ROUTE 7
WIDENING
FAIRFAX COUNTY
INDIRECT AND CUMULATIVE TECHNICAL REPORT

NOVEMBER 2017

VDOT

U.S. Department of Transportation
Federal Highway Administration

7 ROUTE 7 CORRIDOR IMPROVEMENTS VDOT

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Route 7 Corridor Improvements

Reston Avenue to Jarrett Valley Drive

Indirect and Cumulative Effects Technical Report

Fairfax County, Virginia
Project Number: 0007-029-128, B610, C502, P102, R202; UPC 52328
Federal Project Number: DEMO-5A01(439)

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List of Acronyms

AASHTO	American Association of State Highway Transportation Officials
ACS	American Community Survey
APE	Area of Potential Effect
CBC	Community Business Centers
CBPA	Chesapeake Bay Preservation Act
CCB	Center for Conservation Biology
CEQ	Council on Environmental Quality
CLRP	Constrained Long-Range Transportation Plan
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCDOT	Fairfax County Department of Transportation
FCPA	Fairfax County Park Authority
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FY	Fiscal year
HHS	Department of Health and Human Services
HOA	Homeowner Association
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IPaC	Information for Planning and Consultation
LRTP	Long Range Transportation Plan
MWCOG	Metropolitan Washington Council of Governments
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NCRTPB	National Capital Region Transportation Planning Board
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NLEB	Northern Long-eared Bat

NRHP	National Register of Historic Places
NVTA	Northern Virginia Transportation Authority
NWF	National Wildlife Federation
NWI	National Wetland Inventory
PCB	Polychlorinated Biphenyl
PH	Public Hearing
PIM	Public Information Meeting
PWS	Public Water Supply
RMA	Resource Management Area
RPA	Resource Protection Area
SYIP	Six Year Improvement Program
TAZ	Transportation Analysis Zone
TIP	Transportation Improvement Plan
TMDL	Total maximum daily load
TPP	Transportation Project Priorities
TRB	Transportation Research Board
TSA	Transit Station Area
TSP	Transit Signal Priority
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VAC	Virginia Administrative Code
VaFWIS	Virginia Fish and Wildlife Information Service
VaNWBD	Virginia National Watershed Boundary Dataset
V-CRIS	Virginia Cultural Resource Information System
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
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VLR	Virginia Landmarks Register
WERMS	Wildlife Environmental Review Map Service
WMATA	Washington Metro Area Transit Authority
WNS	White-Nose Syndrome

1.0 INTRODUCTION

1.1 Project Description

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), is evaluating improvements along a seven mile section of Leesburg Pike (Route 7) between Reston Avenue and Jarrett Valley Drive in Fairfax County, Virginia (herein referenced as "the study area"). The purpose of these improvements under consideration is to increase capacity, as well as address safety and deficiencies in access management. 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 transportation improvements being considered. As part of the EA, VDOT is evaluating the environmental consequences of the No Build Alternative and one Build Alternative.

To support the analysis in the EA, this Indirect and Cumulative Effects Technical Report has been prepared to document the following:

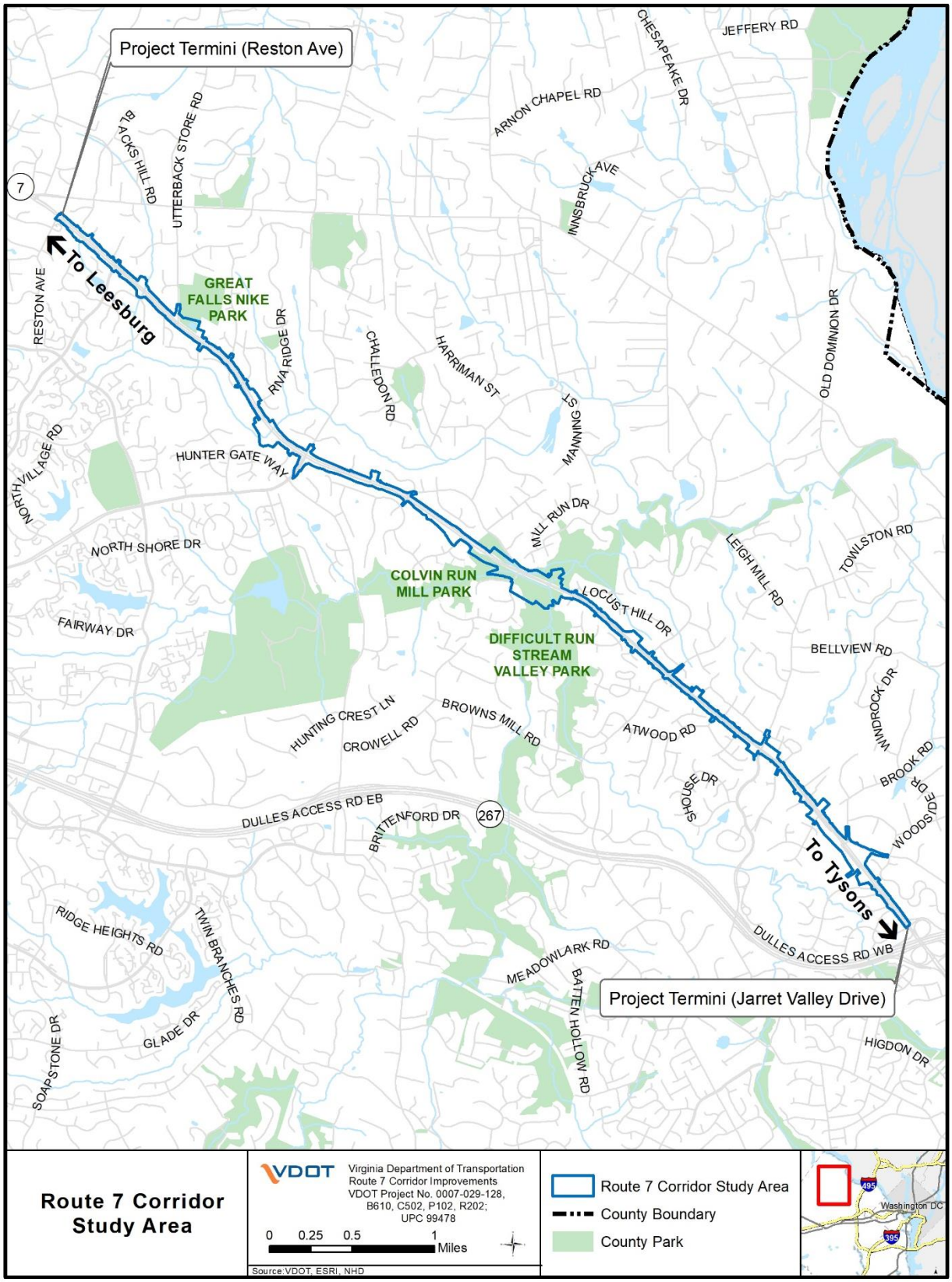
- **Section 1** provides an overview of the study, purpose and need of project, and alternatives;
- **Section 2** summarizes the methods used to identify and evaluate Indirect and Cumulative Effects (ICE) resources for the project;
- **Section 3** summarizes the analysis for indirect effects;
- **Section 4** summarizes the cumulative effects; and,
- **Section 5** provides the references used within the Technical Report.

The proposed roadway improvements would provide an additional lane in each direction and would widen to the inside median where possible. A raised median, multi-purpose trail, and intersection improvements are also proposed. A bridge replacement is proposed for the Difficult Run stream crossing with the wider typical section. The study area is bounded by Reston Avenue to the west and Dulles Toll Road to the east (see **Figure 1-1**).

1.2 Project History

The widening of the Route 7 corridor from four to six lanes west of Tysons Corner to the Fairfax County line has been contemplated in Fairfax County's Comprehensive Plan since 1975. The Fairfax County Parkway (Route 286) interchange at Route 7 was completed in 1999 and included the widening of Route 7 between the Loudoun and Fairfax County line to Rolling Holly Drive. In 2016, a one-mile section of Route 7 was widened between Rolling Holly Drive and Reston Avenue. Currently VDOT is widening Route 7 for a half of a mile between Jarrett Valley Drive and Tyco Road, which includes the replacement of the bridge deck over Dulles Airport Access Highway and Toll Road (Route 267) with construction expected to be completed in Spring 2018.

Figure 1-1: Study Area



Currently, the widening of this section of Route 7 from four to six lanes is included in Fairfax County's Comprehensive Plan 2013 Edition (as amended) for Transportation (Fairfax County, 2017c). The County's interest in improving safety and capacity along Route 7 is also documented in the County's *Third Four Year Transportation Program (FY2013-FY2016)* and the *FY2015-FY2020 Transportation Project Priorities (TPP)* (Fairfax County 2014c and 2014d). This project has long been a part of the Metropolitan Washington Council of Governments (MWCOG) (the Region's Metropolitan Planning Organization) *Constrained Long Range Plan (CLRP)* and the *Transportation Improvement Plan (TIP)* (MWCOG, 2016b and 2016c). In addition to being included in this regional plan, the Northern Virginia Transportation Authority's regional transportation plan entitled *TransAction 2040* designates the Dulles/VA 7 corridor as their top corridor for improvements (NVTA, 2012). This project is also included in VDOT's *2025 State Highway Plan* (VDOT, 2005). This plan is included as part of the *2035 Virginia Surface Transportation Plan* Update (VDRPT, 2013).

1.3 Purpose and Need

The purpose and need for the proposed improvements is to:

- Address capacity deficiencies resulting from existing and future traffic demand.
- Address access management deficiencies.

1.4 Alternatives

1.4.1 No Build Alternative

The No Build Alternative would retain the existing Route 7 roadway and associated intersections/interchanges in their present configuration, and allow for routine maintenance and safety upgrades. This alternative assumes no major improvements to the Route 7 corridor with the exception of previously committed projects, including projects currently programmed and funded in VDOT Fiscal Year (FY) 2018-2023 Six-Year Improvement Program (SYIP), the MWCOG for the National Capital Region CLRP 2016, and Fairfax County Department of Transportation (FCDOT) Capital Projects. As these other projects are independent of the proposed action, they are not fully evaluated in this EA.

1.4.2 Build Alternative

The proposed project would provide an additional lane on each side of the existing roadway for a total of six 11-foot lanes with curb and gutter divided with a 16-foot raised median. Turn lane lengths would also be improved to meet the full American Association of State Highway Transportation Officials (AASHTO) requirements for deceleration and storage to eliminate backups into through lanes. Unsignalized median crossovers not meeting signal warrants would either be closed or converted to median left turn lanes.

In addition, the following improvements are proposed for the corridor:

- There are a number of substandard vertical curves that do not meet the required lengths for stopping sight distance and the roadway's design speed; substandard vertical curves would be corrected to meet the required design speeds;

- Intersection sight distance at the Trap Road/Route 7 intersection is substandard; the Build Alternative would configure the intersection to a right in/right out from the existing full access intersection to prohibit unsafe traffic movements;
- The Utterback Store Road intersection with Route 7 would be reconfigured to eliminate the existing severe skew;
- The project would replace the existing bridge over Difficult Run with a new structure to eliminate flooding issues experienced with the existing structure;
- 10-foot wide shared use paths would be provided along the westbound and eastbound lanes creating a continuous pedestrian route for the entire corridor; and,
- Protected signalized pedestrian movements would be provided at all signalized intersections.

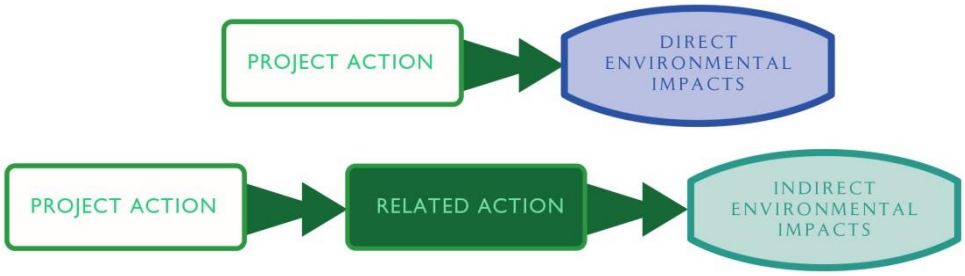
2.0 METHODOLOGY

2.1 Regulatory Context

The National Environmental Policy Agency (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). In addition to CEQ's regulations, an indirect and cumulative effects assessment is conducted in accordance with the requirements and processes outlined in 23 CFR Part 771, Federal Highway Administration Interim Guidance: Indirect and Cumulative Impacts in NEPA (2003), FHWA Position Paper on Secondary and Cumulative Impact Assessment (1992), FHWA's Questions and Answers on Considering Indirect and Cumulative Impacts in the NEPA Process (2014), the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Report 466: Desk Reference for Estimating the Indirect Effect of Proposed Transportation Projects (TRB, 2002), NCHRP Project 25-25 Task 22: Land Use Forecasting for Indirect Impacts Analysis (TRB, 2007), NCHRP Project 25-25 Task 11: Secondary/Indirect and Cumulative Effects Analysis (TRB, 2006), as well as CEQ's Considering Cumulative Effects under the National Environmental Policy Act (1997) and Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (2005).

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(b)). 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(b)). 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**.

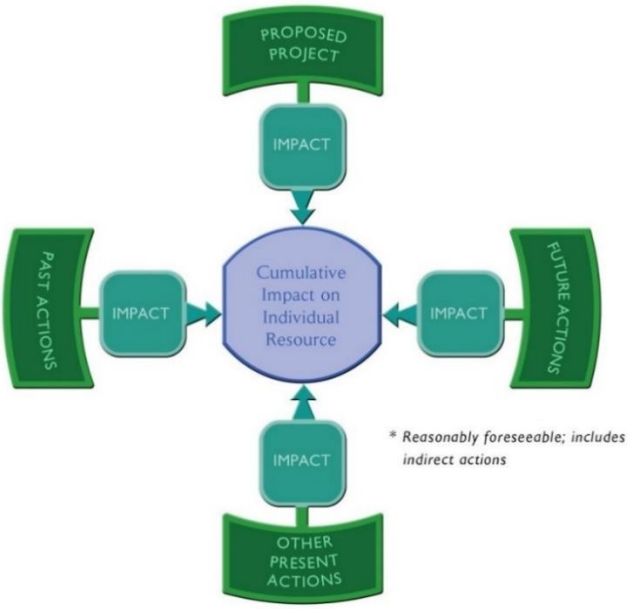
Figure 2-1: Direct vs. Indirect Environmental Impact



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, 1997; 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 1.4**. For the purposes of this Technical Report, the methodology followed for analyzing indirect effects is prescribed in the TRB 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 in an advanced land use progression and is therefore likely to experience more infill development rather than urban sprawl / suburban sprawl.

Based on these principles, 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 the analysis, and considers 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 Proposed 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. The NCHRP 25-25 program, Task 22, *Forecasting Indirect Land Use Effects on Transportation Projects*, documents means of applying planning judgement to indirect and cumulative effects analysis (TRB, 2007). The direction provided in the TRB document is the basis for the indirect effects analyses presented in this Technical Report. Each of the steps for the indirect effects evaluation process is discussed in **Section 3** of 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.

3.0 INDIRECT EFFECTS 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 were reviewed, including Fairfax County's Comprehensive Plan, Transportation Plan Map and the Concept for Future Development Map, and the National Capital Region Transportation Planning Board (NCRTPB) / MWCOG Regional Transportation Priorities Plan for the National Capital Region (Fairfax County, 2014b, 2015a, 2017c; NCRTPB/MWCOG, 2012). 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 consulted with 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.

- US Army Corps of Engineers
- US Fish and Wildlife Service
- US Department of Agriculture, Natural Resources Conservation Service
- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality – Air, Water and Waste Divisions
- Virginia Department of Forestry
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Health
- Virginia Department of Historic Resources
- Virginia Marine Resources Commission
- Virginia Outdoors Foundation
- Fairfax County Department of Health
- McLean Bible Church, Tysons Campus
- Fairfax County Department of Housing and Community Development
- Fairfax County Department of Transportation
- Fairfax County Economic Development Authority
- Fairfax County Fire and Rescue Department
- Fairfax County Local Bay Act Coordinator
- Fairfax County Park Authority
- Fairfax County Public Schools
- Fairfax County Water Authority
- Northern Virginia Soil and Water Conservation District
- Bethel Washington Primitive Baptist Church
- Providence Baptist Church

In addition to the scoping efforts, VDOT has provided multiple opportunities throughout the development of the project for public involvement, including five (5) Public Information Meetings (PIM) and one (1) Design Public Hearing (PH) to provide an opportunity for any person, organization, or agency to express their concerns related to the proposed project and provide input in the development of the project. The PIM meetings were held June 16, 2016, September 24, 2015, June 24, 2014, November 6, 2013, and November 28, 2012. The Design PH was held on November 15, 2016. VDOT also met with local homeowner associations (HOAs), providing project information, updates, and an opportunity for the HOAs to express their concerns related to the proposed project.

The information obtained through these efforts was used to further define the direction and goals of the region, as well as the resources included in the study area. Additional details on the scoping process and responses can be found in the Revised EA, **Section 4.0 Coordination and Comments**.

3.2 Step 2: Identify Study Area Direction and Goals

The second step in the indirect effects analysis focuses on establishing resource specific study areas and assembling information about general trends and goals within these areas.

3.2.1 Study Area

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 neighborhoods, community facilities, and environmental justice (EJ) populations. As no new access is proposed and the Route 7 corridor is developed with the remaining land protected as parkland or within the Resource Protection Area (RPA), discussed in **Section 3.2.2.5 – Natural Resources Protection/Ecosystems**, that would prevent further development, the Socioeconomic Resources ICE Study Area used for the analysis is the same as the direct effects study area (see **Figure 3-1**). The socioeconomic analysis includes Census block groups that intersect the environmental study corridor.
- **Natural Resources:** This study area was established to analyze indirect effects to waters, wetlands, and water quality; floodplains; wildlife habitat; and threatened, endangered, and special status species. The Natural Resources ICE Study Area is the 12-digit Virginia National Watershed Boundary Dataset (VaNWBD) subwatershed hydrologic unit code (HUC) that encompasses the project study area boundary (HUC 02070008004 – Difficult Run) (see **Figure 3-2**). The Natural Resources ICE Study Area is larger than the project study area to account for any upstream influences and / or any downstream effects that may occur as a result of the proposed project.
- **Historic Resources:** This study area was established to analyze indirect effects to historic resources, such as accessibility during construction and changes to visitation. The Historic Resources ICE Study Area is the Area of Potential Effect (APE) as defined for the undertaking (see **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 reported in the Supplemental Cultural Resources Survey and the Supplemental Architectural Survey (VDOT, 2016b and 2016c). Indirect effects analyzed in this ICE document are those related to potential changes in access and induced growth.

3.2.2 Directions and Goals

The directions and goals considered for the analysis are independent of the transportation alternatives being evaluated in the Revised 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.

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.

Figure 3-1: Socioeconomic Resources ICE Study Area

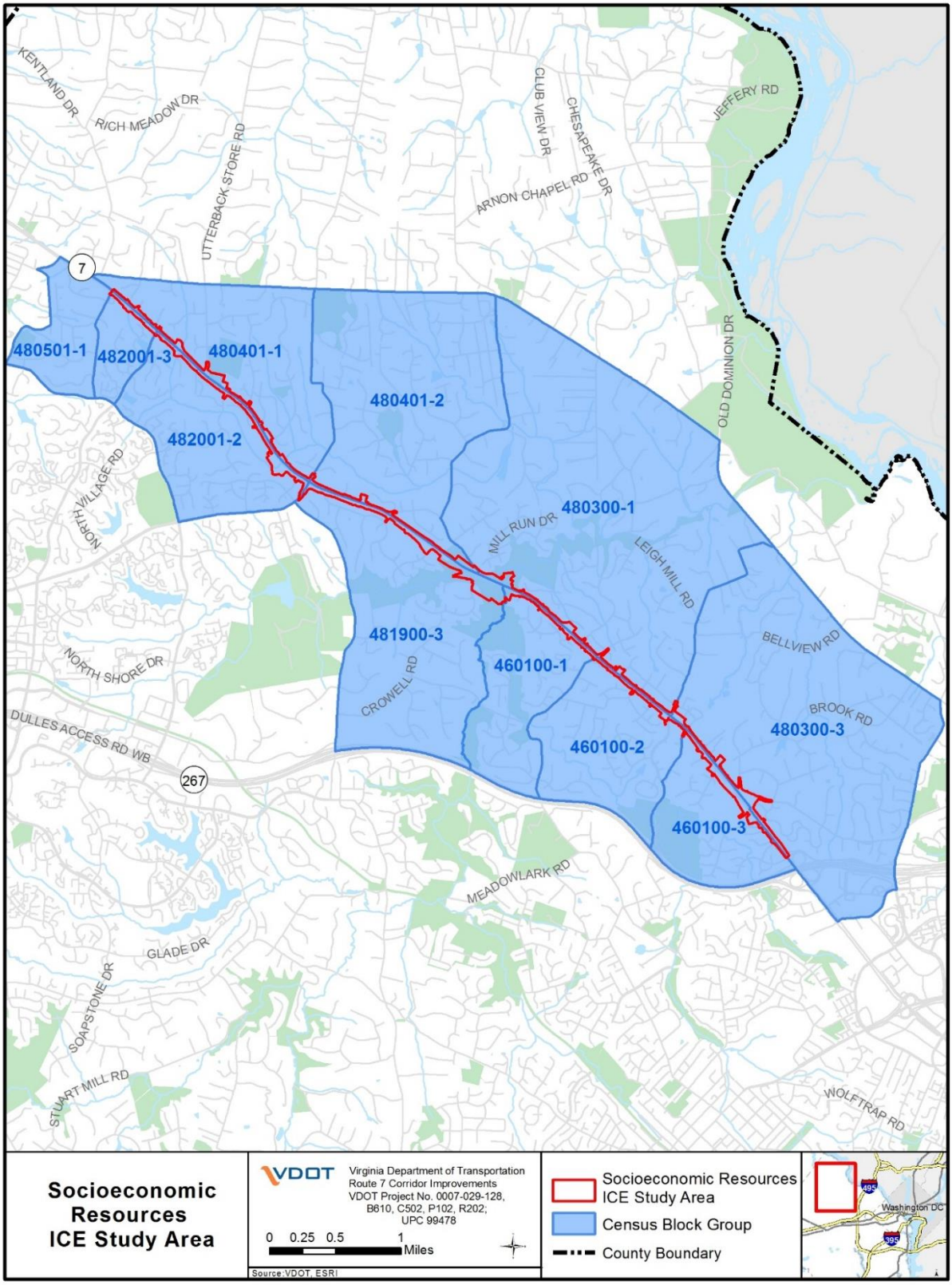


Figure 3-2: Natural Resources ICE Study Area

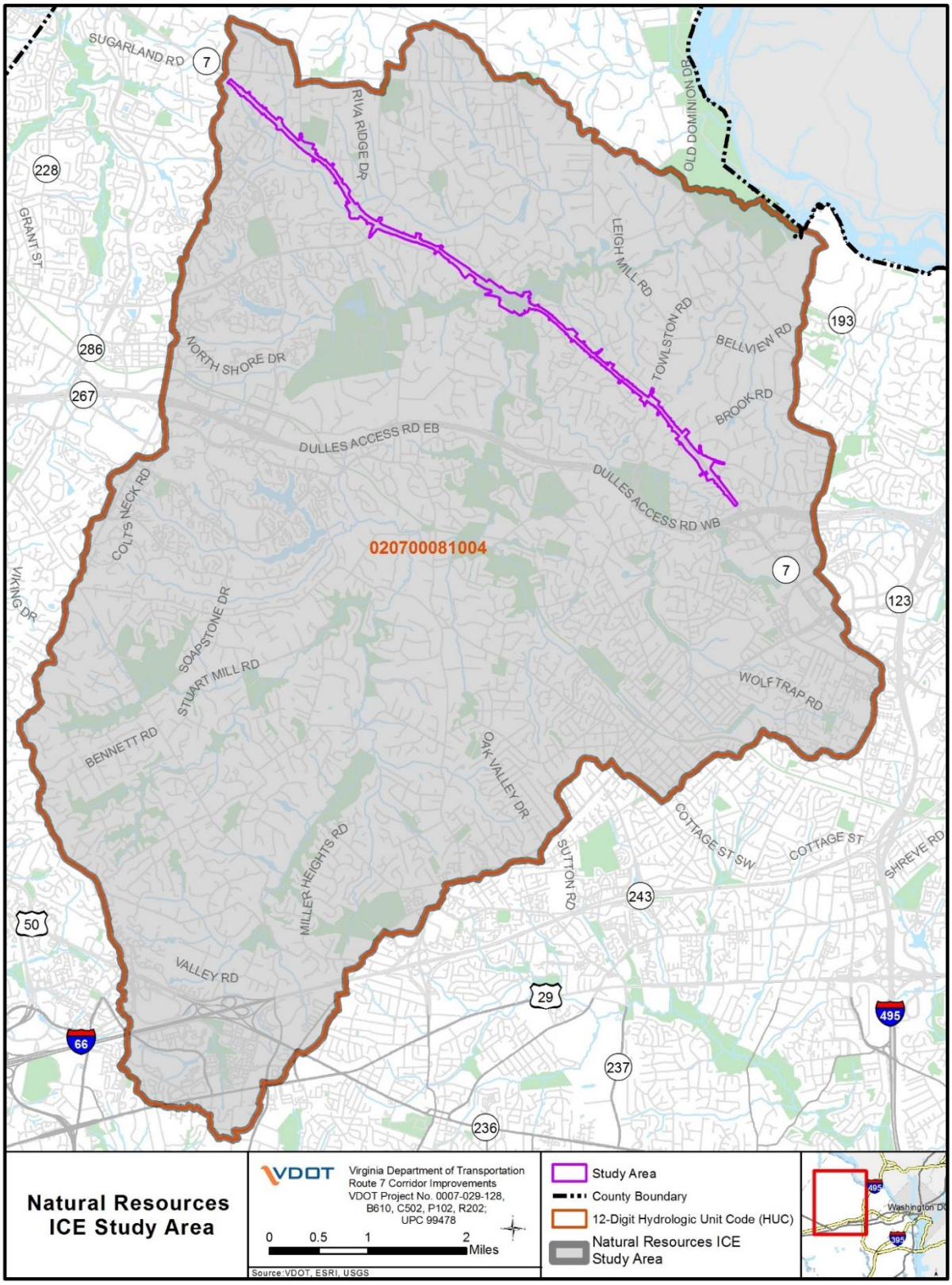
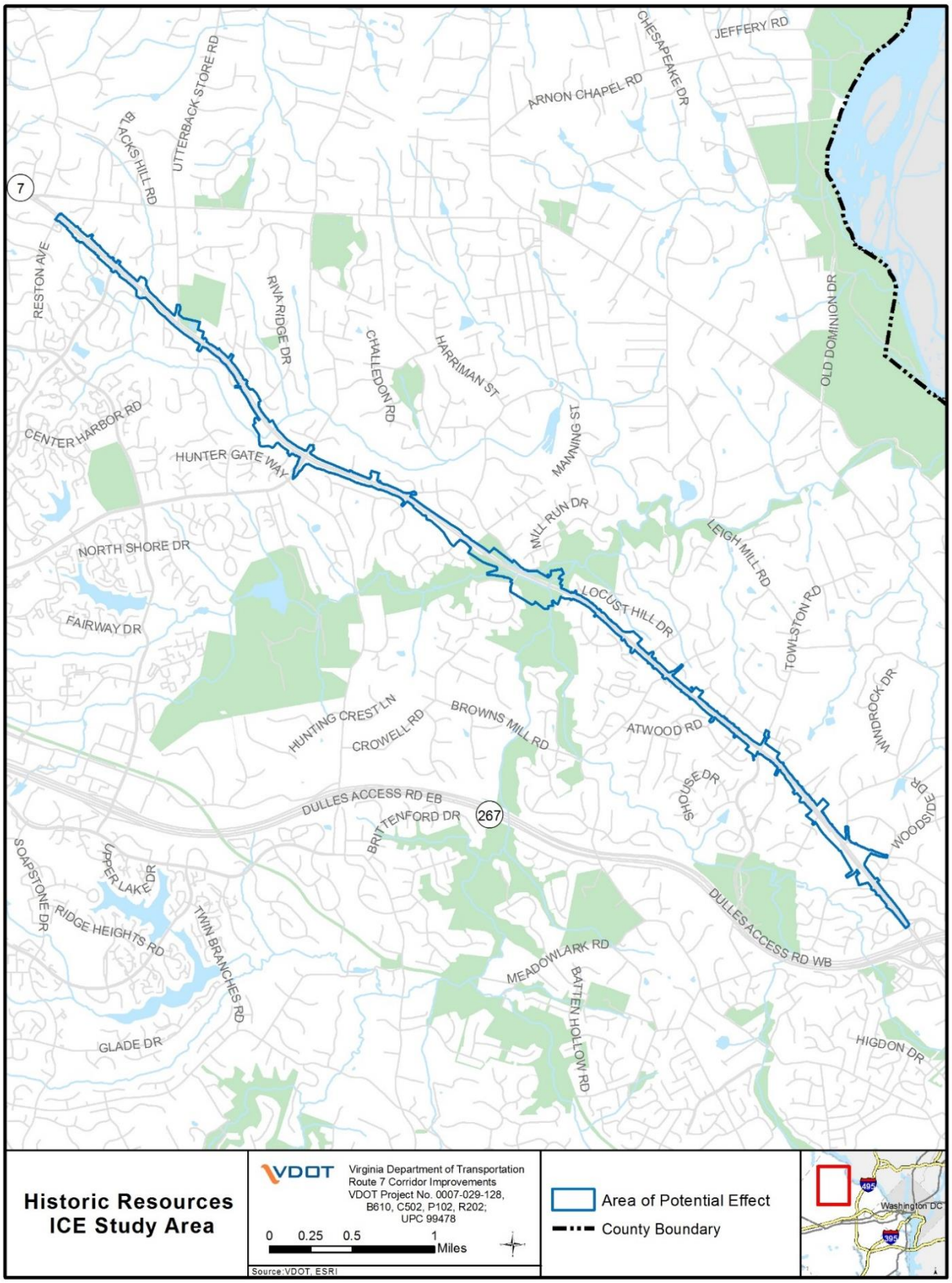


Figure 3-3: Historic Resources ICE Study Area



3.2.2.1 Historic Land Use

Route 7, also known as Leesburg Pike within Fairfax County, is a major commuter roadway in northern Virginia. In 1933, several roadways were renumbered to identify the 71-mile route between Winchester, Virginia and Alexandria, Virginia as Route 7. Although widening of sections of the roadway began in 1954, the section within the Socioeconomic Resources ICE Study Area was not widened until 1969.

Following the end of World War II, the population and the economy expanded. Land use changed beginning westward from the City of Falls Church from agricultural to tract housing and retail shopping. This was due largely to growth of federal government employment in the region, migration to the suburbs, and growth in commercial, industrial, educational, and medical facilities to serve the growing population. The Henry G. Shirley Memorial Highway (I-395) was constructed around 1943, and the Capital Beltway (I-495) was constructed around 1961, both interstates increased accessibility and added to the growing infrastructure of northern Virginia. **Table 3-1** shows the population increase between 1940 and 2010. Fairfax County underwent a substantial population increase between 1940 and 1960, with population increasing more than six times over the 1940 population. This growth has continued, although at a slower pace than occurred between 1940 and 1960 (US Census, 2015j and 2017).

Table 3-1: Historic Populations

Locality	1940	1950	1960	1970	1980	1990	2000	2010
Fairfax County	40,929	98,557	275,002	454,275	569,901	818,584	969,749	1,086,743
10 Year Growth %	--	141%	179%	65%	31%	37%	19%	12%
Virginia	2,677,773	3,318,680	3,966,949	4,651,448	5,346,797	6,187,358	7,078,515	8,024,617
10 Year Growth %	--	24%	20%	18%	15%	16%	14%	13%

Source: US Census of Population and Housing (US Census, 2017), US Census 1980 - 2010 Total Population (US Census, 2015j).

A review of the United States Geological Survey (USGS) historic topographic maps from 1944 show development scattered along Route 7 (see **Appendix A**). Areas to the north are similarly developed, while areas to the south are more developed along the roadway, with centers developed near the station stops of the Washington and Old Dominion railroad in Vienna and Herndon. The areas in between the roadways are generally depicted as natural areas such as brush or forest land.

The density increased slowly through the 1950s and 1960s with development starting in the southern end of the study area in 1966, in the vicinity of Andrew Chapel, New Bethel Church, and Woodside Lake, as well as by Lake Anne and Lake Fairfax to the south of the study area. Further east and south of the study area, Vienna continued to develop into a central area, and new areas identified as Tysons Green and McClean Hamlet started developing. Similar to the 1944 map, the areas not under development remain designated as forest/brush.

In 1962, the Washington Dulles International Airport and the accompanying Dulles Access Road were opened, providing access between the airport and I-495. As seen in the historic topographic maps from 1965, residential development expanded within the study area, with substantial increases visible along Brook Road and Lewisville Road, and around Lake Anne. Additionally, the area outside of Vienna started developing residential neighborhoods, replacing areas formerly designated as forested/shrub areas.

Historic topographic maps from 1971 show increasing development along the arterial roads, as well as the addition of large residential neighborhoods being constructed off Baron Cameron Avenue, the newly constructed Towlston Road (Route 676), and a large recreational area – Wolf Trap Farm Park. Additionally, the Route 7 alignment was straightened in the vicinity of what is now known as Colvin Run Road, displacing several buildings that were located within the new Route 7 alignment. Construction of large neighborhoods continued through the 1980s, first along the eastern end of the corridor, as well as to the area between Route 7 and Georgetown Pike. Then in 1990, development expanded west of Baron Cameron Avenue between Route 7 and the Dulles Access Road. The majority of the area outside of Vienna and Reston, especially along the Dulles Access Road, was identified as developed, primarily in a neighborhood residential pattern, with forested areas only located in the vicinity of the stream valleys.

In response to continued development in the area, VDOT constructed the Dulles Toll Road within the median of the Dulles Access Road in 1984 to serve commuters. The Dulles Greenway was an additional toll road added to the system in 1995 to allow for improved airport access and additional commuters from the northwest.

Google Earth aerial imagery from 2005 depicts heavy residential development along Route 7 and in the areas surrounding Route 7, aside from the natural areas in the vicinity of the stream valleys (Google Earth, 2005). The areas around the Dulles Toll Road interchange are fully developed into residential areas. The present day Middleton Ridge Road development can be seen, as well as substantial development north and south of Route 7 at the western end of the study area. Forested areas are identified along the stream corridors in the lower density areas between Reston, Tysons Corner, and Vienna. While there is slightly more development in present day aerial images, development within the study area and in the surrounding area has not substantially changed since 2005.

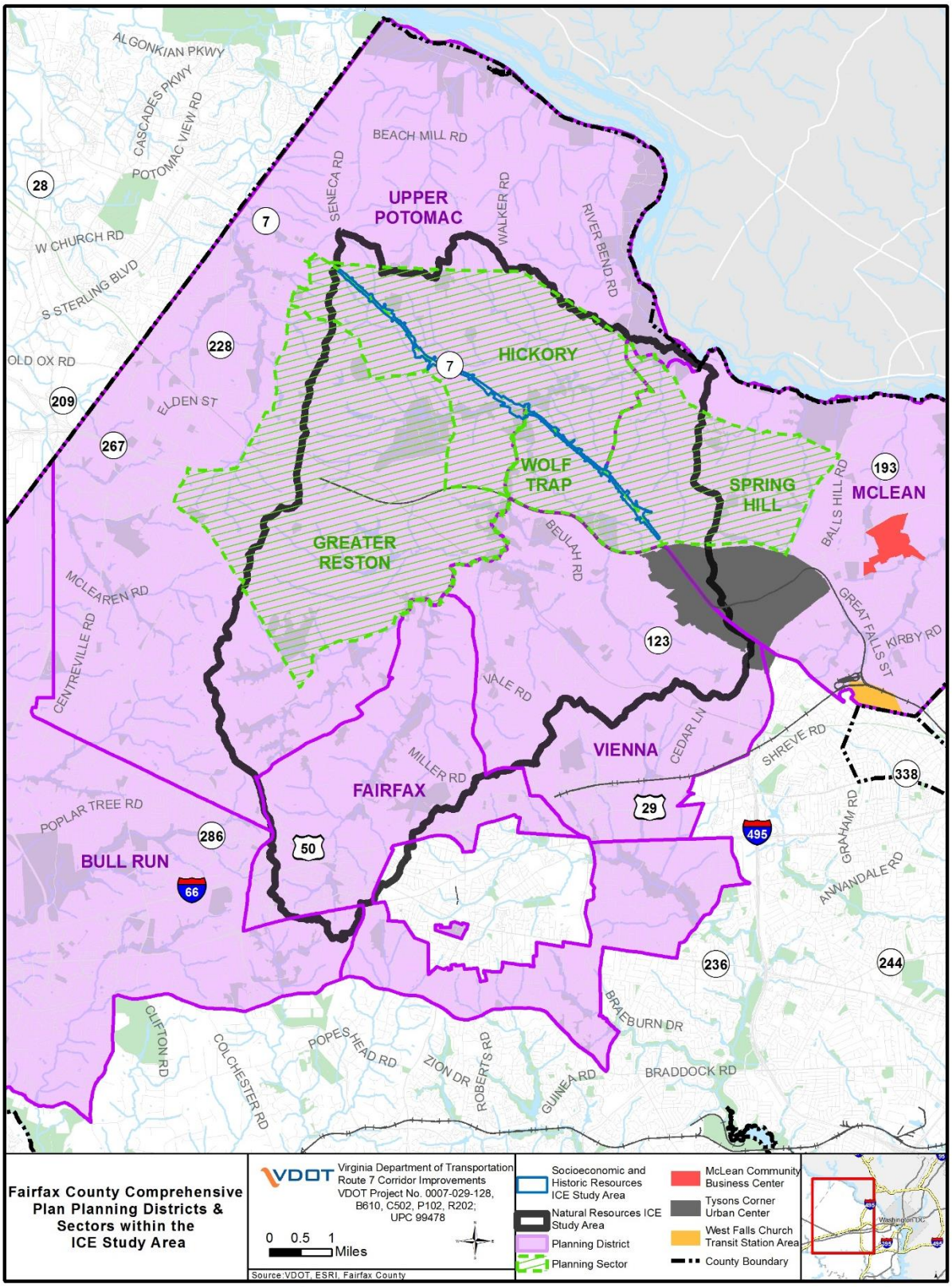
3.2.2.2 Land Use Patterns and Local Plans

The following section describes the local plans that guide the future changes to land use patterns and other development within the ICE Study Areas.

The study area is in northeastern Fairfax County. The *Fairfax County Comprehensive Plan* divides the county into four primary planning areas, with further subdivisions into districts and sectors. The eastern portion of the study area is located within the McLean Planning District and the western portion is located within the Upper Potomac Planning District (see **Figure 3-4**). The Planning Districts contain site-specific guidance that implement the countywide Policy Plan, which includes the Fairfax County Concept for Future Development. Planning sectors contain guidance on the specific uses, ranges of residential density or land use intensity, as well as alternative or optional uses for certain tracts of land in the sector.

The McLean Planning District is generally bordered by Difficult Run, Route 7, Towlston Road, and Old Dominion Drive to the west, the Dulles Airport Access Road/Dulles Toll Road and Route 7 to the southwest, Arlington County and the City of Falls Church to the southeast, and the Potomac River to the north (Fairfax County, 2017). The District contains the Tysons Urban Center, McLean Community Business Center (CBC), and West Falls Church Transit Station Area (TSA). The study area is located to the west of the Tysons Urban Center in the Spring Hill and Wolf Trap Planning Sectors.

Figure 3-4: Fairfax County Comprehensive Plan Planning Districts and Sectors within ICE Study Area



The land use within these sectors is primarily low-density, suburban neighborhoods/low-density residential, large tracts of parkland and institutional uses, with few commercial areas. Route 7 forms the boundary between the planning sectors.

The Upper Potomac Planning District is generally bordered by Difficult Run and Towlston Road to the east, the Potomac River to the north, Loudon County and Washington Dulles Airport to the west, and Lee Jackson Memorial Highway to the south. The District contains a wide variety of land uses and concentrations of development ranging from low-density residential development in the north of the District to urbanized areas near the transit station areas and Washington Dulles Airport. The study area runs through the Hickory and Greater Reston communities. The Hickory community predominately has low-density residential development and large tracts of parkland. While the Greater Reston area has a variety of densities, the northern area adjacent to Route 7 is designated as low density residential. The density increases moving south through the District, with medium density residential located further south of Route 7 (Fairfax County, 2017e).

Plans for the Upper Potomac and McLean Planning District both include maintaining solely residential development along the Route 7 corridor. The plans note that any infill development should be of compatible use, type and intensity to existing uses, typically 1-2 units per acre, or clustered development bordered by open space, especially along Route 7 to provide a buffer between residences and the roadway. The plans recommend ensuring the protection of the stream valleys designated as Environmental Quality Corridors, public access to stream valley parks, and completion of countywide stream valley trails through acquisition or easements of privately owned properties. The plans also recommend improvements to the County's trails system. The trails system is intended to provide both transportation and recreation benefits supporting pedestrian, bicycle, and equestrian uses (Fairfax County, 2017d and 2017e). New portions of the trail system are developed through road improvement projects as well as site plan requirements associated with new development activity.

The larger Natural Resources ICE Study Area is also located in the Fairfax and Vienna Planning Districts, as well as a very small portion of the Bull Run Planning District and the City of Fairfax. The Fairfax Planning District surrounds the City of Fairfax and contains many mixed use centers. Outside of these centers, the area is low density residential development, especially within the Difficult Run Watershed. The portion of the Vienna Planning District within the ICE Study Area contains the Town of Vienna, the Vienna TSA, and the Tysons Urban Center; however, areas outside of these centers are generally single-family neighborhoods, with many areas designated as low density residential areas. Objectives for the Fairfax Planning District and the Vienna Planning District are to preserve stable residential areas, recommending that infill development be of compatible character to existing uses, and to limit commercial encroachment into established residential neighborhoods.

The portion of the ICE Study Area within the Bull Run Planning District and the City of Fairfax is higher density apartment and townhouse complexes mixed with commercial areas and pockets of medium density residential. The Concept for Future Development for the Bull Run Planning District is to strengthen and enhance the existing pattern of development, while encouraging protection of the Occoquan Basin further west of the ICE Study Area. The City of Fairfax Comprehensive Plan Future Land Use Map identifies no change to the future land use for the area within the ICE Study Area.

The Comprehensive Plan states a need for development within Fairfax County to include more efficient travel in either the form of better public transportation or improved highway corridors. The Comprehensive

Plan notes that Fairfax County "should have a land use pattern which increases transportation efficiency, encourages transit use, and decreases automobile dependency" (Fairfax County, 2017c). Fairfax wishes to "concentrate most future development in mixed-use centers, transit station areas and areas of transportation advantage." 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 (Fairfax County, 2017c).

Fairfax County Department of Transportation's Countywide Bicycle Master Plan recommends improvements to the bicycle network within the County and particularly along Route 7. The vision of the Master Plan is "meeting the safety, access, and mobility needs of bicyclists today, while encouraging more people to bicycle in the future…making Fairfax County bicycle friendly and bicycle safe" (FCDOT, 2014). The County plan is in line with VDOT's State Bicycling Policy Plan which was developed to ensure that bicyclists are an integral component of Virginia's multimodal transportation system. The goals of the plan are to "increase the use of bicycling in Virginia to include a full and diverse range of the population for all trip purposes" and "improve safety and comfort of bicyclists throughout Virginia" (VDOT, 2011).

3.2.2.3 Future Population Projections

Although the US Census publishes historical employment, population, and household data, the US Census does not publish forecast data. However, the MWCOG and supporting jurisdictions and planning agencies work together to produce Cooperative Forecasts containing employment, population, and household projections by Transportation Analysis Zones (TAZ) in the Washington region. A series of forecasts constitutes a "Round"; Round 9.0 covers the time period from 2015 to 2045. There are 14 TAZs partially located within the study area boundary – 1715, 1716, 1717, 1718, 1719, 1720, 1721, 1830, 1834, 1889, 1890, 1891, 1892, and 1895.

The population increase for Fairfax County between 2015 and 2045, of seven to eight percent per decade, is lower than the historic trends identified in **Table 3-1**, likely due to the slowing of development in a highly developed area (see **Table 3-2**). The population projections for the TAZs that are within or partially within the Socioeconomic Resources ICE Study Area are much lower than the county's, with 1.1 to 1.7 percent per decade. Both Fairfax County and the Socioeconomic Resources ICE Study Area have an anticipated steady increase in population from 2015 to 2045 (MWCOG, 2016a).

Table 3-2: Future Population Forecasts

Geographic Area	2015	2025	2035	2045	Change from 2015 to 2045
TAZs located partially within Socioeconomic Resources ICE Study Area	22,311	22,564	22,943	23,282	971
10 Year Growth %	-	1.1%	1.7%	1.5%	4.4%
Fairfax County	1,125,400	1,213,200	1,314,300	1,406,700	281,300
10 Year Growth %	-	7%	8%	7%	25%

Source: MWCOG Cooperative Forecast-Round 9.0 (MWCOG, 2016a).

3.2.2.4 Economic Development and Employment

Washington, D.C., Montgomery County, MD, and Fairfax County, VA are predicted to add the largest number of new jobs to the region's employment base by 2045 (MWCOG, 2016a). Employment within Fairfax County is largely dependent on the Professional, Scientific, and Technical Services industry. According to the Virginia LMI, the Professional, Scientific, and Technical Services industry ranks as the largest industry in Fairfax County, employing more than 34 percent of the workforce in Fairfax County. The Administrative and Support and Waste Management and Remediation Services industry ranks as the second largest industry, with 11 percent. Unclassified industries and Information industries rank third and fourth within Fairfax County employment, respectively.

Table 3-3 shows the employment forecasts based upon the MWCOG TAZ data. The forecasted employment percentage change between 2015 and 2045 within the TAZs within the study area (17 percent) is much less than that of Fairfax County (37 percent).

Table 3-3: Employment Forecasts

Geographic Area	2015	2025	2035	2045	Change from 2015 to 2045
TAZs located partially within Socio-economic Resources ICE Study Area	3,871	4,364	4,408	4,516	645
10 Year Growth %	-	13%	1%	3%	17%
Fairfax County	654,100	749,300	827,800	898,100	244,000
10 Year Growth %	-	13%	9%	8%	37%

Source: MWCOG Cooperative Forecast-Round 9.0, (MWCOG, 2016a).

Within the vicinity of the study are several designated development centers, as designated by Fairfax County, including the Tysons Corner Urban Center, Reston and its associated TSAs, and the McLean Community Business Center (Fairfax County, 2017d and 2017e).

3.2.2.5 Natural Resources Protection/Ecosystems

The Natural Resources ICE Study Area underwent a period of rapid urban development from the 1970s to the 1990s, resulting in the loss of the majority of the natural ecosystems that were historically present (see **Section 3.2.2.1 - Historic Land Use**) (Fairfax County Park Authority, 2014). 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 US Environmental Protection Agency (EPA), US 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 RPAs and Resource Management Areas (RMAs). In Virginia, administration and enforcement of the CBPA is carried out by the individual localities subject to the CBPA. In the Natural Resources ICE Study Area, the CBPA is enforced by Fairfax County and the City of Fairfax. RPAs within these two localities are defined by slightly different criteria and generally

include a 100-foot buffer off of certain wetlands and streams and coincide with portions of or all of the 100-year floodplain and certain wetlands associated with the 100-year floodplain. Generally, development within the RPA is limited to water dependent activities (e.g., stormwater management facilities, sanitary sewer gravity lines, etc.), redevelopment of existing developed areas (e.g., development within the footprint of an existing structure or impervious surface), and linear transportation and utility projects. Historically, Fairfax County and the City of Fairfax have strictly enforced their respective Chesapeake Bay Preservation Ordinances and have not generally allowed residential or commercial development within the RPAs.

RMAs include any area not designated as an RPA. Development within the RMA is generally less restrictive; however, coordination with the County or City is still required prior to development.

A substantial portion of the wildlife habitat in the Natural Resources ICE Study Area lies within the stream corridors and their floodplains; therefore, 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 federal or state endangered species laws. The majority of remaining natural areas within the Natural Resources ICE Study Area are located within County-owned parks. Conservation management and protection of the County-owned parks are guided by the Fairfax County Park Authority Natural Resources Management Plan. The plan is structured to support several guiding principles that will inform all aspects of natural resource management on parkland:

- Stewardship of natural capital;
- Preserve biodiversity and sustain wild and healthy ecosystems;
- Protect, restore, and expand ecosystem services;
- Manage resources adaptively and learn through experience; and
- Preserve a legacy of natural heritage for present and future generations.

Although RPA and County-owned parks provide habitat, the current habitat has been severely fragmented by roads and development and has been degraded in overall ecological functionality compared to historic conditions.

3.3 Step 3: Inventory of Sensitive Resources in the Study Area

3.3.1 Socioeconomic Resources

Socioeconomic resources such as neighborhood cohesion, community facilities, and EJ populations are considered valuable and/or unique and may be less able to bear impacts from a transportation improvement. The resources contribute to Fairfax County's Department of Neighborhood and Community Service's goal of bringing "people and resources together to strengthen the well-being of individuals and communities" (Fairfax County, 2015b).

3.3.1.1 Neighborhoods

There are multiple neighborhoods located within or directly adjacent to the study area (see **Figure 3-5**). The majority of the neighborhoods are low-density residential surrounded by adjacent open space buffering/dividing the residential areas. Route 7 acts as a dividing line between neighborhoods to the south and north of the roadway; although there are several intersections along Route 7 where the roadway can be crossed by motor vehicles, bicycles and pedestrians to connect with other neighborhoods.

The areas outside of the immediate study area are primarily low-density residential development mixed with suburban neighborhoods.

3.3.1.2 Community Facilities

Community facilities that would be considered sensitive and/or unique include cemeteries, fire stations, parks, non-profit facilities, schools, religious facilities, and trails (see **Figure 3-6** and **Table 3-4**). Community facilities in the Socioeconomic Resources ICE Study Area were identified through a review of data provided by local agencies, mapping sources, and desktop searches.

Table 3-4: Community Facilities

Map ID	Facility Type	Facility
1	Chesterbrook Academy Preschool	Private School
2	Colvin Run Mill Park	Public Park
3	North Point Fire Station	Fire Station
4	St Athanasius Roman Catholic Church	Religious Facility
5	Wolftrap Fire Station	Fire Station
6	Jills House	Non-Profit Facility
7	Gerry Connolly Fairfax Cross-County Trail through Colvin Run Mill Park	Trail
8	Difficult Run Stream Valley Park	Public Park
9	MTO Shahmaghsoudi School Of Islamic Sufism	Private School
10	St Thomas Episcopal Church & McLean Preschool	Religious Facility/School
11	Bethel Baptist Church	Religious Facility
12	Andrew Chapel Cemetery Association	Cemetery
13	Providence Baptist Church	Religious Facility
14	The Eastern Ridge School	Private School
15	Capital Church	Religious Facility
16	Mclean Bible Church	Religious Facility
17	Mclean Islamic Center	Religious Facility
18	Great Falls Nike Park	Public Park
19	Route 7 Bike Trail	Trail

Source: Fairfax County, VA GIS, accessed July, 2017.

Figure 3-5: Neighborhoods within the Socioeconomic Resources ICE Study Area

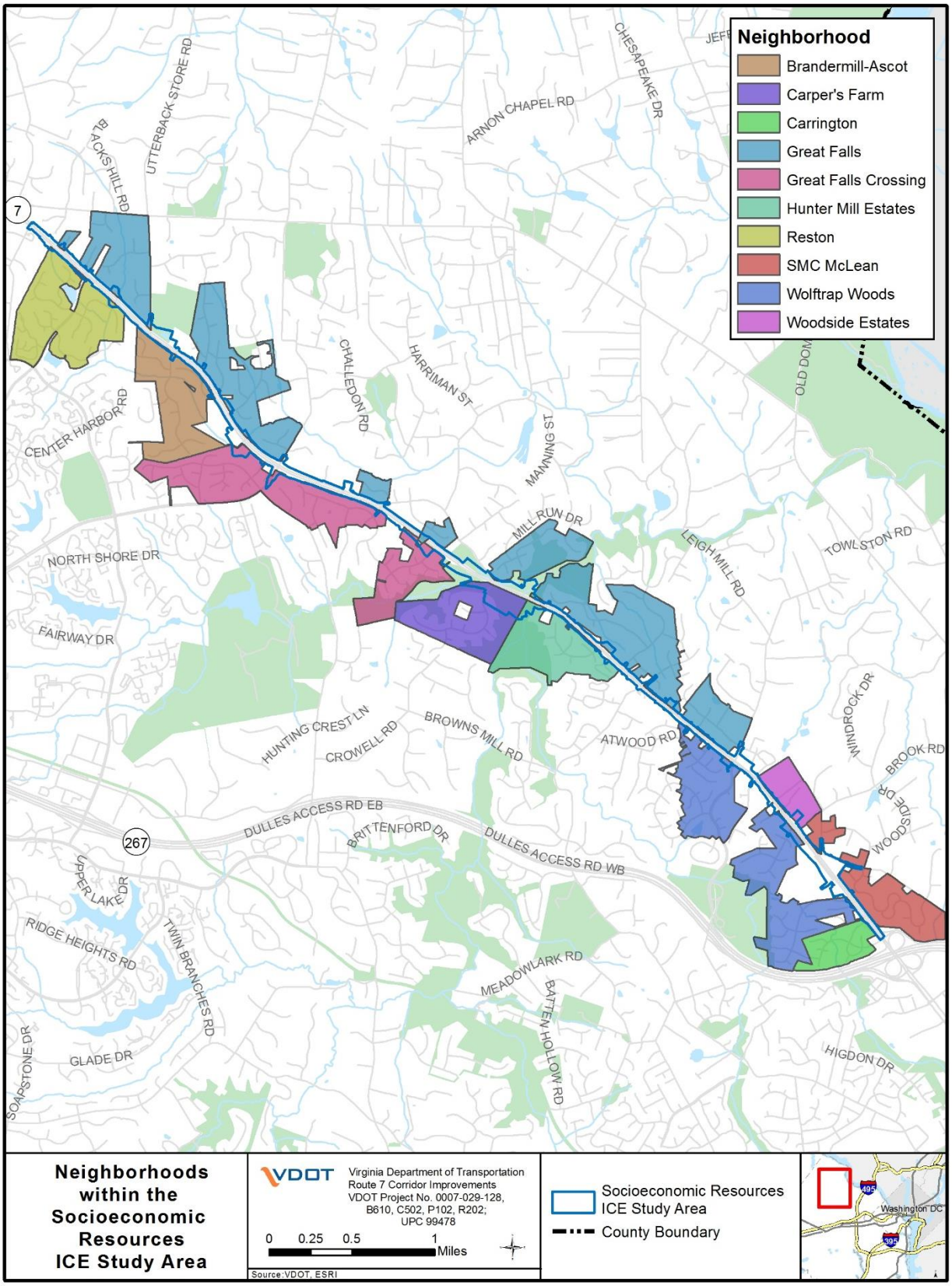
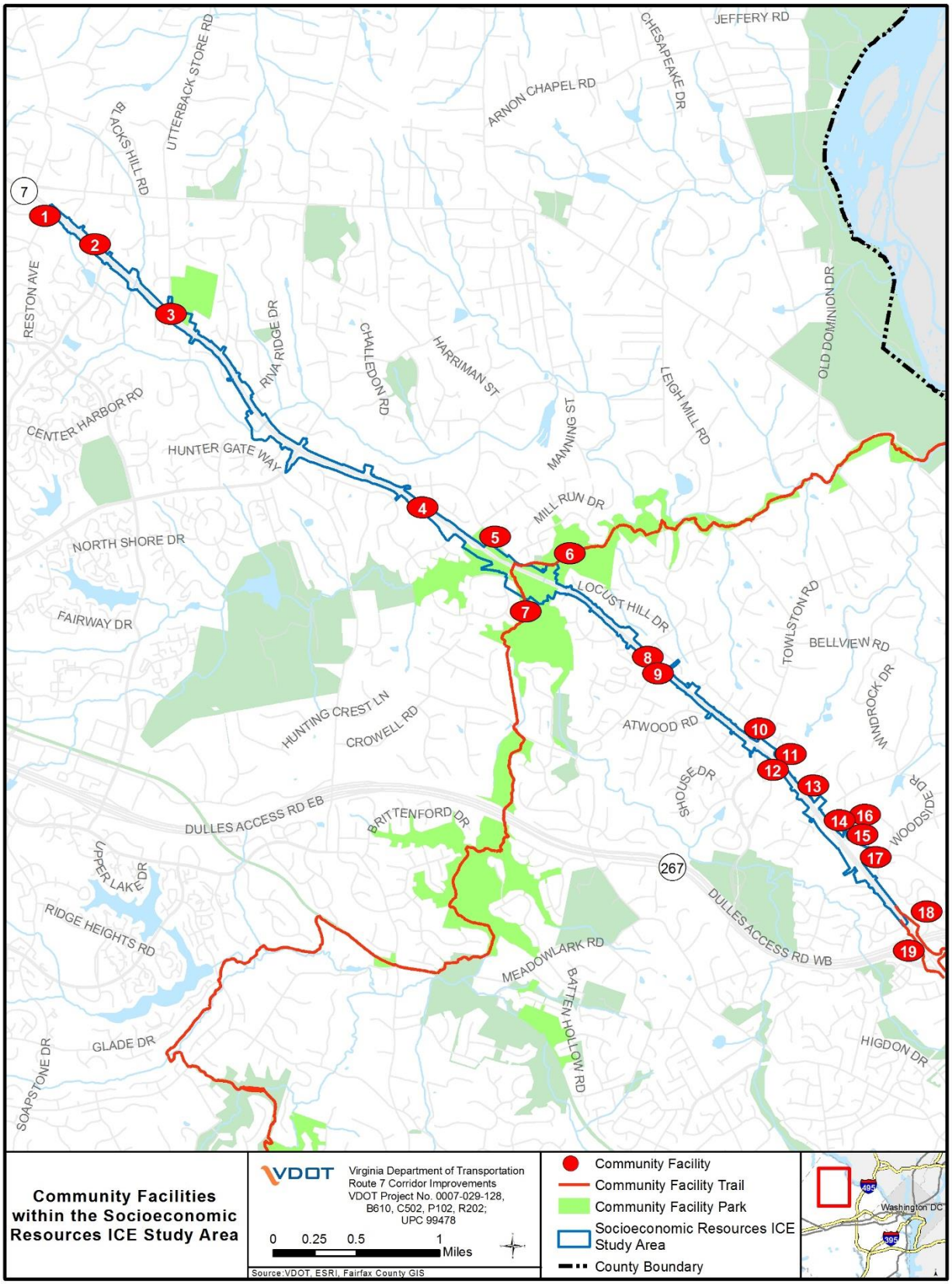


Figure 3-6: Community Facilities within the Socioeconomic Resources ICE Study Area



3.3.1.3 Environmental Justice Populations

Minority Populations

For the purposes of this study, the minority population for a study Census block group will be found to be "meaningfully greater" if its minority population is greater than Fairfax County's (31.3 percent minority), plus an additional 10 percent of that value (3.13 percent), for a threshold of 34.4 percent. Refer to the Socioeconomic Technical Report for additional information on this methodology (VDOT, 2017b). Based on this threshold, 2 of the 11 study Census block groups meet the definition of minority populations (see **Table 3-5** and **Figure 3-7**). Similarly, the "meaningfully greater" threshold for Hispanic/Latino populations was set at 17.7 percent (Fairfax County's 16.1 percent plus 1.6 percent). No Census block groups meet the definition of a Hispanic/Latino population.

Low-Income Populations

Low-income populations are identified where the median household income for a study Census block group is at or below the Department of Health and Human Services (HHS) 2015 poverty threshold for a family of four, or $24,250. Refer to the Socioeconomic Technical Report for additional information on this methodology (VDOT, 2017b). **Table 3-5** presents the median household income of residents in the study Census block groups. No study Census block groups have median household incomes below this threshold, and therefore, none are considered low-income populations.

3.3.2 Natural Resources

Natural resources, including waters, wetlands, and water quality; floodplains; wildlife habitat; and threatened, endangered, and special status species, are considered valuable and/or unique and may be less able to bear impacts from the proposed transportation improvement. Vulnerable natural resources within the Natural Resources ICE Study Area are discussed below.

3.3.2.1 Waters, Wetlands, and Water Quality

The Natural Resources ICE Study Area includes one 12-digit HUC, the Difficult Run subwatershed (HUC 020700081004), which covers an area of more than 37,000 acres (see **Figure 3-2**) (USGS, 2017a). All waters within the Natural Resources ICE Study Area ultimately flow to the Potomac River.

The Natural Resources ICE Study Area contains a large number of named and unnamed perennial and intermittent streams. The National Hydrography Dataset (NHD) shows approximately 586,500 linear feet of streams and an additional 296 acres of waterbodies within the Natural Resources ICE Study Area (USGS, 2017a) (see **Figure 3-8**). Of these, Difficult Run, Wolftrap Creek, Colvin Run, Little Difficult Run, Piney Run, and Snakeden Branch are the most prominent and longest stream courses.

Table 3-5: Minority or Low-Income Populations within the Socioeconomic Resources ICE Study Area

Geographic Areas / Block Groups	Total Population	Minority Population	EJ Threshold	Hispanic/ Latino Population	EJ Threshold	Median Household Income	Poverty Threshold (4 Persons/Household)	EJ Population
4601.00-1	1,187	22.2%		0.0%		$228,750	$24,250	No
4601.00-2	1,936	20.0%		0.0%		$207,813	$24,250	No
4601.00-3	1,507	49.2%		0.0%		$162,891	$24,250	Yes
4803.00-1	2,841	11.4%		1.0%		$250,000+	$24,250	No
4803.00-3	3,183	33.3%		0.0%		$233,462	$24,250	No
4804.01-1	1,744	43.4%	34.4%	0.0%	17.7%	$188,152	$24,250	Yes
4804.01-2	2,525	19.6%		1.1%		$250,000+	$24,250	No
4805.01-1	863	24.1		0.0%		$206,250	$24,250	No
4819.00-3	1,677	19.3%		1.7%		$204,464	$24,250	No
4820.01-2	3,007	29.5%		0.7%		$225,781	$24,250	No
4820.01-3	1,084	8.9%		0.0%		$174,375	$24,250	No
Study Area Block Groups Total	21,554	25.7%		0.5%		--		
Fairfax County	1,128,722	31.3%		5.8%		**$112,552**		
Virginia	8,256,630	28.0%		3.1%		**$65,015**		

Source: US Census of Population and Housing (US Census, 2017) and US Census ACS 5-year (2011-2015) (US Census, 2015b, 2015e, and 2015f).

Figure 3-7: Environmental Justice Populations in the Socioeconomic Resources ICE Study Area

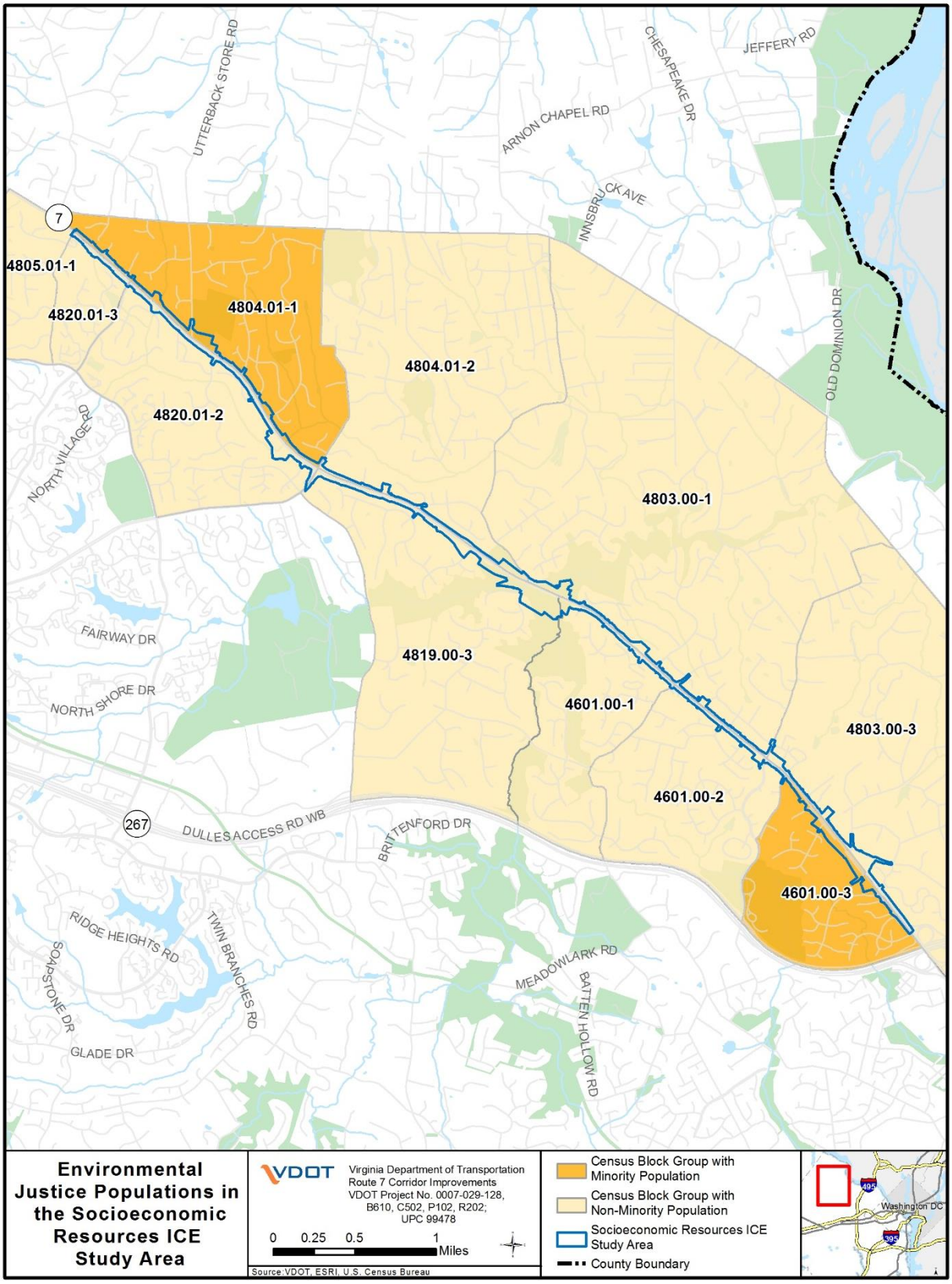
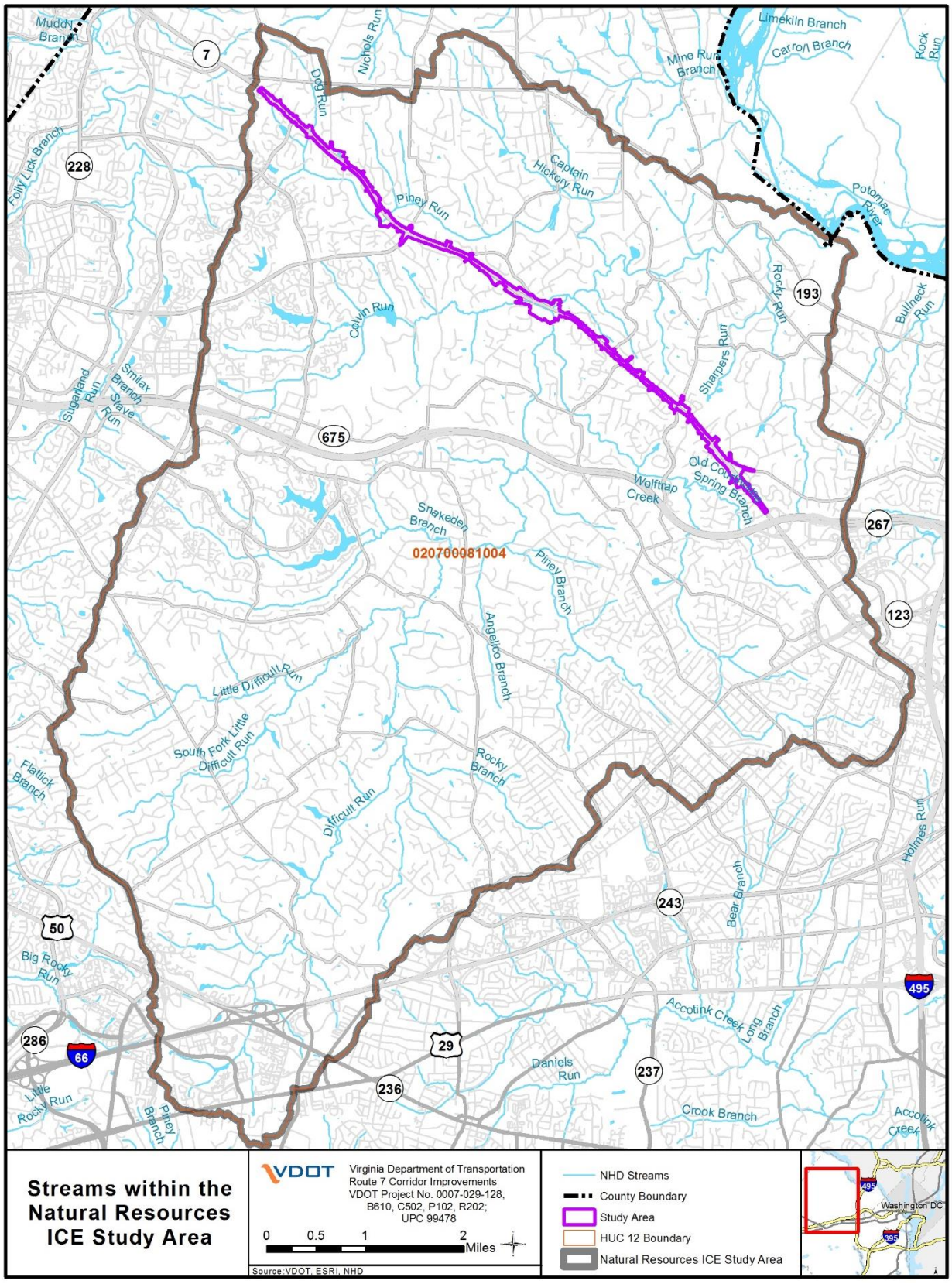


Figure 3-8: NHD Streams within the Natural Resources ICE Study Area



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 CWA. There are thirteen impaired stream segments located within the Natural Resources ICE Study Area, totaling approximately 124,580 linear feet (VDEQ, 2014). Causes of impairment to these streams include E. coli (ten segments), benthic macroinvertebrate bioassessments (ten segments), polychlorinated biphenyl (PCB) in fish tissue (two segments), and heptachlor epoxide (one segment). The major suspected sources of the impairments include grazing in riparian or shoreline zones, impacts from land application of wastes, waste from pets, waterfowl, wildlife other than waterfowl, livestock (grazing or feeding operations), sewage discharges in unsewered areas, sources unknown, post-development erosion and sedimentation, streambank modifications/ destabilization, and livestock (see **Figure 3-9** and **Table 3-6**).

Although the wetlands described in the Natural Resources Technical Report and the Revised EA were delineated, due to the size of the Natural Resources ICE Study Area, National Wetlands Inventory (NWI) data was used to determine the presence of wetlands within the Natural Resources ICE Study Area. Although there are flaws and weaknesses to NWI, this data source is the best available wetland data for the Natural Resources ICE Study Area and is acceptable and appropriate for the size of the Natural Resources ICE Study Area.

NWI mapping depicts 1,848 acres of wetlands in the Natural Resources ICE Study Area (USFWS, 2017a). Of these, approximately 1,291 acres (70 percent) are vegetated wetlands (emergent, scrub-shrub, and forested) and approximately 557 acres (30 percent) are classified as open water (including freshwater ponds, lakes, and riverine open waters) (see **Figure 3-10**). These wetlands and waters are interspersed within the industrial, commercial, and residential areas, and are mostly remnants of larger ecosystems within the floodplains.

In general, the subwatershed is highly urbanized and many of the wetlands and waters have been historically impacted by impervious and semi-impervious surfaces that either abut or are located in close proximity to the existing wetlands and waters. Remaining wetlands and waters are particularly sensitive to future transportation development because, among the various types of development that can occur in a watershed, linear transportation projects tend to be more constrained in terms of avoidance and minimization of impacts to wetlands and streams. For example, public linear transportation projects are one of the few allowed uses within the RPAs of Fairfax County and the City of Fairfax, because it is recognized that one linear feature (e.g., a road) cannot completely avoid other numerous linear features (i.e., stream and wetlands systems) in any given landscape.

Figure 3-9: Impaired Stream Segments within the Natural Resources ICE Study Area

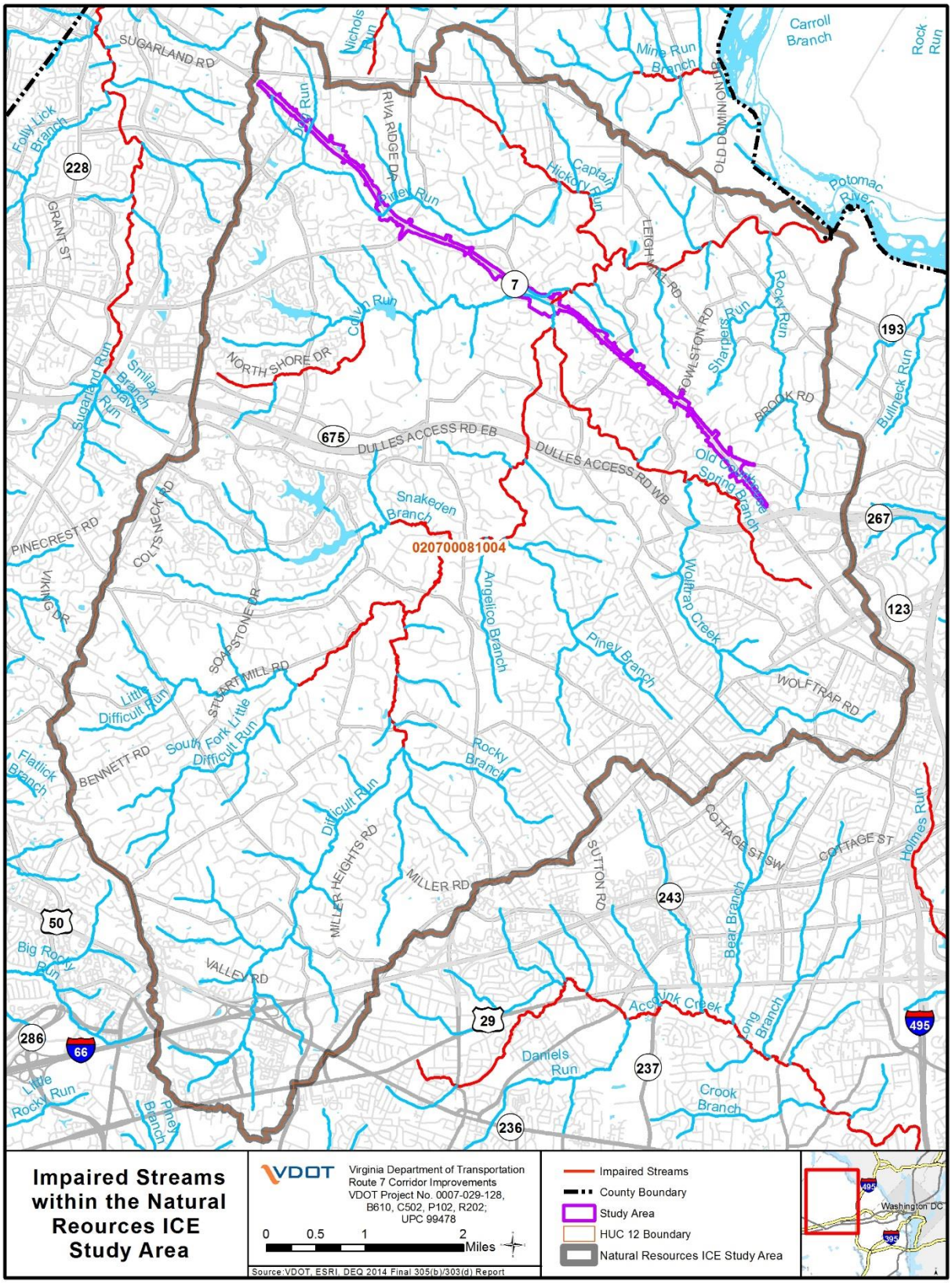


Table 3-6: Impaired Stream Segments within the Natural Resources ICE Study Area

ID	Waters Name	Impairment Reach	Impairment Cause	Impairment Source	Impairment Length within Study Area
VAN-A11R_WOT01A02	Wolftrap Creek	Segment begins at the boundary of the public water supply (PWS) designation area, approximately 0.73 rivermile upstream from the confluence with Difficult Run, and continues downstream until the confluence with Difficult Run	E. coli	Grazing in Riparian or Shoreline Zones; Impacts from Land Application of Wastes; Waste from Pets; Waterfowl; Wildlife Other than Waterfowl; Livestock (Grazing or Feeding Operations); Sewage Discharges in Unsewered Areas	4,045.6 ft
VAN-A11R_WOT01B06	Wolftrap Creek	Segment begins at the confluence with Old Courthouse Spring Branch and continues downstream until the boundary of the PWS designation area, approximately 0.73 rivermile upstream from the confluence with Difficult Run			10,395.0 ft
VAN-A11R_OCS01A04	Old Courthouse Spring Branch	Segment begins at the headwaters of Old Courthouse Spring Branch and continues downstream until the confluence with Wolftrap Creek	Benthic Macroinvertebrate Bioassessments	Source Unknown	11,185.9 ft
VAN-A11R_DIF01B06	Difficult Run	Segment begins at the Route 7 bridge crossing and continues downstream until the confluence with Captain Hickory Run	PCB in Fish Tissue		5,583.9 ft
VAN-A11R_COV02A02	Colvin Run	Segment begins at the headwaters of Colvin Run and continues downstream until the confluence with an unnamed tributary (streamcode XJJ) flowing from Lake Anne	Benthic Macroinvertebrate Bioassessments		11,063.3 ft

Table 3-6: Impaired Stream Segments within the Natural Resources ICE Study Area *(cont.)*

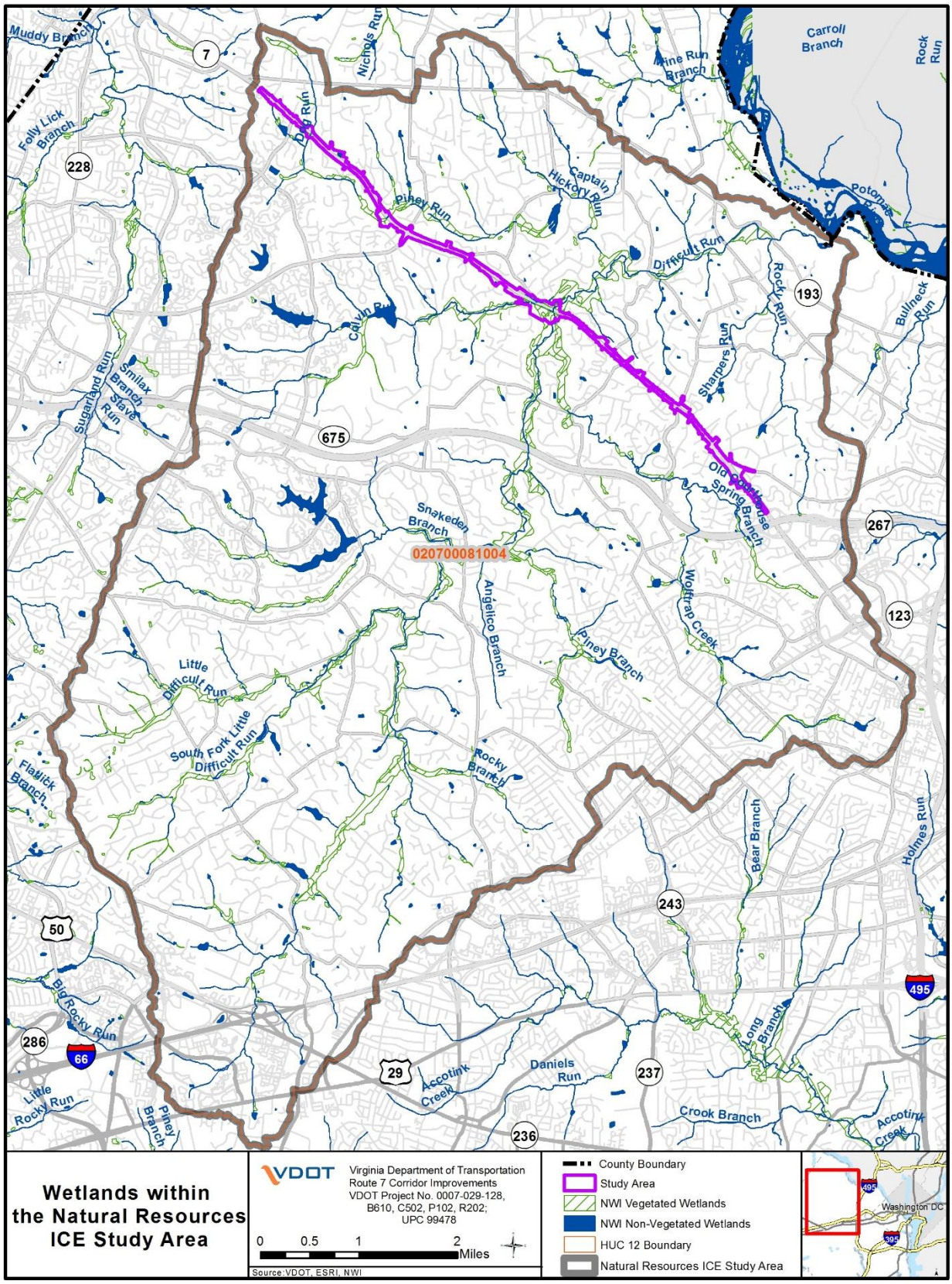
ID	Waters Name	Impairment Reach	Impairment Cause	Impairment Source	Impairment Length within Study Area
VAN-A11R_DIF02A02	Difficult Run	Segment begins at the boundary of the PWS designation area, approximately 0.05 rivermile upstream from the Route 675 crossing, and continues downstream until the confluence with Wolftrap Creek	Benthic Macroinvertebrare Bioassessments; E. coli	Grazing in Riparian or Shoreline Zones; Impacts from Land Application of Wastes; Wastes from Pets; Waterfowl; Wildlife Other than Waterfowl; Source Unknown; Livestock (Grazing or Feeding Operations); Sewer Discharges in Unsewered Areas	4,534.6 ft
VAN-A11R_DIF02B06	Difficult Run	Segment begins at the confluence with Piney Branch and continues downstream until the boundary of the PWS designation area, approximately 0.05 rivermile upstream from the Route 675 crossing			10,443.3 ft
VAN-A11R_DIF03A02	Difficult Run	Segment begins at confluence with Rocky Branch, approximately 0.25 rivermile upstream of Route 672, and continues downstream until the confluence with Piney Branch			18,767.2 ft
VAN-A11R_LID01A02	Little Difficult Run	Segment begins at the confluence with South Fork Little Difficult Run and continues downstream until the confluence with Difficult Run			9,276.6 ft
VAN-A11R_CAH01B06	Captain Hickory Run	Segment begins at the headwaters of Captain Hickory Run and continues downstream until the boundary of the PWS designation area, approximately 0.86 rivermile upstream from the confluence with Piney Run			5,746.5 ft

Table 3-6: Impaired Stream Segments within the Natural Resources ICE Study Area *(cont.)*

ID	Waters Name	Impairment Reach	Impairment Cause	Impairment Source	Impairment Length within Study Area
VAN-A11R_CAH01A04	Captain Hickory Run	Segment begins at the boundary of the PWS designation area, approximately 0.86 rivermile upstream from the confluence with Piney Run, and continues downstream until the confluence with Difficult Run			11,589.1 ft
VAN-A11R_SNA01A02	Snakeden Branch	Segment begins at the confluence with an unnamed tributary to Snakeden Branch, approximately 0.4 rivermile downstream from the Twin Branches Road bridge, and continues downstream until the confluence with Difficult Run			5,163.0 ft
VAN-A11R_DIF01A00	Difficult Run	Segment begins at the confluence with Captain Hickory Run and continues downstream until the confluence with the Potomac River	Benthic Macroinvertebrate Bioassessments; E. coli; Heptachlor Epoxide; PCB in Fish Tissue	Grazing in Riparian or Shoreline Zones; Impacts from Land Application of Wastes; Post-development Erosion and Sedimentation; Streambank Modifications/ destabilization; Wastes from Pets; Waterfowl; Wildlife Other than Waterfowl, Source Unknown; Livestock	16,786.1 ft

Source: Final 2014 VDEQ 305(b)/303(d) Integrated Report (VDEQ, 2014).

Figure 3-10: NWI Wetlands within the Natural Resources ICE Study Area



3.3.2.1 Floodplains

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM) were used to estimate the acreage of floodplains within the Natural Resources ICE Study Area. Approximately 2,734 acres of 100-year floodplains and 26 acres of floodways exist within the Natural Resources ICE Study Area (see **Figure 3-11**). No 500-year floodplains are located within the Natural Resources ICE Study Area (US Department of Homeland Security, 2017).

3.3.2.2 Wildlife Habitat

The Natural Resources ICE Study Area contains a mixture of land cover including, but not limited to, developed land and forest (see **Figure 3-12**) (NLCD, 2011). The composition of land cover directly affects the natural communities, wildlife, and biodiversity found within the Natural Resources ICE Study Area. **Table 3-7** shows the acreage and percentage of each land cover type within the Natural Resources ICE Study Area.

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; Open Space	12,131.5	33%
Developed; Low, Medium, and High Intensities	7,746.4	21%
Developed, subtotal	***19,878***	***53%***
Forest	14,626.2	21%
Wetlands	1,599.2	4%
Pasture/Hay	356.5	1%
Shrub/Scrub	320.4	<1%
Cultivated Crops	304.6	<1%
Open Water	156.9	<1%
Grasslands/Herbaceous	20.8	<1%
Barren Land	7.4	<1%
Total	**37,269.9**	**100%**

Source: NLCD 2011.

The wildlife in the Natural Resources ICE Study Area primarily consists of species that are adapted to urbanized environments; however, some of the major riparian corridors and parks contain forested habitat that supports fauna more typically found within less disturbed floodplain forests, including neotropical migrant birds. Riparian corridors with native vegetation can serve as wildlife corridors, connecting wildlife habitats that might otherwise be separated by human development.

Wildlife corridors within the Natural Resources ICE Study Area were identified using aerial imagery. Streams with contiguous forest cover generally greater than 0.25 mile in width were selected as wildlife corridors, and include portions of Difficult Run, Little Difficult Run, and Colvin Run. These corridors are intersected by roads, which fragment the corridor, but do not prevent the continued use of corridors (see **Figure 3-12**). Information regarding the wildlife that is commonly found within the area is detailed in the Natural Resources Technical Report (VDOT, 2017a).

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

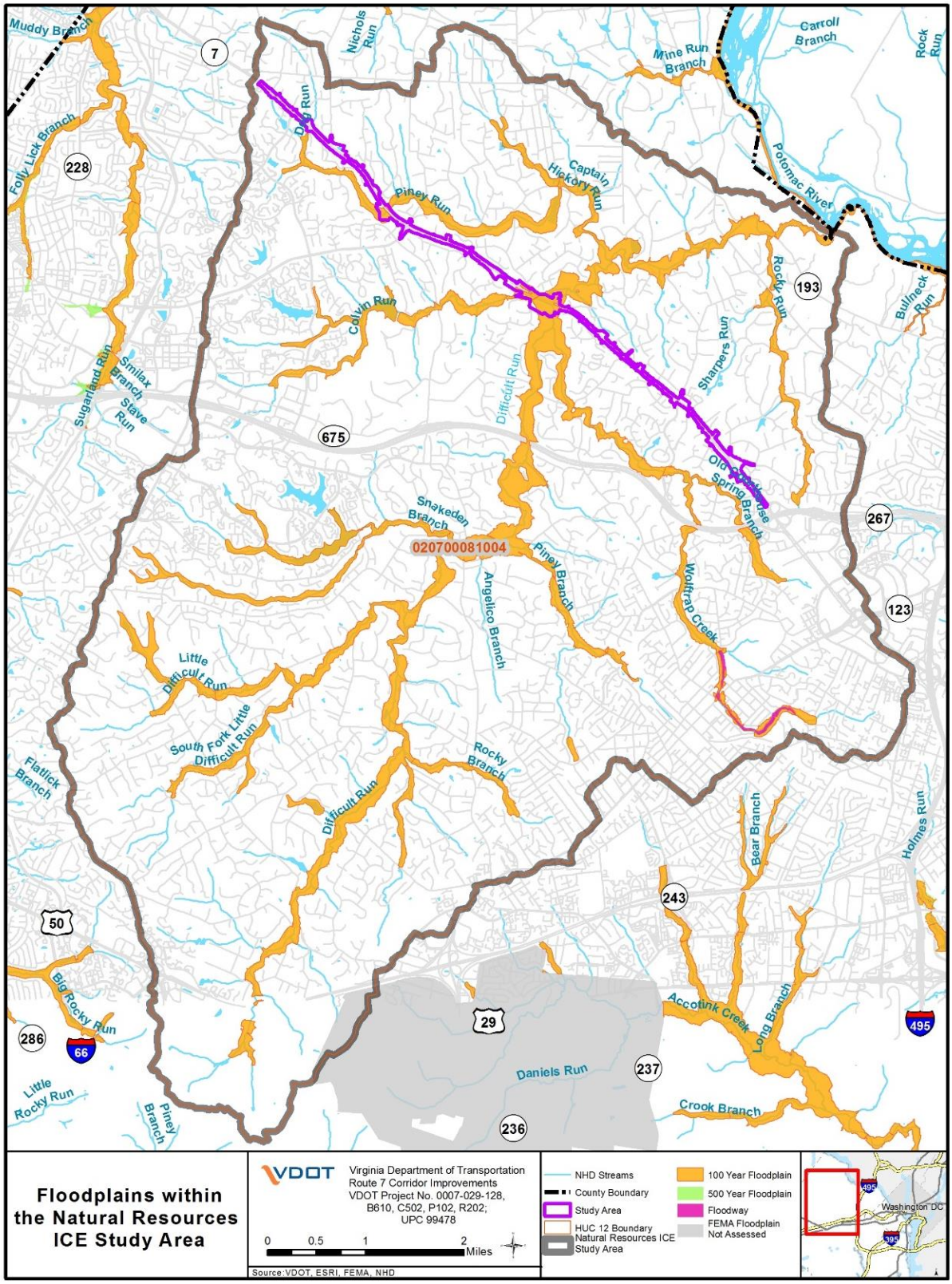
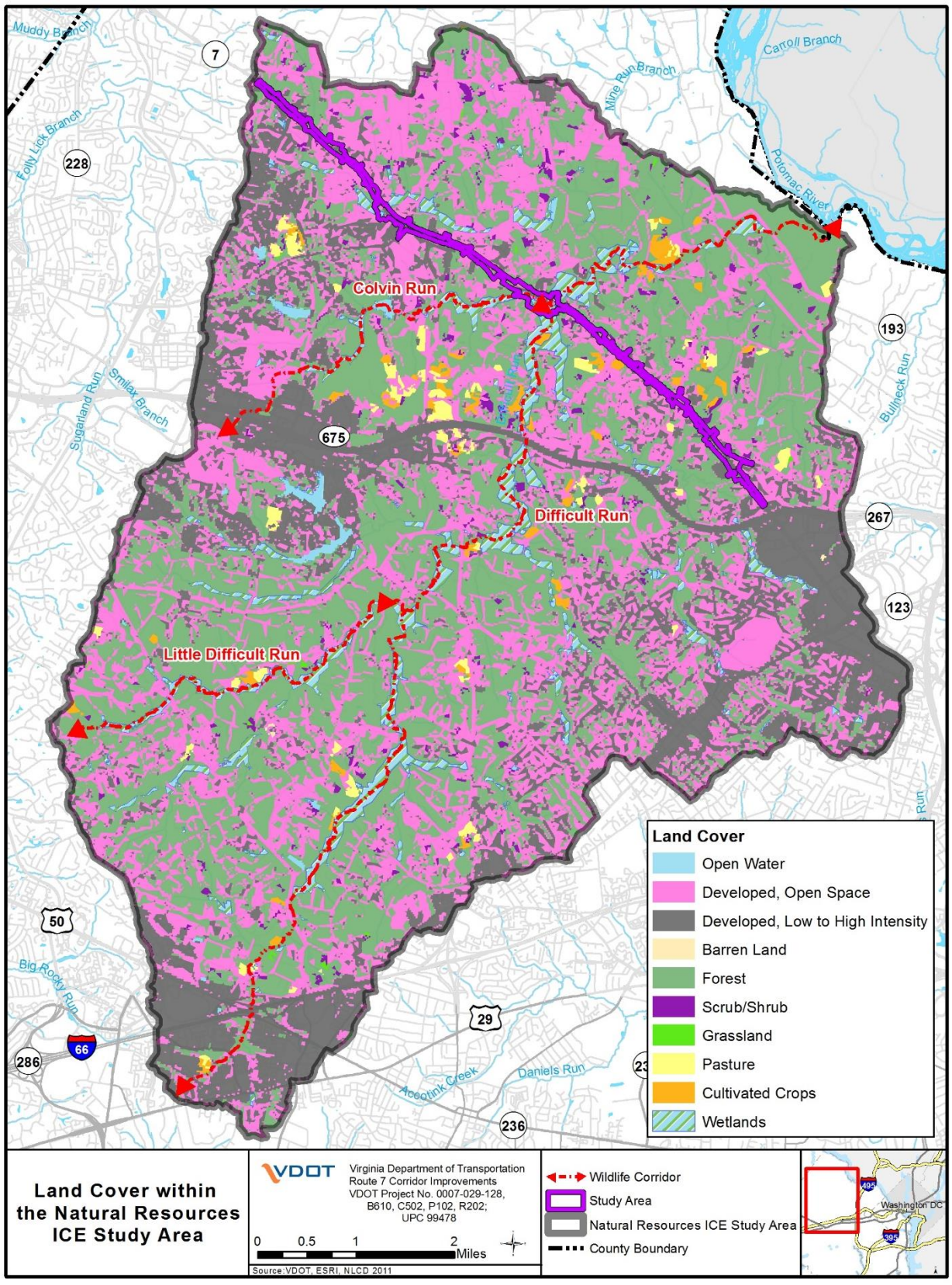


Figure 3-12: Land Cover within the Natural Resources ICE Study Area



3.3.2.3 Threatened, Endangered, and Special Status Species

The US Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC), the Virginia Department of Game and Inland Fisheries (VDGIF) Fish and Wildlife Information Service (VaFWIS), the VDGIF Wildlife Environmental Review Map Service (WERMS), and the Virginia Department of Conservation and Recreation Division of Natural Heritage (VDCR-DNH) databases were queried on July 6, 2017, to identify 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 (USFWS, 2017b; VDGIF, 2017a; VDGIF, 2017b; and VDCR-DNH, 2017). Although database searches did not identify the rusty patched bumblebee (*Bombus affinis*), Fairfax County is considered to be in the historical range of this species and was therefore carried forward for further evaluation (USFWS, 2017c). All species carried forward for further analysis are depicted in **Table 3-8.**

Table 3-8: Threatened, Endangered, and Special Status Species within the Natural Resources ICE Study Area

Common Name	Scientific Name	Legal Status	IPaC	VDCR-DNH (12-Digit HUC)	VaFWIS (2 Mile Buffer)	WERMS
Northern long-eared bat	*Myotis septentrionalis*	FT, ST	X			
Yellow lance	*Elliptio lanceolata*	Proposed FT	X			
Rusty patched bumblebee	*Bombus affinis*	FE, SE				
Wood turtle	*Glyptemys insculpta*	ST		X	C	X
Little brown bat	*Myotis lucifugus lucifugus*	SE			C	X
Tri-colored bat	*Perimyotis subflavus*	SE			C	

FE = federally endangered, FT= federally threatened, SE = state endangered, ST = state threatened, C=confirmed occurrence

Source: USFWS IPaC (USFWS, 2017b), VDGIF-VaFWIS (VDGIF, 2017a, Virginia Natural Heritage Database Search (VDCR-DNH, 2017), and WERMS (VDGIF, 2017b).

Approximately 47,950 linear feet of Difficult Run is designated as threatened and endangered waters for the wood turtle. Portions of two streams, Difficult Run and Little Difficult Run, are designated as historic trout streams, totaling 36,858 linear feet. A portion of Difficult Run, totaling approximately 412 linear feet (0.5 acres), is a confirmed Anadromous Fish Use area for alewife herring (*Alosa pseudoharengus*), hickory shad (*Alosa mediocris*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), striped bass (*Morone saxatilis),* and yellow perch (*Perca flavescens)* (VDGIF, 2017b). The USFWIS IPaC database indicates that no critical habitat occurs within the Natural Resources ICE Study Area (USFWS, 2017b). The Center for Conservation Biology (CCB) indicates that there are three known bald eagle nests in the southwest portion of the Natural Resources ICE Study Area (CCB, 2017).

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

Northern Long-Eared Bat

The Northern long-eared bat (NLEB) was listed by the USFWS as threatened in April 2015. Home range for the northern long-eared bat is widely but patchily distributed in the eastern and north-central 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, 2017). In the winter, they hibernate in caves, mines, and tunnels with relatively constant and cool temperatures, high humidity, and no air currents. In the summer, they roost in old-growth forests with uneven forest structure, single and multiple tree-fall gaps, standing snags, and woody debris. Major threats to the species existence include the fungal disease white-nose syndrome (WNS), wind energy development, and habitat modification. This species has not been recorded within the Natural Resources ICE Study Area, but IPaC has predicted potential occurrences. VDGIF's northern long-eared bat winter habitat and roost trees mapper indicates the closest known hibernacula or roost trees is over 80 miles away from the Natural Resources ICE Study Area (VDGIF, 2017c).

Yellow Lance

On April 5, 2017, the USFWS published a proposed rule to list the yellow lance as threatened under the Endangered Species Act (ESA). A 60-day public comment period began on April 5, 2017 and closed on June 5, 2017. Per USFWS guidance, a final decision would typically be made within 12 months.

The yellow lance is a bright yellow, short-term brooding mussel that grows to about 8.6 centimeters long. It inhabits river basins in Maryland, Virginia, and North Carolina. Suitable habitat consists of clean, fast-flowing rivers with rubble, gravel, and sand substrates. Typically, yellow lance lives in main stream channels at least a meter across. Major threats include water pollution, dams, development, and fragmented habitat (Encyclopedia of Life, 2017). This species has not been recorded in the Natural Resources ICE Study Area, but IPaC has predicted potential occurrences.

Rusty Patched Bumblebee

The rusty patched bumblebee was listed by the USFWS as endangered and became effective on March 21, 2017. The rusty patched bumblebee is a wide-ranging species found throughout the northeastern United States and adjacent Canada. They typically live close to or within woodlands, but have been documented in grasslands, marshes, agricultural landscapes, and residential parks and gardens. Colonies are annual and only mated queens overwinter, typically in soft disturbed soil. Nests are located underground in abandoned rodent nests, in tufts of grass, old birds' nests, rock piles, and cavities in dead trees. Major threats to this species include pathogen spill-over from commercial to wild bees, habitat loss due to agriculture and development, pesticide use, and climate change.

From 2007 to 2016, surveys were conducted to identify known locations of the rusty patched bumblebee. Using a habitat connectivity model, the USFWS determined the probability of the bumblebee occurring in the areas surrounding known locations. The predictive model used typical bumblebee foraging distances, surrounding suitable habitat (derived from National Landcover Database maps), and typical dispersal distances. USFWS has identified areas immediately surrounding a current record as high potential zones where the bumblebee is likely to be present and where coordination should be conducted with USFWS to evaluate potential effects to the species. The area immediately surrounding a high potential zone is called a primary dispersal zone and represents an area of lower probability no greater than 6.2 miles from a known location where the bee may occur based on less frequent dispersal events. Areas not located within high

potential zones or primary dispersal zones are defined as the historical range where the bumblebee could have occurred in the past but is not likely to be present currently.

USFWS's rusty patched bumblebee map indicates that the Natural Resources ICE Study Area is within the historical range, but is approximately 28 miles east of the nearest high potential zone and approximately 20 miles east of the nearest primary dispersal zone for the rusty patched bumblebee (USFWS, 2017d).

Wood Turtle

The wood turtle is a small turtle that is found throughout much of the east coast and midwest from northern Virginia to Nova Scotia and eastern Minnesota to the northern Appalachians. Suitable habitat consists of forested floodplains, fields, wet meadows, and farmland as long as these places have a large creek or stream nearby. They prefer slow moving waters and often hibernate under submerged logs, in beaver dams, or in muskrat burrows. They wander around on land in the summer and hibernate in deep pools during the winter. Threats include destruction of habitat, vehicular encounters, and pet trade (Harding, 2017). Wood turtle has been documented within the Natural Resources ICE Study Area; however, the last known observation (VaFWIS and WERMS) was in Difficult Run in 2002 in the Vicinity of Route 7 (VDGIF, 2017a).

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, 2017). 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 confirmed within a two mile buffer of the Natural Resources ICE Study Area (VDGIF, 2017a). VDGIF's tri-colored and little brown bat habitat mapper indicates the closest hibernacula is over 100 miles away from the Natural Resources ICE Study Area. There are no recorded roost trees in Virginia (VDGIF, 2017c).

Tri-Colored Bat

The tri-colored bat ranges throughout the eastern United States and Canada (NatureServe, 2017). 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 confirmed within a two mile buffer of the Natural Resources ICE Study Area (VDGIF, 2017a). VDGIF's tri-colored and little brown bat habitat mapper indicates the closest hibernacula is over 100 miles away from the Natural Resources ICE Study Area. There are no recorded roost trees in Virginia (VDGIF, 2017c).

Bald Eagle

The bald eagle is a wide-ranging species found throughout much of North America (NatureServe, 2017). Most eagles that breed in Canada and the northern United States move south for winter. Bald eagles migrate widely over most of North America. In the northern Chesapeake Bay region, radio-tagged northern migrants arrive in late fall and depart in early spring; radio-tagged southern migrants arrive throughout April-August and depart June-October. Winter home ranges can be very large, especially for nonbreeding birds.

Breeding habitat most commonly includes areas close to (within 2.5 miles) 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 nesting sites used by two or more eagles are common. Winter nesting sites vary in their proximity to food resources (up to 20 miles) 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 nest-site selection. The CCB mapping portal depicts three bald eagle nests within the Natural Resources ICE Study Area (CCB, 2017).

3.3.3 Historic Resources

Historic resources 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." A desktop review was conducted using the Virginia Cultural Resource Information System (V-CRIS) which identifies properties in Virginia Department of Historic Resources (VDHR) Archives. V-CRIS identifies architectural and archeological resources that are classified as: not evaluated, not eligible, potentially eligible, eligible, and listed within the NRHP. For the purpose of this analysis, historic resources are archaeological sites and architectural resources that are potentially eligible or eligible for listing or listed in the NRHP.

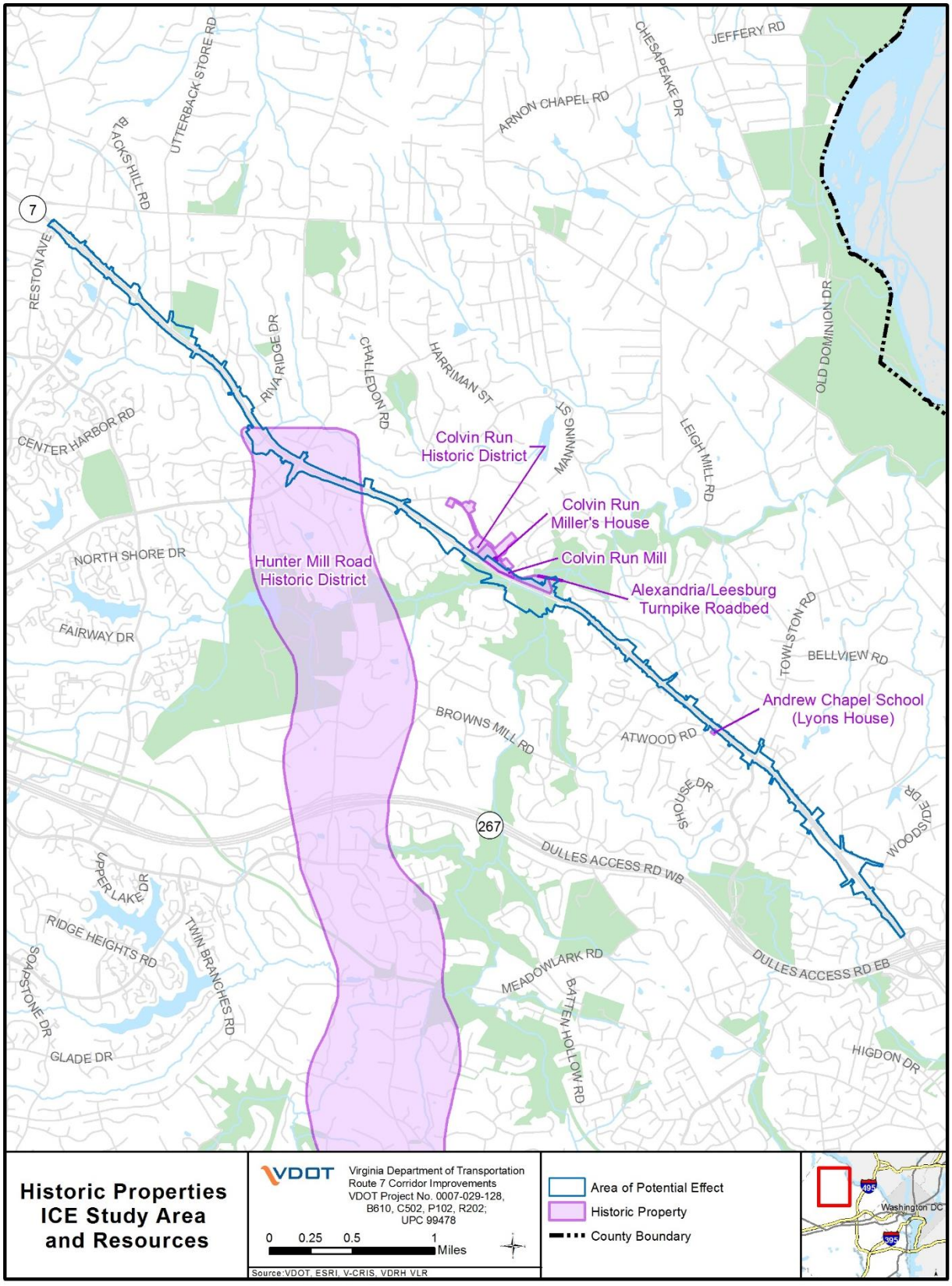
Four architectural resources are either eligible for, potentially eligible for, or listed on the NRHP (see **Table 3-9** and **Figure 3-13**). Additionally, resources listed under VDHR, Virginia Landmarks Register (VLR) are also depicted. No archaeological sites were found to be eligible or potentially eligible for the NRHP.

Table 3-9: Historic Resources within the Historic Resources ICE Study Area

Resource	VDHR Number	Description	NRHP Eligibility
Andrew Chapel School (Lyons House)	029-5305	Ca. 1914. Located at 9325 Leesburg Pike, the house is intact. The property is currently owned and being used by the EE Lyons Construction Company. The property is fenced and the land surrounding the house is used as a parking lot. The historic property does not include the entire property. It includes the house and immediately surrounding land, including land near the entrance to the fenced in property, but not the land currently used for construction equipment parking or the larger building towards the back of the property.	Potentially Eligible for NRHP
Colvin Run Historic District	029-5462	Post 1794. (period of significance: 1974-1947) Colvin Run community is the last surviving crossroads market community in western Fairfax County.	Potentially Eligible for NRHP
Colvin Run Mill	029-0008 / 029-5462-0001	Ca. 1810. Oldest building and contributing resource to Colvin Run Historic District. Careful attention to detail and high standards of workmanship in the restoration have been given both local and national recognition. The Mill is located on land protected by the Fairfax County Park Authority (FCPA) and is within the Colvin Run Historic District.	NRHP and VLR Listed
Hunter Mill Road Historic District	029-5180	Ca. 1790. Hunter Mill Road is one of the last remaining by-ways in Northern Virginia that reflects when farming, hunting and milling were the primary occupations of the area, and topographical features meant the difference between victory and defeat on the battlefield. The northern end extending from the intersection of Hunter Mill Road and Baron Cameron Avenue northward to Leesburg Pike, has dense commercial development. This portion is recommended as non-contributing to the historic district.	Potentially Eligible for NRHP
Colvin Run Miller's House	029-0023	Ca. 1810. The house is located on a triangular piece of land formed by Leesburg Pike and Colvin Run Road.	Potentially Eligible for NRHP
Alexandria / Leesburg Turnpike Roadbed	029-5360	1827. This road trace is a remnant of the original alignment of the Leesburg and Alexandria Turnpike, the predecessor to today's Route 7. This alignment of the turnpike, including the road trace, was laid out in 1827 and completed in 1838. It served as a primary route east-west route through Fairfax County since the mid-eighteenth century until it was bypassed in 1947 with the construction of the current alignment of Route 7.	Potentially Eligible for NRHP

Source: V-CRIS and VDRH VLR, accessed July 2017.

Figure 3-13: Historic Resources within the Historic Resources ICE Study Area



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 3-10**. 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**.

Table 3-10: Direct Impacts of the Alternatives

Notable Feature	No Build Alternative	Build Alternative
Socioeconomic Resources		
ROW Acquisition / Permanent Easements / Temporary Easements*	0	19.92 acres / 9.63 acres / 16.86 acres
Displacements (No. Residential / Commercial)	0	1 / 0
Neighborhood Cohesion	0	No substantial impact
Bike Paths and Recreational Trails	0	Short-term impacts & long-term benefits
Section 4(f) Acquisition / Permanent Easements / Temporary Easements	0	1.68 acres / 1.89 acres / 5.18 acres
Environmental Justice	0	No disproportionate impacts
Waters, Wetlands, and Water Quality		
Vegetated Wetland Impacts	0	2.11 acres
Stream Impacts	0	3,185 lf
Open Water	0	0.03 acres
Water Quality	No substantial impacts	No substantial impacts
Floodplains		
Floodplain Impacts (100-year)	0	18 acres
Wildlife Habitat		
Forest	0	15.30 acres
Shrub/Scrub	0	<1 acres
Wildlife Corridors	0	2 corridors
Threatened, Endangered, and Special Status Species		
Threatened, Endangered, and Special Status Species or potential habitat (No.)	0	4
Threatened and Endangered Waters (No.)	0	1
Anadromous Fish (No.)	0	0
Critical Habitat	0	0
Trout Streams	0	0
Bald Eagle Nests	0	0
Historic Resources		
Historic Resources Properties (# No Effect / # No Adverse Effect)	0	2 / 4

** Includes Section 4(f) Acquisition / Permanent Easements/Temporary Easements*

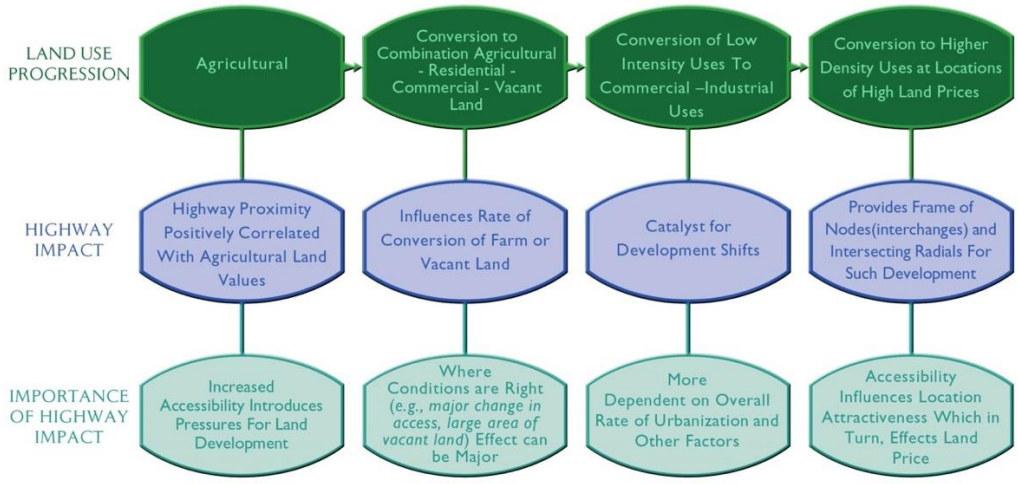
3.5 Step 5: Identify Indirect Effects for Analysis

The objective of this step is to assess whether direct impacts identified above would have the potential to indirectly affect the identified resources. As discussed in **Section 2.2**, indirect effects can occur in the following three broad categories:

- **Encroachment-Alteration Impacts** – Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomics) on the environment;
- **Induced Growth Impacts** – Project-influenced development effects (land use); and
- **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).

Development of vacant land or conversion of the built environment to more intensive uses are often consequences of highway projects. The North Carolina Department of Transportation (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 3-14**) (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 ICE Study Areas are already highly developed and built-out with mature infrastructure. More than 90 percent of the surrounding area is developed, under government control, or consists of protected RPAs (see **Appendix B** for details).

Figure 3-14: Highway Investment on Typical Progress of Urbanization



The No Build Alternative does not consist of any alterations to the existing roadway other than reasonably foreseeable planned projects. The Build Alternative would be on existing alignment and would not create any new interchanges or intersections. The area within one-mile of each signalized intersection was assessed to determine the potential for future growth. The results show that more than 90 percent of the one mile area associated with each signalized intersection is developed or under government control (with residences, commercial/industrial uses, transportation/utility uses, or parkland) or designated as an RPA,

which as described in **Section 3.2.2.5 – Natural Resources Protection/Ecosystems**, greatly limits development and does not generally allow new residential or commercial development. **Appendix B** contains maps and associated tables documenting the percentage of each type of use within the area surrounding each intersection. Additionally, the areas to the east and west of the study area, along Route 7, are already built out and/or undergoing redevelopment. Tysons Urban Center, to the east, already well built out, has a designated redevelopment plan, while Loudon County, to the west, is built out to the Town of Leesburg with concentrations of business and industry, mixed with residential (Fairfax County, 2017c and Loudon County, 2017). This area is therefore not likely to experience induced growth or sprawl, but rather infill development and redevelopment of existing facilities (NCDOT, 2001).

The discussion below provides a summary of potential 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.

3.5.1 Socioeconomic Resources

The Build Alternative has the potential to directly impact land use immediately adjacent to Route 7, including permanent and temporary right of way acquisitions, converting 9.63 acres to transportation use and displacing one residence. The indirect impacts to neighborhood cohesion, community facilities, and environmental justice populations due to these direct impacts are closely related and are described together throughout the rest of the indirect effects analysis.

Since Route 7 is an existing facility that currently acts as a dividing line between neighborhoods, the roadway widening would not further divide neighborhoods, rather, the addition of the shared use lanes would provide connectivity between the neighborhoods as well as accessibility to community facilities. The improvements could indirectly cause an increase in utilization of bicycle and pedestrian travel networks and increased bicycle and pedestrian choice in mode of transportation between neighborhoods and to and from community facilities. Indirect impacts may also include a reduced rate of bicycle/pedestrian and motor vehicle crashes and/or desire for additional bicycle and pedestrian network connectivity. During construction, short-term road closures, detours and loss of parking would indirectly affect access between neighborhoods and could potentially increase the time required to access local businesses or community facilities. All of these indirect effects have the potential to affect environmental justice populations.

Because indirect effects are possible, socioeconomic resources has been advanced to **Step 6** in this analysis.

3.5.2 Natural Resources

Waters, Wetlands, and Water Quality

The Build Alternative would result in direct impacts to waters, wetlands, and water quality from widening the existing road into adjacent wetlands, lengthening culverts and pipes at stream crossings, relocating streams that flow parallel to the expanded roadway (e.g., Colvin Run), and installing stormwater management facilities. Potential indirect effects resulting from project construction could include increased runoff from increased impervious surface and the consequent increase in pollutant discharge and changes to hydrologic regime.

Floodplains

The Build Alternative could result in direct impacts to floodplains from widening or lengthening road crossings across floodplains, as well as the proposed Colvin Run stream relocation. If these direct impacts to floodplains occur, flood storage capacity could be affected, potentially resulting in alteration of drainage patterns or floodplains, water quality degradation, changes in flood flow elevations, and associated effects on floral and faunal communities.

Wildlife Habitat

The Build Alternative could cause direct impacts through loss of wildlife habitat associated with widening the roadway, potentially leading to indirect effects such as changes in regime (e.g., light, hydrology) and changes in vegetation composition. The proposed Colvin Run stream relocation could alter aquatic habitat, potentially changing community composition. Additionally, increased traffic along the widened roadway could have indirect effects to wildlife and wildlife habitat, including increased noise, trash, potential for animal-vehicle collisions, and potential for oil spills. Construction activities could also have the indirect effect of introducing invasive species that may have traveled to the area on equipment and vehicles traveling from other locations.

Threatened, Endangered, and Special Status Species

The Build Alternative is not anticipated to directly impact threatened, endangered, or special status species. However, construction of the Build Alternative and associated Colvin Run stream relocation may indirectly affect threatened, endangered, and special status species by altering landscape or stream habitat. Such alterations may include increased noise, changes in landcover/habitat, increased potential for animal-vehicle collisions, altered hydrology, and degradation of water quality.

Because indirect effects are possible, natural resources has been advanced to **Step 6**.

3.5.3 Historic Resources

Six historic resources occur within the APE of the Build Alternative. Hunter Mill Road Historic District, Colvin Run Mill, Colvin Run Mill Historic District, and Andrews School (Lyons House) would have direct impacts as a result of the proposed project. All six of the resources could be indirectly impacted during construction, and by visual intrusions of the noise walls associated with the project.

Because indirect effects are possible, historic resources has been advanced to **Step 6**.

3.6 Step 6: Analyze Indirect Effects and Evaluate Analysis Results for the No Build and Build Alternatives

This step analyzes indirect and induced growth effects potentially resulting from each alternative under consideration. Three criteria were used to evaluate the overall significance of effects – nature, duration, and intensity, as described below:

- Nature of Impact. The nature of the impact can be described as beneficial or adverse. Beneficial impacts enhance the quality or access to a resource, while adverse impacts degrade the quality or limit access to the resource.

- Duration of Impact. The duration of an impact can be temporary (short-term) or permanent (long-term). Temporary impacts are disturbances that will return to the baseline conditions and permanent impacts are disturbances that alter the environment for the foreseeable future.
- Intensity of Impact. The intensity of an impact concerns the scale or size of the impact on a resource. Intensity is evaluated as negligible, minor, moderate, or significant.

3.6.1 No Build Alternative

3.6.1.1 Effects to Socioeconomic Resources

Under the No Build Alternative, increased traffic delays and congestion would have an adverse long-term indirect effect on access to and from neighborhoods and community facilities throughout the Socioeconomic Resources ICE Study Area. Additionally, the lack of improved bicycle and pedestrian access and safety could also have an adverse long-term indirect effect on neighborhood cohesion and connectivity, and users of the bicycle network within the Socioeconomic Resources ICE Study Area.

3.6.1.2 Effects to Natural Resources

Waters, Wetlands, and Water Quality

Under the No Build Alternative, there would be no improvements to existing stormwater management facilities because there are no existing stormwater management facilities that treat stormwater runoff from Route 7. Potential indirect effects to water quality could be expected due to petroleum spills and leaks from vehicles, and salt or chemical runoff from road maintenance activities.

Floodplains

Under the No Build Alternative, since there would be no change in drainage patterns or flood flow elevations, no indirect effects are anticipated.

Wildlife Habitat

Proximity effects associated with the existing facility, including noise, air, and vehicle passbys would continue to affect wildlife habitat; however, such disruptions are common for species of the area that are already adapted to an urbanized environment.

Threatened, Endangered, and Special Status Species

Proximity effects associated with the existing facility, including noise, air, and vehicle passbys would continue to affect threatened, endangered, and special status species; however, such disruptions are common for species of the area that are already adapted to an urbanized environment.

3.6.1.3 Effects to Historic Resources

Proximity effects associated with the existing facility, including noise, air, and visual intrusions would continue to affect historic resources. Additionally, increased traffic delays would adversely indirectly affect the accessibility to the historic resources.

3.6.2 Build Alternative

3.6.2.1 Effects to Socioeconomic Resources

Short-term road closures or reduction of the through lanes would indirectly affect neighborhood cohesion, community facilities, and environmental justice populations by potentially increasing commute times, emergency vehicle response times, and limiting or restricting access to community facilities or between neighborhoods. Construction could also cause noise impacts. However, since the construction would be limited in duration, the indirect effects would be minor.

The Build Alternative's positive indirect impacts may include altering access to community facilities or services, through reduced travel time and increased travel reliability in the study area. The Build Alternative would also provide an alternate transportation mode choice by providing better bicycle and pedestrian passage between communities, residents, neighborhoods and businesses, and safer interactions between motor vehicles and bicycles/pedestrians.

3.6.2.2 Effects to Natural Resources

Waters, Wetlands, and Water Quality

Construction of the Build Alternative may potentially result in short and long-term minor adverse degradation of water quality through increased sedimentation from land disturbing activities, increased runoff from an increase in impervious surface, increased water pollution due to an increase in vehicular traffic, and occurrences of fuel spills or hydraulic spills from construction equipment and operation of the roadway. 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 proposed new stormwater management facilities and implementation of strict erosion and sediment control measures during construction would help to mitigate these potential effects to water quality by addressing water quality and quantity, and possibly improving water quality over existing conditions by treating runoff from the existing roadway that is currently not being treated.

Construction of the widened roadway also has the potential to change the hydrologic regime, resulting in long-term minor beneficial and adverse indirect impacts. Increased impervious surface increases runoff volume and peak flows in downstream waters which may alter hydrology, habitat structure, water quality, and biodiversity. In addition, longer culverts required for the road expansion may alter the hydraulic dynamics of flow through the culverts and may have minimal effects on downstream geomorphology. A new bridge is proposed over Difficult Run that would increase the hydraulic opening. This increased hydraulic opening would allow greater connectivity of wetlands and a more natural geomorphology of Difficult Run to develop over time, resulting in a general improvement of the geomorphology of Difficult Run. However, during construction of the bridge, temporary changes may occur in water velocity, depth, and erosion and sedimentation rates, which could impact downstream habitat.

The proposed Colvin Run stream relocation has the potential to permanently alter wetland and stream hydrology and macrobenthic habitat, resulting in long-term minor and major adverse indirect impacts. Changes in hydrology could change adjacent wetland vegetation composition and stream depth, resulting in altered terrestrial and aquatic habitat. However, since Colvin Run is currently unstable and eroding, the stabilized relocated stream channel could improve downstream water quality, thus improving aquatic habitat. The impacts to wetlands and streams necessary to construct the project would require a Section 404 permit from the USACE, a Section 401 permit from the VDEQ, and a state-owned bottomland permit from the VMRC (for impacts to streams with a drainage area greater than 5 square miles). Permitting for the project is discussed in further detail in Section 9.1 of the Natural Resources Technical Report.

Due to tree removal associated with the Build Alternative, changes in light regime may be expected, resulting in long-term minor adverse impacts. Changes in light regime could alter the vegetation composition of wetlands, which could modify habitat and wildlife composition.

Floodplains

Construction of the Build Alternative could potentially result in long-term minor adverse and beneficial impacts to floodplains. All construction activities would be designed to ensure that culverts and bridges are adequately sized and do not impede floodwater passage. However, if fill is placed into floodplains, the Build Alternative could indirectly alter drainage patterns, increase water quality degradation, change flood flow elevations, and have associated effects on floral and faunal communities. Since the Build Alternative would widen an existing facility, these indirect effects would be minimal compared to existing conditions. However, the proposed replacement of the existing Difficult Run Bridge would increase the hydraulic opening and would, therefore, improve floodplain connectivity and would potentially lower upstream flood flow elevations.

Wildlife Habitat

Implementation of the Build Alternative could potentially result in short and long-term minor adverse and beneficial impacts to wildlife habitat. Increased noise, human activity, and dust associated with construction could temporarily displace wildlife; however, such disruptions are common for species of the area that are already adapted to an urbanized environment. Prolonged impacts to wildlife habitat could also occur. Clearing vegetation could allow opportunistic species, including invasive species, to permanently establish. Further, the introduction of invasive species on construction equipment or vehicles could lead to permanent vegetation, habitat, and wildlife composition changes. Additional long-term indirect effects to wildlife could include changes in vegetative composition due to changes in light and hydrologic regimes. These vegetative composition changes, as well as vegetation removal, could displace wildlife due to habitat and food loss. Due to an increase in vehicular capacity, increased traffic noise, increased potential for animal-vehicle collisions, and increased potential for oil spills may occur. These indirect effects could impact wildlife health and cause species to permanently relocate.

New stormwater facilities and stormwater regulations would reduce or neutralize impacts to aquatic habitat. Since the Build Alternative would be on an existing alignment, habitat and wildlife corridor fragmentation is not expected to be an indirect effect. Existing culvert and bridge crossings would allow for the continued passage of wildlife beneath Route 7. The proposed replacement of the existing Difficult Run Bridge would allow for continued wildlife movement, aiding aquatic and terrestrial organism passage beneath the road.

Threatened, Endangered, and Special Status Species

Impacts to threatened, endangered, and special status species would be similar to the impacts described to wildlife. However, due to the life characteristics of the threatened, endangered, and special status species, as described in **Section 3.3.2.3**, these species may be less able to adapt to these short and long-term changes.

3.6.2.3 Effects to Historic Resources

The Build Alternative could have an adverse short-term indirect effect on historic resources by altering access and increasing congestion during construction. However, once the construction is complete, the Build Alternative would have a long-term beneficial indirect effect on the historic resources by improving visitors' ability to access the historic resources through reduced congestion, as well as an alternate transportation mode.

3.6.2.4 Induced Growth

The ICE Study Areas and surrounding locality are built-out with mature infrastructure. Since the Build Alternative would not contribute to any conditions conducive to induced growth including transportation on new alignment, land use progression, or largely new infrastructure or economic advances that are not already planned in the ICE Study Areas, no induced growth would be expected as a result of the Build Alternative.

3.6.2.5 Effects Related to Induced Growth

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

The Build Alternative would potentially result in the relocation of some individuals. In accordance with the Uniform Relocation Assistance and Real Property Policies Act of 1970, as amended, individuals would be fairly compensated and relocation resources made available to all qualified relocated residents. Relocated property owners and renters would be provided relocation assistance advisory services together with the assurance of the availability of decent, safe, and sanitary housing. Relocation resources would be made available to all relocated residents without discrimination. The relocation assistance process does not require that a relocated resident locate in a certain area or to a specific structure; however, neighborhood cohesion impacts are generally minimized when there is sufficient replacement housing available and relocated residents are able to relocate and remain within or in close proximity to their existing communities.

Temporary indirect effects to socioeconomic resources from temporary road closures during construction would be minimized by informing the affected resources in advance of when such circumstances would occur, and working with individuals and the community to potentially adjust schedules and identify

alternative access. By improving an existing highway rather than building on new alignment, impacts to community facilities would be minimized.

3.7.2 Natural Resources

Waters, Wetlands, and Water Quality

Mitigation for waters, wetlands, and water quality impacts generally consists of three components: avoidance, minimization, and compensation. Avoiding and minimizing direct effects would also serve to reduce indirect effects. New stormwater facilities would be constructed outside of waters and wetlands to the extent possible. Minimization of impacts to waters and wetlands would occur by ensuring adequate hydraulic openings are in place so that hydrologic flow patterns are not disrupted, that hydraulic connectivity is maintained to wetlands upstream and downstream, and cut/fill area in wetlands are reduced to the minimal design slope necessary. Compensation would be required for unavoidable impacts to waters and wetlands in accordance with federal and state regulations.

To reduce potential for indirect effects, staging areas would not be located in waters or wetlands, disposal of excess material would not occur in waters or wetlands, and borrow material would not be excavated from waters or wetlands. Implementation of strict erosion and sediment control and stormwater measures during construction would minimize permanent and temporary impacts to waters, and thereby indirect effects as well. Additionally, various control measures could be incorporated into the roadway design and maintenance plans to reduce impacts to wetland hydrology and water quality, including stormwater best management practices, as defined in the stormwater regulations, as a means of mitigating expected impacts to water quality.

Floodplains

Design modifications to eliminate or minimize floodplain encroachments to the extent practicable are required by Executive Order (EO) 11988. Since the proposed Build Alternative would primarily be on existing alignment, impacts to floodplains cannot be eliminated, but are expected to be minimal compared to existing conditions. During final design of the Build Alternative, a thorough 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.

Wildlife Habitat

Potential impacts to wildlife habitat expected as a result of the Build Alternative could be minimized through use of design measures such as reducing the roadway cut/fill footprint. Limiting removal of forest stands along the roadway could serve to reduce habitat losses and related indirect effects to wildlife. Impacts to water quality could be minimized through the installation of new stormwater facilities and use of best management practices, as described in the above waters, wetlands, and water quality section.

In addition, temporary impacts would be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. To prevent the introduction and establishment of invasive species, during construction, the contractor would adhere to VDOT's Road and Bridge Specifications manual, Chapter 40 of Title 3.2 of the Code of Virginia, Virginia Administrative Code 2VAC-5-390-20, and other applicable regulations.

Threatened, Endangered, and Special Status Species

Potential indirect impacts to threatened, endangered, and special status species could be minimized through design measures such as reducing construction footprint, avoiding key habitat, implementing stormwater and erosion and sediment control measures, and utilizing best management practices. In addition, temporary impacts could further be reduced through proper location and minimization of staging areas, construction access roads, and modifying construction techniques in valuable habitats.

Additional coordination with VDGIF and USFWS would occur prior to construction in the advanced stages of the project design. Consultation would occur before the permit decision, as any mitigation measures, conditions, or restrictions determined necessary by the USFWS would 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, or restoration of habitat.

3.7.3 Historic Resources

Similar to Socioeconomic Resources, temporary indirect effects from temporary road closures during construction would be minimized by informing the affected resources in advance of when such circumstances would occur, and working with individuals and the community to potentially adjust schedules and identify alternative access.

4.0 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 What are the Geographic Scope and Temporal Boundaries for the Study?

The geographic limits for the cumulative effects analysis are the same as the study areas described in **Section 3.2.1** of this Technical Report.

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 1933, when several roadways were renumbered to identify the 71-mile route between Winchester, Virginia and Alexandria, Virginia as Route 7, to 2040, which is the modeled design year used for the Build Alternative.

4.2 What Are the Resources Affected by the Study?

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

4.3 What Are Other Past, Present, and Reasonably Foreseeable Actions That Have Impacted Or May Impact These Resources?

4.3.1 Past Actions

Many of the past actions that have contributed to the baseline for this analysis occurred as part of the residential and mixed used development including retail and other commercial, institutional, and business development described in **Section 3.2.2**. This development transformed a rural landscape into a suburban/urban environment, resulting in a loss of wildlife habitat and species, impacts to wetlands, streams, and floodplains; and increased levels of air and water pollution. Much of the development does not have any associated stormwater management facilities, since many of the areas were developed before stormwater management requirements were in place. The original development also formed the basis for the substantial level of population growth the region experienced. In association with this growth came an increase in employment and investment in the ICE Study Areas. Past notable projects that have occurred within the vicinity are listed below.

- Route 7 – In 1933, several roadways were renumbered to identify the 71-mile route between Winchester, Virginia and Alexandria, Virginia as Route 7. Widening of sections of Route 7 began in 1954; the section within the Socioeconomic Resources ICE Study Area was not widened until 1969.
- 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 Maine.
- Lake Fairfax Park – A 476-acre park surrounding an 18-acre lake developed in the late 1950's/ early 1960's, purchased by the Fairfax County Park Authority in 1966. The park includes a waterpark, fishing areas, campgrounds, trails, playground, picnic areas, a carousel, and a skatepark.
- Washington Dulles International Airport – Constructed in 1962, Dulles Airport has the capacity for continued growth to increase the number of runways, service more flights, and increase the number of gates. Dulles Airport could accommodate 70 million annual passengers and up to one million aircraft operations per year.
- Dulles Access Road – Constructed with the airport in 1962 to provide access between the airport and I-495.
- 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.
- Tysons Corner Center – Constructed in 1968 and, more recently, Tysons Galleria constructed in 1988, are two super-regional malls within the region called Tysons Corner. Tysons Corner is a highly developed mixed use area consisting of numerous retail, commercial, residential complexes, and corporate headquarters.
- Washington Metrorail – The first segments of the Washington Metrorail opened in 1976. After years of construction and plans for future construction, the Metrorail connects Maryland, Virginia, and Washington, D.C. as an alternative mode of transportation for thousands of users. Until recently, only three lines (Yellow, Blue, and Orange) served the Northern Virginia Region. In

2014, the Silver line opened connecting Northern Fairfax to the Metrorail, providing a significant increase in access to public transportation. The Silver line goes through Tysons, following Route 7 until the Dulles Toll Road, where it turns west and runs in the median of the Toll Road. Currently, Silver Line extends to Reston, but an extension to the Dulles Airport and Loudoun County is currently under construction and expected to be completed by 2020.

- Dulles Toll Road – Built in 1984, provides an alternative route to Route 7. The Toll Road also has the Dulles Airport Access which, provides free and airport-only access to and from the Dulles Airport.
- Dulles Greenway – A tolled road from Route 28 to Leesburg opened in 1995, providing an alternative to Route 7.
- Wolf Trap National Park for the Performing Arts – An indoor and outdoor event and concert performance center opened in 1971 and is located on Trap Road off of the Dulles Toll Road, adjacent to Route 7. This venue hosts more than 80 performances each summer and holds over 7,000 attendees at peak times.

In addition to the projects described above, the ICE Study Area underwent a period of rapid urban development from the 1970s to the 1990s. Large residential neighborhoods, such as the Lake Anne and Lake Fairfax Park developments, were constructed in the vicinity of Route 7 during this time period. Outside of the Route 7 residential development, many mixed use retail/office/residential centers were established, such as Reston, Tysons, Vienna, Oakton, and Fair Lakes. Residences, schools, golf courses, and other community facilities associated with these centers were established surrounding these centers.

While the developments typically avoided stream corridors, many developments were constructed on the forested area adjacent to the streams, reducing the acreage of natural ecosystems associated with the streams (USGS, 2017b). The remaining natural areas are now largely restricted to the major stream corridors, which have received higher levels of protection since the 1980s.

4.3.2 Present and Reasonably Foreseeable Future Actions

Currently, a number of development actions are occurring and/or are planned to occur that could contribute to cumulative effects on resources affected by the project. **Table 4-1** lists the present and reasonably foreseeable future transportation projects that have the potential to contribute to cumulative effects and are either identified in VDOT's Final 2017 SYIP, MWCOG's CLRP, Fairfax County Department of Transportation's scoping response, or are on the Northern Virginia Transportation Authority's (NVTA) Long Range Transportation Plan (LRTP). Pedestrian accessibility, pedestrian and bicycle improvements, shoulder improvements, and bridge replacements projects were excluded as they would have minimal disturbance compared to larger roadway projects.

Table 4-1: Present and Reasonably Foreseeable Future Transportation Projects within the Vicinity

Project	Status
Bridge Decks Replacement and Widening of Route 7 Over Dulles Airport Toll Road	Under Construction
Route 7 and Baron Cameron Avenue, add/upgrade signalized crosswalks	Under Construction
Route 7 Washington Metro Area Transit Authority (WMATA) Transit Signal Priority (TSP)	In Design
Route 7 – Widen To 6 Lanes from Rolling Holly Drive (Mile Marker 50.5) to 0.15 mi East of Reston Avenue (Mile Marker 51.7)	In Design
Tysons Corner Roadway Improvements	In Design
Route 7 Widening – Rolling Holly Drive to Reston Ave	In Design
Transportation / Pedestrian Initiatives – Dulles Corridor / Tysons / Reston Metro Access Improvements	In Design
Georgetown Pike, from Utterback Store Road to Falls Chase Court	In Design
Route 7 Shared Use Paths, both sides from Dulles Toll Road Bridge to Beulah Road	In Design
Georgetown Pike, between Falls Chase Court and Falls Bridge Lane; then Falls Bridge Lane to Seneca Road	Scoping & Environmental Phase

Source: VDOT Final FY 2018-2023 SYIP (2012), *Fairfax County, Hunter Mill and Dranesville Pedestrian Projects, accessed July 2017.*

Fairfax County's Planning and Zoning Viewer Map was reviewed to identify other local non-transportation projects (see **Table 4-2**) (Fairfax County, 2017b). While there are several planning public projects, no planned private developments have been identified in the vicinity of the project.

4.4 What were those impacts?

Cumulative effects consist of the potential impacts of the alternatives under consideration in the Route 7 Corridor Improvements Revised EA and the impacts of the past, present, and reasonably foreseeable future actions. Past, present, and reasonably foreseeable actions have already impacted or have the potential to impact socioeconomic, natural, or historic resources, as does the proposed project. The following discussions illustrate the resources that could potentially be impacted by the Build Alternative and the actions described in **Section 4.4.1** and **Tables 4-1** and **4-2**. These potential impacts are taken into consideration in the following discussions of cumulative impacts to different resources.

4.4.1 Socioeconomic Resources

The cumulative impacts to neighborhood cohesion, community facilities, and environmental justice populations due to past and present actions are closely related and are described together in the following sections.

Past and present actions have been both beneficial and adverse to socioeconomic resources, and it is expected reasonably foreseeable future actions could as well. Past and present growth and development has increased the standards of living for communities, provided for community cohesion, as well as community facilities and recreational resources. Such growth and development has benefited local economies by improving access to markets and customers.

Table 4-2: Present and Reasonably Foreseeable Future Non-Transportation Projects within the Vicinity

Project	Status
Oakcrest School	Under Construction
Wolf Trap Stream Restoration	Under Construction
Stream & Water Quality Improvements – Colvin Run Ph. 1 Lake Fairfax Park	Under Construction
Stream & Water Quality Improvements – Old Courthouse Spring Branch Valley Park	Under Construction
Stream & Water Quality Improvements – Difficult Run Tributary at Brittenford Drive (DF92-00)	In Design
Force Main Rehabilitation – Difficult Run Force Main	In Design
Storm Drainage Outfalls – 10030 Colvin Run Road- Robinson	In Design
Stream & Water Quality Improvements – Bull Neck Run at Springhill Recreation Center	In Design
Capital One Tysons Headquarters – In conjunction with their new headquarters building, Capital One Bank is proposing to build a Wegmans and a 125,000 square foot Capital One Center, which would provide space for cultural offerings and corporate training.	Multi-phased – Under Construction/In Design
Transforming Tysons – Fairfax County envisioned 24-hour urban center with walkable and sustainable infrastructure, intended to provide an area for people to live, work and play by 2050.	Multi-phased – Under Construction/In Design
Dulles Western Lands (also known as Western Land Area Development) – a potential approximate 400-acre commercial development project immediately west of Washington Dulles Airport (the Metropolitan Washington Airports Authority is evaluating the impacts associated with declaring the land excess).	Environmental Phase

Note: It is important to note, of the projects listed above, very few have approved NEPA planning documents or publicly available permit data that provide estimated impacts to aquatic resources.
Source: Fairfax County, 2017h, 2017i, 2017j, Metropolitan Washington Airports Authority (MWAA). 2017a, 2017b, 2017c; Inside NOVA, 2017.

The actions listed in **Section 4.3.1 – 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. Future actions that lead to growth and development are expected to be beneficial for some, but not for others. For example, growth could increase employment opportunities, but require relocations to accommodate.

As discussed in **Section 3.2.2 – Directions and Goals**, Route 7 was constructed prior to the substantial population increase and associated housing development that occurred between the 1960s and 1990s. At that time, Route 7 was the primary through road connecting Alexandria and Winchester. As a major commuter roadway, Route 7 has been expanded in many different places starting in 1954 with the study area portion being expanded in 1969 to accommodate increasing traffic volumes. The creation of other major commuter roads such as I-95, I-495, and the Dulles Toll Road created more accessibility and an increase in businesses and employment, while also impacting community cohesion throughout the region.

Future growth and development of the area should also not adversely affect socioeconomics. Locality plans, which include the Route 7 Corridor Improvements, suggest that properties along the Route 7 corridor remain solely as residential development. As the area is highly developed, the Upper Potomac and McLean

locality plans note that any redevelopment or infill development should be of compatible use, type and intensity to existing uses. Trails, sidewalks, and public access are priorities intended to provide both transportation and recreation benefits supporting pedestrian, bicycle, and equestrian uses (Fairfax County, 2017c). Roadway improvements would include rehabilitation, widening and streetscape efforts, as well as updated pedestrian and bicycle facilities. These types of changes benefit all populations, including minority and low income.

Past and present transportation improvement projects benefit community facilities and recreational resources by improving access and reducing traffic congestion. Immediately east (before Dulles Toll Road), Route 7 is under construction to expand the road and the bridge over Dulles Toll Road from two lanes in each direction to three lanes in each direction. Immediately west (after Reston Ave) of the study area, Route 7 has already been expanded to three lanes in both directions improving access and reducing congestion. The Build Alternative would maintain three lanes of traffic along Route 7, providing a better connection from Tysons Corner to Leesburg. Future transportation projects would continue to improve access to community facilities and businesses as well as provide more efficient travel through the region.

4.4.1.1 No Build Alternative

The No Build Alternative would likely have a minor adverse cumulative effect on communities, businesses, and the population that lives along or that uses the Route 7 corridor due to increased congestion. Increased congestion could potentially cause residential and business relocations away from traffic congestion and air and noise impacts.

4.4.1.2 Build Alternative

The Build Alternative would widen an existing roadway and update bicycle and pedestrian facilities in a highly developed area that has been previously disturbed, limiting the effects of converting other land uses and limiting indirect effects to neighborhoods, community facilities, and environmental justice populations. Although this area has experienced land use conversions and increases in population in the past, these improvements would have a moderate beneficial cumulative impact by improving capacity of the roadway, possibly relieving congestion, and providing an alternate mode of transportation for residents to access other neighborhoods and community facilities.

Local comprehensive planning provides for and encourages bicycle and pedestrian updates in the community. Past and present transportation improvements have benefitted bicycle paths and recreational trails by increasing access and existing networks. The reduction in congestion and increase in travel reliability, connectivity, and safety on bicycle and pedestrian networks could have a moderate beneficial cumulative effect on the residents, commuters, and visitors who would use the bicycle and pedestrian networks. Additionally, providing adequate facilities to support bicycle and pedestrian use may reduce roadway vehicle use and improve community connectivity.

The Build Alternative could have short-term minor adverse effects while the roadway and shared use path are under construction. However, the short-term beneficial effect of more jobs and associated expenditures resulting from the Build Alternative is expected to benefit the local communities.

Overall, the incremental contribution of the Build Alternative would be beneficial for the long-term and both adverse and beneficial for the short-term during construction.

4.4.2 Natural Resources

The cumulative impacts to waters, wetlands, and water quality; floodplains; wildlife habitat; and threatened, endangered, and special status species due to past and present actions are closely related and are described together in the following sections.

From 1950 to the present, Fairfax County has rapidly transitioned from a rural area to a suburban area. Past actions during development have led to the impaired waters and impacted wetlands 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 could otherwise have continued to occur. It is important to note, of the projects listed above in **Section 4.3.1 – Past Actions**, very few have approved NEPA planning documents or publicly available permit data that provide estimated impacts to aquatic resources.

Present and reasonably foreseeable future actions include protections to wetlands, waters, floodplains, water quality, and threatened, endangered, and special status species afforded by federal, state, and local regulations. These protections could limit future adverse impacts to these resources. Additionally, local comprehensive planning includes natural resource management plans that aim to preserve remaining high valued wildlife habitat and water quality by directing growth to specific areas and densities, with the goal of being sustainable in the future.

Future federal actions, as well as larger private developments, would be established 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 total maximum daily load (TMDL)-related requirements established by VDEQ. These controls serve to minimize adverse impacts, identify avoidance and other minimization measures, and set limits on the amount of pollutants that are allowed to enter receiving bodies of water.

Since the passage of federal and state regulations to identify and protect threatened, endangered, and special status 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.

4.4.2.1 No Build Alternative

The No Build Alternative would not improve the existing Route 7 corridor. Since its initial construction, Route 7 has undergone many improvements and widenings, including updating stormwater facilities. However, there are still sections lacking any stormwater management features or the features are outdated and would not be improved under the No Build Alternative. Existing untreated or poorly treated stormwater runoff would continue to have minor adverse cumulative effects on the natural resources in the Natural Resources ICE Study Area.

4.4.2.2 Build Alternative

As previously discussed, past growth and urbanization have diminished natural resources within the Natural Resources ICE Study Area. However, current federal, state, and local regulations and conservation efforts lessen the effects of such development.

The Build Alternative would widen an existing roadway in a highly urbanized area that has been previously disturbed. Direct effects could include impacts to wetlands, streams, and floodplains due to the placement of fill and relocation of Colvin Run, as well as direct loss of wildlife habitat due to vegetation clearing and earth moving. Minor adverse cumulative effects to these resources could include changes in water quality, increased runoff, changes in hydrologic regime, changes in light regime, introduction of invasive species, alteration of drainage patterns, potential changes in flood flow elevations, animal-vehicle collisions, noise, and potential for oil spills. These direct and indirect effects should be minimized by implementation of best management practices and compensatory mitigation.

Construction and post-construction of the Build Alternative would potentially contribute to minor, short-term adverse effects due to localized increases in pollutants and nutrients causing impairment to waterways. Drainage design for the new proposed bridge would be developed in later design phases and is expected to be in conformance with current stormwater regulations in order to minimize effects to natural resources and water quality. Since construction of the Build Alternative includes stormwater management systems, which are currently lacking along this portion of Route 7, implementation of the Build Alternative could improve roadway runoff water quality from current conditions.

Because much of the Natural Resources ICE Study Area is developed, wildlife habitat and corridors are highly fragmented. Habitat is most intact along the riverine corridors crossed by Route 7. The Build Alternative proposes to replace the bridge and increase the hydraulic opening at Difficult Run which would result in a long-term minor beneficial cumulative effect by improving the potential for wildlife movement at this crossing. Mitigation measures developed through consultation with the VDGIF would reduce the potential for adverse effects to up or downstream habitat that supports the state threatened wood turtle known to use Difficult Run in the vicinity of the Route 7 crossing.

4.4.3 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, such as the Fairfax's Architectural Review Board and the History Commission, have reduced the rates of impacts to historic resources. However, conflicts between the protection of historic properties and development and transportation continue to occur.

4.4.3.1 No Build Alternative

The No Build Alternative would not alleviate traffic delays along the corridor, thereby causing a minor adversely cumulative effect on historic resources by affecting visitor's accessibility to the identified historic resources.

4.4.3.2 Build Alternative

While the Build Alternative would affect two historic resources and two historic districts, the cumulative effects for 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 Fairfax's Architectural Review Board and the History Commission for other projects.

4.5 What is the Overall Impact on These Various Resources from the Accumulation of the Actions?

Since 1950, 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 activity. The short-term beneficial effect 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. The project is anticipated to decrease congestion, increase safety, and provide enhanced bicycle and pedestrian facilities. This would result in a beneficial cumulative effect, with a beneficial impact on local socioeconomics that would be in line with locality plans.

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 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. Some historic properties (private and public) may continue to fall into disrepair or be impacted by development in the area. Through the implementation of minimization strategies that would be coordinated with local governments and VDHR, cumulative impacts on historic resources attributable to implementation of the Build Alternative are anticipated to be negligible.

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. Additionally, 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.

5.0 REFERENCES

Center for Conservation Biology (CCB). (2017). CCB Mapping Portal. Accessed July 2017: http://www.ccbbirds.org/maps/#eagles.

City of Fairfax (2015). Comprehensive Plan Future Land Use Map: Accessed 8/2/2017: http://www.fairfaxva.gov/home/showdocument?id=630.

Council on Environmental Quality (CEQ). (1997). Considering Cumulative Effects under the National Environmental Policy Act. Accessed July 2017: http://energy.gov/nepa/council-environmental-quality?page=1.

Council on Environmental Quality (CEQ). (2005). Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Accessed July 2017: http://energy.gov/nepa/council-environmental-quality.

Encyclopedia of Life. (2017). Accessed July 2017: http://eol.org/.

Environmental Protection Agency (EPA). (1999). Consideration of Cumulative Impacts in EPA Review of NEPA Documents. Accessed July 2017: https://www.epa.gov/sites/production/files/2014-08/documents/cumulative.pdf.

Fairfax County. (2007). Difficult Run Watershed Management Plan. Accessed July 2017: http://www.fairfaxcounty.gov/dpwes/watersheds/publications/dr/02_df_wmp_toc_execsum_ada.pdf#page=11.

Fairfax County. (2014a). Fairfax County Bicycle Master Plan. Accessed July 2017: http://www.fairfaxcounty.gov/fcdot/bike/county_bike_master_plan.htm.

Fairfax County. (2014b). Fairfax County Concept for Future Development Map. [map]. Scale not given. Fairfax County, VA: Fairfax County, 2014.

Fairfax County. (2014c). Fairfax County Transportation Plan Map (Third Four-Year Transportation Program for FY 2013 through FY 2016). [map]. Scale not given. Fairfax County, VA: Fairfax County, 2014. Retrieved from http://www.fairfaxcounty.gov/fcdot/fouryearprogram.htm.

Fairfax County. (2014d). Fairfax County Transportation Plan Map (FY2015-FY2020 Transportation Project Priorities). [map]. Scale not given. Fairfax County, VA: Fairfax County, 2017. Retrieved from http://www.fairfaxcounty.gov/fcdot/fctsr.htm.

Fairfax County. (2015a). Fairfax County Transportation Plan Map. [map]. Scale not given. Fairfax County, VA: Fairfax County, 2015.

Fairfax County. (2015b). Neighborhood and Community Services website. Accessed July 2017: http://www.fairfaxcounty.gov/ncs/.

Fairfax County. (2017a). Dranesville District Pedestrian Projects. Accessed July 2017: http://www.fairfaxcounty.gov/fcdot/pedestrian/dranesville.htm.

Fairfax County. (2017b). Fairfax County Comprehensive Land Use Plan. [map]. 1 inch = 2 miles. Fairfax County, VA: Fairfax County, 2017.

Fairfax County. (2017c). Fairfax County Comprehensive Plan 2013 Edition (as amended): Accessed July 2017: http://www.fairfaxcounty.gov/dpz/comprehensiveplan/.

Fairfax County. (2017d). Fairfax County Comprehensive Plan: McLean Planning District, Amended March 2017. Accessed July 2017: http://www.fairfaxcounty.gov/dpz/comprehensiveplan/-area2/mclean.pdf.

Fairfax County. (2017e). Fairfax County Comprehensive Plan: Upper Potomac Planning District, Amended March 2017. Accessed July 2017: http://www.fairfaxcounty.gov/dpz/comprehensiveplan/area3/upperpotomac.pdf.

Fairfax County. (2017f). Fairfax County Geospatial Data – GIS Mapper. Accessed July 2017.

Fairfax County. (2017g). Fairfax County GIS Historic Imagery Viewer. Accessed July 2017: http://fairfaxcountygis.maps.arcgis.com/apps/webappviewer/index.html?id=0612f9deb6bb4f0a9fa5cdce0cc75144.

Fairfax County. (2017h). Hunter Mill District Pedestrian Projects. Accessed July 2017: http://www.fairfaxcounty.gov/fcdot/pedestrian/huntermill.htm.

Fairfax County. (2017i). Planning and Zoning Viewer Map. Accessed July 2017: http://fairfaxcountygis.maps.arcgis.com/apps/webappviewer/index.html?id=9e238ecc6855430fbb4ce1782dea1336.

Fairfax County. (2017j) Transforming Tysons. Accessed July 2017: http://www.fairfaxcounty.gov/tysons/.

Fairfax County. (2017k). Wildlife. Accessed July 2017: http://www.fairfaxcounty.gov/living/wildlife/.

Fairfax County Department of Transportation (FCDOT). (2014). Fairfax County Bicycle Master Plan. Accessed July 2017: http://www.fairfaxcounty.gov/fcdot/bike/county_bike_master_plan.htm.

Fairfax County Department of Transportation (FCDOT). (2017a). Fairfax County FCDOT Capital Projects. [Interactive map]. Scale varies. Fairfax County, VA: Fairfax County, 2017. Accessed July 2017: http://fairfaxcountygis.maps.arcgis.com/apps/Viewer/index.html?appid=31d474851ec649398c5950fec5fde64b.

Fairfax County Department of Transportation (FCDOT). (2017b). Fairfax County Transportation Status Report. Accessed July 2017: http://www.fairfaxcounty.gov/fcdot/pdf/fctsr/fctsr_3-2017.pdf.

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

Federal Highway Administration (FHWA). (1992). Position Paper on Secondary and Cumulative Impact Assessment. Accessed July 2017: https://www.environment.fhwa.dot.gov/guidebook/-content/Secondary_Cumulative_Impact_Assessmt.asp.

Federal Highway Administration (FHWA). (2003). Interim Guidance: Indirect and Cumulative Impacts in NEPA. Accessed July 2017: https://www.environment.fhwa.dot.gov/guidebook/qaimpactmemo.asp.

Federal Highway Administration (FHWA). (2011). Environmental Justice Emerging Trends and Best Practices Guidebook. Washington, D.C.: U.S. Department of Transportation. Accessed July 2017: http://www.fhwa.dot.gov/environment/environmental_justice/resources/guidebook_2011/-guidebook04.cfm.

Federal Highway Administration (FHWA). (2012). FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Order 6640.23. Washington, D.C.: U.S. Department of Transportation. Accessed July 2017: https://www.fhwa.dot.gov/legsregs/directives/orders/664023a.cfm.

Federal Highway Administration (FHWA). (2014). Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process. Washington, D.C.: Accessed July 2017: https://www.environment.fhwa.dot.gov/guidebook/qaimpact.asp.

Google Earth (2005). USDA. Google earth V 7.3.0. (June 7, 2005). Vienna, Virginia. 38° 57.801'N 77° 147.340'W, Eye alt 26467 feet. USDA Farm Service Agency. Accessed July 2017: http://www.earth.google.com.

Harding, P. v. 2017. *Glyptemys insculpt*a. Retrieved from International Union for Conservation of Nature (IUCN) Red List of Threatened Species: http://www.iucnredlist.org/details/4965/0.

Inside NOVA (2017) *Capital One Presses for Performing-Arts Center*, *Wegmans in Tysons*, article dated June 26, 2017.

Loudon County, 2017. Land Use map. Accessed July 2017: https://logis.loudoun.gov/weblogis/.

Metropolitan Washington Airports Authority (MWAA). (2017a). About Dulles International. Accessed July 2017. Retrieved from: http://www.flydulles.com/iad/about-dulles-international.

Metropolitan Washington Airports Authority (MWAA). (2017b). About Dulles Toll Road. Accessed July 2017. Retrieved from: http://www.dullestollroad.com/toll/about-dulles-toll-road.

Metropolitan Washington Airports Authority (MWAA). (2017c). Dulles Western Lands. Accessed July 2017. Retrieved from: http://www.mwaa.com/business/dulles-western-lands.

Metropolitan Washington Council of Governments (MWCOG). (2016a). MWCOG Cooperative Forecast-Round 9.0. Accessed July 2017: http://rtdc-mwcog.opendata.arcgis.com/datasets/-a544e25084cf4d1897c7a23c68b4e0f1_0?geometry=-77.477%2C38.897%2C-76.414%2C39.058.

Metropolitan Washington Council of Governments (MWCOG). (2016b). Financially Constrained Long-Range Transportation Plan for the National Capital Region (CLRP). The National Capital Region Long Range Transportation Plan. Accessed July 2017: http://old.mwcog.org/clrp/.

Metropolitan Washington Council of Governments (MWCOG). (2016c). Financially Constrained Long-Range Transportation Plan for the National Capital Region (CLRP). The National Capital Region Long Range Transportation Plan. Accessed January 2017: http://old.mwcog.org/clrp/.

National Capital Region Transportation Planning Board (NCRTPB) / Metropolitan Washington Council of Governments (MWCOG). (2012). Regional Transportation Priorities Plan for the National Capital Region. Accessed July 2017: https://encrypted.google.com/search?{google:acceptedSuggestion}oq=Regional+Transportation+Priorities+Plan+for+the+National+Capital+Region.&sourceid=chrome&ie=UTF-8&q=Regional+Transportation+Priorities+Plan+for+the+National+Capital+Region.

National Land Cover Database 2011 (NLCD). (2011). Accessed June 2017: https://www.mrlc.gov/nlcd2011.php.

NatureServe. (2017). NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. Accessed July 2017: http://explorer.natureserve.org.

Nextdoor. (2017). Virginia Neighborhoods. Accessed July 2017: https://nextdoor.com/find-neighborhood/va/.

North Carolina Department of Transportation (NCDOT). (2001). Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina. Raleigh, NC: State of North Carolina Department of Transportation/Department of Environmental and Natural Resources. Accessed July 2017: https://connect.ncdot.gov/resources/environmental/compliance%20guides%20and%20procedures/volume%2001%20assessment%20guidance%20policy%20report.pdf.

Northern Virginia Transportation Authority (NVTA). 2012. TransAction 2040. Retrieved October, 2017 from http://www.thenovaauthority.org/wp-content/uploads/2015/10/NVTA_TA2040_TechReport_20121121_LoRes.pdf.

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, D.C.

Transportation Research Board (TRB). (2006). Secondary/Indirect and Cumulative Effects Analysis. National Cooperative Highway Research Program Project 25-25 Task 11. Accessed July 2017: http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(11)_FR.pdf.

Transportation Research Board (TRB). (2007). Forecasting Indirect Land Use Effects on Transportation Projects. NCHRP Program 25-25, Task 22. Accessed July 2017: http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(22)_FR.pdf.

University of Groningen (GMW) – Humanities Computing. (2012). American History: From Revolution to Reconstruction and beyond, The Postwar Economy: 1945-1960. Accessed July 2017: http://www.let.rug.nl/usa/outlines/history-1994/postwar-america/the-postwar-economy-1945-1960.php.

U.S. Bureau of Economic Analysis (BEA). (2016). Regional Economic Accounts: Fairfax County. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015a). 2011-2015 American Community Survey 5-Year Estimates, Average Household Size, B25010. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015b). 2011-2015 American Community Survey 5-Year Estimates, Hispanic or Latino Origin By Race, B03002. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015c). 2011-2015 American Community Survey 5-Year Estimates, Housing Units, B25001. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015d). 2011-2015 American Community Survey 5-Year Estimates, Means of Transportation to Work, Workers 16 years and over, B08301. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015e). 2011-2015 American Community Survey 5-Year Estimates, Median Household Income in the Past 12 Months (in 2015 Inflation Adjusted Dollars), B19013. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015f). 2011-2015 American Community Survey 5-Year Estimates, Population Totals, B01003. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015g). 2011-2015 American Community Survey 5-Year Estimates, Poverty Status in the Past 12 Months, S1701. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015h). 2011-2015 American Community Survey 5-Year Estimates, Sex by Age, B01001. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015i). 2011-2015 American Community Survey 5-Year Estimates, Tenure, B25003. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015j). Census 1980-2010 and American Community Survey 2011-2015, Total Population, B01003. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2015k). Census 1980-2010 and American Community Survey 2011-2015, Vacancy, B25004. Washington, D.C.: U.S. Department of Commerce.

U.S. Census Bureau (Census). (2017). Census of Population and Housing 1940-2010. Accessed July 2017: https://www.census.gov/prod/www/decennial.html.

U.S. Department of Health and Human Services (HHS). (2015). 2015 Poverty Guidelines. Washington, D.C.: Office of the Assistant Secretary.

U.S. Department of Homeland Security. (2017). National Flood Hazard Layer. Accessed July 2017: https://www.fema.gov/national-flood-hazard-layer-nfhl.

U.S. Fish and Wildlife Service (USFWS). (2017a). National Wetlands Inventory. Accessed July 2017: https://www.fws.gov/wetlands/data/data-download.html.

U.S. Fish and Wildlife Service (USFWS). (2017b). Information for Planning and Consultation (IPaC). Accessed July 2017: https://ecos.fws.gov/ipac/.

U.S. Fish and Wildlife Service (USFWS) Virginia Field Office. (2017c). Step 2 - Official Species List. Accessed July 2017: https://www.fws.gov/northeast/virginiafield/endangered/projectreviews_step2.html.

U.S. Fish and Wildlife Service (USFWS). (2017d). Rusty Patched Bumble Bee Map. Accessed November 11, 2017: https://www.arcgis.com/home/item.html?id=61e47c589e9a4dd49afaf3cba23a7741.

U.S. Geological Survey. (USGS). (2017a). Get NHD Data. Accessed July 2017: https://nhd.usgs.gov/data.html.

U.S. Geological Survey (USGS). (2017b). USGS Historical Topographic Map Explorer. Accessed July 2017: http://historicalmaps.arcgis.com/usgs/.

Virginia Department of Conservation and Recreation (VDCR). (2017). VaNWBD shapefiles. Accessed July 2017: http://www.drc.virginia.giv/soil-and-water/hu#nwbdprod.

Virginia Department of Conservation and Recreation Department of Natural Heritage (VDCR-DNH). (2017). Virginia Natural Heritage Database Search. Accessed July 2017: https://vanhde.org/species-search.

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.

Virginia Department of Game and Inland Fisheries (VDGIF). (2017a). Fish and Wildlife Information Service (FWIS). Accessed July 2017: http://vafwis.org/fwis/.

Virginia Department of Game and Inland Fisheries (VDGIF). (2017b). Wildlife Environmental Review Map Service. Accessed July 2017: https://www.dgif.virginia.gov/gis/werms/.

Virginia Department of Game and Inland Fisheries (VDGIF). (2017c). Virginia Department of Game and Inland Fisheries ArcGIS Online. Accessed July 2017: http://dgifvirginia.maps.arcgis.com/home/index.html.

Virginia Department of Historic Resources (VDHR). (2011). 2011 Guidelines to Conducting Historic Resources Survey in Virginia. Accessed July 2017: http://www.dhr.virginia.gov/arch_DHR/archaeo_index.htm.

Virginia Department of Rail and Public Transportation (VDRPT) and Virginia Department of Transportation (VDOT). (2013). Virginia Surface Transportation Plan 2035 Update. Retrieved October 2017 from http://www.vtrans.org/resources/VSTP/VSTPUpdate_FinalReport_AccessibleFinal_aCoverTOCChap1.pdf.

Virginia Department of Transportation (VDOT). (2005). 2025 State Highway Plan. Retrieved October 2017 from http://www.virginiadot.org/projects/resources/Virginia2025StateHighwayPlanTechReport.pdf.

Virginia Department of Transportation (VDOT). (2011). Virginia Department of Transportation State Bicycling Policy Plan. 2011. Accessed July 2017: http://www.virginiadot.org/programs/resources/bike/VDOT_Bicycle_Policy_Plan.pdf.

Virginia Department of Transportation (VDOT). (2016a). Route 7 Widening Environmental Assessment, Fairfax County, From: Reston Avenue, To: Jarret Valley Drive. Accessed July 2017: http://www.connectroute7.org/documents/rte_7_widening_upc_52328_-_environmental_assessment_ea.pdf.

Virginia Department of Transportation (VDOT). (2016b). Supplemental Architectural Survey for the Route 7 Improvement Project, Fairfax County, Virginia.

Virginia Department of Transportation (VDOT). (2016c). Supplemental Cultural Resources Survey for the Route 7 Improvement Project, Fairfax County, Virginia.

Virginia Department of Transportation (VDOT). (2017a). Route 7 Widening Environmental Assessment, Fairfax County, From: Reston Avenue, To: Jarret Valley Drive Natural Resources Technical Report.

Virginia Department of Transportation (VDOT). (2017b). Route 7 Widening Environmental Assessment, Fairfax County, From: Reston Avenue, To: Jarret Valley Drive Socioeconomic and Land Use Technical Report.

Virginia Department of Transportation (VDOT). (2017c). VDOT FY 2017 Final Six-Year Improvement Program. Accessed July 2017: http://syip.virginiadot.org/Pages/allProjects.aspx#.

Virginia Department of Transportation (VDOT). (2017d). Virginia Roads Projects. Accessed July 2017: http://vdot.maps.arcgis.com/apps/webappviewer/index.html?id=0c2b5e43bae244b981186f5f58f0400b.

Virginia Employment Commission – Virginia Labor Market Information (LMI). (2017a). Community Profiles: Fairfax County. Richmond, VA: Department of Labor and Industry.

Virginia Employment Commission – Virginia Labor Market Information (LMI). (2017b). Community Profiles: Virginia. Richmond, VA: Department of Labor and Industry.

Wolf Trap National Park for the Performing Arts. (2017). About Wolf Trap in D.C. | Wolf Trap. Accessed July 2017. Retrieved from: http://www.wolftrap.org/about.aspx.

Appendix A – USGS Historic Topographic Maps

GREAT FALLS 0.6 MI.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

189 ROCKVILLE 7.4 MI.
POTOMAC 1.6 MI.

SENECA 9.9 MI. 190
POTOMAC 1.9 MI. 191
BRADLEY HILLS COUNTRY CLUB 1.6 MI.

BRADLEY HILLS COUNTRY CLUB 1.6 MI. 191

VIRGINIA-MARYLAND
FALLS CHURCH QUADRANGLE
7½-MINUTE SERIES

(Seneca)
(Rockville)
(Kensington)
Great Falls
Congressional Country Club
Burning Tree Country Club
Woodhaven
Emery Corners
Hermon Ch.
Gibson Grove
Concord Ch.
Bear Island
Carderock
Cabin John
Bannockburn Heights
Country Club Village
Fairway Hills
Glen Echo
Glen Echo Heights
Chautauqua
Rupperts
Sycamore
Potomac
River
Maryland
Virginia
Stubblefield Falls
Prospect Hill
Belleview
Swinks Mill
Spring Hill
Langley
Walter Heights
Kings Manor
Bulls Hill
Jackson
Jones Corners
Pleasant Grove
Odrick Sch.
McLean
West McLean
Lewinsville
Ash Grove
Gantt Hill
Freedom Hill
Tysons Crossroads
Howard
Madrillon
Woodford
Franklin
Wedderburn
Enola
Dunn Loring
Idylwood
El Nido
Chesterbrook
Franklin Park
Franklin Forest
Minor Hill
Country Club Grove
Country Club Manor
Country Club Hills
Millburn Terrace
Garden
Falls Hills
Mt. Daniel
Sherwood
Antrim
West Falls Church
East Falls Church
Virginia Forest
Falls Church
Greenway Downs
Prout Hill
National Memorial Park
Brockmont
Madison Sch.
Jefferson Sch.
Dulin Chapel
Oakwood Cem.
Brockwood
Lacey Forest
Westover Hills
Highland Park
(Annandale)
(Fairfax)
(Alexandria)

Mapped by the Geological Survey
1913-1915
Revised in 1941-1942

Gray tint indicates areas in which only
landmark buildings are shown

JUNC. U. S. NO. 50 3.1 MI.
WARRENTON 34 MI.

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN
DECLINATION, 1942

Scale 1/31680

1 Mile

500 0 500 1000 1500 2000 2500 Yards

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 .5 0 1 Kilometer

Contour interval 10 feet
Datum is mean sea level

JUNC. U. S. NO. 50 0.3 MI.
ALEXANDRIA (CIVIC CENTER) 8 MI.

ROAD CLASSIFICATION
1945

Dependable hard-surface heavy-duty road	Dry weather roads	U. S. Route 15
Secondary hard-surface all weather road	Loose-surface graded	
	Unsurfaced, graded	
	Dirt road	State Route 26

More than two lanes indicated along road with tick at point of change 3 LANE 4 LANE

Polyconic projection. 1927 North American datum
5000 yard grid based on U.S. zone system, B
10000 foot grids based on Virginia (North) and
Maryland rectangular coordinate systems

JUNC. U. S. NO. 50 1.4 MI.

FALLS CHURCH, VA.-MD.
Edition of 1945
N3852.5-W7707.5/7.5

VIRGINIA-MARYLAND 1:62,500

WAR DEPARTMENT
CORPS OF ENGINEERS, U. S. ARMY
(SENECA)

FIRST EDITION-AMS 2

FAIRFAX QUADRANGLE
15 MINUTE SERIES

(HARPERS FERRY 1:125,000)

(ROCKVILLE)

(GAITLETT)

(INDIAN HEAD)

(MIDDLEBURG)

WASHINGTON & VIC. (1:31,680)

GAINESVILLE 4.2 MI.

ALEXANDRIA 11.5 MI.

ANNANDALE 3.1 MI.

FAIRFAX, VA.-MD
N3845-W7715/15

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SENECA QUADRANGLE
MARYLAND—VIRGINIA
15 MINUTE SERIES (TOPOGRAPHIC)

Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USFS

Compiled in 1952 by the Army Map Service from 1:25 000-scale maps dated 1944

Polyconic projection. 1927 North American datum
10,000-foot grids based on Maryland coordinate system and Virginia coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

SCALE 1:62 500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1944

ROAD CLASSIFICATION
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U.S. Route — State Route

This area also covered by 7.5 minute, 1:24 000-scale maps: Germantown 1953, Poolesville 1952, Sterling 1952, and Seneca 1952

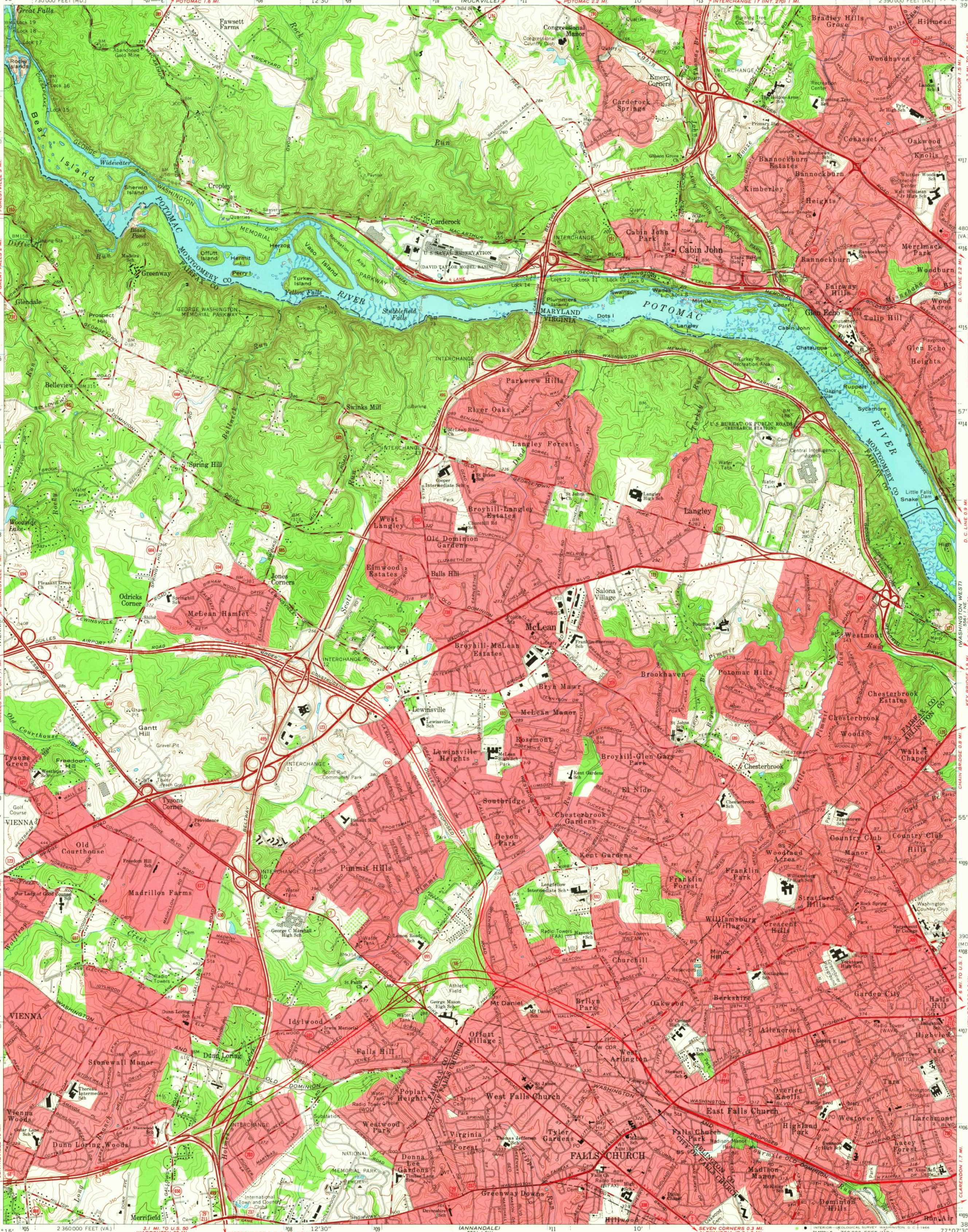
SENECA, MD.—VA.
N3900—W7715/15

1944

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FALLS CHURCH QUADRANGLE
VIRGINIA—MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, USCE, NCPS, and WSSC

Topography by photogrammetric methods from aerial photographs taken 1955. Field checked 1956. Revised 1965

Polyconic projection. 1927 North American datum
10,000-foot grids based on Virginia coordinate system, north zone, and Maryland coordinate system
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U. S. Route — State Route

VIRGINIA
QUADRANGLE LOCATION

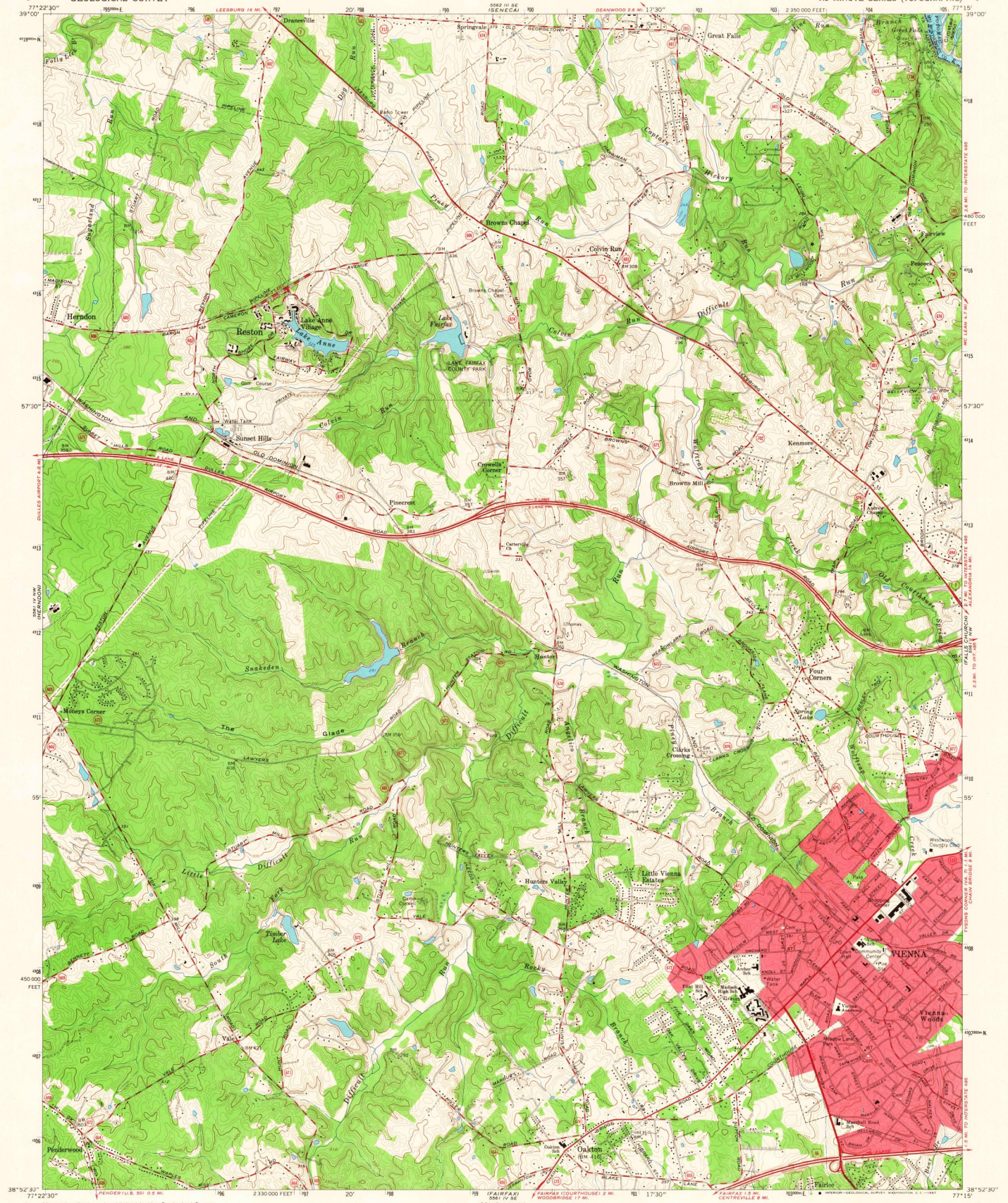
FALLS CHURCH, VA.—MD.
N3852.5—W7707.5/7.5

1965

AMS 5561 I NW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

VIENNA QUADRANGLE
VIRGINIA—MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1:24000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

Heavy-duty	Light-duty
Medium-duty	Unimprovec dirt
Interstate Route	State Route

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography by photogrammetric methods from aerial photographs taken 1949. Field checked 1951. Revised from aerial photographs taken 1964. Field checked 1966

Polyconic projection. 1927 North American datum
10,000-foot grid based on Virginia coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks,
zone 18, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

MN GN
7° 124 MILS
17°27' 26 MILS
UTM GRID AND 1966 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

VIRGINIA
QUADRANGLE LOCATION

VIENNA, VA.—MD.
N3852.5—W7715/7.5

1966

AMS 5561 IV NE—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SENECA QUADRANGLE
MARYLAND—VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 SENECA 15' QUADRANGLE

77°22'30" 2 320 000 FEET (VA.) 96 97 98 20' 17'30" 02 720 000 FEET (MD.) 04 05 77°15'
39°07'30" 470 000 FEET (MD.)
530 000 FEET (VA.)
430 000 FEET (MD.)
490 000 FEET (VA.)
2'30"
5'
39°00'
77°22'30" 95 700 000 FEET (MD.) 97 98 20' 99 100 101 17'30" 02 03 2 350 000 FEET (VA.) 77°15'

SCALE 1:24 000
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
5 0 1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION
Primary highway, all weather, hard surface — Light-duty road, all weather, improved surface
Secondary highway, all weather, hard surface — Unimproved road, fair or dry weather
State Route

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1968
Supersedes Army Map Service map dated 1952

Polyconic projection. 1927 North American datum
10,000-foot grids based on Maryland coordinate system and Virginia coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

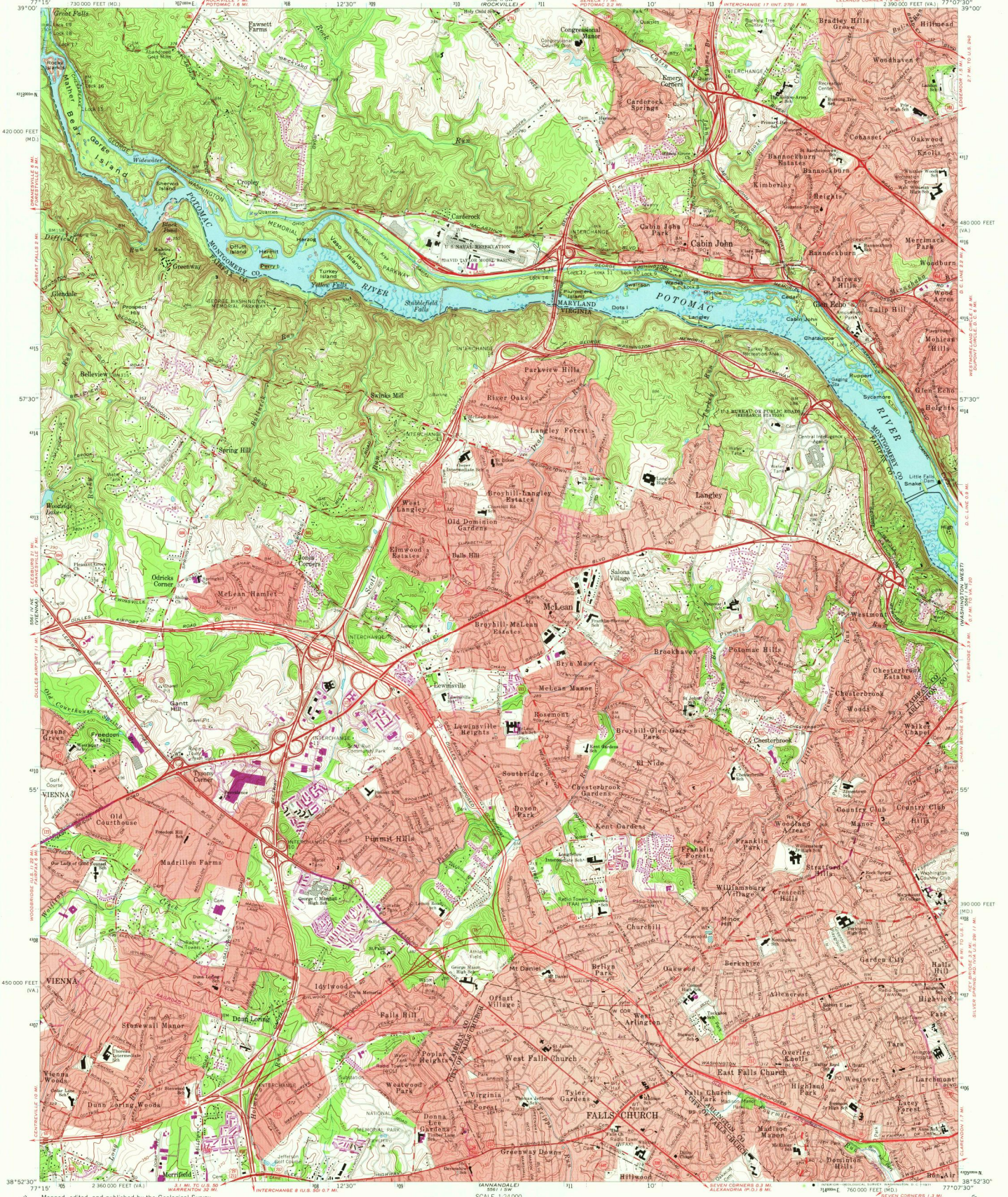
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

SENECA, MD.—VA.
SE/4 SENECA 15' QUADRANGLE
N3900—W7715/7.5
1968
AMS 5562 III SE—SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FALLS CHURCH QUADRANGLE
VIRGINIA—MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, USCE, NCPS, and WSSC

Topography by photogrammetric methods from aerial photographs taken 1955. Field checked 1956. Revised 1965

Polyconic projection. 1927 North American datum
10,000-foot grids based on Virginia coordinate system, north zone, and Maryland coordinate system
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

Revisions shown in purple compiled from aerial photographs taken 1971. This information not field checked

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — U. S. Route — State Route

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
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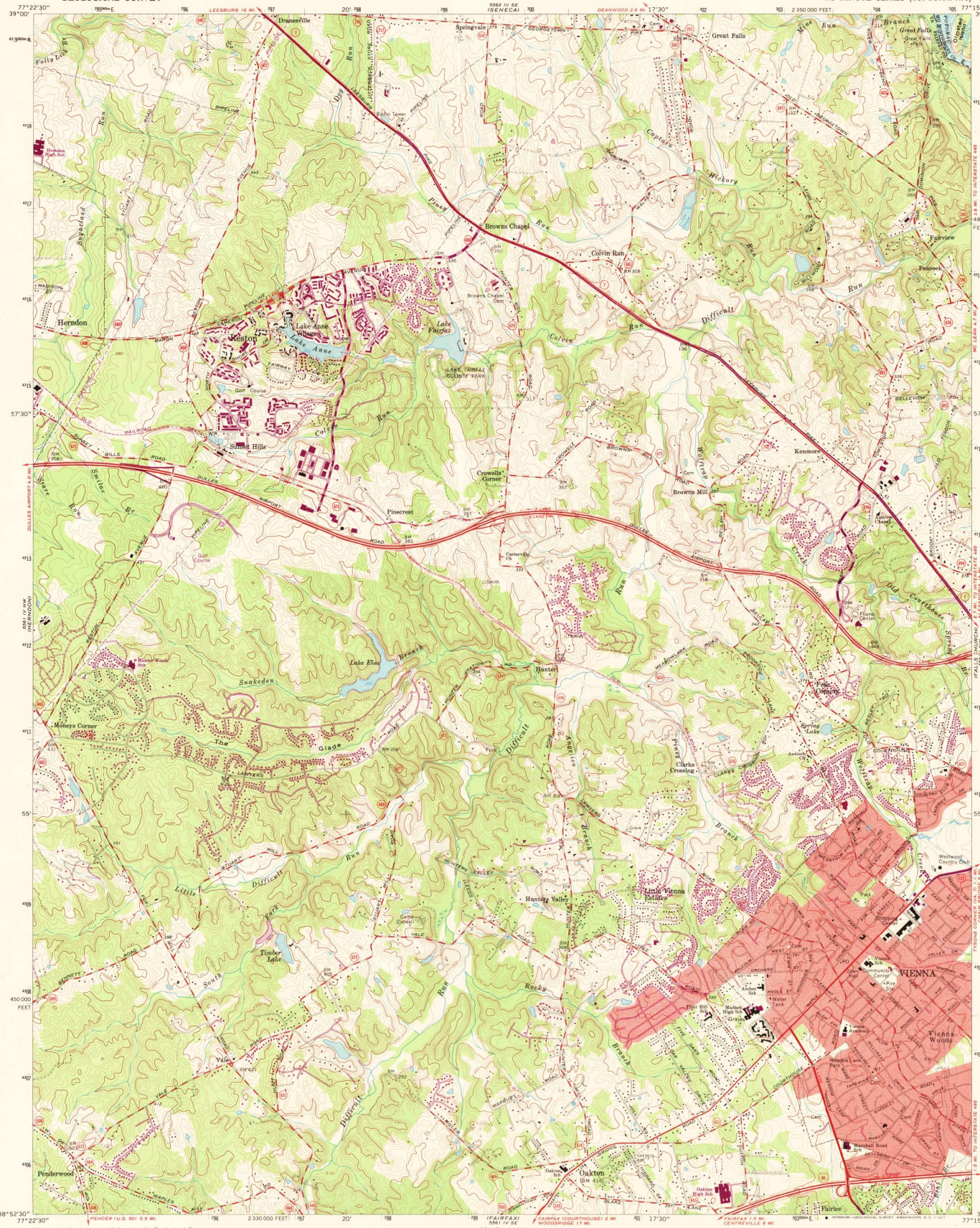
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

FALLS CHURCH, VA.—MD.
N3852.5—W7707.5/7.5

1965
PHOTOREVISED 1971
AMS 5561 I NW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

VIENNA QUADRANGLE
VIRGINIA—MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography by photogrammetric methods from aerial photographs taken 1949. Field checked 1951. Revised from aerial photographs taken 1964. Field checked 1966

Polyconic projection. 1927 North American datum
10,000-foot grid based on Virginia coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — State Route

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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QUADRANGLE LOCATION

Revisions shown in purple compiled from aerial photographs taken 1971. This information not field checked

VIENNA, VA.—MD.
N3852.5—W7715/7.5

1966
PHOTOREVISED 1971
AMS 5561 IV NE—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FALLS CHURCH QUADRANGLE
VIRGINIA-MARYLAND
7.5-MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:24 000

Produced by the United States Geological Survey

Topography compiled 1955. Planimetry derived from imagery taken 1994. Survey control current as of 1956. Contours that conflict with updated major features are dashed

North American Datum of 1983 (NAD 83). Projection and 1 000-meter grid: Universal Transverse Mercator, zone 18
2 500-meter ticks: Virginia Coordinate System of 1983 (north zone). 10 000-foot ticks: Maryland Coordinate System of 1983

North American Datum of 1927 (NAD 27) is shown by dashed corner ticks. The values of the shift between NAD 83 and NAD 27 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1998 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

ADJOINING 7.5′ QUADRANGLE NAMES

1	2	3
4		5
6	7	8

1 Seneca
2 Rockville
3 Kensington
4 Vienna
5 Washington West
6 Fairfax
7 Annandale
8 Alexandria

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1998

ROAD CLASSIFICATION

Primary highway hard surface ..... Light-duty road, hard or improved surface .....
Secondary highway hard surface ..... Unimproved road .....

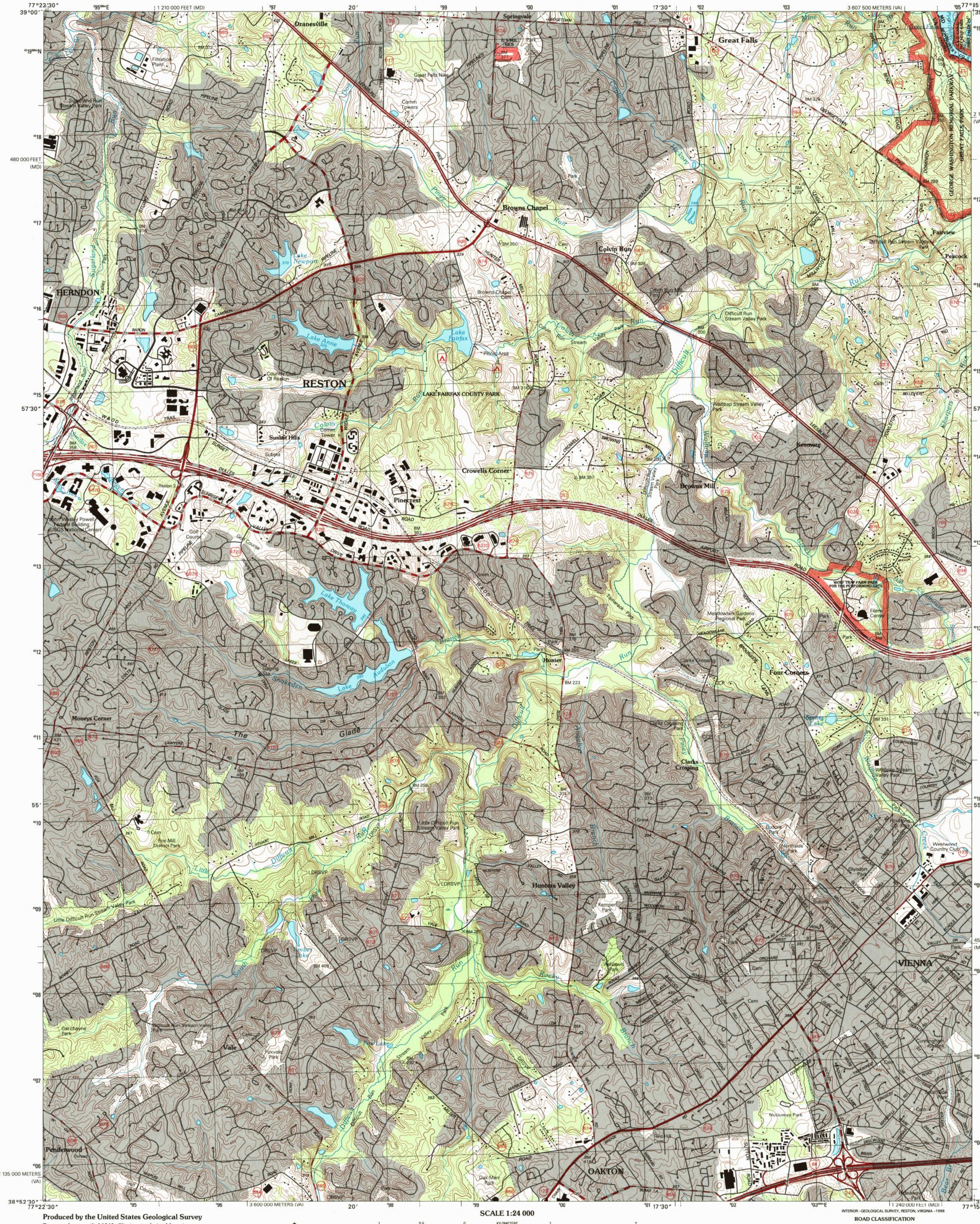
Interstate Route U.S. Route State Route

FALLS CHURCH, VA-MD
1994
NIMA 5561 I NW-SERIES V834

ISBN 0-607-87909-7

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

VIENNA QUADRANGLE
VIRGINIA-MARYLAND
7.5-MINUTE SERIES (TOPOGRAPHIC)



Produced by the United States Geological Survey

Topography compiled 1949. Planimetry derived from imagery taken 1994. Survey control current as of 1981. Contours that conflict with updated major features are dashed

North American Datum of 1983 (NAD 83). Projection and 1 000-meter grid: Universal Transverse Mercator, zone 18
2 500-meter ticks: Virginia Coordinate System of 1983 (north zone). 10 000-foot ticks: Maryland Coordinate System of 1983

North American Datum of 1927 (NAD 27) is shown by dashed corner ticks. The values of the shift between NAD 83 and NAD 27 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

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10½° 187 MILS — 1°27′ 26 MILS

UTM GRID AND 1998 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

ADJOINING 7.5' QUADRANGLE NAMES
1 Sterling
2 Seneca
3 Rockville
4 Herndon
5 Falls Church
6 Manassas
7 Fairfax
8 Annandale

INTERIOR–GEOLOGICAL SURVEY, RESTON, VIRGINIA–1998

ROAD CLASSIFICATION
Primary highway hard surface
Secondary highway hard surface
Light-duty road, hard or improved surface
Unimproved road
Interstate Route — U.S. Route — State Route

VIENNA, VA-MD
1994
NIMA 5561 IV NE-SERIES V834

ISBN 0-607-87083-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SENECA QUADRANGLE
MARYLAND-VIRGINIA
7.5-MINUTE SERIES (TOPOGRAPHIC)

77°22'30" 39°07'30" 2 160 000 METERS (VA) 490 000 FEET (MD) 530 000 FEET (MD) 2 150 000 METERS (VA) 3 607 500 METERS (VA) 1 210 000 FEET (MD) 1 240 000 FEET (MD) 77°15' 39°00'

INTERIOR - GEOLOGICAL SURVEY - RESTON, VIRGINIA - 1998

SCALE 1:24 000

KILOMETERS 1 0 1 2
METERS 1000 0 1000 2000
MILES 1 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

UTM GRID AND 1998 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MARYLAND
QUADRANGLE LOCATION

ADJOINING 7.5' QUADRANGLE NAMES

1	2	3
4		5
6	7	8

1 Poolesville
2 Germantown
3 Gaithersburg
4 Sterling
5 Rockville
6 Herndon
7 Vienna
8 Falls Church

ROAD CLASSIFICATION

Primary highway hard surface ..... Light-duty road, hard or improved surface .....
Secondary highway hard surface ..... Unimproved road .....
Interstate Route U.S. Route State Route

Produced by the United States Geological Survey

Topography compiled 1963. Planimetry derived from imagery taken 1994. Survey control current as of 1968. Contours that conflict with updated major features are dashed

North American Datum of 1983 (NAD 83). Projection and 1 000-meter grid: Universal Transverse Mercator, zone 18
10 000-foot ticks: Maryland Coordinate System of 1983
2 500-meter ticks: Virginia Coordinate System of 1983 (north zone)

North American Datum of 1927 (NAD 27) is shown by dashed corner ticks. The values of the shift between NAD 83 and NAD 27 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

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THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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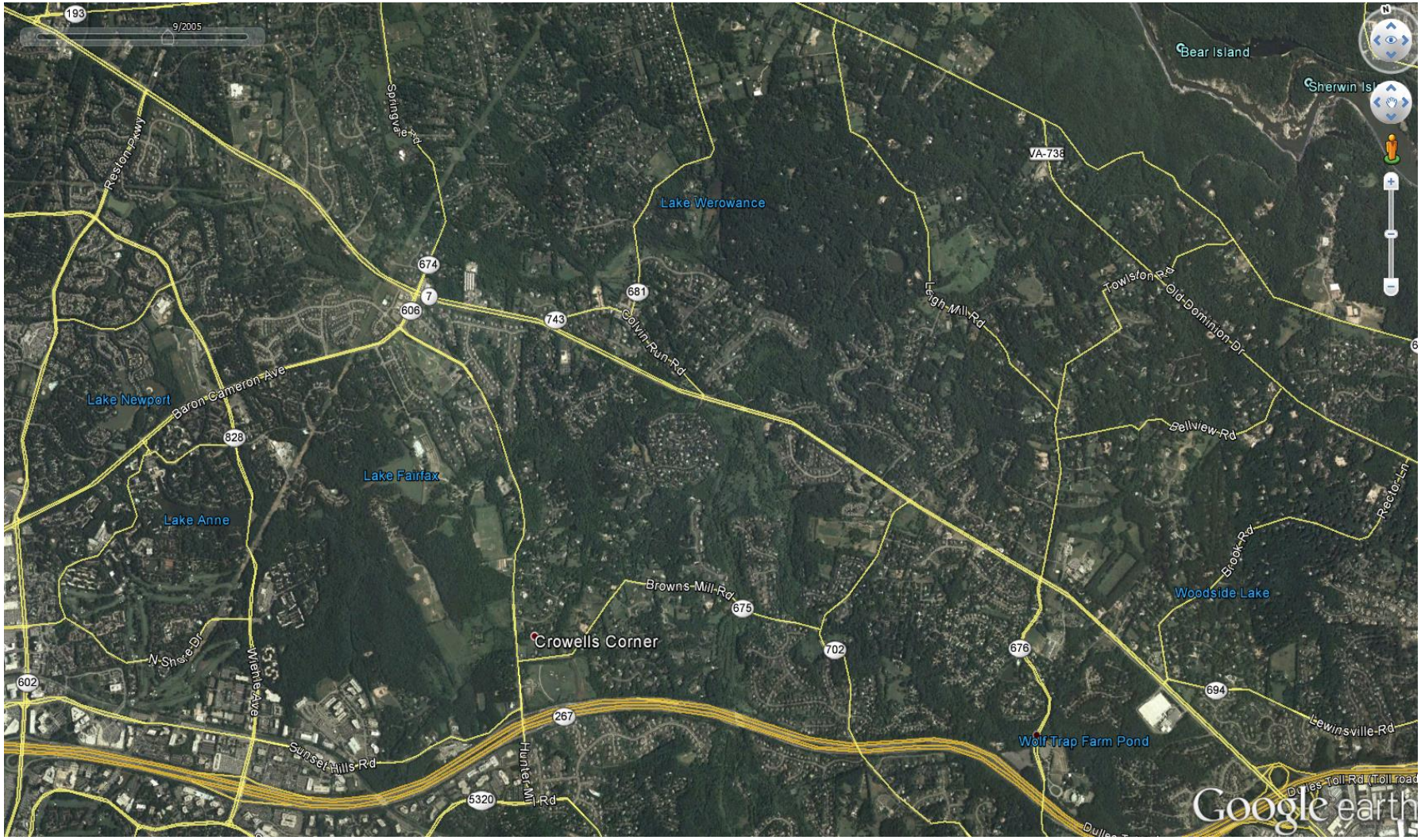
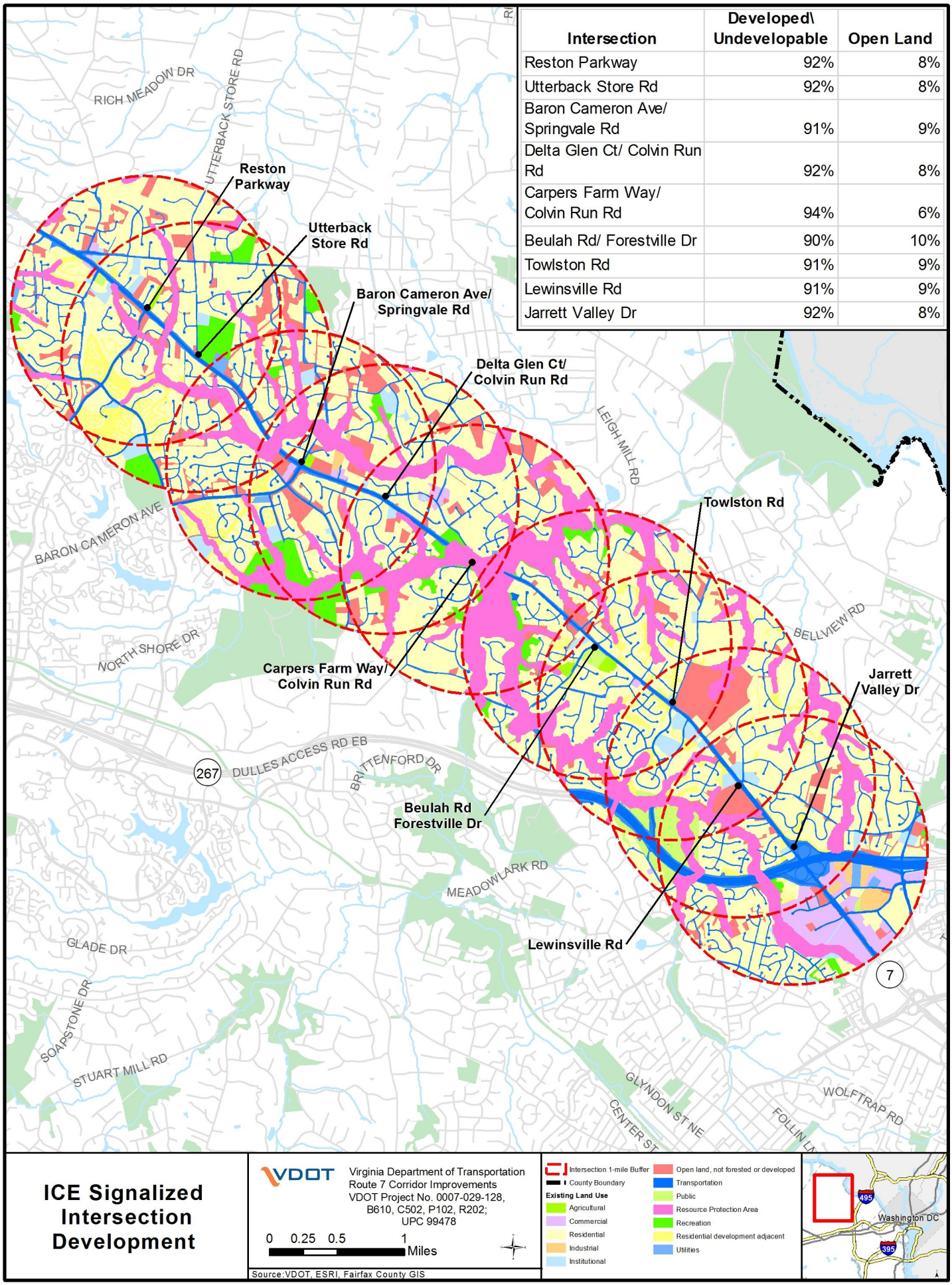
SENECA, MD-VA
1994
NIMA 5562 III SE-SERIES V833

ISSN 0-607-87081-8
9780607870817



2005 Google Earth Aerial Image

Appendix B – Evaluation of Potential for Induced Growth



Intersection	Developed\ Undevelopable	Open Land
Reston Parkway	92%	8%
Utterback Store Rd	92%	8%
Baron Cameron Ave/ Springvale Rd	91%	9%
Delta Glen Ct/ Colvin Run Rd	92%	8%
Carpers Farm Way/ Colvin Run Rd	94%	6%
Beulah Rd/ Forestville Dr	90%	10%
Towlston Rd	91%	9%
Lewinsville Rd	91%	9%
Jarrett Valley Dr	92%	8%

ICE Signalized Intersection Development

VDOT Virginia Department of Transportation
Route 7 Corridor Improvements
VDOT Project No. 0007-029-128,
B610, C502, P102, R202;
UPC 99478

0 0.25 0.5 1 Miles

Source:VDOT, ESRI, Fairfax County GIS

Intersection 1-mile Buffer
County Boundary

Existing Land Use
- Agricultural
- Commercial
- Residential
- Industrial
- Institutional
- Open land, not forested or developed
- Transportation
- Public
- Resource Protection Area
- Recreation
- Residential development adjacent
- Utilities

ICE Signalized Intersection Assessment of Development Potential

Intersection									
	1	2	3	4	5	6	7	8	9
Land Use	Reston Parkway	Utterback Store Rd	Baron Cameron Ave/ Springvale Rd	Delta Glen Ct/ Colvin Run Rd	Carpers Farm Way/ Colvin Run Rd	Beulah Rd/ Forestville Dr	Towlston Rd	Lewinsville Rd	Jarrett Valley Dr
Agricultural	0.24%	0.24%	0.17%	0.17%	0.00%	0.33%	0.62%	0.00%	0.00%
Commercial	0.29%	0.04%	0.58%	1.01%	0.59%	0.10%	0.10%	0.97%	8.50%
Industrial	0.03%	0.00%	0.35%	0.35%	0.00%	0.00%	1.64%	1.82%	3.55%
Institutional	1.57%	2.27%	2.40%	1.36%	0.47%	1.71%	2.58%	2.55%	2.05%
Open land, not forested or developed	8.17%	8.23%	9.04%	8.32%	6.30%	10.07%	9.37%	9.35%	8.28%
Public	0.16%	0.16%	0.00%	0.00%	0.00%	0.57%	3.08%	4.36%	2.67%
Recreation	3.65%	5.28%	3.85%	5.16%	3.18%	1.90%	0.00%	0.16%	0.60%
Residential	59.00%	54.34%	49.57%	50.93%	51.04%	47.06%	49.25%	44.51%	44.07%
Residential development adjacent	6.14%	5.98%	2.88%	0.86%	0.09%	0.51%	5.14%	3.98%	0.13%
RPA	8.93%	11.80%	19.86%	22.23%	30.84%	28.85%	18.54%	18.60%	15.25%
Transportation	11.27%	11.24%	10.73%	9.32%	7.45%	8.89%	9.67%	13.70%	14.37%
Utilities	0.54%	0.42%	0.56%	0.30%	0.04%	0.00%	0.00%	0.00%	0.53%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Total	Reston Parkway	Utterback Store Rd	Baron Cameron Ave/ Springvale Rd	Delta Glen Ct/ Colvin Run Rd	Carpers Farm Way/ Colvin Run Rd	Beulah Rd/ Forestville Dr	Towlston Rd	Lewinsville Rd	Jarrett Valley Dr
Developed/Undevelopable	92%	92%	91%	92%	94%	90%	91%	91%	92%
Open Land	8%	8%	9%	8%	6%	10%	9%	9%	8%

ROUTE 7 WIDENING - FAIRFAX COUNTY

VDOT

U.S. Department of Transportation
Federal Highway Administration

ROUTE 7 CORRIDOR IMPROVEMENTS
VDOT