggerhead Shrike	*Lanius ludovicius*	ST
Henslow's Sparrow	*Ammodramus henslowii*	ST
Bald Eagle	*Haliaeetus leucocephalus*	Protected

Source: USFWS IPaC, VDGIF-FWIS, and VDCR-DNH
FE = federally endangered, FT= federally threatened, SE = state endangered, ST = state threatened

Following is a description of each of the identified federal threatened, endangered, and special status species potentially located within the Natural Resources ICE Study Area.

Brook Floater

The brook floater is a northeastern North American species historically found from Nova Scotia to South Carolina in the Atlantic drainages, with an isolated record in Greenbrier River of West Virginia, part of the Ohio drainage (NatureServe, 2015). Present distribution is spotty, including the Potomac drainage in Virginia, small populations in North and South Carolina, several populations farther north in New York (Neversink River), Maine, Massachusetts, Connecticut, and New Hampshire.

The brook floater is typically found buried in the substrate in shallow riffle and shoal areas in creeks and small rivers with clean, fast-flowing water. The brook floater prefers relatively firm rubble, gravel, and sand substrates swept free from siltation. The species occurs in running water and although typically found in riffles and moderate rapids with sandy shoals or riffles with gravel bottoms, the species can also be found

in a range of flow conditions (usually not in very slow flow conditions). No consistent substrate preference has been documented, but the species is thought to prefer stable habitats such as coarse sand and gravel. The species is more common in small to mid-sized streams or creeks than in large rivers and is more common in upper portions of large watersheds with intact upland forest but is absent from headwater streams. This species has been documented from Fairfax County, but is not known to occur in any of the streams that cross the project alignment.

Dwarf Wedgemussel

The dwarf wedgemussel is discontinuously distributed in the Atlantic coast drainages from Maine to North Carolina (NatureServe, 2015). Historically known from approximately 70 sites in streams, the species is now known from 25-30 streams and rivers (Strayer et al., 1996). Throughout the species range, especially the north Atlantic Slope, populations have declined to only a few viable occurrences in each of the remaining states where the species is extant. The dwarf wedgemussel is a small bivalve, rarely exceeding 45 mm in length. Clean young shells are usually greenish-brown with green rays. As the animal ages, the shell color becomes obscured by diatoms or mineral deposits and appears black or brown. Maximum age for the dwarf wedgemussel is around twelve years. The tessellated darter (*Etheostoma olmstedi*), johnny darter (*Etheostoma nigrum*), and mottled sculpin (*Cottus bairdi*) have been identified as hosts for the dwarf wedgemussel.

The dwarf wedgemussel appears to be a generalist in terms of the preference for stream size, substrate and flow conditions – this species inhabits small streams less than five meters wide to large rivers more than 100 meters wide; is found in a variety of substrate types including clay, sand, gravel and pebble, and sometimes in silt depositional areas near banks; and usually inhabits hydrologically stable areas, including very shallow water along streambanks and under root mats, but this mussel has also been found at depths of 25 feet in the Connecticut River. Dwarf wedgemussels are often patchily distributed in rivers. During scoping, VDCR-DNH provided comments suggesting that potential habitat for this species may exist within Holmes Run; however, the dwarf wedgemussel has not been documented in any of the localities crossed by the project.

Little Brown Bat

The little brown bat occupies a wide range in North America from the Alaska-Canada boreal forest south through most of the contiguous United States, though the species is generally absent from the southern Great Plains region (NatureServe, 2015). The core of the range, based on historical abundance, appears to be the northeastern United States and boreal Canada, with smaller populations in the southern and western United States.

The little brown bat uses a wide range of habitats and often uses human-made structures, caves, and hollow trees for resting sites. Foraging habitat for the little brown bat is over water, along the margins of lakes and streams, or in woodlands near water. Winter hibernation sites (caves, tunnels, abandoned mines, and similar sites) generally have a relatively stable temperature of about 2 degrees to 12 degrees Celsius. Maternity colonies commonly are located in warm buildings (e.g., attics) and other structures; also infrequently in hollow trees. Microclimate conditions suitable for raising young are relatively narrow, and availability of suitable maternity sites may limit the species' abundance and distribution. Most summer colonies range from 50 to 2,500 individuals (average 400). This species has been recorded in all three localities crossed by I-395.

Northern Long-eared Bat

The northern long-eared bat is widely but patchily distributed in the eastern and northcentral United States and adjacent southern Canada, and southward to southern Texas, Louisiana, Alabama, Georgia, and Florida, and westward in the United States generally to the eastern margin of the Great Plains region (NatureServe, 2015). The overall summer and winter ranges are essentially the same.

The northern long-eared bat is generally associated with old-growth forests composed of trees 100 years old or older. The species relies on intact interior forest habitat, with low edge-to-interior ratios. Relevant late-successional forest features include a high percentage of old trees, uneven forest structure (resulting in multilayered vertical structure), single and multiple tree-fall gaps, standing snags, and woody debris. Late successional forest characteristics may be favored for several reasons, including the large number of partially dead or decaying trees that the species uses for breeding, summer day roosting, and foraging. Small, highly fragmented, or young forests that provide limited areas of subcanopy foraging habitat may not be suitable. Young forests may also lack appropriate nursery sites. Foraging occurs within forests, along forest edges, over forest clearings, and occasionally over ponds. Hibernation occurs primarily in caves, mines, and tunnels, typically those with large passages and entrances, relatively constant and cool temperatures, high humidity, and no air currents. Hibernators frequently roost in crevices, drill holes, and similar sites where the bats may be overlooked during surveys, but roosting in the open is not uncommon. Rarely are there more than 100 individuals per hibernation colony. Individuals usually roost solitarily. In summer, the northern long-eared bat is generally colonial, but reproductive females and juveniles often roost alone.

This species has experienced severe recent declines in abundance associated with rapidly spreading white-nose syndrome in eastern North America, and the disease is expected to spread across the species' range; threats from wind-energy development, winter and summer habitat modification, destruction and disturbance of habitat (e.g., vandalism to hibernacula, roost tree removal), climate change, and contaminants may be substantial for White Nose Syndrome (WNS)-reduced populations. This species has been recorded in all three localities crossed by I-395.

Tri-colored Bat

The tri-colored bat ranges throughout eastern United States and Canada (NatureServe, 2015). The tri-colored bat is associated with forested landscapes, where the species forages near trees (including forest perimeters) and along waterways. In many areas, most foraging occurs in riparian areas. Maternity and other summer roosts are mainly in dead or live tree foliage (including attached lichen clumps such as *Usnea* and "Spanish moss"); caves, mines, and rock crevices may be used as night roosts between foraging forays. Maternity colonies also utilize human-made structures (buildings, bridges), or tree cavities; sometimes the maternity colonies are in open sites that would not be tolerated by most other bats. Reproductive females roost alone or in groups of up to about 50 individuals. Hibernation sites often are in caves, mines, or cavelike tunnels, as well as box culverts under highways, especially those near forest. Hibernating individuals perch singly, infrequently in small groups. This species has been recorded in all three localities crossed by I-395.

Wood Turtle

The wood turtle occurs in eastern North America, from Cape Breton Island, Nova Scotia, New Brunswick, and Quebec south to northern Virginia and Eastern Panhandle of West Virginia (NatureServe, 2015).

Wood turtles live along permanent streams during much of the year but in summer may roam widely over land and can be found in a variety of terrestrial habitats adjacent to streams, including deciduous woods, cultivated fields, woodland bogs, and marshy pastures. Use of woodland bogs and marshy fields is most common in the northern part of the range. Wood turtles are often associated with the margins of woods to balance thermoregulatory and feeding needs.

Wood turtles are usually found where openings in the streamside canopy allow growth of herbaceous plants. These openings provide both food and basking sites. As with other turtles, nesting wood turtles require loose substrate on fully exposed (unshaded) sites, such as sandy banks or sand-gravel bars in streams. When natural openings are unavailable, the wood turtle may use man-made disturbances including road grades, railroad grades, sand pits, or plowed fields. The man-made disturbed areas are a substantial source of adult mortality. Overwintering occurs in bottoms or banks of streams where water flows all winter, including pools underneath a layer of ice; underwater muskrat burrows, beaver lodges, or over-bank root systems also may be used as winter hibernation sites. The wood turtle has been found only in Pimmits Run within the Natural Resources ICE Study Area.

Peregrine Falcon

The peregrine falcon breeds on every continent except Antarctica. In North America, much recovery of populations has occurred (NatureServe, 2015). The peregrine falcon prefers various open habitats from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centers. When not breeding, the species occurs in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports.

Peregrines often nest on a ledge or hole on the face of rocky cliff or crag. River banks, tundra mounds, open bogs, large stick nests of other species, tree hollows, and man-made structures (e.g., ledges of city buildings) are used locally. Man-made sites, including tall buildings, bridges, rock quarries, and raised platforms, are frequently the nest sites of choice in Virginia. The peregrine falcon is an uncommon visitor to the Natural Resources ICE Study Area, and has only been documented as a migrant.

Loggerhead Shrike

The loggerhead shrike is widely distributed in suitable habitat throughout the United States and Canada, but is not common anywhere (NatureServe, 2015). This species has undergone a large and statistically significant decrease over the last 40 years in North America. Habitat loss is often cited as one of the most important causes of the decline.

Loggerhead shrikes breed in open country with scattered trees and shrubs, savanna, and, occasionally, open woodland; and often perches on poles, wires, or fence posts. Suitable hunting perches are an important part of the habitat requirements. In Virginia, loggerhead shrikes nest in shrubs or small trees surrounded by shortgrass pasture areas.

Loggerhead shrikes feed primarily on large insects, small birds, lizards, frogs, and rodents; although the bird sometimes scavenges. The diet varies with season and location. Prey is usually captured via a short flight from a perch. Habitat for this species is largely limited in the Natural Resources ICE Study Area.

Henslow's Sparrow

Henslow's sparrows breed in the north central United States and parts of north central Canada. In winter, the sparrows migrate south and overwinter from South Carolina down to the Gulf Coast states (NatureServe, 2015). The Henslow's sparrow breeds in open fields and meadows with grass interspersed with weeds or shrubby vegetation, especially in damp or low-lying areas, adjacent to salt marsh in some areas. Henslow's sparrows are found in a variety of habitats that contain tall, dense grass and herbaceous vegetation.

The Henslow's sparrow nest is well-hidden in grass, either at the base of grass tuft (usually) or up to 40 cm above the ground in stems of growing herbage. Nests can be either open or domed. A "typical" domed nest is located at the base of a clump of grass with dead grass from the clump forming an arched roof over the nest. Occasionally a nest is placed in a depression in the ground, but most are at least two cm above the substrate.

Habitat for this species is largely limited in the Natural Resources ICE Study Area, and is absent from the immediate project area.

Bald Eagle

The bald eagle is a wide-ranging species found throughout much of North America (NatureServe, 2015). Most eagles that breed in Canada and the northern U.S. move south for winter. Bald eagles migrate widely over most of North America. In the northern Chesapeake Bay region, radio-tagged northern migrants arrived in late fall and departed in early spring; radio-tagged southern migrants arrived throughout April-August and departed June-October. Winter home ranges can be very large, especially for nonbreeding birds.

Breeding habitat most commonly includes areas close to (within four km) coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds. Nests usually are in tall trees, on pinnacles, or cliffs near water. Tree species used for nesting vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, or others. The same nest may be used year after year, or a pair may use alternate nest sites in successive years.

In winter, bald eagles may associate with waterfowl concentrations or congregate in areas with abundant dead fish or other food resources. Wintering areas are commonly associated with open water though in the region some bald eagles use habitats with little or no open water if upland food resources (e.g. rabbit or deer carrion, livestock afterbirths) are readily available. Wintering eagles tend to avoid areas with high levels of nearby human activity (boat traffic, pedestrians) and development (buildings). Bald eagles preferentially roost in conifers or other sheltered sites in winter in some areas; typically the birds select the larger, more accessible trees. Communal roost sites used by two or more eagles are common. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in winter roost-site selection.

The Natural Resources ICE Study Area contains little suitable nesting or winter roosting habitat.

3.3.3 Historic Resources

Historic properties are considered notable features for their value to the area's historical and cultural foundations, and the state and nation's heritage. The NHPA [16 U.S.C. §470] defines a historic property as any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property or resource." For the purpose of this analysis, historic properties are archeological sites and architectural resources eligible for listing or listed in the NRHP. Historic properties within the study area are shown on **Figure 3-3**.

The project area was subject to architectural and archaeological surveys in 2006-2008 as part of the I-95/I-395 HOV/Bus/HOT Lanes Project. The 2007 architectural survey identified four historic properties in the vicinity of the APE—the Pentagon (000-0072), the Alexandria Canal Path (44AX0028), Parkfairfax Historic District (100-0151), and the Fairlington Historic District (000-5772).[4]

The 2006-2008 archaeological surveys identified five previously-recorded sites (44AX0028, 44FX2214, 44AX0037, 44AX0176, and 44AX0177) and one newly-recorded site (44FX3210) within the APE. The five previously recorded sites were found to be destroyed within the APE, and 44FX3210 was determined not eligible for listing in the NRHP.

To supplement this information, a database search was conducted in 2016 using V-CRIS (Virginia Cultural Resources Information System). Three resources were identified (000-4385, 000-9727, and 029-5470); however, all three have been destroyed due to dense twentieth and twenty-first century development. Therefore, based on available information, there are no known historic properties located outside of the APE evaluated by Dovetail, but within the APE for the existing project that could be affected by the currently-proposed I-395 Express Lanes Project.

3.4 STEP 4: IDENTIFY IMPACT CAUSING ACTIVITIES OF THE BUILD ALTERNATIVE

The objective of this step is to identify direct impacts that could have indirect effects that may conflict with the regional direction and goals discussed in **Step 2** and/or impact the resources identified in **Step 3**. The NCHRP Report 466 includes groups of actions associated with transportation projects that are known to trigger indirect effects. Some examples of these impact-causing activities include alteration of drainage, channelization, noise and vibration, cut and fill, barriers, excavation, erosion and sediment control, landscaping, and alteration of travel time/cost. The estimated direct impacts due to impact-causing activities are summarized in **Table 3-9.** Comparing impact causing activities to regional directions and goals and the resources in the ICE study areas enables the identification of resources that could be indirectly affected. The findings of this identification process are presented in **Step 5**.

[4] Additional resources were surveyed and identified by others after the cultural resources analysis for this EA was completed. To be conservative, the potential impacts associated with these potential historic properties have been included in this EA. Additional coordination with VDHR and District of Columbia State Historic Preservation Office (DC SHPO) will be conducted based on further design details in the vicinity of the historic resources.

Table 3-9: Direct Impacts of the Build Alternative

Notable Feature	Estimated Direct Impact
Land Use	
Right of Way Acquisition and/or Easements (Acres)	5.30
Potential Displacements (No.)	0
Community Facilities	
Recreational Trails (No.)	0
Scenic Easements (No.)	0
Parks (No.)	0
Schools (No.)	0
Other Community Facilities (No.)	0
Water, Wetland, Water Quality	
Ground Water Sources (No.) / Surface Water Intakes (No.)	0 / 0
State Wild and Scenic Rivers (Linear Feet)	0
National Hydrography Dataset (NHD) Stream Impacts (Linear Feet)	0*
Wetlands (Acres)	0.004*
Jurisdictional Ditch (Linear Feet)	0
Open Water (Acres)	0
Temporary Impacts to Vegetated Wetlands and Open Water (Acres)	0
Floodplains	
100 Year Floodplains (Acres)	0.09*
500 Year Floodplains (Acres)	0.01*
Wildlife	
Forested Habitat/Wildlife Corridors (Acres)	0
Regional Biodiversity (Acres of Conservation Lands)	0
Threatened Endangered, and Special Status Species	
Threatened, Endangered, and Special Status Species or potential habitat (No.)	0
Anadromous Fish (No.)	0
Threatened and Endangered Waters (Acres)	0
Historic Resources	
Historic Resources Properties (acres)	5.06*

**Currently, 5.96 acres of potential impact are estimated for the construction of noise barriers, with 5.06 acres outside of the VDOT right of way and within historic districts (0.9 acres of potential impact are within VDOT right of way). The 5.06 acres of impact would be considered a Section 4(f) use. This value is based on a conservative estimate of the right of way width required to construct and maintain the barriers (approximately 30 feet). VDOT anticipates that during the final design noise analysis, barrier locations would be refined and may be shifted to be fully located within the VDOT right of way. Additional coordination with the VDHR and DC SHPO will be conducted based on further design details.*

3.5 STEP 5: IDENTIFY INDIRECT EFFECTS FOR ANALYSIS

The objective of this step is to assess whether direct impacts identified above would have the potential to have indirect effects on the identified resources. As discussed in **Section 2.2**, indirect effects can occur in

the following three broad categories: encroachment-alteration impacts, induced growth impacts, and impacts related to induced growth.

Development of vacant land or conversion of the built environment to more intensive uses are often consequences of highway projects. The NCDOT *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* provides characteristics for induced growth as well as illustrates the different stages of development (see **Figure 3-13**) (NCDOT, 2001). These characteristics include existing land use conditions in the project area, increased accessibility that may result from new transportation improvements, local political and economic conditions, the availability of other infrastructure, and the rate of urbanization in the region. The area and localities surrounding this project are in a very advanced land development stage, as is most of the entire region. The proposed project is not anticipated to encourage or accelerate any changes in land use that are not already expected in the localities within the study area. Improvements are included in transportation plans of the localities and any increases or decreases in population are already anticipated or planned for by the localities and would likely not be directly related to this project.

Figure 3-13: Highway Investment on Typical Progress of Urbanization

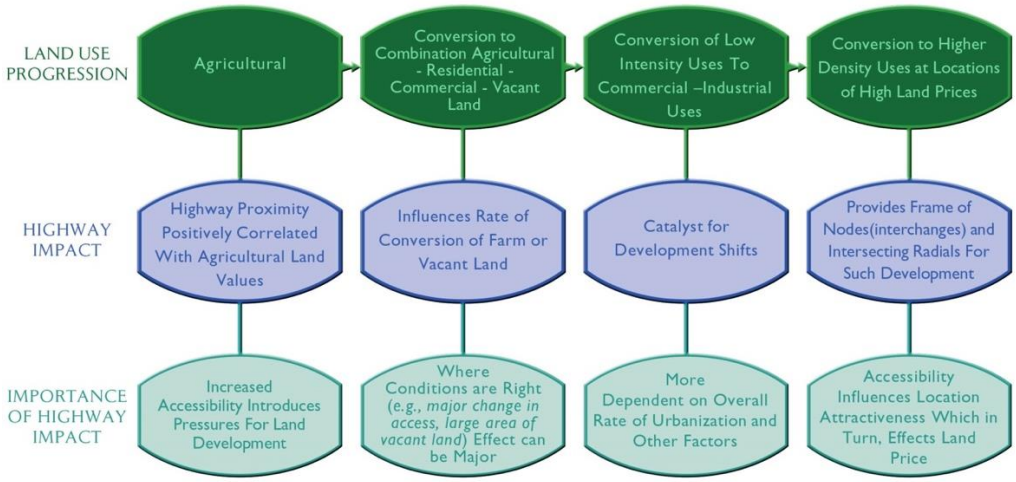


Table 3-10 provides a summary of potentially substantial indirect effects meriting analysis, identifying the indirect effect type, the impact-causing activities (direct effects), indirect effects from direct effects and a description of the potential change. For those indirect effects not carried forward for detailed analysis, a brief explanation of the rationale of the decision is provided.

Table 3-10: Potentially Substantial Indirect Effects of the Project Meriting Analysis

Impact-Causing Activities (Direct Effects)	Indirect Effects from Direct Effects	Potential Manifestation of Indirect Effects	Indirect Effects Analyses
Encroachment-Alteration			
Effects to Socioeconomic Resources			
Right of Way Acquisition, Noise	Changes in community cohesion and access to community facilities/services	Communities become more attractive, or unattractive, depending on perceived benefits or detriments of living in proximity to the improved road	There would be no changes to community cohesion or access to community facilities or services based on right of way acquisitions. Traffic volumes are not expected to increase based on the Build Alternative. Vehicle exhaust and noise are anticipated to improve based on the reduction of congestion in the project area, as well as the addition of noise barriers.
Alteration of Travel Time, Circulation Patterns, and Travel Costs	Changes in travel patterns and additional travel expenses	Improvements to quality of life due to improved transportation choices	The Build Alternative offers the three HOT lanes, as well as three no cost general purpose lanes that would also see a reduction in congestion based on the addition of the third HOT lane.
Effects to Natural Resources			
Wetland and Open Water Fill	Disruption of ecosystem functioning	Alterations of hydrology and species interaction	Only minor wetland fill is likely, and that fill would be associated with installation of noise barriers; however, these would be installed in a manner that would not impede hydrology.
Floodplain Encroachment	Disruption of ecosystem functioning	Alterations of hydrology and species interaction	Encroachments on FEMA-designated floodplains are minimal for this project; and federal regulation and VDOT design parameters minimize potential effects to floodplains.

Impact-Causing Activities (Direct Effects)	Indirect Effects from Direct Effects	Potential Manifestation of Indirect Effects	Indirect Effects Analyses
Effects to Historic Resources			
Right of Way and Visual Impacts	Right of way and/or easements impacts are minor for the installation of noise barriers, power, signal, and signage requirements. Indirect effects from the noise barriers, power, signal, and signage requirements are not anticipated.	N/A	Given the location of the historic resources and the nature of the proposed project, any right of way and/or easement, and/or visual impacts from noise barriers, power, signal, and signage requirements would not adversely affect the qualities of the historic resources that make them eligible for listing in the NRHP. The Virginia Department of Historic Resources (VDHR) and the District of Columbia State Historic Preservation Office (DC SHPO) have reviewed the undertaking in accordance with the NHPA and determined that the project will have No Adverse Effect on historic properties. Additional coordination with VDHR and the DC SHPO will be conducted based on further design when more detail is available regarding the need for and design of noise barriers in the vicinity of the Fairlington and Parkfairfax Historic Districts.

3.6 STEP 6: ANALYZE INDIRECT EFFECTS AND EVALUATE ANALYSIS RESULTS FOR THE NO BUILD AND BUILD ALTERNATIVES

Using planning judgment, this step analyzes indirect and induced growth effects potentially resulting from each alternative.

3.6.1 No Build Alternative

Effects to Socioeconomic Resources

Under the No Build Alternative, increased traffic delays and lack of travel reliability would have a negative impact on businesses and residents throughout the Socioeconomic Resources ICE Study Area.

A number of parks and recreation areas exist within the Socioeconomic Resources ICE Study Area. Under the No Build Alternative, these parks and recreation areas would continue to be affected by the proximity effects such as air quality, noise, and visual impacts.

Effects to Natural Resources

There would be no improvements to the system. Potential indirect effects could be associated with petroleum from vehicles, and salt or chemicals due to road maintenance.

Effects to Historic Resources

No loss or damage to historic properties is anticipated under the No Build Alternative. As with parklands, proximity effects associated with the existing facility, including noise, air quality, and visual intrusions would continue to affect historic resources.

Induced Growth

No induced growth would be expected as a result of the No Build Alternative. The Socioeconomic Resources ICE Study Area and surrounding localities are already highly developed and any growth would continue regardless of the conditions of the surrounding roadway network.

Effects Related to Induced Growth

Since no induced growth would be expected as a result of the No Build Alternative, there would likely be no effects related to the lack of induced growth.

3.6.2 Build Alternative

Effects to Socioeconomic Resources

The Build Alternative involves improvements to an existing facility within existing right of way. As such, this project would not divide or segment existing communities or interfere with community cohesion. Existing communities are accustomed to the presence of an interstate facility and the associated noise and visual effects. The Build Alternative would be built largely within VDOT's existing right of way and would not result in any displacements or relocations. Noise barrier requirements and locations have not been set; however, minor right of way and/or easements may be necessary. Based upon preliminary design, approximately 5.06 acres may be required. Additionally, approximately 0.24 acres would be required for

power, signal, and signage requirements. Further information regarding right of way and/or easements is included in the ***Right of Way Technical Report*** (VDOT, 2016h). Additional travel choices are anticipated to create better overall travel conditions in the Socioeconomic Resources ICE Study Area for all communities, including EJ communities within the Socioeconomic Resources ICE Study Area. Although costs are associated with using the HOT lanes, the three general purpose lanes would also benefit as the HOT lanes could reduce the number of vehicles using the general purpose lanes. The decrease in traffic delays could also have a positive impact on businesses and residents throughout the Socioeconomic Resources ICE Study Area.

During construction, short-term road closures and detours would indirectly effect residents and businesses, potentially increasing commute time, emergency response time, and the time to access community facilities, including schools and recreation facilities. This would not disproportionally impact low income or minority populations.

Based on the ***Noise Analysis Technical Report*** (VDOT, 2016g), the Build Alternative would include 8.1 miles of feasible and reasonable noise barriers. These noise barriers would benefit 2,027 of the impacted receptors, as well as 2,626 not impacted receptors. While noise barriers could impact the visual qualities of the area, impacts would not be disproportionally borne by low income or minority populations.

Effects to Natural Resources

Construction of the project may result in increased sedimentation from land disturbing activities and occurrences of fuel spills or hydraulic spills from construction equipment. The introduction of pollutants from roadway runoff can facilitate the degradation of nearby terrestrial and aquatic habitat through increased deposition of sediments or contamination from chemical pollutants in the form of heavy metals, inorganic salts, asbestos, and petroleum products and their byproducts. When runoff enters waters that are already impaired, the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition, which in turn can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The effects can result in changes in community structure at a local level, but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation.

During construction, the contractor would adhere to standard erosion and sediment control. Since this project was approved by VDEQ for stormwater grandfathering under the Part C II technical criteria of 9VAC25-870-93, the contractor would adhere to stormwater criteria prescribed in the regulations preceding July 2014.

The project is not expected to have indirect effects on floodplains as none of the activities associated with the project would alter the 100 or 500-year flood elevations. The only activity proposed within floodplains is installation of noise barriers, and these would be installed in a manner that does not impede floodwater passage.

This project would not directly impact any wildlife corridors or threatened or endangered species. The only potential indirect effects to wildlife habitat that may result from this project would be to aquatic wildlife habitat through introduction of additional pollutants.

Effects to Historic Resources

As currently proposed, the project would not impact contributing elements of historic resources/districts that make the resources eligible for listing in the NRHP. However, right of way and/or easements may be required from historic resources for the installation of noise barriers. The construction of noise barriers would not adversely affect any of the qualities of the resources that make them eligible for listing in the NRHP. Proximity effects associated with the existing facility, including noise, air quality, and visual intrusions would continue to affect historic resources. VDHR and the District of Columbia State Historic Preservation Office (DC SHPO) have reviewed the undertaking in accordance with the NHPA and determined that the project will have No Adverse Effect on historic properties. Additional coordination with VDHR and the DC SHPO would be necessary during the final design noise analysis when more detail is available regarding the need for and design of noise barriers in the vicinity of the historic resources.

Induced Growth

No induced growth would be expected as a result of the Build Alternative. The Socioeconomic Resources ICE Study Area and surrounding localities are already highly developed and any growth would continue regardless of the conditions of the surrounding roadway network.

Effects Related to Induced Growth

Since no induced growth would be expected as a result of the Build Alternative, there would likely be no effects related to the lack of induced growth.

3.7 STEP 7: ASSESS CONSEQUENCES AND DEVELOP MITIGATION

The No Build Alternative would not result in substantial indirect impacts to any resource. Therefore, mitigation is not required for the No Build Alternative. The following sections assess the consequences and mitigation for potential impacts resulting from the Build Alternative.

3.7.1 Socioeconomic Resources

Localities plan for and incorporate growth, development, and land use into comprehensive plans. The comprehensive plans for all of the localities state that infill and redevelopment is planned and likely to occur. These plans for development and changes in land use may happen independently of the implementation of this project. However, as previously noted, the localities support a multi-modal transportation system that provides transportation choices and reduces SOV use. Indirect effects are anticipated to be minimal because the proposed improvements are to an existing facility within existing right of way in an environment that is highly developed and influenced by highway-related pressures. The Build Alternative is expected to improve travel times, provide better access for public transit, and reduce congestion at Eads Street, encouraging businesses to remain in place. Additionally, as part of the Development Framework Agreement, 95 Express would fund an annual transit payment. Mitigation efforts for temporary impacts during construction would include public outreach.

3.7.2 Natural Resources

There would be limited direct impacts to water resources or wildlife habitat since all work, with the potential exception of some noise barrier installation, would take place within the existing right of way of I-395. Potential indirect impacts to wetlands, streams, water quality, floodplains, wildlife habitat, and threatened, endangered, and special status species could result from increased stormwater runoff.

Implementation of strict erosion and sediment control measures as outlined in Chapter 10 of VDOT's Drainage Manual (VDOT, 2012) during construction would minimize temporary impacts to surface waters. Examples of control measures that may be considered include sediment traps, sediment basins, etc.

Indirect effects associated with sediment transport should be minor during construction through the proper use of stormwater control measures. During construction, VDOT would adhere to standard erosion and sediment control and stormwater measures and the associated required monitoring protocols.

There are three urban wildlife corridors, which follow the underpasses to beneath I-395, that the project would cross; however, none of the crossings would be modified. Therefore, the project would not add impediments to wildlife utilization.

During final design, a hydrologic and hydraulic analysis would evaluate the effect of the proposed roadway improvements on stormwater discharge. The hydraulic study would be used to provide adequate design of the hydraulic opening and proper conveyance of floodwaters to minimize potential impacts to the floodplain. Design modifications to eliminate or minimize floodplain encroachments to the extent practicable are required by Executive Order 11988; therefore, the project would not be expected to impact floodplains.

The project is not anticipated to have indirect effects to threatened, endangered, and special status species. If future design changes result in impacts to wildlife habitat, direct and indirect impacts could be reduced through use of design measures such as bridging, countersinking culverts, and reducing the roadway footprint. In addition, temporary impacts can be reduced through proper location and minimization of staging areas, construction access roads, and modifying construction techniques in affected habitats. If the project is determined to have an effect on threatened, endangered, and special status species, mitigation measures would be further developed following additional coordination with VDGIF and USFWS prior to construction. Through the consultation process under the Endangered Species Act (ESA), indirect effects are taken into account and appropriate mitigation measures identified. Consultation would occur before the permit decision, as any mitigation measures, conditions, or restrictions determined necessary by the USFWS would likely be included by regulatory agencies as conditions of any permit issued. Mitigation measures may include use of time-of-year restrictions on construction, contractor training in recognizing and avoiding threatened, endangered, and special status species and their habitats, and restoration of habitat. While many of these mitigation actions would be incorporated to offset direct impacts, the actions also would mitigate indirect effects outside of the area of direct impact.

3.7.3 Historic Resources

The construction of noise barriers, power, signal, and signage requirements would not adversely affect any of the qualities that make the historic resources eligible for listing in the NRHP.

VDHR and the DC SHPO have reviewed the undertaking in accordance with the NHPA and determined that the project will have No Adverse Effect on historic properties. Additional coordination with VDHR and the DC SHPO would be necessary during the final design noise analysis when more detail is available regarding the need for and design of noise barriers in the vicinity of the historic resources. Although a No Adverse Effect determination is anticipated, mitigation would include aesthetic improvements to the noise barriers to minimize further degradation to these resources.

4. CUMULATIVE EFFECTS

As noted in **Section 2.3** the cumulative effects analysis is based on the process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (5th Cir. 1985), as described in FHWA's Guidance: *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2014). The following sections follow this direction.

4.1 STUDY AREA AND GEOGRAPHIC SCOPE

The geographic limits for the cumulative effects analysis are the same as the Socioeconomic ICE Resources, Natural Resources, and historic properties ICE study areas described in **Section 3.2.1** of this report.

4.2 WHAT ARE THE TEMPORAL BOUNDARIES FOR THE STUDY?

The analysis of cumulative effects must consider past, present, and reasonably foreseeable future actions. The temporal boundary used to establish the timeframe for this cumulative effects assessment spans from the early 1940s, with the construction of the Reagan National Airport, the Shirley Memorial Highway and the Pentagon, to 2040, which is the modeled design year used for the Build Alternative.

4.3 WHAT ARE THE RESOURCES AFFECTED BY THE STUDY?

These resources affected by the Build Alternative would be the same as those resources identified in Step 3, discussion in **Section 3.3** of the indirect effects analysis.

4.4 WHAT ARE OTHER PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS THAT HAVE IMPACTED OR MAY IMPACT THESE RESOURCES?

4.4.1 Past Actions

Many of the past actions that have contributed to the baseline for this analysis occurred as part of the residential, commercial, and industrial development described in **Section 3.2.2**. This development transformed a rural landscape into an urban environment. This change resulted in a loss of wildlife habitat and species, impacts to wetlands and streams, and increased levels of air and water pollution. The development also formed the basis for the tremendous level of population growth the region experienced. With this growth has come an increase in employment and investment in the Socioeconomic Resources ICE Study Areas. Past notable projects and transportation resources that have occurred within the Socioeconomic, Natural Resources, and Historic Properties ICE study areas are listed below.

- Henry G. Shirley Memorial Highway – Construction began in 1941 on the first limited-access freeway in Virginia. The road was completed from Woodbridge, Virginia, to the 14th Street Bridge

over the Potomac River between Virginia and Washington, D.C. in 1952. This highway is a 17.3-mile portion of the future I-95 and Interstate 385 in Virginia.

- Reagan National Airport – Completed in 1941 and located on 860 acres, the Reagan National Airport has a total of 44 gates and public parking for more than 9,000 vehicles. From April 2014 to March 2015, the airport handled 21,195,775 passengers.
- The Pentagon – Headquarters of the United States Department of Defense, located in Arlington County, Virginia, across the Potomac River from Washington D.C, was completed in 1943. The Pentagon is one of the world's largest office buildings, with approximately 6,500,000 square feet. Approximately 26,000 employees work in the Pentagon.
- I-95 – Construction started in 1957 on the 178.73-mile interstate, traveling from North Carolina, through Virginia, to Maryland. I-95 extends from Florida to the New England states.
- George Washington Memorial Parkway – A 24.9-mile roadway designed for recreational driving and links sites that commemorate important episodes in American history and preserve habitat for local wildlife.
- Columbia Pike/State Route (SR) 244 – This state highway runs 8.25-miles from Annandale east to SR 27 and I-395 at the Pentagon. This highway is a major southwest-northeast thoroughfare in northeastern Fairfax County and eastern Arlington County.
- I-395 – The I-395 corridor begins at the I-95 / I-495 Capital Beltway Interchange and ends at the US Route 50 Interchange in northwest Washington, D.C., an approximate distance of 14 miles. I-395 is the primary north-south interstate highway into Washington, D.C. serving both local, commuter, and regional traffic. The existing I-395 facility within the study limits generally includes four northbound and four southbound general purpose lanes and two reversible HOV lanes between the northbound and southbound general purpose lanes.
- I-495 – Completed in 1964, the 64-mile highway that surrounds Washington, D.C. is also located in Virginia and Maryland. This interstate is widely known as the Capital Beltway. The Capital Beltway was originally envisioned as primarily a bypass for long-distance eastern seaboard traffic to avoid driving directly through Washington, D.C. However, the explosive growth of both housing and business in the Washington, D.C. suburbs following the Beltway's completion quickly made the Beltway the area's main thoroughfare for local traffic.
- Washington Metro – This rapid transit system serving the Washington, D.C. metropolitan area opened in in 1976. The Washington Metro provides services to many jurisdictions in Maryland and Virginia, including Fairfax, Alexandria, and Arlington. The Metro presently includes six lines, 91 stations, and 117 miles of route.
- Mark Center - Adjacent to Interstate 395 within the City of Alexandria, Virginia, the JBG Mark Center site is an assembly of parcels totaling approximately 150 acres. Today, the site contains approximately 2,600 garden-style apartment units dating from the 1970s, and a 60,000 square foot retail center, which added more than 6,400 employees to the intersection of Interstate 395 and Seminary Road in 2011.

4.4.2 Present and Reasonably Foreseeable Future Actions

There are a number of development actions that are occurring and/or are planned to occur that could contribute to cumulative effects on resources affected by the alternatives. In addition to the I-395 Express Lanes Northern Extension Project, there are numerous VDOT actions planned within the study area, as identified in VDOT's Final 2016 Six-Year Improvement Program (SYIP). Projects in the SYIP are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. Due to scarce financial resources, projects that do not have identified funding may not

be constructed, and are therefore not reasonably foreseeable. **Table 4-1** lists all of the present and reasonably foreseeable future transportation projects that would add capacity within the ICE study areas and notes the status of each project.

Table 4-1: Present and Reasonably Foreseeable Future Transportation Projects within the Socioeconomic Resources and Natural Resources ICE Study Areas

Project	Description	Construction Start Date
Washington Boulevard at Columbia Pike (West) Interchange Improvements	Replacement of the Washington Boulevard Bridge over Columbia Pike and associated interchange improvements including ramp modifications	2015
Acceleration / Deceleration Lane from Westmoreland Street to Haycock Road	Westbound acceleration/deceleration lane from 0.2 miles west of Haycock Road to Route 703, Lee Highway	2015
I-395 HOV / Transit Ramp at Seminary Road	Construction of a south-facing ramp from the HOV lanes to the top level of the Seminary Road rotary that provides additional access for HOV and transit	2016
12th Street Extension	Construct 12th Street between S. Eads Street and S. Fern Street	2016
Bridge Rehabilitation Carlin Springs Road at Geo Mason Drive	Bridge rehabilitation to include widening for pedestrian access and deck replacement	2016
I-66 Inside the Beltway	Peak period tolling in peak direction along I-66	2017
Route 27 Washington Boulevard Phase 2 Construction Shared Use Path	Construction of Phase 2 shared use path adjacent to Washington Boulevard	2017
Installation of Curb and Gutter, Sidewalks and Upgrade Signal on US 50	Installation of curb and gutter, sidewalks and signal upgrade and crosswalks from Irving Street to 500 feet away from the intersection	2017
I-95 Express Lanes Southern Terminus	Two-mile extension of the I-95 Express Lanes south of the Exit 143 / Garrisonville Road Interchange	2018
Installation of Curb and Gutter, Sidewalks and Upgrade Signal on US 50	Installation of curb and gutter, sidewalks and signal upgrade and crosswalks from Park Drive to 500 feet away from the intersection	2018
Route 309/29 at Five Points Intersection Improvements	Construct a fully functional intersection, meeting Americans with Disabilities Act (ADA) requirements and improving traffic flow, improvements to intersection and turn lanes	2018
Major Bridge Rehabilitation on Washington Boulevard/Route 27 at Route 10	Replace and widen the structurally deficient bridge superstructure, modify substructure and replace abutments	2018

Project	Description	Construction Start Date
I-395 4th Lane South Widening	Widening of southbound I-395 to provide one additional through lane from south of Edsall Road to north of Duke Street	2019
Army Navy Drive Complete Streets	Multi-modal improvements along Army Navy Drive between South Joyce Street and 12th Street including constructing a dedicated bicycle facility and improving transit accommodations	2019
Seminary Road and Beauregard Street Ellipse	Modification of the intersection to an ellipse design to eliminate weaving issues on westbound Seminary Road and increase capacity	2020
ADA Compliant Sidewalk and Retaining Wall to 18th Street	Add approximately 225 feet of ADA compliant sidewalk and retaining wall to the south side of 18th Street North	2020
Boundary Channel Drive Interchange	Interchange modifications to improve operations and reduce weaving along southbound I-395 including constructing two roundabouts, providing connections to Long Bridge Park Drive and US Route 1, and multi-modal improvements	2021
Washington Boulevard at Columbia Pike (East) Interchange Improvements	Interchange improvements to remove the NW and SW ramps and conversion to a diamond configuration	TBD
Pentagon South Parking Lot Improvements	Reconfiguration of the South Parking Lot as part of the Pentagon Master Plan	TBD
Arlington Boulevard Trail Improvements	Design and construct multi-use trail along Arlington Boulevard/Route 50 in Arlington County	TBD
Route 244	Columbia Pike multi-modal corridor improvements from the Fairfax County line to Washington Boulevard	TBD

Source: VDOT Six-Year Improvement Program.

Other local non-transportation projects and projects being studied by other state and federal agencies are described in **Table 4-2**. In addition to these planned actions by federal, state, and city agencies, there is anticipation that private development would continue in the future.

Table 4-2: Present and Reasonably Foreseeable Future Non-Transportation Projects within the Socioeconomic Resources and Natural Resources ICE Study Areas

Project Name	Project Type	Project Description
Fairfax		
Lincolnia Senior Center	Residential; Community Facility	Renovations are underway for the center. Status: Under Construction.

Project Name	Project Type	Project Description
Proposed Temporary Relocation of Bailey's Crossroads Community Shelter	Public Facility	Relocation of the shelter for a five-year period until a permanent location can be secured and structure built. Status: Public Hearing Process.
Lincolnia Residences Renovations	Residential	Housing and Community Development affordable housing for seniors and assisted living. Status: Under Construction.
Alexandria		
Beauregard Plan (Southern Towers, Southern Towers Clubhouse, Seminary Plaza, Seminary Overlook), BRAC/WSH, Mark Center Plaza, Meadowcreek Lynbrook Residential Redevelopment, Beauregard/Armisted	Residential; Commercial;	Small area plan, providing convenient access to transit, with a variety of neighborhood services, adjacent to established neighborhoods. The goal is to integrate redevelopment into the context of the existing neighborhoods. Status: Approved with Phases Underway.
Landmark Mall Redevelopment	Residential; Commercial	Demolition of the two-story central area of the mall and replacement with a mixed-use residential and retail complex, housing retail, restaurants and 350-400 apartments. Status: Site Plans Approved.
Arlington		
1900 Crystal Drive	Residential; Commercial;	Demolish a 401,935 square feet office building and replace this building with a 24-story building consisting of ground floor retail and up to 719,704 square feet of office space. Status: Site Plan Process Approved.
Crystal Plaza 6	Residential; Commercial; Office	Convert a 12 story, 1960s office building to multifamily residential with ground floor retail or ground floor office space. Status: Site Plan Process Approved.
ART Bus Facility	Facilities	Arlington Transit bus facility at South Eads and 32nd Street to provide light duty maintenance, bus wash bay, natural gas fueling station and parking. Status: Under Construction.
Four Mile Run Stream Restoration	Environmental	Naturalize the banks along the stream corridor and improve access to the stream through overlooks and terracing, replace riprap with native plants, creating living shorelines and restore tidal wetland condition in Four Mile Run Park on the Alexandria side. Status: Construction Approved.

Project Name	Project Type	Project Description
Metropolitan Park 4/5	Residential; Commercial	Phases 4 and 5 of the Metropolitan Park portion of the Pentagon City Phased Development Site Plan - construct one building consisting of 699 residential units and retail/grocery space. Status: Site Plan Process Approved.
PenPlace	Recreation; Community Facilities	Multi-dimensional facility for recreational, performance and restaurant. Community center offering community rooms, art/studio space, exercise/gym space, daycare and senior facilities, library, theater, university and garden shop. This is the 5th phase of construction. Status: Project Approved.
Pentagon City Pedestrian Tunnel Renovation	Pedestrian / Quality of Life	Repair and restore tunnel space, including mechanical, electrical and plumbing systems, reinforce structural components. Status: Under Construction.
Metropolitan Park Phase 6	Residential; Commercial	Construct a 22-story residential building with 588 units and retail space. Status: Site Plan Under Review.
223 23rd Street (Crystal Plaza 5)	Residential; Commercial; Office	Rezone and redevelop site with a 353-unit residential building, office, and retail. Redevelopment for the entire block M. Status: Project Inactive.
The Berkeley	Residential	Rezone a portion of the site and construct 287 residential units in two structures. Status: Site Plan Review Complete.
Park Shirlington	Residential	Rezone and construct 750 residential units, with 100 being committed as affordable housing. Status: Inactive.
400 Army Navy Drive	Residential	Rezone site and construct 458 residential units. Status: Site Plan Process Approved.
Pentagon Center	Residential	Change use of two office buildings to residential units. Status: Project Approved.
1720 South Eads	Residential	Rezone and construct a 198-unit residential building on the former Crystal City Post Office Site, including 16 affordable housing units. Status: Project Approved.
Route 110 Trail Improvements	Pedestrian / Quality of Life	Construct on the east side of US Route 10 from Memorial Drive to the Pentagon.
Pentagon Parking Facility Improvements	Facilities / Environmental	As part of the South Parking Improvements project, stormwater management measures would be incorporated into the design and LED lighting upgrades.

Project Name	Project Type	Project Description
Pentagon South Pedestrian Safety Project	Pedestrian / Quality of Life	Installation of new walkways and crosswalks within and adjacent to the South Parking Lot, including the pedestrian tunnel under I-395, to reduce pedestrian and vehicular conflicts and provide a safer pedestrian experience for visitors to the Pentagon 9/11 Memorial.
Pentagon Stormwater Quality Improvements	Environmental	The project would implement water quality improvement measures in order to meet Total Maximum Daily Load (TMDL) pollutant load reduction requirements associated with the Pentagon Reservation's MS4 permit.
Pentagon Memorial Visitor Education Center	Public Facility	Develop a visitor education center to educate visitors about the memorial and the events that took place on September 11, 2001. The center would serve to complement the Pentagon 9/11 Memorial.

Sources: Available data from - Alexandria Active Development Projects, https://www.alexandriava.gov/planning/info/default.aspx?id=84782*; Arlington Projects and Planning,* https://projects.arlingtonva.us/private-development/*; Fairfax County Improvement Program,* http://www.fairfaxcounty.gov/dmb/advertised/fy2007/fy07_advertised_cip.html; *Pentagon Reservation Master Plan Update, October 2, 2014*

4.5 WHAT WERE THOSE IMPACTS?

Cumulative effects consist of the impacts of the alternatives under consideration in the EA and the impacts of the past, present, and reasonably foreseeable future actions. **Table 4-3** illustrates the resources that could potentially be impacted by the actions described in **Section 4.4.1** and **Tables 4-1** and **4-2**. Project types from **Section 4.4.1** and **Tables 4-1** and **4-2** were categorized together in the table below based on similarity and project type. These potential impacts are taken into consideration in the following discussions of cumulative impacts to different resources.

Table 4-3: Activities with Potential Cumulative Effects on Identified Resources

Project Type	Project Type	Resources Potentially Impacted
Major roadway projects	Transportation	Socioeconomics, Natural Resources, and Historic Properties
Metro System	Transportation	Socioeconomics, Natural Resources, and Historic Properties
Redevelopment/Mixed-Use (existing structures, changed use)	Residential / Mixed-Use	Socioeconomics, Natural Resources, and Historic Properties
Transportation improvements to existing facilities (widening, rehabilitation, maintenance activities)	Transportation	Socioeconomics, Natural Resources, and Historic Properties
Education Center	Public Facility	Socioeconomics, Natural Resources, and Historic Properties
Parking Improvements	Facilities	Socioeconomics, Natural Resources, and Historic Properties
Stream restorations, trails, pedestrian facilities	Socioeconomic / Environmental	Socioeconomics, Natural Resources, and Historic Properties

4.5.1 Socioeconomic Resources

Since the 1940s, the actions discussed in this section have led to rapid residential and commercial development, along with continued industrial growth. This growth and development has led to the existing land uses, population dynamics, and income levels within the Socioeconomic Resources ICE Study Area today.

The actions listed in **Section 4.4.1, Past Actions** and **Tables 4-1** and **4-2** have facilitated this growth and/or improved the quality of life within the Socioeconomic Resources ICE Study Area. The Socioeconomic ICE Study Area encompasses mid- to high-density residential and commercial uses. Due to the lack of vacant land, locality plans propose redevelopment, offering mixed use areas with commercial, government, business, public facilities, open space, and residential combinations. Roadway improvements would include rehabilitation, widening and streetscape efforts, as well as updated pedestrian facilities. These types of changes benefit all populations, including minority and low income.

In addition to continued residential and commercial redevelopment, the following community plans propose increasing the amount of parkland or recreational facilities in the Socioeconomic Resources ICE Study Area:

- Fairfax County Comprehensive Plan, 2013 Edition;
- Alexandria Master Plan & Citywide Chapters; and,
- Valuing Arlington's Community Parks and Open Space White Paper.

Congestion on I-395 would continue under the No Build Alternative. Future growth in the region would increase the number of vehicles using the roadway and could cause some traffic to divert to the local roadways, affecting the population that live along or use those roadways. Congestions would be alleviated under the Build Alternative, reducing the potential for vehicle diversions to the local roadways.

4.5.2 Natural Resources

Rapid urbanization took place in the Fairfax/Alexandria/Arlington area from the 1920s through the 1980s (Zell, 2011). Arlington County transformed from a rural area (1920s) to a suburban area (1940s) to an urban area (by the 1980s). Similar urbanization occurred during this same period in northern Fairfax County. Past actions during and after the major urbanization have led to the impaired waters and impacted wetland systems and floodplains within the Natural Resources ICE Study Area. Many of these past actions occurred without the benefit of modern stormwater management facilities and/or water quality regulations. Past actions also resulted in the loss and fragmentation of much of the terrestrial wildlife habitat that previously existed within the Natural Resources ICE Study Area. Much of the impairment to wildlife habitat occurred up through the 1980s prior to the enactment of a number of major environmental regulations. Since that time, environmental regulations, natural resource planning, and restoration efforts have reduced adverse natural resource impacts from what would otherwise have continued to occur.

Present and reasonably foreseeable future actions would include protections to wetlands, floodplains, water quality, and threatened, endangered, and special status species afforded by federal, state, and local regulations. These protections would limit future adverse impacts to these resources. Additionally, local comprehensive planning includes natural resource management plans that aim to preserve remaining highly

valued wildlife habitat and water quality by directing growth to specific areas and densities, with the goal of being sustainable into the future.

Future federal actions, as well as larger private developments, would be developed within the framework of these regulatory and technological controls, which should reduce impacts to these resources during future development. Two specific controls for checking future impacts are USACE and VDEQ water quality permits and TMDL-related requirements established by VDEQ. These controls serve to minimize excessive impacts, identify avoidance and other mitigation measures, and set limits on the amount of pollutants that are allowed to enter receiving bodies of water. Both the No Build Alternative and the Build Alternative would be subject to these controls to minimize excessive impacts.

Since the passage of federal and state regulations to identify and protect rare, threatened, and endangered species, impacts to these species by future actions would be reduced from what the impact would have been if development had been allowed to continue unabated. The anticipated reduction is a result of coordination with agencies responsible for protecting aquatic and wildlife species, consideration of alternatives that minimize and avoid impacts, and conservation and mitigation measures. Therefore, future impacts to threatened, endangered, and special status species would be controlled and limited through this process. These checks would be in place for both the No Build Alternative and the Build Alternative.

4.5.3 Historic Resources

Damage or loss of historic resources was far more prevalent from actions that occurred prior to the NHPA of 1966. The NHPA of 1966 combined with the establishment of historic resource protection objectives established at the local planning level, have reduced the rates of impacts to historic resources. However, conflicts between the protection of historic properties and development and transportation continue to occur.

Under the No Build Alternative, planned future development and transportation projects could result in permanent loss and proximity effects (air quality, noise, and visual impacts) to historic resources. Similarly, the Build Alternative may potentially affect historic properties and contribute to the cumulative loss or degradation of historic resources. However, the cumulative effects for the No Build Alternative and the Build Alternative are not anticipated to be substantial with the protections provided by the Section 106 process for federal actions and by the plan review process by local jurisdictions for other projects. **Table 4-4** summarizes the cumulative effects to resources from each of the alternatives.

Table 4-4: Cumulative Effects to Resources Resulting from the Alternatives

Proposed Action / Alternative		Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Cumulative Effect
Socioeconomic Resources					
No Build	No improvements beyond maintenance and safety upgrades would be made to I-395. Existing traffic diversions and traffic congestion would likely increase, proportional with the increase of traffic on the interstate.	Washington D.C, the Nation's Capital, has been highly developed since the 1970s. Past development due to the construction of the Interstate systems and transit options has aided in the development of government offices, commercial properties, and businesses thus requiring a wide variety of housing and community facilities for the large populations across the study area.	The localities in the Socioeconomic Resources ICE Study Area are highly developed. Development within the Socioeconomic Resources ICE Study Area mainly consists of redevelopment of existing structures for multi-use purposes and multifamily residential options. Other present actions include improvements to existing transportation facilities and pedestrian options, as well as stream restoration projects.	Continued upgrades to transportation options to alleviate congestion would be expected, as well as redevelopment of existing structures, and the offering of multi-use options for housing, business and community facilities that encourage alternative transit options.	Any future growth in the region would add to the congestion on the Interstate, thus causing drivers to divert onto local roadways. The No Build Alternative would contribute minor adverse increments to the beneficial cumulative effects to socioeconomics, land use, and community facilities.
Build Alternative	The reduction of congestion and additional travel choices would improve commute times and travel safety. These improvements could attract additional people to use this facility; however, these improvements are not anticipated to impact regional growth patterns.				The Build Alternative would alleviate congestion contributing minor beneficial increments to the beneficial cumulative effects to socioeconomics, land use, and community facilities.
Natural Resources					
No Build	No change to existing resources.	There has been substantial impact, manipulation, and loss of aquatic resources due to development. Associated runoff has impaired the majority of the streams within the Natural Resources ICE Study Area. Access to and over waterways for transportation facilities and other development resulted in loss of wetlands. Floodplains have experienced substantial effects over time with destruction and alteration, as well as the placement of buildings and structures within floodplains. Wildlife has experienced substantial effects over time with destruction and alteration of habitat. Runoff from all forms of development activities throughout the Study Area has degraded aquatic habitats.	Limited impacts to wetlands, floodplains, and Chesapeake Bay Resource Protection Areas (RPAs) due to protection afforded by state and federal regulations. New developments would install stormwater management facilities to reduce impact to the existing disturbed environment. Operation of highway systems limits wildlife movement. Maintaining the manmade environment prevents reestablishment of fragmented habitat. The ESA and related regulations protect species from adverse effects associated with certain actions. Several localities have been working to restore and conserve the limited natural habitat remaining within the area. Additionally, all of the localities are implementing stormwater improvements in an effort to improve water quality.	There would continue to be very limited impacts to wetlands, floodplains, and RPAs due to protection afforded by state and federal regulations. New developments would install stormwater management facilities to reduce impact to existing disturbed environment. Continued operation of the highway system would continue to limit wildlife movement. Maintaining the manmade environment prevents reestablishment of fragmented habitat. ESA and related regulations protect species from adverse effects associated with certain actions. Ongoing locality natural resource planning actions include preservation, management, and restoration of remaining natural areas, streams, and wetlands.	Unconstrained runoff entering waters that are already impaired could result in accelerated changes in the macrobenthic community structure and composition. The effects could result in changes in community structure at a local level, but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation. There would be continued, but reduced impact to terrestrial habitat from development due to the existing urbanized environment. The No Build Alternative would contribute minor adverse increments to the adverse cumulative effects to natural resources.
Build Alternative	The majority of road construction activities would take place within existing right of way. Temporary stormwater protection facilities would be utilized during construction to minimize effects.				The Build Alternative would contribute minor adverse increments to the adverse cumulative effects to natural resources.

Proposed Action / Alternative		Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Cumulative Effect
Historic Properties					
No Build	Any improvements that would occur under the No Build Alternative have the potential to impact historic properties and could include permanent loss and/or proximity effects (air quality, noise and visual impacts) to historic properties.	Damage or loss to historic resources prior to NHPA of 1966 was far more prevalent. The more recent project actions, including the Washington Metro, were held to a higher standard with the NHPA and local ordinances.	Present actions, including redevelopment to mixed-use areas, transportation improvements and stream restorations/parks/trails would have to follow the NHPA (federal actions) and any local ordinances (all actions).	Based on the highly developed nature of the study area, any reasonably foreseeable future actions would be similar to those present actions, focusing on redevelopment and transportation improvements that encourage options other than SOV use.	Any projects that would occur under the No Build Alternative would have the potential to impact historic resources. However, the full extent of any architectural or archaeological resource impacts would be uncertain until the project specifics are known. However, the NHPA of 1966 is in place to protect these properties, as well as coordination with the VDHR and Section 106 consulting parties. Additionally, local governments, VDHR, and the DC SHPO also aid in the protection of these properties whether they are private or public undertaking.
Build Alternative	The Build Alternative would not adversely affect historic properties, thus not contributing to cumulative effects. However, any development in the project area, combined with future actions could result in changes that may diminish the integrity of a historic resource's location, feeling or association.				Through implementation of minimization strategies that would be coordinated with the VDHR and Section 106 consulting parties (as necessary), cumulative impacts on historic resources attributable to implementation of the Build Alternative would be reduced.

4.6 WHAT IS THE OVERALL IMPACT ON THESE VARIOUS RESOURCES FROM THE ACCUMULATION OF THE ACTIONS?

Since the early-1900s, the ICE study area has been in a progression of development, being fully developed in the 1970s, in part due to the adjacency of the area to Washington D.C. The potential for future development is largely limited.

Any additional project, due to the lack of vacant land for development, would result in redevelopment activities and a further improvement to the quality of life. The short-term impact of more jobs and associated expenditures resulting from the Build Alternative is expected to benefit the local communities. Once complete, this project is not anticipated to create induced growth or infill development beyond what was anticipated without the project.

Historically, conversion of natural areas to developed land has had the greatest impact on the area. This development has helped lead to the degradation and/or loss of the natural resources over time. The degree of degradation was in part due to the lack of strong federal, state, and local protective regulations. These actions not only impacted the region but maintained the effects of those impacts to the present day such that the environment has not returned to the original state.

Prior to the NHPA and local protective measures, the impact to historic resources through the development of the area was much higher than the potential impacts today. Through the implementation of minimization strategies that would be coordinated with local governments, VDHR and the DC SHPO, cumulative impacts on historic resources attributable to implementation of the Build Alternative would be reduced.

Past and present actions have shaped the current state of socioeconomic, natural, and historic resources within the associated ICE study areas, and future actions would continue to shape these resources irrespective of this project. However, since the region is already highly developed, cumulative effects of the No Build Alternative and the Build Alternative are expected to be minimal. In addition, current regulatory requirements and planning practices are helping to avoid or minimize the contribution of present and future actions to adverse cumulative effects for socioeconomic, natural, and historic resources.

5. REFERENCES

Arlington County, Virginia (2016). Arlington Projects and Planning. Retrieved from https://projects.arlingtonva.us/private-development/.

Arlington County, Virginia. (2016). Comprehensive Plan. Retrieved from https://projects.arlingtonva.us/plans-studies/comprehensive-plan/.

City of Alexandria (2002). City of Alexandria Recreation, Parks, and Cultural Activities Strategic Master Plan. 90 pp. plus appendices.

City of Alexandria (2016). Alexandria Active Development Projects, Retrieved from https://www.alexandriava.gov/planning/info/default.aspx?id=84782.

City of Alexandria. (2016). Alexandria Master Plan & Citywide Chapters. Retrieved from https://www.alexandriava.gov/planning/info/?id=44614

Council on Environmental Quality (CEQ). (1981). Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. Retrieved from http://energy.gov/sites/prod/files/G-CEQ-40Questions.pdf

Environmental Protection Agency (EPA) 1999. Consideration of Cumulative Impacts in EPA Review of NEPA Documents. Retrieved from https://www.epa.gov/sites/production/files/2014-08/documents/cumulative.pdf

Fairfax County, Virginia. (2015). Fairfax County Comprehensive Plan 2013 Edition (as amended). Retrieved from http://www.fairfaxcounty.gov/dpz/comprehensiveplan/.

Fairfax County, Virginia (2016). Fairfax County Improvement Program. Retrieved from http://www.fairfaxcounty.gov/dmb/advertised/fy2007/fy07_advertised_cip.html.

Fairfax County Park Authority (2014). Natural Resource Management Plan. County of Fairfax, 19 pp.

Federal Highway Administration (FHWA) (2014). Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process.

Kozel, Scott M. (2005) Roads to the Future. Retrieved from http://www.roadstothefuture.com/Shirley_Highway.html

Metropolitan Washington Airports Authority (2016). Reagan National. Retrieved from http://www.flyreagan.com/dca/reagan-national-airport.

Nationwide Environmental Title Research, LLC (2016). Retrieved from http://www.historicaerials.com.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: July 7, 2016).

North Carolina Department of Transportation (NCDOT). (2001). Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina. Raleigh, North Carolina: State

of North Carolina Department of Transportation/Department of Environment and Natural Resources. Retrieved from https://connect.ncdot.gov/resources/environmental/compliance%20guides%20and%20procedures/volume%2001%20assessment%20guidance%20policy%20report.pdf.

Roads to the Future (2005). Henry G. Shirley Memorial Highway. Retrieved from http://www.roadstothefuture.com/Shirley_Highway.html.

Transportation Research Board (TRB). (2002). *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects.* NCHRP Report 466. National Cooperative Highway Research Program. Washington, DC.

United States Census Bureau (Census). (2014). 2010-2014 American Community Survey, Various Tables. Washington, DC: U.S. Department of Commerce.

United States Department of Defense (2014). Pentagon Reservation Master Plan Update. Retrieved from https://www.ncpc.gov/files/projects/Pentagon_Reservation_Master_Plan_Project_Design_MP174_Jan2015.pdf.

United States Geological Survey (2016). USGS Historical Topographic Map Explorer. Retrieved from http://historicalmaps.arcgis.com/usgs/.

Virginia Department of Environmental Quality Office of Watershed Protection and Virginia Institute of Marine Science. Online Wetland Condition Assessment Tool (WetCAT), http://cmap.vims.edu/WetlandViewer/Virginia/WetCAT_VA.html, accessed July 6, 2016.

Virginia Department of Environmental Quality, Virginia Department of Conservation and Recreation, and Virginia Department of Health (2014). Virginia Water Quality Assessment Final 2014 305(b)/303(d) Integrated Report. 2014. 293 pp. plus appendices.

Virginia Employment Commission - Virginia Labor Market Information (LMI). (2016). Community Profiles: Alexandria City. Richmond, VA: Department of Labor and Industry.

Virginia Employment Commission - Virginia Labor Market Information (LMI). (2016). Community Profiles: Arlington County. Richmond, VA: Department of Labor and Industry.

Virginia Employment Commission - Virginia Labor Market Information (LMI). (2016). Community Profiles: Fairfax County. Richmond, VA: Department of Labor and Industry.

Weldon Cooper Center for Public Service (2016). Virginia Population Data. Retrieved from http://www.coopercenter.org/demographics/population-data.

Zell, Greg (2010). Natural Resources Management Plan of Arlington County. Department of Parks, Recreation, and Cultural Resources. Arlington County, Virginia. 46 pp.

Zell, Greg (2011). Wildlife of Arlington – A Natural Heritage Resource Inventory Technical Report. Department of Parks, Recreation, and Cultural Resources. Arlington County, Virginia. 111 pp.

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