APPENDIX O
INDIRECT AND CUMULATIVE EFFECTS TECHNICAL REPORT

May 2020

U.S. Department of Transportation

Federal Highway Administration

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX

ABBREVIATIONS AND ACRONYMS

ATI	Area of Traffic Influence
BMP	Best Management Practice
CCT	Corridor Cities Transitway
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CLRP	Constrained Long Range Plan
CO	Carbon Monoxide
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
EIS	Environmental Impact Statement
EJ	Environmental Justice
ESA	Endangered Species Act
ETL	Express Toll Lanes
FCA	Forest Conservation Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIDS	Forest Interior Dwelling Species
GIS	Geographic Information Systems
GP	General Purpose
GSSC	Great Seneca Science Corridor
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IPaC	Information Planning and Consultation
LSC	Life Sciences Center
LULC	Land Use/Land Cover
MARC	Maryland Area Regional Commuter
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDNR-WHS	Maryland Department of Natural Resources – Wildlife and Heritage Services
MDOT SHA	Maryland Department of Transportation State Highway Administration
MDP	Maryland Department of Planning
MDTA	Maryland Transportation Authority
MHT	Maryland Historical Trust
M-NCPPC	Maryland-National Capital Park and Planning Commission
MSAT	Mobile Source Air Toxics
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards

NCRTPB	National Capital Region Transportation Planning Board
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetland Inventory
PM	Particulate Matter
PROS	Park, Recreation, and Open Space
RTE	Rare, Threatened and Endangered
TAZ	Traffic Analysis Zone
TIP	Transportation Improvement Plan
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation Department of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDNR	Virginia Department of Natural Resources
WHS	Wildlife and Heritage Service

1

1 INTRODUCTION

1.1 Overview

The Federal Highway Administration (FHWA), as the Lead Federal Agency, and the Maryland Department of Transportation State Highway Administration (MDOT SHA), as the Local Project Sponsor, are preparing an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the I-495 & I-270 Managed Lanes Study (Study). The Study is evaluating potential transportation improvements to portions of the I-495 and I-270 corridors in Montgomery and Prince George's Counties, Maryland, and Fairfax County, Virginia.

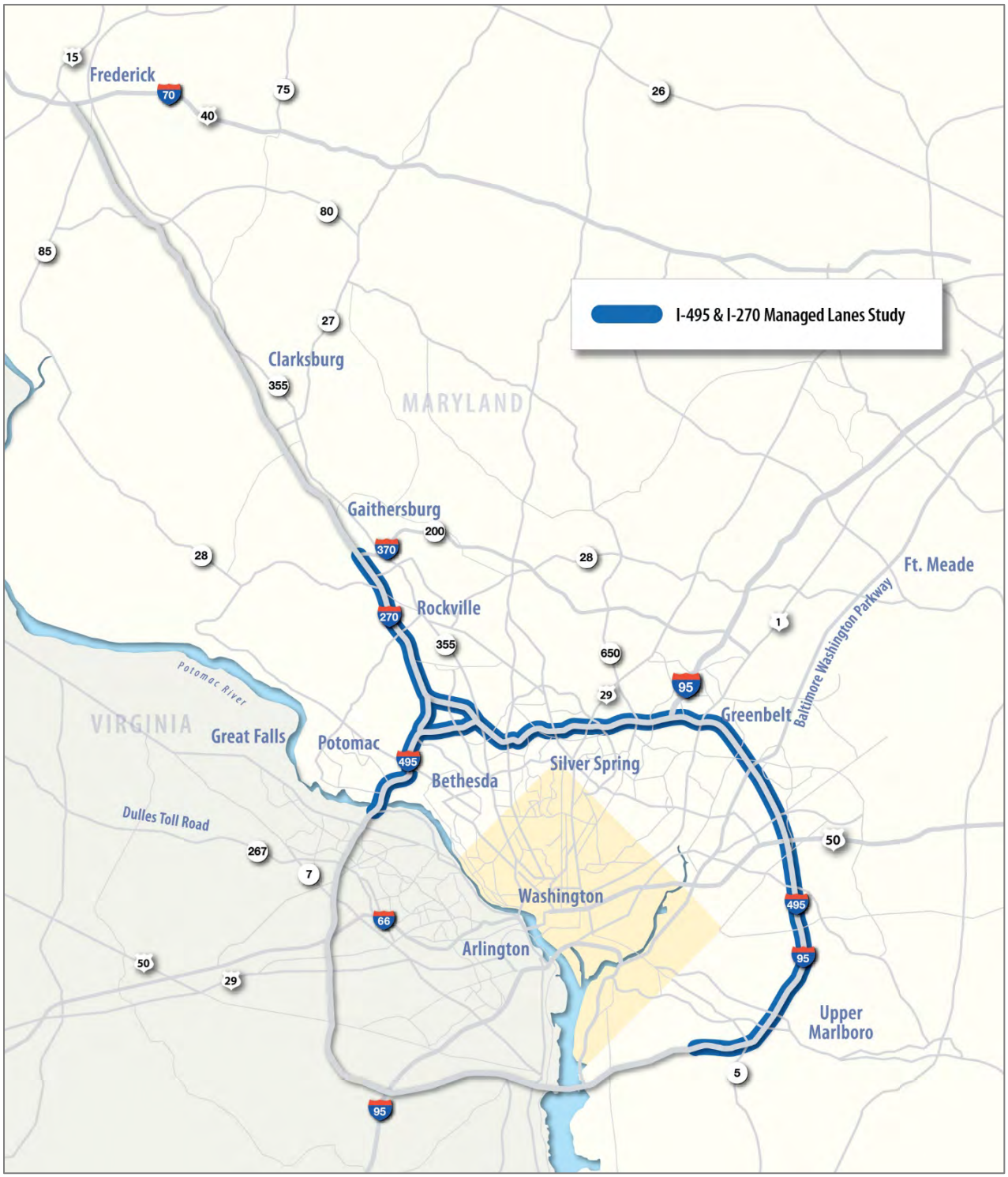
This EIS is being prepared in accordance with FHWA and Council on Environmental Quality (CEQ) regulations implementing NEPA and provisions of the Fixing America's Surface Transportation Act. The content of the EIS also conforms to CEQ guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the FHWA's Guidance for *Preparing and Processing Environmental and Section 4(f) Documents* (Technical Advisory T6640.8A, October 1987).

The purpose of the Indirect and Cumulative Effects (ICE) Technical Report is to present an assessment of potential indirect and cumulative impacts of the Screened Alternatives to the human and natural environment and is being prepared to support and inform the EIS. The report begins with a description of the study corridors, followed by a summary of the Purpose and Need, and a description of the alternatives evaluated.

1.2 Study Corridors

I-495 and I-270 in Maryland are the two most heavily traveled freeways in the National Capital Region, each with Average Annual Daily Traffic volume up to 260,000 vehicles per day in 2018 (MDOT SHA, 2019). I-495 is the only circumferential route in the region that provides interregional connections to many radial routes in the region, such as I-270, US 29 (Colesville Road), I-95, the Baltimore-Washington Parkway, US 50 (John Hanson Highway), and MD 5 (Branch Avenue). I-270 is the only freeway link between I-495 and the fast-growing northwest suburbs in northern Montgomery County and the suburban areas in Frederick County. In addition to heavy commuter traffic demand, I-495 provides connectivity along the East Coast, as it merges with I-95 in Maryland for 25 miles around the east side of Washington, DC. (**Figure 1-1**).

Figure 1-1: Study Corridors



1.3 Study Purpose and Need

The purpose of the Study is to develop a travel demand management solution(s) that addresses congestion and improves trip reliability on I-495 and I-270 within the Study limits, and enhances existing and planned multimodal mobility and connectivity. The Study will address the following needs:

- **Accommodate Existing Traffic and Long-Term Traffic Growth** - High travel demand from commuter, business, and recreational trips results in severe congestion from 7 to 10 hours per day on the Study corridors, which is expected to deteriorate further by the planning horizon year of 2040. Additional roadway capacity is needed to address existing and future travel demand and congestion, reduce travel times, and allow travelers to use the facilities efficiently.

- **Enhance Trip Reliability** - Congestion on I-495 and I-270 results in unpredictable travel times. Travelers and freight commodities place a high value on reaching their destinations in a timely and safe manner, and in recent years, the study corridors have become so unreliable that uncertain travel times are experienced daily. More dependable travel times are needed to ensure trip reliability.

- **Provide Additional Roadway Travel Choices** - Travelers on I-495 and I-270 do not have enough roadway options for efficient travel during extensive periods of congestion. Additional roadway management options are needed to improve travel choices, while retaining the general-purpose lanes.

- **Accommodate Homeland Security** - The National Capital Region is considered the main hub of government, military, and community installations related to homeland security. These agencies and installations rely on quick, unobstructed roadway access during a homeland security threat. Additional capacity would assist in accommodating a population evacuation and improving emergency response access should an event related to homeland security occur.

- **Improve Movement of Goods and Services** - I-495 and I-270 are major regional transportation networks that support the movement of passenger and freight travel within the National Capital Region. Existing congestion along both corridors increases the cost of doing business due to longer travel times and unreliable trips. The effects of this congestion on the movement of goods and services is a detriment to the health of the local, regional, and national economy. Efficient and reliable highway movement is necessary to accommodate passenger and freight travel, moving goods and services through the region.

Additional roadway capacity and improvements to enhance reliability must be financially viable. MDOT's traditional funding sources would be unable to effectively finance, construct, operate, and maintain improvements of this magnitude. Revenue sources that provide adequate funding, such as pricing options, are needed to achieve congestion relief and address existing high travel demand.

Given the highly constrained area surrounding the interstates in the Study corridors, MDOT SHA recognizes the need to plan and design this project in an environmentally responsible manner. MDOT SHA will strive to avoid and minimize community, natural, cultural, and other environmental impacts, and mitigate for any unavoidable impacts at an equal or greater value. MDOT SHA will work with our Federal,

State, and Local resource agency partners in a streamlined, collaborative, and cooperative way to meet all regulatory requirements to ensure the protection of environmental resources to the maximum extent practicable. Any build alternatives will offset unavoidable impacts while prioritizing and coordinating comprehensive mitigation measures in or near the study area, which are meaningful to the environment and the community.

1.4 Alternatives Evaluated

Seven alternatives are being evaluated and compared in the technical reports supporting the EIS. These Screened Alternatives include Alternatives 1, 5, 8, 9, 10, 13B, and 13C and are illustrated in the typical sections shown in **Figure 1-2**.

The following terms are used in the description of the alternatives.

- **General Purpose (GP) Lanes** are lanes on a freeway or expressway that are open to all motor vehicles.[1]
- **Managed Lanes** are highway facilities, or a set of lanes, where operational strategies are proactively implemented and managed in response to changing conditions.[2]
- **High-Occupancy Toll (HOT) Lanes** are High-Occupancy Vehicle (HOV) facilities that allow lower-occupancy vehicles, such as solo drivers, to use the facilities in return for toll payments, which could vary by time of day and level of congestion.[1]
- **Express Toll Lanes (ETL)** are dedicated managed lanes within highway rights-of-way that motorists may use by paying a variably priced toll.[3]
- **High-Occupancy Vehicle (HOV)** Lanes are any preferential lane designated for exclusive use by vehicles with two or more occupants for all or part of a day, including a designated lane on a freeway, other highway or a street, or independent roadway on a separate right-of-way.[4]
- **Reversible Lanes** are facilities in which the direction of traffic flow can be changed at different times of the day to match peak direction of travel, typically inbound in the morning and outbound in the afternoon.[1]

A. Alternative 1: No Build

The No Build Alternative, often called the base case, includes all projects in the 2040 financially Constrained Long-Range Plan (CLRP) for the National Capital Region adopted by the Metropolitan Washington Council of Governments (MWCOG) - Transportation Planning Board. This includes other projects impacting the facilities that are subject to this Study. Specifically, the CLRP reflects the Purple Line which is currently under construction (Spring 2019), and the extension of the I-495 Express Lanes in Virginia from north of the Dulles Toll Road interchange to the American Legion Bridge (Virginia's 495 Express Lanes Northern Extension [NEXT] Project). Alternative 1 also includes the I-270 Innovative Congestion Management Contracts, which are providing a series of construction projects to improve

[1] *National Cooperative Highway Research Program, Research Report 835, Guidelines for Implementing Managed Lanes*. Transportation Research Board. 2016

[2] https://ops.fhwa.dot.gov/publications/managelanes_primer/index.htm

[3] https://www.fhwa.dot.gov/ipd/tolling_and_pricing/defined/demand_mgmt_tool.aspx

[4] https://ops.fhwa.dot.gov/freewaymgmt/hovguidance/glossary.htm

mobility and safety at key points along I-270 targeted to reduce congestion at key bottlenecks along the corridor. All improvements are being implemented within the existing roadway right-of-way and are anticipated to be completed in 2021. While these improvements will improve mobility and safety, they will not address the long-term roadway capacity needs for the I-270 corridor. Routine maintenance and safety improvements along I-495 and I-270 are included in the No Build Alternative, but it does not include new capacity improvements to I-495 and I-270. Consistent with NEPA requirements, Alternative 1 will be carried forward for further evaluation to serve as a base case for comparing the other alternatives.

B. Alternative 5: 1-Lane, High-Occupancy Toll Managed Lanes Network

This alternative consists of adding one HOT managed lane in each direction on I-495 and converting the one existing HOV lane in each direction to a HOT managed lane on I-270. Buses would be permitted to use the managed lanes.

C. Alternative 8: 2-Lane, Express Toll Lane Managed Lanes Network on I-495 and 1-Lane Express Toll Lane and 1-Lane HOV Managed Lanes Network on I-270

This alternative consists of adding two ETL managed lanes in each direction on I-495, retaining one existing HOV lane in each direction on I-270, and adding one ETL managed lane in each direction on I-270. Buses would be permitted to use the managed lanes.

D. Alternative 9: 2-Lane, High-Occupancy Toll Managed Lanes Network

This alternative consists of adding two HOT managed lanes in each direction on I-495, converting the one existing HOV lane in each direction on I-270 to a HOT managed lane, and adding one HOT managed lane in each direction on I-270, resulting in a two-lane, managed lane network on both highways. Buses would be permitted to use the managed lanes.

E. Alternative 10: 2-Lane, Express Toll Lane Managed Lanes Network and 1-Lane HOV Managed Lane Network on I-270 Only

This alternative consists of adding two ETL managed lanes in each direction on I-495, retaining one existing HOV lane per direction on I-270, and adding two ETL managed lanes in each direction on I-270. Buses would be permitted to use the managed lanes.

F. Alternative 13B: 2-Lane, High-Occupancy Toll Managed Lanes Network on I-495 and HOT Managed Reversible Lanes Network on I-270

This alternative consists of adding two HOT managed lanes in each direction on I-495 and converting the existing HOV lanes in both directions to two HOT managed, reversible lanes on I-270. Buses would be permitted to use the managed lanes.

G. Alternative 13C: 2-Lane, ETL Managed Lanes Network on I-495 and ETL Managed, Reversible Lanes Network and 1-Lane HOV Managed Lane Network on I-270

This alternative consists of adding two ETL managed lanes in each direction on I-495 and retaining the existing HOV lanes in both directions and adding two ETL managed, reversible lanes on I-270. Alternative 13C would maintain the existing roadway network on I-270 with HOV lanes to allow for HOV travel while adding two managed, reversible lanes. Buses would be permitted to use the managed lanes.

H. Consideration of Alternative 9M

The analysis for the Screened Alternatives summarized above was completed in Spring of 2019 and reflects information available to MDOT SHA at that time. As the Study progressed through the NEPA process, the project team obtained comments as a result of cooperating agency coordination. As a result of this continued effort, MDOT SHA and FHWA have evaluated an additional alternative for the Study known as Alternative 9M. Alternative 9M is considered a blend of two Screened Alternatives, Alternative 5 (one-lane HOT) and Alternative 9 (two-lane HOT).

Alternative 9M has the same LOD as Alternative 9 along I-495 from south of the George Washington Memorial Parkway in Virginia to the I-270 West Spur and from the I-95 interchange to west of MD 5 as well as along I-270 from I-495 to I-370. Alternative 9M has the same LOD as Alternative 5 along I-495 from I-270 West Spur to the I-95 interchange. Alternative 9M includes the same build elements as the other Screened Alternatives including direct access locations and interchange improvements.

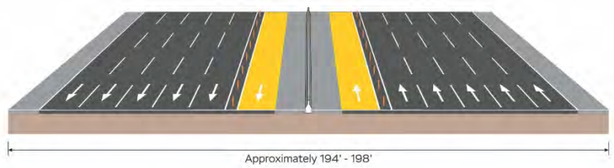
Because Alternative 9M is a blend of Alternatives 9 and 5, the environmental impacts associated with Alternative 9M are covered in this Technical Report. Specific impacts associated with Alternative 9M have been quantified and are shown in the DEIS for comparison with the other Build Alternatives. Any differences in the quantity or intensity of impacts between Alternative 9M and other alternatives are noted either in tables or text in the DEIS.

Figure 1-2: Typical Sections of Alternatives Considered

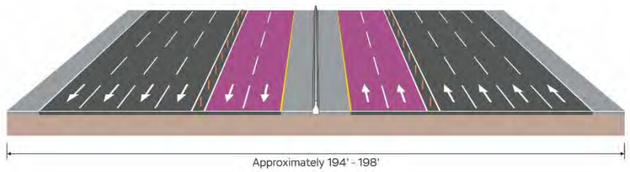
SCREENED ALTERNATIVES

1 No Build (Existing):
All projects in Constrained Long-Range Plan (CLRP) (including I-270 Innovative Congestion Management (ICM) improvements)

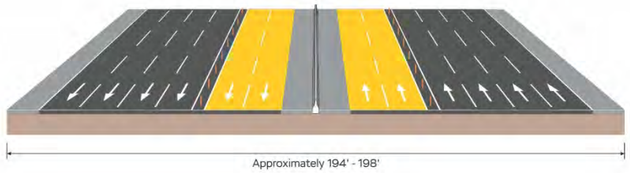
5 1-Lane, HOT Managed Lane Network:
Add one HOT managed lane in each direction **on I-495** and convert one existing HOV lane in each direction to a HOT managed lane **on I-270**

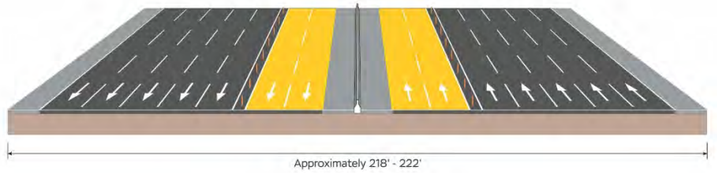


8 2-Lane, ETL Managed Lanes Network on I-495, 1-Lane ETL and 1-Lane HOV Managed Lane network on I-270 only
Add two ETL managed lanes in each direction **on I-495** and add one ETL managed lane and retain one HOV lane in each direction **on I-270**



9 2-Lane, HOT Managed Lane Network:
Add two HOT managed lanes in each direction **on I-495** and convert one existing HOV lane to a HOT managed lane and add one HOT managed lane in each direction **on I-270**





Legend
- New HOT Managed Lanes
- New ETL Managed Lanes

* **Note:** Managed Lanes Could Include Buses

NOT TO SCALE

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

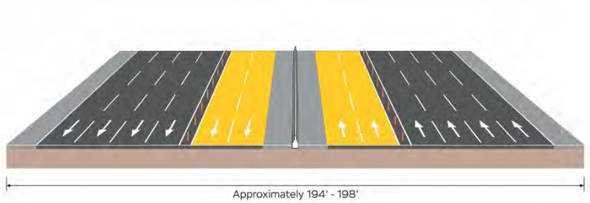
SCREENED ALTERNATIVES

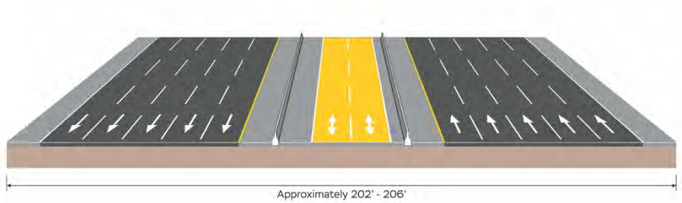
10 2-Lane, ETL Managed Lane Network and 1-Lane HOV Managed Lane Network on I-270 only

Add two ETL managed lanes in each direction **on I-495 and on I-270** and retain one existing HOV lane in each direction **on I-270 only**

13B 2-Lane, HOT Managed Lane Network on I-495; HOT Managed, Reversible Lane Network on I-270:

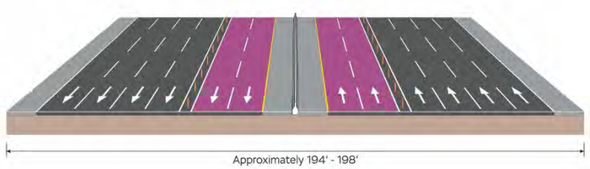
Add two HOT managed lanes in each direction on I-495 and convert existing HOV lanes to two HOT managed reversible lanes **on I-270** while maintaining GP lanes

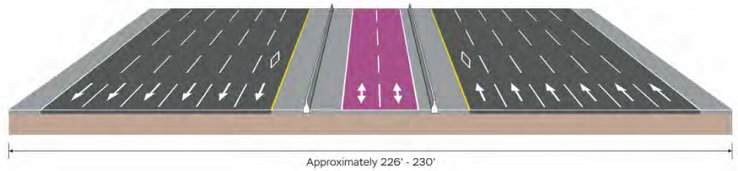




13C 2-Lane, ETL Managed Lane Network on I-495; ETL Managed, Reversible Lane Network and 1-Lane HOV Managed Lane Network on I-270

Add two ETL managed lanes in each direction on I-495, maintain existing HOV managed lanes on I-270 and add two reversible ETL managed lanes on I-270





Legend

- New HOT Managed Lanes
- New ETL Managed Lanes

* **Note:** Managed Lanes Could Include Buses

NOT TO SCALE

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

2

2 SCOPING AND METHODOLOGY

2.1 Legislation and Regulatory Guidance

This ICE assessment was conducted in accordance with MDOT SHA's current ICE guidelines (MDOT SHA, 2012) and the guidelines established by MDOT SHA, NEPA, and its implementing CEQ regulations and CEQ ICE Guidance.

The CEQ regulations define indirect and cumulative effects as follows:

Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the patterns of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

Cumulative effects are defined as impacts on the environment that result from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

2.2 ICE Analysis Scope and Methodology

The ICE Analysis methodology is described in this section, following these general steps:

- Step 1: Collect data and identify resources (**Section 2.2.1**)
- Step 2: Define the ICE Analysis Boundary (**Section 2.2.2**)
- Step 3: Define the ICE time frame (**Section 2.2.3**)
- Step 4: Define the analysis approach and methodology (**Section 2.2.4**)

This ICE analysis considers the resources, listed below, that could potentially experience direct or indirect impacts by the Screened Alternatives.

- Socioeconomic Resources (communities, residences, businesses, parks and recreation);
- Cultural Resources (historic structures/districts and archeological sites);

- Natural Resources (surface water, wetlands, floodplains, forest, wildlife /wildlife habitat, and sensitive species); and
- Air Quality

The ICE analysis also considered local planning documents and data reflected in previously completed NEPA documents.

2.2.1 Resource Identification and Data Collection

This ICE analysis relies on the following general types of data:

- General population and employment trends based on census and geographic data;
- General growth trends based on reports, historic maps, and aerial imagery;
- Planning and forecasting documents concerning past, present, and future economic development; employment; land use; zoning; transportation; resource protection; and recreation; and
- The history and origins of the proposed action and previous studies undertaken in its development.

The data collection for the ICE analysis focused on the same socioeconomic, natural, and cultural resources evaluated for direct effects and documented in the other technical reports. The ICE scoping analysis initially examined resources that are directly impacted, and also considered whether additional resources could be indirectly impacted. No additional resources were identified beyond those directly affected.

Existing data was used to prepare maps and tables showing the natural and socioeconomic resources within the ICE Analysis Area, as described below. Data was supplemented with field-verified information, as appropriate. The information includes land use, communities, and reasonably foreseeable development for the Study's ICE time frame. Past and present land uses are quantified, along with reasonably foreseeable developments within the future time frame (discussed below), to identify land use development trends.

2.2.2 ICE Analysis Area Boundary

The environmental resources that could be impacted by the Screened Alternatives were reviewed to identify a geographic boundary for the ICE analysis. The geographic boundary used for the ICE analysis was developed by synthesizing sub-boundaries to create a single ICE Analysis Area boundary. The resources analyzed for ICE and the representative sub-boundaries are listed in **Table 2-1** and further described below.

Table 2-1: Representative Sub-Boundaries for Environmental Resources

Resource	Representative Sub-Boundaries
Socioeconomic Resources	
Communities, residences, businesses, facilities	Area of Traffic Influence (ATI); Census Tracts; Census Designated Places (CDPs), Planning Areas
Parks and Recreation	CDPs, Planning Areas

Resource	Representative Sub-Boundaries
Cultural Resources	
Historic structures/districts and archeological sites	CDPs, Planning Areas
Natural Resources	
Wetlands and aquatic habitat	Watersheds
Surface water	Watersheds
Floodplains	Watersheds
Forests	Watersheds, CDPs, Planning Areas
Wildlife, Wildlife habitat and sensitive species	CDPs, Planning Areas, Watersheds
Other	
Air Quality	CDPs, Planning Areas, ATI

A. Watersheds

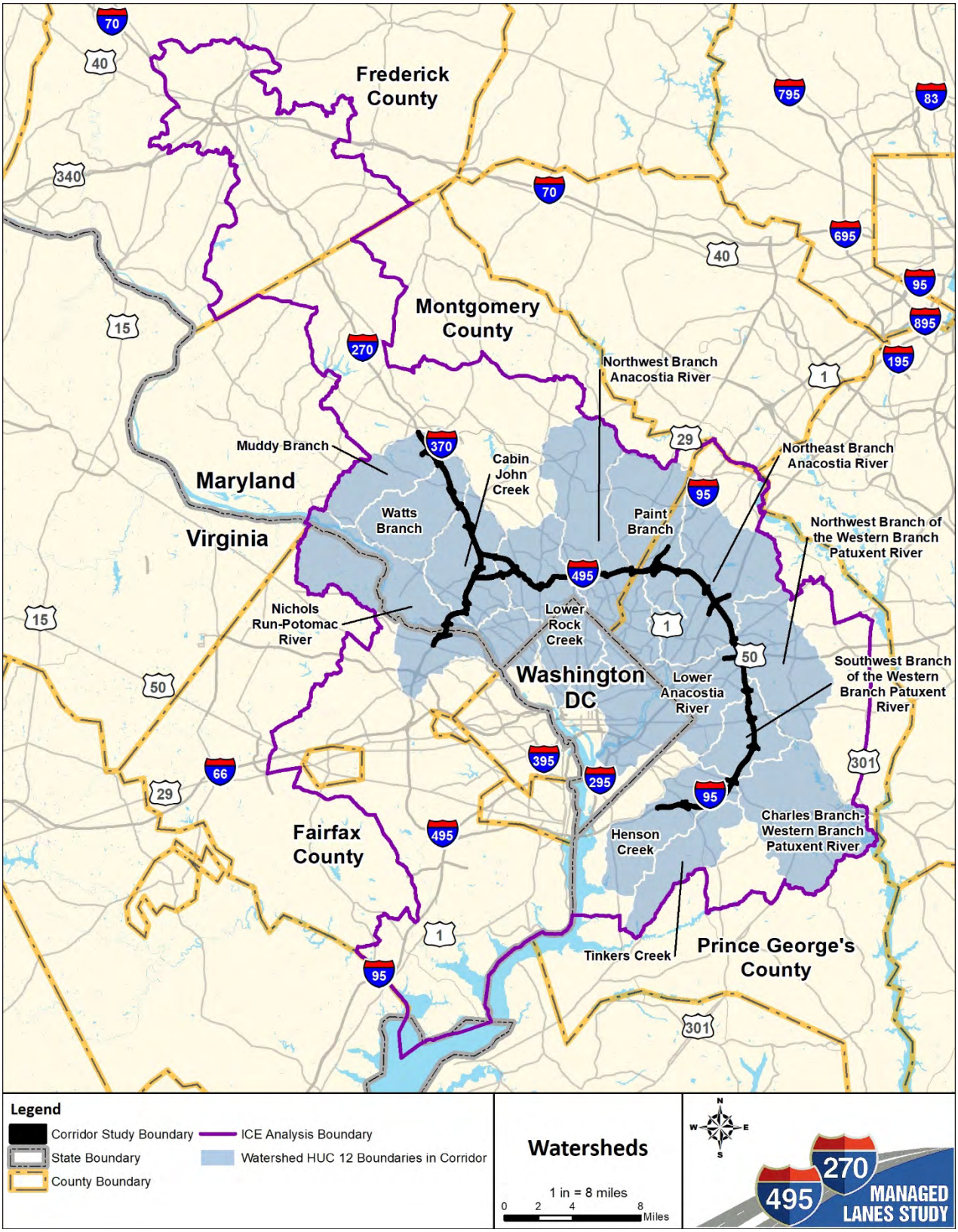
Watershed boundaries from the US Geological Survey (USGS) helped to define the scope of indirect and cumulative effects to forests, surface water, wetlands, aquatic habitat floodplains, wildlife, wildlife habitat, and threatened or endangered species. The study corridors primarily drain to the Potomac River, including portions of the Middle Potomac-Catoctin and Middle Potomac-Anacostia-Occoquan Watersheds, as identified by 8-Digit Hydrologic Unit Codes (HUCs).[5] The far eastern portion of the study corridors are part of the Patuxent 8-Digit HUC Watershed.

Watersheds at the 12-digit HUC were considered in developing the boundary representative of natural environmental resources and potential for indirect and cumulative effects. As shown in **Figure 2-1**, the Study corridor is located within the following 12-Digit HUC watersheds:

- Cabin John Creek
- Charles Branch- Western Branch Patuxent River
- Great Seneca Creek
- Henson Creek
- Lower Anacostia River
- Lower Rock Creek
- Muddy Branch
- Nichols Run-Potomac River
- Northeast Branch Anacostia River
- Northwest Branch Anacostia River
- Northwest Branch of the Western Branch Patuxent River
- Paint Branch
- Southwest Branch of the Western Branch Patuxent River
- Tinkers Creek
- Watts Branch

[5] Hydrologic Unit Codes (HUC) are used by the US Geological Survey (USGS) to classify watersheds into a hierarchy of hydrologic units. The 12-digit HUCs in the 2013 national Watershed Boundary Dataset were used for the ICE analysis.

Figure 2-1: Watersheds



B. Census Tracts

Figure 2-2 shows the 87 US Census Tracts in which the study corridor is located. These 87 Census Tracts have a combined population of 392,773 according to the 2016 US Census American Community Survey 5-Year estimates. The population of each Census Tract is listed in **Appendix A**. Census Tracts were used rather than Block Groups to account for a larger area and ensure that all potential indirect and cumulative effects are encompassed within the boundary.

C. Planning Areas

Planning area boundaries, established by counties for local-level planning decisions about public facilities, land use, and other factors, were used as an ICE sub-boundary because they encompass public parks, community resources, and important cultural resources in the study corridors. **Table 2-2** lists the Planning Areas within which the study corridors are located, as shown in **Figure 2-3**. These Planning Area Boundaries were considered in the development of the ICE Analysis Area boundary.

Table 2-2: Planning Area Boundaries

County	Planning Area	Map Key (Figure 2-3)
Montgomery	Bethesda/Chevy Chase	1
	Gaithersburg & Vicinity	2
	Kemp Mill/4 Corners	3
	Kensington/Wheaton	4
	North Bethesda	5
	Potomac	6
	Rockville	7
	Silver Spring	8
	Takoma Park	9
	White Oak	10
Prince George's	Bladensburg-New Carrollton & Vicinity	11
	College Park-Berwyn Heights & Vicinity	12
	Fairland-Beltsville & Vicinity	13
	Glenn Dale-Seabrook-Lanham & Vicinity	14
	The Heights	15
	Westphalia & Vicinity	16
Fairfax	Planning Area II	17

D. Census Designated Places

CDPs are another way of analyzing concentrations of populations, communities, cultural resources, and community facilities. CDPs, shown in **Figure 2-4**, are statistical delineations of settled concentrations of population. The CDPs were considered in the development of the overall ICE Analysis Area boundary.

Figure 2-2: Census Tracts

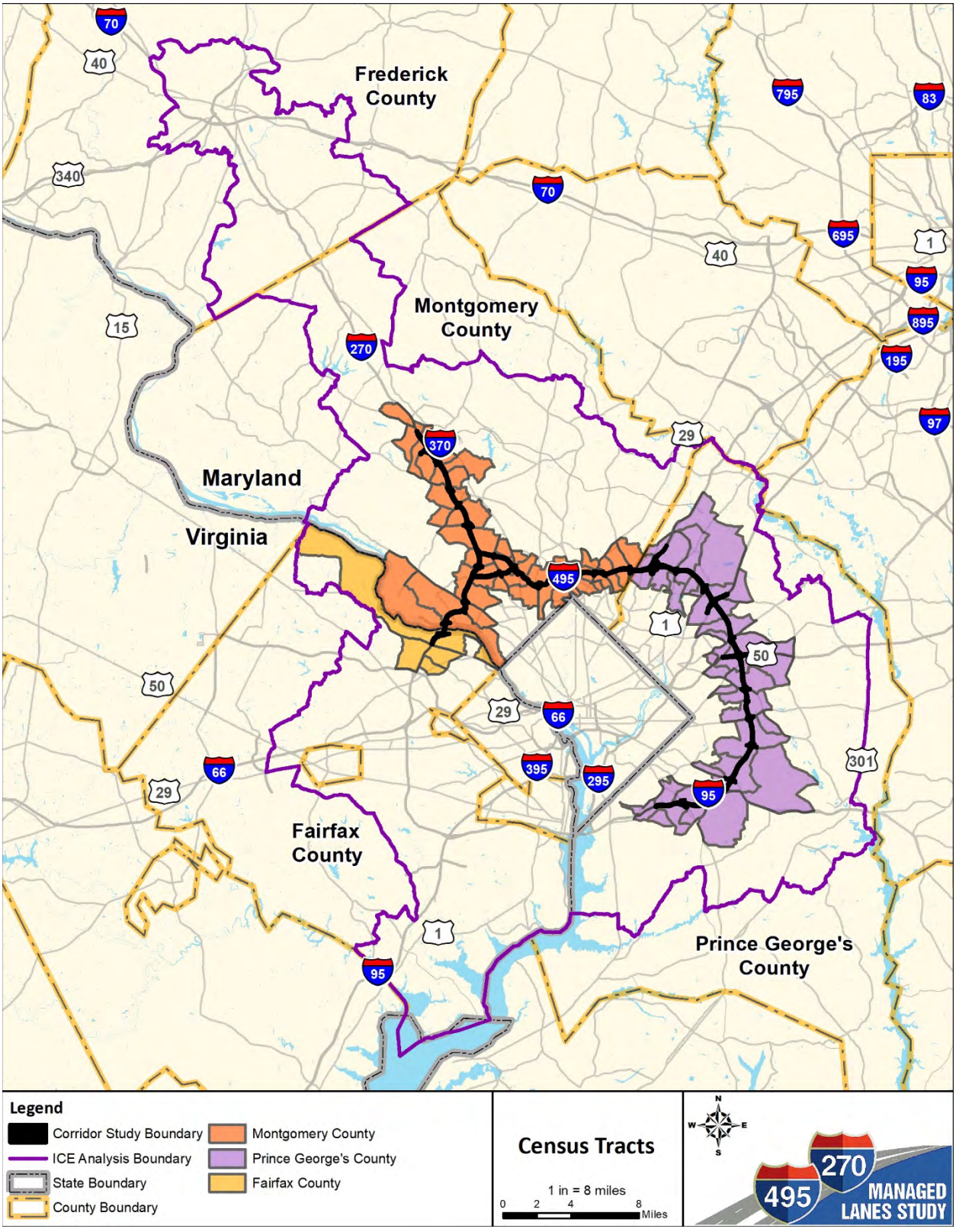
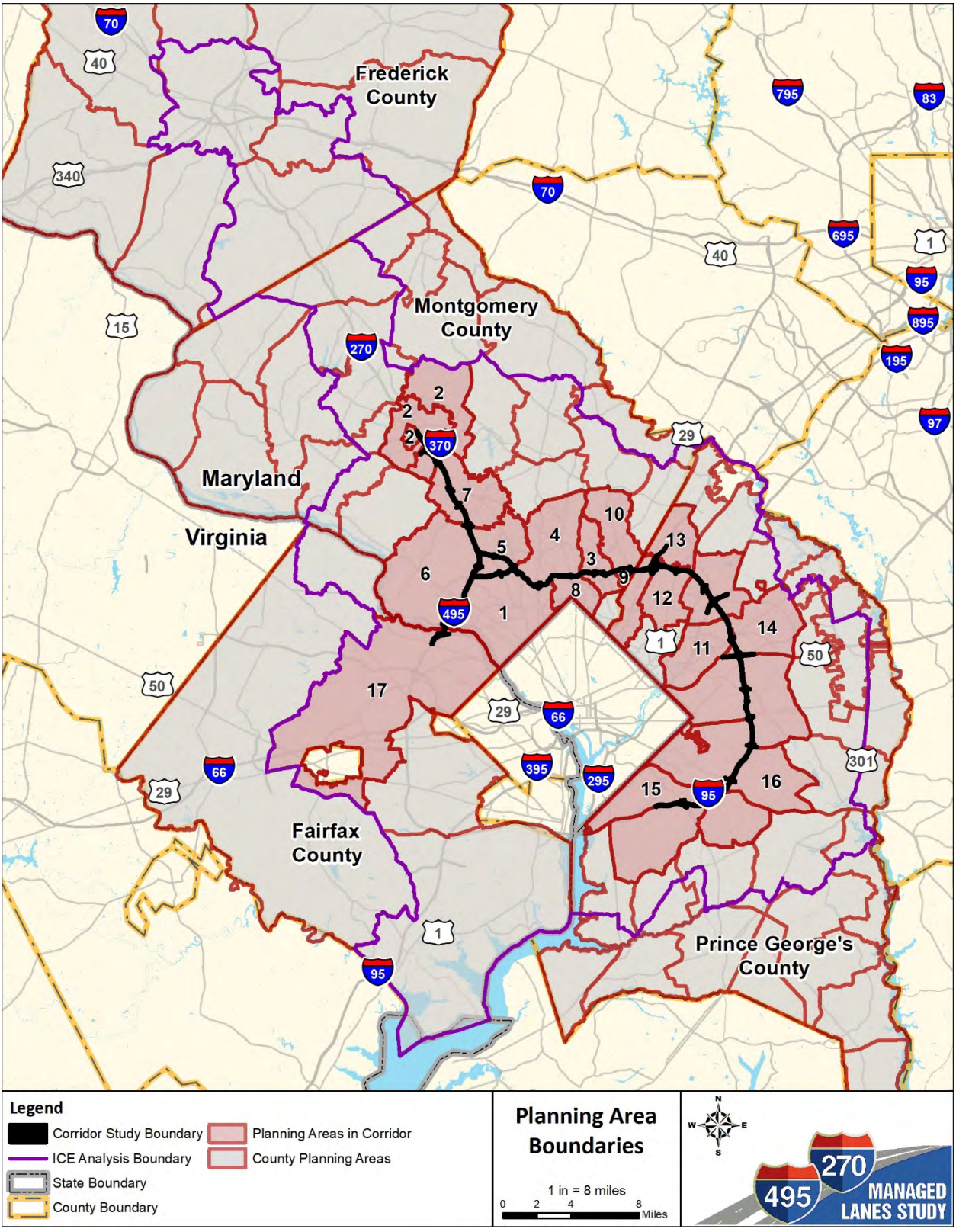


Figure 2-3: Planning Area Boundaries



The study area corridors are located in the 33 CDPs listed in **Table 2-3**, with corresponding numbered labels on **Figure 2-4**.

Table 2-3: Census Designated Places

CDP	Map No.	CDP	Map No.	CDP	Map No.
Adelphi	1	Gaithersburg	12	North Bethesda	23
Andrews AFB	2	Glenarden	13	North Chevy Chase	24
Beltsville	3	Greenbelt	14	Potomac	25
Bethesda	4	Hillandale	15	Rockville	26
Cabin John	5	Kemp Mill	16	Seabrook	27
Camp Springs	6	Lake Arbor	17	Silver Spring	28
Chevy Chase	7	Lanham	18	South Kensington	29
College Park	8	Largo	19	Springdale	30
Forest Glen	9	Marlow Heights	20	Summerfield	31
Forestville	10	Morningside	21	Temple Hills	32
Four Corners	11	New Carrollton	22	Westphalia	33

E. Traffic Analysis Zones and Area of Traffic Influence

The Area of Traffic Influence (ATI) is the geographic area within which the roadways are expected to experience a considerable change in traffic volumes due to improvements planned for the Screened Alternatives. The ATI was developed based on the MDOT SHA Statewide Traffic Model. The traffic analysis zones (TAZs) from the MWCOG that encompass these roadway segments are identified as belonging to the ATI and were considered in the development of the overall ICE Analysis Area boundary. The ATI includes two classes: TAZs that have a total estimate of 800 to 2,000 vehicles per day driving through some portion of the study corridor, and those that have a total of 2,000 or more vehicles per day driving through some portion of the study corridor. **Figure 2-5** shows the ATI.

F. Overall ICE Analysis Area Boundary

The overall ICE Analysis Area boundary was synthesized using the outermost extents of portions of the sub-boundaries for Planning Areas, 12-Digit HUC Watersheds, and TAZs. CDPs and Census Tracts were generally encompassed within the other sub-boundaries. The boundary was developed to capture the full geographic area where potential indirect and/or cumulative effects are reasonably foreseeable.

Figure 2-4: Census Designated Places

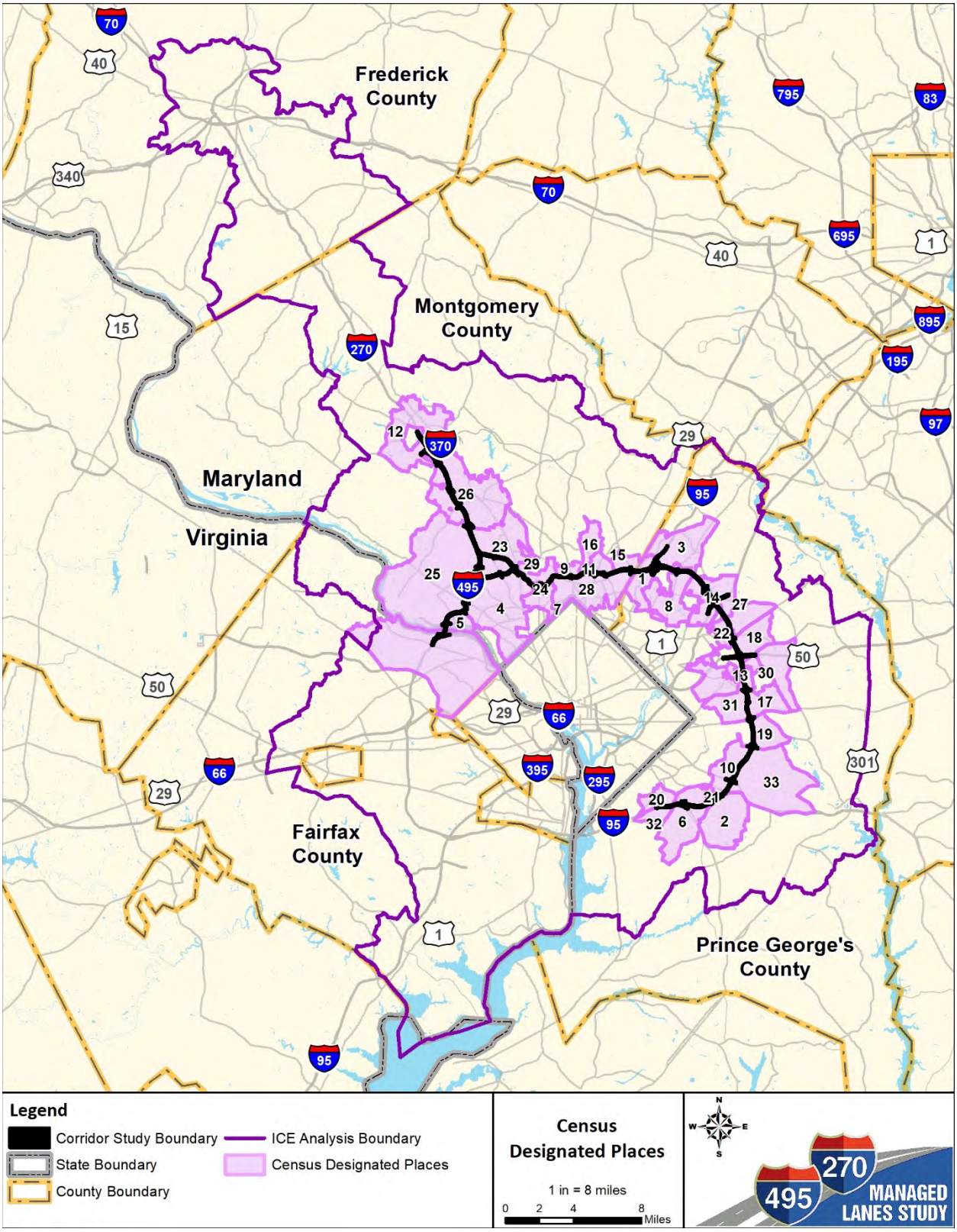
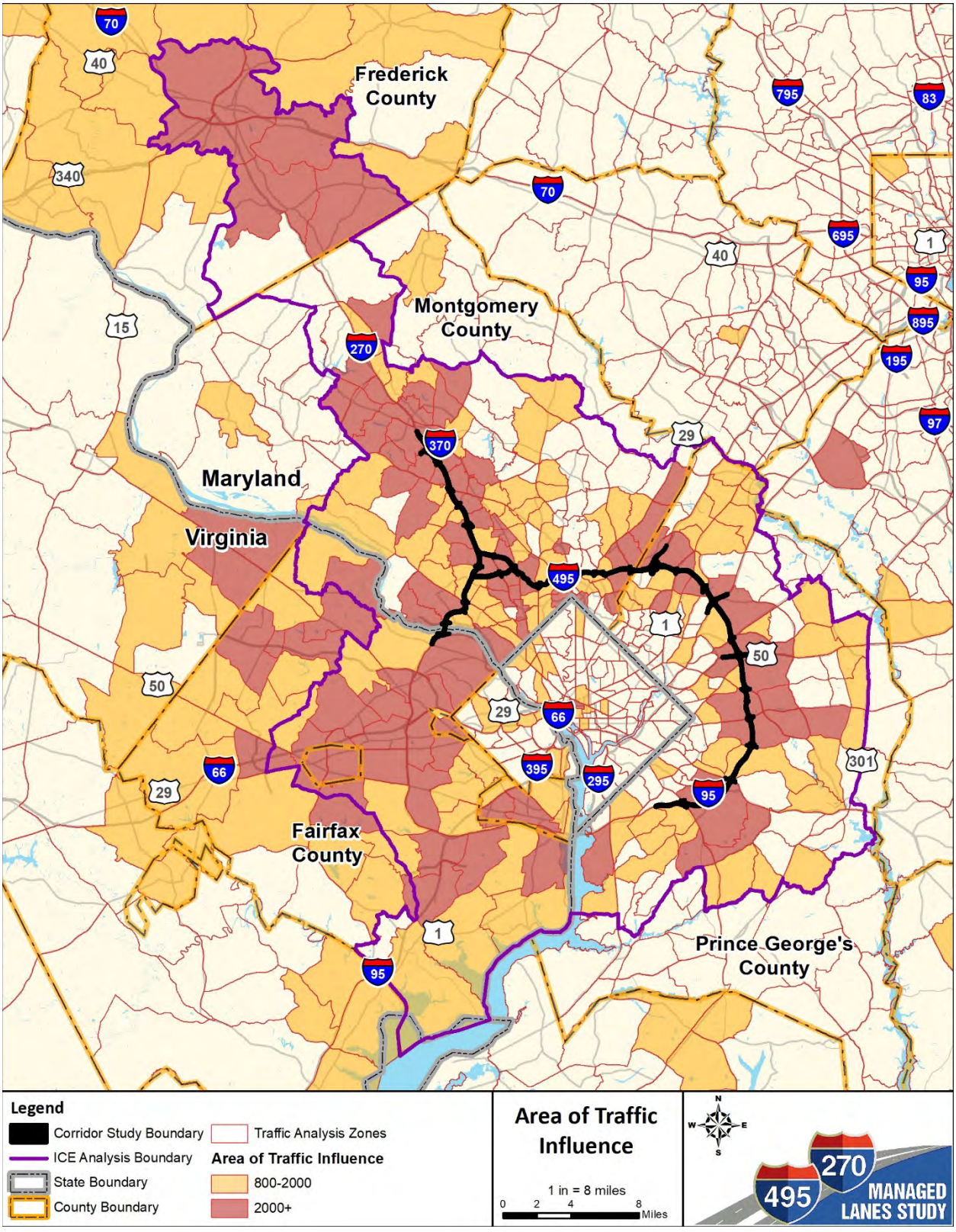


Figure 2-5: Area of Traffic Influence



The ICE Analysis Area boundaries were established as follows.

- Areas closest to the study corridors were established to follow the outermost edges of either the contiguous portions of the ATI or the 12-digit HUC watershed boundaries (whichever extended the furthest). Portions of the boundary were adjusted to form a less complex and more compact shape where appropriate, following TAZ boundaries.
- Portions of the ICE Analysis Area boundary along I-270 further from the study corridor improvements followed the 2,000 or more vehicle classification portion of the ATI and extended at least one TAZ on either side of I-270. This proposed boundary definition extends to areas in and around I-270 that would most likely experience potential indirect and cumulative effects.
- In the Virginia portion of the ICE Analysis Area boundary, the boundary was drawn to include the HUC-12 watersheds that contain the study corridors (located along the Potomac River). The boundary was also extended to include the planning areas contiguous to I-495 in order to form a contiguous boundary encompassing I-495 and the District of Columbia.

Figure 2-6 shows the overall ICE Analysis Area boundary, and the sub-boundaries that were used to develop specific portions of the boundary.

2.2.3 ICE Time Frame

The temporal boundaries, or time frame, of the ICE analysis includes setting a past and future time frame. In general, the temporal boundary is identified based on factors including data availability, relevant historical events or trends, and the design year for improvements being evaluated in the EIS.

A period of 70 years, from 1970 to 2040, is the ICE time frame (or temporal boundary). The first section of I-495 was opened in 1961, and the highway was completed in 1964. Therefore, 1970 is the first year for which decennial census data was available after the completion of I-495. In addition, 1970 generally coincides with the opening of I-95 between Baltimore and Washington, DC. Washington National Pike was built from 1953 to 1960 and became known as I-270 in 1975.

The past time frame also reflects population trends in Montgomery, Prince George's, and Fairfax Counties. The counties experienced rapid increases in population between 1930 and 1970. Prince George's County grew 117 percent between 1940 and 1950. Montgomery County's growth rate peaked at 107 percent between 1950 and 1960. After 1970, the population growth leveled to an average of seven percent every ten years in Prince George's County and 17 percent in Montgomery County. Fairfax County followed a similar trend, peaking at 179 percent growth between 1950 and 1960, then leveling off after 1980 (**Figure 2-7**). Additionally, natural and socioeconomic resource information is more limited prior to the passage of NEPA in 1969. In summary, 1970 was selected as the past time frame based on past events, population changes, and availability of data.

The future time frame of 2040 was determined based on the Study's design year, as well as the availability of data. Population and employment projections are available through 2040 from MWCOG, allowing a more accurate depiction of future conditions within the ICE Analysis Area.

Figure 2-6: Overall ICE Analysis Area Boundary

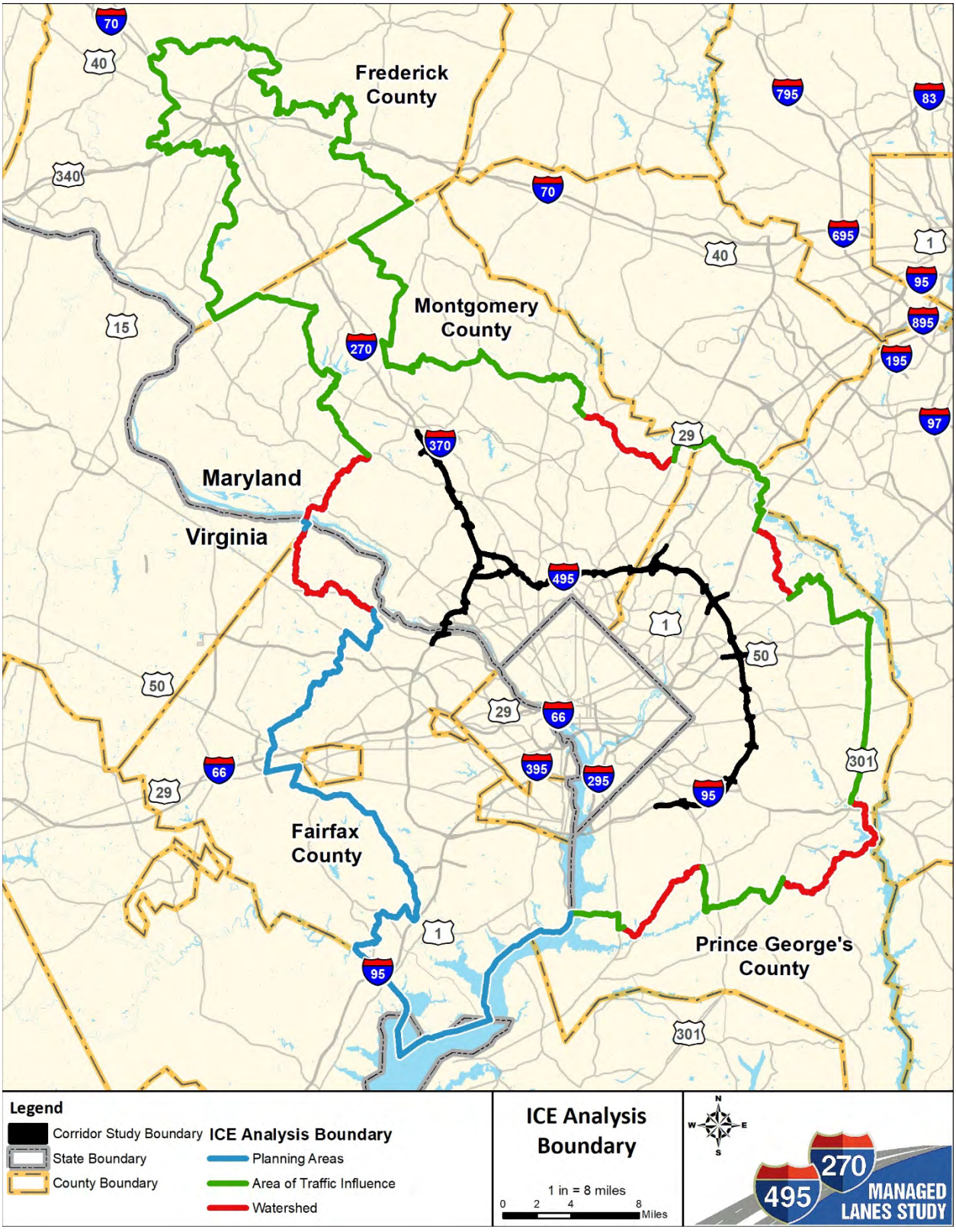
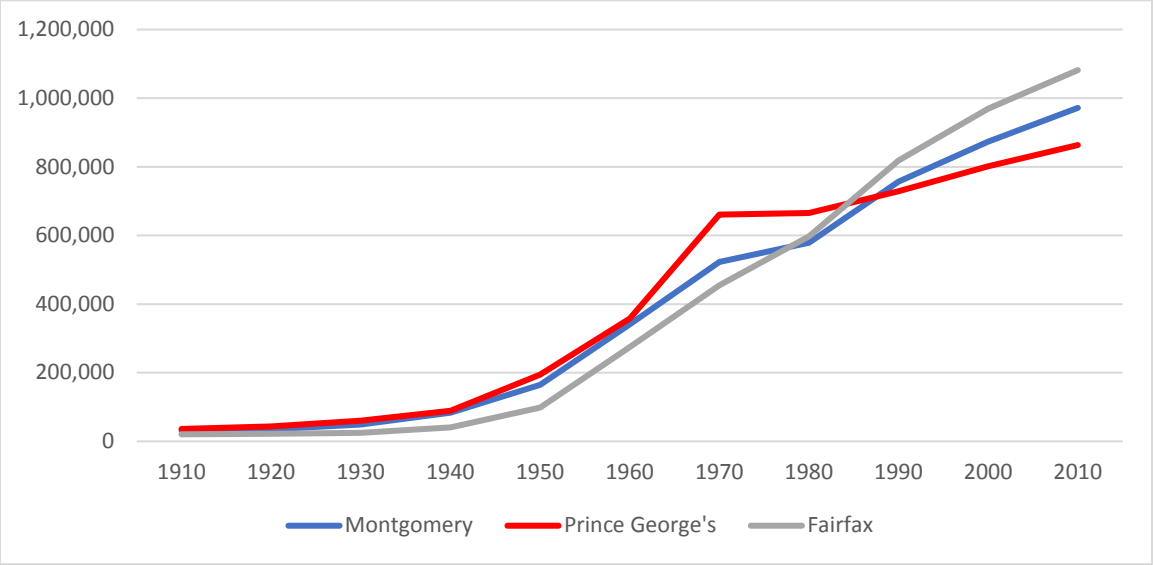


Figure 2-7: Population in Montgomery, Prince George's and Fairfax Counties



Source: US Census Bureau Decennial Census 1910-2010

2.2.4 ICE Analysis Approach and Methodology

The ICE analysis requires an understanding of past, current and potential future conditions in the study area in order to assess the potential for impacts associated with the range of study alternatives. Consideration of past effects included research and review of published literature, census information, and historic aerial imagery. Geographic information systems (GIS) mapping was obtained or created for the ICE Analysis Area and used to assess trends from the past to the present time frame. Resources identified within the ICE boundary are considered in light of past and present socioeconomic, cultural, natural environmental and air quality conditions and trends. Future conditions are analyzed to compare build and no build scenarios and the resulting potential indirect and cumulative effects.

The methodologies identified in the MDOT SHA ICE guidance were applied, including trends analysis and overlays.

- Trends analysis involves qualitative discussion of impacts to a resource over time. Past and current effects can allow for an informed projection of likely future effects.
- Overlays of present and future land use maps over the existing environmental resources allow for quantitative or qualitative description of the impacts to those resources.

Based on these methods, the ICE Analysis is designed to identify impacts to resources from other actions (past, present, and future) including indirect impacts—if any—due to each build alternative. Then, the potential incremental effects of the Screened Alternatives are evaluated in light of the past, present, and future impacts identified. **Table 2-4** provides a brief summary of the resources, data, data sources, and analysis methodology used for identifying potential indirect and cumulative effects.

Table 2-4: Data Sources and Methodology

Resource	Data	Data Sources	Analysis Methodology
Socioeconomic Resources			
Communities (facilities, services, cohesion), residences, businesses, parks and recreation	Aerial photos, land use maps, census data, county comprehensive plans	M-NCPPC, MDP, Maryland iMap GIS, MWCOG, US Census Bureau, Montgomery County, Prince George's County, Fairfax County, Alexandria, City of Fairfax	Overlay mapping and aerial photos, analyze trends in population and housing and availability of services, examine county comprehensive plans
Cultural Resources			
Historic structures/districts and archeological sites	Historic maps and photos, land use maps, historical site records	M-NCPPC, MHT, VDNR, National Register	Overlays of land use surrounding historical sites; trend analysis
Natural Resources			
Surface Water / Floodplains	Stream mapping, aerial imagery, land use data, watershed boundaries, floodplain mapping	M-NCPPC, MDNR, MDE, VDEQ, FEMA	Overlays of land use and historical imagery, trends analysis
Wetlands and Aquatic Habitat	Wetlands mapping, land use and historical imagery	M-NCPPC, MDNR, VDNR, NWI	Overlays of land use and historical imagery, trends analysis
Forests	Land use mapping and historical imagery	M-NCPPC, MDP, VDNR	Overlays of land use and historical imagery, trends analysis
Wildlife, Habitat and Sensitive Species	Land use mapping and imagery	M-NCPPC, MDP, VDNR	Overlays of land use and historical imagery, trends analysis
Other			
Air Quality	CLRP	NCRTPB	Regional conformity discussion

A. Socioeconomic Resources

Analysis of indirect and cumulative effects to communities and community facilities considers community services and cohesion, parks and recreational facilities, and planned land uses. Aerial imagery, historic maps, census statistics for tracts and CDPs, land use maps, and land use plans are used as appropriate. Overlays of historic aerial photographs facilitate the analysis of trends in population and housing growth, including qualitative comparisons of facilities over time. County and local comprehensive plans are used to identify future land uses, planned projects, and other relevant information. Data from the Maryland-National Capital Park and Planning Commission (M-NCPPC), the Maryland Department of Planning (MDP), MWCOG, and US Census Bureau are used, as appropriate.

B. Cultural Resources

Historic maps and photos, land use maps, and historical site records are used to evaluate potential indirect and cumulative impacts to historic structures, historic districts, and archeological sites. Data from the M-NCPPC, the Maryland Historical Trust (MHT), the Virginia Department of Historic Resources, and the National Register of Historic Places are used.

C. Natural Resources

Evaluation of indirect and cumulative effects to natural resources includes conclusions derived from data from the Maryland Department of Natural Resources (MDNR), Maryland Department of the Environment (MDE), Virginia Department of Environmental Quality (VDEQ), Virginia Department of Natural Resources (VDNR), USGS, US Environmental Protection Agency (USEPA), M-NCPPC, Federal Emergency Management Agency (FEMA), National Wetlands Inventory, US Army Corps of Engineers (USACE), and the Natural Resources Conservation Service. This evaluation includes surface water and floodplains, wetlands and aquatic habitat, forests, wildlife, wildlife habitat, and sensitive species to identify potential indirect and/or cumulative effects. Trends analysis is used to identify qualitative trends in these resources over time, and land use overlays allow for comparison of these resources relative to changing land uses in the ICE Analysis Area.

D. Air Quality

The ICE Analysis includes a brief, qualitative discussion of potential indirect and cumulative effects to air quality. This includes a summary of the direct impacts to air quality and a discussion of regional air quality conformity planning.

3

3 INDIRECT AND CUMULATIVE EFFECTS ANALYSIS

3.1 Background Information

3.1.1 Land Use

The ICE Analysis Area covers portions of Montgomery, Prince George's, and Frederick counties in Maryland; and Fairfax County, Arlington County, Alexandria,[6] Fairfax, and Falls Church in Virginia; as well as Washington, DC. Each of these jurisdictions regulates zoning and enacts land use planning documents to guide future land use and related elements. Some jurisdictions are divided into smaller areas for planning purposes.

A. Plans by Jurisdiction

a. Montgomery County

Montgomery County's General Plan was adopted in 1964 and updated most recently in 1993. (Another update to the plan began in 2018 and is scheduled for completion in 2021). It establishes a comprehensive vision for the County's future, with broad policy guidelines for land use, transportation, conservation, the environment, open space, employment, and housing. An important element of the General Plan is the concept of "wedges and corridors," in which growth is concentrated along the I-270 Corridor, Metrorail Red Line corridors, and the communities closest to Washington, DC (M-NCPPC, 1964). The corridors are separated by wedges of open space, parks, conservation areas, farmland, and low-density neighborhoods.

Overall land use objectives in the General Plan, as refined in 1993, include, among others, to direct the major portion of Montgomery County's future growth to the Urban Ring and I-270 Corridor, especially to transit station locales. The plan also calls for preserving farmland and rural open space, providing for moderate density residentially-based suburban communities, and providing a coordinated and comprehensive system of parks, recreation, and open space (M-NCPPC, 1993).

Transportation goals in the plan include, among others, developing an interconnected transportation system that provides choices in the modes and routes of travel, improving the efficiency of the existing and planned transportation system by managing its supply and demand, and providing a transit system in appropriate areas of the County that is a viable alternative to single-occupant vehicle travel. The plan also

[6] Alexandria, Fairfax, and Falls Church are independent cities in Virginia with jurisdiction equivalent to counties.

calls for reducing traffic delays on the road system without eroding the quality of life in surrounding communities, unless alternatives to the single-occupant vehicle are available. (M-NCPPC, 1993).

More detailed land use recommendations are found in area master plans. A master plan conveys land use policy for a defined geographic area and sets a vision for the future with specific recommendations. Each community within Montgomery County has a master plan that creates a comprehensive view of land use trends and future development. Even more detailed guidelines may be put forth in sector plans or minor master plans, which cover small portions of a master plan area.

Table 3-1 includes a brief summary of each of the master plans for the planning areas within the ICE Analysis Area. The summary focuses primarily on the land use goals and main objectives of each master plan.

Table 3-1: Montgomery County Master Plans Within the ICE Analysis Area

Plan	Year	Plan Highlights
Aspen Hill Master Plan	1994	• Plan area is largely built-out residential, with commercial centers dispersed throughout, a large employment area near the center and no industrial areas. • Plan goals include maintaining existing land use patterns and promoting the suburban residential character of Aspen Hill area, with supporting commercial uses.
Bethesda – Chevy Chase Master Plan	1990	• Plan area includes well established residential neighborhoods, a combination of open space and wooded areas, employment and shopping opportunities, and a high level of transportation service. Recommends supporting the existing residential character and zoning. • Plan recommends a moderate level of development, in balance with the overall transportation capacity. Recommends moderate level of highway improvements.
Bethesda Central Business District Master Plan	1994	• The plan focuses on strengthening the mature suburban downtown of Bethesda and providing opportunities for new development. A key component is to complete the Metro Core, intended as the focus for the most development with infill structures, green open space, and streetscape improvements. • The vision includes expanded opportunities to live in the downtown area with varied housing types and price ranges. The plan also preserves surrounding neighborhoods.
Clarksburg Master Plan	1994	• Envisions a transit and pedestrian-oriented community surrounded by open space. • Support for employment growth adjacent to I-270 corridor, and future widening of I-270. Recommends residential growth east and west of I-270.
Cloverly Master Plan	1997	• Cloverly contains a variety of communities including farms, rural neighborhoods, historic African-American communities, suburban subdivisions, and commercial areas set among parks and undeveloped areas. • The plan supports and reinforces the existing land use patterns and encourages development in the commercial center. Retains the low-density

Plan	Year	Plan Highlights
		residential zoning of most undeveloped property, with opportunity for limited expansion of the Cloverly Commercial Area.
Damascus Master Plan	2006	• Damascus is a small town surrounded by agricultural and open spaces. It includes community-oriented commercial uses, a variety of housing types, and a mixed-use Town Center surrounded by single-family residential areas. • Plan provides for a moderate amount of planned growth in the area, oriented primarily in and adjoining the Town Center. Seeks to protect open spaces by clustering new development.
Fairland Master Plan	1993	• Fairland includes new neighborhoods adjacent to mature neighborhoods, served by local shopping, schools, public services, and parks. • The plan recommends new residential development including single-family detached homes and a golf course community.
Gaithersburg City Master Plan	2009	• Envisions growth concentrated in existing population and business centers, growth areas adjacent to these centers, or strategically selected new centers. Emphasizes compact, mixed-use walkable design compatible with existing character. • Calls for a range of housing densities and types to provide options for residential use. Encourages efficient multimodal transportation and coordination of appropriate design for state and county infrastructure projects.
Germantown Master Plan	1989	• Recommends changes to previous 1974 Master Plan to emphasize environmental issues, encourage detached dwelling units in the mix of housing, and increase densities near transit stations. • Encourages research and development facilities and corporate office development in the Employment Corridor along I-270. Concentrates retail activities in the Town Center, Regional Shopping Mall, and Village Centers to discourage strip development along major roadways.
Kemp Mill Master Plan	2001	• Emphasizes the existing walkability, green spaces, and stable neighborhoods with a varied housing stock in Kemp Mill. The plan aims to reinforce the unique character of Kemp Mill neighborhoods and recognizes that a neighborhood commercial center should serve as a focal point or center for the surrounding neighborhoods. • The plan also provides recommendations aimed at enhancing existing neighborhoods and ensuring that development is controlled through compatibility between zoning and existing land uses.
Four Corners Master Plan	1996	• The plan retains existing residential zoning to protect and reinforce the neighborhoods as the foundation of the community. It retains the existing commercial district boundaries and encourages clear delineation between residential and non-residential areas. • The plan aims to encourage improvements to intersections, pedestrian circulation, bikeway network, and increased use of transit.
Master Plan for the Communities	1989	• The plan recommends that the predominantly low-to medium-density residential character of the area be maintained and protected.

Plan	Year	Plan Highlights
of Kensington-Wheaton		• Recommends development and promotion of modes of transportation other than the single-occupant automobile to facilitate peak-hour commuting.
North Bethesda / Garrett Park Master Plan	1992	• Plan recommends that future development be focused at Metrorail stops, new transit stations, and areas best served by transportation infrastructure, with more emphasis on housing. • Acknowledges deteriorated suburban traffic conditions due to rapid growth, with recognition that land use and physical design characteristics of suburban workplaces have directly contributed to the decline in suburban mobility by inducing most employees to drive alone to work.
Olney Master Plan	2005	• The plan proposes a slight increase in the level of planned growth of housing units, and retail and commercial use. The plan also calls for increased protection of forested land as parkland to protect the area's sensitive environmental resources. • Recommends a network of regional and local transportation facilities to ensure that future land use will be adequately served without affecting existing communities and the area's environmental resources.
Potomac Subregion Master Plan	2002	• The plan recognizes Potomac's evolution from a rural and agricultural to a semi-rural and suburban subregion. It strongly recommends that sustaining the environment be the pre-eminent policy, and acknowledges that, "Inexorable population growth continues to foster intense development pressure on the Potomac Subregion." • Recommends maintaining and reaffirming low-density residential land use and maintaining a two-lane road policy that limits road capacity expansion.
Upper Rock Creek Area Master Plan	2004	• A primary goal of the plan is to protect environmental resources and maintain stream quality by keeping streams, forests, and wetlands in a natural state. It also places equal emphasis on preserving residential character. • The generally low-density nature of the Upper Rock Creek watershed is in keeping with the "wedges and corridors" concept outlined in the Montgomery County General Plan.
Rockville Comprehensive Master Plan	2002	• Underlying principles of the plan include protecting the character of neighborhoods, developing a sense of cohesive community, fostering a vibrant Town Center with distinctive character, and providing a diversity of integrated transportation options. • Recommends that new development should positively impact quality of life for existing residents and promotes Smart Growth principles that new growth should be concentrated in the Town Center.
East Silver Spring Master Plan	2000	• The plan recognizes the residential nature of the area and the community orientation of its local commercial centers, and its recommendations are designed to sustain and enhance residential neighborhoods. • The plan recommends a neighborhood-friendly circulation system that accommodates local and regional traffic, while providing pedestrian, bicycle, and auto access to transit, recreation, and shops.

Plan	Year	Plan Highlights
North and West Silver Spring Master Plan	2000	• North and West Silver Spring are composed primarily of established residential neighborhoods supported by local commercial centers. The planning area includes some light industrial, service, and institutional uses. • The plan's recommendations are designed to sustain and enhance these neighborhoods with upgraded infrastructure, stabilized and reused historic resources, renovated parks, and a neighborhood-friendly transportation system that provides pedestrian, bicycle, and vehicular access to Metrorail, recreation, and retail areas.
Takoma Park Master Plan	2000	• The plan's recommendations are designed to sustain and enhance residential neighborhoods. It also makes recommendations to sustain and revitalize viable commercial centers without negatively impacting the surrounding neighborhoods.
White Oak Master Plan	1997	• The plan retains existing residential zoning to protect and reinforce the integrity of the existing neighborhoods. It provides guidance for future improvements and development within the commercial centers to strengthen their function as retail facilities and places of community interaction. • The plan enhances the pedestrian environment along major highways and arterials within commercial centers by encouraging streetscape improvements.
Great Seneca Science Corridor (GSSC) Master Plan	2010	• The GSSC Master Plan envisions a science and medical hub known as the Life Sciences Center (LSC). It is concerned with protecting residential neighborhoods and investments made by businesses and institutions in the area – growth and change in the LSC must occur in a way that does not overburden the surrounding communities. • Aligns the Corridor Cities Transitway (CCT) through the LSC and provides four transit stations that will be the focal point of new development. It concentrates density, building height, and civic green spaces at the CCT stations.

Montgomery Planning, 2018a

The master plans within Montgomery County are intended to achieve a range of different goals unique to the specific communities to which they apply. Many of these areas are largely built-out, with matured land uses that are predominantly residential. Thus, many plans focused on strengthening and maintaining the character of existing residential areas and community-oriented retail and commercial uses. The plans also support the overall "wedges and corridors" concept of the General Plan as applied to the localized master plan areas. Common themes from the master plans are listed below.

- Maintaining and enhancing the character and functioning of existing residential communities, while allowing for managed growth, supporting diversity of housing stock, and promoting affordable housing.
- Smart Growth principles of clustered development, transit accessibility, and environmental conservation.
- Supporting community-oriented commercial retail centers that are concentrated in designated areas.

- Support for local roadway improvements, intersection improvements, streetscape enhancements, and pedestrian and bicycle infrastructure upgrades.
- Encouraging the increased availability and use of mass transit for commuters.
- Support for protecting open space and sensitive environmental resources, in accordance with the "wedges and corridors" concept of the General Plan.

In addition to the Master Plans above, the ICE Analysis Area includes several Sector Plans and Minor Master Plans, listed below (Montgomery Planning, 2018a).

- Forest Glen Sector Plan
- Four Corners Sector Plan
- Chevy Chase Lake Sector Plan
- Forest Glen/Montgomery Hills Sector Plan
- Friendship Heights Sector Plan
- Germantown Employment Area Sector Plan
- Glenmont Transit Impact Area and Vicinity Sector Plan
- Grosvenor-Strathmore Metro Area Minor Master Plan
- Town of Kensington and Vicinity Sector Plan
- Long Branch Sector Plan
- Greater Lyttonsville Sector Plan
- Takoma/Langley Crossroads Sector Plan
- Twinbrook Sector Plan
- Westbard Sector Plan
- Wheaton Central Business District and Vicinity Sector Plan
- White Flint Sector Plan

b. Prince George's County

Plan 2035: Prince George's Approved General Plan – Blueprint for Tomorrow (Plan 2035) designates six area classifications that represent the County's growth policy. These classifications are shown on a Growth Policy Map (*M-NCPPC, 2014)*. The Growth Policy Map identifies Regional Transit Districts, Employment Areas, Local Centers, Established Communities, Future Water and Sewer Service Areas, and Rural and Agricultural Areas. Each of these is associated with specific goals and policies to achieve outcomes in the Plan based on existing conditions and planned future growth.

In addition to the Growth Policy Map, the Plan lays out a series of land use policies that reflect the land use goals of the County. These are summarized as:

- Directing a majority of projected new residential and employment growth to the Regional Transit Districts.
- Limiting expansion of public water and sewer in rural and agricultural areas;
- Using the Plan 2035 policies to guide development of land use policies for all future county planning documents.
- Phasing new residential development to coincide with the provision of public facilities and services.
- Implementing the Growth Policy Map through coordinated multimodal transportation and mobility planning and programs.
- Supporting new employment growth in Employment Areas.
- Limiting future mixed-use land uses outside of the Regional Transit Districts and Local Centers.

- Strengthening and enhancing existing residential areas and neighborhoods in the Established Communities.
- Limiting expansion of new commercial zoning outside of the Regional Transit Districts and Local Centers.
- Retaining future water and sewer service areas until additional residential development capacity is needed to meet growth projections.
- Preserving and protecting the Rural and Agricultural Areas to conserve agricultural and forest resources.
- Participating in regional planning activities to enhance collaboration, coordination, and implementation on regional issues.

The Plan also includes transportation and mobility policies, summarized as:

- Ensure that countywide transportation improvements are integrated with and support the Plan 2035 vision and land use pattern.
- Expand and improve transit service.
- Maintain levels of service standards for roads and highways.
- Use complete and green street practices.
- Improve overall safety levels.
- Pursue a range of transportation facility and systems funding sources and strategies.
- Promote the use of low-carbon transportation methods.
- Ensure that parking requirements for transit-accessible areas are appropriate.
- Improve mobility options for targeted population groups.

Additionally, there are 38 active Master Plans, Sector Plans, and Transit District Development Plans (TDDP) pertaining to the ICE Analysis Area in Prince George's County. These include:

- Bladensburg, New Carrollton & Vicinity Master Plan
- Bowie and Vicinity Master Plan
- Bowie MARC Sector Plan
- Branch Avenue Corridor Sector Plan
- Capitol Heights TDDP
- Central Annapolis Road Sector Plan
- Central Branch Avenue Sector Plan
- Central US 1 Corridor Sector Plan
- College Park-Riverdale Park TDDP
- East Glenn Dale Area Sector Plan
- East Riverdale-Beacon Heights Sector Plan
- Eastover/Forest Heights/Glassmanor Sector Plan
- Gateway Arts District Sector Plan
- Glenn Dale-Seabrook-Lanham Sector Plan
- Greater Cheverly Sector Plan
- Greenbelt Metro Area Sector Plan
- Greenbelt/193 Sector Plan
- Henson Creek-South Potomac Master Plan
- Landover Gateway Sector Plan

- Landover Metro Area & MD 202 Corridor Sector Plan
- Langley Park-College Park-Greenbelt Master Plan
- Largo-Lottsford Master Plan
- Largo Town Center Sector Plan
- Marlboro Pike Sector Plan
- Morgan Blvd. & Largo Town Center Metro Sector Plan
- New Carrollton TDDP
- Planning Area 68 Master Plan
- Port Towns Sector Plan
- Prince George's Plaza TDDP
- Southern Green Line Sector Plan
- Subregion 1 Master Plan
- Subregion 4 Master Plan
- Subregion 5 Master Plan
- Subregion 6 Master Plan
- Takoma/Langley Crossroads Sector plan
- The Heights Master Plan
- West Hyattsville TDDP
- Westphalia Sector Plan

c. Frederick County

The Frederick County Comprehensive Plan was adopted in 2010. The plan notes that Frederick County has experienced numerous changes and transitions during the past 50 years that have taken the County from its predominantly rural, small town, agricultural roots to a suburbanizing bedroom community, and to a maturing county with an established employment base and a prominent community in the City of Frederick (Frederick County, 2010). It states that the County will have opportunities to accommodate and focus growth in a manner that maintains rural areas and strengthens communities. Notable land use goals from the plan are summarized below.

- Develop a consensus with municipalities to determine how much new residential growth is desired in municipality-centered Community Growth Areas.
- Ensure that adequate infrastructure is provided – concurrently with development – in order to accommodate long-term land use plans.
- Reduce non-rural development outside of Community Growth Areas while maintaining opportunities for compatible agricultural support services and uses in the Rural Communities.
- Manage land use planning and development in a manner that is compatible with the conservation, protection, and enhancement of the County's Green Infrastructure.
- Increase the proportion and density of new residential development occurring within Community Growth Areas while minimizing new development outside.

The Plan also calls for enhancing the quality of the transportation system to assure an acceptable level of service, safety, and travel conditions for roadway users, as well as reducing the need for single-occupancy auto use through travel demand management, transit service, bicycling, and walking. Travel demand management is proposed as an alternative mitigation strategy to the expansion of roadway capacity.

d. Fairfax County

The ICE Analysis Area includes a portion of Fairfax County Planning Area II. In addition to the countywide Comprehensive Plan for Fairfax County, there are three plans within Area II including Fairfax, McLean, and Vienna (Fairfax County, 2017). **Table 3-2** provides a brief summary of each.

Table 3-2: Fairfax County Comprehensive Plans

Plan	Year	Plan Highlights
Comprehensive Plan for Fairfax County	2017	• Includes land use policy objectives, such as establishing areas of community focus with a mixture of compatible land uses, increasing transportation efficiency, encouraging transit use and decreasing automobile use. • Policy to protect, enhance, and maintain stability of established residential neighborhoods.
Fairfax County Comprehensive Plan - Fairfax Planning District	2017	• The predominant character of the Fairfax Planning District is low-density residential development. • Main objectives include preserving stable residential areas, limiting commercial encroachment into residential neighborhoods, improving pedestrian access, and ensuring compatibility of any future expansion of major institutional uses.
Fairfax County Comprehensive Plan – McLean Planning District	2017	• The district contains the McLean Community Business Center, the West Falls Church Transit Station Area, and a portion of the Tysons Urban Center surrounded by predominantly low-density residential neighborhoods. • Major objectives include balancing growth with internal and external traffic demands, ensuring that development is at a compatible scale, providing improved access to West Falls Church, and containing commercial and higher density uses within the established urban areas.
Fairfax County Comprehensive Plan – Vienna Planning District	2017	• The district is predominantly comprised of single-family neighborhoods with the exception of the Vienna Transit Station Area, Merrifield Suburban Center, and the Tysons Urban Center. • Major objectives include providing compatible infill development that maintains the stability of established residential neighborhoods, achieving appropriate development in the Vienna Transit Station Area and Merrifield Suburban Center, and preserving the environment.

e. City of Fairfax

The 2012 City of Fairfax Comprehensive Plan notes that Fairfax is a city predominantly composed of neighborhoods, as well as a large amount of parkland and open space (City of Fairfax, 2012). Because of its central location within the Northern Virginia region, the City is experiencing pressures from the intense development now underway immediately outside its boundaries. The guiding principles of the Plan include protecting residential neighborhoods, promoting centers of commerce, protecting small town atmosphere, and ensuring safe and efficient movement of traffic.

f. Arlington County

The purpose of the Arlington County Comprehensive Plan identifies a series of overarching principles, summarized below (Arlington County, 2016).

- Retention of the predominantly residential character of the County, and limitation of intense development to defined areas.

- Promotion of commercial and industrial activities in designated areas appropriately related to residential neighborhoods.
- Development of facilities which will promote efficiency in the areas of health, welfare, culture, and recreation.
- Provision of effective water, sewage, and storm water management.
- Provision of an adequate system of traffic routes designed to form an integral part of the regional transportation system, and assuring a safe convenient flow of traffic.

g. City of Alexandria

The citywide portion of Alexandria's 1992 Master Plan lays out a series of land use goals, including preserving the predominant character of Alexandria as a city of residential neighborhoods with a mix of uses, preserving and enhancing residential neighborhoods and historic aspects of the City, preserving residential and commercial diversity, and preserving and increasing parkland and open space throughout the City (City of Alexandria, 1992).

The 2008 Comprehensive Transportation Master Plan for Alexandria encourages the use of alternative modes of transportation, reducing dependence on the private automobile. It calls for the establishment of transit-oriented, pedestrian friendly village centers, focused on neighborhood preservation and increased community cohesion (City of Alexandria, 2008).

h. Falls Church

The City of Falls Church's Comprehensive Plan was adopted in 2017. The plan includes a series of core values including small town character in an urban setting, economic sustainability, environmental sustainability, inclusiveness and social sustainability, education, mobility and accessibility, public health and safety, and responsiveness and accountable governance (City of Falls Church, 2017).

i. Washington, DC

The Land Use Element of the Comprehensive Plan for Washington, DC is described as the "cornerstone" of the plan. It establishes the basic policies guiding the physical forms of the cities, and provides direction on a range of development, conservation, and land compatibility issues (District of Columbia Office of Planning, 2010). The issues facing the District of Columbia addressed in the Land Use Element include:

- Promoting neighborhood conservation.
- Creating and maintaining successful neighborhoods.
- Strengthening downtown.
- Enhancing neighborhood commercial districts and centers.
- Balancing competing demands for finite land resources.
- Directing growth and new development to achieve economic vitality while minimizing adverse impacts on residential areas and open space.
- Siting challenging land uses.

The plan goes on to state:

> *"Although the District of Columbia was almost fully developed by 1960, the demand for land and housing and jobs has continued to fuel land use change. The changing needs of the federal government, private industry, and the city's institutions still shape the landscape on a daily basis. The city's aging housing stock still requires refurbishment and replacement. The renewed popularity of city living generates the need for more housing and new amenities."*

j. Land Use Plans - Conclusions

The ICE Analysis Area includes portions of numerous planning jurisdictions that have established a wide range of planning documents. These documents consider past and present conditions to develop visions, goals and strategies for future land uses. As such, they are integral to understanding the trends and patterns of development and change throughout the ICE Analysis Area. The following discussions of past, present, and future land uses are based on the information presented in these plans, along with quantified data and mapping on past and present land uses where available.

B. Past and Present Land Use

Because of the broad nature of the ICE Analysis Area, different data sets are available from the various jurisdictions throughout the area. The available information varies in notable ways such as, the level of detail, classification scheme, time frame, and format. Therefore, the discussion below corresponds with the availability of data for the various jurisdictions included in this ICE analysis.

a. Maryland Portion of the ICE Analysis Area

For the Maryland portion of the ICE Analysis Area, Land Use/Land Cover (LULC) is available for 1973, 2002, and 2010 data years from the MDP. As shown in **Table 3-3**, in 1973, forest and agriculture were the most prevalent LULC categories present throughout the area, at approximately 35 percent and 28 percent, respectively. Residential was the third most prevalent land use, at 24 percent. By 2002, the proportion of residential land use had risen to 39 percent, while forest and agricultural land dropped to 28 percent and 13 percent, respectively. This trend continued through 2010, with residential at 43 percent, forested land at 25 percent, and agricultural at 12 percent. The conversion of agricultural land is particularly notable, with a decline of approximately 58 percent between 1973 and 2010.

The data suggests an overall pattern of agricultural and forest land converted into residential use between 1973 and 2010. Institutional and industrial uses rose modestly in this time frame, and other land use categories were generally stable. This substantial increase in residential land use coincides with the growing population in the ICE Analysis Area as described below in **Section 3.1.2**.

Table 3-3: Past and Present Land Use/Land Cover in the Maryland Portion of the ICE Analysis Area[7]

Land Use / Land Cover	1973	2002	2010
Commercial	19,295 (4%)	19,330 (4%)	19,191 (4%)
Industrial	3,023 (1%)	14,465 (3%)	13,605 (3%)
Agricultural	128,605 (28%)	61,251 (13%)	53,416 (12%)
Forest	159,057 (35%)	129,263 (28%)	114,960 (25%)

[7] There have been minor adjustments to the LULC data in this time - in particular, transportation was not included as a category in 1973. However, the data is still broadly comparable for identifying major land use trends over this time frame.

Land Use / Land Cover	1973	2002	2010
Institutional	14,891 (3%)	24,750 (5%)	26,106 (6%)
Other	14,765 (3%)	21,124 (5%)	19,300 (4%)
Residential	108,682 (24%)	176,440 (39%)	194,768 (43%)
Water	6,430 (1%)	7,821 (2%)	7,789 (2%)
Wetlands	516 (<1%)	365 (<1%)	347 (<1%)
Transportation	N/A	257 (<1%)	5,587 (1%)

Source: Maryland Department of Planning, 1973, 2002, 2010 Land Use/Land Cover via Maryland iMap GIS

Land use in the Maryland portion of the ICE Analysis Area is predominantly suburban, mid to low-density residential use, with more dense areas closer to Washington, DC and becoming less intense further from the city core. Commercial, industrial, and institutional uses are generally clustered around major transportation corridors, especially interstate highways. Green spaces are generally stream valley corridors and larger parks dispersed throughout the area.

The land uses are notably different in northern Montgomery County, generally north of Germantown along I-270, and Frederick County, where much more rural and agricultural uses predominate. Several large forested areas are also located near the border between Montgomery and Frederick Counties such as Sugarloaf Mountain Park and Little Bennett Regional Park. Additional residential, institutional, and other areas are clustered around Frederick near the northern extent of the ICE Analysis Area.

b. District of Columbia

Table 3-4 provides land use data for the District of Columbia from 2005, as presented in the District of Columbia Comprehensive Plan.

Table 3-4: 2005 Land Use in the District of Columbia

2005 Land Use	Acreage
Road rights-of-way	10,018 (26
Residential	11,068 (28%)
Commercial	1,795 (5%)
Industrial	418 (1%)
Institutional, Public and Federal Facilities	6,234 (16%)
Permanent Open Space	7,980 (20%)
Rail, Utilities	857 (2%)
Vacant	843 (2%)

District of Columbia Office of Planning, 2010

The comprehensive plan notes the expansive city core of about four-square miles centered around the open spaces of the federal city. The core is surrounded by an inner ring of moderate- to high-density residential and mixed-use neighborhoods. Beyond the inner ring is an outer ring of less dense development, characterized largely by single-family housing and garden apartments. The two rings generally correspond to historic development patterns, with most of the inner ring developed prior to 1910 and the outer ring developed after 1910. No historical land use GIS data is readily available for the District of Columbia. However, as noted in the Comprehensive Plan, the District was almost fully developed by 1960.

c. Virginia

The Virginia portion of the ICE Analysis Area is generally characterized by mature suburban residential land uses, with commercial and other uses focused in hubs along major transportation corridors. The land uses are denser in the areas closer to Washington, DC, becoming more suburban further away from the urban core. The Virginia portion of the ICE Analysis Area has seen a major growth in office buildings since 1970, particularly in areas close to highways, Metrorail stations, and near Washington, DC.

Residential land use accounts for 50 percent of the land use in the Fairfax County portion of the ICE Analysis Area. The majority of this (44 percent of the total area) is low-density residential. Institutional use accounts for 15 percent, and recreation accounts for 11 percent. Agricultural use accounts for less than one percent. This reflects the area's composition of mostly developed, primarily suburban land uses (**Table 3-5**).

Table 3-5: 2018 Land Use in the Fairfax County Portion of the ICE Analysis Area

Land Use	Acres	Percentage
Agricultural	35	<1%
Commercial	4,815	4%
Residential	60,497	50%
Industrial	2,157	2%
Institutional	17,917	15%
Recreation	13,194	11%
Other (Open Land, Public, Utilities)	21,658	18%

Fairfax County has also seen substantial growth in commercial land uses and denser residential use. As noted in the Fairfax County Comprehensive Plan (Fairfax County, 2017):

> *"Between 1970 and 1995, the number of acres in nonresidential land uses, excluding public facilities, quadrupled, expanding by 463 percent. At the same time, the number of acres in residential land use in the county grew by 168 percent. While single-family detached housing continued to be the predominant land use, the combined development of townhouses and apartments out paced single-family detached housing since 1970 at a rate of 6 to 4 and since 1990, out paced single-family dwelling units at a rate of 2 to 1."*

The portions of the ICE Analysis Area in Fairfax County have experienced growth in residential land uses since 1970, as reflected in the substantial population growth detailed in **Section 3.1.2**, below. Past land use data is not available in the same level of detail as in Maryland and thus cannot be as easily quantified. However, the available information suggests this area has likely followed a trajectory similar to the suburban Maryland portions of the ICE Analysis Area, wherein agricultural and forest land has been converted to suburban residential land uses.

Aerial imagery of Arlington indicates similar prevalence of residential uses, but with higher densities of residential, office, and institutional uses in areas closer to Washington, DC. The Arlington General Land Use Plan states that since the 1970s, the Rosslyn-Ballston and Jefferson Davis Metro corridors have been targeted for high-density development. The highest density land uses are focused within walking distance of Metro stations, with densities, heights, and uses tapered down to existing single-family residential

neighborhoods further away. The Columbia Pike corridor has been a focus of commercial development in Arlington since the 1980s.

Alexandria is primarily residential with concentrations of higher density residential, commercial, and institutional uses focused along the Potomac River and near major transportation facilities. According to Alexandria's comprehensive plan, in 1990 the City was comprised of 50 percent residential land use, 10 percent commercial, 15 percent industrial, 11 percent institutional, 7 percent parks, and 6 percent vacant land. The plan notes that commercial land use nearly doubled between 1974 and 1990, mostly from growth in office buildings. During the early part of this period, most of the large office buildings were built in or adjacent to the Central Business District or along Eisenhower Avenue. More recently large office buildings and multi-building office parks have been developed near the Metrorail stations, in close proximity to I-395 highway interchanges, or on the north waterfront near the National Airport and the District of Columbia.

C. Future Land Use

The availability and level of detail for future land use varies depending on the planning jurisdiction. Background information on future land use is summarized below based on available plans and data by jurisdiction.

a. Montgomery County

The zoning designations in Montgomery County, which are reflective of planned future land uses, primarily focus on commercial, institutional, and industrial uses along the I-270 Corridor, with residential areas surrounding to the east and west. Northern portions of the county, including areas along I-270 within the ICE Analysis Area, are largely designated for agricultural and rural use.

A review of the various land use plans in Montgomery County, as described in **Table 3-1** above, indicates that the comprehensive planning documents aim to protect existing suburban residential areas along I-495, and maintain them in their current form. New growth is to be primarily focused into hubs around existing mass transit, and in more densely urbanized areas closer to Washington, DC. Minimal farmland remains in Montgomery County to be converted; much of the remaining undeveloped land is in the system of preserved parks that was originally envisioned in the "Wedges and Corridors" concept. Therefore, future land use change will most likely take the form of infill development and densification.

b. Prince George's County

Future land use changes are outlined in the Growth Policy Map, included in the Prince George's Approved General Plan (M-NCPPC, 2014). The Growth Policy Map identifies the following areas:

- Regional Transit Districts – Centers with extensive transit and transportation infrastructure and the long-term capacity to become mixed-use, economic generators.
- Employment Areas – Areas with the highest concentrations of economic activity in targeted industry clusters, to concentrate new business development.
- Local Centers – Focal points for development and civic activity based on their access to transit or major highways. Recommends directing medium to medium-high residential development and limited commercial uses to these locations.

- Established Communities – Existing residential neighborhoods and commercial areas served by public water and sewer outside of the Regional Transit Districts and Local Centers. These are most appropriate for context-sensitive infill and low- to medium-density development.

- Future Water and Sewer Service Areas – Holding zones in which near-term development is deferred until additional residential capacity is required.

- Rural and Agricultural Areas - Low-density residential communities, natural resources, and historic areas where the plan recommends retaining low-density residential use, supporting park and open space land uses, maintaining infrastructure, and stabilizing small-scale commercial activities.

The Regional Transit Districts, Employment Areas, and Local Centers are primarily focused along and inside I-495, particularly near highways and Metro lines. Most of the area between I-495 and US 301 is designated as Established Communities with pockets of Future Water and Sewer Service Areas scattered throughout. The Rural and Agricultural Areas are primarily east of US 301, along with several large areas near the northern and southern boundaries of the County. This overall distribution indicates that new growth will be focused primarily around major transit hubs and highways, along with infill development in existing residential communities. Growth will likely be diverted away from rural and agricultural areas on the outer perimeter of the County.

c. Frederick County

Frederick County's 2010 Comprehensive Plan aims to focus new development in designated Community Growth Areas, which include Municipal Growth Areas and Unincorporated Growth Areas (Frederick County, 2010). The Community Growth Areas are primarily located in the vicinity of Frederick and along major highways including I-270 and I-70. Community Growth Areas in the ICE Analysis Area include Middletown, Frederick, Frederick Southeast, Ballenger Creek, Urbana, and Monrovia.

Outside of the Community Growth Areas, the areas within the ICE Analysis Area are designated for agricultural and rural uses, or as green infrastructure. Agricultural and rural designations are intended to emphasize the importance of agriculture and the rural character of the County. The Green Infrastructure areas include the County's network of natural resources and protected lands.

In summary, the comprehensive plan policy is to direct future land use growth in the vicinity of existing population centers and highway infrastructure, particularly near Frederick and along I-270 in the ICE Analysis Area. Additionally, the plan aims to preserve the existing character of agricultural, rural, and green infrastructure areas outside of these locations.

d. Virginia

Fairfax County is largely built-out, and the comprehensive plan aims to protect and strengthen existing residential land uses and manage pressure for future growth (Fairfax County, 2017). The Plan states:

> *"As land values increase due to decreasing supply, the pressure to redevelop existing lower density, as well as nonresidential acreage, will increase […] While in selected instances this may be desirable, the practice of redevelopment must be carefully controlled so as to not undermine stable neighborhoods and provision of public services and facilities."*

The plan also calls for the creation of community-focused mixed-use centers with a compatible mix of housing, commercial, institutional/public services, and recreation uses. These are encouraged within the established urban centers such as Tysons Corner, primarily located along major highways in the County, and focused mostly closer to Arlington and Washington, DC.

Arlington's comprehensive plan calls for retention of the predominantly residential character of the County, and limitation of intense development to defined areas (Arlington County, 2016). In particular, it calls for concentrating high-density development within the Rosslyn-Ballston and Jefferson Davis Metrorail Transit Corridors. It calls for promoting mixed-use development in Metro Station areas, increasing the supply of housing by encouraging construction of a variety of housing types and prices at a range of heights and densities in and near Metro Station Areas, and preserving and enhancing neighborhoods and neighborhood retail areas. Therefore, future land uses will likely be similar to existing but with densification and infill redevelopment, particularly focused around Metro stations.

Alexandria is largely built out; the 1992 Land Use Master Plan for Alexandria notes that there were 1,100 acres of vacant and redevelopable land in the City (City of Alexandria, 1992). The plan also calls for more mixed-use development and maintaining existing residential areas. Future land uses in Alexandria will likely be similar to existing, with mixed-use infill and densification in targeted growth areas around major transportation facilities.

e. District of Columbia

The District of Columbia comprehensive plan notes that the City has been largely built-out since the 1960s, but demand for land for housing and jobs has continued to fuel land use change (DC Office of Planning, 2010). Changing needs of the federal government, private industry, and the City's institutions shape the City's landscape. The City's aging building stock still requires refurbishment and replacement, and the renewed popularity of city living generates the need for more housing and new amenities. The plan states that between 2005 and 2025, approximately 30 percent of DC's future housing growth and 70 percent of its job growth will occur within the urban core of the City and adjacent to close-in areas along the Anacostia River.

The plan notes that two areas are emerging as major hubs of central city growth in DC. The first includes land in the triangle bounded by New York Avenue, Massachusetts Avenue NW, and the CSX railroad, along with adjacent lands around the New York Avenue Metro station. The second includes the South Capitol corridor and Near Southeast, including the site of the Washington Nationals Baseball park and the adjoining Southeast Federal Center and waterfront area. Whereas much of Central Washington was redeveloped with single-purpose office uses during the second half of the 20th century, these two areas are envisioned as mixed-use centers, including housing and employment. Other established business districts such as Golden Triangle, the Downtown Core, and Near Southwest will continue to see infill development.

3.1.2 Population, Housing and Employment

Population data presented in **Table 3-6** was collected for the County-level jurisdictions in the ICE Analysis Area from the US Census Bureau Decennial Census (1970-2010) and American Community Survey 5-Year estimates (2016). Future population projections (2020-2040) are from MWCOG Round 9.1 Cooperative Forecasting.

Table 3-6: Population 1970-2040

Year	1970	1980	1990	2000	2010	2016	2020	2030	2040
Montgomery County, MD	522,809	579,053	757,027	873,341	971,777	1,026,371	1,052,000	1,128,800	1,197,100
Prince George's County, MD	660,567	665,071	729,268	801,515	863,420	897,693	923,100	953,000	982,400
Frederick County, MD	84,927	114,792	150,208	195,277	233,385	243,465	267,800	303,600	332,200
Fairfax County, VA	455,021	596,901	818,584	969,749	1,081,726	1,132,887	1,162,500	1,264,700	1,362,500
Arlington County, VA	174,284	152,599	170,936	189,453	207,627	226,092	232,700	256,000	278,100
Alexandria City, VA	110,938	103,217	111,183	128,283	139,966	151,473	159,200	172,800	190,800
Fairfax City, VA	21,970	19,390	19,622	21,498	22,565	23,620	26,000	26,900	27,900
Falls Church City, VA	10,772	9,515	9,578	10,377	12,332	13,597	14,200	16,400	17,300
Washington, DC	756,510	638,333	606,900	572,059	601,723	659,009	729,500	842,200	940,700

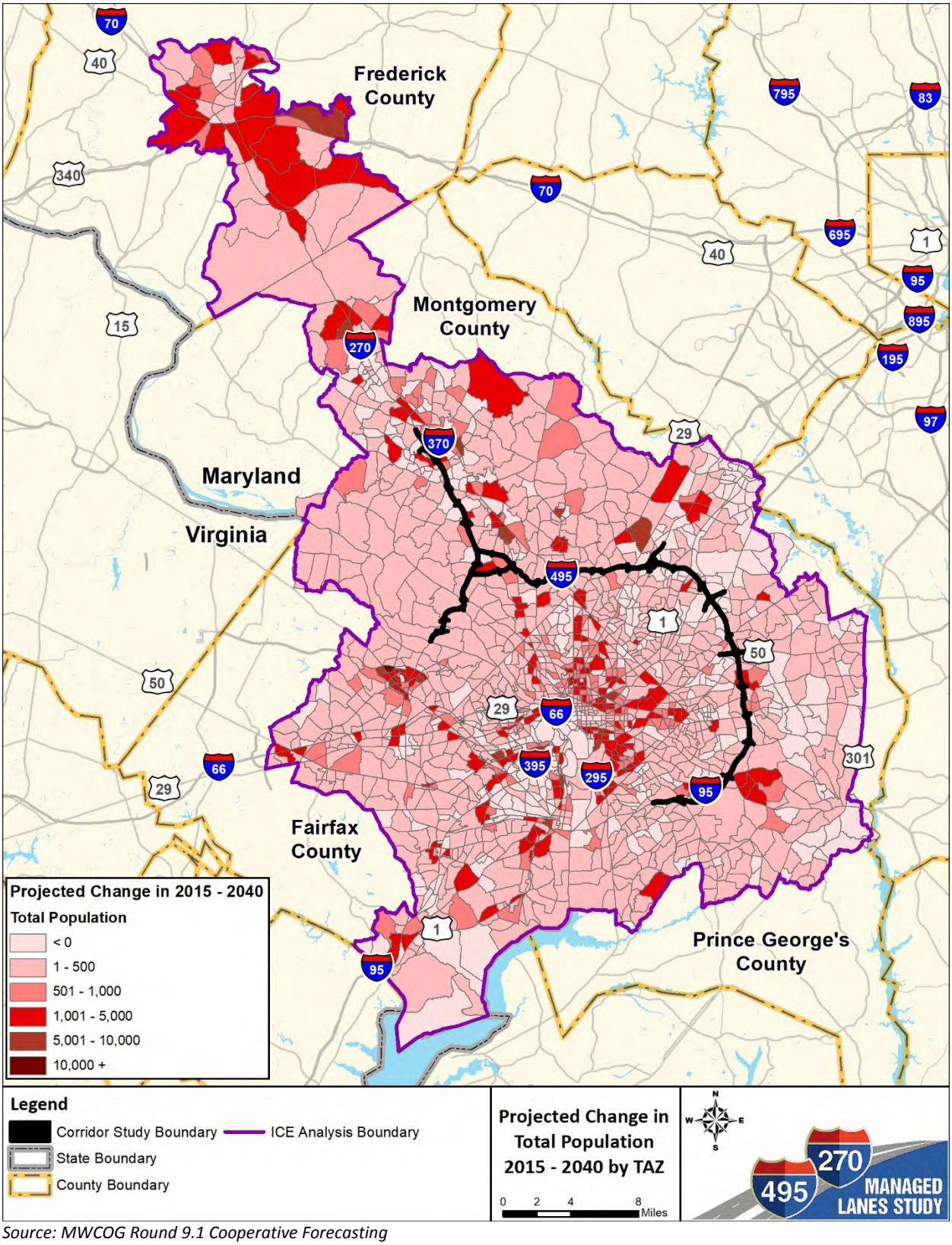
Sources: US Census Bureau Decennial Census (1970-2010); American Community Survey 5-Year estimates (2016); MWCOG Round 9.1 Cooperative Forecasting.

Most ICE Analysis Area jurisdictions have seen substantial population growth since 1970. Montgomery County's population nearly doubled between 1970 and 2016; and Prince George's County grew by over 35 percent. Frederick County, the least populous of the three Maryland counties, nearly tripled with a growth of 187 percent. Fairfax County, the most populous of the ICE Analysis Area counties in Virginia, grew nearly 150 percent during that time. Arlington County grew by approximately 30 percent. The incorporated cities in Virginia of Alexandria, Fairfax City, and Falls Church have experienced growth of 37 percent, 8 percent, and 26 percent, respectively. Washington, DC has been the exception to this trend – its population declined by nearly 13 percent between 1970 and 2016. However, the population of Washington, DC has been rising since approximately 2000, when it was 24 percent below 1970 levels.

All of the ICE Analysis Area jurisdictions are projected to increase in population by 2040. Most are estimated to rise at a somewhat more modest pace compared to the prior decades, as the land uses become more mature and available land becomes scarcer. Washington, DC is estimated to continue rising in population, regaining the population lost since 1970 and exceeding it by 2030.

Figure 3-1 shows the estimated growth by TAZ between 2015 and 2040. Areas with the greatest population growth (shown in darker shades) are generally clustered around I-270 and I-495, in Washington, DC, and along other major roadway corridors such as I-95 and I-66. A notable concentration of population growth is forecast to occur near Frederick. The forecasts show that much of the existing low density residential areas are forecast to remain relatively stable in terms of population, while more dense development clustered in proximity to major transportation infrastructure is forecast to grow in many locations. This is consistent with the recommendations of the comprehensive plans outlined in **Section 3.1.1**.

Figure 3-1: Projected Population Growth 2015 – 2040 by TAZ



Source: MWCOG Round 9.1 Cooperative Forecasting

Much of the housing growth occurred as farmland in the jurisdictions surrounding Washington, DC were converted to suburban residential uses. The growth in housing has gradually tapered off as developable land has been depleted in these areas; new housing growth primarily comes from infill, densification, and redevelopment of existing land uses. Housing is shown in **Table 3-7**.

Table 3-7: Housing 1970-2016

Year	1970	1990	2000	2010	2016
Montgomery County, MD	161,366	295,723	334,632	375,905	385,485
Prince George's County, MD	200,207	270,090	302,378	328,182	330,708
Frederick County, MD	26,292	54,872	73,017	90,136	93,645
Fairfax County, VA	130,787	307,966	359,411	407,998	411,072
Arlington County, VA	71,232	84,847	90,426	105,404	110,763
Alexandria City, VA	44,424	58,252	64,251	72,376	75,087
Fairfax City, VA	6,263	7,677	8,204	8,680	8,801
Falls Church City, VA	3,762	4,668	4,725	5,489	5,709
Washington, DC	278,444	278,489	274,845	296,719	306,711

Source: Census Bureau Decennial Census 1970, 1990, 2000, 2010; US Census American Community Survey 5-Year Estimates, 2012-2016. Note: Housing data for 1980 Decennial Census was not available on the US Census Bureau Website

Employment growth projections were obtained from MWCOG Round 9.1 Cooperative Forecasts, presented in **Table 3-8**. Employment is projected to grow between 2015 and 2040 for all jurisdictions in the ICE Analysis Area. Washington, DC is the greatest concentration of employment in the ICE Analysis Area, followed by Fairfax County and Montgomery County. Employment growth in Washington, DC is projected to rise by 213,500 (27 percent) between 2015 and 2040, Fairfax County by 210,400 (32 percent) in that time, Montgomery County by 133,700 (26 percent), and Prince George's County by 54,700 (16 percent).

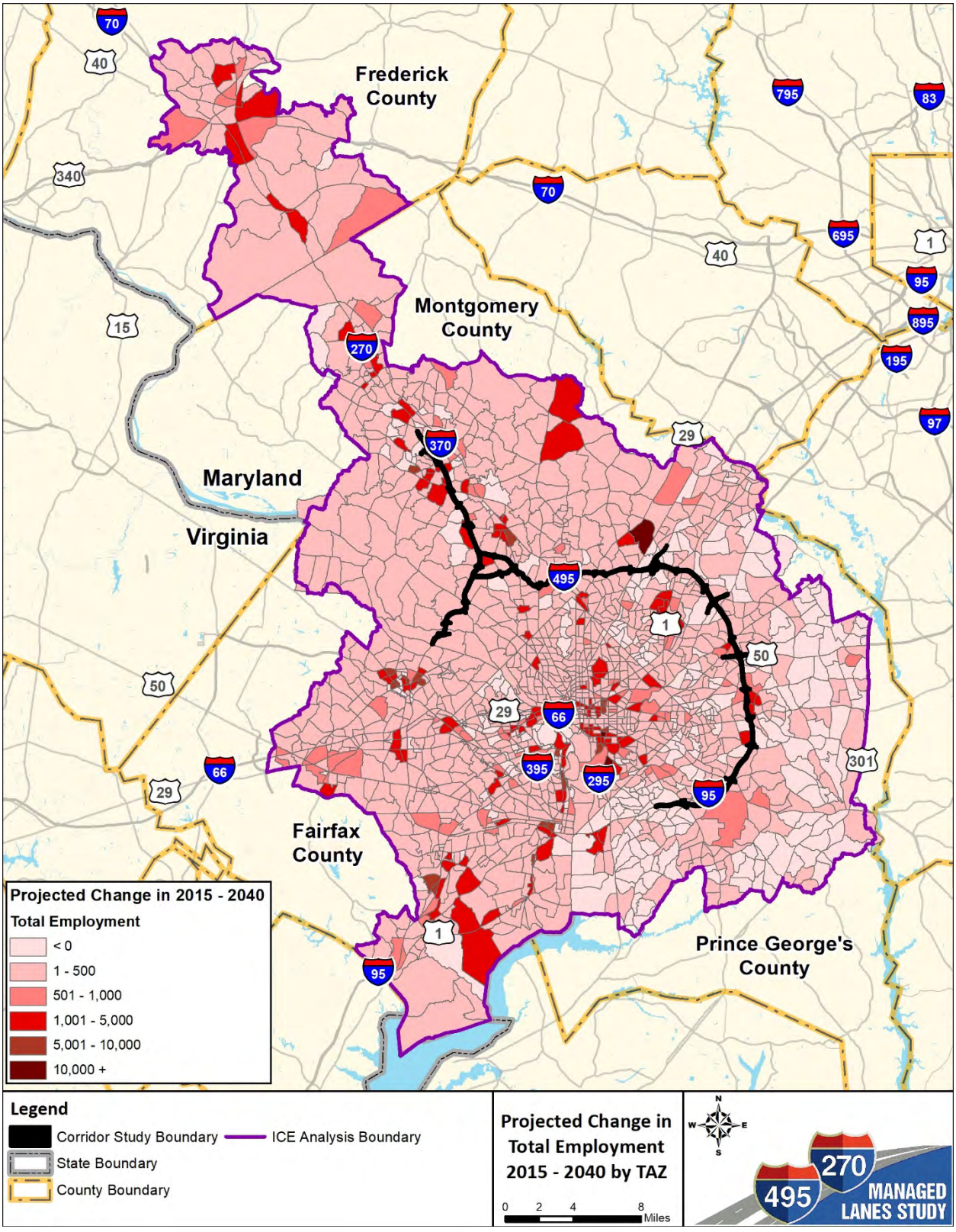
Table 3-8: Employment 2015-2040

Year	2015	2020	2030	2040
Montgomery County, MD	520,200	543,500	604,500	653,900
Prince George's County, MD	338,600	349,000	375,700	393,300
Frederick County, MD	106,200	110,600	121,300	133,900
Fairfax County, VA	654,100	702,600	790,600	864,500
Arlington County, VA	209,600	213,200	242,100	267,600
Alexandria city, VA	106,200	110,100	127,300	142,700
Fairfax City, VA	20,800	21,900	23,700	25,600
Falls Church City, VA	12,000	14,300	17,600	18,300
Washington, DC	798,300	846,300	937,900	1,011,800

Source: MWCOG Round 9.1 Cooperative Forecasts

Figure 3-2 below shows the total estimated change in employment by TAZ for the ICE Analysis Area between 2015 and 2040, with greater employment growth forecast for darker shaded areas. The forecasts predict growth clustered in central Washington, DC as well as other urban centers primarily located along major transportation infrastructure corridors such as I-495, I-270, I-95 and I-66. Similar to population growth shown above, several growth areas are located along I-495 and I-270.

Figure 3-2: Projected Employment Growth 2015 -2040 by TAZ



Source: MWCOG Round 9.1 Cooperative Forecasting

3.1.3 Future Development in the ICE Analysis Area

Future transportation and non-transportation development in the ICE Analysis Area has been summarized based on the following resources:

- 2016 Amended Constrained Long-Range Transportation Plan for the National Capital Region issued by the National Capital Region Transportation Planning Board (NCRTPB) (NCRTPB), 2016);
- Visualize 2045: A Long-Range Plan for the National Capital Region (MWCOG, 2018a)
- MWCOG's 2017 Commercial Construction Indicators (MWCOG, 2017); and
- MWCOG's Regional Economic Monitoring Systems Report (MWCOG, 2018b).

Given the large extent of the ICE Analysis Area, the analysis of present and future major non-transportation and transportation developments within the boundary is broadly summarized below.

A. Residential and Commercial Development

MWCOG member jurisdictions include all the ICE Analysis Area jurisdictions and more. According to MWCOG's Round 9.1 Cooperative Forecast, the Metropolitan Washington Region will add more than 633,000 households between 2015 and 2040, for a total of 2.6 million households. Fairfax County, the District of Columbia, and Montgomery County would have more than half of the expected household growth in the ICE Analysis Area. MWCOG has estimated the region will add 485,000 new housing units between 2018 and 2040, which averages to approximately 22,000 housing units per year (MWCOG, 2018c). Priority locations for such development include regionally identified Activity Centers and areas near existing high-capacity transit stations. Most (64 percent) of the household growth would occur in MWCOG Regional Activity Centers such as in the City of Alexandria, District of Columbia, and Arlington County (MWCOG, 2018c).

Commercial development in the MWCOG region declined by seven percent in 2017 compared to 2016 (MWCOG, 2018d). Seven of the ten largest development projects in the MWCOG region, by square footage, are located within the ICE Analysis Area. **Table 3-9** lists the top commercial construction projects in the ICE Analysis Area in 2017 (MWCOG, 2018e). Northern Virginia jurisdictions experienced more than half of all the new construction studied by MWCOG. Last year in the ICE Analysis Area jurisdictions, 89 buildings were erected totaling 7.9 million square feet of space, primarily for offices. Future commercial development is anticipated principally in MWCOG Regional Activity Centers. As of August 2018, just in the District alone, 212 near-term and 215 long-term commercial and residential projects totaling approximately 123 million square feet, valued at $38.4 billion, have been identified in the commercial and residential development project pipeline (Washington, DC Economic Partnership, 2018).

Additionally, the recently planned Amazon National Landing Headquarters located in Arlington and Alexandria would include 4.1 million square feet of development and house up to 25,000 employees (Business Insider, 2019).

Future residential and commercial development in the ICE Analysis Area will continue in accordance with land use and zoning specified in area master plans. None of the future projects identified are known to be dependent upon the I-495 & I-270 Managed Lanes Study.

Table 3-9: 2017 Top Commercial Construction Projects in the ICE Analysis Area

Project Name	Land Use	Jurisdiction
2415 Eisenhower Ave	Office	Alexandria
CEB Tower at Central Place	Office	Arlington
MITRE 4	Office	Fairfax County
FedEx Distribution Center	Distribution Center	Montgomery County
The Wharf Intercontinental	Hotel	DC
ULine NoMA	Office/Retail Mixed Use	DC
800 Maine at the Wharf	Office	DC

Commercial construction projects within the ICE Analysis Area that are among the 10 largest in the region, based on square footage

B. Transportation Projects

According to the MWCOG 2016 Amended CLRP (NCRTPB, 2016), approximately 57 major roadway construction projects and 15 major transit projects are proposed in the ICE Analysis Area (see **Table 3-10**). Some of the projects listed anticipate construction out to 2040. Billion-dollar projects in the ICE Analysis Area include the MD-5 (Branch Avenue) widening to six lanes plus interchanges, I-66 Outside the Beltway widening, I-270 / US-15 HOV widening, Maryland Area Regional Commuter (MARC) capacity and frequency improvements, Purple Line expansion from Bethesda to New Carrollton, and US-1 BRT from Huntington Metro Station to Woodbridge. Almost all planned highway construction includes widening or upgrading existing roads rather than building new facilities.

None of the transportation projects listed in **Table 3-10** are dependent upon the improvements evaluated by the I-495 & I-270 Managed Lanes Study, because they are already included in other plans.

Table 3-10: Major Transportation Projects in the ICE Analysis Area

Jurisdiction	Project	Project Description	Construction Year
Major Roadway Projects			
DC	I-295/Malcolm X Avenue SE Interchange Improvement Project	Reconstruct interchange at Malcolm X Ave	2020
DC	I-395, 14th Street Bridge and DC approach to Bridge	I-395 - remove 3rd St SB exit ramp, reconfigure 3rd St SB entrance and 2nd St NB exit ramps, reconnect F St between 2nd and 3rd St	2019
Virginia	VA-123 Widening	VA-123 (Gordon Blvd) - widen to 6 lanes	2022
DC	South Capitol Street Corridor Project	South Capitol St - convert to 6 lanes Urban Blvd, incl. Frederick Douglass Bridge Reconstruction	2021
Maryland	I-270/US-15 widening*	I-270/US-15 widen including HOV	2025, 2035
Maryland	I-70 – Widening	I-70 - widen to 6 lanes with interchange at Meadow Rd	2020

Jurisdiction	Project	Project Description	Construction Year
Maryland	I-95/I-495 - interchange to Access the Greenbelt Metro Station	Upgrading the partial interchange to a full interchange	2020
Maryland	MD-5 Branch Avenue Metro Access Improvements	Metro access improvements, construct 8 lanes	2030
Maryland	I-270 – interchange at Watkins Mill Rd Interchange Project	I-270 - interchange at Watkins Mill Rd Ext	Under construction
Maryland	Baltimore Washington Parkway (MD-295)/MD-193 (Greenbelt Rd) Intersection Improvements	Intersection Improvement	2020, 2025
Maryland	MD-4 at Suitland Parkway Interchange Project	Suitland Pkwy - interchange at Rena/Forestville Rd	2025
Maryland	US-1 (Baltimore Ave)	Reconstruct 4 lanes	2030
Maryland	US 15 Catoctin Mountain Highway SRI Monocacy Blvd Interchange	US-15 (Catoctin Mtn Hwy) - reconstruct intersection at Monocacy Blvd	Under construction
Maryland	US-50 (John Hanson Hwy) - Westbound Ramp	US-50 (John Hanson Hwy) - westbound ramp to Columbia Park Rd	2025
Maryland	Robert Crain Hwy	MD-3 (Robert Crain Hwy) - widen to 6 lanes	2030
Maryland	MD-4 (Pennsylvania Ave) Widening	MD-4 (Pennsylvania Ave) - widen to 6 lanes with interchanges at Dower House Rd and Westphalia Rd,	2022, 2035
Maryland	MD-4 (Pennsylvania Ave) Interchange	MD-4 (Pennsylvania Ave) – interchange at Suitland Pkwy	2022, 2035
Maryland	MD-5 (Branch Ave) Corridor	MD-5 (Branch Ave) - upgrade, widen to 6 lanes including interchanges	2017, 2035
Maryland	MD-27 (Ridge Rd) Widening	MD-27 (Ridge Rd) - widen to 6 lanes	2020
Maryland	MD-28/MD-198 Corridor Improvement	MD-28 (Norbeck Rd)/MD-198 (Spencerville Rd) - widen to 4, 6 lanes,	2025
Maryland	I-270/MD-85 widening	MD-85 (Buckeystown Pke) - widen to 4, 6 lanes,	2020, 2025
Maryland	MD-97 Brookeville Bypass	MD-97 (Brookeville Bypass) - construct 2 lane bypass	2018
Maryland	MD-117 Widening	MD-117 (Clopper Rd) - widen to 4 lanes	2025
Maryland	MD-118 Widening	MD-118 (Germantown Rd) - widen to 4 lanes	2020
Maryland	MD-124 Widening	MD-124 (Woodfield Rd) - widen to 6 lanes	2020
Maryland	MD-197 Widening	MD-197 (Collington Rd) - widen to 4/5 lanes	2025

Jurisdiction	Project	Project Description	Construction Year
Maryland	MD-202 (Landover Rd) Reconstruction	MD-202 (Landover Rd) - Largo Town Center Metro Access Improvement, reconstruct 6 lanes	2025
Maryland	MD-210 (Indian Head Hwy) Additional Lanes and Interchange Improvement	MD-210 (Indian Head Hwy) - upgrade to 6 lanes and interchange improvement	2019, 2030
Maryland	MD-223 (Woodyard Rd) Widening	MD-223 (Woodyard Rd) - widen to 4 lanes	2017, 2020
Maryland	MD-450 (Annapolis Rd) – Widening	MD-450 (Annapolis Rd) - widen to 4 lanes	2020
Maryland	Mid County Hwy Extension	Mid County Hwy Extension (M-83) - construct 4, 6 lanes,	2025
Maryland	Middlebrook Rd Extension	Middlebrook Rd Extended - construct 4 lanes	2025
Maryland	Montrose Pkwy Expansion	Montrose Pkwy East - construct 4 lanes	2025
Virginia	I-66 HOT (Inside Beltway) - Revise Operations	I-66 HOT (Inside Beltway) - revise operations from HOV 2+ to HOT during peak hours and bus service	2021, 2040
Virginia	I-66 HOT Lane Widening	I-66 HOT (Outside Beltway) - widen to 6 lanes (3 GP, 2 HOT, and 1 auxiliary) and bus service	2021, 2040
Virginia	I-66 Vienna Metro Access Ramp	I-66 - construct HOV ramps to access Vienna Metro Station	2021
Virginia	I-66 Widening	I-66 - construct 1 lane in each direction	2020, 2040
Virginia	I-95/Fairfax County Pkwy Interchange	I-95/Fairfax County Pkwy - enhanced interchanges for BRAC	2025
Virginia	I-95/I-495 Interchange Reconstruction	I-95/I-495 - reconstruct interchange at Van Dorn St	2015
Virginia	Interstate 395 Express Lanes Extension -	I-395 HOT - additional lane and revise operation from HOV 3+ during peak to HOT 3+	2019
Virginia	I-395 Expansion	I-395 - construct new SB lane	2019
Virginia	I-495 Hot Lanes Expansion	I-495 - construct 4 HOT lanes	2025, 2030
Virginia	I-495 Auxiliary Lane Expansion	I-495 Auxiliary Lanes - construct 2 auxiliary lanes in both directions	2030
Virginia	I-495 Interchange	I-495 - interchange at VA 267	2030
Virginia	Dulles Toll Rd (VA-267) - Interchange	Dulles Toll Rd (VA-267) - interchange at New Boone Blvd Ext	2037
Virginia	US-1 (Richmond Hwy) Widening	US-1 (Richmond Hwy) - widen to 6 lanes	2035
Virginia	US-1 (Richmond Hwy) Widening	US-1 (Richmond Hwy) - widen to 6 lanes	2025
Virginia	US-29 (Lee Hwy) Widening	US-29 (Lee Hwy) - widen to 3, 6 lanes	2025

Jurisdiction	Project	Project Description	Construction Year
Virginia	US-50 (Arlington Blvd) Widening and Reconstruction	US-50 (Arlington Blvd) - widen/reconstruct 6 lanes including interchanges	2025
Virginia	VA-7 (Leesburg Pke) Widening	VA-7 (Leesburg Pke) - widen to 6 lanes,	2021
Virginia	VA-7 (Leesburg Pke) Widening	VA-7 (Leesburg Pke) - widen to 6, 8 lanes	2025, 2030
Virginia	VA-7 (Leesburg Pke) Widening	VA-7 (Leesburg Pke) - widen to 6 lanes	2025
Virginia	VA-123 (Chain Bridge Rd) Widening	VA-123 (Chain Bridge Rd) - widen to 8 lanes	2025
Virginia	VA-236 (Little River Tpke) - Widening	VA-236 (Little River Tpke) - widen to 6 lanes,	2025
Virginia	VA-289 (Franconia/Springfield Pkwy) new HOV Lanes with Interchange	VA-289 (Franconia/Springfield Pkwy) - HOV lanes with interchange at Neuman St	2025
Virginia	VA-638 (Pohick Rd) Widening	VA-638 (Pohick Rd) - widen to 4 lanes	2025
Virginia	VA-638 (Rolling Rd) Widening	VA-638 (Rolling Rd) - widen to 4 Lanes	2020
Major Transit Projects			
DC	DC Streetcar Expansion	DC Streetcar	2020, 2022
DC	DC Dedicated Bicycle Lane Network	New bike lanes	Under construction
Maryland	Corridor Cities Transitway	Corridor Cities Transitway BRT - from Shady Grove to COMSAT	2020
DC, Maryland, Virginia	Bus Improvements	Tiger Grant Bus Priority Improvements	n/a
Maryland	MARC Improvements	MARC - Increase trip capacity and frequency along all commuter rail lines	2029
Maryland	Purple Line Expansion	Purple Line from Bethesda to New Carrollton	2020
Virginia	Crystal City Transitway Extension	Crystal City Transitway: Northern Extension BRT	2023
Virginia	Duke Street Transitway Extension	Duke St Transitway - King St Metro to Fairfax County line	2024
Virginia	Potomac Yard Metrorail Station Project	Potomac Yard Metro Station	2021
Virginia	US-1 BRT Expansion	US-1 BRT from Huntington Metro Station to Woodbridge	2030
Virginia	US 1- Bus Turn Lanes	US-1 bus right turn lanes	2035
Virginia	West End Transitway Extension	West End Transitway - Van Dorn St Metro to Pentagon Metro	2019
Virginia	Virginia Railway Express	VRE - Reduce headways along the Manassas and Fredericksburg Lines	2020
Virginia	I-495 Express Bus Service	I-495 HOT Lane Express Bus Service	TBD

Jurisdiction	Project	Project Description	Construction Year
Virginia	I-66 HOT Lane Enhancement of Bus Services	I-66 HOT Lane Enhanced Bus Service	TBD

Source: MWCOG 2016 Amended CLRP (NCRTPB, 2016)
**I-270/US-15 widening is a separate component of the I-495 and I-270 Managed Lanes Study Analysis*

This section presents the results of the ICE analysis. **Table 3-11** provides an overview of the resources considered.

Table 3-11: ICE Analysis Resources

Category	Resources Considered
Socioeconomic Resources	Land Use Residences Businesses Community Facilities Community Cohesion Demographics
Cultural Resources	Historic Architecture Archaeological Resources
Natural Resources	Surface Water Wetlands Floodplains Forest Wildlife and Wildlife Habitat Sensitive Species
Air Quality	Air Quality

Access to/from the managed lanes would be provided via direct access ramps at select interchanges, at-grade auxiliary lanes where ingress to the managed lanes from the GP lanes or egress from the managed lanes to the GP lanes would be provided, and at the end points of the Study. Potential direct, indirect, and cumulative effects resulting from managed lane access will be considered in the EIS.

3.1.4 Socioeconomic Resources

This analysis of indirect and cumulative effects considers land use, residences, businesses, community facilities, community cohesion, and demographics.

A. Indirect Impacts

The indirect effects of worsening traffic congestion under the No Build Alternative could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work. While no resources are anticipated to be directly impacted by a No Build Alternative, the No Build Alternative does include currently planned and programmed infrastructure projects that may affect the ICE Analysis Area. Moreover, under the No Build Alternative motor vehicle volumes are forecasted to increase over time and with them are anticipated increases in travel times and delays related to growing traffic congestion. Worsening traffic congestion could have potential negative effects on motor vehicle-

reliant activities, such as; emergency response services, supply chain/commercial trucking and deliveries, school bus schedules, and workforce commuters.

The proposed Screened Alternatives would include expansion of existing highway facilities and implementation of managed lane strategies. The Screened Alternatives could change travel patterns by providing increased capacity along existing facilities. Communities along connecting roadways could experience noise impacts due to changes in traffic volumes.

I-495 and I-270 are fundamental links in the regional transportation system in the Washington, DC metropolitan region, serving as the backbone of the roadway network in the ICE Analysis Area. Roadway improvements, such as those proposed under the Screened Alternatives, can be an attraction to commercial or real estate development. The possibility of induced growth in this study area would be lessened by the long-term presence of the existing highway, as well as the mature land uses and developments that have occurred in the ICE Analysis Area. As a result, the likelihood of induced commercial or residential development is reduced substantially by the built-out environment that has been in existence for many years. Moreover, much of the undeveloped land within the ICE Analysis Area is designated by comprehensive plans for preservation.

Comprehensive plans in the ICE Analysis Area, particularly those areas closest to the study area corridors in the counties immediately surrounding Washington, DC, emphasize managing new growth in order to preserve the character of existing residential areas. The growth anticipated in these well-developed portions of the ICE Analysis Area is generally planned to be directed into designated hubs near major transportation facilities.

Provision of new capacity through managed lanes along I-495 and I-270 could result in increased demand for growth in the ICE Analysis Area by allowing greater accessibility to employment and other land uses along the corridors and in Washington, DC. The degree to which new growth would occur, beyond that which would occur under the No-Build Alternative, cannot be determined with certainty. Factors such as economic conditions and potential future changes to local plans and land use policies can create a degree of uncertainty in predicting future indirect land use effects. The new capacity from the Screened Alternatives would largely accommodate existing traffic from past growth (as evidenced by the extremely poor traffic conditions seen today and described in the Purpose and Need chapter) along with reasonably foreseeable traffic growth that is expected to occur regardless of the Screened Alternatives. It is also reasonably foreseeable that some level of increased development would likely occur, beyond that which would occur under the No Build Alternative.

Areas along the northern portion of the ICE Analysis Area near Frederick, Maryland would be the most vulnerable to new development pressure. Areas of undeveloped farmland still remain relatively close to I-270, near the boundary between Montgomery and Frederick Counties. Improved travel times along I-270 could lead to increased pressure for development in these areas. This demand for development would be subject to existing zoning regulations and comprehensive plans, which are largely focused on directing new development into desired locations and avoiding consumption of natural resource lands. The designated community growth areas in Frederick County would most likely experience increased demand for development. Rural and suburban areas in northern Montgomery County may see increased pressure for development, particularly the areas with the most access to I-270. Less densely developed areas on

the outskirts of Prince George's County may also experience increased pressure for development where developable land remains.

The population is expected to continue to increase within the ICE Analysis Area. This will create additional demands on community facilities and services, such as parks, schools, health and emergency services, and utilities. The Screened Alternatives could help to facilitate population and employment growth; however, they are not expected to substantially change the existing trends in the ICE Analysis Area, as the project is designed to accommodate existing and planned transportation demand. Much of the need for the project derives from past growth which has led to congested conditions and need for additional capacity.

Generally, improvements proposed under the Screened Alternatives would occur within and adjacent to the existing highway corridor. The Screened Alternatives would not reduce the number of free GP lanes and are expected to reduce congestion on all travel lanes. Therefore, indirect community impacts due to cut-through traffic would be minimal. For additional discussion of community impacts, refer to the *Community Effects Assessment Technical Report*.

B. Cumulative Impacts

Past actions that have impacted socioeconomic resources include the numerous infrastructure and land development activities that occurred in the ICE Analysis Area throughout the ICE time frame. As described in **Section 3.1.2**, jurisdictions in the ICE Analysis Area have experienced substantial growth of population, housing, and employment since 1970. For example, Montgomery County's population nearly doubled between 1970 and 2016; and Prince George's County grew by over 35 percent according to US Census 2016 five-year estimates. This growth and development in the ICE Analysis Area has entailed continuous expansion and intensification of urban and suburban land uses into previously rural landscapes. Similarly, the network of transportation infrastructure has been continually expanded to accommodate the transportation needs of the growing regional economy and population.

Present and future actions impacting socioeconomic resources include the land development and infrastructure improvements required to accommodate existing and future populations and economic activity. MWCOG estimates show ICE Analysis Area jurisdictions growing in population and employment through 2040. Demand from existing populations and economic activity has created substantial traffic congestion in the region, and many currently planned projects are intended to accommodate this existing demand. Future projects, as described in **Section 3.1.3,** will continue to expand infrastructure capacity to meet the needs of the growing population.

The past, present and future actions have had both beneficial and adverse impacts to socioeconomic resources. Past and present growth and development has improved local economies and led to provision of community facilities, transportation infrastructure, and recreational resources benefiting residences and businesses. Construction and expansion of transportation facilities has facilitated economic growth by providing access to employment and community facilities and allowing for more efficient movement of goods and services. The I-270 and US 15 widening project, a separate part of the overall Managed Lanes Study, may have effects to similar resources along the I-270 corridor.

Increased population and employment in the ICE Analysis Area is expected to increase traffic volumes and create eventual need for more transportation improvement projects. The proposed action is one of many

reasonably foreseeable future transportation projects designed to address both existing volumes, as well as anticipated growth. The Screened Alternatives alone would provide improved access, mobility, and traffic conditions. Combined with the other projects identified above in **Section 3.1.3.B**, it is anticipated that there would be a greater overall benefit to local communities.

Past transportation projects have had impacts to communities such as residential and business displacements, noise, visual, and community cohesion impacts. Some examples of major past projects with community impacts include the Intercounty Connector (MD 200) completed in 2014 and the previous widening of I-270 completed in 1990. A current major project with community impacts is the Purple Line, currently under construction.

The No Build Alternative, considered in the context of growth and development occurring throughout the ICE Analysis Area, would result in potentially negative socioeconomic impacts from increasing traffic congestion. The effects of worsening traffic congestion could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work.

Each of the Screened Alternatives would result in relatively similar impacts to land use, residences, businesses, and community facilities. The total right-of-way required (outside of existing highway right-of-way) ranges from approximately 28 acres to 337 acres. Each Screened Alternative would require between 13 and 15 acres of commercial/employment land use, 27-32 acres of industrial use, 38-47 acres of mixed-use, 54-60 acres of parks and open space, 11-13 acres of planned unit/planned community, 133-161 acres of residential, and 10 acres of transportation.

All of the Screened Alternatives would require potential relocations for residences and businesses. Alternative 5 would require 25 residential relocations, and all other Screened Alternatives would require 34. All Screened Alternatives would require four business relocations. Each of the Screened Alternatives would have noise impacts.

Each of the Screened Alternatives would impact between 28 and 31 community facilities. The Screened Alternatives would impact one correctional facility, one higher education facility, three hospitals, and between 12 to 14 places of worship. Each would impact one police station, one to two post offices, five schools, and four recreation centers. Generally, the assumed property acquisition for right-of-way from community facilities would include acquiring strips of land from the edges of undeveloped areas or areas of trees from properties adjacent to I-495 or I-270. More detailed discussion of potential community facility impacts are included in the *Community Effects Assessment Technical Report*.

The overall impact of the Screened Alternatives on residences, businesses, and community facilities is substantial relative to many other transportation and development projects, though other large projects of similar regional importance have had greater impacts. The continual expansion of transportation facilities in the region, while providing benefits of increased access and mobility, also has detrimental effects on communities adjacent to these facilities, including potential loss of community cohesion. As such, the Screened Alternatives would contribute to the incremental impact of displacing residences, businesses, and community facilities in the ICE Analysis Area.

Between 24 and 28 percent (eight out of 34 or seven out of 25 total) of the residences assumed to be relocated by the Screened Alternatives are located in environmental justice (EJ) areas. Twenty-five (25) percent (one out of four total) of the businesses assumed to be relocated be the Screened Alternatives are located in EJ areas. Community facilities within EJ areas would be impacted, including: ten places of worship, three schools, one higher education facility, one postal facility, one police station, two recreation centers, and 13 parks. None of the 32 housing complexes in the Community Effects Assessment Analysis Area with subsidized units would experience the relocation of properties. Additionally, effects to human health and safety, air quality, noise, vibration, water quality, hazardous material sites, natural resources, visual landscape and aesthetic values, economy and employment, access and mobility, community cohesion and quality of life, and tolling considerations would be distributed consistently throughout the corridor study boundary and would be mitigated to the greatest extent applicable. As such, physical impacts and effects to other environmental characteristics would not be considered disproportionately high or adverse in potential EJ populations. While past, present, and future projects would likely have impacts to potential EJ populations, the Screened Alternatives are not expected to contribute substantially to the incremental impact on these populations.

The Screened Alternatives would require a wider overall right-of-way contributing to the cumulative effects to community cohesion resulting from past, present, and future transportation and development projects. Improvements along I-495 and I-270 would be to existing roadway facilities where communities have previously been separated by their original construction, or later grew around them. Improvements to these corridors would be at the periphery of established communities and would not bisect residential areas or create new impediments to travel through communities. Therefore, the incremental effect of this widening would be small relative to the existing effect of the highways, which already divide and impede local travel between communities immediately adjacent to the corridors. Many of the communities affected by the wider right-of-way and resulting cohesion effects would also benefit from the improved functioning of the facility for longer distance travel.

Impacts to parklands and recreational facilities have occurred from past transportation and development projects, such as right-of-way, noise, and visual impacts from construction and expansion of transportation facilities. However, such impacts have been limited by the regulations implementing Section 4(f) of the USDOT Act of 1966. Additionally, any parklands acquired by local jurisdictions with funding from the Land and Water Conservation Fund Act (LWCF) or the Maryland Program Open Space, require in-kind replacement of any LWCF or Program Open Space parkland that is converted from public recreational use.

Furthermore, local jurisdictions have expanded park facilities in response to growing populations. For example, the 1964 Master Plan for Montgomery County notes that County holding of park lands were 6,500 acres when the plan was published (M-NCPPC, 1964); the 2017 Park, Recreation and Open Space (PROS) Plan notes that Montgomery County currently owns over 36,000 acres of parkland (Montgomery Parks, 2017). While impacts to parklands and recreational facilities have occurred during the past time frame, they have likely been offset by increases in overall parkland acreages, and major impacts from future projects would be limited due to federal, state, and local laws and regulations preserving parklands. Past and present transportation improvements have also provided benefit to parks and recreational facilities by increasing access.

New park facilities will continue to be developed in Montgomery and Prince George's Counties in the future, as outlined in the 2017 PROS Plan (Montgomery Parks, 2017) and the Prince George's County *Formula 2040: Functional Master Plan for Parks, Recreation and Open Space* (M-NCPPC, Department of Parks and Recreation, Prince George's County, 2013).

Montgomery and Prince George's Counties combined have a total parkland area of roughly 57,500 acres (MNPPC, Department of Recreation, Prince George's County, 2013; Montgomery Parks, 2017). The Screened Alternatives would impact between 133 and 140 acres of parklands in Montgomery and Prince George's Counties, or 0.2 percent of the total acreage. The impacts to parklands would primarily be narrow strips of right-of-way taken along the existing roadway corridors and would not have the effect of bisecting existing facilities in most instances. (See the *Draft Section 4(f) Evaluation* for more detailed information on park impacts, avoidance, and mitigation measures.)

The incremental effect of these park impacts would be small relative to the overall amount of park lands in the ICE Analysis Area, and considering the planned development of new park facilities in Montgomery and Prince George's Counties. The Screened Alternatives have been developed to minimize park impacts relative to other major regionally important projects of comparable size, but the Study would still have substantial park impacts compared to most other transportation and development projects which are generally smaller-scale in nature. Future parkland development may occur in areas not in close proximity to the parklands impacted by the Screened Alternatives, thus reducing the access to parklands in the communities served by those parks. Reduction of parkland could be felt more acutely in urban areas, given the developed nature of surrounding land uses and minimal availability of land to convert to new parklands. Furthermore, the overall ratio of parkland acres to population in Montgomery County and Prince George's County may be affected if new parks are planned to accommodate expected population growth. The Screened Alternatives would add to the impacts from other past, present and future projects to parklands in communities adjacent to the I-495 and I-270 corridors, often in well-developed areas where replacement parkland could not be easily located. Therefore, there would likely be an incremental impact felt by communities in close proximity to the impacted parks, in consideration of the overall cumulative effect. Coordination is ongoing with the Officials with Jurisdiction over impacted parklands to identify and incorporate minimization and mitigation measures in accordance with Section 4(f), as described in the *Draft Section 4(f) Evaluation*.

3.1.5 Cultural Resources

Section 106 of the National Historic Preservation Act and Section 4(f) of the 1966 USDOT Act mandate protection of historic sites, and minimization and/or mitigation for any unavoidable impacts associated with federally-funded projects. 36 CFR 800.5(1) notes that adverse effects "may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative". Section 106 coordination among the MDOT SHA, FHWA, the MHT and others is ongoing, and an Adverse Effect finding has been made. Consultation continues in an effort to avoid and minimize impacts.

A. Indirect Impacts

The Screened Alternatives, responding to an identified need for additional capacity, may be one factor in increased demand for residential or commercial development due to improved travel access along the study corridors – particularly in areas with undeveloped land such as northern Montgomery County and

in the vicinity of Frederick. Potential indirect effects could occur to historic properties resulting from increased population growth and development in the APE. However, these areas are subject to many greater economic and demographic pressures producing increased population and development that are not caused by the Study. Development of new land uses or more intensive land uses could lead to destruction or degradation of these resources, as older structures are cleared to make way for new construction, or agricultural and rural areas are converted to more intensive urban and suburban uses with resulting changes in land use context surrounding cultural resource areas. Archeological sites could also be impacted by new construction accompanying land development. Thus, land development can lead to destruction or altering the integrity of historically important characteristics of archeological and architectural historic properties. These resources benefit from protections offered by existing federal and state laws and local planning ordinances. Therefore, the potential indirect effects to cultural resources would likely be avoided or minimized by reasonably anticipated compliance with those laws.

B. Cumulative Impacts

Past actions that have impacted historic properties include the numerous infrastructure and land development activities that have occurred in the APE. The APE has experienced substantial growth of population, housing, and employment since the mid twentieth-century. This has resulted in destruction or degradation of historic properties, including demolition for new construction and/or changes in land use. Present and future actions, including transportation projects and land development activity, would likely continue to impact cultural resources in similar ways. For transportation projects, however, existing protective regulations and consultation requirements associated with Section 106 and Section 4(f) resources would minimize and mitigate for such effects, reducing the overall net effect to historic properties. Potential future impacts to cultural resources from non-transportation projects would also be subject to applicable federal, state, and local planning ordinances that protect many of these resources.

There are no planned developments within the APE that are dependent on completion of the Screened Alternatives. The Study is responding to other large-scale pressures resulting in increased population and development that result in depleted capacity and congestion on I-495 and I-270; it is not the cause of generalized degradation of historic properties in the APE due to development. As a result, there are no indirect adverse effects to historic properties specifically caused by the undertaking.

Each of the Screened Alternatives would impact between approximately 122 and 126 acres of historic architectural resources. Each of the Screened Alternatives would impact 20 to 21 known historic architectural resources. Impacts to historic properties would primarily consist of the incorporation of strips of land along the highway right-of-way into the transportation facility to accommodate mainline widening and stormwater management facilities. The Screened Alternatives would have adverse effects to several historic properties, historic districts, and their contributing landscape elements. Historic standing structures would be demolished including the bridge carrying the Metropolitan Branch of the B&O Railroad across I-495, a masonry arched culvert (MDOT SHA Small Structure 15046X0) that contributes to the historic railroad, and up to 17 sheds in the Glenarden Historic District erected during the period of significance.

Much of the past, present, and future growth in the study area concentrates in population centers close to the I-495 and I-270 corridors, in close proximity to where the Screened Alternative impacts would occur. While the Screened Alternatives are subject to compliance with Section 4(f) and Section 106 regulations

that limit the direct impact of the project on cultural resources, the impacts would occur in areas where continual growth and urbanization have likely had adverse effects on cultural resources. The relatively minor incremental effect of the project would thus contribute to the overall degradation of cultural resources in the ICE Analysis Area, in light of other past, present and future actions.

3.1.6 Natural Resources

Direct impacts to natural resources are summarized in **Table 3-12** and described below, followed by discussion of potential indirect and cumulative effects for each resource category. Generally, both the direct and indirect effects would be relatively similar for any of the Screened Alternatives. Refer to the *Natural Resources Technical Report* for a more detailed discussion of natural resources impacts.

Table 3-12: Natural Resources Direct Impacts

Alternative	5	8	9	10	13B	13C
Surface Water (linear feet)	149,800	152,000	152,000	152,900	151,900	152,600
Wetlands (acres)	15	16	16	16	16	16
100-Year Floodplain (acres)	114	120	120	120	120	120
Unique and Sensitive Areas (acres)	395	408	408	411	407	409
Targeted Ecological Areas	75	77	77	77	77	77
Green Infrastructure Hubs	42	45	45	46	44	44
Green Infrastructure Corridors	279	286	286	288	286	287
Rare Threatened and Endangered Species Habitat (acres)	177	183	183	183	183	183
FIDS (acres)	25	28	28	28	28	28
Forest Canopy (acres)	1,434	1,497	1,497	1,515	1,489	1,503

A. Surface Water

Section 401 and Section 402 of the federal Clean Water Act (CWA) (33 United States Code (U.S.C.) 1341-1342) regulate water quality and the introduction of contaminants to waterbodies. The MDE and VDEQ are the regulatory agencies responsible for ensuring adherence to water quality standards in Maryland and Virginia, respectively.

Under the Code of Maryland Regulations (COMAR): Title 26 Department of the Environment, Subtitle 08 Water Pollution, Chapter 02 Water Quality (26.08.02), the State of Maryland has adopted water quality standards to enhance and protect water resources and serve the purposes of the federal CWA. Similarly, all of Virginia's surface waters are classified by VDEQ according to designated uses promulgated in Virginia's water quality standards (9 VAC 25-260).

MDE has also designated certain surface waters of the state as Tier II (High Quality) waters, based on monitoring data that documented water quality conditions that exceeded the minimum standard necessary to meet designated uses. In accordance with federal antidegradation regulations (40CFR131.12), these waters are afforded additional antidegradation protections to ensure that these high quality waters are maintained (COMAR 26.08.02.04-1). Impacts to Tier II waters are reviewed by MDE

for certain state permits and approvals (including Wetlands and Waterways permits and authorizations), with the purpose of preventing degradation to high quality waters as a result of permitted activities. The review process would identify impacts, examine potential avoidance of these impacts, as well as potentially requiring additional minimization measures to further protect water quality.

At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under Section 404 of the Clean Water Act (CWA). Section 404 also identifies jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined as "areas possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." The U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE) share responsibility for implementing Section 404, which specifically regulates dredge and fill activities affecting WOTUS.

In compliance with CWA Sections 303(d), 305(b), and 314 and the Safe Drinking Water Act (SDWA), states develop a prioritized list of waterbodies that currently do not meet water quality standards. The 303(d) prioritized list includes those waterbodies and watersheds that exhibit levels of impairment requiring further investigation or restoration. MDE and VDEQ use monitoring data to compare stream conditions to water quality standards and determine which streams should be listed. The waterbodies on this list may be subject to a total maximum daily load (TMDL) of these constituents under Section 303(d) of the CWA. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

The majority of the I 495 & I 270 Managed Lanes Study corridor is located within the Potomac River drainage basin, with the eastern-most portion of the study corridor, between approximately US 50 and MD 4, falling within the Patuxent River drainage basin (refer to **Figure 2-1**.)

a. Indirect Impacts

Indirect impacts of the Screened Alternatives would result from effects related to changes in facility-related run-off quality and quantity associated with changes in drainage patterns and imperviousness. These changes may lead to increased erosive stream flows or reduced infiltration and stream base flows over time. Both indirect and direct project-related impacts could affect aquatic habitat and biota in the immediate study area, as well as upstream or downstream of the project.

Indirect downstream impacts to surface water would be minimized through the development and application of approved erosion and sediment control plans and stormwater-related best management practices (BMPs). In addition, coordination with state and local agencies overseeing water resources in the ICE Analysis Area will continue throughout the study to determine appropriate mitigation for impacts.

As noted above, improved traffic flow along existing transportation corridors would provide better accessibility to employment and other land uses in the analysis area. As such, indirect impacts could also occur from increased demand for development in areas with improved access. Less-developed areas in the ICE Analysis Area, such as those near Frederick, Maryland and northern Montgomery County, would be most susceptible to increased demand for new development. Conversion of land from rural to urban and suburban uses could result in an increase in impervious surfaces affecting watersheds in the ICE Analysis Area. Such development would be subject to applicable state and local regulations regarding land

use, imperviousness, and tree and forest requirements, floodplain buffers, stormwater, and sediment and erosion control measures.

b. Cumulative Impacts

Within the ICE Analysis Area and throughout the region, past and current land use practices and development have impacted the relative health of surface waters despite existing regulations, plans and policies. Of particular concern to surface waters are the interrelated effects of loss of native vegetative cover, and increased stormwater flows, flooding, land surface and stream channel erosion, and sediment deposition during and after development. These combined negative effects typically accompany increases in land surface imperviousness over time.

According to the 2010 *Montgomery County Water Resources Functional Master Plan*: "State and County monitoring data show that water quality is continuing to degrade in many portions of Montgomery County and regionally as growth continues, especially in older developed areas and areas with increasing impervious cover." (Montgomery Planning, 2010).

The plan goes on to state: "County monitoring shows that urban and suburban streams are generally in fair to poor condition while less densely developed watersheds often are in good and in some cases excellent condition. This pattern supports the correlation between higher levels of imperviousness and lower water quality, a trend that supports accommodating future growth in existing urban areas near transit as opposed to developing in greenfields, which would increase impervious cover." (Montgomery Planning, 2010).

The 2017 *Prince George's County Resource Conservation Plan* states that, "[…]between 1999 and 2013, […] there has been no statistical improvement in water quality in the County's watersheds." Watersheds were reported ranging from "very poor" to "fair", with no watersheds in Prince George's County rated "good" or "very good" according to the measurement scale used. (M-NCPPC, 2017). The plan also notes the lack of reliable data available to measure stream health prior to the 1999 survey: "The water quality in the County's streams has been deteriorating over time, but prior to the use of biological stream survey studies, a reliable and replicable method for measuring long-term stream and subwatershed health had not been established at the County Level." (M-NCPPC, 2017).

The 2010 *Montgomery County Water Resources Functional Master Plan* includes an evaluation of nutrient loading compared between existing (2010) and 2030 conditions. The plan predicted "minor changes" in nutrient loading between existing land cover and 2030 scenarios. The plan also noted, "These results are not unexpected because there is little vacant land left for new development in the County, and therefore no significant land conversion scenario options remain." (Montgomery Planning, 2010).

The *Montgomery County Water Resources Functional Master Plan* also states, "Accordingly, future land use and development patterns will not significantly influence water quality trends. Strategies such as Environmental Site Design on redeveloped and infill properties, retrofitting older development, and stream restoration will be necessary to protect and improve water quality." (Montgomery Planning, 2010.)

In the *Frederick County Water Resource Element of the Water and Sewerage Plan,* it is noted that more developed watersheds surrounding Frederick have the highest level of impervious cover compared to

more rural areas in the county (Frederick County, 2010b). These areas are identified as priority mitigation areas to prevent further increase in imperviousness and the resulting water quality impacts.

Adverse effects on stream and water quality are likely to continue as existing forest and agricultural lands are converted to residential and other urban uses. Transportation facilities will continue to be expanded and improved to accommodate growing populations and economic activity. Local comprehensive plans and development regulations will primarily focus new growth in urbanized areas near major transportation facilities, in watersheds which are already impacted. Conversion of agricultural and forest land to developed uses is likely to have less impact in the future time frame in areas with more highly developed land use patterns, such as southern Montgomery County, where the conversion of agricultural and forest land to developed uses has slowed and new development is primarily infill. Other areas, such as Frederick County, may experience further conversion to developed uses and impervious surfaces.

Future development and transportation projects would likely result in lesser impacts than past activities, because of state and local regulations pertaining to imperviousness, tree and forest requirements, floodplain buffers, stormwater, and sediment and erosion control measures designed to minimize impacts to surface waters and general watershed health.

Any unavoidable direct impacts will be regulated under state and federal wetlands and waterways permits issued for the project. As part of the permitting process, a detailed compensatory mitigation package, including final mitigation design, will be developed and require approval by the USACE and MDE prior to permit issuance.

All Screened Alternatives would have direct impacts to surface waters and watershed characteristics in the corridor study boundary including ephemeral, intermittent, and perennial stream channels. Because the Screened Alternatives would improve existing roadways, the direct stream channel impacts are primarily related to culvert and bridge extensions. The Screened Alternatives would have impacts ranging from approximately 149,800 linear feet up to 152,900 linear feet (**Table 3-12**). No Tier II streams would be directly impacted.

The Screened Alternatives would result in an increase in impervious surface within the watersheds that contain the I-270 and I-495 corridors, adding to the cumulative effect of other activities accompanying growth and urbanization in the ICE Analysis Area. Surface water quality in the ICE Analysis Area watersheds is generally linked to the level of development activity and impervious surfaces. While they would contribute (directly and indirectly) to the continuing urbanization and growth of the ICE Analysis Area, the Screened Alternatives would each include improvements in already highly developed areas. As such, the Screened Alternatives would likely have a lower incremental effect than that of a facility in a new location, or in an undeveloped watershed with minimal impervious surface.

The incremental impact of the additional impervious surface from the Screened Alternatives on surface water quality would be further minimized by stormwater management measures. Water quality would be protected by implementing strict erosion and sediment control plans with best management practices appropriate to protect water quality during construction activities. Post-construction stormwater management and compliance with TMDLs would be accounted for in the stormwater design and water quality monitoring to comply with required permits.

B. Wetlands

Wetland impacts are subject to regulatory jurisdiction under Section 404 of the CWA (33 U.S.C. 1344). Wetlands and streams within the I-495 & I-270 Managed Lanes Study corridor were delineated by MDOT SHA environmental scientists from March 2018 through May 2019, with delineation ongoing for properties that have not yet permitted access. A total of 396 wetlands were delineated within the corridor study boundary. The wetlands features include 117 Palustrine Emergent wetlands, 259 Palustrine Forested wetlands, and 20 Palustrine Scrub-Shrub wetlands. More detailed descriptions of wetland resources and impacts are included in the *Natural Resources Technical Report*. The Screened Alternatives would have similar impacts on wetlands; affecting approximately 15 to 17 acres each (See **Table 3-12**).

The full ICE Analysis Area contains approximately 40,900 acres of wetlands according to National Wetlands Inventory (NWI) mapping.

a. Indirect Impacts

Indirect impacts to wetlands and waterways from the Screened Alternatives could result from roadway runoff, sedimentation, and changes to hydrology. A detailed assessment of indirect hydrologic effects will occur once final amounts of cut and fill are determined in the final phase of engineering design.

Indirect impacts to wetlands could occur from increased demand for development due to improved access to employment and other land uses. Undeveloped areas in the ICE Analysis Area (primarily those located near Frederick, Maryland and northern Montgomery County) would be potentially susceptible to increased demand for conversion of land from rural to urban and suburban uses, potentially resulting in impacts to wetland areas. The degree to which this increased demand may occur cannot be quantified based on available information. This demand would be limited by existing local land use ordinances and guided by county comprehensive plans.

Any wetlands impacts associated with proposed public or private development would require permitting by the USACE and state regulatory agencies, as well as review and approval by county governments to ensure consistency with environmental protection guidelines.

All direct and indirect impacts would lead to a decrease in available wetland and waterway habitat within the study area and ultimately a decrease in plant and animal species inhabiting these areas. Impacts to wetland functions may include: losses of groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, sediment/shoreline stabilization, wildlife habitat, recreation, educational/scientific value, uniqueness/heritage, visual quality/aesthetics, wildlife habitat, and endangered species habitat. Impacts to wetlands would be regulated by the USACE and the MDE. Indirect effects would be minimized by the required permitting process, which would identify avoidance, minimization, and mitigation as needed to offset wetland losses

b. Cumulative Impacts

Past land use development and transportation projects have had impacts on wetlands, particularly those that occurred prior to the passage of state and federal laws that regulate wetland impacts. Since these laws were implemented, impacts to wetlands have largely been offset by required mitigation including construction of new wetlands. The LULC data presented in **Table 3-3** above shows a relatively small decline

in wetland acreage in the Maryland portion of the ICE Analysis Area between 1973 and 2010. However, much of the natural wetland acreage was likely lost prior to 1973 due to land development, agriculture, and transportation development.

Wetlands impacts associated with future proposed public or private development would require permitting by the USACE and state regulatory agencies, as well as review and approval by county governments to ensure consistency with environmental protection guidelines.

The Screened Alternatives would have similar impacts on wetlands; affecting approximately 15 to 16 acres each (See **Table 3-12**). Direct impacts to wetlands would be regulated by the USACE and the MDE. Continual efforts to avoid and minimize impacts have occurred throughout the planning process and will continue as the I-495 & I-270 Managed Lanes Study moves forward to more detailed stages of design. The Screened Alternatives would thus contribute a relatively minor incremental effect towards the long-term trend of wetland loss, which has more recently slowed due to protective legislation. The incremental effect would be minimized by the required permitting process, which would identify avoidance, minimization, and mitigation as needed to offset wetland losses.

C. Floodplains

Floodplains provide numerous natural and beneficial functions including flood moderation; water impurity and sediment filtration; groundwater recharge; habitat for fish, terrestrial wildlife, and plants; outdoor recreation space; and open space for agriculture, aquaculture, and forestry (US Department of Transportation, 1979). Floodplains naturally and economically help to maintain water quality and reduce flood property damage by providing floodwater storage and decreasing water flow velocity and sedimentation. Floodplains also provide protected environments for plants to grow and for fish and other wildlife to breed and forage. In addition to the advantage of flood damage reduction, humans also benefit from floodplains through the agricultural and recreational space they provide (FEMA, 2018).

Floodplains within the corridor study boundary were identified using Maryland iMap and FEMA's Effective Floodplain GIS layer. Acreage of the 100-year floodplains within the limits of disturbance for the Screened Alternatives were calculated using GIS. No floodplain fieldwork was conducted.

The full ICE Analysis Area contains approximately 6,700 acres of FEMA's 100-year floodplains.

a. Indirect Impacts

Disturbances in floodplains can reduce their capability to provide ecological services associated with flood control, maintenance of stream flow, stream bank and channel stabilization, and wildlife habitat. Loss of these services may result in increased flooding, erosion and sedimentation, and damage to channel morphology. Floodplain encroachment could alter the hydrology of the floodplain, which could indirectly result in more severe flooding in terms of flood height, duration, and erosion. Indirect impacts from the Screened Alternatives would be limited as they are confined to widening in existing corridors. Existing culverts would be extended or resized where appropriate, and bridges widened or replaced in accordance with design standards. Indirect impacts to floodplains would be minimized through adherence to existing regulatory requirements.

b. Cumulative Impacts

Each of the Screened Alternatives would have similar impacts to 100-year floodplains, ranging between approximately 114 acres and 120 acres of direct impact (see **Table 3-12**). The impacts would result from widening of existing waterway crossings along I-495 and I-270. Construction of new roadway improvements across drainage ways and floodplains may create increases in floodplain elevation and size with potential for property damage and natural resource impacts. To ensure that floodwater impacts due to roadway construction are minimized, drainage structures are required to be designed to maintain the current flow regime and associated flooding. Flooding risks would be minimized in all alternatives, since all culverts and bridges would be designed to limit the increase in the elevation of the regulatory flood so that structures will not be affected. Existing culverts, culvert extensions, and new culverts associated with these improvements would require hydraulic evaluations to verify potential impacts to flooding. The incremental impact of the Screened Alternatives to floodplains, considered in light of past, present and future impacts, is expected to be relatively minimal due to existing regulatory controls and regulations.

D. Forest

State-funded highway construction projects that involve cutting and clearing of forests are regulated under Maryland Reforestation Law (Natural Resources Article Section 5-103), a regulation created to protect Maryland forests and mitigate for the loss of forest cover. Forest impacts must be replaced on an acre-for-acre or one-to-one basis on public lands, within two years or three growing seasons of project completion (MDNR, 1997).

The Chesapeake Bay Land Cover GIS dataset was used to identify forested areas in the full ICE Analysis Area. Forest and shrub land cover accounts for approximately 51 percent of the ICE Analysis Area (or approximately 341,700 acres).

a. Indirect Impacts

Indirect impacts to forests from any of the Screened Alternatives could result from roadway runoff, sedimentation, and the introduction of non-native plant species within disturbed areas. These indirect impacts could lead to terrestrial habitat degradation within the ICE Analysis Area, and ultimately a decrease in plant and animal species that inhabit these areas. Additionally, disturbance and land conversion along the edges of forest stands may facilitate immigration, establishment, and/or spread of invasive plant species over time. However, these indirect effects are expected to be relatively minor because the improvements would occur along highly urbanized, established corridors that have very little undisturbed land along them, as confirmed by aerial imagery and plans.

Increased demand for land development resulting from greater access provided by the Screened Alternatives could result in pressure for conversion of forest land to residential or commercial use. State and local policies protecting forested land, and the effects of zoning and comprehensive planning to direct growth and protect natural resources, would help to offset such indirect effects. For example, the Montgomery County Forest Conservation Law regulates private developments in Montgomery County, and may require property owners to prepare a forest conservation plan to receive development approval (Montgomery Planning, 2018). The Prince George's County Woodland and Wildlife Habitat Conservation Ordinance defines a policy to "conserve and protect trees, woodlands, and wildlife habitat by requiring site planning techniques and construction practices which prevent adverse effects on these sensitive environmental features." (Prince George's County Code, Sec. 25-117(a)(1)).

b. Cumulative Impacts

Past development and transportation projects have had substantial impacts on forested land in the ICE Analysis Area. As shown in **Table 3-3** above, forested land in the ICE Analysis Area declined by over 44,000 acres between 1973 and 2010. This decline has likely been a direct result of the conversion of nearly 90,000 acres of land to residential and other developed land uses during that time frame. Impacts from the expansion of transportation facilities to accommodate a growing population has also had impacts on forests in the ICE Analysis Area.

Present and future development projects will likely continue to have impacts on forested land, but continued loss of forests as a result of non-transportation development would be regulated and minimized by the Maryland Forest Conservation Act of 1991 (FCA) and local environmental protection measures. The FCA requires the preparation of a forest conservation plan for projects of 40,000 square feet and larger. The FCA sets forth reforestation and afforestation threshold percentages for any land undergoing development, and also protects high priority forests, such as large contiguous stands and riparian forests. Potentially applicable local measures include the Montgomery County Forest Conservation Law and the Prince George's County Woodland and Wildlife Habitat Conservation Ordinance.

Each of the Screened Alternatives would have similar direct impacts to forest, ranging between 1,434 acres to 1,515 acres of forest canopy as shown in **Table 3-12**. Because the Screened Alternatives would improve existing roadways in a highly urbanized area, impacted forestland along the study corridor is primarily edge habitat. Forest land within the corridor study boundary occurs predominantly as small strips along roadsides and interchanges, stream valleys, and steep slopes, with larger tracts occurring on undeveloped park lands. Individual forest stands in Montgomery County are typically smaller and more fragmented than those found in Prince George's County, due to a higher level of development adjacent to I-495 and I-270 in Montgomery County. Development along I-495 in Prince George's County is more clustered, allowing for larger, less disturbed forested tracts.

The incremental effect of the Screened Alternatives on forested land in the ICE analysis area would be potentially substantial. While future development and transportation projects would be regulated in a manner that minimizes forest impacts, the past losses of forest in the ICE Analysis Area have been substantial. The Screened Alternatives would directly impact approximately 1,500 acres of forest canopy in the ICE Analysis Area, making the contribution of this single project relatively large compared to most other current or future projects. The required 1:1 mitigation will help offset the incremental effect of this impact; however, it may not be possible to find suitable replacement land within close proximity of the build corridors. Additionally, this may result in replacement of mature forest areas with new, smaller trees. Thus, while the overall cumulative loss would be offset by the required mitigation, the localized forest loss in urbanized areas where forest cover has been depleted by other actions would result in a major incremental effect near the Screened Alternatives, particularly if suitable mitigation replacement areas cannot be located close to the affected areas.

E. Wildlife and Wildlife Habitat

Due to the broad use of available habitat by terrestrial and aquatic wildlife, numerous federal and state agencies may be involved in the regulation of proposed habitat impacts. Federal and state agencies regulate and manage activities associated with terrestrial and aquatic wildlife and their habitats on

conserved lands and through the enforcement of laws related to hunting and fishing as well as threatened and endangered species. The United States Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), and MDNR act as consulting agencies under the United States Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), and provide environmental analysis of projects or permit applications coordinated through federal and state agencies. Their role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts. The *Natural Resources Technical Report* contains regulatory specifics pertaining to threatened and endangered species.

Larger, contiguous forested areas are important as Forest Interior Dwelling Species (FIDS) of birds depend on these areas to successfully breed and produce sustainable populations. In Maryland, potential FIDS habitat is defined as a contiguous forest area that is greater than 50 acres in size and contains at least 10 acres of forested interior greater than 300 feet from the nearest forest edge.

The Chesapeake Bay Land Cover dataset includes trees and shrubs, herbaceous land, water, barren land, and impervious surfaces. **Table 3-13** presents the land cover in the ICE Analysis Area.

Table 3-13: Land Cover in the ICE Analysis Area

Land Cover	Acres in ICE Analysis Area
Trees and Shrubs	341,700
Herbaceous	168,300
Water	19,400
Barren	3,200
Impervious	137,600
Total ICE Analysis Area	**670,000**

Source: Chesapeake Conservancy: Chesapeake Bay Land Cover 2016.
Note: values rounded to closest 100 acres.

a. Indirect Impacts

Habitat fragmentation is indirectly associated with habitat loss. Habitat fragmentation can have wide-ranging indirect effects to wildlife, resulting in species shifts associated with greater edge habitat and less interior habitat (smaller patch size); lower diversity due to smaller habitat patches; potential isolation of populations; increased vulnerability of species to external competition and predation; potential decreased flow of genetic material through the landscape; restricting wildlife movements that disrupt foraging, breeding/nesting and migration; increased risk of invasive species establishment; and generally, reduced biological diversity. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health.

Altering sunlight in riparian areas by removing forest canopy or shading with bridges and culverts can indirectly alter aquatic vegetation and wildlife community composition. This could occur by introducing invasive species and changes in light regime (more or less sunlight) which favor different types of plants and animals, as well as altering water chemistry that increases or decreases dissolved oxygen and temperature that can impact nutrient cycling and aquatic life. Moreover, widening of existing bridges and lengthening culverts under the Screened Alternatives could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter up and downstream hydrologic flow. This could

possibly impact aquatic vegetation, and breeding, nesting, and foraging habitat that can, in turn, increase wildlife vulnerability to predation and the health of aquatic life, ultimately impacting the ability of the ecosystem to maintain itself.

Because the Screened Alternatives would improve existing roadways in highly urbanized areas which are already highly fragmented and affected by the existing transportation facilities, the potential negative indirect effects to terrestrial and aquatic wildlife and wildlife habitat would be limited. Best management practices, such as state-of-the-art sediment and erosion control techniques and stormwater management controls, would further reduce the indirect downstream adverse effects of the Screened Alternatives to these resources. More information is included in the *Natural Resources Technical Report.*

b. Cumulative Impacts

Past land development and transportation projects have had substantial impacts on wildlife habitat in the ICE Analysis area. As noted in **Section 3.2.3 D** above, over 44,000 acres of forested land were converted to residential or other uses between 1973 and 2010. The 2016 land cover data shows that much of the developed portions of the ICE Analysis Area still contains tree and shrub cover. However, this tree and shrub cover is highly fragmented and interspersed with lawns and impervious surfaces. The 2016 land cover data also shows that impervious surfaces account for over 20 percent of the land cover in the ICE Analysis Area. Fragmented patches of tree and shrub cover in residential areas can function as wildlife habitat, but not to the same degree as intact contiguous forests.

Past projects have also had impacts to surface water, wetlands, floodplains, forest, and sensitive species in the ICE Analysis Area as discussed in **Section 3.2.3 A, B, C, and D**. The major growth of population and land development in the ICE Analysis Area has thus had a substantial detrimental effect on wildlife habitat.

Planning and preservation efforts, such as the designation of stream valley parks as green infrastructure corridors, have been implemented to help reduce the effects of this growth and development. Continuing efforts to preserve intact quality habitat such as riparian corridors, park lands, sensitive areas, wetlands, waters and forests will help to minimize present and future impacts to wildlife habitat.

The Screened Alternatives would widen existing interstates in an area that is already highly urbanized, and much of the intact habitat is already designated for preservation. However, the Screened Alternatives would have impacts to unique and sensitive areas including targeted ecological areas; green infrastructure hubs and green corridors; rare, threatened and endangered species (RTE) habitat; wetlands and waters, and forest.

Table 3-12 presents the impacts to unique and sensitive areas, wetlands, waters, and forest. Areas with the most intact habitat in the study corridor include riparian corridors and park land.

Overall, the cumulative effects of transportation and development projects would be adverse to wildlife and wildlife habitat, but would be reduced by applicable federal, state, and local laws and regulations requiring potential adverse effects to be avoided, minimized, or mitigated. The Screened Alternatives would contribute incrementally to the overall cumulative effect on wildlife habitat, given the direct impacts to key resources such as targeted ecological areas, green infrastructure hubs, green corridors, RTE Species areas, and FIDS habitat.

F. Sensitive Species

State- and federally-listed threatened or endangered species were identified within the ICE Analysis Area through a review of the USFWS Information Planning and Consultation (IPaC), MDNR Wildlife and Heritage Service (MDNR-WHS), Virginia Fish and Wildlife Information Service, Virginia Department of Conservation and Recreation-Department of Natural Heritage (VDCR-DNH) databases, and the District's Wildlife Action Plan (2015). The review identified 243 state- and federally-listed threatened and endangered species potentially in the ICE Analysis Area (see **Appendix B**). Federally-designated critical habitat in the ICE Analysis Area is for the Atlantic Sturgeon in the Potomac River, with its northern extent at Little Falls Dam (NOAA, 2018).

Although bald eagles are no longer federally- or state-listed, the raptors currently are protected under the Bald and Golden Eagle Protection Act. Threats to the bald eagle include habitat destruction, electrocution, poisoning, wind farms, and pesticides.

Data obtained from the Mid-Atlantic Fishery Management Council and National Marine Fisheries Service Mid-Atlantic Region Habitat Conservation Division indicates that there are currently no Essential Fish Habitat or Habitat Area of Particular Concern mapped in the ICE Analysis Area.

To assess the potential for the presence of Maryland state-listed terrestrial or aquatic RTE species within the I-495 & I-270 Managed Lanes Study corridor, the Maryland Trilogy Application was completed. This online application solicits state-listed RTE species review from the MDNR-WHS and MDNR Environmental Review Program. In addition, mapped MDNR Sensitive Species Project Review Areas were reviewed in Maryland to determine areas supporting or providing habitat buffers for RTE species within the corridor study boundary. For Virginia state listed RTE species, the VDCR was contacted for information on the potential presence of RTE plant and insect species within the corridor study boundary. A response letter was submitted by the VDCR Division of Natural Heritage on May 3, 2018 that presented a table of natural heritage resources, including the habitat of rare, threatened, or endangered plant and animal species, within a two-mile radius of the corridor study boundary. The VDGIF online Fish and Wildlife Information Service was accessed on March 19, 2019 to identify species of conservation concern within a three-mile radius of the corridor study boundary. To assess the potential presence of federally-listed RTE species under the jurisdiction of the USFWS, the IPaC tool was used.

No federal- or state-listed species are known to occur within the corridor study boundary. However, within the Virginia portion of the I-495 & I-270 Managed Lanes Study corridor the federally-listed threatened northern long-eared bat (*Myotis septentrionalis*) was identified as potentially occurring within suitable summer roosting forested habitat and the state-listed threatened wood turtle (*Glyptemys insculpta*) potentially within suitable riverine habitat in the Potomac River Gorge. Coordination is ongoing with the USFWS, VDGIF, and VDCR to determine whether any potential effects could occur to these two species from any of the Screened Alternatives.

Within the Maryland portion of the corridor study boundary, the MDNR identified several state-listed threatened or endangered plant species that may occur within scour bars or the adjacent floodplain of the Potomac River. A habitat assessment is pending on federal lands within the Chesapeake and Ohio Canal National Historical Park to determine whether suitable habitat for the state-listed plant species exists. If suitable habitat is found, a targeted species survey will be conducted within the suitable habitat

to document presence/absence of the listed species. If populations of the listed species are found, an assessment of potential effects to the species from any of the Screened Alternatives will be conducted. Therefore, until this work is completed, and potential presence of such species can be evaluated in more depth, there are no anticipated effects to RTE species from any of the proposed I-495 & I-270 Managed Lanes Study Screened Alternatives.

a. Indirect Impact

Loss of protected species' habitat and fragmentation of such habitat can indirectly affect protected and other wildlife species as described above. Endangered Species Act (ESA) Section 7 consultation with the USFWS and USEPA regarding the Screened Alternatives' potential effects to federally-protected species is ongoing, and potential impacts to state-listed threatened and endangered species are being coordinated with MDNR, VDGIF, and VDCR-DNH. No development or direct access to development is dependent upon implementing any of the Screened Alternatives, but increased demand for land use changes and potential human and natural environmental impacts related to such could result from the Screened Alternatives.

Approximately 62 Bald Eagle nests are in the ICE Analysis Area (Maryland Bird Conservation Partnership, 2018; Watts and Byrd, 2013). Construction and operation of transportation improvements and other development can indirectly cause abandonment of nest locations due to noise and increased human activity. The closest eagle nest to the Screened Alternatives is 1.9 miles east of I-495 in the Greenbelt, Maryland area.

b. Cumulative Impacts

Past projects have had detrimental impacts on sensitive species, particularly development and transportation projects that occurred prior to the passage of the ESA in 1973 and the Maryland Nongame and Endangered Species Conservation Act in 1975. The overall impacts of past actions since 1970 have likely had effects on sensitive species due to the conversion of wildlife habitat to urbanized land uses.

Though no federal- or state-listed species are known to occur within the corridor study boundary, the Screened Alternatives would impact between 177 and183 acres of RTE species habitat, as shown in **Table 3-12**. Present and future development could potentially impact protected species, though such effects would likely be minimized by adherence to federal and state laws and regulations for protected species. The incremental effect of the Screened Alternatives, in consideration of past, present, and future impacts to RTE species habitat, is substantial. Habitat for RTE species has likely declined substantially as the ICE Analysis Area has become increasingly urbanized and developed, and the Screened Alternatives would each require major incremental impact to RTE species habitat. Avoidance, minimization, and mitigation in consultation with agencies with jurisdiction would help to minimize the incremental effect of the Screened Alternatives on RTE species. More information on direct impacts to RTE species habitat and potential avoidance and mitigation measures is included in the *Natural Resources Technical Report.*

3.1.7 Air Quality

Federal requirements for air quality analyses for transportation projects derive from NEPA and, where applicable, the federal transportation conformity rule (40 CFR Parts 51 and 93). NEPA guidance for air quality analyses for transportation projects may be found on or via the FHWA website for planning and the environment.

As required by the Clean Air Act, USEPA sets the National Ambient Air Quality Standards (NAAQS) for airborne pollutants that have adverse impacts on human health and the environment. The NAAQS are a set of baseline standards over which state governments can choose to impose stricter standards.

The project is currently included in the NCRTPB FY 2019 – 2024 Transportation Improvement Program (TIP) [TIP ID 6432 and Agency ID AW0731 (planning activities)] and the NCRTPB *Visualize 2045 Long-Range Plan* (CEID 1182, CEID 3281, and Appendix B page 56). This project is included in the Air Quality Conformity Analysis that accompanies the Visualize 2045 Plan. Prior to the Record of Decision being signed, the selected alternative will be included in the TIP and Long-Range Plan.

Montgomery County, Prince George's County, and Fairfax County were previously designated as maintenance areas for the Particulate Matter $(PM)_{2.5}$ 1997 primary annual standard, but the USEPA has revoked that NAAQS. Therefore, transportation conformity requirements no longer apply for the fine particulate matter ($PM_{2.5}$) standard and no analysis is necessary.

A. Indirect Impacts

The quantitative assessment conducted for project-specific carbon monoxide (CO), quantitative analysis for mobile source air toxics (MSAT) impacts, and the regional conformity analysis conducted for ozone (NCRTPB) can be considered indirect effects analyses because they look at air quality impacts attributable to the project that occur in the future. These analyses demonstrate that, in the future 1) air quality impacts from CO will not cause or contribute to violations of the CO NAAQS, 2) MSAT emissions will be significantly lower than they are today, and 3) the mobile source emissions budgets established for the region for purposes of meeting the ozone NAAQS will not be exceeded. Therefore, the indirect effects of the project are not expected be significant.

B. Cumulative Effects

The annual conformity analysis conducted by the NCRTPB represents a cumulative impact assessment for purposes of regional air quality because it assesses the incremental effect of the project in light of reasonably foreseeable future projects and effects of past and present projects. Federal conformity requirements, including specifically 40 CFR 93.114 and 40 CFR 93.115, apply as the area in which the project is located is designated as nonattainment for ozone. Accordingly, there must be a currently conforming transportation plan and program at the time of project approval, and the project must come from a conforming plan and program (or otherwise meet criteria specified in 40 CR 93.109(b)).

- The existing air quality designations for the region are based, in part, on the accumulated mobile source emissions from past and present actions, and these pollutants serve as a baseline for the current conformity analysis.
- The conformity analysis quantifies the amount of mobile source emissions for which the area is designated nonattainment/maintenance that will result from the implementation of all reasonably foreseeable regionally significant transportation projects in the region (i.e., those proposed for construction funding over the life of the region's transportation plan).
- The most recent conformity analysis was completed in October 2018, with FHWA and Federal Transit Administration issuing a conformity finding on October 17, 2018 for the TIP and CLRP covered by that analysis. This analysis demonstrates that the incremental impact of the proposed

project on mobile source emissions, when added to the emissions from other past, present, and reasonably foreseeable future actions, is in conformance with the State Implementation Plan (SIP) and will not cause or contribute to a new violation, increase the frequency or severity of any violation, or delay timely attainment of the NAAQS established by USEPA.

Therefore, the cumulative impacts of the study are expected to be minimal.

3.2 Summary and Conclusions

Each of the Screened Alternatives would have roughly similar direct impacts to socioeconomic, cultural, and natural resources. These would include direct impacts to communities, parks, historic resources, wetlands and waterways, floodplains, and forested land.

Existing land use in the ICE Analysis Area includes a mix of developed residential, commercial and institutional land uses, along with open spaces, forested areas, and relatively small areas of farmland. County and local master plans focus on protecting existing open space and residential communities by directing future development to designated areas. There are no planned developments in the ICE Analysis Area that are dependent upon the completion of the Screened Alternatives.

Potential for indirect effects from the Screened Alternatives would be primarily related to a potential increase in demand for land use development resulting from improved access along the I-270 and I-495 corridors. More rural, less developed portions of the ICE Analysis Area such as northern Montgomery County and southern Frederick County near I-270, and other locations where undeveloped land exists would be most likely to experience pressure for new development. Induced growth, potentially resulting from greater accessibility along the I-270 and I-495, could in turn lead to effects on socioeconomic, cultural, and natural resources in the ICE Analysis Area.

The Screened Alternatives would improve existing highly urbanized major roadway corridors and would not create facilities along new alignment. Substantial population growth and land development has occurred in the ICE Analysis Area during the analysis time frame, and the project needs have arisen as a result of this growth. The Screened Alternatives would provide new capacity and managed lanes strategies to reduce the already high levels of congestion in the study area. Indirect impacts would be minimized by existing master plans and zoning regulations pertaining to new development.

There would be potential for indirect impacts to downstream water quality, wetlands, and wildlife habitat as a result of increased impervious surface and temporary construction impacts that could potentially increase sediment and pollutant-loaded runoff. The increase in impervious surface could indirectly impact floodplains and waterways by causing excess erosion or sedimentation. Erosion and sediment controls and permitting requirements would minimize increases in sediment and runoff resulting from the Screened Alternatives, as well as any other new developments occurring in the ICE Analysis Area.

Past developments and transportation projects have had substantial impacts on socioeconomic, cultural, and natural resources in the ICE Analysis Area. Major growth in employment and population in the ICE Analysis Area since 1970 has resulted in conversion of natural land and wildlife habitat into urbanized land uses. Infrastructure has been continually expanded to accommodate the growing population and economy.

Reasonably foreseeable present and future projects will likely continue to impact socioeconomic, cultural, and natural resources in the ICE Analysis Area. However, present and future impacts are likely to be lower due to the combined effects of laws and regulations that protect resources such as wetlands, waterways, RTE species, forest, historic architecture, and others.

The incremental effects of the Screened Alternatives, considered in light of the past, present and future actions impacting the environment will likely occur. The Screened Alternatives are comprised of large-scale improvements to high volume, regionally important roadway facilities. As such, the incremental effect of the Screened Alternatives would be substantial in consideration of the numerous other impacts on resources in the ICE Analysis Area. Resources such as cultural resources, forests and parklands, which would have substantial impacts in locations where proximal replacement of the resources may not be possible, are likely to result in the greatest incremental effects.

Cumulative impacts to water quality could occur from stream loss and the incremental increase of impervious surfaces that may increase runoff from past, present, and future development projects. These would be minimized through the use of BMPs during construction and use of stormwater management facilities. Federal, state and local laws controlling future development and requiring forest conservation and mitigation/reforestation would minimize the potential for cumulative impacts to forest and terrestrial habitat.

Indirect and cumulative impacts to air quality from the Screened Alternatives would not cause or contribute to any violation of NAAQS. Furthermore, the Screened Alternatives are accounted for in the annual conformity analysis conducted by the NCRTPB, which represents a cumulative impact assessment for purposes of regional air quality. Therefore, no substantial indirect or cumulative effects to air quality are anticipated from the Screened Alternatives.

4

4 REFERENCES

Arlington County. 2016. *Comprehensive Plan*. https://projects.arlingtonva.us/plans-studies/comprehensive-plan/

City of Alexandria. 1992. *Alexandria Master Plan Citywide Chapters.* https://www.alexandriava.gov/planning/info/default.aspx?id=44614#CitywideChaptersoftheMasterPlan

City of Alexandria. 2008. *City of Alexandria Comprehensive Transportation Master Plan.* https://www.alexandriava.gov/uploadedfiles/tes/info/tes_tmp_complete.pdf

City of Fairfax. 2012. *Comprehensive Plan.* https://www.fairfaxva.gov/government/community-development-planning/planning/current-comprehensive-plan

City of Falls Church. 2017. *Comprehensive Plan.* https://www.fallschurchva.gov/1984/Comprehensive-Plan

District of Columbia Office of Planning. 2010. *The Comprehensive Plan for the National Capital.* https://planning.dc.gov/page/comprehensive-plan

Fairfax County. 2017. *Fairfax County Comprehensive Plan. https://www.fairfaxcounty.gov/planning-zoning/fairfax-county-comprehensive-plan*

Frederick County. 2010a. *2010 County Comprehensive Plan.* https://frederickcountymd.gov/170/County-Comprehensive-Plan

Frederick County. 2010b. *Water Resources Element: A Functional Element of the 2010 County Comprehensive Plan. https://www.frederickcountymd.gov/DocumentCenter/View/10447/Water-Resources-Element--Adopted-Plan?bidId=*

Maryland Bird Conservation Partnership. 2018. *The Eagle Nest Monitoring Program.* https://marylandbirds.org/bald-eagle-nest-monitoring/

MDOT SHA. 2012. *Indirect and Cumulative Effects Analysis Guidelines.* https://www.roads.maryland.gov/OPPEN/SHA%20ICE%20Guidelines.pdf

M-NCPPC. 2017. *Prince George's County Resource Conservation Plan.* *http://mncppcapps.org/planning/publications/BookDetail.cfm?item_id=329&Category_id=1*

M-NCPPC, Department of Parks and Recreation, Prince George's County. 2013. *Formula 2040: Functional Master Plan for Parks, Recreation and Open Space.* *http://www.pgparks.com/DocumentCenter/View/118/2040-Functional-Master-Plan-PDF?bidId=*

M-NCPPC. 2014. *Plan 2035: Prince George's Approved General Plan – Blueprint for Tomorrow.* http://www.pgparks.com/374/Plan-2035

M-NCPPC. 1964. *On Wedges and Corridors: A general plan for the Maryland-Washington Regional District in Montgomery and Prince George's counties.* http://www.montgomeryplanning.org/community/general_plans/wedges_corridors/wedges_corridors64.shtm

Montgomery Parks. 2017. *Park, Recreation, and Open Space (PROS) Plan.* *https://www.montgomeryparks.org/projects/directory/2017-park-recreation-open-space-pros-plan-update/#plan*

Montgomery Planning. 2010. *Water Resources Functional Master Plan.* *https://montgomeryplanning.org/planning/environment/water-and-wetlands/water-resources-plan/*

Montgomery Planning. 2018a. *Master Plan List*. https://montgomeryplanning.org/planning/master-plan-list/

Montgomery Planning. 2018b. Forest Conservation Program. https://montgomeryplanning.org/planning/environment/forest-conservation-and-trees/

MWCOG. 2017. *Commercial Construction Indicators: 2017 Report.* https://www.mwcog.org/documents/commercialconstruction/

MWCOG. 2018a. *Visualize 2045: A Long-Range Transportation Plan for the* National *Capital Region.* https://www.mwcog.org/visualize2045/document-library/

MWCOG. 2018b. *Regional Economic Monitoring Systems Report.* https://www.mwcog.org/documents/2018/11/26/regional-economic-monitoring-system-rems-economy/

MWCOG. 2018c. *New COG analysis recommends increase in area housing production.* https://www.mwcog.org/newsroom/2018/09/12/new-cog-analysis-recommends-increase-in-area-housing-production/

MWCOG. 2018d. *2017 Commercial Construction Indicators*. https://www.mwcog.org/documents/commercialconstruction/

MWCOG. 2018d. *Commercial construction slows in Metropolitan Washington, COG reports.* https://www.mwcog.org/newsroom/2018/04/02/commercial-construction-slows-in-metropolitan-washington-cog-reports/

NCRTPB. 2016. *Constrained Long-Range Transportation Plan for the National Capital Region.* http://www1.mwcog.org/clrp/

NOAA. 2018. *GARFO Master ESA Species Table: Atlantic Sturgeon.* https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/

Washington, DC Economic Partnership. 2018. *Washington, DC Development Report.* https://wdcep.com/reports/dc-development-report/

Watts, B. D. and M. A. Byrd. 2013. *Virginia bald eagle nest survey: 2013 breeding season*. Center for Conservation Biology, College of William and Mary and Virginia Commonwealth University, Williamsburg, VA. https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/

APPENDIX A: ICE ANALYSIS AREA CENSUS TRACTS AND POPULATION

Census Tracts	Total Population
Census Tract 7007.17, Montgomery County, Maryland	6,875
Census Tract 7007.18, Montgomery County, Maryland	5,137
Census Tract 7007.24, Montgomery County, Maryland	3,781
Census Tract 7008.16, Montgomery County, Maryland	8,841
Census Tract 7008.17, Montgomery County, Maryland	5,793
Census Tract 7008.29, Montgomery County, Maryland	3,280
Census Tract 7010.01, Montgomery County, Maryland	5,836
Census Tract 7010.02, Montgomery County, Maryland	3,662
Census Tract 7010.04, Montgomery County, Maryland	5,532
Census Tract 7010.05, Montgomery County, Maryland	3,908
Census Tract 7010.06, Montgomery County, Maryland	5,374
Census Tract 7010.07, Montgomery County, Maryland	3,115
Census Tract 7012.05, Montgomery County, Maryland	6,802
Census Tract 7012.06, Montgomery County, Maryland	6,592
Census Tract 7012.11, Montgomery County, Maryland	6,660
Census Tract 7012.14, Montgomery County, Maryland	3,768
Census Tract 7012.15, Montgomery County, Maryland	4,818
Census Tract 7015.05, Montgomery County, Maryland	7,137
Census Tract 7015.09, Montgomery County, Maryland	6,689
Census Tract 7016.01, Montgomery County, Maryland	2,343
Census Tract 7016.02, Montgomery County, Maryland	7,280
Census Tract 7021.01, Montgomery County, Maryland	5,932
Census Tract 7021.02, Montgomery County, Maryland	3,195
Census Tract 7022, Montgomery County, Maryland	5,013
Census Tract 7023.02, Montgomery County, Maryland	3,987
Census Tract 7027, Montgomery County, Maryland	7,077
Census Tract 7028, Montgomery County, Maryland	5,087
Census Tract 7029, Montgomery County, Maryland	5,219
Census Tract 7030, Montgomery County, Maryland	1,967
Census Tract 7039.01, Montgomery County, Maryland	3,179
Census Tract 7040, Montgomery County, Maryland	6,856
Census Tract 7041, Montgomery County, Maryland	4,671
Census Tract 7043, Montgomery County, Maryland	4,042
Census Tract 7044.01, Montgomery County, Maryland	3,481
Census Tract 7044.03, Montgomery County, Maryland	1,618
Census Tract 7044.04, Montgomery County, Maryland	5,239
Census Tract 7045.01, Montgomery County, Maryland	3,588

Census Tracts	Total Population
Census Tract 7045.02, Montgomery County, Maryland	2,492
Census Tract 7045.03, Montgomery County, Maryland	4,284
Census Tract 7050, Montgomery County, Maryland	4,486
Census Tract 7051, Montgomery County, Maryland	5,256
Census Tract 7058, Montgomery County, Maryland	6,102
Census Tract 7059.01, Montgomery County, Maryland	4,049
Census Tract 7059.02, Montgomery County, Maryland	4,114
Census Tract 7060.08, Montgomery County, Maryland	5,288
Census Tract 7060.09, Montgomery County, Maryland	5,355
Census Tract 7060.12, Montgomery County, Maryland	3,270
Census Tract 7060.13, Montgomery County, Maryland	3,118
Census Tract 8011.04, Prince George's County, Maryland	3,336
Census Tract 8017.02, Prince George's County, Maryland	3,980
Census Tract 8017.08, Prince George's County, Maryland	3,411
Census Tract 8019.01, Prince George's County, Maryland	4,738
Census Tract 8019.04, Prince George's County, Maryland	3,092
Census Tract 8019.05, Prince George's County, Maryland	5,262
Census Tract 8019.06, Prince George's County, Maryland	1,750
Census Tract 8019.07, Prince George's County, Maryland	2,574
Census Tract 8021.04, Prince George's County, Maryland	1,790
Census Tract 8022.01, Prince George's County, Maryland	1,847
Census Tract 8022.03, Prince George's County, Maryland	4,706
Census Tract 8022.04, Prince George's County, Maryland	6,170
Census Tract 8035.08, Prince George's County, Maryland	4,114
Census Tract 8035.12, Prince George's County, Maryland	6,421
Census Tract 8035.14, Prince George's County, Maryland	4,236
Census Tract 8035.19, Prince George's County, Maryland	5,233
Census Tract 8035.21, Prince George's County, Maryland	5,890
Census Tract 8035.25, Prince George's County, Maryland	1,998
Census Tract 8036.01, Prince George's County, Maryland	3,661
Census Tract 8036.02, Prince George's County, Maryland	2,324
Census Tract 8036.05, Prince George's County, Maryland	7,001
Census Tract 8036.06, Prince George's County, Maryland	5,340
Census Tract 8036.08, Prince George's County, Maryland	5,952
Census Tract 8036.12, Prince George's County, Maryland	3,347
Census Tract 8067.06, Prince George's County, Maryland	3,311
Census Tract 8067.08, Prince George's County, Maryland	3,979
Census Tract 8067.10, Prince George's County, Maryland	5,758
Census Tract 8067.13, Prince George's County, Maryland	3,722

Census Tracts	Total Population
Census Tract 8067.14, Prince George's County, Maryland	3,895
Census Tract 8069, Prince George's County, Maryland	5,036
Census Tract 8073.01, Prince George's County, Maryland	3,658
Census Tract 8073.04, Prince George's County, Maryland	2,003
Census Tract 8073.05, Prince George's County, Maryland	3,464
Census Tract 8074.04, Prince George's County, Maryland	5,832
Census Tract 8074.05, Prince George's County, Maryland	5,918
Census Tract 8074.08, Prince George's County, Maryland	5,744
Census Tract 8074.09, Prince George's County, Maryland	4,214
Census Tract 4701, Fairfax County, Virginia	2,736
Census Tract 4801, Fairfax County, Virginia	4,142
TOTAL ICE Analysis Area Census Tracts	392,773

Source: US Census ACS 5-Year Surveys 2016

APPENDIX B: THREATENED AND ENDANGERED (T&E) SPECIES LIST

Species	Status	Listing Source
Atlantic Sturgeon (*Acipenser oxyrinchus*)	FE, SE	VAFWIS, USFWS-IPaC (District, Prince George's)
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE	NOAA Fisheries (District, Prince George's)
Dwarf Wedgemussel (*Alasmidonta heterodon*)	FE, SE	USFWS-IPaC, MDNR (DC, Frederick, Montgomery Counties)
Harperella (*Ptilimnium nodosum*)	FE	USFWS-IPaC
Hay's Spring Amphipod (*Stygobromus hayi*)	FE	USFWS-IPaC (District)
Yellow Lance (*Elliptio lanceolate*)	FT	USFWS-IPaC (Fairfax)
Northern Long-eared Bat (*Myotis septentrionalis*)	FT, ST	USFWS-IPaC, VAFWIS (Fairfax)
Small Whorled Pogonia (*Isotria medeoloides*)	FT	USFWS-IPaC, MDNR (Montgomery, Fairfax)
Tall Dock (*Rumex latissimus*)	SE	MDNR (Frederick, Montgomery)
Horse-tail Papsalum (*Papsalum fluitans*)	SE	MDNR (Frederick)
Climbing Milkweed (*Matelea obliqua*)	SE	MDNR (Frederick, Montgomery)
Blue Wild Indigo (*Baptisia australis*)	ST	MDNR (Frederick, Montgomery, Prince George's)
Tall Tickseed (*Coreopsis tripteris*)	SE	MDNR (Frederick, Montgomery)
Buttercup Scorpionweed (*Phacelia covellei*)	SE	MDNR (Frederick, Montgomery, Prince George's)
Sundial Lupine (*Lupinus perennis*)	ST	MDNR (Frederick, Prince George's)
Long's Rush (*Juncus longyi*)	SE	MDNR (Frederick, Montgomery, Prince George's)
Long-stalk Greenbrier (*Smilax pseudochina*)	ST	MDNR (Frederick, Montgomery, Prince George's)
American Brook Lamprey (*Lethenteron appendix*)	ST	MDNR (Frederick, Montgomery, Prince George's)

Species	Status	Listing Source
Trailing Stitchwort (*Stellaria alsine*)	SE	MDNR (Frederick, Montgomery, Prince George's)
Selys' Sundragon (*Helocarodulia selysii*)	ST	MDNR (Frederick, Prince George's)
Glassy Darter (*Etheostoma vitreum*)	ST	MDNR (Frederick, Montgomery, Prince George's)
Stripeback Darter (*Percina notogramma*)	SE	MDNR (Frederick, Prince George's)
Triangle Floater (*Alasmidonta undulata)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Green Floater (*Lasmigona subviridis*)	SE	MDNR (Frederick, Montgomery)
Upland Sandpiper (*Bartramia longicauda)*	SE	MDNR (Frederick)
Vandel's Cave Isopod *(Caecidotea vandeli)*	SE	MDNR (Frederick, Montgomery)
Northern Barrens Tiger Beetle *(Cicindela patruela)*	SE	MDNR (Frederick, Prince George's)
Elfin Skimmer *(Nannothemis bella)*	SE	MDNR (Frederick, Prince George's)
Allegheny Woodrat (*Neotoma magister*)	SE	MDNR (Frederick, Montgomery)
Edwards' Hairstreak *(Satyrium edwardsii)*	SE	MDNR (Frederick)
Appalachian Bewick's Wren *(Thryomanes bewickii altus)*	SX	MDNR (Frederick)
Climbing Fumitory *(Adlumia fungosa)*	ST	MDNR (Frederick)
Earleaf False Foxglove *(Agalinis auriculate)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Purple Giant-hyssop *(Agastache scrophulariifolia)*	ST	MDNR
Red Milkweed *(Asclepias rubra)*	SE	MDNR (Frederick, Prince George's)
Lobed Spleenwort *(Asplenium pinnatifidum)*	SE	MDNR (Frederick, Montgomery)
Canadian Milkvetch *(Astragalus canadensis)*	SE	MDNR (Frederick, Montgomery)

Species	Status	Listing Source
Least Grapefern *(Botrychium simplex)*	SX	MDNR (Frederick, Montgomery)
Tuberous Grass-pink *(Calopogon tuberosus)*	SE	MDNR (Frederick, Prince George's)
Field Sedge *(Carex conoidea)*	SE	MDNR (Frederick, Prince George's)
Davis' Sedge *(Carex davisii)*	SE	MDNR (Frederick, Montgomery)
Short's Sedge *(Carex shortiana)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Scarlet Indian-paintbrush (Castilleja coccinea)	SE	MDNR (Frederick)
Red Turtlehead *(Chelone obliqua)*	ST	MDNR (Frederick, Prince George's)
Goldthread *(Coptis trifolia)*	SE	MDNR (Frederick, Prince George's)
Spring Coralroot *(Corallorhiza wisteriana)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Roundleaf Dogwood *(Cornus rugosa)*	SE	MDNR (Frederick)
Long-bract Green Orchid *(Dactylorhiza viridis)*	SE	MDNR (Frederick)
Bicknell's Witchgrass *(Dichanthelium bicknellii)*	SX	MDNR (Montgomery, Prince George's)
Eastern Leatherwood *(Dirca palustris)*	ST	MDNR (Frederick)
Woodland Horsetail *(Equisetum sylvaticum)*	SE	MDNR (Frederick)
White Trout Lily *(Erythronium albidum)*	ST	MDNR (Frederick)
Glade Spurge *(Euphorbia purpurea)*	SE	MDNR (Frederick)
Rough Wood Aster *(Eurybia radula)*	SE	MDNR (Montgomery, Prince George's)
Spotted Joe-pye Weed *(Eutrochium maculatum)*	SX	MDNR (Frederick)
Queen-of-the-prairie *(Filipendula rubra)*	SE	MDNR (Frederick)
Fringe-top Bottle Gentian *(Gentiana andrewsii)*	ST	MDNR (Frederick, Prince George's)

Species	Status	Listing Source
Sharp-scaled Mannagrass *(Glyceria acutiflora)*	SE	MDNR (Frederick)
Northern Oak Fern *(Gymnocarpium dryopteris)*	SE	MDNR (Frederick)
Golden-seal *(Hydrastis canadensis)*	ST	MDNR (Frederick, Montgomery)
Winged Loosestrife *(Lythrum alatum)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Starflower Solomon's-plume *(Maianthemum stellatum)*	SE	MDNR (Frederick, Montgomery)
Climbing Milkweed *(Matelea obliqua)*	SE	MDNR (Frederick)
Appalachian Sandwort *(Minuartia glabra)*	SE	MDNR (Frederick)
Glade Mallow *(Napaea dioica)*	SE	MDNR (Frederick)
Little Floatingheart *(Nymphoides cordata)*	SE	MDNR (Frederick)
One-side Wintergreen *(Orthilia secunda)*	SX	MDNR (Frederick, Montgomery, Prince George's)
Black-fruit Mountain-ricegrass *(Patis racemosa)*	ST	MDNR (Frederick)
Smooth Cliffbrake *(Pellaea glabella)*	E	MDNR (Frederick, Montgomery)
Yellow Fringed Orchid *(Platanthera ciliaris)*	ST	MDNR (Frederick, Prince George's)
Large Purple Fringed Orchid *(Platanthera grandiflora)*	ST	MDNR (Frederick)
Purple Fringeless Orchid *(Platanthera peramoena)*	ST	MDNR (Frederick, Montgomery, Prince George's)
Small Purple Fringed Orchid *(Platanthera psycodes)*	SX	MDNR (Frederick, Montgomery)
Southern Mountainmint *(Pycnanthemum pycnanthemoides)*	SX	MDNR (Frederick, Prince George's)
Torrey's Mountainmint *(Pycnanthemum torreyi)*	SE	MDNR (Frederick, Montgomery)
Whorled Mountainmint *(Pycnanthemum verticillatum)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Shumard Oak *(Quercus shumardii)*	ST	MDNR (Frederick, Montgomery)
Carolina Buttercup *(Ranunculus carolinianus)*	SX	MDNR (Frederick)

Species	Status	Listing Source
Yellow Water Crowfoot *(Ranunculus flabellaris)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Wild Black Currant *(Ribes americanum)*	SX	MDNR (Frederick)
Tall Dock *(Rumex altissimus)*	SE	MDNR (Frederick)
Sessile-fruit Arrowhead *(Sagittaria rigida)*	SE	MDNR (Frederick)
Narrowleaf Willow *(Salix exigua)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Canada Burnet *(Sanguisorba canadensis)*	ST	MDNR (Frederick, Montgomery, Prince George's)
Northern Pitcherplant *(Sarracenia purpurea)*	ST	MDNR (Frederick, Prince George's)
Blunt-lobe Grapefern *(Sceptridium oneidense [?])*	SE	MDNR (Frederick)
Water Bulrush *(Schoenoplectus subterminalis)*	SE	MDNR (Frederick)
Shale Barren Skullcap *(Scutellaria leonardii [h])*	ST	MDNR (Frederick, Montgomery)
Veined Skullcap *(Scutellaria nervosa)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Rock Skullcap *(Scutellaria saxatilis)*	SE	MDNR (Frederick, Montgomery)
Sweet-scented Indian-plantain *(Senecio suaveolens)*	SE	MDNR (Frederick, Montgomery)
Snowy Campion *(Silene nivea)*	SE	MDNR (Frederick, Montgomery, Prince George's)
Prairie Goldenrod *(Solidago rigida)*	SX	MDNR (Frederick, Montgomery)
Yellow Nodding Ladies'-tresses *(Spiranthes ochroleuca)*	SE	MDNR (Frederick, Montgomery)
Eastern Featherbells *(Stenanthium gramineum)*	ST	MDNR (Frederick, Montgomery, Prince George's)
Purple Meadow Parsnip *(Thaspium trifoliatum)*	SE	MDNR (Frederick)
Yellowleaf Tinker's-weed *(Triosteum angustifolium)*	SE	MDNR (Frederick, Montgomery)
Valerian *(Valeriana pauciflora)*	SE	MDNR (Frederick, Montgomery)

Species	Status	Listing Source
Navel-shaped Corn-salad *(Valerianella umbilicata)*	SX	MDNR (Frederick, Montgomery)
Broadleaf Bunchflower *(Veratrum hybridum)*	SE	MDNR (Frederick, Montgomery)
Marsh Speedwell *(Veronica scutellata)*	SE	MDNR (Frederick, Montgomery)
Northern Prickly-ash *(Zanthoxylum americanum)*	SE	MDNR (Frederick, Montgomery)
Golden-banded Skipper (Autochton cellus)	SX	MDNR (Frederick, Prince George's)
American Bittern *(Botaurus lentiginosus)*	ST	MDNR (Frederick, Prince George's)
Sedge Wren *(Cistothorus platensis)*	SE	MDNR (Frederick, Prince George's)
Six-banded Longhorn Beetle *(Dryobius sexnotatus)*	SE	MDNR (Montgomery)
Rainbow Snake *(Farancia erytrogramma)*	SE	MDNR (Montgomery)
Skillet Clubtail *(Gomphus ventricosus)*	SX	MDNR (Montgomery)
Eastern Small-footed Myotis *(Myotis leibii)*	SE	MDNR (Montgomery)
Chesapeake Logperch *(Percina bimaculate)*	ST	MDNR (Montgomery, Prince George's)
Trout-perch *(Percopsis omiscomaycus)*	SX	MDNR (Montgomery)
Bachman's Sparrow *(Peucaea aestivalis)*	SX	MDNR (Montgomery, Prince George's)
Tawny Crescent *(Phyciodes batesii)*	SX	MDNR (Montgomery)
Regal Fritillary *(Speyeria Idalia)*	SX	MDNR (Montgomery)
Rock Creek Groundwater Amphipod *(Stygobromus kenki)*	SE	MDNR (Montgomery)
Ten-lobe False Foxglove *(Agalinis obtusifolia)*	SX	MDNR (Montgomery, Prince George's)
Thread-leaved Gerardia *(Agalinis setacea)*	SE	MDNR (Montgomery, Prince George's)
Nantucket Shadbush *(Amelanchier nantucketensis)*	ST	MDNR (Montgomery)

Species	Status	Listing Source
Woolly Three-awn *(Aristida lanosa)*	SE	MDNR (Montgomery)
Lake-cress *(Armoracia lacustris)*	SE	MDNR (Montgomery)
Leopard's-bane *(Arnica acaulis)*	SE	MDNR (Montgomery, Prince George's)
Great Indian-plantain *(Arnoglossum reniforme)*	SX	MDNR (Montgomery)
Ozark Milkvetch *(Astragalus distortus)*	ST	MDNR (Montgomery)
Broad-glumed Brome *(Bromus latiglumis)*	SE	MDNR (Montgomery)
Bluehearts *(Buchnera americana)*	SX	MDNR (Montgomery, Prince George's)
Buxbaum's Sedge *(Carex buxbaumii)*	SX	MDNR (Montgomery, Prince George's)
Carey's Sedge *(Carex careyana)*	SE	MDNR (Montgomery)
Cypress-knee Sedge *(Carex decomposita)*	SE	MDNR (Montgomery)
Hitchcock's Sedge *(Carex hitchcockiana)*	SE	MDNR (Montgomery, Prince George's)
Porcupine Sedge *(Carex hystericina)*	SE	MDNR (Montgomery)
Mead's Sedge *(Carex meadii)*	SE	MDNR (Montgomery)
Big Shellbark Hickory *(Carya laciniosa)*	SE	MDNR (Montgomery)
Prickly Hornwort *(Ceratophyllum echinatum)*	SE	MDNR (Montgomery)
Curly-heads *(Clematis ochroleuca)*	SX	MDNR (Montgomery)
Hazel Dodder *(Cuscuta coryli)*	SX	MDNR (Montgomery)
Smartweed Dodder *(Cuscuta polygonorum)*	SE	MDNR (Montgomery)
Glade Fern *(Homalosorus pycnocarpos)*	ST	MDNR (Montgomery, Prince George's)
Featherfoil *(Hottonia inflata)*	SE	MDNR (Montgomery)
Eastern Bloodleaf *(Iresine rhizomatosa)*	SE	MDNR (Montgomery)
Dwarf Crested Iris *(Iris cristata)*	SE	MDNR (Montgomery)

Species	Status	Listing Source
Hairy Lettuce *(Lactuca hirsuta)*	SX	MDNR (Montgomery)
Vetchling Peavine *(Lathyrus palustris)*	SE	MDNR (Montgomery, Prince George's)
Dwarf Bulrush *(Lipocarpha micrantha)*	SE	MDNR (Montgomery)
American Gromwell *(Lithospermum latifolium)*	SE	MDNR (Montgomery)
Virginia False Gromwell *(Lithospermum virginianum)*	SE	MDNR (Montgomery, Prince George's)
Climbing Fern *(Lygodium palmatum)*	ST	MDNR (Montgomery, Prince George's)
Lowland Loosestrife *(Lysimachia hybrida)*	ST	MDNR
Carolina Anglepod *(Matelea carolinensis)*	SE	MDNR (Montgomery, Prince George's)
Purple Mecardonia *(Mecardonia acuminate)*	SE	MDNR (Montgomery, Prince George's)
Hair-awn Muhly *(Muhlenbergia capillaris)*	SE	MDNR (Montgomery, Prince George's)
Wiry Witch Grass *(Panicum flexile)*	SE	MDNR (Montgomery)
Yellow Nailwort *(Paronychia virginica var.Virginica)*	SE	MDNR (Montgomery)
Horse-tail Paspalum *(Paspalum fluitans)*	SE	MDNR (Montgomery)
Roundleaf Fameflower *(Phemeranthus teretifolius)*	ST	MDNR (Montgomery, Prince George's)
Smooth Phlox *(Phlox glaberrima)*	SE	MDNR (Montgomery)
Downy Phlox *(Phlox pilosa)*	SE	MDNR (Montgomery)
Racemed Milkwort *(Polygala polygama)*	ST	MDNR (Montgomery, Prince George's)
Seneca Snakeroot *(Polygala senega)*	ST	MDNR (Montgomery)
Leafy Pondweed *(Potamogeton foliosus)*	SE	MDNR (Montgomery, Prince George's)
Flatstem Pondweed *(Potamogeton zosteriformis)*	SE	MDNR (Montgomery)

Species	Status	Listing Source
Green-flower Wintergreen *(Pyrola chlorantha)*	SX	MDNR (Montgomery, Prince George's)
Water-plantain Spearwort *(Ranunculus ambigens)*	SX	MDNR (Montgomery, Prince George's)
Hairy Wild Petunia *(Ruellia humilis)*	SE	MDNR (Montgomery)
Pursh's Wild Petunia *(Ruellia purshiana)*	SE	MDNR (Montgomery)
Engelmann's Arrowhead *(Sagittaria engelmanniana)*	ST	MDNR (Montgomery, Prince George's)
Sessile-fruit Arrowhead *(Sagittaria rigida)*	SE	MDNR (Montgomery, Prince George's)
Smith's Bulrush *(Schoenoplectus smithii)*	SX	MDNR (Montgomery, Prince George's)
Virginia Mallow *(Sida hermaphrodita)*	SE	MDNR (Montgomery)
Racemose Goldenrod *(Solidago racemose)*	ST	MDNR (Montgomery)
Rock Goldenrod *(Solidago rupestris)*	SX	MDNR (Montgomery)
Smooth False Buttonweed *(Spermacoce glabra)*	SE	MDNR (Montgomery)
Swamp Wedgescale *(Sphenopholis pensylvanica)*	ST	MDNR (Montgomery, Prince George's)
Shining Ladies'-tresses *(Spiranthes lucida)*	SE	MDNR (Montgomery)
Gritty Hedge-nettle *(Stachys aspera)*	SE	MDNR (Montgomery)
Bog Fern *(Thelypteris simulata)*	ST	MDNR (Montgomery, Prince George's)
Climbing Dogbane *(Thyrsanthella difformis)*	SE	MDNR (Montgomery)
Coastal False Asphodel *(Triantha racemosa)*	SX	MDNR (Montgomery, Prince George's)
Buffalo Clover *(Trifolium reflexum)*	SX	MDNR (Montgomery)
Nodding Pogonia *(Triphora trianthophoros)*	SE	MDNR (Montgomery)
Goosefoot Corn-salad *(Valerianella chenopodiifolia)*	SE	MDNR (Montgomery)

Species	Status	Listing Source
Piedmont Clubtail *(Gomphus parvidens)*	SX	MDNR (Prince George's)
Eastern Sedge Barrens Leafhopper *(Limotettix minuendus)*	SE	MDNR (Prince George's)
Eastern Harvest Mouse *(Reithrodontomys humulis)*	SX	MDNR (Prince George's)
Spring Blue Darner *(Rhionaeschna mutata)*	SE	MDNR (Prince George's)
Sensitive Joint-vetch *(Aeschynomene virginica)*	FT, SE	MDNR (Prince George's)
Sandplain Gerardia *(Agalinis acuta)*	FE, SE	MDNR (Prince George's)
Pale False Foxglove *(Agalinis skinneriana)*	SE	MDNR (Prince George's)
Woodland Agrimony *(Agrimonia striata)*	SE	MDNR (Prince George's)
Golden Colicroot *(Aletris aurea)*	SX	MDNR (Prince George's)
Chaffweed *(Anagallis minima)*	SX	MDNR (Prince George's)
Canada Anemone *(Anemone canadensis)*	SX	MDNR (Prince George's)
Single-head Pussytoes *(Antennaria solitaria)*	ST	MDNR (Prince George's)
Swamp-pink *(Arethusa bulbosa)*	SX	MDNR (Prince George's)
Long-stalked Sedge *(Carex pedunculata)*	SE	MDNR (Prince George's)
Slender Sedge *(Carex tenera)*	SX	MDNR (Prince George's)
Velvety Sedge *(Carex vestita)*	ST	MDNR (Prince George's)
Plains Frostweed *(Crocanthemum bicknellii)*	SE	MDNR (Prince George's)
Stiff Tick-trefoil *(Desmodium obtusum)*	SE	MDNR (Prince George's)
Wild Bleedinghearts *(Dicentra eximia)*	ST	MDNR (Prince George's)
White-bracted Thoroughwort *(Eupatorium leucolepis)*	ST	MDNR (Prince George's)
Warty Spurge, Bluntleaf Spurge *(Euphorbia spathulata)*	SE	MDNR (Prince George's)
Dwarf Huckleberry *(Gaylussacia dumosa)*	SE	MDNR (Prince George's)
Striped Gentian *(Gentiana villosa)*	SE	MDNR (Prince George's)
Short's Hedge-hyssop *(Gratiola viscidula)*	SE	MDNR (Prince George's)

Species	Status	Listing Source
Nuttall's Micranthemum *(Hemianthus micranthemoides)*	SX	MDNR (Prince George's)
Few-flowered Tick-trefoil *(Hylodesmum pauciflorum)*	SE	MDNR (Prince George's)
Slender Blueflag *(Iris prismatica)*	SE	MDNR (Prince George's)
Dwarf Iris *(Iris verna)*	SE	MDNR (Prince George's)
Torrey's Rush *(Juncus torreyi)*	SE	MDNR (Prince George's)
Slender Pinweed *(Lechea tenuifolia)*	SX	MDNR (Prince George's)
Sandplain Flax *(Linum intercursum)*	ST	MDNR (Prince George's)
Hairy Ludwigia *(Ludwigia hirtella)*	SE	MDNR (Prince George's)
Sweet Pinesap *(Monotropsis odorata)*	SE	MDNR (Prince George's)
American Feverfew *(Parthenium integrifolium)*	SE	MDNR (Prince George's)
Swamp Lousewort *(Pedicularis lanceolate)*	SE	MDNR (Prince George's)
Heartleaf Plantain *(Plantago cordata)*	SX	MDNR (Prince George's)
White Fringed Orchid *(Platanthera blephariglottis var. Blephariglottis)*	ST	MDNR (Prince George's)
Marsh Fleabane *(Pluchea camphorata)*	SE	MDNR (Prince George's)
Crossleaf Milkwort *(Polygala cruciate)*	ST	MDNR (Prince George's)
Flatleaf Pondweed *(Potamogeton robbinsii)*	SX	MDNR (Prince George's)
Carolina Clubmoss *(Pseudolycopodiella caroliniana)*	SE	MDNR (Prince George's)
Long-stalked Crowfoot *(Ranunculus hederaceus)*	SE	MDNR (Prince George's)
Capitate Beakrush *(Rhynchospora cephalantha)*	SE	MDNR (Prince George's)
Few-flowered Beakrush *(Rhynchospora oligantha)*	SX	MDNR (Prince George's)
Few-flowered Beakrush *(Rhynchospora rariflora)*	SX	MDNR (Prince George's)
Showy Goldenrod *(Solidago speciosa)*	ST	MDNR (Prince George's)
Eastern Silvery Aster *(Symphyotrichum concolor)*	SE	MDNR (Prince George's)
Fibrous Bladderwort *(Utricularia striata)*	SE	MDNR (Prince George's)

Species	Status	Listing Source
Fringed Yellow-eyed-grass (Xyris fimbriate)	SE	MDNR (Prince George's)
Appalachian Springsnail (*Fontigens bottimeri*)	SE	VDCR-DNH (Fairfax)
Little Brown Bat (*Myotis lucifugus lucifugus*)	SE	VAFWIS (Fairfax)
Tri-colored Bat (*Permyotis subflavus*)	SE	VAFWIS (Fairfax)
Brook Floater (*Alasmidonta varicosa*)	SE	VAFWIS, MDNR (Fairfax, Frederick, Montgomery)
Rustypatch Bumblebee (*Bombus* (*Bombus*) *affinus*)	SE	VDCR (Fairfax)
Wood Turtle (*Glyptemys insculpta*)	ST	VAFWIS, VDCR-DNH (Fairfax)
Peregrine Falcon (*Falco peregrinus*)	ST	VAFWIS (Fairfax)
Loggerhead Shrike (*Lanius ludovicianus)*	ST, SE	VAFWIS, MDNR (Fairfax, Frederick, Montgomery County)
Henslow's Sparrow (*Ammodramus henslowii*)	ST	VAFWIS (Fairfax)
Appalachian Grizzled Skipper (*Pyrgus wyandot*)	ST	VAFWIS (Fairfax)
Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*)	ST	VAFWIS (Fairfax)

Status Codes:

- **E:** Endangered
- **FT** : Federally Threatened
- **ST**: State Threatened
- **SE**: State Endangered
- **FE**: Federally Endangered
- **SX**: Presumed Extirpated