TRI-COUNTY PARKWAY LOCATION STUDY

VDOT PROJECT NUMBER R000-96A-102, PE-101

FEDERAL PROJECT NUMBER STP-5401 (385)

PRINCE WILLIAM, FAIRFAX, AND LOUDOUN COUNTIES, VIRGINIA

DRAFT ENVIRONMENTAL IMPACT STATEMENT
and
DRAFT SECTION 4(F) EVALUATION

Submitted Pursuant to:
42 U.S.C. 4332(2)(c) and 49 U.S.C. 303

Submitted by:
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
and
VIRGINIA DEPARTMENT OF TRANSPORTATION

3/15/05
Date of Approval

Chief Engineer, Virginia Department of Transportation

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Date of Approval

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The proposed action involves the construction of a new north-south transportation link to connect the City of Manassas with I-66 and the Dulles corridor. The study area extends from the interchange of VA 28 and VA 234 in Prince William County, north through Fairfax County to US 50 (John Mosby Highway) in Loudoun County. The study area presently lacks adequate north-south transportation facilities linking the I-66 corridor with the Dulles area and VA 267.

Comments on this draft EIS are due by May 23, 2005 and should be sent to VDOT to the attention of Mr. Earl T. Robb at the aforementioned address.

EXECUTIVE SUMMARY

S.1 PURPOSE AND NEED FOR THE PROJECT

The proposed action involves the construction of a new north-south transportation link to connect the City of Manassas with I-66 and the Dulles corridor. The study area extends from the interchange of VA 28 and VA 234 in Prince William County, north through Fairfax County to US 50 (John Mosby Highway) in Loudoun County. The purpose of the proposed Tri-County Parkway involves the following four key elements:

1. Improve transportation mobility and capacity and by doing so, improve access and reduce congestion.
2. Enhance the linkage of communities and the transportation system that serves those communities.
3. Accommodate social demands, environmental goals and economic development needs.
4. Improve safety and by doing so, reduce the average crash, injury and accident rates on the roadway network.

The study area lacks adequate north-south transportation facilities linking the I-66 corridor with the Dulles area and VA 267. East of US 15 and west of the I-495 (Capital Beltway) only three principal urban arterials connect these roads - VA 28 (Sully Road), Route 7100 (Fairfax County Parkway), and VA 123 (Chain Bridge Road). These north-south facilities are heavily congested and will deteriorate further by the year 2025. Level of Service (LOS) on VA 28 is currently deficient in the a.m. and p.m. peak periods. By 2025, most segments of VA Route 28 northbound in the a.m. and southbound in the p.m. are expected to operate at LOS F or G.

S.2 ALTERNATIVES CONSIDERED

In accordance with 23 CFR 771.123 and FHWA Technical Advisory T 6640.8A, a broad range of preliminary alternatives was identified for consideration and development in the Tri-County Parkway Location Study.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Transportation System Management (TSM) Alternative: The public and agency scoping process initially identified Transportation System Management (TSM) improvements as a possible alternative to construction of the Tri-County Parkway. The intent of the TSM alternative is to maximize the efficiency of the existing transportation system; therefore, it should only consist of minor improvements with little work outside the right-of-way. Major improvements such as the addition of lanes, the wholesale correction of geometric deficiencies, or the reconstruction of an entire route would be considered a separate build alternative and not a TSM alternative. In this instance, however, the 2003 CLRP for the Washington, DC metropolitan region and its companion FY 2004-2009 Transportation Improvement Plan (TIP) as well as the Virginia Department of Transportation's (VDOT) 2005-2010 Six Year Improvement Program already include a wide array of TSM improvements that address the Tri-County Parkway study area. There are no practicable TSM measures beyond those already proposed in the CLRP and VDOT Six Year Plan which could reasonably be implemented to sufficiently satisfy the purpose and need for the Tri-County Parkway. TSM-type improvements programmed into the aforementioned plans do not sufficiently satisfy the project's purpose and need when considered as a stand-alone alternative; therefore, the TSM Alternative was eliminated from further consideration.

Mass Transit Alternative: Improving mass transit in the study area through the expansion of existing transit facilities and services and/or the provision of light rail or other transit systems was initially identified in the scoping process as an alternative to the Tri-County Parkway. After further consideration, it was determined that the nature of the study area makes the identification of a mass transit alternative that can address the corridor's purpose and need problematic. The service areas of the transit authorities operating in the northern Virginia area (WMATA, Potomac and Rappahannock Transportation Commission (PRTC), and Loudoun and Fairfax County Transit systems) serve only portions of the study area. No transit authority exists nor are there plans to establish such an authority whose service area covers or would cover the entire study area. WMATA provides service in Fairfax County (although not within the study area), PRTC in Prince William County and Manassas, and Loudoun and Fairfax County transit authorities serve the respective counties. While WMATA Metrobus and Metrorail service, PRTC bus service and Loudoun County Transit bus service do span jurisdictional lines, the cross-jurisdiction service is commuter service focused on east-west trips destined for

the District of Columbia and inner northern Virginia suburbs, rather than local service. In addition, transportation plans developed for the northern Virginia region do not identify programmed projects to provide transit service in the study area. The CLRP identifies the implementation of east-west rail service along the Dulles Access Road/Toll Road Corridor (as an expansion of express bus service). The CLRP identifies "studies" to provide HOV and transit (feeder and express bus and rail transit) service improvements in the I-66 Corridor between Fauquier County and Arlington County, transit service (priority bus) improvements in the US 50 Corridor between Loudoun County and Arlington County, and light rail (on VA 28) from Manassas to Dulles Airport. These studies have neither financial plans, detailed project scopes, alignments, or costs associated with them, nor are they slated for construction in the CLRP. Finally, the development patterns and traffic patterns and volumes within the study corridor do not favor north-south through movement along the corridor. The majority of trips and greatest volumes are to points outside of the study area or along only a portion of the corridor (i.e., from the Manassas and Centerville areas to I-66 and points east, from the South Riding area to the Dulles corridor). The through volumes are by far the weakest in the study area and would not attract sufficient transit riders to make such service viable; therefore, the Mass Transit Alternative has been eliminated from consideration.

Other Candidate Build Alternatives: Several preliminarily identified candidate build alternatives (CBAs East One, East Two, West One, and West Four) were eliminated from further consideration due to their impacts upon study area resources and their inability to address the objectives of purpose and need. These preliminary CBAs and reasons for their dismissal are discussed in detail in Chapter 2 of this EIS and in the Alternatives Identification and Screening Technical Report (VDOT, 2004).

ALTERNATIVES CARRIED FORWARD FOR DETAILED STUDY

No-Build Alternative

Consistent with the requirements of NEPA and FHWA guidelines, full consideration is given to the environmental consequences of taking no action to meet future travel demand in this DEIS (hereinafter referred to as the "No-Build Alternative"). The No-Build Alternative includes routine maintenance improvements that maintain the continuing operation of the existing roadway network in the study area and currently programmed, committed, and funded roadway and transit projects as included in the 2003 CLRP and the VDOT Six Year Program. Projects already included within the CLRP and VDOT Six Year Program and considered as part of the No-Build include roadway widening and interchange improvements in the VA 28 corridor between the City of Manassas and VA 7, along with an array of TSM improvements to improve the efficiency of vehicles traveling along the roadways in the study area. The No-Build Alternative, while having minor direct construction impacts, would result in other economic, environmental, and quality of life impacts that can be expected from the continuation of roadway system deficiencies. While the No-Build Alternative does not meet the project needs for traffic, safety, and roadway infrastructure improvements, it provides a baseline condition with which to compare the improvements and consequences associated with the CBAs.

Candidate Build Alternatives (CBAs)

Three north-south alignments or CBAs have been carried forward for detailed study in the EIS (the West Two CBA, the West Four CBA, and the Comprehensive Plan CBA). Each CBA consists of two or more general design cross-section segments. The regional travel demand model analysis suggests that, overall, the West Two, West Four, and Comprehensive Plan CBAs provide material and relatively equal travel time savings, reductions in delay, and capacity improvement during peak hour travel. There are unique and distinct transportation advantages and disadvantages to individual sub-areas within the study area that are impacted differently depending on the CBA; however, on an overall study area basis, the aforementioned alternatives perform comparatively well, based upon the quantitative measures of capacity, travel time, and delay.

The West Two CBA: The West Two CBA impacts the least amount of floodplain and historic sites and does not impact any public facilities. It is second lowest of the build alternatives in impacts to neighborhoods, parks, stream crossings, and wetlands. Qualitatively, this alternative does not serve the system and community linkage needs as well as the West Four CBA or the Comprehensive Plan CBA. It addresses social and economic demands as well as the West Four CBA but not as well as the Comprehensive Plan CBA (which performs the best of all CBAs). The West Two CBA addresses safety needs in a manner comparable to the

West Four CBA and the Comprehensive Plan CBA. From a traffic modeling standpoint, the West Two and West Four CBAs result in similar increases in study area VMT as compared to No-Build and rank second to the Comprehensive Plan CBA (which results in the smallest increase in VMT). This CBA is anticipated to have service levels ranging between C and D over its entire length. These are indicative of moderate, but not severe congestion during the peak hour. The West Two CBA affects the largest decrease in the hours of peak delay over the No-Build Alternative, although it results in a slight increase in the amount of peak deficient VMT when compared to the No-Build Alternative.

The West Four CBA: The West Four CBA ranks the lowest of the build alternatives in impacts to neighborhoods, second lowest in impacts to historic resources, and in the middle range of alternatives for impacts to other resource areas. As with the Comprehensive Plan CBA, it does not impact public facilities. This alternative is second only to the Comprehensive Plan CBA in meeting system and community linkage needs and performs the same as the West Two CBA relative to social and economic demands and safety. The West Four CBA performs very similar to the West Two CBA in the traffic and highway quantitative screening process. VMT increases and LOS are similar to the West Two CBA. West Four CBA increases the amount of peak deficient VMT slightly over the No-Build Alternative; however, it betters the No-Build Alternative in decreasing the hours of peak delay (although not as well as the West Two CBA).

The Comprehensive Plan CBA: The Comprehensive Plan CBA (along with the West Two CBA) impacts the fewest number of historic sites. Despite the environmental impacts associated with it, the Comprehensive Plan CBA is being carried forward because of it has been supported by the jurisdictions in the study area through their comprehensive planning process; presently, four of the five jurisdictions in the study area have included the alignment of the Comprehensive Plan CBA in their planning documents. However, FHWA may not be able to support this alternative because of its impacts to public parks and historic sites given the legal standard established by Section 4(f) of the Department of Transportation Act of 1966. Further, in their review of the preliminary Draft Environmental Impact Statement, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers have expressed concerns about the permitability of the Comprehensive Plan CBA under Section 404 given the LEDPA standard that the Corps is bound by (the least environmentally damaging project alternative). Notwithstanding, the Comprehensive Plan CBA also avoids public facility takings. It does, however, have the greatest impact of the CBAs on floodplains, parks, and wetlands, and ranks second among CBAs in impacts to neighborhoods and stream crossings. The Comprehensive Plan CBA is the best of the CBAs in meeting system and community linkage needs and satisfying social and economic demands as well as reducing peak deficient VMT and minimizing increases in overall VMT. It is also among the top ranked alternatives in addressing safety needs. While the Comprehensive Plan CBA will result in decreased levels of peak delay compared to the No-Build Alternative, it ranks second to the West Two CBA in its effectiveness. LOS conditions exhibit greater variation in this alternative compared to the West Two CBA and the West Four CBA - ranging between LOS B and F.

S.3 SUMMARY OF IMPACTS

Potential impacts are described in the EIS using a 600-foot-wide assessment corridor. The probable footprint of construction will vary throughout the selected corridor; however, it is known that the average width of construction and right-of-way will be significantly narrower than the 600-foot-wide assessment corridor. Although this use of a 600-foot-wide assessment corridor results in an over-statement of reasonably expected impacts, subjecting all alternatives to a standardized assessment area of uniform width allows the alternatives to be assessed on the basis of their comparative merits. If a CBA is selected for construction, future design efforts would provide opportunities to further avoid and minimize impacts within the 600-foot-wide corridor. The exception to this standard is waters of the U.S. which, because site-specific delineations were conducted, allowed in the body of the EIS a discussion of effects within a 200-foot-wide average limits of construction. Table S-1 presents the primary consequences associated with the various alternatives within the Tri-County Parkway study area.

TABLE S-1: ENVIRONMENTAL IMPACT ASSESSMENT MATRIX

Assessment Factor	Issue / Resource	No-Build [1]	West Two	West Four	Comp Plan
Relative Effectiveness of Satisfying Purpose and Need	Improve Mobility and Capacity	not effective	effective	effective	effective
	Enhance the Linkage of Communities and the Transportation System	not effective	effective	effective	effective
	Accommodate Social Demands and Economic Development Needs	not effective	effective	effective	effective
	Improve Safety	not effective	effective	effective	effective
Land Use Impacts	Agriculturally Zoned (acres)	2.8	353	281	0
	Residentially Zoned (acres)	0.3	3	95	463
	Commercially / Industrially Zoned (acres)	4.2	42	91	150
	Public Facilities (acres)	0.1	1	1	60
	Public Parks (acres)	4.2	42.1	42.1	212.2
Farmlands	Prime Farmlands (acres)	10.1	132.1	101.1	79.0
	Agricultural and Forestal Districts (acres)	0	0	21.9	65.7
Public Parklands	Section 4(f) & Section 106 Parkland Encroachments (acres)	0	42.1	42.1	212.2
	Effect on Park Visual Experience	no effect	effect, not adverse	effect, not adverse	adverse effect
	Effect on Internal Park Mobility and Access	adverse effect	effect, not adverse	effect, not adverse	adverse effect
	Consistent with Resource Management Plan	not consistent	consistent	consistent	not consistent
Recreational Resources and Open Space	Private Parks or Recreational Resources Affected (acres)	0	6.1	6.1	0
	Designated Open Space Affected (acres)	0	0	0	0
Visual Impacts	Number of Adversely Affected Visually Sensitive Areas	1	1	1	2
Socioeconomics / Relocations	Capital Costs	N/A	$201,174,000	$176,674,000	$547,826,000
	Number of Residences Relocated	0	21	13	22
	Number Non-Profit/Community Facilities Relocated	0	0	0	1
	Number of Commercial Businesses Relocated	0	0	0	3
	Lost Tax Revenue (dollars)	0	210,206	194,641	399,509
	Number of Communities or Neighborhoods Affected	0	4	1	12
Environmental Justice	Minority Population Affected (number of individuals)	10	96	273	1,581
	Low-Income Population Affected (number of individuals)	9	93	197	1,611
Hazardous Materials	Number of Sites Encroached Upon	0	1	1	5
	Number of Nearby Sites With Potential Pathways	0	19	29	91
Cultural Resources[2]	Number of Prehistoric and Historic Archaeological Resources Affected	0	11	7	23
	Number of Historic Architectural Resources Adversely Affected	0	2	1	1
Air Quality	Relative Conformity With State or Regional Plans	does not conform	fully conforms	fully conforms	fully conforms
Noise	Number of Noise Sensitive Receptors Affected (loudest hour)	0	66	115	852
	Costs of Noise Abatement (millions of dollars)	0	9.481	7.694	13.193
Surface Water Resources	Stormwater Pollutant Loading Expressed as a Function of Water Quality Volume (cubic feet)	31,265	312,650	388,700	515,450
	Number of Sites of Potential Contamination Located Upstream of a Public Water Supply	0	6	2	6
	Perennial Streams Affected (linear feet)	750	7,503	8,431	27,070
	Intermittent Streams Affected (linear feet)	1,377	16,574	13,765	16,297
	Ephemeral Streams Affected (linear feet)	21	214	214	3,508
	Open Water Bodies Affected (acres)	0.8	9.11	13.33	8.10

Assessment Factor	Issue / Resource	No-Build [1]	West Two	West Four	Comp Plan
Groundwater Resources	Number of Sole Source Aquifers Affected	0	0	0	0
	Number of Wellhead Protection Areas Affected	1	3	3	7
Floodplains / Floodways	100-Year Floodplain Encroachment (acres)	2.69	26.9	39.4	287.8
	Number of Regulated Floodways Crossed	0	4	6	7
Terrestrial Ecology	Forest Land Habitat Affected (acres)	27.8	338.2	277.5	440.3
	Agricultural Land Habitat Affected (acres)	14	202.4	223.8	140.2
	Transitional Land Habitat Affected (acres)	3.2	31.5	81.1	120.6
Aquatic Ecology	Benthic Habitat Affected (linear feet of stream)	2,220	24,077	22,196	43,367
	Seasonally Flooded Aquatic Habitat Affected (expressed in acres as a function of floodplain effects)	2.69	26.9	39.4	287.8
Waters of the U.S.[3], Including Wetlands	Acreage of Wetlands Affected	2.27	22.72	36.35	49.29
	Acreage of Mitigation Required	3.37	33.71	55.28	82.05
Wild & Scenic Rivers	Number of National Wild & Scenic Rivers Affected	0	0	0	0
	Number of State Wild & Scenic Rivers Affected	0	0	0	0
Threatened & Endangered Species	Documented Presence of Federally Listed T&E Species	0	0	0	0
	Documented Presence of State Listed T&E Species	0	0	0	0
	Potential Habitat for Federal-Listed T&E Species (No. Sites)	0	1	1	0
	Potential Habitat for State-Listed T&E Species (No. Sites)	0	0	0	0
Biodiversity	Number of Wildlife Corridors Bisected or Disrupted	0	2	2	1
	Inner-Core Forest Habitat Affected (acres) [4]	13.9	169.1	138.8	220.2
	Number of B4 or B5 BRANK Sites Affected	0	0	1	1

[1] Assumes that effects associated with the TSM components of the No-Build alternative (the base case) are equivalent to roughly 10 percent of lowest CBA effect.
[2] All cultural resources identified in this table are NRHP-listed or NRHP-eligible.
[3] Non-Wetland Waters of the U.S. are addressed under Surface Water Resources as Perennial and Intermittent Streams and Water Bodies.
[4] Assumes that 50% of total forest acreage is inner-core.

S.4 COMMENTS AND COORDINATION

On 1 March 2002, VDOT distributed a letter inviting federal, state, and local agencies along with political representatives to attend a 20 March 2002 Agency Scoping Meeting. The 1 March 2002 letter was accompanied by a March 2002 color brochure titled "Tri-County Parkway Location Study Scoping Information Document". The letter and brochure was distributed to the three representatives from the U.S. Congress, the two representatives of the U.S. Senate, 12 federal agencies (including their various divisions and field offices), 21 state agencies (including their various divisions and field offices), nine regional agencies, 66 agencies of the four local jurisdictions affected by the project, and two other uncategorized parties. Parties to who the invitation letter and information brochure were sent are listed in the "Distribution List" section of the March 2002 information brochure (see Section 6.0 of this EIS). A week prior to the Agency Scoping Meeting, similar material was sent to each of the County Board of Supervisor Chairpersons and Supervisors representing districts impacted by the project in Prince William, Fairfax, and Loudoun counties.

Additional project scoping was accommodated primarily through Inter-Agency Coordination Meetings (IACMs). Agencies participating in the IACMs included VDOT, FHWA, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (COE), U.S. Fish and Wildlife Service (FWS), National Marine Fisheries, Virginia Department of Environmental Quality (DEQ), Virginia Department of Game and Inland Fisheries (DGIF), Virginia Institute of Marine Sciences (VIMS), Virginia Marine Resources Commission (VMRC), Virginia Department of Historic Resources (DHR), and the Virginia Department of Conservation and Recreation (DCR). Additional agency coordination included meetings, phone conferences, and data exchanges with the National Park Service (NPS) and the Northern Virginia Regional Parks Authority (NVRPA). Coordination with the Natural Resources Conservation Service (NRCS) was provided to secure identification and rating of prime farmlands in the study area.

S.5 APPROVALS REQUIRED

Construction of the Tri-County Parkway would result in several actions requiring environmental regulatory permits. These include:

- Corps of Engineers authorization for work in waters of the U.S. (including wetlands) under Section 404 of the Clean Water Act
- Authorization from the Virginia Marine Resources Commission for construction in state subaqeuous lands under Title 62.1 of the Code of Virginia
- Virginia Department of Environmental Quality authorization for work in waters of the state under the Virginia Water Protection Permit program.

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Tri-County PARKWAY Location Study

Table of Contents

LIST OF TABLES

LIST OF FIGURES

List of Appendices

1.0 PURPOSE AND NEED

1.1 STUDY AREA

The Tri-County Parkway Location Study evaluates a new north-south transportation link in Northern Virginia that will connect the City of Manassas with I-66 and the Dulles corridor. The corridor begins in the north at the intersection of US 50 and Route 606 (Old Ox Road) and extends to the south at the interchange of VA 28 / VA 234. It is approximately 15 miles long and traverses portions of the counties of Prince William, Fairfax, and Loudoun along with the cities of Manassas and Manassas Park. Figure 1.3-1 illustrates the project from a regional perspective, while Figure 1.3-2 depicts the study area within which alternatives have been evaluated.

1.2 HISTORY

The need for a new north-south transportation link connecting the City of Manassas with I-66 and the Dulles corridor was first identified during the development of the transportation element of the comprehensive plans for Prince William, Fairfax, and Loudoun counties. This proposed connection has been the subject of many local studies and plans, and has been known by many names throughout the years. In Prince William County, a version of this connection has been referred to as the "Route 28 Bypass" and in Loudoun County a version of this connection has been known as the "Loudoun County Parkway". Several conceptual alignments through Fairfax County were considered even before it was first proposed in their comprehensive plan. Versions of a north-south connector (hereinafter referred to as the "Tri-County Parkway") have been incorporated into the three counties' comprehensive plans for over ten years. Tri-County Parkway has also been adopted by the Metropolitan Washington Council of Governments (MWCOG), and has been included in their Constrained Long-Range Plan (CLRP) and Transportation Improvement Program (TIP).

1.3 NEED FOR THE PROJECT

The need for the project is based on current and future transportation network deficiencies, system linkage, social and economic development needs, and safety. The following provides a discussion of need-related issues which influence traffic conditions within the study area. A more-detailed discussion of these issues is contained in the Purpose and Need Technical Report (VDOT, 2004).

1.3.1 MOBILITY, CAPACITY AND CONGESTION

1.3.1.1 Existing Conditions

Due to increasing regional development and traffic volumes, mobility and capacity is presently less than desirable within certain portions of the study area. Also, as a result of these factors, congestion is currently a problem within the study area. An analysis of travel speeds in the morning and afternoon peak periods shows problems along US 50, US 29, VA 234 Business, and VA 28 (Interstate 66 was not included in this analysis, though it too experiences congested conditions). Average travel speeds in the peak direction on these roadways drops below 20 miles per hour for long segments, indicative of severe congestion. More-detailed discussion of these issues is provided in the Transportation and Traffic Technical Report (VDOT, 2004). Appendix A (Traffic Speed Data Charts) of the Technical Report shows maps of current areas of congestion and charts illustrating average travel speeds on area roadways.

1.3.1.2 Future Conditions

The study area is located in a region poised to substantially increase in population and employment over the next 25 years. Consequently, the demand for travel within the study area will increase. Work trips destined for inside the study area (representing a subset of total travel demand with the greatest impact on morning and afternoon congestion) will increase from 37,967 in 2005 to 53,527 in 2030, a 41 percent increase. Work trips destined for areas to the north of the study area, such as the Dulles/Sterling/Ashburn area and the Reston/Herndon/Dulles Corridor area where many technology-related jobs are located, are expected to nearly double from 22,535 in 2005 to 42,139 in 2030.

Of particular note are the expected large increases in travel demand from the South Riding area and the Gainesville/Catharpin area. The other two areas within the study window, Manassas and Centreville, are largely built-out today and show modest increases in the number of work trips destined for the study area of 6 to 19 percent for a 2030 forecast year. On the other hand, work trips destined for the study area from the Gainesville/Catharpin area are expected to grow by 129 percent (from 3,420 to 7,841) and from the South Riding area by 276 percent (from 2,513 to 9,441) between 2005 and 2030. Work trips from Gainesville/Catharpin and South Riding destined for areas to the north (Dulles/Sterling/Ashburn and Reston/Herndon/Dulles Corridor) are expected to grow at similarly aggressive rates of 129 percent (1,731 to 3,530) and 275 percent (3,028 to 13,752), respectively. These increases in travel demand are expected to increase the traffic volumes on area roadways and worsen the level of congestion considerably. Model results indicate that overall congestion in 2030 will be far worse than in 2005. Table 1.3-1 shows the existing and predicted future average daily traffic (ADT) volumes for roadways located within the study area.

TABLE 1.3-1
EXISTING AND FUTURE TRAFFIC VOLUMES

Route and Location	Existing ADT	Future ADT
Godwin Drive – VA 28 to Wellington Drive	20,000	11,100
Godwin Drive – Wellington Drive to VA 234 Business	37,600	11,300
Existing Loudoun County Parkway – Braddock Road to US 50	7,500	26,200
VA 234 Bypass – Balls Ford Rd to Wellington Rd	21,700	91,200
VA 234 Bypass – south of I-66	29,000	105,800
VA 28 – VA 234 Bypass to Wellington Road	17,000	19,600
VA 28 – North of Lomond Dr/Liberia Ave	41,100	57,100
VA 28 – South of I-66	62,000	121,500
I-66 – West of US 29 interchange (Centreville)	41,400	188,600
I-66 – West of VA 234 Bypass interchange	78,600	199,200
VA 234 Business – north of Godwin Drive	24,000	27,000
VA 234 Business – south of Godwin Drive	34,200	22,500
Braddock Road – east of Gum Springs Road	8,000	17,100
US 50 – east of Gum Springs Road	16,200	32,900
Proposed VA 659 Relocated – north of US 50	N/A	30,400
Loudoun County Parkway – north of US 50	15,700	35,900
US 29 – east of I-66/Gainesville interchange	6,700	19,300
US 29 – east of I-66/Centreville interchange	36,200	36,200

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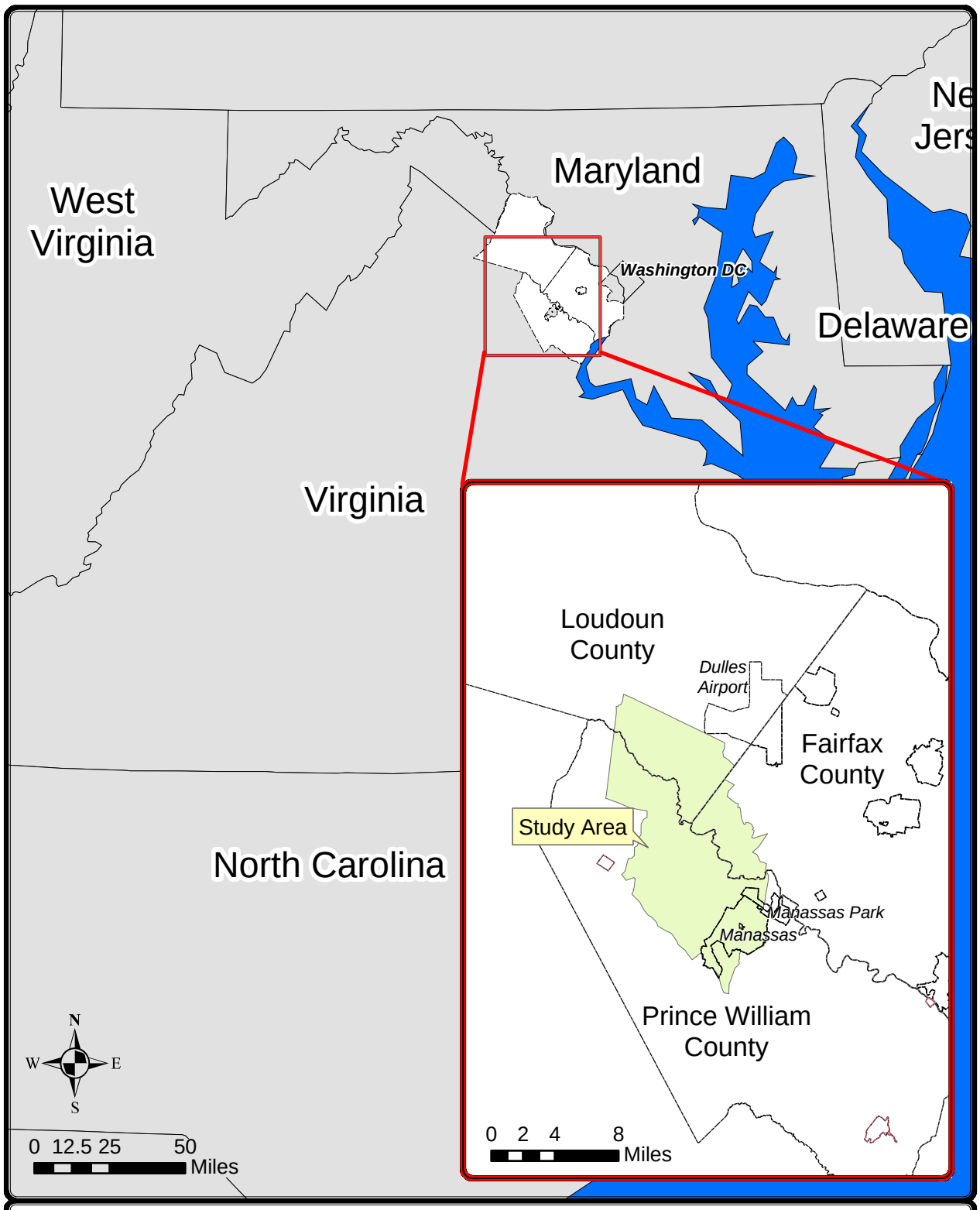
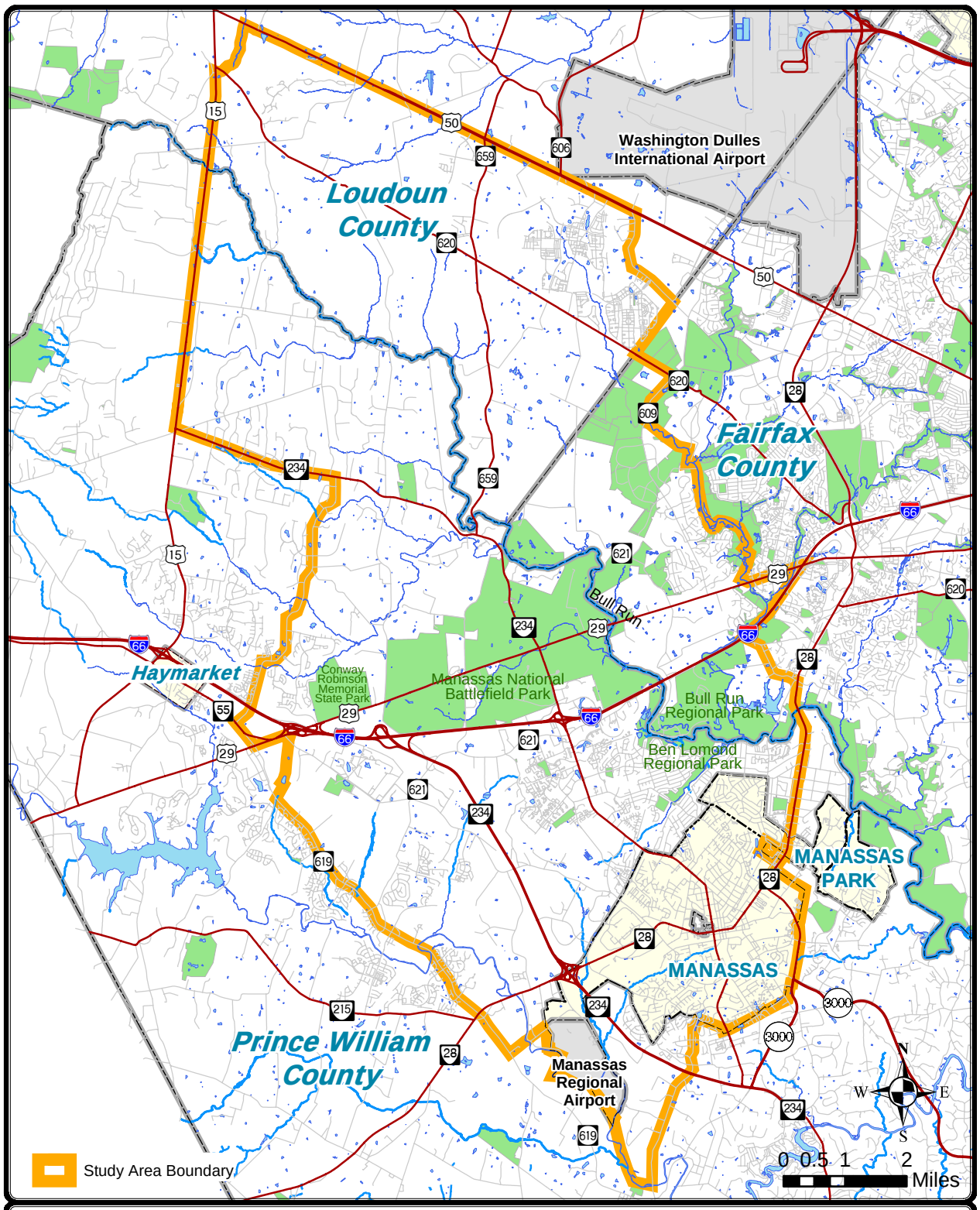


Tri-County PARKWAY Location Study

FIGURE 1.3-1
REGIONAL LOCATION MAP



Tri-County PARKWAY Location Study

FIGURE 1.3-2
STUDY AREA MAP

1.3.2 SYSTEM AND COMMUNITY LINKAGE

1.3.2.1 Existing Conditions

The southern terminus (City of Manassas) and the northern terminus (Washington Dulles International Airport) of the study area are characterized by rapidly growing populations and employment centers. These areas are served by primary, multimodal, east-west transportation corridors – namely, I-66 in the south and the Washington Dulles Access and Toll Road and Dulles Greenway in the north. The study area lies east of US 15 and west of the I-495 (Capital Beltway). Only three principal urban arterials connect these roads, VA 28 (Sully Road), Route 7100 (Fairfax County Parkway), and VA 123 (Chain Bridge Road). Existing north-south transportation linkages connecting Manassas, I-66, Washington Dulles International Airport and the Washington Dulles Access and Toll Road, and Dulles Greenway are limited.

The issue of connectivity is further exasperated when there is insufficient access between jobs and housing. Currently, within the study area, there are more jobs than residents and the majority of these residents live to the south in Prince William County and the City of Manassas and typically work closer to Washington D.C. Efficient connectivity of jobs and housing in the study area is lacking.

Table 1.3-2 illustrates this lack of connectivity as a function of the level of service (LOS) currently experienced on roadways within the study area. LOS is a commonly used measure referring to the degree of roadway or intersection congestion. LOS is typically described using a letter scale from "A" to "F", with "A" representing the best service and "F" representing the worst. In this analysis, an additional letter "G" was added to indicate congestion where traffic volumes far outstrip available roadway capacity. Table 1.3-3 describes the various levels of service and Table 1.3.4 shows the volume to capacity ratios used to define LOS in this study.

TABLE 1.3-2
EXISTING ADT AND LOS (INTERSTATE AND U.S. ROUTES)

Route and Location	ADT	AM LOS[5]	PM LOS[5]
I-66 from Fauquier/Prince William county line to US 15[2]	30,200	B	C
I-66 from US 15 to US 29 (Gainesville)[2]	41,400	C	C
I-66 from US 29 (Gainesville) to VA 234 Bypass[2]	76,100	E	E
I-66 from VA 234 Bypass to VA 234[2]	78,600	E	F
I-66 from VA 234 to US 29 (Centreville)[2]	103,400	E	E
I-66 from US 29 to VA 28[2]	141,100	E	F
US 15 from US 29 to I-66[2]	10,000	B	B
US 15 from I-66 to VA 234[2]	13,500	C	D
US 15 from 234 to VA 701[2]	15,700	C	C
US 15 from VA 701 to US 50[3]	13,000	D	E
US 29 from US 15 to VA 55[2]	37,700	D	D
US 29 from VA 55 to I-66 (Gainesville)[2]	56,600	D	E
US 29 from I-66 (Gainesville) to Prince William/Fairfax county line[4]	6,700	D	E
US 29 from Prince William/Fairfax county line to I-66 (Centreville)[4]	13,000	E	E
US 29 from I-66 (Centreville) to VA 28[4]	34,000	E	F
US 50 from US 15 to VA 606[3]	16,200	D	E
US 50 from VA 606 to Loudoun/Fairfax county line[3]	29,100	C	C
US 50 from Loudoun/Fairfax county line to VA 28[4]	40,000	D	E

Sources:
[1] Tri-County Parkway Traffic Count Program (City of Manassas), 2002;
[2] Interstate 66 Traffic Count Program, 2000 and 2001;
[3] Other VDOT study area traffic counts, 1999;
[4] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes on Interstate, Arterial and Primary Routes, 2000;
[5] Metropolitan Washington Council of Governments Conformity Model Outputs, 2000.

TABLE 1.3-3
LOS DESCRIPTIONS

LOS	Description	Congestion Level
A	Free traffic flow with low volumes and high speeds. Speeds controlled by driver desires, speed limits, and roadway physical conditions.	Low
B	Stable traffic flow, with operating speeds remaining near free flow. Drivers still have reasonable freedom to maneuver.	Low
C	Stable flow, but with higher volumes, more closely controlled speeds and maneuverability.	Moderate
D	Approaching unstable flow with tolerable operating speeds maintained, but considerably affected by changes in operating conditions.	Moderate
E	Unstable flow with low speed and momentary stoppages.	Severe
F	Forced flow with low speed. Stop-and-go with stoppages for long periods are possible.	Severe

Source: Highway Capacity Manual, Transportation Research Board, 2000.

TABLE 1.3-4
LEVEL OF SERVICE CRITERIA

LOS	Max V/C (Freeway segments)	Max V/C (Arterial and Collector segments)
G	unlimited	unlimited
F	1.15	1.15
E	1.00	1.00
D	0.90	0.85
C	0.74	0.64
B	0.53	0.44
A	0.32	0.27

Source: Highway Capacity Manual, Transportation Research Board, 2000.

The most severe congestion experienced within the study area is currently along VA 28. The traffic pattern shows significant peaking with northbound flows severely congested in the a.m. and southbound flows severely congested in the p.m. The areas of greatest delay are between the City of Manassas Park and the Loudoun/Fairfax county line near Dulles Airport. I-66 follows a similar peaking pattern (eastbound in the a.m., westbound in the p.m.), though the level of service experienced is marginally better. Other roadways currently experiencing LOS F or G in either peak period are US 29 from I-66 (Centreville) to VA 28, VA 234 from I-66 to Godwin Drive, VA 234 Business from VA 28 to VA 674, and various segments along VA 659, VA 609, and VA 662.

1.3.2.2 Future Conditions

By 2030, the lack of adequate north-south transportation links within the study area will continue to result in significant traffic congestion during peak a.m. and p.m. travel times. Table 1.3.5 shows the greatest delays continue to exist between the City of Manassas Park and the Loudoun/Fairfax county line near Dulles Airport; however, traffic volumes on many of these roadways will far outstrip available roadway capacity and will experience LOS F or G in either peak period. Transportation improvements, particularly those that add north-south capacity, will enhance the overall transportation system and will promote access between jobs and housing within the study area.

TABLE 1.3-5
FUTURE ADT AND LOS (INTERSTATE AND U.S. ROUTES)

Route and Location	ADT	AM LOS[5]	PM LOS[5]
I-66 from Fauquier/Prince William county line to US 15[2]	82,900	G	G
I-66 from US 15 to US 29 (Gainesville)[2]	131,000	G	G
I-66 from US 29 (Gainesville) to VA 234 Bypass[2]	202,100	G	G
I-66 from VA 234 Bypass to VA 234[2]	177,500	F	G
I-66 from VA 234 to US 29 (Centreville)[2]	193,300	G	G
I-66 from US 29 to VA 28[2]	187,600	G	G
US 15 from US 29 to I-66[2]	34,700	B	C
US 15 from I-66 to VA 234[2]	41,900	C	E
US 15 from 234 to VA 701[2]	33,500	D	D
US 15 from VA 701 to US 50[3]	22,400	G	G
US 29 from US 15 to VA 55[2]	67,000	G	G
US 29 from VA 55 to I-66 (Gainesville)[2]	83,100	G	G
US 29 from I-66 (Gainesville) to Prince William/Fairfax county line[4]	20,700	G	G
US 29 from Prince William/Fairfax county line to I-66 (Centreville)[4]	36,500	E	E
US 29 from I-66 (Centreville) to VA 28[4]	50,400	F	E
US 50 from US 15 to VA 606[3]	42,700	G	G
US 50 from VA 606 to Loudoun/Fairfax county line[3]	44,500	F	G
US 50 from Loudoun/Fairfax county line to VA 28[4]	72,700	F	G

Sources:
[1] Tri-County Parkway Traffic Count Program (City of Manassas), 2002;
[2] Interstate 66 Traffic Count Program, 2000 and 2001;
[3] Other VDOT study area traffic counts, 1999;
[4] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes on Interstate, Arterial and Primary Routes, 2000;
[5] Metropolitan Washington Council of Governments Conformity Model Outputs, 2000.

1.3.3 SOCIAL DEMANDS AND ECONOMIC DEVELOPMENT NEEDS

1.3.3.1 Existing Conditions

To address ever-increasing regional development and traffic volumes, the need to provide a sufficient north-south transportation link connecting Manassas, I-66, Washington Dulles International Airport, the Washington Dulles Access and Toll Road, and Dulles Greenway will continue to be vital to regional transportation and economy. Goods movement is an important factor to consider when evaluating improvements to the transportation system of the study area, and is also considered by businesses seeking to locate in the area. The movement of goods has an impact on traffic generation, capacity, and vehicle mix.

In addition, recreation, shopping, and related trips to area facilities and attractions add to congestion during both peak and off-peak periods. The Manassas National Battlefield Park received nearly 800,000 visitors during 2003 and the newly opened National Air and Space Museum is expected to receive approximately three million visitors in 2004. These facilities and other recreational attractions add to the congestions already being experienced along study area roadway.

Increased congestion and the lack of a north-south transportation link also contribute to longer emergency response times for police, fire, and rescue services.

1.3.3.2 Future Conditions

The ability of each county to address transportation needs is vital to accommodate existing business and attract new ones. To this end, each county has identified economic development corridors that will promote business development. These corridors are identified in each county's comprehensive plan and include: VA

28, US 50, VA 234, US 29, Loudoun County Parkway, and the Dulles Greenway among others. The Tri-County Parkway is listed as a priority in accomplishing these goals.

As discussed in Section 1.3.1, traffic volumes are expected to increase significantly by 2030. This increase is due, in part, to expected population and employment growth within the study area. This is further exacerbated by the lack of adequate north-south transportation links connecting housing and employment centers. As the study area develops, it will become more difficult for the current transportation system to (1) provide efficient connectivity of jobs and housing in the study area, (2) provide additional access to the area's parks, recreation sites, community facilities and services, and (3) handle the movement of goods necessary to serve the growing number of homes and businesses. More-detailed discussion of these issues is provided in the Socioeconomic Technical Report (VDOT, 2004).

1.3.4 SAFETY

1.3.4.1 Existing Conditions

Safety is a concern within the study area. Average crash and injury rates in the study area exceed statewide average rates on primary roads, secondary roads, and interstate facilities. Many roadway segments exhibit crash rates more than twice the state average. Many of the locations with above-average rates are along north-south facilities within the study area. For each mile traveled on VA 234 Business (Sudley Road) from the northern boundary of Manassas and Prince William County to just before the I-66 interchange, a driver is 6.4 times more likely to experience a crash than on an average primary system roadway within the region or 7.9 times more likely than on a similar average facility within the Commonwealth. Since crash rates fluctuate from year to year based on a variety of factors, for this analysis a single rate was determined for a four-year study period (1997-2000). A summary of the average crash rates in the study area is presented in Table 1.3-6.

TABLE 1.3-6
INCIDENT RATES FOR AREA ROADWAYS

FACILITY	LIMITS	CRASH RATE	INJURY RATE	DEATH RATE
VA 28	Fauquier/Prince William Co line to WCL Manassas	102.62	44.41	0.60
	within the City of Manassas	429.72	157.43	0.80
	City of Manassas Park to Fairfax Co line	224.84	90.39	0.56
	Fairfax Co line through I-66 interchange	218.73	90.57	1.07
	north of I-66 interchange to Loudoun Co line	81.78	32.08	0.36
VA 234	Prince William Parkway to SCL Manassas	198.64	88.68	0.00
	SCL Manassas to Godwin Drive	602.44	264.85	0.93
	NCL Manassas to before I-66 interchange	1247.64	547.99	5.86
	I-66 interchange through US 29 intersection	489.44	220.38	2.56
	north of US 29 intersection to US 15	181.97	76.53	1.70
US 50	US 15 through VA 659 Gum Spring Road intersection	90.77	34.20	0.66
	after VA 659 to VA 609 Pleasant Valley intersection	71.93	30.41	1.17
	after VA 609 to VA 28 Sully Road	125.29	49.60	0.00
US 29	Fauquier/Prince William co line to VA 674 Wellington	197.86	78.63	0.37
	I-66 interchange (Gainesville) through VA 234 intersection	129.89	52.79	0.84
	after VA 234 to before I-66 interchange (Centreville)	180.18	80.74	0.00
	I-66 interchange (Centreville) to VA 28 Sully Road	561.45	230.92	0.00
I-66	Fauquier/Prince William co line through Haymarket	28.15	10.12	0.88
	US 29 (Gainesville) interchange to before VA 234	27.44	11.22	0.00
	VA 234 interchange to Prince William/Fairfax co line	64.92	24.20	0.20
	US 29 (Centreville) and VA 28 interchanges	132.37	43.75	1.12
Godwin Drive	VA 234 bypass/VA 28 to VA 234 Sudley Road	321.53	195.93	2.51
Wellington	US 29 to before VA 234 bypass intersection	132.68	46.33	0.00

FACILITY	LIMITS	CRASH RATE	INJURY RATE	DEATH RATE
Road	VA 234 bypass intersection to VA 28	352.74	122.24	0.00
Liberia Ave/ Lomond Dr.	Prince William Parkway through VA 28 intersection	485.87	228.88	0.00
	Mathis Ave intersection to WCL Manassas	707.99	252.56	0.00
	WCL Manassas to VA 234	397.07	130.93	0.00
Gum Spring Road (659)	VA 234 Sudley Road to US 50	172.05	70.85	5.06
Sanders Ln/ Pageland Ln/ Lightridge Farm Road (705)	US 29 to VA 620 Braddock Road	113.80	64.01	0.00
Pleasant Valley Road	US 29 to before VA 620 Braddock Road	188.23	78.71	3.42
	VA 620 Braddock Road to US 50	459.43	209.57	8.06
Bull Run Post Office Road/Elk Lick Road (621)	VA 658 Compton Road to US 50	447.27	263.78	0.00

Source: VDOT Statewide Crash Statistics, Fairfax, Loudoun, and Prince William Counties; 1997, 1998, 1999, and 2000.

1.3.4.2 Future Conditions

As the study area develops and as traffic volumes and the number of vehicle miles of travel increase, it will become more difficult to manage and reduce those safety concerns addressed above. Crash and injury rates in the study area will continue to exceed statewide average rates on primary roads, secondary roads, and interstate facilities. A summary of the number of crashes expected to occur in the future (2030) is presented in Table 1.3-7. These numbers are based on the same crash rate developed for the existing condition and applied to the number vehicle miles of travel predicted for the future condition. A more-detailed discussion of safety issues is contained in the Transportation and Traffic Technical Report (VDOT, 2004).

TABLE 1.3-7
EXPECTED INCIDENTS FOR AREA ROADWAYS

FACILITY	LIMITS	EXPECTED CRASHES	EXPECTED INJURIES	EXPECTED DEATHS
VA 28	Fauquier/Prince William Co line to WCL Manassas	63	27	0
	within the City of Manassas	166	61	0
	City of Manassas Park to Fairfax Co line	71	28	0
	Fairfax Co line through I-66 interchange	135	56	1
	north of I-66 interchange to Loudoun Co line	365	143	2
VA 234	Prince William Parkway to SCL Manassas	9	4	0
	SCL Manassas to Godwin Drive	89	39	0
	NCL Manassas to before I-66 interchange	366	161	1
	I-66 interchange through US 29 intersection	53	24	0
	north of US 29 intersection to US 15	48	20	0
US 50	US 15 through VA 659 Gum Spring Road intersection	39	15	0
	after VA 659 to VA 609 Pleasant Valley intersection	33	14	1
	after VA 609 to VA 28 Sully Road	47	19	0
US 29	Fauquier/Prince William co line to VA 674 Wellington	141	56	0
	I-66 interchange (Gainesville) through VA 234 intersection	30	12	0
	after VA 234 to before I-66 interchange (Centreville)	60	27	0
	I-66 interchange (Centreville) to VA 28 Sully Road	58	24	0
I-66	Fauquier/Prince William co line through Haymarket	49	18	2
	US 29 (Gainesville) interchange to before VA 234	63	26	0
	VA 234 interchange to Prince William/Fairfax Co line	57	21	0

FACILITY	LIMITS	EXPECTED CRASHES	EXPECTED INJURIES	EXPECTED DEATHS
	US 29 (Centreville) and VA 28 interchanges	292	97	2
Godwin Drive	VA 234 bypass/VA 28 to VA 234 Sudley Road	21	13	0
Wellington Road	US 29 to before VA 234 bypass intersection	15	5	0
	VA 234 bypass intersection to VA 28	20	7	0
Liberia Ave/ Lomond Dr.	Prince William Parkway through VA 28 intersection	139	65	0
	Mathis Ave intersection to WCL Manassas	24	8	0
	WCL Manassas to VA 234	29	10	0
Gum Spring Road (659)	VA 234 Sudley Road to US 50	86	35	3
Sanders Ln/ Pageland Ln/ Lightridge Farm Road (705)	US 29 to VA 620 Braddock Road	15	8	0
Pleasant Valley Road	US 29 to before VA 620 Braddock Road	26	11	0
	VA 620 Braddock Road to US 50	48	22	1
Bull Run Post Office Road/Elk Lick Road (621)	VA 658 Compton Road to US 50	80	47	0

1.4 PURPOSE AND PROBLEM STATEMENT SUMMARY

The purpose of the project involves the following four key elements.

1. Improve transportation mobility and capacity and, by doing so, improve access and reduce congestion.
2. Enhance the linkage of communities and the transportation system that serves those communities.
3. Accommodate social demands and economic development needs.
4. Improve safety and, by doing so, reduce the average crash, injury, and accident rates on the roadway network.

The study area presently lacks adequate north-south transportation facilities linking the I-66 corridor with the Dulles area and VA 267.

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2.0 ALTERNATIVES

In accordance with 23 CFR 771.123 and FHWA Technical Advisory T 6640.8A, a broad range of preliminary alternatives was identified for consideration and development in the Tri-County Parkway Location Study. The following is a discussion of the alternatives considered for this project. It will describe why reasonable alternatives were selected for detailed study and why other alternatives were eliminated from further consideration.

2.1 PRELIMINARY ALTERNATIVES DEVELOPMENT

2.1.1 Scoping

A broad range of alternatives were developed through public input, input from local jurisdictions, the project Technical Advisory Committee, VDOT officials, County transportation officials, County Comprehensive Plans, the Northern Virginia 2020 Transportation Plan, and the FY 2004-2009 Transportation Improvement Plan/2003 Constrained Long Range Plan (CLRP) for the metropolitan Washington, DC region. Open forum public meetings were held in Fairfax, Loudoun, and Prince William counties in March and December 2002 to solicit additional agency and public comment on Tri-County Parkway alternatives. Additional review and input regarding alternatives were received through the Agency Partnering Process that includes VDOT, FHWA, the EPA, Corps of Engineers, and USFWS. Agency Partnering meetings were held on June 19, 2003 to specifically review the Candidate Build Alternatives (CBAs) and appropriate screening criteria. A subsequent Agency Partnering meeting was held July 31, 2003 to provide additional information and field review the study area.

2.1.2 Logical Termini

FHWA regulations [23 CFR 771.111(f)] require that a highway project connect logical termini, defined as (1) rational end points for a transportation improvement, and (2) rational end points for a review of the environmental impacts. The proposed termini for the Tri-County Parkway project include a northern terminus near the intersection of US 50 (John Mosby Highway) and VA 606 (Old Ox Road) and a southern terminus at the interchange of VA 28 and VA 234. These termini establish the general location limits of each alternative given detailed consideration in this Draft EIS. The locations of these termini are shown on Figure 2.1-1.

These termini have been selected in accordance with FHWA Technical Guidelines (FHWA, November 5, 1993) for termini development. Efforts have been made to ensure that the proposed termini would allow the evaluation of project alternatives that:

1. Would function independently of and not force other transportation improvements.
2. Would not restrict the consideration of project alternatives that avoid significant environmental resources (such as Bull Run Regional Park).
3. Would allow for consideration of environmental issues on a broad scope so that segments of the project would not force improvements in areas where environmental issues would be insurmountable.

These termini are discussed in greater detail in the Logical Termini Technical Report (VDOT, 2002) including other termini considered but eliminated from further consideration.

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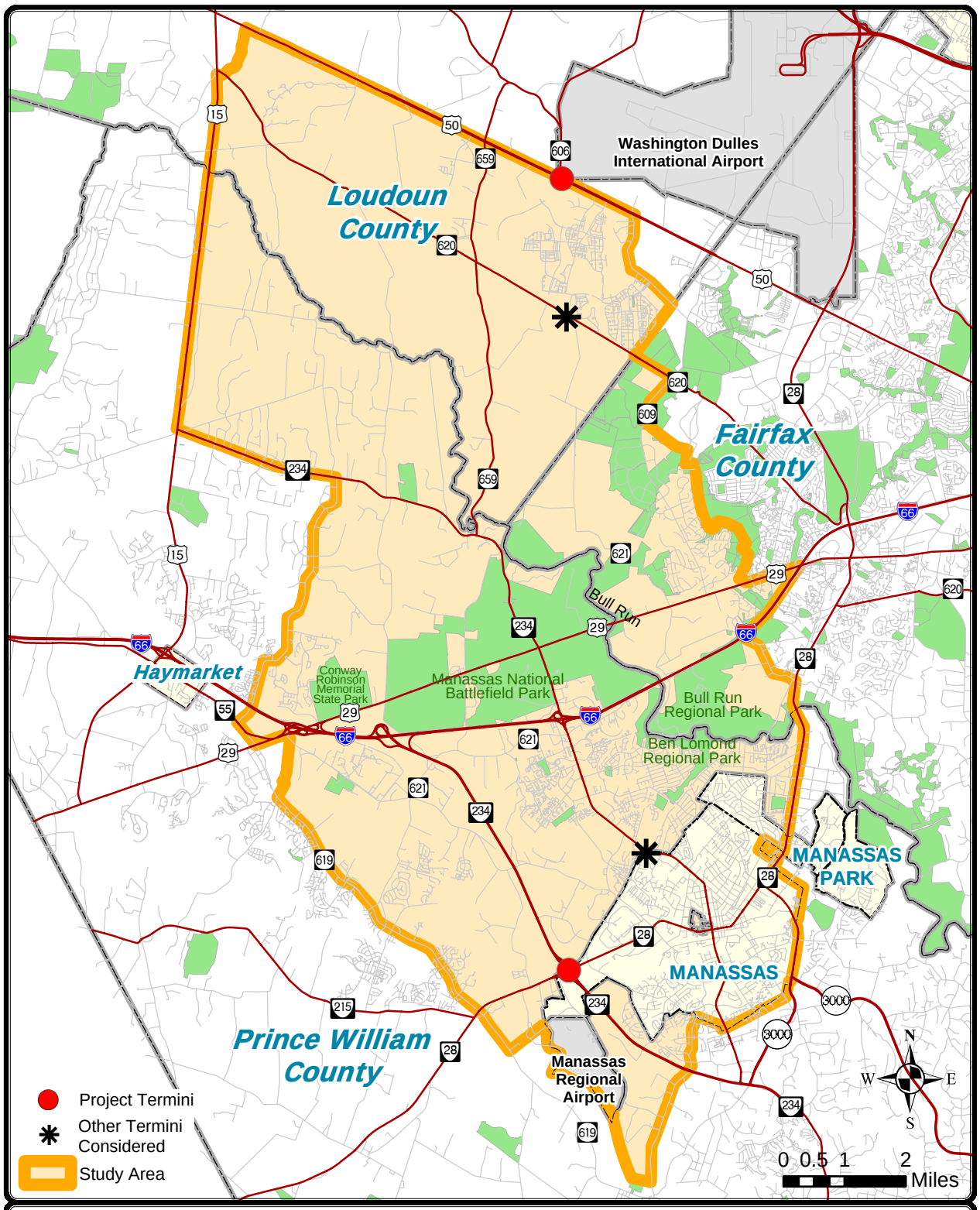


Tri-County PARKWAY Location Study

FIGURE 2.1-1
LOGICAL TERMINI LOCATION MAP

2.1.2.1 Northern Terminus

US 50 (John Mosby Highway) at VA 60 (Old Ox Road) is proposed as the northern terminus for the Tri-County Parkway preliminary build alternatives. The southwest tip of Dulles International Airport boundary is also near this terminus. Within a half-mile radius of the northern terminus, no parklands or historic resources or districts exist which could be potentially affected by the Tri-County Parkway connection.

The northern terminus on US 50 enables connection of the proposed Tri-County Parkway with existing portions of the Loudoun County Parkway, which extends north from US 50 to the Dulles Greenway and provides access to Dulles International Airport. A connection with US 50 also offers traffic from the Tri-County Parkway the flexibility of traveling east and west of Dulles International Airport, thus creating a transportation facility that can function independently of other transportation projects. Finally, this terminus provides flexibility in evaluating alternatives that pass either east or west of the Manassas National Battlefield, while at the same time maintaining the connection to the Loudoun County Parkway.

2.1.2.2 Southern Terminus

The southern terminus for the Tri-County Parkway Location Study is at the interchange of VA 28 and VA 234. The Manassas Regional Airport is located directly to the south of this interchange. No parklands or historic resources or districts exist in the immediate vicinity or north of this location that could potentially be affected by improvements to or adjacent to this interchange.

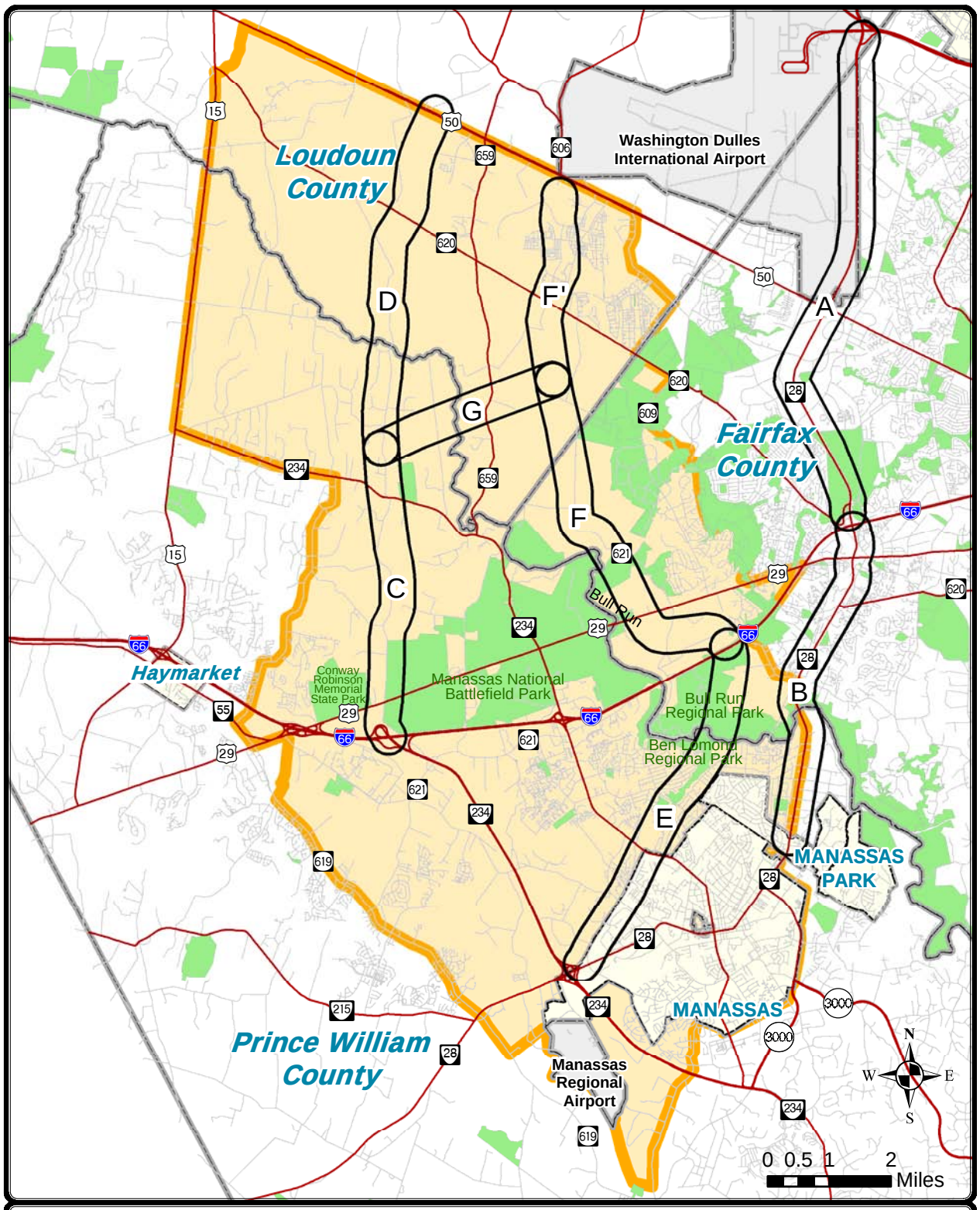
The southern terminus allows commuters the ability to link to the major employment centers and traffic generators in the area including: Prince William Business Park, Lockheed Martin, Manassas Gateway Business Park, Manassas Air and Rail Industrial Park, and Manassas Regional Airport. It also creates a common endpoint to evaluate alternatives to the east and west of Manassas National Battlefield.

2.1.3 Initial Candidate Build Alternatives Considered

The initial concepts for Tri-County Parkway Candidate Build Alternatives (CBAs) range from expanding and improving existing roadways to specific routes for the new highway. Initial CBAs were identified from a review of improvements and enhancements to existing roadways proposed by local jurisdictions and/or the Commonwealth of Virginia and documented in state, regional, and local planning documents and build alternatives proposed during the initial public and agency scoping process. A 3,000-foot-wide corridor that follows the proposed alignment for the planned roadways defines each alternative (see Figure 2.1-2). As applied to the initial identification of CBAs, this corridor width is narrow enough to locate the proposed roadway facility within a geographic area while allowing maximum flexibility to adapt it to existing environmental and community features.

2.1.3.1 VA 28 Improvements (Segments A and B)

This alternative, identified as Segments A and B in Figure 2.1-2, includes the implementation of the VA 28 Public-Private Transportation Act (PPTA) project, an initiative that will widen VA 28 to eight lanes and add interchanges between Dulles Airport and I-66 as proposed in the 2003 CLRP and the Virginia Department of Transportation's (VDOT) 2005-2010 Six Year Improvement Program (Six Year Program). Currently funded improvements include the construction of six interchanges along the corridor. The construction of additional interchanges and widening VA 28 will be accomplished when funding becomes available. The 2003 CLRP and the Northern Virginia 2020 Transportation Plan, prepared by the Transportation Coordinating Council (TCC), propose improving VA 28 through widening, adding interchanges, and enhancing intersections from I-66 south to the City of Manassas.



Tri-County PARKWAY Location Study

FIGURE 2.1-2
INITIAL CANDIDATE BUILD ALTERNATIVES

2.1.3.2 VA 234 Bypass Extension Plus Relocation of VA 659 (Segments C and D)

This alternative, identified as Segments C and D in Figure 2.1-2, combines several projects identified in the Northern Virginia 2020 Transportation Plan with a proposal to relocate VA 659 to the west of its current alignment:

- Widening (two lanes to four lanes) existing VA 234 Bypass from I-66 south to VA 28
- Extending the VA 234 Bypass from I-66 north to re-connect with VA 234 in the Catharpin area northwest of the Manassas National Battlefield
- Relocating VA 659 south of US 50 westward to link with the VA 234 Bypass Extension

2.1.3.3 Tri-County Parkway Comprehensive Plan Alternative (Segments E and F)

This alternative, identified as Segments E and F in Figure 2.1-2, is the alignment for the Tri-County Parkway as proposed in the Prince William County, Fairfax County, and Loudoun County Comprehensive Plans. The proposed Parkway is a four-lane and six-lane roadway on new and existing alignment that begins at US 50 in Loudoun County and extends in a southerly direction through Fairfax County, skirting the northeastern boundary of the Manassas National Battlefield Park, to VA 234 and Godwin Drive in Prince William County. The Parkway then extends along Godwin Drive to a southern terminus at the intersection of Godwin Drive and VA 28 in the City of Manassas.

2.1.3.4 Tri-County Parkway -VA 234 Bypass Alternative (Segments C, G, and F)

This alternative, shown as Segments C, G, and F in Figure 2.1-2, combines the portion of the proposed VA 234 Bypass alignment between VA 234 and I-66 with a new roadway segment that connects VA 234 with VA 620. The portion of Segment F between VA 620 and the US 50-Loudoun County Parkway intersection completes this alternative.

2.1.4 Preliminary Candidate Build Alternatives

In addition to review by the general public, VDOT, FHWA, the EPA, Corps of Engineers, and USFWS reviewed the Initial CBAs through the Agency Partnering Process at meetings held in June and July 2003. The study team also reviewed the initial seven alignment segments relative to existing environmental resource data (e.g., wetlands maps, historic resources, park locations) and identified potential resource impacts should a particular segment be selected for the Tri-County Parkway. This further scoping effort resulted in the identification of sub-segments or sub-alternatives to the initial seven candidate build segments for purposes of minimizing impacts to resources: sub-segments B', C', F1, F2, F3, F4, F'2, F'3, and F'4. The various segments and sub-segments were combined to form seven preliminary CBAs, shown in Figure 2.1-3. Table 2.1-1 outlines the combinations of segments and sub-segments that comprise each CBA.

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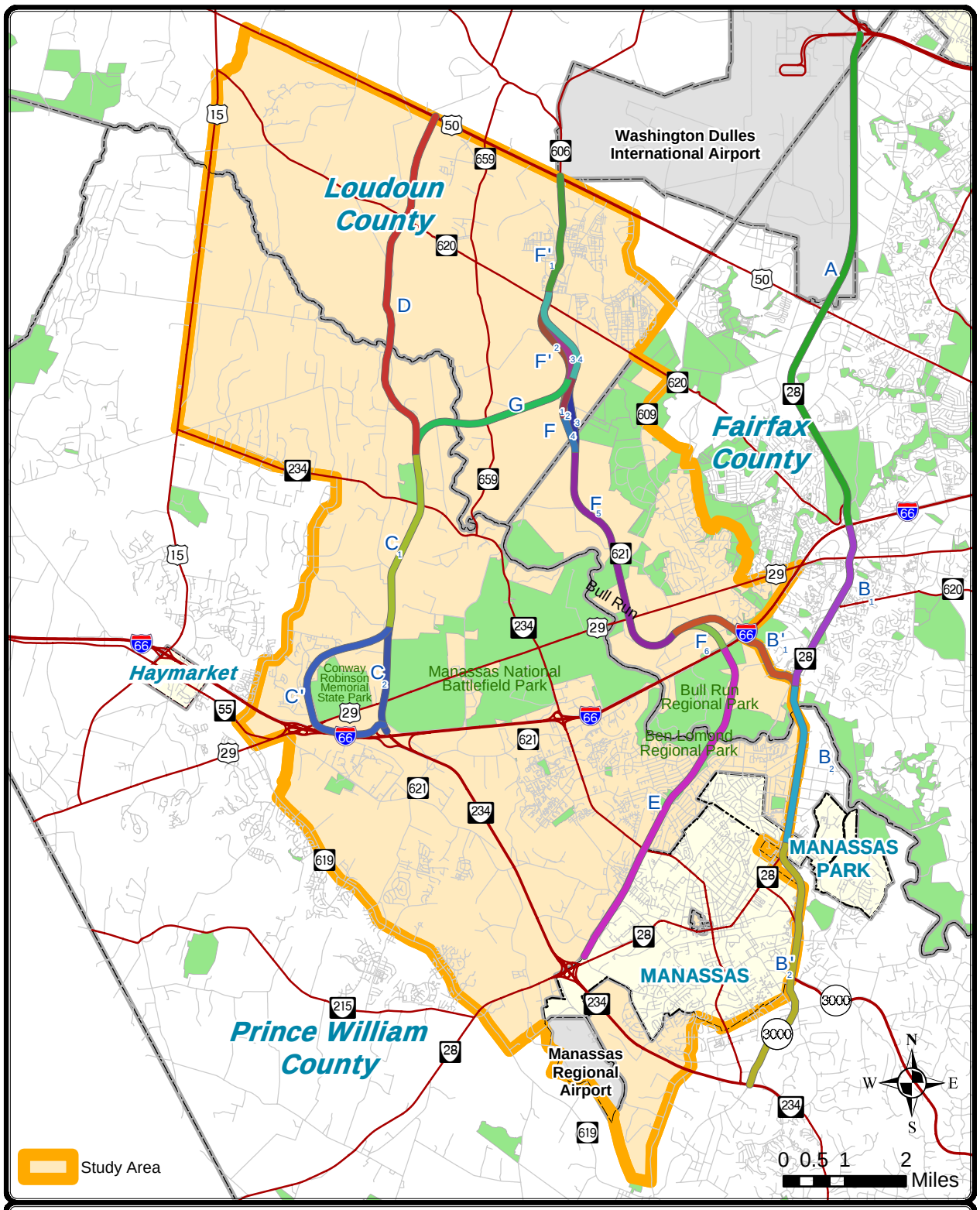

Tri-County PARKWAY Location Study

FIGURE 2.1-3
PRELIMINARY CANDIDATE BUILD ALTERNATIVES

TABLE 2.1-1
PRELIMINARY CBAS: COMBINATION OF SEGMENTS CONSIDERED

CBA	Segments Comprising CBA
West One	D+C1+C'
West Two	D+C1+C2
West Three	F'1+F'2,3,4+G+C1+C'
West Four	F'1+F'2,3,4+G+C1+C2
Comprehensive Plan	F'1+F'2,3,4+F1,2,3,4+F5+F6+E
East One	F'1+F'2,3,4+F1,2,3,4+F5+B'1+B2+B'2
East Two	A+B1+B2+B'2

2.2 SCREENING OF PRELIMINARY CANDIDATE BUILD ALTERNATIVES

Once identified, the Tri-County Parkway CBAs listed in Table 2.2-1 were evaluated with respect to their ability to address the project purpose and need. The screening process applied qualitative and quantitative criteria to each CBA to further refine the range of reasonable alternatives. The qualitative criteria represent ordinal rankings or assessments (greater than/less than) of each CBA's ability to address purpose and need elements: system and community linkage; social and economic demand; and safety.

Quantitative criteria include secondary environmental resource data and travel demand/traffic data. The secondary data were secured from local, state, and federal data sources tied to a GIS attribute table. Travel demand runs were developed in order to assess specific, quantitative transportation measures such as volume, delay, and vehicle hours traveled.

Quantitative impacts were assessed for a 600-foot-wide corridor for the seven CBAs. A corridor width of 600 feet adequately captures the existing social, economic, and environmental setting of the study area potentially affected by each of the study alternatives. This decision was based on the environmental and man-made features of the study area as well as the topography through which the study alternatives would traverse. The actual impacts are likely to be much less than identified in the 600-foot-wide corridor, because the improved right-of-way width required for a principal arterial facility such as the proposed Tri-County Parkway is typically around 200 to 250 feet. The 600-foot-wide corridor will provide adequate width to evaluate potential improvements beyond the typical right-of-way width and alignment shifts associated with grade, slope, and curvature of the facility to reduce social, economic, and environmental impacts.

2.2.1 Qualitative Screening Criteria

The qualitative assessment focuses on each CBA's ability to address the project's purpose and need. The assessment matrix in TABLE 2.2-1 is an ordinal ranking. Ordinal data is sufficient for "greater than" or "less than" comparisons. The results of the qualitative screening are discussed in greater detail in the Location Study Report (VDOT, 2004).

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TABLE 2.2-1
TRI-COUNTY PARKWAY SCREENING
QUALITATIVE ASSESSMENT MATRIX

Purpose and Need Elements	Alternatives						
	West				Comprehensive Plan	East	
	1	2	3	4		1	2
System and Community Linkage	○	◔	◔	◑	●	○	○
Social and Economic Demands	◑	◑	◑	◑	◕	◑	◑
Safety	◕	◕	◕	◕	◕	◔	◔

Ranking Legend

Symbol	Ranking
○	Inadequate
◔	Minimal
◑	Partial
◕	Sufficient
●	Exceptional

2.2.2 Quantitative Screening Criteria

2.2.2.1 Natural and Man-Made Resource Considerations

Quantitative screening criteria of Table 2.2-2 illustrates the results of a GIS data query where a 600-foot-wide footprint conforming to the geometric configuration previously provided in Figure 2.1-3 was overlaid upon the study area to determine the impacts to a narrow range of natural and man-made resources including floodplains, historic resources, neighborhoods, public parks, public facilities (i.e., churches, police, fire, and schools), stream crossings, and wetlands (as identified from existing local, state, and federal data sources). These resources were chosen because they are the types of resources from a regulatory and public acceptance perspective that have the greatest potential to influence decision-making. While a 600-foot-wide assessment corridor overstates the actual footprint of the proposed Tri-County Parkway, from an order of magnitude perspective, this screening approach has proven successful for purposes of decision making in narrowing the number of CBAs to be considered in a Draft EIS. Those CBAs carried forward for detailed study have been evaluated with a higher level of scrutiny in Chapter 4 of this Draft EIS.

2.2.2.2 Traffic and Highway Operational Quantitative Screening

The MWCOG Regional Transportation Model (Version 2.1, Release C) was used to compare the CBAs from a traffic and operational standpoint. To determine if the various segment combinations functioned as a viable stand alone alternative, the model analyzed several “measures of effectiveness” or MOE based on traffic volume, vehicle speed, and roadway capacity. These MOE were then used to determine the quality of service provided by various segment improvements. These results were then used to develop the quantitative traffic screening criteria: daily Vehicle Miles Traveled (VMT); roadway Level of Service (LOS); and peak hour traveler delay. The screening of alternatives with respect to traffic and travel demand characteristics is discussed in greater detail in the Location Study Report (VDOT, 2004).

TABLE 2.2-2
TRI-COUNTY PARKWAY QUANTITATIVE DATA SCREENING

Alternative	Floodplains (acres)	Historic Resource Sites	Neighbor-hoods (acres)	Parks (acres)	Public Facility Takings	Stream Crossings	Wetlands (acres)
West One	61	2	207	0	0	25	5
West Two	25	2	148	27	0	20	7
West Three	100	3	201	0	0	33	10
West Four	65	3	142	27	0	28	12
Comprehensive Plan	207	2	212	106	0	31	30
East One	87	6	296	24	9	28	14
East Two	50	5	160	85	11	19	13

Source: Prince William, Fairfax, and Loudoun County GIS Datasets; National Wetland Inventory; FEMA Flood Data; USGS Quad Maps; VDHR

Notes:
1. Neighborhood and Facility data not available for Segment A of Alternative East Two.
2. Neighborhood data is the most recently available GIS data provided by local jurisdictions: Loudoun County (February 2003); Fairfax County (November 2001); Prince William County (February , 2002).
3. 600-foot-wide study assessment corridor applied to all alternatives.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

2.3.1 Transportation System Management (TSM) Alternative

The public and agency scoping process identified Transportation System Management (TSM) improvements as a possible alternative to construction of the proposed Parkway. TSM encompasses a number of strategies to add capacity and improve operational deficiencies of the existing transportation system, including:

- Intelligent Transportation Systems – Technology based systems to improve traffic flow by the use of traffic sensors, signal synchronization, closed-circuit television cameras, variable message signs, highway advisory radio, ramp metering, and media communication.
- Travel Demand Management – Implementation of measures designed to reduce congestion such as car-pooling and High Occupancy Vehicle (HOV) lanes as well as measures such as optimizing traffic signal timing or adding signals.
- Access Management – Reduce traffic impedance cause by turning vehicles by eliminating the number of direct access points along a roadway.
- Minor Geometric Improvements – Modification of existing intersections and travel lanes to improve safety and traffic flow (e.g., adding travel lanes and dedicated turn lanes).
- Low-cost Transit Improvements – Increasing the number and frequency of buses and trains.

The intent of the TSM alternative is to maximize the efficiency of the existing transportation system; therefore, it should only consist of minor improvements with little work outside the right-of-way. Major improvements such as the addition of lanes, the wholesale correction of geometric deficiencies, or the reconstruction of an entire route would be considered a separate build alternative and not a TSM alternative. There is no regulatory requirement to specifically consider a TSM alternative. The impetus for considering a TSM alternative is FHWA guidance. This goes back approximately 20 years when significant advances were being made in computers and communication, and planners saw TSM as an inexpensive solution for addressing congestion while minimizing environmental impacts. In order for a TSM alternative to be carried forward for consideration and detailed analysis in an environmental document, FHWA would have to find that a particular TSM alternative were a reasonable alternative under NEPA.

In this instance, however, the 2003 CLRP for the Washington, DC metropolitan region and its companion FY 2004-2009 Transportation Improvement Plan (TIP) as well as the Virginia Department of Transportation's (VDOT) 2005-2010 Six Year Improvement Program already include a wide array of TSM improvements that address the Tri-County Parkway study area. There are no practicable TSM measures beyond those already proposed in the CLRP and VDOT Six Year Plan which could reasonably be implemented to adequately

address the purpose and need for the Tri-County Parkway; namely, to improve transportation mobility and capacity, improve system linkage, and accommodate social demand and economic development needs. TSM-type improvements programmed into the aforementioned plans do not sufficiently satisfy the project's stated purpose and need when considered as a stand-alone alternative and, therefore, the TSM Alternative was eliminated from further consideration. Notwithstanding, TSM improvements already programmed in the regional TIP as well as VDOT's Six-Year Program to maximize the efficiency of the existing transportation system will continue to be developed and implemented in accordance with those planning documents and have been included as part of the No-Build Alternative.

2.3.2 Mass Transit Alternative

Improving mass transit in the study area through the expansion of existing transit facilities and services and/or the provision of light rail or other transit systems was identified in the scoping process as an alternative to the Tri-County Parkway. In general, mass transit options may include:

- Priority Bus – initiatives that give buses priority over other traffic. Priorities include dedicated bus lanes (during peak hours and/or at other times) on roadways, bus advance areas that enable buses to go to the front of the queue at traffic lights, and traffic signal pre-emption.
- Express Bus – new or expanded service along freeway or HOV corridors to move people to employment destinations.
- Extension of the existing Metrorail or Virginia Railway Express (VRE) service to additional areas or construction of new rail systems.
- Bicycle/Pedestrian improvements – expansion of existing trails and improved trail connections between activity centers.

The nature of the study area makes the identification of a mass transit alternative that can adequately address the corridor's purpose and need problematic. The service areas of the transit authorities operating in the northern Virginia area – WMATA, Potomac and Rappahannock Transportation Commission (PRTC), and Loudoun and Fairfax County Transit systems – serve only portions of the study area. There is no transit authority in existence whose service area covers the entire study area, nor are there plans to establish such an authority in the foreseeable future. WMATA provides service in Fairfax County (although not within the study area), PRTC in Prince William County and Manassas, and Loudoun and Fairfax County transit authorities serve the respective counties. While WMATA Metrobus and Metrorail service, PRTC bus service, and Loudoun County Transit bus service do span jurisdictional lines, the cross-jurisdiction service is commuter service focused on east-west trips destined for the District of Columbia and inner northern Virginia suburbs, rather than local service.

In addition, transportation plans developed for the northern Virginia region do not identify programmed projects to provide transit service in the study area. The CLRP identifies the implementation of east-west rail service along the Dulles Access Road/Toll Road Corridor (as an expansion of express bus service). The CLRP identifies "studies" to provide HOV and transit (feeder and express bus and rail transit) service improvements in the I-66 Corridor between Fauquier County and Arlington County, transit service (priority bus) improvements in the US 50 Corridor between Loudoun County and Arlington County, and light rail (on VA 28) from Manassas to Dulles Airport. These studies have neither financial plans, detailed project scopes, alignments, nor costs associated with them - nor are they slated for construction in the CLRP.

Finally, the development patterns and traffic patterns and volumes within the study corridor do not favor north-south through movement along the corridor. The majority of trips and greatest volumes are to points outside the study area or along only a portion of the corridor (i.e., from the Manassas and Centerville areas to I-66 and points east, from the South Riding area to the Dulles corridor). The through volumes are by far the weakest in the study area and would not attract sufficient transit riders to make such service viable; therefore, the Mass Transit Alternative has been eliminated from further consideration.

2.3.3 Other Candidate Build Alternatives Considered But Eliminated

Combining the qualitative and quantitative screening criteria into an integrated discussion provides a sound rationale to discriminate between the current array of alternatives. The alternatives should be reasonable and practicable and should reflect the criteria necessary to be considered responsive to the project's purpose and

need. The following is a discussion of those CBAs eliminated from further consideration due to their impacts upon study area resources and their inability to adequately address the objectives of purpose and need. It should be noted that four of the preliminary CBAs (West Three, West Four, Comprehensive Plan, and East One) included multiple sub-segment options for segments F and F': F1, F2, F3, F4, F'2, F'3, and F'4. As a result of the initial application of the qualitative and quantitative screening criteria, the alignments of Segments F and F' were further refined. Sub-segments F1 and F'2 were developed specifically to minimize impacts to the natural environment; however, they were found to substantially impact the man-made environment and were thus eliminated from further consideration. Sub-segments F3 and F'3 were found to impact multiple man-made and natural resources and were, therefore, eliminated from consideration. Sub-segments F2, F4, and F'4 were found to minimize impacts to both the man-made and natural environment and were retained as the sub-segment alignments and basis of comparison among the CBAs.

2.3.3.1 The East One CBA

The East One CBA is comprised of segments F'1, F'4, F2, F4, F5, B'1, and B'2. This alternative has the highest incidence of historic resource impacts and the largest acreage of neighborhood takings. The neighborhoods include a large ethnic commercial strip along VA 28 from Liberia Avenue north to the Manassas Park corporate limits. The area is dominated by a diverse mix of ethnic restaurants, shops, and neighborhoods that are densely arrayed in close proximity to the existing VA 28 right-of-way. Neighborhood and subsequent commercial takings would evoke economic impacts and would raise environmental justice concerns. Qualitatively, this alternative does not sufficiently serve the study area, provides no new north-south alternative, and does little to serve the social, economic, or safety issues in the study area. East One provides no new linkage to existing and emerging development in the heart of the study area and does not connect directly to the designated project termini. Additional flaws in the East One CBA include the second highest impact upon public facilities. Six churches, a fire station, a library, an elementary school, and a high school would likely have to be relocated. From a traffic demand modeling standpoint, it provides almost no measurable traffic relief compared with other alternatives and performs at a level far behind that of other modeled alternatives in terms of congestion relief. Implementation of this alternative is projected to increase the total study area VMT more than the other modeled CBAs. East One increases peak deficient VMT (LOS E or F) and provides only a very small (less than one percent) decrease in the hours of peak delay. For all of these reasons, the East One CBA was dropped from further consideration.

2.3.3.2 The East Two CBA

The East Two CBA is comprised of segments A, B1, B2, and B'2. The Segment A portion of this CBA would consist of those improvements described in the CLRP and are generally described as the widening of existing VA 28 to an eight-lane, divided freeway facility. The East Two CBA has the greatest impact upon public facilities (with 11 major takings) and the second highest incidence of historic resource impacts. The Segment A portion of this CBA would affect 59 acres of the Ellanor C. Lawrence Park and 17 acres of Sully Park - the second highest effects to parklands of those CBA segments assessed. East Two impacts three public schools, six churches, a fire station, and a library. Neighborhood impacts include a large ethnic commercial strip along VA 28 from Liberia Avenue north to the Manassas Park corporate limits. The area is dominated by a diverse mix of ethnic restaurants, shops, and neighborhoods that are densely arrayed in close proximity to the existing VA 28 right-of-way. Neighborhood and subsequent commercial takings would evoke economic impacts and would raise environmental justice concerns. The Segment A portion of this CBA would affect 7.7 acres of wetlands (the second highest effects to wetlands of those CBA segments assessed) and would require 10 stream crossings (the third highest effects to streams of those CBA segments assessed). From both a qualitative and quantitative perspective, the East Two CBA is the least responsive to the purpose and need. It occupies the eastern edge of the study area and, for most of its northern extent, the East Two CBA is outside the Tri-County Parkway study area. Fundamentally, this alternative does not serve the study area, provides no new north-south alternative, and does little to serve the social, economic, or safety issues in the study area. Modeled traffic scenarios clearly indicate that the corridor defined by segments A and B fails to provide any substantive relief to the transportation measures of capacity, delay, and travel time savings in the study area. For the aforementioned reasons, the East Two CBA was eliminated from further consideration.

2.3.3.3 The West One CBA

The West One CBA is comprised of segments D, C1, and C'. The West One CBA does an inadequate job of linking the community resources in the core of the study area. Additionally, West One will not be as effective in addressing travel demand in the corridor because of the location of the northern terminus. This CBA (particularly the C' segment) would affect less floodplain and wetland acreage than other CBAs. Two historic resources (Pageland I and Pageland II tracts) are affected, however, which would be problematic. Both tracts are eligible for the National Register of Historic Places and have been identified by the congressional Civil War Advisory Commission. Shifting the alignment to avoid these two sites will incur further impacts to residential neighborhoods to the west. The neighborhood impacts are also high and could be substantially higher as alignment geometry becomes more finite to avoid the Pageland sites. Finally, the C' segment of this alternative is operationally problematic in terms of engineering design, safety, and constructability. This segment will have to parallel existing I-66 and then tie into the existing I-66 and VA 234 interchange. The Manassas National Battlefield Park Bypass Study, likewise, screened this segment and dropped it from further consideration. For the aforementioned reasons, this CBA was dropped from further consideration as a feasible build alternative for the Tri-County Parkway.

2.3.3.4 The West Three CBA

The West Three CBA is comprised of segments F'1, F'4, G, C1, and C'. The West Three CBA reflects similar characteristics as the West One CBA. For Segment C', the impacts are comparable to the West One CBA. Segment C' flaws the entire alternative. Similarly this alternative was dropped from further consideration for its impacts to neighborhoods, riverine wetland resources, and operational/constructability issues.

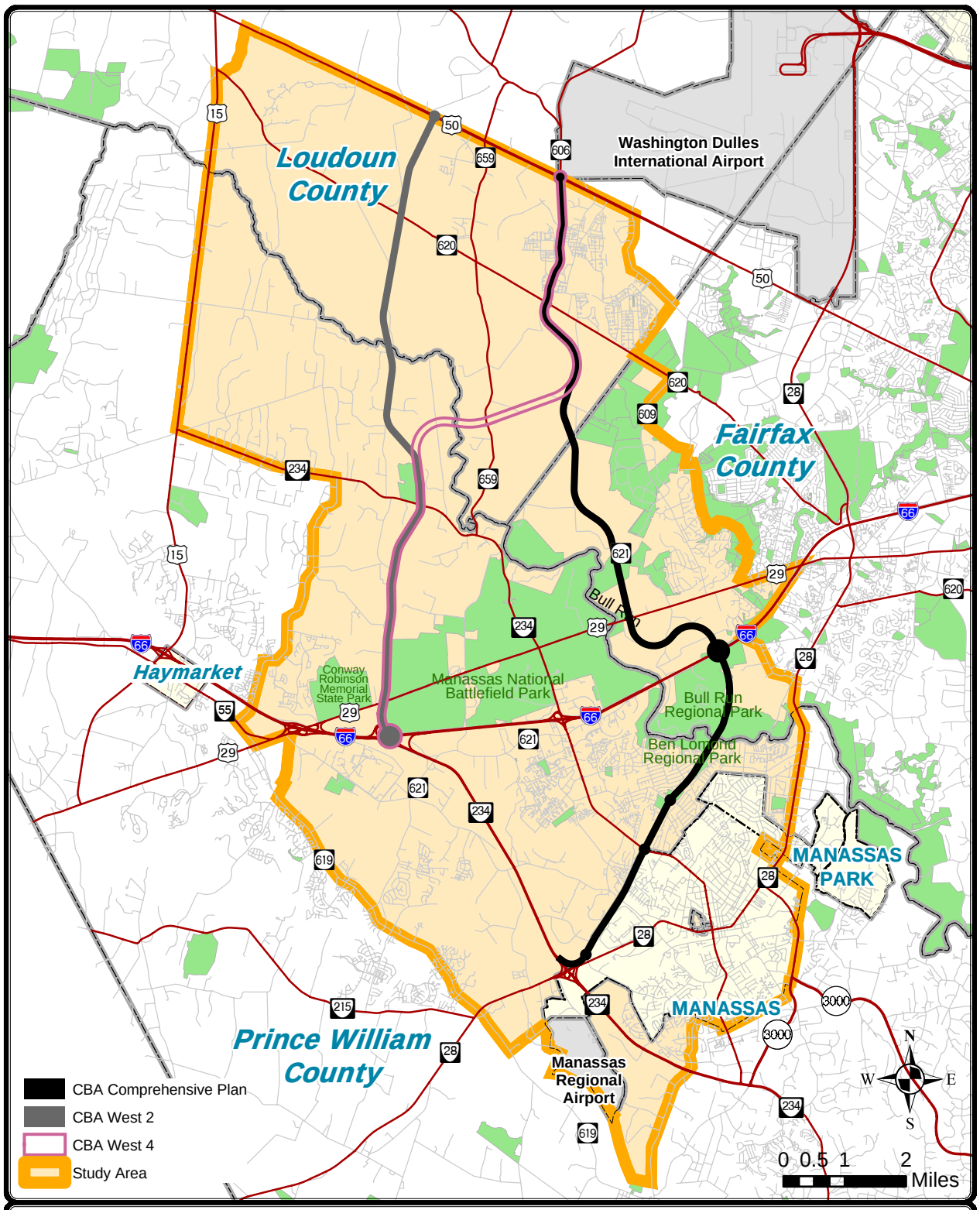
2.4 ALTERNATIVES CARRIED FORWARD FOR DETAILED STUDY

2.4.1 The No-Build Alternative

Consistent with requirements of NEPA and FHWA guidelines, full consideration is given to the environmental consequences of taking no action to meet future travel demand in this DEIS (hereinafter referred to as the "No-Build Alternative"). Additionally, when asked during initial Tri-County Parkway public meetings to identify the transportation issues which they would be interested in seeing addressed in the Location Study, approximately nine percent of individuals who provided verbal or written responses indicated they did not understand the need to build the parkway and/or preferred that no road be built. The No-Build Alternative includes routine maintenance improvements that maintain the continuing operation of the existing roadway network in the study area and currently programmed, committed, and funded roadway and transit projects as included in the 2003 CLRP and the VDOT Six Year Program. The No-Build Alternative, while having no direct construction costs, would result in other economic and environmental impacts that can be expected from the continuation of roadway system deficiencies (see Chapter 4). While the No-Build alternative does not meet the project needs for traffic and safety, it provides a baseline condition with which to compare the improvements and consequences associated with the CBAs. Projects programmed in the CLRP and VDOT Six Year Program include roadway widening and interchange improvements in the VA 28 corridor between the City of Manassas and VA 7. They also include an array of TSM improvements to improve the efficiency of vehicles traveling along the roadways in the study area. A complete listing of roadway and transit projects assumed as part of the No-Build Alternative is listed in the Alternatives Identification and Screening Technical Report (VDOT, 2004).

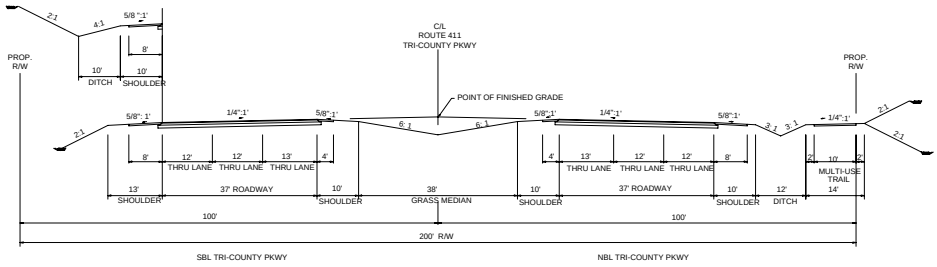
2.4.2 Candidate Build Alternatives (CBAs)

Three north-south alignments (or CBAs) shown in Figure 2.4-1 have been carried forward for detailed study in this Draft EIS. Each CBA consists of two or more general design cross-section segments (Figure 2.4-2). The number and location of these cross-section segments is dependent upon the CBA under consideration. The Comprehensive Plan CBA consists of three general design cross-section segments: *Segment 1, Options 1 and 2,* from US 50- VA 606 (Old Ox Road) intersection to the Fairfax County Line; *Segment 2*, from the Fairfax County Line to I-66; and *Segment 3*, from I-66 to the VA 234-VA 28 intersection. The West Two and

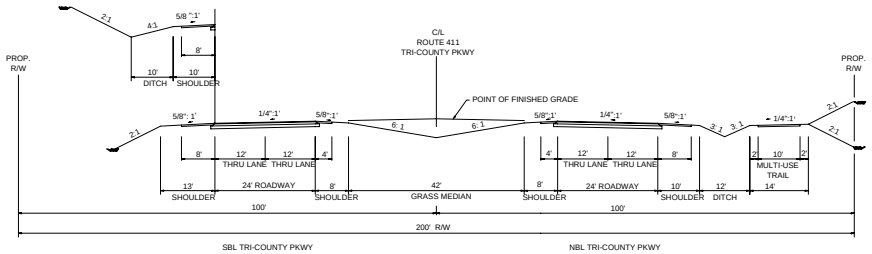


Tri-County PARKWAY Location Study

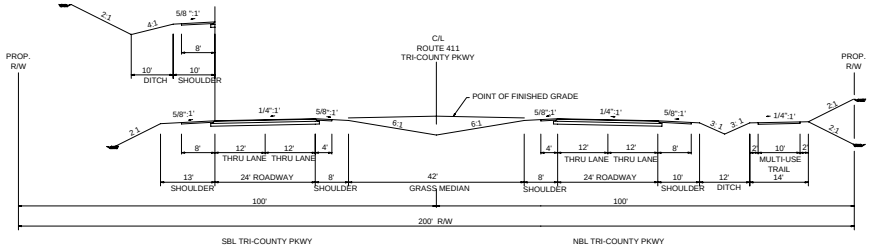
FIGURE 2.4-1
CANDIDATE BUILD ALTERNATIVES



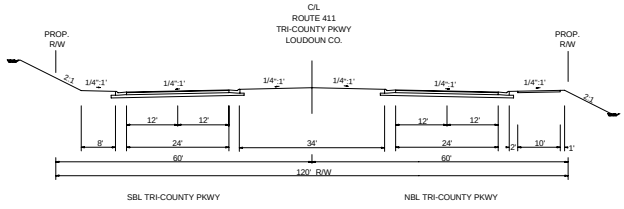
GENERAL DESIGN SEGMENT 3



GENERAL DESIGN SEGMENT 2



GENERAL DESIGN SEGMENT 1, OPTION 1



GENERAL DESIGN SEGMENT 1, OPTION 2

Tri-County PARKWAY Location Study

FIGURE 2.4-2
TYPICAL SECTIONS

West Four CBAs consist of two general design cross-section segments: *Segment 1, Option 1*, from the intersection of US 50-VA 877(Racefield Road) to the Prince William County Line, and *Segment 2*, from the Prince William County Line to the interchange of I-66 and VA 234.

It should be noted that the regional travel demand model analysis suggests that, overall, the West Two, West Four, and Comprehensive Plan CBAs provide similar travel time savings, reductions in delay and capacity improvement during peak hour travel. There are unique and distinct transportation advantages and disadvantages to individual sub-areas within the study area that are impacted differently depending on the CBA; however, on an overall study area basis, the aforementioned alternatives perform equally well, based upon the quantitative measures of capacity, travel time, and delay.

2.4.2.1 The West Two CBA

The West Two CBA is comprised of segments D, C1, and C2. The West Two CBA impacts the least amount of floodplain and historic sites and does not affect public facilities. It is second lowest of the CBAs in effects to neighborhoods, parks, stream crossings, and wetlands.

Qualitatively, the West Two CBA does not serve the system and community linkage needs as well as the West Four CBA or the Comprehensive Plan CBA. It addresses social and economic demands as well as the West Four CBA but not as well as the Comprehensive Plan CBA (which performs the best of all CBAs).

The West Two CBA addresses safety needs in a manner comparable to the West Four CBA and the Comprehensive Plan CBA. From a traffic modeling standpoint, the West Two CBA and the West Four CBA result in similar increases in study area VMT as compared to No-Build, and rank second to the Comprehensive Plan CBA (which results in the smallest increase in VMT). This CBA is anticipated to have service levels ranging between C and D over its entire length. These are indicative of moderate, but not severe congestion during the peak hour. The West Two CBA affects the largest decrease in the hours of peak delay over the No-Build Alternative, although it results in a slight increase in the amount of peak deficient VMT when compared to the No-Build Alternative.

2.4.2.2 The West Four CBA

The West Four CBA is comprised of segments F'1, F'4, G, C1, and C2. The West Four CBA ranks the lowest of the CBAs in effects to neighborhoods, second lowest in effects to historic resources, and is in the middle range of alternatives for effects to other resource areas. As with the Comprehensive Plan CBA, it does not affect public facilities.

Qualitatively, the West Four CBA is second only to the Comprehensive Plan CBA in meeting system and community linkage needs and performs at a comparable level as the West Two CBA relative to social and economic demands and safety.

The West Four CBA performs very similar to the West Two CBA in the traffic and highway quantitative screening process. VMT increases and LOS are similar to the West Two CBA. The West Four CBA increases the amount of peak deficient VMT slightly over the No-Build Alternative; however, it betters the No-Build Alternative in decreasing the hours of peak delay (although not as well as the West Two CBA).

2.4.2.3 The Comprehensive Plan CBA

The Comprehensive Plan CBA is comprised of segments F'1, F'4, F2, F4, F5, F6, and E. The Comprehensive Plan CBA (along with the West Two CBA) impacts the fewest number of historic sites. It also avoids public facility takings. It does, however, have the greatest impact of all the CBAs on floodplains, parks, and wetlands, and ranks second among CBAs in impacts to neighborhoods and stream crossings.

The Comprehensive Plan CBA is the best of the CBAs in meeting system and community linkage needs and satisfying social and economic demands, as well as reducing peak deficient VMT and minimizing increases in overall VMT. It is also among the top ranked CBAs in addressing safety needs. While the Comprehensive Plan CBA will result in decreased levels of peak delay compared to the No-Build Alternative, it ranks second to the West Two CBA in its effectiveness. LOS conditions exhibit greater variation in this alternative (ranging between LOS B and F) compared to the West Two and West Four CBAs.

Despite the environmental impacts associated with it, the Comprehensive Plan CBA is being carried forward because of it has been supported by the jurisdictions in the study area through their comprehensive planning process (i.e., presently, four of the five jurisdictions in the study area have included the alignment of the Comprehensive Plan CBA in their planning documents). However, FHWA may not be able to support this alternative because of its impacts to public parks and historic sites given the legal standard established by Section 4(f) of the Department of Transportation Act of 1966. Further, in their review of the preliminary Draft Environmental Impact Statement, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers have expressed concerns about the Comprehensive Plan CBA and its permitability under Section 404 given the LEDPA standard that the Corps is bound by (the least environmentally damaging project alternative).

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3.0 AFFECTED ENVIRONMENT

3.1 TRANSPORTATION AND TRAFFIC

3.1.1 System Components

The study area is comprised of parts of three Northern Virginia counties (Fairfax, Loudoun, and Prince William) and two incorporated cities (Manassas and Manassas Park). It is bounded approximately by US 50 to the north, US 15, VA 234, VA 676, and VA 619 to the west, the City of Manassas corporation line to the south, and VA 28 to the east (see Figure 1.3-2 and Figure 2.1-1 for the existing road system).

3.1.2 Existing Transportation Network

3.1.2.1 Existing Non-Highway System

Transportation facilities and services are located throughout the study area. Non-highway transportation components include two airports, freight and passenger rail systems, and public transit. Washington Dulles International Airport is the Washington region's second-busiest airport and provides the bulk of air passenger movement into and out of the study area, while Manassas Regional Airport serves mostly smaller aircraft. Both Virginia Railway Express and Amtrak operate frequent passenger service along the Norfolk Southern railway passing through Manassas to Washington, D.C. This railway also serves freight movements along with the former Southern Railway, which branches off from the main Norfolk Southern line in central Manassas and continues northwest toward Gainesville and Haymarket. Washington Metropolitan Area Transit Authority (WMATA, also known as Metro) and Potomac and Rappahannock Transportation Commission (PRTC, also known as OmniRide) operate fixed service bus routes throughout the study area. OmniRide serves the City of Manassas and parts of Prince William County with local bus service and commuter buses along Interstate 66 and Metro provides some local service adjacent to VA 28 in the Centreville and Chantilly areas.

3.1.2.2 Existing Highway System

The following discussion summarizes major facilities in the existing highway network. Lane capacities referenced below are captured in Table 3.1 1, Characteristics of the Existing Road Network. VA 28 (Nokesville Road/Center Street/Centreville Road/Sully Road) is a primary north-south route within the study area. It is a four-lane arterial south of the City of Manassas, acts as a local street with many signals through the city, is an arterial between the Manassas north corporation line and I-66, and is a six-lane, limited-access facility north of I-66 to Dulles Airport. It connects most of the other major highway facilities in the region, including the VA 234 Bypass, VA 234 Business, US 29, I-66, and US 50.

VA 234 Bypass is another major north-south limited-access facility with several signalized intersections. The four-lane roadway connects I-66 to VA 621 (Balls Ford Road), VA 674 (Wellington Road), University Boulevard in the Innovation at Prince William Business Park, VA 28 (Nokesville Road), VA 234 Business south of Manassas, and the extension of Liberia Avenue (also known as the Prince William Parkway or VA 3000).

VA 234/VA 234 Business (Dumfries Road/Grant Avenue/Sudley Road) is a primary north-south facility linking southern Prince William County with central Manassas and areas to the north of the City of Manassas. From the VA 234 Bypass south of Manassas, VA 234 Business is a four-lane arterial to central Manassas where it becomes a local street, beyond VA 28 it is a two-lane local street until it is redesignated VA 234 at the intersection of Grant Avenue and Sudley Road. It then becomes a four-lane arterial serving mostly suburban retail development to the I-66 interchange. After a short four-lane segment north of I-66, it becomes a two-lane rural roadway providing access to the Manassas National Battlefield Park and eventually connecting to VA 659 (Gum Spring Road) and US 15.

Interstate 66 is the highest-type east-west facility in the region. Consisting of two lanes in each direction west of VA 234 and three lanes (plus an HOV 2+ lane in peak periods) in each direction east of VA 234, it connects Fauquier and Prince William counties with Fairfax County, the Metrorail Orange Line terminus at

Vienna/Fairfax-GMU station, the Capital Beltway, Arlington County, and Washington, D.C. I-66 has interchanges within the study area at US 15, US 29 (Gainesville), VA 234 Bypass, VA 234, US 29 (Centreville), and VA 28.

Three US primary routes are within or near the study area. US 29 (Lee Highway) is another major east-west facility. It is primarily a four-lane rural arterial west of the I-66 interchange in Gainesville, becomes a two-lane rural facility through the Manassas National Battlefield Park to VA 621, and widens to a four-lane suburban arterial in Fairfax County to VA 28. US 29 accesses I-66 at a second interchange in Centreville just west of VA 28. This roadway is one of the primary access roads to the Manassas Battlefield. US 50 (John S. Mosby Highway/Lee Jackson Memorial Highway) serves east-west traffic from southern Loudoun County, travels south of Dulles Airport, and provides airport access via VA 28. It connects two important north-south local roads: VA 659 (Gum Spring Road) and VA 609 (Pleasant Valley Road) and is the primary access point to the large South Riding development in Loudoun County. US 15 (James Madison Highway) is west of the study area boundary, but it connects several important study area roadways. Its two-lane section serves north-south traffic between US 29 near the Prince William/Fauquier County line, Haymarket and Catharpin areas, VA 234, and US 50.

There are several important local and secondary roads vital to mobility within the area. Godwin Drive is a four-lane arterial in the City of Manassas and connects the VA 234 Bypass and VA 28 with VA 674 (Wellington Road) and VA 234 (Sudley Road). VA 674 (Wellington Road) is a two-lane roadway for the segment between US 29 to the north and Rixlew Drive, and widens to four lanes at the Godwin Drive intersection to VA 28. Four north-south secondaries and one east-west secondary roadway provide access to areas between US 29 and US 50 in Fairfax and Loudoun counties. VA 659 (Gum Spring Road), VA 658/VA 621 (Compton Road/Bull Run Post Office Road), VA 609 (Pleasant Valley Road), and VA 662 (Stone Road/Poplar Tree Road/Westfields Boulevard) provide north-south mobility between these primary roadways. VA 621 is only partially paved throughout its length between VA 658 and US 50. VA 620 (Braddock Road) is an important east-west facility connecting VA 659, VA 621, VA 609, and VA 662 with Loudoun County's South Riding development, large employment centers in Westfields, and VA 28 just north of the I-66 interchange. It is currently an unpaved roadway west of South Riding.

TABLE 3.1-1
CHARACTERISTICS OF THE EXISTING ROAD NETWORK

Route and Location	Number of Lanes
North/South Routes	
VA 28 from Fauquier/Prince William county line to I-66	4
VA 28 from I-66 to Dulles Airport	6
VA 234 Bypass from I-66 to VA 28	4
VA 234 Business from Prince William Parkway to VA 28	4
VA 234 Business from VA 28 to intersection of Grant Avenue and Sudley Road	2
VA 234 from Grant Ave/Sudley Rd to Battleview Parkway	4
VA 234 from Battleview Parkway to US 15	2
VA 15 from US 29 to US 50	2
Godwin Drive from VA 28 to VA 234	4
VA 674 from US 29 to Rixlew Drive	2
VA 674 from Godwin Drive to VA 28	4
VA 659 from VA 234 to US 50	2
VA 658 from VA 28 to US 29	2

Route and Location	Number of Lanes
VA 621 from US 29 to US 50	2
VA 609 from US 29 to Fairfax County Park Authority boundary	4
VA 609 from Fairfax County Park Authority boundary to US 50	2
VA 662 from US 29 to VA 28	4
East/West Routes	
I-66 from Fauquier/Prince William county line to VA 234	4
I-66 from VA 234 to VA 28	6+1 HOV in each direction
US 29 from US 15 to I-66 (Gainesville)	4
US 29 from I-66 (Gainesville) to VA 621	2
US 29 from VA 621 to VA 28	4
US 50 from US 15 to VA 661	4
US 50 from VA 661 to VA 28	6
VA 620 from US 15 to VA 28	2

Source: Metropolitan Washington Council of Governments and Virginia Department of Transportation, 2004.

3.1.3 Existing Volumes and Levels of Service (LOS)

3.1.4 Existing ADT

Existing Average Daily Traffic (ADT) volumes along roadways in the Tri-County Parkway study area were obtained from the count program described above and supplemented with published count data from VDOT. This information is summarized in Table 3.1-2 and Table 3.1-3.

TABLE 3.1-2
EXISTING ADT AND LOS (VIRGINIA AND LOCAL ROUTES)

Route and Location	ADT	AM LOS[5]	PM LOS[5]
VA 28 from VA 215 to VA 234 Bypass/Godwin Drive[2]	12,000	D	E
VA 28 from Godwin Drive to VA 674[1]	17,000	A	B
VA 28 from VA 674 to VA 234 Business[1]	24,300	B	D
VA 28 from VA 234 Business to Prescott Avenue[4]	27,000	B	C
VA 28 from Prescott Avenue to Liberia Avenue[1]	32,400	B	D
VA 28 from Liberia Avenue to Manassas Drive[1]	41,100	E	F
VA 28 from Manassas Drive to Prince William/Fairfax county line[4]	46,000	F	F
VA 28 from Prince William/Fairfax county line to VA 658[2]	59,600	F	F
VA 28 from VA 658 to US 29[2]	62,900	F	F
VA 28 from US 29 to I-66[4]	62,000	G	G
VA 28 from I-66 to US 50[4]	63,000	F	G
VA 28 from US 50 to Fairfax/Loudoun county line[4]	83,000	F	G

Route and Location	ADT	AM LOS[5]	PM LOS[5]
VA 234 from US 15 to VA 659[2]	14,700	C	D
VA 234 from VA 659 to US 29[2]	9,200	D	E
VA 234 from US 29 to I-66[2]	13,500	D	E
VA 234 from I-66 to Godwin Drive[4]	24,000	F	F
VA 234 from Godwin Drive to Sudley Road/Grant Avenue[1]	34,200	D	D
VA 234 Business from Sudley Road/Grant Avenue to VA 28[4]	15,000	C	C
VA 234 Business from VA 28 to VA 674[4]	24,000	F	F
VA 234 Business from VA 674 to Prince William Parkway[1]	14,900	D	D
VA 234 Bypass from I-66 to VA 621[2]	29,000	B	C
VA 234 Bypass from VA 621 to VA 674[2]	21,700	B	C
VA 234 Bypass from VA 674 to VA 28[2]	18,500	B	C
VA 674 from US 29 to VA 234 Bypass[4]	8,500	C	C
VA 674 from VA 234 Bypass to Godwin Drive[4]	9,200	C	D
VA 674 from Godwin Drive to VA 28[4]	12,000	B	D
VA 659 from VA 234 to Prince William/Loudoun county line[4]	3,800	E	F
VA 659 from Prince William/Loudoun county line to VA 620[4]	4,200	E	F
VA 659 from VA 620 to US 50[4]	4,900	E	G
VA 609 from US 29 to Blue Ridge View Drive[4]	8,000	A	C
VA 609 from Blue Ridge View Drive to Cub Run Road[4]	6,500	D	G
VA 609 from Cub Run Road to US 50[4]	4,200	B	E
VA 621 from US 29 to VA 620[4]	900	A	C
VA 621 from VA 620 to US 50[4]	600	A	A
VA 662 from US 29 to VA 620[4]	21,000	C	D
VA 662 from VA 620 to VA 28[4]	17,000	F	G

Sources: [1] Tri-County Parkway Traffic Count Program (City of Manassas), 2002;
[2] Interstate 66 Traffic Count Program, 2000 and 2001;
[3] Other VDOT study area traffic counts, 1999;
[4] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes on Interstate, Arterial and Primary Routes, 2000;
[5] Metropolitan Washington Council of Governments 2000 Conformity Model Outputs.

TABLE 3.1-3
EXISTING ADT AND LOS (INTERSTATE AND U.S. ROUTES)

Route and Location	ADT	AM LOS[5]	PM LOS[5]
I-66 from Fauquier/Prince William county line to US 15[2]	30,200	B	C
I-66 from US 15 to US 29 (Gainesville)[2]	41,400	C	C
I-66 from US 29 (Gainesville) to VA 234 Bypass[2]	76,100	E	E
I-66 from VA 234 Bypass to VA 234[2]	78,600	E	F
I-66 from VA 234 to US 29 (Centreville)[2]	103,400	E	E
I-66 from US 29 to VA 28[2]	141,100	E	F
US 15 from US 29 to I-66[2]	10,000	B	B
US 15 from I-66 to VA 234[2]	13,500	C	D
US 15 from 234 to VA 701[2]	15,700	C	C
US 15 from VA 701 to US 50[3]	13,000	D	E
US 29 from US 15 to VA 55[2]	37,700	D	D
US 29 from VA 55 to I-66 (Gainesville)[2]	56,600	D	E
US 29 from I-66 (Gainesville) to Prince William/Fairfax county line[4]	6,700	D	E
US 29 from Prince William/Fairfax county line to I-66 (Centreville)[4]	13,000	E	E
US 29 from I-66 (Centreville) to VA 28[4]	34,000	E	F
US 50 from US 15 to VA 606[3]	16,200	D	E
US 50 from VA 606 to Loudoun/Fairfax county line[3]	29,100	C	C
US 50 from Loudoun/Fairfax county line to VA 28[4]	40,000	D	E

Sources:
[1] Tri-County Parkway Traffic Count Program (City of Manassas), 2002;
[2] Interstate 66 Traffic Count Program, 2000 and 2001;
[3] Other VDOT study area traffic counts, 1999;
[4] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes on Interstate, Arterial and Primary Routes, 2000;
[5] Metropolitan Washington Council of Governments Conformity Model Outputs, 2000.

3.1.5 Existing LOS Conditions

Level of service (LOS) is a commonly used measure referring to the degree of roadway or intersection congestion. LOS is typically described using a letter scale from "A" to "F", with "A" representing the best service and "F" representing the worst. In this analysis, an additional letter "G" was added to indicate congestion where traffic volumes far outstrip available roadway capacity. LOS is determined from the available roadway capacity and peak traffic demand, as calculated by the Metropolitan Washington Council of Governments. The procedure used may underestimate congestion where there is a high density of traffic signals, such as in the City of Manassas. Table 3.1-4 describes the various levels of service and Table 3.1-5 shows the volume to capacity ratios used to define LOS in this study. Different volume to capacity ratios define the cutoff values for LOS on freeways versus other facility types due to a freeway's ability to accommodate greater traffic volumes at higher speeds. The American Association of State Highway Transportation Officials (AASHTO) manual on Geometric Design of Highways and Streets calls for a design year LOS of "D" in metropolitan areas.

TABLE 3.1-4
LOS DESCRIPTIONS

LOS	Description	Congestion Level
A	Free traffic flow with low volumes and high speeds. Speeds controlled by driver desires, speed limits, and roadway physical conditions.	Low
B	Stable traffic flow, with operating speeds remaining near free flow. Drivers still have reasonable freedom to maneuver.	Low
C	Stable flow, but with higher volumes, more closely controlled speeds and maneuverability.	Moderate
D	Approaching unstable flow with tolerable operating speeds maintained, but considerably affected by changes in operating conditions.	Moderate
E	Unstable flow with low speed and momentary stoppages.	Severe
F	Forced flow with low speed. Stop-and-go with stoppages for long periods are possible.	Severe

Source: Highway Capacity Manual, Transportation Research Board, 2000.

TABLE 3.1-5
LEVEL OF SERVICE CRITERIA

LOS	Max V/C (Freeway segments)	Max V/C (Arterial and Collector segments)
G	unlimited	unlimited
F	1.15	1.15
E	1.00	1.00
D	0.90	0.85
C	0.74	0.64
B	0.53	0.44
A	0.32	0.27

Source: Highway Capacity Manual, Transportation Research Board, 2000.

The most severe congestion experienced within the study area is currently along VA 28. The traffic pattern shows significant peaking with northbound flows severely congested in the a.m. and southbound flows severely congested in the p.m. The areas of greatest delay are between the City of Manassas Park and the Loudoun/Fairfax county line near Dulles Airport. I-66 follows a similar peaking pattern (eastbound in the a.m., westbound in the p.m.), though the level of service experienced is marginally better. Other roadways currently experiencing LOS F or G in either peak period are US 29 from I-66 (Centreville) to VA 28, VA 234 from I-66 to Godwin Drive, VA 234 Business from VA 28 to VA 674, and various segments along VA 659, VA 609, and VA 662.

3.1.6 Truck Volumes

The impact on traffic of heavy vehicles within the study area is not widespread (see Table 3.1-6) The largest percentage of trucks recorded (20 percent) is along VA 659 south of US 50, which carries many trucks traveling to and from a rock quarry. Traffic on Interstate 66 is comprised of 16 percent trucks within the study area. Other facilities carrying above 10 percent trucks include US 15 between US 29 and US 50 (10 percent to 16 percent), VA 234 between US 29 and VA 659 (13 percent), and VA 234 Bypass between VA 621 and VA 674 (13 percent). All other roadways for which there is classification data showed between 4 percent and 9 percent trucks.

TABLE 3.1-6
PERCENT TRUCKS ON SELECTED ROUTE SEGMENTS

Route and Location	Percent Trucks
VA 28 from Godwin Drive to VA 674 [1]	5%
VA 28 from VA 674 to VA 234 Business [1]	4%
VA 28 from Prescott Avenue to Liberia Avenue [1]	4%
VA 28 from Liberia Avenue to Manassas Drive [1]	5%
VA 28 from Manassas Drive to US 50 [5]	6%
VA 234 from Prince William Parkway to VA 674 [2]	6%
VA 234 Business from Grant Avenue to Godwin Drive [2]	5%
VA 234 from I-66 to US 29 [2]	9%
VA 234 from US 29 to VA 659 [2]	13%
VA 234 Bypass from VA 621 to VA 674 [2]	13%
VA 609 south of US 50 [3]	5%
VA 620 at VA 662 [3]	5%
VA 659 south of US 50 [3]	20%
US 15 from US 29 to VA 55 [2]	16%
US 15 from VA 234 to VA 705 [2]	12%
US 15 from VA 705 to US 50 [4]	10%
US 50 at VA 606 [4]	3%
Godwin Drive from VA 28 to VA 234 Business [1]	4%
I-66 within the study area [5]	16%

Sources: [1] Tri-County Parkway Traffic Count Program (City of Manassas), 2002;
[2] Interstate 66 Traffic Count Program, 2000 and 2001;
[3] VDOT mechanical counts, April 2002;
[4] Other VDOT study area traffic counts, 1999
[5] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes on Interstate, Arterial and Primary Routes, 2000.

3.1.7 Safety Issues and Crash Data Analysis

Safety is an issue of concern along many roadways within the study area. While many segments exhibit crash rates well below the Tri-County area wide average rates, others exceed these rates by several times. Crash rates are determined by dividing the number of crashes in a segment by an estimate of the vehicle miles traveled (VMT) within that segment. Rates typically are given per 100 million vehicle miles of travel. Since these rates fluctuate from year to year based on a variety of factors, for this analysis a single rate was determined for a four-year study period (1997-2000). Within the City of Manassas, data is available only for 1997 and 1998; crash rates for roadway sections within the city reflect these two years only. In order for a crash to be included in the database maintained by VDOT, it must either cause an injury or be responsible for at least $1,000 in property damage. A summary of the average crash rates in Virginia can be found in Table 3.1-7. A summary of the average crash rates in the Tri-County region (includes all of Prince William, Fairfax, and Loudoun counties) can be found in Table 3.1-8 and incidental rates for area roadways can be found in Table 3.1-9.

TABLE 3.1-7
STATEWIDE AVERAGE INCIDENCE RATES
(per 100 million VMT, 1998-2000)

Incident	Primary	Secondary	Interstate[1]
Crash	157.0	250.0	72.0
Injury	100.0	142.0	38.0
Death	1.7	1.9	0.6

Source: VDOT Statewide Crash Statistics, 1998, 1999, and 2000.

TABLE 3.1-8
TRI-COUNTY REGION AVERAGE INCIDENCE RATES
(per 100 million VMT, 1997-2000)

Incident	Primary	Secondary	Interstate[1]
Crash	195.04	266.74	82.00
Injury	114.11	143.83	45.00
Death	0.83	1.10	0.27

Source: VDOT Statewide Crash Statistics, Fairfax, Prince William and Loudon counties; 1997 1998,1999, and 2000
[1] Interstate rates from 1996 only.

TABLE 3.1-9
INCIDENCE RATES FOR AREA ROADWAYS
(per 100 million VMT, 1997-2000, above average in bold)

Route and Location	Crash rate	Injury rate	Death rate
VA 28 from Fauquier/Prince William county line to WCL Manassas	102.62	44.41	0.60
VA 28 within the City of Manassas	**519.12**	**191.16**	0.00
VA 28 from Manassas Park to Fairfax/Prince William county line	**224.84**	90.39	0.56
VA 28 from Fairfax/Prince William county line through I-66 interchange	**218.73**	90.57	1.07
VA 28 from north of I-66 interchange to Loudoun/Fairfax county line	81.78	32.08	0.36
VA 234 from Prince William Parkway to SCL Manassas	198.64	88.68	0.00
VA 234 from Manassas corp. limit to Godwin Drive	**500.56**	**215.97**	0.00
VA 234 from NCL Manassas to before I-66 interchange	**1,247.64**	**547.99**	**2.86**
VA 234 from I-66 interchange through US 29 intersection	**489.44**	**220.38**	**2.56**
VA 234 from north of US 29 intersection to US 15	181.97	76.53	1.70
US 50 from US 15 through VA 659 intersection	90.77	34.20	0.66
US 50 from after VA 659 intersection through VA 609 intersection	71.93	30.41	1.17
US 50 from after VA 609 intersection to VA 28	125.29	49.60	0.00
US 29 from Fauquier/Prince William county line to VA 674	197.86	78.63	0.37
US 29 from I-66 interchange (Gainesville) through VA 234 intersection	129.89	52.79	0.84
US 29 from after VA 234 intersection to before I-66 (Centreville)	180.18	80.74	0.00
US 29 from I-66 interchange (Centreville) to VA 28	**561.45**	**230.92**	0.00
I-66 from Fauquier/Prince William county line through Haymarket	28.15	10.12	0.88
I-66 from US 29 (Gainesville) interchange to before VA 234	27.44	11.22	0.00
I-66 from VA 234 to before US 29 (Centreville) interchange	64.92	24.20	0.20
I-66 from US 29 (Centreville) interchange to VA 28 interchange	**132.37**	43.75	**1.12**
Godwin Drive from VA 234 Bypass/VA 28 to VA 234	248.20	102.52	0.00
Liberia Avenue from Prince William Parkway through VA 28 intersection	**442.15**	**153.40**	0.00
Liberia Avenue from Mathis Avenue intersection to WCL Manassas	**765.40**	**236.91**	0.00
Lomond Drive from WCL Manassas to VA 234	**397.07**	130.93	0.00
VA 674 from US 29 to before VA 234 Bypass intersection	132.68	46.33	0.00
VA 674 from VA 234 Bypass intersection to VA 28	**397.61**	143.14	0.00
VA 659 from VA 234 to US 50	172.05	70.85	**5.06**
VA 705 from US 29 to VA 620	113.80	64.01	0.00
VA 609 from US 29 to before VA 620	188.23	78.71	**3.42**
VA 609 from VA 620 to US 50	**459.43**	**209.57**	**8.06**
VA 621 from VA 658 to US 50	**447.27**	**263.78**	0.00

Source: VDOT Statewide Crash Statistics, Fairfax, Prince William, and Loudon counties; 1997 1998, 1999, and 2000

A total of six roadway segments of those studied exhibited crash rates more than twice the average. One segment stood out above all others: for each mile traveled on VA 234 (Sudley Road) from the northern Manassas/Prince William County line to just before the I-66 interchange, a driver is 6.4 times more likely to experience a crash than on an average primary system roadway within the Tri-County region. Two adjacent sections of VA 234, to the north from the I-66 interchange through the US 29 intersection, and to the south, from the southern Manassas/ Prince William County line to Godwin Drive, also exhibited crash rates of 2.6 and 2.5 times the area wide average for primaries. Other roadway segments with crash rates at least twice the Tri-County region average were VA 28 within the City of Manassas (2.7 times), Liberia Avenue from the Mathis Avenue intersection to the western Manassas/Prince William County line (2.9 times), and US 29 from the I-66 interchange in Centreville to the VA 28 intersection (2.9 times).

Among the safest roadway segments in the region are Interstate 66 from the Fauquier/ Prince William County line to before the VA 234 interchange, US 50 from east of the VA 659 (Gum Spring Road) intersection through the VA 609 (Pleasant Valley Road) intersection, and VA 28 in Fairfax County from north of the I-66 interchange to the Loudoun County line. A driver traveling one mile along each of these segments is less than half as likely to experience a crash as a driver traveling on an average similar type of facility in the Tri-County region.

The rates of injury crashes tended to follow the same patterns as those of property damage crashes. Death rates tend to be skewed since they are such isolated incidents; a single crash involving a death over a four-year period on a lightly traveled roadway can force the death rate per VMT to a very high value. For instance, one death on VA 609 from VA 620 to US 50 resulted in the highest death rate of all segments (8.06), and two deaths on VA 659 resulted in the second-highest death rate (5.06) compared to a Tri-County region average rate of 1.06. About half the roadway segments studied experienced at least one death in the four-year study period, and half did not. A total of 26 deaths occurred on the roadways studied within the four-year time frame. The total number of deaths in each year on the roadway segments studied is experiencing a downward trend, from 11 in 1997 to three in 2000. There were no death crashes within the City of Manassas in 1997 and 1998, so the impact of any death crashes in the more recent years on this trend is not known.

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3.2 LAND USE

More-detailed information pertaining to data collection methods and findings is presented in the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004).

3.2.1 Existing Land Use

Figure 3.2-1 provides a summary of current land uses for each jurisdiction in the study area. The majority of the study area, especially north of Interstate 66, is predominantly agricultural and forest land, but is being rapidly converted to residential uses.

Rapid residential development is currently occurring in the South Riding, Sterling, and Ashburn areas at the northern border of the study area. Other areas of rapid residential growth are located along US 50 and VA 659 (Gum Spring Road). Most residential development north of Interstate 66 occurs along the major arterials of VA 620 and VA 609, and as a cluster of mainly of low density residential development located northwest and west of the Manassas National Battlefield. Residential development south of I-66 occurs primarily along VA 619 (Linton Hall Road) in the southwestern portion of the study area. The majority of Manassas and Manassas Park is residential, with low density development largely located south of Sudley Road and east of Godwin Drive.

A cluster of commercial development occurs along VA 620 Braddock Road, US 50, and US 29. Another cluster of strip and neighborhood commercial developments occurs along Liberia Avenue and VA 234 (Sudley Road). More commercial development is located near existing residential areas providing local services. Less-concentrated commercial areas exist in the cities of Manassas (along VA 234 and VA 28) and Manassas Park (a small concentration of commercial development along VA 28). The majority of commercial development within Prince William County is currently along VA 234.

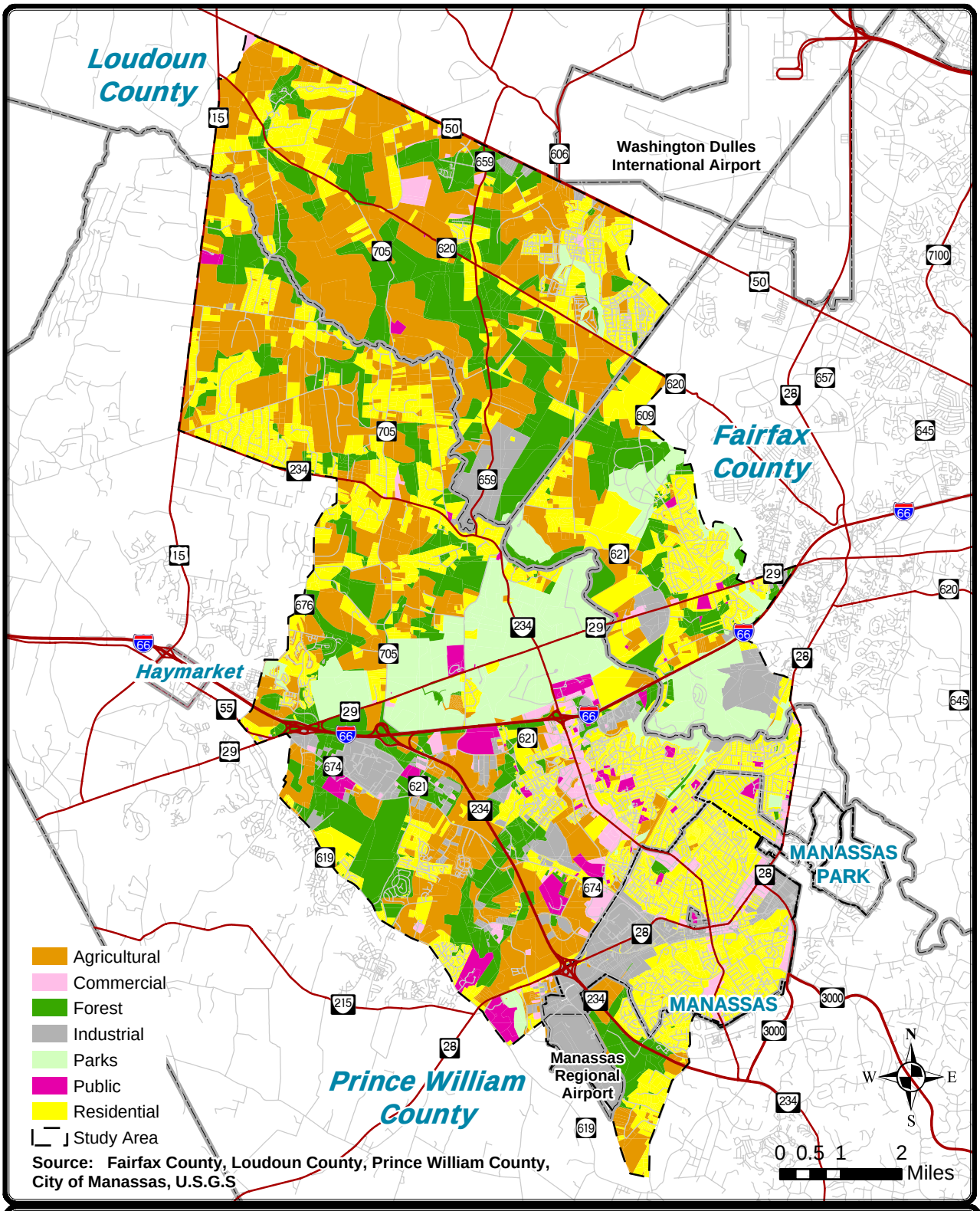
Industrial development is primarily along US 50 near the Washington Dulles International Airport. Industrial development also occurs along the southern portion of Godwin Drive, VA 234 Bypass, Balls Ford Road (near the Manassas Regional Airport along VA 28), and on the portions of US 29 that are not located within the Manassas National Battlefield. In the cities of Manassas and Manassas Park, light industrial uses are small and are found near city boundaries.

Several parks (comprising a total of 2,072 acres) are located within the study area, including: the 1,500-acre Bull Run Regional Park, various facilities managed by the Fairfax County Park Authority, Cub Run Stream Valley Park, and Richard W. Jones Park.

3.2.2 Future Land Use

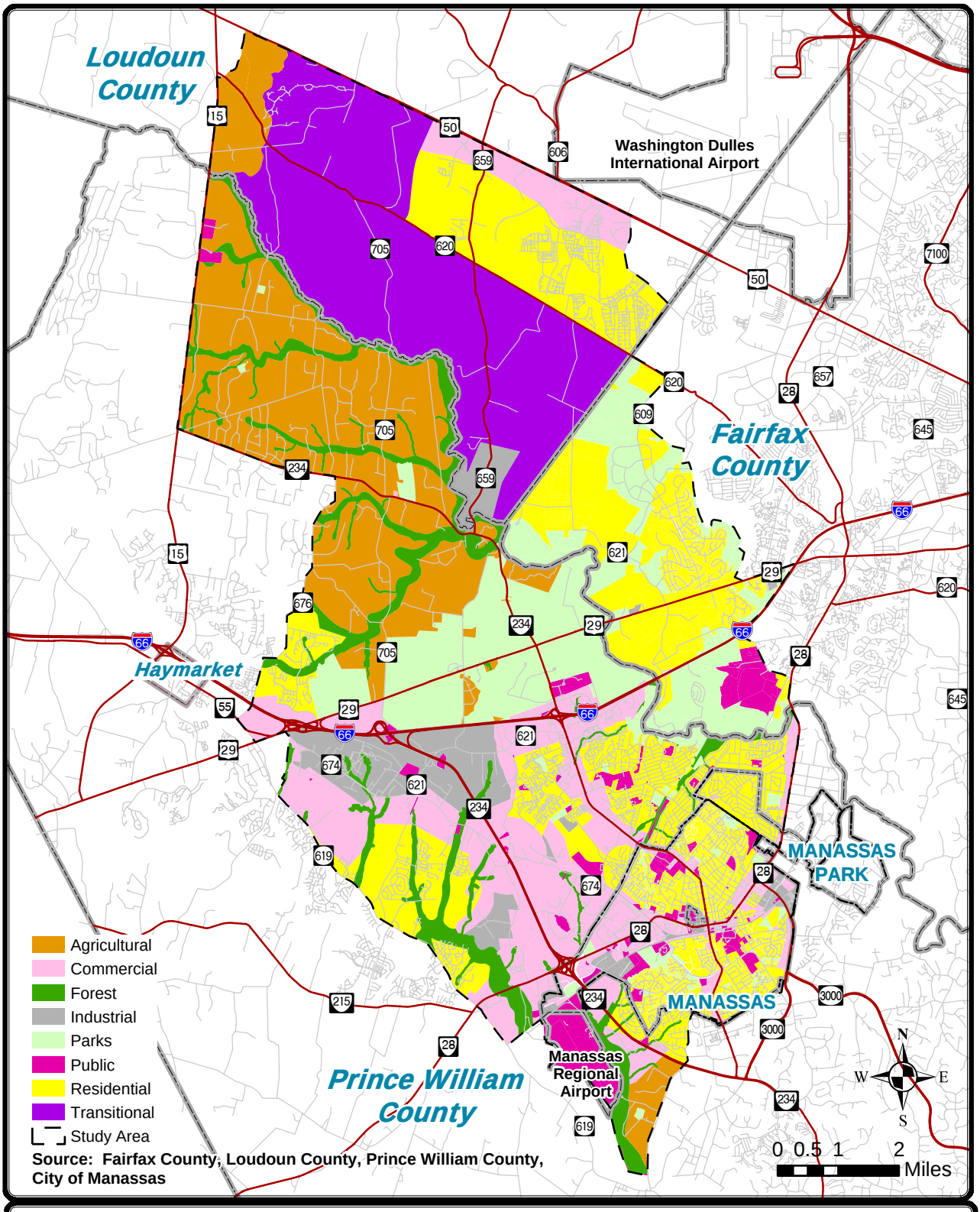
Comprehensive Plan updates prepared by local jurisdictions target preservation and managed growth. Improved transportation is an integral part of such growth, as reflected in several transportation corridors being focused on by the jurisdictions. Tri-County Parkway is one such corridor. Future land uses are illustrated in Figure 3.2-2. Considering the study area as a whole, the largest proposed land use increases are commercial land and parkland. This change reflects edicts of local comprehensive plans which target simultaneous growth and preservation. Commercial land is proposed to increase by almost 7,600 acres, with the majority occurring in Prince William County.

Jurisdictions within the study area are currently focusing on several growth centers for more concentrated development. A net increase of 2,377 acres in parkland is anticipated. Compared to current land uses, the largest net decreases are anticipated to be agricultural and forest. With rapid suburbanization, these land uses will be subject to conversion to other uses. An approximate decrease of 9,000 acres of forest land is anticipated. Loudoun County will experience the largest loss (at 5,000 acres), followed by Prince William County (at 2,400 acres), and Fairfax County (at 1,700 acres). In terms of agricultural land uses, Loudoun County will experience the largest decrease (at 7,000 acres), followed by Fairfax County (at 1,200 acres).



Tri-County PARKWAY Location Study

FIGURE 3.2-1
EXISTING LAND USE



Tri-County PARKWAY Location Study

FIGURE 3.2-2
FUTURE LAND USE

3.3 FARMLANDS

Because the Tri-County Parkway will affect certain areas considered to be rural, coordination with the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) is required. A more-detailed explanation of data collection methods and findings pertaining to farmlands is presented in the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004).

3.3.1 Prime Farmland Soils

Prime farmland is one of the several kinds of important farmland identified by the U.S. Department of Agriculture (USDA). In Virginia, no distinction is made between prime farmland and unique, statewide, or locally important farmland. Table 3.3-1 lists the farm types and acreages for jurisdictions representing the study area. Figure 3.3-1 shows the locations of prime farmland soils in the study area. This figure includes locations where prime farmland soils have been converted through development.

TABLE 3.3-1
FARM TYPES AND ACREAGES BY COUNTY

Counties	Farms (No.)	Land in Farms (acres)	Total Cropland (farms)	Total Cropland (acres)	Harvested Cropland (farms)	Harvested Cropland (acres)	Land in Orchard (farms)	Land in Orchard (acres)
1987								
Fairfax	198	12,602	150	6,378	101	2,921	3	N/A
Loudoun	934	206,601	806	141,432	663	78,078	55	1,218
Prince William	136	36,926	252	27,448	197	15,341	5	12
Total	1,268	256,129	1,208	175,258	961	96,340	63	1,230
1992								
Fairfax	151	15,714	116	4,979	79	1,675	7	18
Loudoun	942	195,476	836	124,982	667	69,572	50	281
Prince William	259	32,973	227	21,903	182	12,565	6	15
Total	1,352	244,163	1,179	151,864	928	83,812	63	314
1997								
Fairfax	121	12,313	84	3,517	60	2,098	11	166
Loudoun	1,032	184,988	872	117,122	666	68,216	50	284
Prince William	261	35,936	222	25,758	165	18,226	6	9
Total	1,414	233,237	1,178	146,397	891	88,540	67	459

Source: Agriculture of Census for Fairfax, Loudoun and Prince William County, 1987, 1992, 1997.
Note: The data presented above reflects county totals only. This data is not available at the study area level.

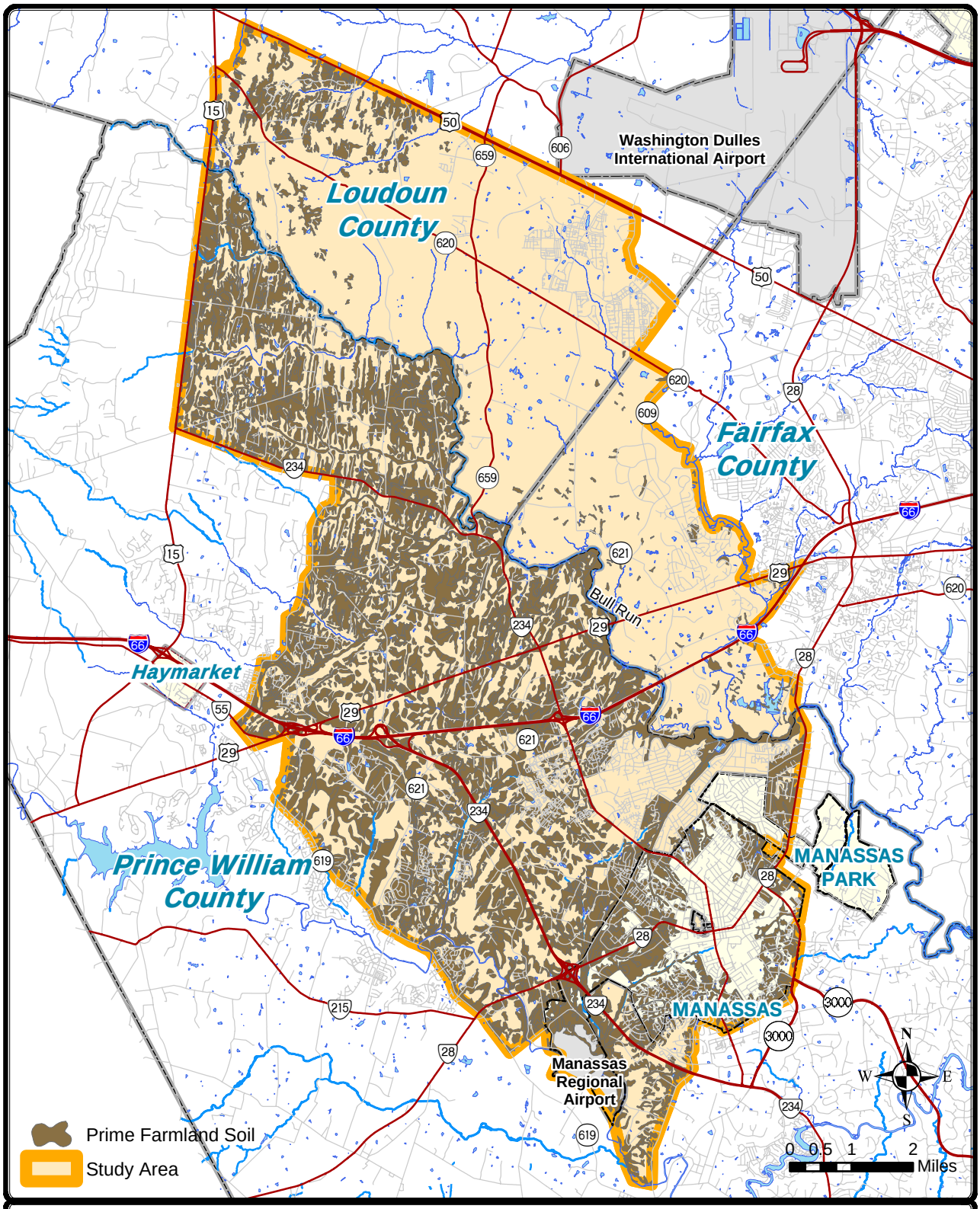
3.3.2 Agricultural and Forestal Districts

Table 3.3-2 lists the names or designations of the Agricultural and Forestal (A&F) Districts within the study area. See Figure 4.3-1 of Chapter 4 for locations of potentially affected Agricultural and Forestal (A&F) Districts. A more-detailed discussion of Agricultural and Forestal (A&F) Districts is presented the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004).

TABLE 3.3-2
AGRICULTURAL AND FORESTAL DISTRICTS LOCATED WITHIN THE STUDY AREA

County	A&F District Name or Designation	Acreage
Fairfax County	Cox	117
	Stone Bridge	273
	Smith	29
	Richardson	40
Loudoun County	Pretty Chicks Welcome	458
	Supercalifragilisticexpialidociously Beautiful (Super Cal)	203
Prince William County	None	0

Source: Fairfax, Loudoun, and Prince William Planning Department, GIS data, and personal communications.



Tri-County PARKWAY Location Study

FIGURE 3.3-1
PRIME FARMLAND SOILS

3.4 PARKLANDS, RECREATION AREAS, AND OPEN SPACE EASEMENTS

3.4.1 Regulatory Context

Classification of existing parklands, recreation areas, and open space easements was conducted in accordance with Section 4(f) of the Department of Transportation Act of 1966, Section 106 of the National Historic Preservation Act of 1966, and Section 6(f) of the Land and Water Conservation Fund Act of 1965. Parks and recreational resources of the study area are listed in Table 3.4-1. See Figure 4.4-1 of Chapter 4 for locations of potentially affected parklands and recreation areas. A more-detailed description of these resources is provided in the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004).

3.4.2 Properties of Concern as Related to Section 4(f)

Because of their national and regional importance, two parklands within the study area warrant detailed discussion, specifically, the Manassas National Battlefield Park and the Bull Run Regional Park. Both of these resources have been determined to be Section 4(f) properties.

3.4.2.1 Manassas National Battlefield Park

The Manassas National Battlefield is a 5,074-acre park owned and administered by the U.S. Department of the Interior, National Park Service (NPS) and is part of the National Park System. The Battlefield enables visitors to learn about the American Civil War and the two major battles that took place in 1861 and 1862. Ceremonies and living history portrayals of these battles occur every year in the park on the 21st of July and the 28th, 29th, and 30th of August.

The primary activities at the Battlefield are recreation and sightseeing. Specifically, recreational opportunities include walking tours, auto touring, bird watching, fishing, hiking, horseback riding, and wildlife viewing. The Battlefield provides the opportunity for visitors to explore the historic terrain where the First and Second Battles of Manassas were fought. The Battlefield is also a nationally significant resource that is currently listed on the National Register of Historic Places.

3.4.2.2 Bull Run Regional Park

The 900-acre Bull Run Regional Park is owned and administered by the Northern Virginia Regional Park Authority (NVRPA). Spacious fields within the park accommodate large groups for picnics, camping, and special events. Scenic woodland and trails within the park offer sightseeing and miles of hiking. US 29 and Bull Run Post Office Road offer access to the park.

Primary activities within the park are recreation and sightseeing. Specifically, recreational opportunities include swimming (outdoor swimming pool); family and group camping; miniature golf; Frisbee golf; a bridle path and staging area for equestrians; access to the 17-mile Bull Run-Occoquan Trail (no bikes); scenic, historic nature and hiking trails; picnicking for families and large groups; soccer fields; playgrounds; the Bull Run Public Shooting Center (sporting clays, skeet, and trap); an indoor archery range and archery; and a gun pro shop (offering Learn-to-Shoot Classes). The Bull Run Special Events Center hosts outdoor activities such as concerts, craft shows, festivals, and other special events

3.4.2.3 Other Properties

A number of neighborhood parks are located throughout the study area. Many of these parks are proffered through residential developments or are donated or acquired by the park authorities within the respective region. Many of the major parks promote team sport activities such as soccer, football, and baseball.

TABLE 3.4-1
STUDY AREA PARK AND RECREATIONAL RESOURCES

Name of Park or Recreation Site	Number of Annual Visitors	Acreage/ Square Feet	Amenities
Ben Lomond Regional Park and Community Center	*Park:* 538,507[1] *Center:* 70,451	*Park*: 205 *Center:* 9,984 sq. ft.	*Park*: Water park, baseball, softball, football, basketball, lighted tennis courts, nature trail, playground and picnic tables. *Center*: dance, physical fitness and art programs.
Bull Run Regional Park	700,000	900	Special Events Center, Outdoor swimming pool, camping, miniature golf, disc golf, equestrian facilities, nature and hiking trails, soccer, shooting center, playground and picnic facilities.
Conway Robinson Memorial State Forest	Not available, site not monitored	400	Equestrian facilities and mountain biking.
Cub Run Stream Valley Park	Not available, site not monitored	817	Historic, biking and hiking trails and playground.
Sully Historic Site	23,000-26,000	Not available	Picnic grounds, gardens and museum store
James S. Long Regional Park	45,092	170	Soccer, baseball, tennis, basketball, equestrian ring, playground and picnic facilities.
Manassas National Battlefield Park	830,000	5,074	Self-guided walking and driving tours, museum and Civil War historic sites.
Robert Trent Jones Park	42,000	245	18 hole golf course, hiking and biking trails, playground and picnic facilities.
Fairfax National Golf Course	Not available	340	27 hole golf course, large brick clubhouse, fully stocked golf shop, natural grass practice facility and full service grill room
Field of Dreams Multisport Complex	Not available	120	Facilities for soccer, lacrosse, football, baseball, softball, volleyball, track, basketball, and hiking trails, nature preserve, information kiosk and gazebo
Newly Acquired Fairfax County Park Authority Property	Not available	838	Not available. Still in master planning phase.
Nissan Pavilion at Stone Ridge	300,000	100	Open-air concert pavilion with theater-style reserved seating including festival lawn seating. The facility can accommodate 24,000 people per event.
Sudley Park	Not available	101	Soccer, softball and baseball, football and picnic facilities.

Source: 2002 Virginia Outdoor Plan, correspondence with local and regional park authorities and resource websites.
Note: [1]This number includes the Splashdown Water Park visitors.

3.5 VISUAL QUALITY

Viewsheds and visually sensitive areas have been identified within the study area in accordance with FHWA's Technical Advisory T6640.8A and FHWA's Visual Impact Assessment for Highway Projects (U.S. Department of Transportation, FHWA, 1999). Visual issues pertinent to determining effects on historic resources under the Historic Preservation Act of 1966 and the project's use under Section 4(f) of the Department of Transportation Act of 1966 have also been identified. These areas and methods employed to define and assess them are discussed in greater detail in the Visual Quality Technical Report (VDOT, 2004).

Baseline (existing) visual quality was determined for certain areas based on the viewer activity and frequency of that particular area, along with the potential of that area to be affected by new roadways and/or development activities. To determine the visual context of each area, the quality of the viewshed was evaluated based on that portion of the landscape that is visible or potentially visible from new roadways and/or development activities or from which the new roadways and/or development activities may be seen.

As discussed in the Visual Quality Technical Report (VDOT, 2004), the visual context of each area was evaluated based on four criteria (i.e., unique, distinctive, common, and intrusive). These criteria were based on the vividness, intactness, and unity of the visual environment. Vividness is the visual strength or memorability of the landscape components as they combine in striking and distinctive visual patterns. Intactness is the visual integrity of the natural and man-made environment, especially as it relates to intrusive encroachment. Unity is the visual coherence and compositional harmony of the landscape. Other factors were also considered in the selection of these visually sensitive areas. These factors include the area type and the importance of the area. Visually sensitive areas identified within the study area are grouped into one or more of seven different types. These include agricultural, commercial, cultural, industrial, natural, recreational, and residential areas.

The study area contains two visually sensitive areas which are of particular concern due to their national and regional importance and their volume of visitors. These are the Manassas National Battlefield Park and Bull Run Regional Park (Table 3.5-1). The locations of these areas are shown in Figure 4.5-1 of Chapter 4.

TABLE 3.5-1
VISUALLY SENSITIVE AREAS OF NATIONAL AND REGIONAL IMPORTANCE

Site No.	Visually Sensitive Area	Area Type	Area Importance	Visual Context
14	Manassas National Battlefield Park and Historic District	Recreational, Natural, and Cultural	NRHP Listed – Military, Architecture, Recreation, Scenic, and Wildlife Habitat	Unique
17	Bull Run Regional Park	Recreational and Natural	Recreation, Scenic, and Wildlife Habitat	Distinctive

Source: National Register of Historic Places, 2002.

No FHWA-designated All-American Roads or National Scenic Byways are located in the state of Virginia. Virginia has a program that recognizes road corridors containing aesthetic or cultural value near areas of historical, natural, or recreational significance known as Virginia Byways; however, no Virginia Byways are located in the study area.

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3.6 SOCIOECONOMIC SETTING

3.6.1 Population

Rapid population growth has been experienced throughout the Tri-County Parkway project corridor and is expected to continue in the future. Table 3.6-1 presents the 1990, 2000, and 2030 data for residents in the Tri-County Parkway study area. The 2030 figures are from MWCOG projections that have not been revised based on the 2000 Census. The 2030 projection for the Commonwealth is an interpolation of MWCOG data with 2025 projections. From 1990 to 2000, the study area's population increased by 40 percent and an annual average increase of 2,962 persons per year. The 2030 forecast represents an even greater annual increase over the next 35 years. The study area's 2000 population of 102,908 represents 1.45 percent of the Commonwealth's total population. A population base of this size is larger than most cities in Virginia. Of those jurisdictions represented by the study area, Loudoun County shows the largest percentage increase in population between 2000 and 2030 (with approximately an 800 percent increase), followed by Fairfax County (with a 91.8 percent increase), then Prince William County (with a 57.4 percent increase), and Manassas (with a 5.1 percent increase). Manassas Park is the only jurisdiction in the study area to show a decline in population. Within the study area, Manassas Park is generally built-out, causing limited potential for a major increase in the number of households.

TABLE 3.6-1
POPULATION FOR THE TRI-COUNTY STUDY AREA

Jurisdiction	1990	2000	2030	Percent change from 2000 to 2030
Virginia	6,187,358	7,078,515	8,791,520*	24.20% *
Fairfax County	4,538	8,018	15,376	91.77%
Loudoun County	1,288	7,421	67,167	805.09%
Prince William County	34,509	47,033	71,661	52.36%
Manassas City	27,957	35,135	36,919	5.08%
Manassas Park City	4,999	5,301	5,163	-2.60%
Study Area Total	73,291	102,908	196,286	90.74%

Source: U.S. Census (1990 and 2000); MWCOG (2030); *Parsons Brinckerhoff calculation based on 2025 estimate

3.6.2 Household Income

Table 3.6-2 illustrates income data for the jurisdictions represented in the study area for 1989 and 1999. Northern Virginia, as a whole, tends to have higher median household incomes due to the large amount of technical and government employees working in and around the Washington D.C. metropolitan area. Loudoun County had a significant increase in income from 1990 to 2000 due to the large technology based enterprises and other private businesses that have taken interest in located in or near the Loudoun County portion of the Dulles Corridor (the area along VA 267). Manassas city, along with Fairfax and Loudoun counties, have out-paced the study area average percent increase. Loudoun County's large 55 percent increase in income has closed the gap between it and Fairfax County, with a difference of less than $600.

TABLE 3.6-2
MEDIAN HOUSEHOLD INCOME FOR JURISDICTIONS REPRESENTED IN THE STUDY AREA

Jurisdiction	1989	1999	Percent increase from 1989 to 1999
Fairfax County	$59,284	$81,050	36.7%
Loudoun County	$52,064	$80,648	54.9%
Prince William County	$49,370	$65,960	33.6%
Manassas Park City	$46,674	$60,409	29.4%
Manassas City	$39,076	$60,794	55.6%
All Jurisdictions (average)	$49,294	$69,772	41.5%

Source: 2000 US Census

Fairfax County had the highest median income in the study area in 1999, and was among one of the highest in the nation. Fairfax County's median household income, as well as the rest of the study area, is shown in Table 3.6-3. Numerous Fortune 500 Companies such as Nextel, Capital One Financial Group, Gannett Company, SLM Corporation (the parent company of Sallie Mae), and NVR Incorporated (parent company of Ryan Homes) are located within the Dulles corridor portion of Loudoun County. These companies have helped to bring higher income employment to Loudoun County and, in turn, have contributed to an increase in the household income over the past decade. Fairfax County's median household income is far above the study area average. Other jurisdictions, which have more diverse land uses within the study area, have lower median household income. All jurisdictions have incomes consistent or higher than the study area average.

TABLE 3.6-3
STUDY AREA MEDIAN HOUSEHOLD INCOME

Jurisdiction	Median Household Income, 1999
Fairfax County	$112,849
Loudoun County	$64,820
Prince William County	$58,459
Manassas Park City	$60,409
Manassas City	$60,794
Study Area average	$65,407

Source: 2000 US Census, Parsons Brinckerhoff

3.6.3 Employment

Fairfax County has the largest number of jobs (517,734) and the largest labor force (532,000) out of the jurisdictions being represented in the study area. This is due primarily to the strategic location of the county, being located on the Mid-Atlantic Seaboard and within close proximity to neighboring Metropolitan Washington DC. With more than 400 technology firms in Fairfax County, incomes are relatively higher than regional averages and are very competitive. Some of the larger companies in Fairfax County are outside the study area and are generally in the information technology sector, internet, energy, global and international trade, and retail sectors. Larger employers include: American Management Systems, Comprehensive Technologies International, Computer Sciences Corporation, DynCorp, EDS, Netcom Solutions International, Netplex, Reliable Integration Services, Science Applications International Corporation (SAIC), Signal Corporation, CareerBuilder.com, FOLIO*fn*, Road Runner Group, Streampipe.com, Tyson's Corner, and Exxon Mobile Corporation.

Loudoun County's labor market overall has increased dramatically in the last ten years. According to the Virginia Employment Commission, resident labor force increased by 78.9 percent, while employment by Loudoun County residents increased by 80 percent. In 2000, Loudoun County had 93,862 residents employed. Most of the employment in Loudoun County is focused in the Dulles corridor. Some of the larger employers include: America Online, MCI (formerly World Com), Com Search, NLX, and Independence Air (formerly Atlantic Coast Airlines).

Prince William County has had a steady increase in employment over the past decade. According to the 2000 Census, 84,569 residents were employed in Prince William County. The majority of the large employers in Prince William County are outside the project area. Some of the larger employers include: Didlake Inc., Micron Technology, Potomac Hospital, Quantico Marine Corp Base, S.W. Rodgers Company, and Vulcan Construction Materials.

Table 3.6-4 contains current and future employment projects for the study area and shows the forecasted growth for employment in the Commonwealth. The study area employment is projected to increase significantly (by 111.0 percent) by 2030, which is high in comparison to the Commonwealth projected increase of 43.0 percent. With a 327.3 percent increase, Fairfax County employment is projected to increase the most out of the jurisdictions represented. Loudoun County (with a 289.4 percent increase) follows, with Prince William (150.2 percent), Manassas Park (44.4 percent), and Manassas (21 percent) remaining.

TABLE 3.6-4
EMPLOYMENT FOR THE STUDY AREA

Jurisdiction	2000	2030	Percent change from 2000 to 2030
Virginia	4,413,620	6,311,948*	43.01%*
Fairfax County	1,079	4,611	327.34%
Loudoun County	2,621	10,205	289.36%
Prince William County	26,373	65,983	150.19%
Manassas Park City	730	1,054	44.38%
Manassas City	19,912	24,095	21.01%
Study Area Total	50,215	105,948	110.99%

* Data was interpolated from 2025 forecasts.
Source: 2000 Woods and Poole 2000 and 2025 employment forecast (Virginia); MWCOG (Study Area); Parsons Brinckerhoff

3.6.4 Housing

Table 3.6-5 presents selected housing data for the study area and the Commonwealth of Virginia. Of the 36,000 occupied housing units in the study area, 74 percent were owner occupied. This percentage is larger than Commonwealth average of just over 63 percent. All but one jurisdiction (Prince William County) has percent owner occupied units above that of the Commonwealth. Only 2.9 percent of the housing units in the study area are vacant, suggesting a high demand for housing.

TABLE 3.6-5
HOUSING DATA FOR TRI-COUNTY STUDY AREA

Jurisdiction	Total Housing Units	Owner Occupied	Percent of Owner Occupied	Renter Occupied	Percent of Renter Occupied	Vacant	Percent Vacant
Virginia	2,904,192	1,837,939	63.2 %	861,234	29.7 %	205,019	7.1%
Study Area	35,999	23,917	74.2%	10,967	22.9%	1,115	2.9%

Source: 2000 US Census

3.6.5 Residential Developments

Figure 3.6-1 illustrates residential developments in the study area. As of January 2003, Fairfax County contained 20 residential developments, Loudoun County contained ten residential developments, and Prince William County contained 84 residential developments located within the study area. Refer to the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004) for specific development names.

3.6.6 Public Facilities

Figure 3.6-2 shows the emergency services, fire/police, churches/cemeteries, schools/libraries, and sewer/water/sanitary services located within the study area. The type, name, and location (street address and jurisdiction) of institutional and public facilities within the study area are tabulated in the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004). The majority of the facilities are located south of Interstate 66, with a high concentration near the cities of Manassas and Manassas Park. Services such as fire stations, police stations, and universities are located in this area. Schools, post offices, and churches are located closer to the southern and northern edges of the study area. Cemeteries are the only facilities dispersed throughout the study area.

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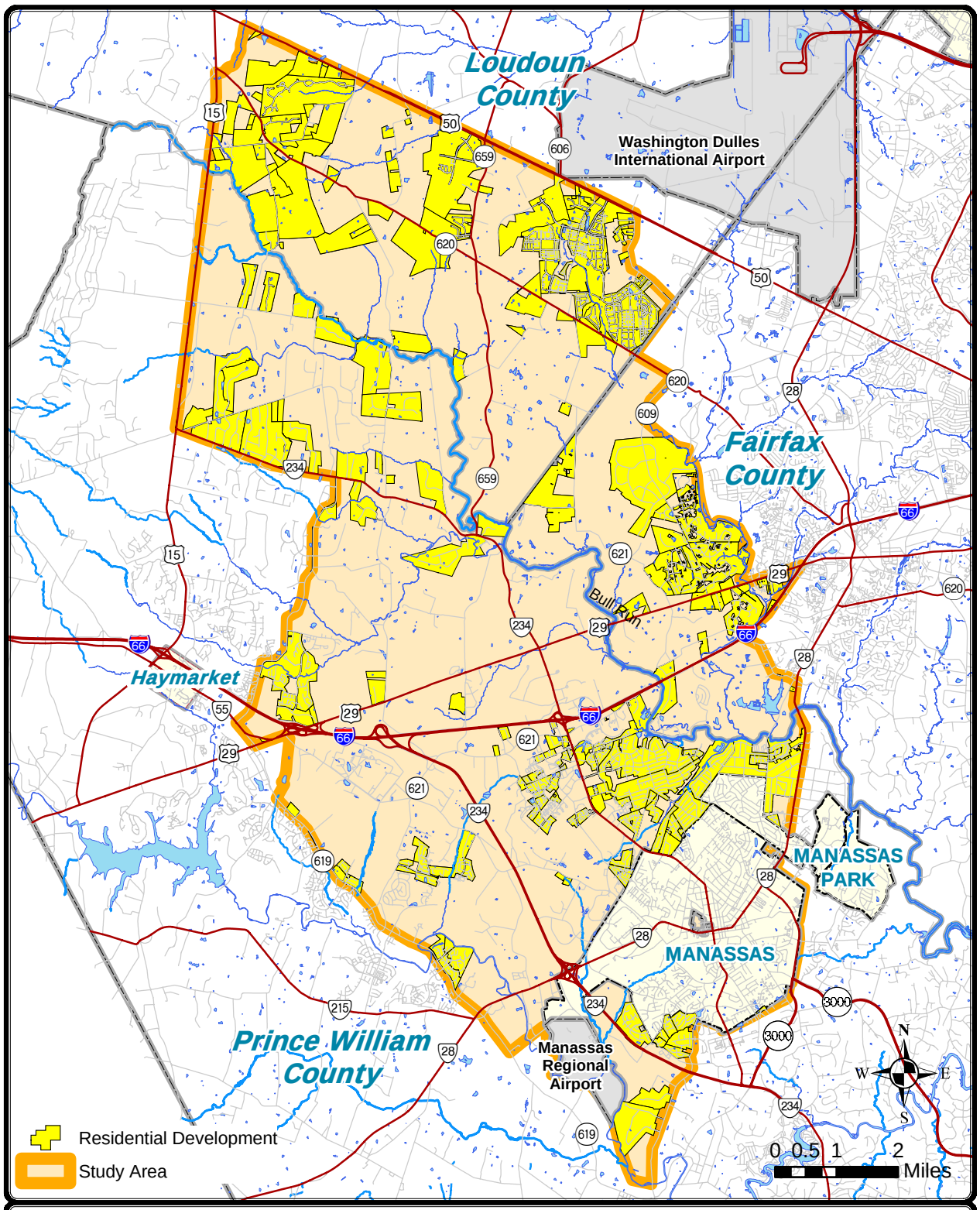
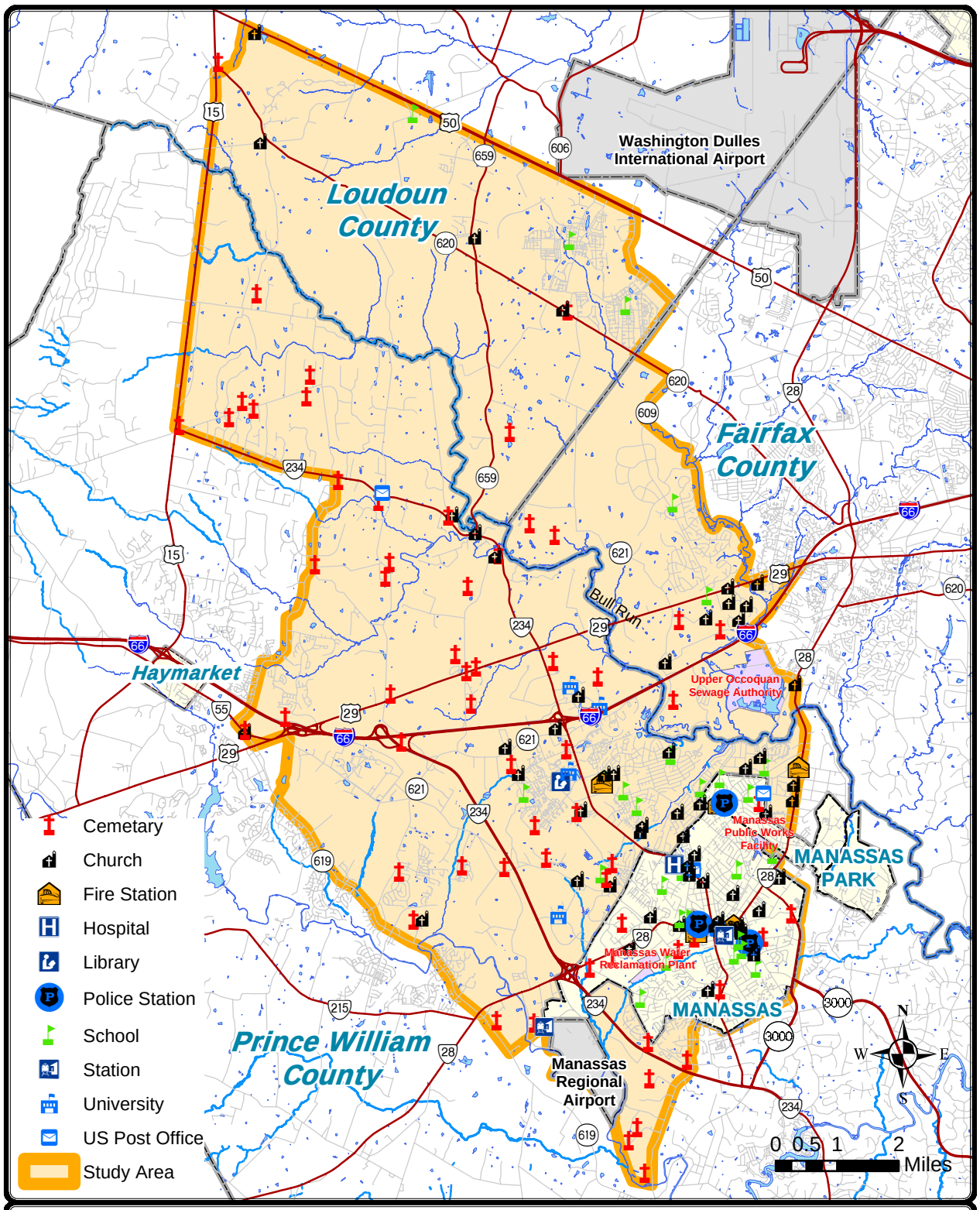


Tri-County PARKWAY Location Study

FIGURE 3.6-1
RESIDENTIAL DEVELOPMENTS



Tri-County PARKWAY Location Study

FIGURE 3.6-2
PUBLIC FACILITIES

3.6.7 Environmental Justice

3.6.7.1 Minority Populations

Figure 3.6-3 and Table 3.6-6 provide a summary of minority populations for the study area. The majority of the overall population in the study area is white non-Hispanic, with 27 percent of the study area's population being classified as minority. The study area's percentage of minority is slightly below the Commonwealth average of 28 percent. All jurisdictions represented in the study area have a lower percentage of minority residents - except for Prince William County which, at a rate of 29 percent, is slightly above the Commonwealth's percentage of minority population. Among the minority groups, the Latino population is the most prevalent. This is especially true in the City of Manassas, where numbers have increased over the past few years (Manassas, 2004). Not only has the Hispanic/Latino population grown, but the populations tend to cluster. Georgetown South, Bristoe Station, and Point of Woods are neighborhoods with high Hispanic populations in Manassas. The western half of the City of Manassas Park (the portion within the study area) is more diverse than the eastern half, but there are no clusters of one specific race or ethnicity (Manassas Park, 2004). Other minorities, such as African-Americans and Asian-Americans, are also located within and immediately outside the study area in smaller numbers. Loudon County, for example, has several small African-American communities located in large census tracts with a majority White population; thus, a cursory review of census records does not show areas with high concentrations of minorities. These neighborhoods, Aldie Mountain and Blue Mountain, are located just outside the study area (Loudoun County, 2004).

TABLE 3.6-6
MINORITY POPULATIONS IN THE STUDY AREA

Jurisdiction	Total Population	White Non-Hispanic	Minority[1]	Percent Minority
Virginia	7,078,515	5,120,110	1,958,405	28%
Study Area	101,722	74,559	27,152	24%

Source: 2000 U.S. Census
[1] Total minority is the sum of all persons other than white-non-Hispanic. Hispanics may be of any race.

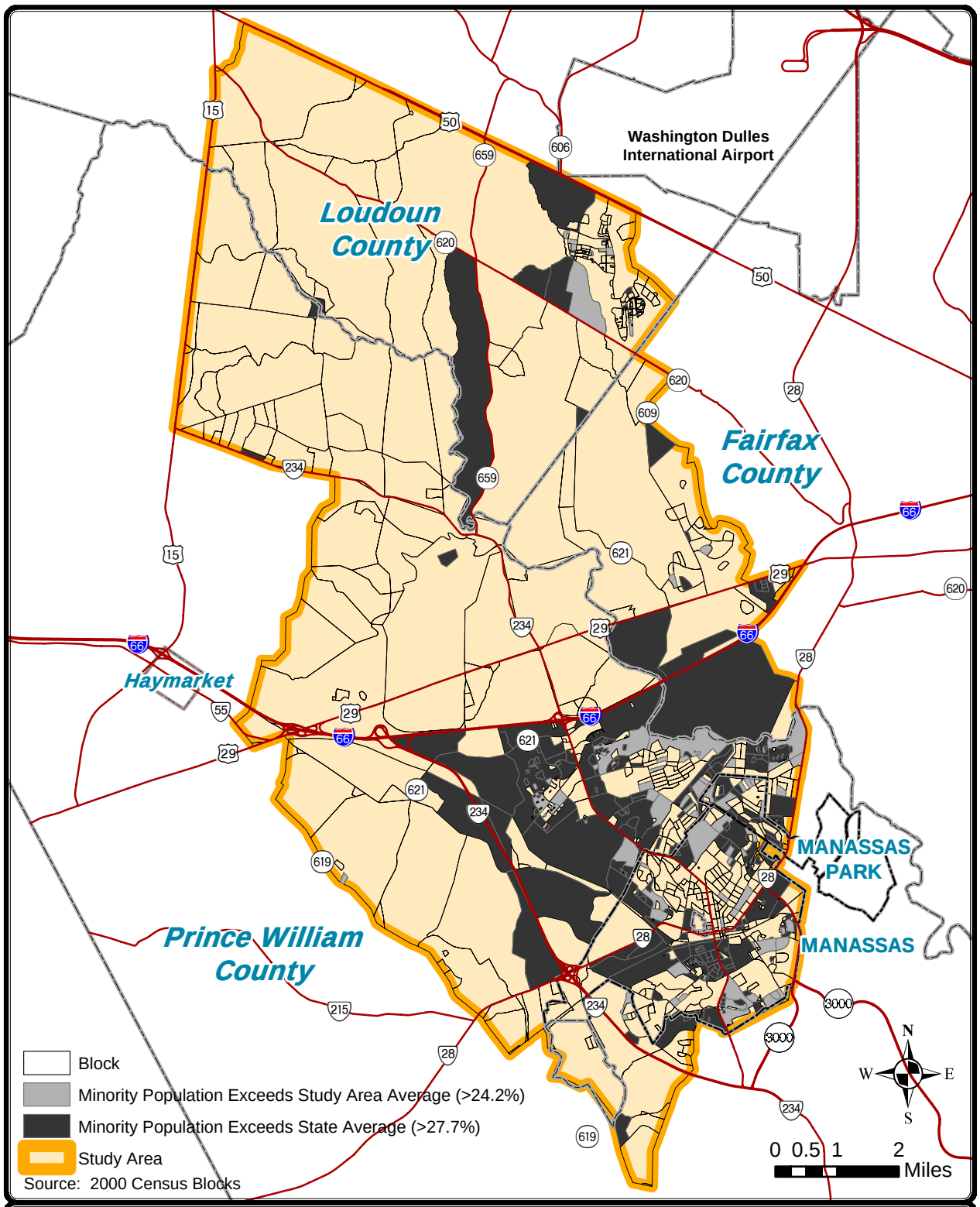
3.6.7.2 Low-Income Populations

Figure 3.6-4 and Table 3.6-7 present the 2000 Census data for the populations of low-income families and individuals in the study area. The median household incomes for the individual jurisdictions represented in the study area are considerably higher than the Commonwealth, thus the percent of people below the poverty level are well below the 9.6 percent value for Virginia. Small clusters of low-income populations and/or populations qualifying for affordable housing are found in the cities of Manassas and Manassas Park. Refer to the Socioeconomic Technical Report (VDOT, 2004) for more information on low-income populations, including details on the low-income neighborhoods within the study area.

TABLE 3.6-7
LOW INCOME AND POVERTY CHARACTERISTICS FOR THE STUDY AREA

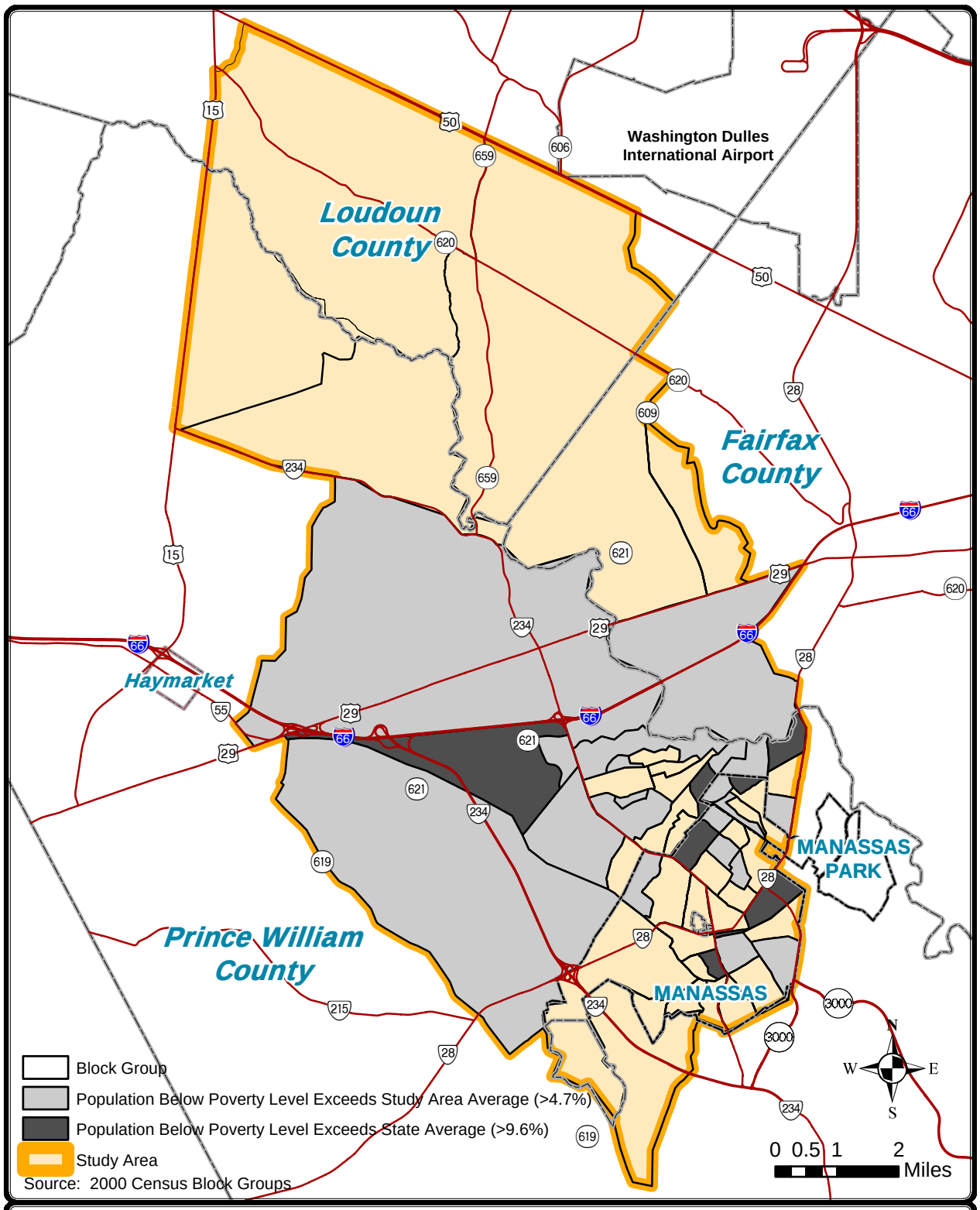
Locality	Median Household Income	Families Below Poverty Level	Percent of Families in Poverty	Persons for Whom Poverty Level is Determined[1]	People Below Poverty Level	Percent of People Below Poverty Level
Virginia	$46,677	129,890	2%	6,844,372	656,641	9.60%
Fairfax County	$112,849	67	1%	8,032	218	2.70%
Loudoun County	$64,820	50	3%	7,032	107	1.50%
Prince William County	$55,459	893	2%	45,538	2,913	6.40%
Manassas Park City	$55,608	108	2%	5,272	337	6.40%
Manassas City	$60,450	560	2%	34,163	2,151	6.30%
Study area average/ total	$65,407 [2]	1,678 [3]	2% [2]	100,037 [3]	5,726 [3]	4.69% [2]

Source: 2000 US Census, Parsons Brinckerhoff
[1] Poverty status is determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old.
[2] Study area average [3] Study area total



Tri-County PARKWAY Location Study

FIGURE 3.6-3
MINORITY POPULATIONS



Tri-County PARKWAY Location Study

FIGURE 3.6-4
LOW INCOME POPULATIONS

3.7 HAZARDOUS MATERIALS

3.7.1 Existing Data Review and Regulatory Database Search

An assessment corridor width of 600 feet was used to identify potential hazardous material sites (i.e., those potentially associated with hazardous materials which could pose a legal liability if acquired in whole or through easement). Sites near an alternative boundary, but not within the boundary of the 600-foot-wide assessment corridor, were also identified because they could result in potential contamination of the study area, depending on the site characteristics. More-detailed information on methods and findings are provided in the Hazardous Materials Technical Report (VDOT, 2004).

3.7.2 Identified Sites Associated with the Built Environment

The database search and windshield survey identified a total of 985 potential hazardous material sites within the study area. Many of the sites are identified as having multiple sources (e.g., a single site may have several USTs and a LUST, and appear in more than one database) and, therefore, the total number of locations within the study area are far fewer than the total number of hazardous material sources reported. See Figures 4.7-1 through 4.7-9 of Chapter 4 for locations of potentially affected hazardous material sites. A more-detailed discussion of hazardous material sites is presented the Hazardous Materials Technical Report (VDOT, 2004). A complete listing of the occurrences found in the database search and the windshield surveys is also included in Appendix 1 of the Hazardous Materials Technical Report. A distribution summary of the hazardous materials occurrences is presented in Table 3.7-1.

TABLE 3.7-1
SOURCE DISTRIBUTION SUMMARY

Agency/Database – Type of Record	No. of Sites Within Study Area
State **AST** Registered aboveground storage tanks	43
State **UST** Registered underground storage tanks	219
State **LUST** Leaking underground storage tanks	391
US EPA **GNRTR** RCRA registered small or large hazardous waste generator	121
US EPA and State **SPILLS** ERNS and state spills list	179
US and State **ERNS** Emergency Response Notification System	16
US EPA **CORRACTS** RCRA Corrective Actions	6
State **SPL** State equivalent priority list	1
US and State **SWLF** Solid waste landfills, incinerators, or transfer stations	1
US EPA **CERCLIS / NFRAP** Sites under review by EPA	6
OTHER Sites recorded from field observation	2

Source: Compiled from VISTA Information Solutions, Inc. Report ID: 440390001

3.7.3 Identified Sites Associated with the Natural Environment (Geologic Hazards)

In addition to hazardous material sites associated with the built environment, naturally occurring asbestos has been found in some igneous rocks (e.g., diabase) within the study area. A geologic map of the study area (see Figure 3.12-1) provides a general overview and information regarding rock units potentially containing asbestos minerals, (specifically, diabase and greenstone units). Other rock types may also contain asbestos. Through weathering, these rocks generate soil and, therefore, some soil types may contain naturally occurring asbestos. Consequently, disturbance from construction activities for any of the alternatives in areas where naturally occurring asbestos is suspected may require additional study and implementation of controls for asbestos.

3.8 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966 (NHPA) as amended (36 CFR 800), requires federal agencies to consider the effects of their actions on significant historic properties included in or eligible for the National Register of Historic Places (NRHP). To satisfy this requirement, it is necessary to consult with the State Historic Preservation Officer (SHPO) when identifying historic resources and determing effects to historic resources. In the Commonwealth of Virginia, the Director of the Virginia Department of Historic Resources (DHR) serves as the SHPO. For the Tri-County Parkway project, previously recorded historic resources, including archaeological sites, were identified in the study area using DHR's database. A Phase I Architectural Survey was conducted in accordance with the provisions of Section 106 of the NHPA to identify other potentially eligible architectural resources (addressed in section 4.8 of this EIS). Potentially eligible archaeological resources will be identified and evaluated in accordance with revised regulations of the NHPA, which allow a phased approach where multiple corridors or large land areas are under consideration. More-detailed discussion of methodologies and findings are presented in the Reconnaissance Survey and Cultural Resource Overview (VDOT, 2004), the Phase I Architectural Survey and Management Summary (VDOT, 2004), and the Phase II Architectural Evaluation (VDOT, 2004).

3.8.1 Architectural Resources

3.8.1.1 Architectural Setting

The study area is made up of portions of three Piedmont Virginia counties: Prince William, Fairfax, and Loudoun. Initial establishment of these counties reflected episodes of expanding historic settlement from their founding in the early eighteenth century. Settlement density, a factor that stimulated westward movement, continues to define these counties today. While some rural pockets remain and the historic landscape of Manassas Battlefield Military Park survives relatively intact, rapid development is depleting the historic building stock in the study area. A number of houses have been boarded-up awaiting their demise. Many are already gone.

3.8.1.2 Resources Identified

Within the study area, a total of 517 resources have been previously recorded at DHR. They include homes, farms, historic districts, schools, commercial, and Civil War related resources. Of these, a total of 22 previously recorded resources located in the study area were determined eligible for the NRHP. These resources are listed in Table 3.8-1 and their general locations are shown on Figure 3.8-1.

TABLE 3.8-1
ARCHITECTURAL RESOURCES LISTED ON OR
ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

VDHR NUMBER	CITY/COUNTY	QUADRANGLE	NAME	COMMENTS
029-0378	Fairfax	Manassas	Lane's Mill	Eligible; also 44FX46
029-0410	Fairfax	Manassas	Union Mills Historic District	Potentially Eligible
029-5012	Fairfax	Manassas	Centerville Confederate Military Railroad	Eligible; also 44FX1750
029-5117	Fairfax	Manassas	Blackburn's Ford Battlefield	Potentially Eligible (Civil War Sites Advisory Commission Recommendation)
076-0004	Prince William	Gainesville	Ben Lomond	NRHP Easement
076-0014	Prince William	Independent Hill	Moor Green/Moor House	NRHP
076-0016	Prince William	Manassas	Signal Hill	NRHP
076-0024	Prince William	Nokesville	Bristow Station Battlefield	De-listed, Determined Eligible by VDHR
076-0031	Prince William	Independent Hill	White House/Brent House	NRHP; Brentsville Historic District

VDHR NUMBER	CITY/COUNTY	QUADRANGLE	NAME	COMMENTS
076-0040	Prince William	Manassas	Mitchell's Ford Entrenchment	NRHP
076-0070	Prince William	Independent Hill	Bradley	Eligible
076-0149	Prince William	Independent Hill	Bloom Hill Farm	Eligible
076-0245	Prince William	Nokesville	Davis-Beard House	NRHP
076-0271	Prince William	Gainesville/ Manassas	Manassas National Battlefield and Historic District	NRHP
076-0338	Prince William	Nokesville/ Independent Hill	Brentsville Historic District	NRHP
076-5032	Prince William	Nokesville	Cannon Branch Fort	NRHP Easement; also 44PW227
076-5036	Manassas	Nokesville/ Manassas	Manassas Station Battlefield	Eligible
155-0001	Manassas	Manassas	Liberia	NRHP
155-0010	Manassas	Independent Hill	Manassas Industrial School for Colored Youth	NRHP
155-0107	Manassas	Manassas	Pickeral House	Eligible
155-0161	Manassas	Independent Hill/ Manassas	Manassas Historic District	NRHP
155-5002	Manassas	Manassas	Mayfield Fortification	NRHP; also 44PW226

Source: Virginia Department of Historic Resources, 2002.

3.8.2 Archaeological Resources

A total of 323 archaeological sites have been previously recorded within the study area. Of these, a total of 14 previously recorded resources located in the study area were determined eligible for the NRHP. These resources are listed in Table 3.8-2. These sites have not been depicted on a study area map to protect them from vandalism and relic hunters. Investigations to identify additional potentially eligible archaeological sites will be conducted on the CTB-selected alternative (determined after the draft EIS and concluded before the final EIS).

TABLE 3.8-2
ARCHAEOLOGICAL SITES LISTED ON OR
ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES

VDHR Number	County	Quadrangle	Site Description (NA=Native American; H=Historic period)	Comments
44FX0046	Fairfax	Manassas	H - 18th c., Mill (029-0378)	Eligible for NRHP
44FX1750a	Fairfax	Manassas	H - Civil War railroad embankment (029-5012), within Bull Run Regional Park	NRHP Listed
44FX1750b	Fairfax	Manassas	H - Civil War railroad embankment (029-5012), within Bull Run Regional Park	NRHP Listed
44LD0459	Loudoun	Arcola	NA/H - Early Archaic, Late Archaic, Early, Middle, and Late Woodland	Eligible for NRHP
44PW0080	Prince William	Gainesville	H - 18th to 19th c., Structural remains and cemetery associated with Monroe House (076-0147)	Eligible for NRHP
44PW0226	Prince William	Manassas	H - Civil War, Mayfield Fortification (155-5002)	NRHP Listed
44PW0227	Prince William	Nokesville	H - Civil War earthwork	Same location as NRHP Easement for Cannon Branch Fort (076-5032)
44PW0487	Prince	Independent Hill	H – 19th c., Icehouse	Same location as

VDHR Number	County	Quadrangle	Site Description (NA=Native American; H=Historic period)	Comments
	William			# 076-0149
44PW0505	Prince William	Independent Hill	H - 1892 to 1938, African-American school; 1861 to 1865 Civil War camp	Eligible for NRHP
44PW0579	Prince William	Gainesville	H - Civil War cemetery and Duncklin Monument	Eligible for NRHP
44PW0580	Prince William	Gainesville	H - 19th c., Unfinished Railroad	Eligible for NRHP
44PW0612	Prince William	Gainesville	H - 19th c, Kitchen Ben Lomond House (076-0004)	NRHP listed
44PW0972	Prince William	Nokesville	NA/H - Middle Archaic/18th to 19th c.	Eligible for NRHP
44PW0973	Prince William	Nokesville	NA/H - Unknown/19th to 20th c.	Eligible for NRHP

Source: Virginia Department of Historic Resources, 2002.

These sites are located in settings ranging from floodplains to ridge tops and date from the Paleoindian period through the twentieth century. Previous archaeological research in the vicinity of the project area has revealed that there is generally a high probability of prehistoric occupation in areas that are relatively level. Precontact sites have been recorded in upland hollows, on ridges, saddles, benches, terraces, floodplains, and in rockshelters. The potential is high for the presence of camps and upland habitations throughout most of the project area. Although many of the sites located in the current project area are apt to consist of lithic scatters, the potential for significant sites is high on larger upland landforms such as ridge tops and saddles.

Residential and commercial development has increased in recent years and exceeds that depicted on the topographic maps. This development will undoubtedly have had an effect on the preservation of archaeological sites within the project area. Site preservation is not expected in areas with extensive grading, underground utilities, or foundation excavation; however, intact sites could be encountered in areas such as minimally landscaped green spaces or under some types of parking lots. Along broad floodplains, even in developed areas, the potential for intact sites is generally higher since they may be sealed in place by alluvial deposits.

A number of variables affect the preservation of archaeological sites in areas that are currently farmed. In fields that have been deeply plowed over long periods of time, sites may be encountered but would not normally retain intact deposits or features. This would be especially true in areas with slope and/or naturally eroded soils. The probability for site preservation is higher in more recently cultivated areas that have had shallow plowing or where no-till cultivation methods have been employed. Sites may also be preserved beneath cultivated fields that are located on broad floodplains. Without reference to specific areas and types of cultivation practices, it is impossible to assign a probability for site preservation in currently farmed areas.

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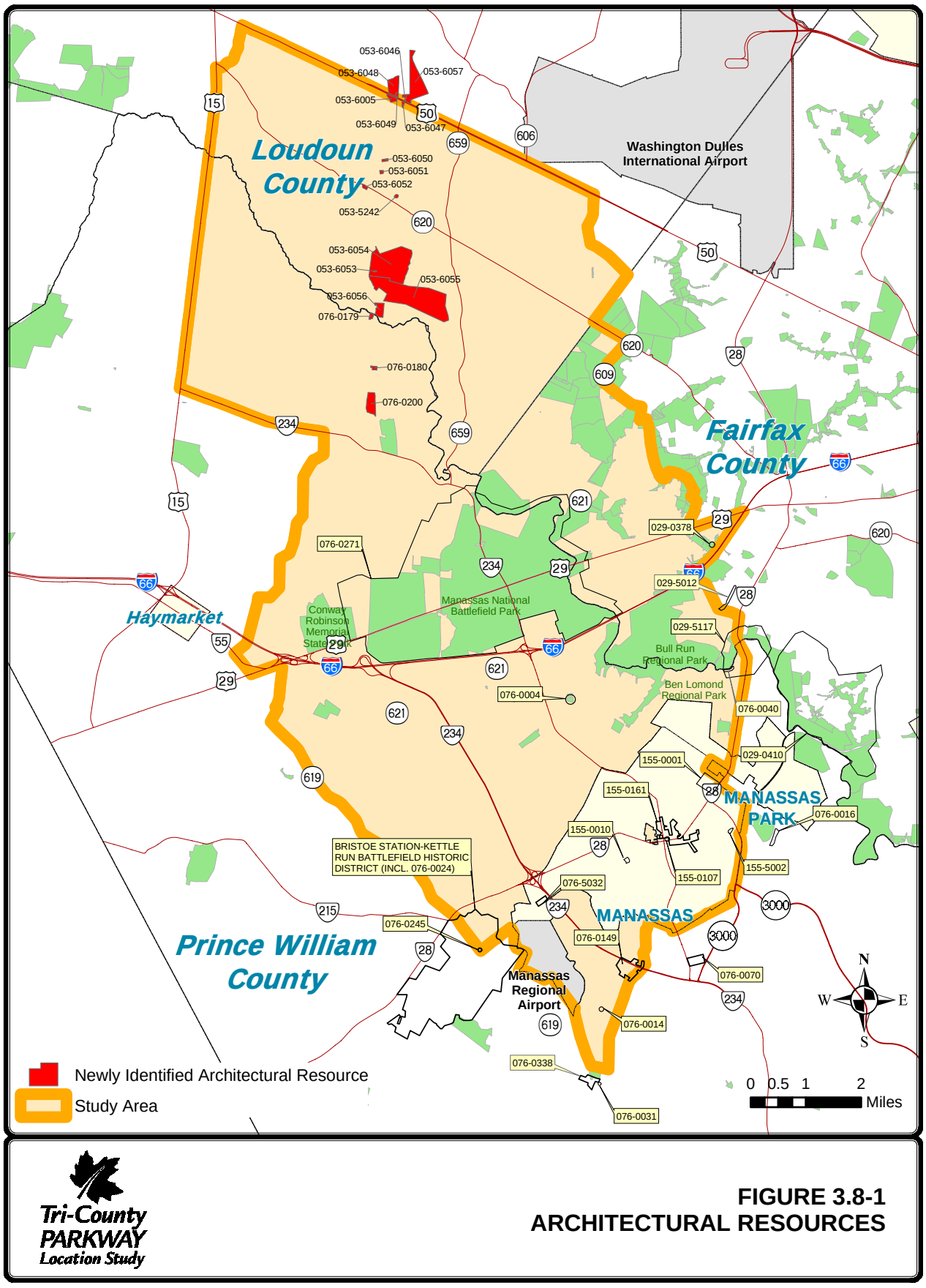

Tri-County PARKWAY Location Study

FIGURE 3.8-1
ARCHITECTURAL RESOURCES

3.9 AIR QUALITY

Air quality is a general term used to describe the pollutant levels in the atmosphere. The air quality baseline of the study area is set forth in this section. More-detailed discussion of methods and findings as related to air quality of the study area is provided in the Air Quality Technical Report (VDOT, 2004)

Section 107 of the 1997 Clean Air Act Amendments requires the EPA to publish a list of all geographic areas in compliance with the NAAQS, as well as those not in attainment of the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment areas; the designation subjects the effected areas to a regulatory burden that must be followed to clean up the air. Failure to do so can result in a variety of restrictions including restrictions on the area to advance certain transportation projects.. The designation of an area is made on a pollutant-by-pollutant basis. A network of sampling stations monitors air pollutant levels throughout Virginia. The stations are operated under the supervision of the Virginia Department of Environmental Quality (DEQ). Table 3.9-1 gives the data from the stations within the study area (Fairfax County, Loudon County, Prince William County and the City of Manassas) for 2001. The counties comprising the area are in attainment for all pollutants except for the 1-hour ozone standard and the 8-hour ozone standard. The area is in attainment for the CO standard, but a project-level analysis has been performed per FHWA's Technical Advisory T6640.8A.

TABLE 3.9-1
AIR QUALITY SUMMARY - DEQ MONITORING SITES HIGHEST RECORDED LEVELS DURING 2002

Polluant	Fairfax County	Fairfax County	Loudon County	Prince William County	Prince William County
	Mclean Governmental Center	Chantilly, Upper Cub Run Treatment Plant	Ashburn, Broad Run High School	Long Park	Manassas Health Department
Station Number	**L-46-A8**	**L-46-F**	**38-I**	**45-L**	**45-A**
Carbon Monoxide (CO)					
Maximum 1-hour	3.3 ppm	2.2 ppm	NM	NM	NM
Concentrations > 35 ppm	0	0	NM	NM	NM
Maximum 8-hour	2.3 ppm	1.2 ppm	NM	NM	NM
Concentrations > 9 ppm	0	0	NM	NM	NM
Nitrogen Dioxide (NO_2)					
No. of 1-hour Observations	6076	8401	8506	8464	NM
1-Hour Maximum	0.071 ppm	0.050 ppm	0.052 ppm	0.047 ppm	NM
Annual Arithmetic Mean	0.019 ppm	0.009 ppm	0.014 ppm	0.011 ppm	NM
Annual Mean > 0.05 ppm	0	0	0	0	NM
Particulate Matter < 10 Micrometers (PM_{10})					
No. Of 24-Hour Observations	NM	54	NM	NM	57
24-Hour	NM	57 $\mu g/m^3$	NM	NM	51 $\mu g/m^3$
Concentrations > 150 g/m^3	NM	0	NM	NM	0
Annual Arithmetic Mean	NM	18 $\mu g/m^3$	NM	NM	18 $\mu g/m^3$
Mean > 50 g/m^3	NM	1	NM	NM	1
Ozone (O_3)					
No. Of 1-Hour Observations	6696	7250	5070	4918	NM
1-Hour Maximum	0.131 ppm	0.149 ppm	0.132 ppm	0.129 ppm	NM
Concentrations > 0.12 ppm	1	1	1	1	NM

Polluant	Fairfax County	Fairfax County	Loudon County	Prince William County	Prince William County
	Mclean Governmental Center	Chantilly, Upper Cub Run Treatment Plant	Ashburn, Broad Run High School	Long Park	Manassas Health Department
Station Number	**L-46-A8**	**L-46-F**	**38-I**	**45-L**	**45-A**
No. Of 8-Hour Observations	6696	7262	5127	4969	NM
8-Hour Maximum	0.104 ppm	0.099 ppm	0.119 ppm	0.108 ppm	NM
Concentrations > 0.08 ppm	7	12	23	7	NM
Sulfur Dioxide (SO_2)					
No. of 24-Hour Observations	363	364	NM	NM	NM
24-Hour Maximum	0.021 ppm	0.014 ppm	NM	NM	NM
Concentrations > 0.14 ppm	0	0	NM	NM	NM
Annual Arithmetic Mean	0.007	0.004	NM	NM	NM
Lead (Pb)					
Quarterly Average	NM	NM	NM	NM	NM

Source: Virginia Ambient Air Monitoring 2002 Data Report, DEQ, 2002.
Note: NM = Not Monitored

In July of 1997, EPA added PM2.5 as a criterion pollutant to the NAAQS. For the past year and a half, EPA has coordinated with the states to determine which areas will be designated nonattainment. Although all of Virginia's monitors are in compliance with the PM2.5 standard, EPA has designated the cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park as well as the counties of Arlington, Fairfax, Loudoun, and Prince William as nonattainment for PM2.5. The rationale for this decision is based on the fact that these jurisdictions are part of a larger metropolitan statistical area encompassing Virginia, Maryland, and the District of Columbia, which includes other jurisdictions that are not in compliance with the PM2.5 standard. Because particulate matter is a regional problem brought about, in part, by regional transportation patterns, commercial and industrial growth, and land use development, the cities and counties located in Northern Virginia were included in the Washington, D.C. metropolitan area PM2.5 nonattainment area. Areas designated nonattainment for PM2.5 will have 12 months from the time that the nonattainment designation becomes effective to demonstrate conformity to the new standard. In addition, EPA issued a Supplemental Notice of Proposed Rulemaking in early December for conducting hot-spot analyses in PM2.5 nonattainment areas, requesting comment on several options they have proposed. Given the effective date of the PM2.5 nonattainment designations and the uncertainty surrounding hot-spot analyses for PM2.5 nonattainment areas, this draft EIS does not address the issue. Whatever requirements are in place at the time of the final EIS will be addressed at that time.

The counties comprising the study area are part of an area currently designated as a severe nonattainment area under the 1-hour ozone standard (0.12 ppm). In July of 1997, EPA evaluated the latest scientific data and developed a standard more protective of public health after discovering that adverse health effects resulting from ozone exposure occur at lower concentrations spread out over longer periods of time. As a result, EPA adopted an 8-hour standard for ozone (0.08 ppm) but before they could apply it, it was tied up in litigation. Finally, in spring of 2004, EPA designated areas in nonattainment with the 8-hour standard; the localities comprising the study area are all included in the area designated nonattainment under the 8-hour standard, effective June 15, 2004. Areas designated nonattainment under the 8-hour ozone standard have one year to demonstrate conformity in accordance with the procedures established by EPA at which time the 1-hour ozone standard will be revoked. The Tri-County Parkway is currently included in the constrained Long-Range Plan for the region for construction, and the plan has been found to conform with the State Implementation Plan for the 1-hour ozone standard by FHWA and FTA. The MPO for the Washington, D.C. Metropolitan Area is currently completing a regional conformity analysis for the 8-hour ozone standard. No phases of the project are currently included in the region's Transportation Improvement Program with the exception of the environmental study.

3.10 NOISE

3.10.1 Noise Standards and Criteria

Baseline noise conditions for the study area were determined in accordance with Federal Highway Administration (FHWA) and Virginia Department of Transportation (VDOT) noise assessment guidelines. More-detailed discussion of methodologies and finds pertaining to noise related issues in provided in the Noise Technical Report (VDOT, 2004).

3.10.2 Existing Noise Conditions

To assess existing noise conditions within the study area, noise measurements were conducted at 28 sites from December 1 to 4, 2003, and on May 25, 2004. Measurements were conducted in the vicinity of noise-sensitive land uses in each of the alternative corridors near the proposed project alignment. The measurements characterized existing noise levels in the study area but were not necessarily conducted during the loudest hour of the day, and included noise from sources other than traffic, such as aircraft over-flights and human activity. During the noise measurement program, a windshield survey of noise-sensitive land and building uses was conducted to supplement the mapping provided. Existing noise data was collected in two ways. Attended short-term measurements were conducted at 25 representative sites throughout the entire study area. Secondly, unattended long-term measurements of noise levels were collected for a 24-hour period at three sites. Figure 4.9-1 shows the location of each noise measurement site. In the next two sections, results are presented first for the short-term measurements, and second for the long-term measurements.

3.10.2.1 Short-Term Noise Measurements

Short-term noise measurements of 20 to 30 minutes duration were obtained at a total of 25 sites. A summary of the short-term noise measurement results is presented in Table 3.10-1. For each site, the table lists the assigned site number, the location and a description of the associated land use, the letter designation of the Project Alternative corridor in which the site falls, the measured sound level, and the dominant sources of noise heard at each site. Table 3.10-1 reports both the total measured L_{eq} sound levels, which includes all one-minute periods, and the L_{eq}s associated with traffic only. In some cases, the traffic-only levels were used for comparison with noise predictions. Simultaneous traffic counts on nearby roadways were performed during several short-term noise measurements. The field data sheets are presented in the Noise Technical Report (VDOT, 2004).

The measured L_{eq} total noise levels in the study corridor ranged from a low of 39 dBA at the cul-de-sac near 12410 Boxwood Farms Road (Site 5) to a high of 66 dBA at 9701 Lomond Drive (Site 13). The dominant noise sources in the study area were traffic on local roads, aircraft flying overhead ("overflights") and wind in the trees. These noise sources are typical in the project area and are included in the total noise levels shown in Table 3.10-1. At most of the measurement sites, the total and traffic-only noise levels were very close, indicating that traffic is the dominant noise source at those locations. At some measurement sites in locations farther from roadways, the contributions from aircraft and other noise sources were more significant, resulting in a greater difference between the total and the traffic-only noise levels.

TABLE 3.10-1
SHORT-TERM NOISE MEASUREMENT SUMMARY

Site No.	Location and Land-use Description	Alternative Corridor.	Measured L_{eq} in dBA		Dominant Sources of Noise
			Total	Traffic Only	
1	Residence: 6621 Lolan St.	C	61	61	Route 29 (Lee Hwy) traffic, incl. trucks
3	Sudley Park, future baseball fields	C	53	53	Rt. 234 (Sudley Rd.) traffic, aircraft overflights
4	Residences - Cul-de-sac 12191 Richland Dr.	C	52	52	Distant traffic, wind in trees, aircraft

Site No.	Location and Land-use Description	Alternative Corridor.	Measured L_{eq} in dBA		Dominant Sources of Noise
			Total	Traffic Only	
5	Residences - Cul-de-sac 12410 Boxwood Farms Rd.	G	39	39	Distant aircraft, distant traffic
6	Residence 27022 Gum Spring Rd. (Rt. 659)	G	61	61	Traffic on Gum Spring, incl. trucks, aircraft
7	E.G. Smith City of Manassas Baseball Complex	E	59	59	Godwin Dr. traffic, incl. trucks
8	Residences - Cul-de-sac Confederate Trail	E	63	62	Godwin Dr. traffic, aircraft, train horn
10	Residences – Cul-de-sac Asheville St.	E	61	61	Godwin Dr. traffic, incl. trucks
11	Residences: 8237 Sunset Dr.	E	45	45	Traffic on Highland St. and Sunset Dr.
12	Residences: 9855 Nimitz Ct.	E	44	43	Distant traffic, aircraft, train horn
13	Residences 9701 Lomond Dr.	E	66	66	Lomond Dr. traffic
14	Residences 7912 Norfolk Ct.	E	43	42	Distant traffic, aircraft, distant dogs
15	Residences 7814 Amherst Dr.	E	50	48	Distant traffic, aircraft overflights
16	Residences – Cul-de-sac 9325 King George Dr.	E	45	42	Distant traffic, aircraft overflights
17	Bull Run Park Special Event Center	E	59	59	Interstate 66 traffic
18	Residence: 15211 Compton Rd.	F	52	52	Distant traffic, aircraft, wind
19	Residence: 15901 Lee Highway	F	65	65	Lee Highway traffic, incl. trucks
20	Stone Bridge Manassas Battlefield Park	F	64	64	Lee Highway traffic, incl. trucks, aircraft
21	Residences – Cul-de-sac Sudley Forest Ct.	F	55	55	Wind in trees, aircraft, distant construction
22	Residence 26821 Bull Run Post Office Rd.	F	53	52	Wind in trees, aircraft, Bull Run PO Rd. traffic, distant construction
24	Residences 25465 Beresford Dr.	F’	50	50	Aircraft, wind in trees, distant traffic
25	Residences Ashbury Dr./Astell St.	F’	54	53	Aircraft overflights, wind in trees, distant traffic
26	Residences 12750 Chatter Brook Dr.	D	44	N/A	Aircraft overflights, traffic on Sanders La. and local
27	Residence: 25005 Goshen Rd.	D	51	50	Aircraft overflights, traffic on Goshen Rd. (gravel)
28	Residence/ Equestrian center 41753 John Mosby Hwy (Rt. 50)	D	54	48	Aircraft overflights, traffic on Rt. 50

3.10.2.2 Long-Term Noise Measurements

Long-term measurements of approximately 24 hours duration were conducted at three sites in the project area to sample the hour-to-hour cycle of fluctuations in sound levels throughout the day. Table 3.10-2 provides a summary of the long-term measurements. For each site, the table provides the location and

description of the associated land use, the letter designation of the Project Alternative corridor in which the site falls, the beginning and ending dates and times, the measured hourly L_{eq} sound level during the loudest hour of the day and the hour in which it occurred, and the dominant sources of noise heard while the site was attended. More-detailed descriptions of each long-term measurement site are given in the Noise Technical Report (VDOT, 2004).

TABLE 3.10-2
LONG-TERM NOISE MEASUREMENT SUMMARY

Site No.	Location	Alt. Seg	Measurement Period		Loudest Hours		Dominant Sources of Noise
			Begin Date & Time	End Date & Time	L_{eq} in dBA	Period	
LT-2	Residence 5675 Pageland Road	C	12/2/03 3:30 pm	12/3/03 4:00 pm	63	7:00 to 8:00 am	Wind in trees, aircraft, traffic on Pageland - autos during peak periods and trucks
LT-9	Residence 8906 Sweetbriar St.	E	12/3/03 3:25 pm	12/4/03 4:00 pm	60	5:00 to 6:00 pm	Godwin Drive traffic, including trucks
LT-23	Residence 25045 Impala Ct.	F'	12/1/03 2:12 pm	12/2/03 4:00 pm	60	3:00 to 4:00 pm	Aircraft from Dulles airport
					57	8:00 to 10:00 am	Wind in trees, distant traffic

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3.11 WATER QUALITY

3.11.1 Surface Water Resources

The Tri-County Parkway study area lies within the Potomac River watershed. The majority of the study area is within the Middle Potomac-Anacostia-Occoquan Subarea (U.S. Geological Survey (USGS) Hydrologic Unit Code 02070010). The northwestern corner of the study area, part of the Broad Run (Potomac River) and Goose Creek watersheds, is within the Middle Potomac-Catoctin Subarea (USGS Hydrologic Unit Code 02070008). Bull Run and Broad Run are the two major streams within the study area. A number of named and unnamed perennial and intermittent tributaries of Bull Run, Broad Run (Kettle Run), and Broad Run (Potomac River) are present within the study area. Because of the generally rolling terrain and the gently sloping hills and valleys of the Piedmont physiographic province, the streams generally exhibit moderately to gently sloping gradients. Numerous small ponds are also present within the study area. Figure 4.11-1 of Chapter 4 depicts the locations of waterways and surface water resources within the study area. A more-detailed discussion of surface water resources is presented in the Water Quality Technical Report (VDOT, 2004).

3.11.1.1 Public Surface Water Supplies

Surface waters are the major source of potable water within the study area. The Broad Run (Kettle Run), Bull Run, Goose Creek, and Broad Run (Potomac River) drainage basins contribute varying amounts of surface water to public water supplies of the region. Bull Run flows directly into Occoquan Reservoir (an impoundment of the Occoquan River) which has an intake located approximately 16 miles to the east of the study area. The Broad Run (Potomac River) watershed is within the drainage system for the Middle Potomac River drinking water intake. These two supplies, the Occoquan Reservoir and Potomac intake, are the primary public drinking water sources for the study area and the surrounding region. The Fairfax County Water Authority (FCWA) manages the Occoquan Reservoir and Potomac intake systems and provides water to the majority of residents within the study area including residents of Loudoun, Prince William and Fairfax counties, and the City of Manassas. The City of Fairfax provides public drinking water to customers in eastern Loudoun County (as well as to its residents) and the Loudoun County Sanitation Authority supplies Loudoun County customers in part through reservoirs on Goose Creek, the receiving waterway of Howser's Branch. The City of Manassas draws water from Lake Manassas, an impoundment of Broad Run (Kettle Run), which is located approximately one mile southwest (upstream) of the study area. Other public water suppliers operating within the study area (Loudoun County Sanitation Authority and the Prince William County Service Authority) obtain drinking water from surface waters located outside the watershed of the project area or purchase water from the FCWA or the City of Manassas. The Virginia Department of Health (VDH) has identified Source Water Assessment Program (SWAP) areas, where contamination of drinking water source(s) could pose a threat to public health, and has mapped the location and character of potential water supply contamination sources (PSCs) to groundwater and surface water supplies in Virginia. Portions of the study area, specifically the northwestern and southeastern corners, are within the public surface water protection (SWAP) area boundaries (*i.e.,* upstream watershed) for the Potomac River intake, Occoquan Reservoir, and Goose Creek water systems. Boundaries of these SWAPS are shown in Figure 4.11-2 of Chapter 4. Potential contamination source data for the study area is presented in section 4.11 of this EIS and in the Water Quality Technical Report (VDOT, 2004).

3.11.1.2 Surface Water Quality

The Virginia Department of Environmental Quality has designated surface waters in the study area as non-tidal waters of the Coastal and Piedmont Zones (Class III). Under Section 401 of the Clean Water Act (CWA), certification of compliance with state water quality standards is required for discharges to surface waters. Special aquatic life and human health standards (acute and chronic) for ammonia, bacteria, chloride, hydrogen sulfide, heavy metals (11), and insecticides and organic compounds (23) apply to public water supplies. Table 3.11-1 summarizes Virginia water quality standards for Class III surface waters.

TABLE 3.11-1
VIRGINIA WATER QUALITY STANDARDS FOR CLASS III NON-TIDAL WATERS

Criteria	Dissloved Qxygen (mg/L)		pH Range	Maximum Temperature	Fecal Coliform	
	Minimum	Dailey Average			30 Day[1]	Max[2]
Standard	4.0	5.0	6.0-9.0	32°C	200	1,000

Notes: [1] Geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a 30-day period.
[2.] 1,000 fecal coliform bacteria per 100 ml at any time.

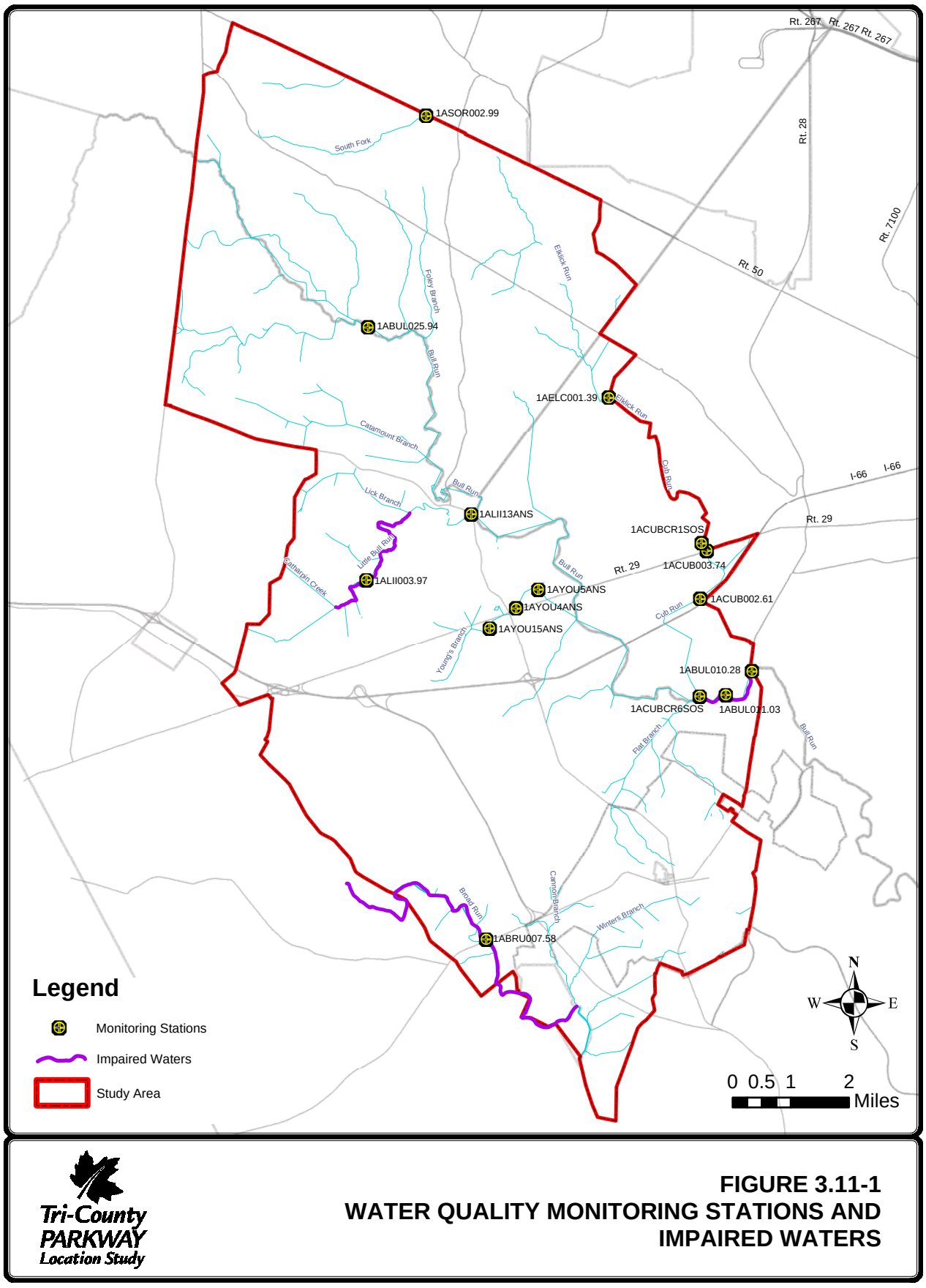
Impaired water bodies are those that do not meet statutory water quality standards and designated uses, and thus do not support aquatic life and wildlife, fish and shellfish consumption, are not suitable for recreational use by humans, or do not meet public water supply standards. Within the study area, fecal coliform is the leading cause of impairment, impacting 16.04 miles on three stream sections (VDEQ, 2004). Another 5.64 miles of stream, the headwaters of Young's Branch, is listed by VDEQ (2004) as threatened with regard to the aquatic life goal. The primary source of fecal coliform contamination in flowing waters is wildlife (excluding waterfowl); however, agricultural runoff, urban runoff, leaking sanitary sewerage, and failing septic fields, as well as domestic animals are additional sources (VDEQ, 2004). Table 3.11-2 provides a summary of the 303(d) impaired waters occurring in the study area. The location of impaired stream reaches is depicted in Figure 3.11-1.

TABLE 3.11-2
VDEQ 2004 303(D) IMPAIRED WATERS

Stream Name	Segment ID	Segment Length (mi)	Impairment Cause	Source of Impairment	County/City
Bull Run	VAN-A23R-01	4.8	Fecal coliform bacteria, Aquatic life/benthics	Unknown	Fairfax/Prince William
		5.75	Fish Tissue-PCBs	Unknown	Fairfax/Prince William
Little Bull Run	VAN-A21R-01	3.03	Fecal coliform bacteria	Unknown	Prince William
Broad Run	VAN-A19R-01	7.26	Fecal coliform bacteria	Unknown	Prince William, City of Manassas
Total		16.04			

Source: 2004 VDEQ 303(d) Fact Sheets for Category 5 Waters (Appendix A, 2004 Draft305b/303d Report), website source at http://www.deq.state.va.us/wqa/pdf/2004ir/irapa1y04.pdf.

Baseline water quality of surface water resources within the study area was determined using published water quality monitoring data for state-monitored and federal-monitored streams provided by the Virginia Department of Environmental Quality (VDEQ) Ambient Water Quality Monitoring program and the VDEQ 2004 Draft 303b/303d Integrated Water Quality Report (VDEQ, 2004). Water quality parameters, which can be reasonably expected to be impacted by new highway construction and highway operation, were identified through review of research findings published by the Federal Highway Administration (FHWA) (U.S. Department of Transportation (USDOT), 1996, 1998). VDEQ 305(b) water quality assessments for 15 monitoring stations on seven streams within the study area are presented in Table 3.11-3. Recent water quality trends (based on benthic sampling in four streams) are provided in Table 3.11-4 (VDEQ, 2000, 2002, 2004). The locations of water quality sampling sites are depicted on Figure 3.11-1. Additional water quality data including historical trends is presented in the Water Quality Technical Report (VDOT, 2004). Although measurements of physical and chemical water quality parameters suggest that Cub Run and Bull Run are in fair condition, aquatic benthic communities reflect an overall tendency towards water quality degradation. Data for Water Year 1990 for sampling stations on these two waterways indicates this trend has been evident for the last decade (FHWA, 1993; Fairfax County DPWES, 2001).



Tri-County PARKWAY Location Study

FIGURE 3.11-1
WATER QUALITY MONITORING STATIONS AND IMPAIRED WATERS

TABLE 3.11-3
VDEQ 305(B) WATER QUALITY ASSESSMENTS FOR STUDY AREA STATIONS

ID	Stream	County	Status	T (C°)	dO	pH	Fecal Coliform	Fish Tissue: Metals/Other Toxics	Total Phosphorus	Benthics[1]	Benthics Rating
SOR002.99	South Fork Broad Run	Loudoun	Fully Supporting	0/4	0/4	0/4	1/4	N/A	S	N/A	N/A
BRU007.58	Broad Run	Prince William	Impaired	0/19	0/19	0/17	4/19	N/A	S	N/A	N/A
LII003.97	Little Bull Run	Prince William	Impaired	0/17	0/17	0/15	2/17	N/A	S	N/A	N/A
LII13ANS	Little Bull Run	Prince William	Fully Supporting	N/A	N/A	N/A	N/A	N/A	N/A	LP	Good
BUL010.28	Bull Run	Prince William	Impaired	0/30	0/30	0/30	4/34	0/2	S	MI	N/A
BUL011.03	Bull Run	Fairfax	Fully Supporting	N/A	N/A	N/A	0/1	N/A	N/A		N/A
BUL025.94	Bull Run	Prince William	Fully Supporting	0/18	0/18	0/16	0/19	N/A	S	N/A	N/A
YOU15ANS	Youngs Branch	Prince William	Observed Effects	N/A	N/A	N/A	N/A	N/A	N/A	MP	Fair
YOU4ANS	Youngs Branch	Prince William	Observed Effects	N/A	N/A	N/A	N/A	N/A	N/A	MP	Fair
YOU5ANS	Youngs Branch	Prince William	Observed Effects	N/A	N/A	N/A	N/A	N/A	N/A	MP	Fair
ELC001.39	Elklick Run	Fairfax	Fully Supporting	0/6	0/6	0/6	1/5	N/A	S	N/A	N/A
CUB002.61	Cub Run	Fairfax	Fully Supporting	0/8	0/8	0/8	0/8	N/A	S	N/A	N/A
CUB003.74	Cub Run	Fairfax	Fully Supporting	0/18	0/18	0/15	1/17	N/A	S	N/A	N/A
CUBCR1SOS	Cub Run	Fairfax	Fully Supporting	N/A	N/A	N/A	N/A	N/A	N/A	LP	4/5 Good, 1/5 Fair
CUBCR6SOS	Cub Run	Fairfax	Fully Supporting	N/A	N/A	N/A	N/A	N/A	N/A	LP	1/2 Good, 1/2 Fair

Source: *VDEQ 2004 305(b)/(303(d) Integrated Report*, Supplemental List of Monitoring Stations: Potomac Shenandoah Basin, website at: http://www.deq.state.va.us/wqa/pdf/2004ir/mnstat1.pdf. Bold type indicates impairment.

[1] Notes: S = Supporting designated uses
MI = Moderately Impaired
MP = Medium Probability for Adverse Conditions (Citizen Monitoring, Insufficient Information but having Observed Effects)
LP = Low Probability for Adverse Conditions (Citizen Monitoring, Insufficient Information but indicating Fully Supporting)
N/A = No Data

TABLE 3.11-4
WATER QUALITY TRENDS –
BIOLOGICALLY MONITORED STREAMS WITHIN THE STUDY AREA

Stream	Station	Degree of Impairment[1]		
		2000	2002	2004
Little Bull Run	LII13ANS	N/A	LP	LP
Bull Run	BUL010.28	**MI**	**MI**	**MI**
Youngs Branch	YOU15ANS	N/A	MP	MP
Youngs Branch	YOU4ANS	N/A	MP	MP
Youngs Branch	YOU5ANS	N/A	MP	MP
Cub Run	CUBCR1SOS	N/A	LP	LP
Cub Run	CUBCR6SOS	N/A	LP	LP

Sources: DEQ, 2000, 2002, 2004. Bold type indicates impairment.
[1] Notes: S = Supporting designated uses
MI = Moderately Impaired
MP = Medium Probability for Adverse Conditions (Citizen Monitoring, Insufficient Information but having Observed Effects)
LP = Low Probability for Adverse Conditions (Citizen Monitoring, Insufficient Information but indicating Fully Supporting)
N/A = No Data

3.11.2 Groundwater Resources

The study area encompasses portions of the Piedmont physiographic province where ground water occurs in secondary fractures of igneous and metamorphic rocks. Virginia Water Quality Standards for ground water for the Piedmont physiographic province are summarized in TABLE 3.11-5. A more-detailed discussion of groundwater resources is presented in the Water Quality Technical Report (VDOT, 2004).

TABLE 3.11-5
VIRGINIA GROUNDWATER QUALITY STANDARDS: PIEDMONT PHYSIOGRAPHIC PROVINCE

Criteria	pH	Ammonia Nitrogen	Nitrite Nitrogen	Nitrate Nitrogen
Standard	5.5-8.5	0.025 mg/L	0.025 mg/L	5 mg/L

Source: Virginia Water Quality Standards (9 VAC 25-280-50), 2003.

Wellhead protection is protection of all or part of the area surrounding a well from which groundwater is drawn (EPA, 1999b). Individual localities implement Wellhead Protection Programs through their planning, zoning, and/or environmental regulations. No Wellhead Protection Programs implemented through local municipal or county regulations are currently in effect within the study area. At the federal level, the Sole Source Aquifer Protection Program was authorized to protect aquifers that have been designated as the sole or principal drinking water source for an area and which, if contaminated, would create a significant hazard to public health. No sole source aquifers are present within the study area.

With the exception of the City of Manassas Park (three wells), municipalities and water agencies operating within the study area do not own or operate any community well systems within the study area. Some landowners within the study area rely on private wells for their potable water, especially in localized areas underlain by a lower Paleozoic/Precambrian schist aquifer. The Virginia Department of Health (VDH) maintains records of 23 groundwater wells permitted as public drinking water systems within the study area. Depths of established wells within the study area are variable. Although a formal wellhead protection program does not exist in Virginia, VDH performs vulnerability assessments for public groundwater wells based on a one-mile fixed radius wellhead protection area as part of its Source Water Assessment Program (SWAP). Water quality problems may be encountered by a public water supply well if pollution-related activity occurs above or below the ground within these SWAP areas. See Figure 4.11-3 of Chapter 4 for locations of potentially affected public groundwater wells and associated wellhead protection areas.

3.12 NATURAL RESOURCES

3.12.1 Aquatic Ecology, Biodiversity, and Wildlife Habitat

This section addresses habitats primarily pertaining to streams, rivers, open waters, and deepwater habitats; however, many of the species discussed in this section are also dependent on wetland habitats. Wetlands are discussed in greater detail in Section 3.12.2. A wide diversity of aquatic habitat is present within the study area. These habitats provide valuable resources for many aquatic and water-dependent species. In addition to wetlands, aquatic habitats within the study area include free-flowing (lotic) systems, which are primarily un-vegetated intermittent and perennial habitats within streams, and restrictive-flow (lentic) systems, such as beaver ponds and small impoundments, including stormwater management facilities. Habitats within these systems have variable substrates and water chemistry that support different communities of aquatic biota. Riparian corridors along Broad Run, Bull Run, and larger tributaries cumulatively contribute to regional biodiversity. The biodiversity of aquatic communities varies significantly from north to south across the study area – with corridors being more contiguous and less altered in northern portions of the study area and corridors being more fragmented and altered by development and nonpoint discharge in the southern portions. The biodiversity of certain stream segments has been adversely affected by nonpoint pollution (increased sedimentation, nutrient loading, and fecal coliform counts) over a long history of agricultural practices – particularly those associated with livestock management. More recently, the biodiversity of streams in urbanized areas has been affected by channel modifications and by point and nonpoint pollution.

3.12.1.1 Deepwater Habitat

Riverine deepwater habitat within the study area is principally located along the larger streams - including Bull Run, Cub Run, Broad Run (Kettle Run), and possibly Elklick Run and Little Bull Run. National Wetlands Inventory (NWI) mapping indicates that 48 acres of lacustrine deepwater habitat is also present within the study area; the majority associated with the Upper Occoquan Sewage Authority emergency overflow retention facility adjacent to Bull Run Regional Park. Deepwater palustrine habitats also occur within farm ponds and other impoundments throughout the study area.

3.12.1.2 Fish and Fish Habitat

Although there are no commercial fisheries located within the study area, many of the streams and ponds provide habitat for a wide variety of fish. Many of the perennial streams within the study area contain great diversity and large quantities of fish species. Because intermittent streams do not flow year round, intermittent streams do not generally support permanent populations of fish; however, they do provide seasonal breeding grounds for some fish species and temporary refuge for juveniles. Additionally, intermittent streams are important to fish resources primarily as seasonal sources of water and sediment delivered downstream to more suitable fish habitats. Intermittent stream channels contribute nutrients to downstream reaches from primary production and leaf litter. In addition to fish found in perennial and intermittent streams within the study area, farm ponds are generally stocked with game fish by landowners for private recreation. A listing of fish species reported for the study area is provided in the Natural Resources Technical Report (VDOT, 2004). No wild trout streams, stocked trout waters, or recreational trout fisheries managed any resource agency occur within the study area (VDGIF, 2004b). Additionally, none of the waterways within the study area have been designated essential fish habitat by the National Marine Fisheries Service and, with the exception of the American eel (*Anguila rostrata*), no anadromous fish species have been documented in the study area.

3.12.1.3 Benthic Communities

Benthic macroinvertebrates are common inhabitants of aquatic habitats within the study area. These organisms usually inhabit bottom substrates for at least part of their life cycle. Because different groups of macroinvertebrates have different tolerances to the chemical and physical characteristics of water bodies, the species compositions within different water bodies may differ depending on the bottom substrate and quality of the water. The benthic organisms most commonly observed in streams within the study area are mayflies (Order *Ephemeroptera*), caddisflies (Order *Tricoptera*), hellgrammites (Order *Megaloptera*), midge and black fly larvae (Order *Diptera*), and water beetles (Order *Coleoptera*). Stoneflies (Order *Plecoptera*), which are generally intolerant of pollution, are present in low numbers or are absent in study area streams. Other

benthic invertebrates commonly found in study area streambeds include crayfish (Family *Cambaridae*), freshwater clams (Class *Pelecypoda*), and aquatic snails (Families *Hydrobiidae*, *Pleuroceridae*, and *Viviparidaea*). Among the clams, the non-native Asian clam (Family *Corbiculidae*) is particularly prevalent. The results of recent benthic macroinvertebrate sampling within the study area are presented in the Natural Resources Technical Report (VDOT, 2004). According to VDGIF and DCR records, twelve aquatic mollusk species (Family *Unionidae*) are also present within the study area watersheds, potentially including two mussels that are federal species of concern. Although suitable habitat for the endangered (federal- and state-listed) dwarf wedgemussel occurs within certain stream reaches in the study area, the species itself has not been reported within the study area (see section 3.12.6.1.3).

3.12.1.4 Waterfowl and Other Water-Dependent Migratory Birds

Waterways, water bodies, and wetlands within the study area provide suitable habitat for a number of bird species that are dependent on aquatic habitat for at least a portion of their life cycle. Waterfowl species observed in the study area include common loon (*Gavia immer*), pied-billed grebe (*Podilymbus podiceps*), double-crested cormorant (*Phalacrocorax auritus*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), American black duck (*Anas rubribes*), wood duck (*Aix sponsa*), American green-winged teal (*Anas crecca*), gadwall (*Anas strepera*), ringed-neck duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), and hooded merganser (*Lophodytes cucllatus*) (VDGIF, VAFWIS accessed 2002). Although the majority of these species occur primary as winter residents or spring and fall migrants, Canada geese, mallards, and wood ducks nest within the study area. Two hundred and sixty seven (267) migratory birds listed for protection under the Migratory Bird Treaty Act are reported to occur within the study area (see Appendix E of the Natural Resources Technical Report (VDOT, 2004)). Of these 267 species, 85 are dependent on aquatic habitat for at least a portion of their life cycle. Of the total 85 water-dependent species reported for the study area, four have been identified as "Species of Management Concern" by FWS. Of the four water-dependent "Species of Management Concern" within the study area, the "reason for concern" for one species (the least bittern) is reported to be "dependence on vulnerable or restricted habitats" (see Natural Resources Technical Report (VDOT, 2004)).

3.12.1.5 Other Wildlife Species Associated With Aquatic Habitat

Aquatic habitats of the study area provide food sources and denning for a number of water-dependent wildlife species. Aquatic habitats may also be used as travel corridors within and between watersheds. Additionally, open water habitats may provide escape from terrestrial predators. Several water-dependent mammals including beavers (*Castor canadensis*), muskrats (*Ondatra zibethicus*), and river otters (*Lontra canadensis*) have been observed in streams and wetlands within the study area. The northern water snake (*Nerodia sipedon sipedon*) is commonly found in wetlands within the study area and several species of aquatic turtles have been recorded in the study area. These aquatic turtles include eastern mud turtle (*Kinosternon subrubrum subrubrum*), eastern musk turtle (*Sternotherus odoratus*), eastern painted turtle (*Chrysemys picta picta*), and spotted turtle (*Clemmys guttata)* (VDGIF, VAFWIS accessed 2002). Most amphibians require open water to breed, and some need open water throughout the year. Intermittent streams within the study area are particularly important for juvenile amphibians because these sites support fewer predators than perennial streams. Several species of frogs have been recorded or observed in the study area. These species include eastern cricket frog (*Acris crepitans crepitans*), Cope's gray tree frog (*Hyla chrysoscelis*), northern spring peeper (*Pseudacris crucifer crucifer*), southern chorus frog (*Pseudioacris feriarum*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans melanota*), and southern leopard frog (*Rana spenocephala*). Common toads found within the study area are American toad (*Bufo americanus*) and Fowler's toad (*Bufo fowleri*). Salamander and newt species recorded or observed within the study area include red-spotted newt (*Notophthalmus viridescens viridescens*), northern red-backed salamander (*Plethodon cinereus*), and spotted salamander (*Ambystoma maculatum*) (VDGIF, VAFWIS accessed 2002).

3.12.1.6 Aquatic Invasive Species

Table 3.12-1 provides a list of invasive species within the region that could potentially affect the study area. Recently, two aquatic nuisance animals appeared in the metropolitan Washington, DC area. In 2004, the northern snakehead (*Channa argus*), an Asian fish species, was identified within the Potomac River drainage in Maryland and Virginia. If populations of this fish become established, it has the potential to have substantially adverse ecological impacts by feeding on and competing with native fishes, or may interfere with

local economies if populations become established. In western Prince William County, Virginia (Thoroughfare Gap area), a large population of zebra mussels (*Dreissena polymorpha*) were discovered in 2002 in an abandoned water-filled rock quarry. This zebra mussel population poses a substantial and immediate potential threat to public water supplies (VDGIF, 2004c). Lake Manassas and the Occoquan Reservoir, primary water supplies for northern Virginia, are located downstream of the quarry; if the zebra mussel escapes and becomes established, treatment at these water facilities could cost approximately $500,000 to $850,000 per year for chemicals and system maintenance. Zebra mussels also disrupt the aquatic food chain by removing microscopic organisms from the water column and compete for substrate within other benthic species, including other mussel populations.

The VDCR Division of Natural Heritage and the Virginia Native Plant Society have identified 109 invasive alien plant species that threaten or potentially threaten natural areas, parks, and other lands in Virginia (Table 3-12-2). Of these 109 species, 58 invasive plant species (because of their regional presence) have the potential to inhabit aquatic environments within the study area. Plant species with high invasiveness generally disrupt ecosystem processes and cause major alterations in plant community and structure. They readily establish into relatively undisturbed habitats and rapidly colonize heavily disturbed substrates or water regimes.

TABLE 3.12-1
INVASIVE AQUATIC NUISANCE SPECIES OBSERVED OR WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME	INVASIVENESS	HABITAT
Zebra mussel	***Dreissena polymorpha***	**High**	**Lakes and ponds**
Eurasian ruffle	*Gymnocephalus cernuus*	High	Lakes and ponds
Asian swamp eel	*Monopterus albus*	High	Canals, ditches, streams, ponds
Northern snakehead	***Channa argus***	**High**	**Ponds, streams**
Round goby	*Neogobius melananostomus*	High	Ponds, lakes, streams
Flathead catfish	***Pylodictis olivarius***	**Moderate**	**Rivers, lakes, reservoirs**
Nutria	*Myocastor coypus*	Low	Streams, ponds, lakes
Fire ant	*Solenopus invicta*	Low	Floodplains, wetland edges
Asian tiger mosquito	*Aedes albopictus*	High	Wetlands, swamps, floodplains

Source: VDGIF Website research sources. Bold type indicates species of management concern (most aggressive and highest degree of invasiveness that are known for the Commonwealth and regionally near the Tri-County Parkway study area). If encountered in or near the selected alternative corridor, active management may be required to prevent colonization within construction areas.

TABLE 3.12-2
INVASIVE AQUATIC/WETLAND PLANT SPECIES OBSERVED OR WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME	INVASIVENESS	HABITAT
Redtop	*Agrostis gigantea*	Occasional	Wetlands, mitigation sites
Garlic mustard	***Alliaria petiolata***	**High**	**Floodplains**
Field garlic	*Allium vineale*	Medium	Fields, mitigation sites, naturalized
Alligatorweed	*Alternanthera philoxeroides* *	High	Ponds, shores, ditches (aquatic)
Porcelain-berry	***Ampelopsis brevipedunculata***	**High**	**Floodplains, mitigation sites**
Chocolate vine	*Akebia quinata* *	Medium	Floodplains
Mugwort	*Artemisia vulgaris*	Medium	Meadows, fields, mitigation sites
Jointed grass	***Arthraxon hispidus***	**Medium**	**Wetlands, mitigation sites, becoming naturalized**
Japanese barberry	*Berberis thunbergii* *	Medium	Floodplains
Oriental bittersweet	***Celastrus orbiculatus***	**High**	**Floodplains, mitigation sites**
Canada thistle	***Cirsium arvense***	**High**	**Meadows, fields, mitigation sites**

COMMON NAME	SCIENTIFIC NAME	INVASIVENESS	HABITAT
Common dayflower	*Commelina communis*	Occasional	Disturbed wetlands, mitigation sites
Poison hemlock	*Conium maculatum*	Occasional	Wetlands, mitigation sites
Field bindweed	*Convolvulus arvensis*	Medium	Wetlands, mitigation sites, pond edges
Crown vetch	*Coronilla varia*	Occasional	Fields, mitigation sites
Orchard grass	*Dactylis glomerata*	Occasional	Fields, mitigation sites
Chinese yam	***Dioscorea oppositifolia***	**High**	**Floodplains**
Common teasel	*Dipsacus sylvestris* *	Medium	Disturbed areas, mitigation sites
Brazilian waterweed	*Egeria densa* *	Medium	Ponds, shores, ditches (aquatic)
Russian olive	*Elaeagnus angustifolia*	Occasional	Floodplains, mitigation sites
Autumn olive	***Elaeagnus umbellata***	**High**	**Floodplains, mitigation sites**
Wintercreeper	***Euonymus fortunei***	**Medium**	**Floodplains**
Japanese hops	*Humulus japonicus*	Medium	Floodplains
Hydrilla	***Hydrilla verticillata***	**High**	**Ponds, shores, ditches (aquatic)**
Red morning glory	*Ipomea coccinea*	Occasional	Disturbed areas, mitigation sites
Ivy-leaved morning glory	*Ipomea hederacea*	Medium	Floodplains, mitigation sites
Common morning glory	*Ipomea purpurea*	Medium	Floodplains, fields, mitigation sites
Chinese lespedeza	***Lespedeza cuneata***	**High**	**Meadows, fields, mitigation sites**
Chinese privet	***Ligustrum sinense***	**High**	**Floodplains, mitigation sites**
Japanese honeysuckle	Lonicera japonica	**High**	**Anywhere, naturalized**
Bush honeysuckle	***Lonicera maackii***	**Medium**	**Floodplains, mitigation sites**
Amur honeysuckle	***Lonicera tatarica***	**Medium**	**Floodplains, mitigation sites**
Birdsfoot trefoil	*Lotus corniculata*	Occasional	Fields, mitigation sites
Moneywort	*Lysimachia nummularia*	Medium	Wetlands, mitigation sites, floodplains
Purple loosestrife	***Lythrum salicaria***	**High**	**Wetlands, mitigation sites, ponds**
Yellow sweet clover	*Melilothus officinalis*	Occasional	Disturbed areas, mitigation sites
Japanese stilt grass	***Microstegium vimineum***	**High**	**Anywhere, becoming naturalized**
Silver grass	*Miscanthus sinensis*	Occasional	Disturbed wetlands, mitigation sites
Aneilema	***Murdannia keisak***	**High**	**Ponds, wetlands, (semi-aquatic)**
Parrotfeather	***Myriophyllum aquaticum***	**High**	**Ponds, shores, ditches (aquatic)**
Water milfoil	***Myriophyllum spicatum***	**High**	**Ponds, shores, ditches (aquatic)**
Beefsteak plant	*Perilla frutescens*	Occasional	Floodplains
Timothy	*Phleum pratense* *	Medium	Wetlands, fields, mitigation sites
Common reed	***Phragmites australis***	**High**	**Disturbed wetlands, ditches, construction zones**
Canada bluegrass	*Poa compressa*	Medium	Fields, mitigation sites
Rough bluegrass	*Poa trivialis*	Medium	Fields, floodplains, mitigation sites
Bristled knotweed	*Polygonum cespitosum* *	Medium	Wetlands, mitigation sites
Japanese knotweed	***Polygonum cuspidatum***	**High**	**Wetlands, floodplains, mitigation sites**
Mile-a-minute	***Polygonum perfoliatum***	**High**	**Floodplains, mitigation sites**
Lesser celandine	*Ranunculus ficaria* *	High	Ponds, shores, ditches (aquatic)
Multiflora rose	***Rosa multiflora***	**High**	**Floodplains, mitigation sites**
Curled dock	*Rumex crispus* *	Medium	Disturbed wetlands, mitigation sites, naturalized
Giant Foxtail	*Setaria faberi*	Medium	Disturbed wetlands, mitigation sites
Common chickweed	*Stellaria media*	Medium	Disturbed wetlands, mitigation sites,

COMMON NAME	SCIENTIFIC NAME	INVASIVENESS	HABITAT
			naturalized
Siberian elm	*Ulmus pumila*	Occasional	Suburban/urban areas, mitigation sites
Ivy-leaved speedwell	*Veronica hederaefolia*	Medium	Fields, mitigation sites, naturalized
Chinese wisteria	***Wisteria sinensis***	**Medium**	**Floodplains, mitigation sites**
Common cocklebur	*Xanthium strumarium*	Medium	Disturbed wetlands, mitigation sites

Source: VDCR-DNH, 2003. Asterisk (*) indicates species requires appropriate level of general management to prevent populations from reaching threshold requiring active control and eradication efforts. Bold type indicates species of management concern (most aggressive and highest degree of invasiveness). For these species, active management may be required to prevent major colonization of construction areas.

3.12.2 Waters of the U.S., Including Wetlands

Waters of the U.S. are described generically in EPA's 404 (b) (1) Guidelines as rivers, streams, ponds, and special aquatic sites, (*e.g.*, sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes). Waters of the U.S. encountered within the study area include streams, shallow ponds, wetlands, and deepwater habitats.

3.12.2.1 Navigable Waters of the U.S. (Section 10 Waters)

Navigable waters of the U.S. are "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport the interstate of foreign commerce." According to the Norfolk District COE, no waters within the study area have been determined to be navigable waters of the U.S.

3.12.2.2 Wetlands

Wetlands data and digital mapping for the study area was obtained through analysis of National Wetlands Inventory (NWI) maps published by the U.S. Fish and Wildlife Service. In Northern Virginia, NWI mapping typically under represents the actual areas of jurisdictional wetlands in a given geographic area. An analysis of delineated wetland areas versus NWI mapped wetlands suggest that approximately three times more wetlands may be present in a given study area than is mapped by NWI data (Rolband, 1995). Field delineations to locate the boundaries of waters of the U.S. were subsequently conducted; this data is presented in section 4.12 of this EIS. See Figures 4.12-1 through 4.12-12 of Chapter 4 for locations of potentially affected wetlands.

Waters of the U.S. present within the study area are summarized by Cowardin classification in Table 3.12-3 and are shown by USGS 7.5-minute quadrangle in the Natural Resources Technical Report (VDOT, 2004). Cowardin classifications present within the study area include palustrine wetlands dominated by trees (PFO); shrubs (PSS); or persistent emergent plants (PEM); as well as numerous riverine habitats - including ephemeral (RE); intermittent (R4); and perennial streams (R2, R3). Riverine habitat includes all persistent wetlands and deepwater habitats contained within a defined channel. Vegetated riverine habitats are jurisdictional wetlands regulated by the Corps of Engineers and DEQ. Unvegetated riverine habitats are not considered wetlands, but are regulated by federal and state authorities as waters of the U.S. A description of wetland communities species comprising them are presented in the Natural Resources Technical Report (VDOT, 2004).

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TABLE 3.12-3
TOTAL EXISTING WATERS OF THE U.S. IN THE STUDY AREA, BY COVER TYPE AND ACREAGE

COWARDIN CLASS	DESCRIPTION	AREA (acres)
PEM	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	351
PFO	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	2,861
PSS	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Temp. / Season. Flooded	67
PEM/PFO PFO/PEM	Palustrine, Emergent/Forested, Broad-leaved Deciduous, Temp./Season. Flooded	73
PEM/PSS PSS/PEM	Palustrine, Emergent/Scrub-Shrub, Broad-leaved Deciduous, Temp./Season. Flooded	139
PFO/PSS PSS/PFO	Palustrine, Forested/Scrub-Shrub, Broad-leaved Deciduous, Temp./Season. Flooded	73
R2-3	Riverine, Perennial (Streams)	235
POW/PUBh	Palustrine, Open Water	395
Waters of the U.S. Total		**4,194**

Source: National Wetlands Inventory (NWI) Digital database, U.S. Fish and Wildlife Service, 1995 -2002. Total does not include acreages for ephemeral or intermittent stream that may be determined to be waters of the U.S. by the U.S. Army Corps of Engineers.

3.12.2.3 Special Wetland Sites

Some of the temporarily flooded palustrine emergent wetlands observed during field investigations are considered vernal pool habitats (Kenney and Burne, 2000). A vernal pool is a fish-free seasonal wetland, which fills annually from precipitation, runoff, and rising groundwater. Vernal pools have increased habitat value for some forms of wildlife, particularly amphibians, whose regional populations are in decline (Petranka *et a*l, 2003; Kenney and Burne, 2000; Hoffman, 1992; Gibbs, 1993). Higher quality vernal pools are particularly prevalent within the Bull and Cub Run floodplains. Portions of the Manassas National Battlefield Park (MNBP) are registered with the Virginia Native Plant Society as a specially recognized regional wetland habitat (VNPS, 2003a). The most important special wetland in the MNBP is an upland depression swamp near Battery Heights and a 40-acre seepage swamp on Bull Run, at the Old Stone Bridge crossing on US Route 29 (Belden and others, 1998). The National Park Service (NPS, 1993), Virginia Native Plant Society (VNPS, 2003a, 2003b) and VDCR-DNH (Fleming, 1993; Belden and others, 1998) also consider emergent wetlands near Stuart's Hill (on the Brauner Tract) and at Bald Hill as especially sensitive. Riparian areas and meadows at these locations contain populations of rare plants including hairy beardtongue (*Penstemon hirsutus*), Appalachian quillwort (*Isoetes appalachiana*), and marsh hedgenettle (*Stachys pilosa* var. *arenicola*). These (and other areas containing National Heritage Resources located in terrestrial habitat within MNBP) are described in the Natural Resource Technical Report (VDOT, 2004).

3.12.2.4 Wetlands on National Park Service Lands

National Park Service (NPS) Director's Order 77-1 procedures were implemented to identify wetlands on NPS lands within the study area affiliated with Manassas National Battlefield Park (NPS, 2003). For NPS property, all areas identified as aquatic habitats, (*i.e*., all ponds, wetlands, and streams) must be classified as Director's Order wetlands. Using the Cowardin classification, aquatic habitats were categorized; a complete summary of the wetland determinations for NPS property within each corridor is presented in Section 4.12 of this EIS.

3.12.3 Floodplains (100-Year)

Development in floodplains reduces the ability of these areas to detain floodwaters, thereby reducing flood storage capacity and placing development in the floodplain and downstream properties at risk. For regulatory purposes, the floodplain is considered the lowland area adjoining inland and coastal waters, including that area subject to a one percent or greater change of flooding in any given year (*i.e.,* once every hundred years). Flooding within the study area is generally flash flooding associated with intense periods of heavy rain or river flooding resulting from regionally heavy rains or successive storms. About 60 percent of Virginia's river floods

begin with flash flooding from tropical systems passing over or near the state. The most recent severe flooding (June 1972) resulted from heavy rain associated with Tropical Storm Agnes. Most northern Virginia streams and creeks overflowed their banks causing major damage to roads, bridges, homes, businesses, and agricultural land and crops. Damage from Tropical Storm Agnes within the Potomac River basin totaled $129,128,000. Within the study area, the most severe flooding occurs along Broad Run, Bull Run, and Cub Run. Regulatory 100-year floodplain is present along most of the study area's waterways including Broad Run (South Fork, Potomac) and Elklick Run in Loudoun County; Cub Run, Elklick Run, and Bull Run in Fairfax County; and Broad Run (Kettle Run), Bull Run, Little Bull Run, Catharpin Creek, Black Branch, Foley Branch, Chestnut Lick, Lick Branch, Holkums Branch, Cameron Branch, and Black Branch in Prince William County. In total, 6,666 acres of regulated floodplain is present along these waterways. See Figure 4.12-15 of Chapter 4 for locations of potentially affected floodplains. A more-detailed discussion of floodplains is presented the Natural Resources Technical Report (VDOT, 2004).

3.12.4 Wild and Scenic Rivers

3.12.4.1 Federal Wild and Scenic Rivers

According to the Virginia Outdoors Plan published by Virginia DCR in 2002, no Federal wild and scenic rivers are located in or immediately downstream of the study area.

3.12.4.2 State Scenic Rivers

According to the Virginia Outdoors Plan published by Virginia DCR in 2002, no state wild and scenic rivers are located in or immediately downstream of the study area.

3.12.5 Terrestrial Ecology, Biodiversity, and Wildlife Habitat

Natural vegetation communities of the study area were classified according to The Natural Communities of Virginia: Classification of Ecological Community Groups: First Approximation (VDCR, DNH, 2001) where possible. The study area has experienced significant alterations over the past several hundred years due primarily to human activity. Land use throughout the study area commonly consists of agricultural activities, sylvicultural activities, quarry/mine activities, and, more recently, residential and commercial development. Urbanization of the study area, especially in the southern half, has encroached on the various terrestrial and wildlife habitats found in the study area; however, a large percentage of the northern half of the study area remains undeveloped. The major terrestrial systems identified in the study area include, hardwood forests (oak-hickory), bottomland hardwood forests, pine forests, mixed hardwood-pine forests, agricultural lands (cropland and pasture), and brush/old field communities.

Research has shown that biodiversity generally decreases as the area of natural habitat is reduced and that biodiversity generally increases with greater landscape diversity and edge habitat (i.e., the transition between forest and fields). Research has also shown that riparian corridors perform a valuable role in sustaining wildlife diversity, especially in areas that have a reduced amount of natural habitat. These riparian areas often provide the primary corridors for wildlife migration between isolated areas of natural habitat. The patchwork of pastureland, abandoned fields, riparian corridors, and various forest types within the northern part of the study area creates a relatively complex structure and habitat diversity, which probably helps to support a relatively rich assemblage of plants and animals. Portions of the study area consist largely of a mosaic of farms and pastures separated by forested areas, abandoned fields, riparian corridors, and parkland. This mosaic pattern is more common in the northwestern portion of the study area. The central and southern portions of the study area have undergone more drastic changes due to urbanization and have little natural area remaining. The urbanized portions of the study area have smaller and more-fragmented forested tracts and fallow fields, which typically leads to reduced biodiversity.

The DCR-DNH maintains a database of rare terrestrial communities that occur throughout Virginia. Table 3.12-4 lists rare terrestrial communities that are reported to occur within the project study area.

TABLE 3.12-4
RARE TERRESTRIAL COMMUNITIES IN THE PROJECT AREA

Community Name	Description	Counties
Basic Oak-Hickory Forests	Occurs throughout Virginia Piedmont. Common canopy species include various hardwoods.	Fairfax Prince William
Chestnut Oak Forests	Found on rocky, upland slopes; less common in Piedmont than on mountain ridges. Chestnut oak is dominant with various other hardwood species.	Prince William
Eastern Hemlock Forests	Found in isolated, north-facing river bluffs and ravines of the Piedmont. Eastern hemlock is dominant with various other hardwood species.	Fairfax
Eastern White Pine	Eastern white pine forests typically occur with hardwoods. White pine is a fast growing, early successional invader of disturbed habitats, which may persist in mixed forests.	Prince William
Low Elevation Basic Outcrop Barrens	Scrub and herbaceous vegetation of exposed, base-rich outcrops in the Piedmont and mountain regions. Vegetation is usually a patchwork of scrub thickets, herbaceous mats, and lithophytic lichens.	Loudoun
Mesic Mixed Hardwood Forests	Characterized by mixed canopy of hardwoods.	Fairfax Prince William
Piedmont/Mountain Basic Woodlands	Deciduous and mixed woodlands of xeric, rocky habitats that occur widely throughout the Piedmont.	Fairfax
Pine-Oak/Heath Woodlands	Canopy species similar to those in the oak-hickory forests. Shortleaf and Virginia pines are commonly associated where past disturbance has occurred.	Prince William
Coastal Plain/Piedmont Acidic Seepage Swamp	Scattered throughout the outer Piedmont in habitats where seepage discharge at ground surface is drained away as stream flow. Flood tolerant species are common.	Fairfax Prince William
Upland Depressional Swamp Forest	Seasonally flooded depressions found in nearly level Piedmont uplands, scattered throughout the eastern and central Piedmont. Flood tolerant species are common.	Fairfax Prince William
Piedmont/Mountain Swamp Forest	Seasonally flooded, deciduous forests occur along rivers and large streams. Flood tolerant species are common.	Prince William

Source: Virginia Department of Conservation and Recreation, Division of Natural Heritage, 2002.

3.12.5.1 Forest Lands

The study area's approximate 13,500 acres of forest land consists of four main types. The majority of the forest lands in the study area are fragmented by existing agricultural lands, road corridors, residential development, and commercial development. The primary forest lands of the study area include: (1) Basic Oak –Hickory Forests, (2) Acidic Oak – Hickory Forests, (3) Piedmont / Mountain Bottomland Forests, and (4) Eastern White Pine – Hardwood Forests. Although not formally recognized under The Natural Communities of Virginia: Classification of Ecological Community Groups: First Approximation, pine plantations within the study area can be thought of as planted-pine variants of Eastern White Pine – Hardwood Forests. See Figure 4.12-13 of Chapter 4 for locations of potentially affected forests. A more-detailed discussion of forest lands is presented the Natural Resources Technical Report (VDOT, 2004).

From the perspective of limited or unique natural resources, one of the more significant hardwood forests in the study area is the Hunter-Hacor tract, which is owned and managed by the Fairfax County Park Authority. A portion of the Hunter-Hacor Tract along with forested tracts to the southeast comprise a natural heritage community known as the Elklick Diabase Flatwoods (Virginia Division of Natural Heritage, 2002). The Hunter-Hacor tract and adjoining forest tracts comprising the Elklick Diabase Flatwoods are illustrated on Figure 4.12-13 of Chapter 4. The tract supports one of Virginia's largest stands of the globally rare oak-hickory forest on diabase soils. Based on the presence and number of natural heritage resources within the Elklick Diabase Flatwoods, the Virginia Division of Natural Heritage has assigned this community a biodiversity ranking of "B3" (high significance). The Hunter-Hacor tract is currently protected under a conservation easement (Fairfax County Park Authority, letter to Virginia Department of Transportation, 25 April 2002).

3.12.5.2 Wildlife Species (Including Migratory Birds) Associated with Forest Habitat

Forest lands within the study area provide habitat for a large and diverse assemblage of wildlife species. Species that commonly inhabit the forest lands include large and small game species, small mammals, birds, amphibians, and reptiles. Wildlife species reported in the study area and vicinity are discussed in the Natural Resources Technical Report (VDOT, 2004).

The various landscapes within the study area provide a wide variety of habitats for migratory birds. Of those bird species reported for the project area (VDGIF, 2003), approximately 267 species of migratory birds protected by the MBTA are reported as potentially occurring within close proximity to the study area (see Appendix E of the Natural Resources Technical Report (VDOT, 2004)). Of these 267 species, 182 are terrestrial species who are not dependent on aquatic habitat for a portion of their life cycle. Of the 267 listed bird species, 202 have been documented, by the VDGIF Wildlife Database, within close proximity to the study area. Of the 33 migratory bird "Species of Management Concern" listed for the northeast region (FWS, 1995), 24 have been observed within the Tri-County region. Of the 24 "Species of Management Concern" reported for the Tri-County region, 20 are considered to be dependent on terrestrial habitat. Of the 20 terrestrial "Species of Management Concern" within the Tri-County region, the "reason for concern" for five of the species is reported to be "dependence on vulnerable or restricted habitats" (see Natural Resources Technical Report (VDOT, 2004)) . The U.S. Fish & Wildlife Service usually requires a permit for the taking of a protected bird or the taking of a nest of a protected raptor, because they typically use the same nest from year to year. Several raptor species are known to occur within the study area – including Cooper's hawk (*Accipiter cooperii*), broad-winged hawk (*Buteo platypterus*), red-shouldered hawk (*Buteo lineatus*), and the red-tailed hawk (*Buteo jamaicensis*). Preliminary survey of the study area identified no raptor nesting sites; however, a more-detailed field investigation of the selected alternative may be needed at a later date to assess conditions at that time and to determine if species protected by the MBTA would be affected.

3.12.5.3 Agricultural Lands (Cropland and Pasture)

Approximately 11,899 acres of agricultural land are located in the study area. The agricultural land uses in the study area include pastureland and cropland. Farming in the study area has declined with the rapid urban and commercial growth experienced in northern Virginia and as agricultural land uses shift to smaller tracts of land. See Figure 4.12-14 of Chapter 4 for locations of potentially affected agricultural lands. A more-detailed discussion of agricultural lands is presented the Natural Resources Technical Report (VDOT, 2004).

3.12.5.3.1 Plant Communities

The majority of agricultural land in the study area is comprised of pasturelands grazed by cattle and horses and are vegetated predominantly with various grass species (Poaceae). Vegetable crops and hay are the most predominant crops. Several nurseries and Christmas tree farms are also located in the study area.

3.12.5.3.2 Wildlife Associated with Agricultural Lands

Wildlife habitat associated with agricultural lands is generally limited in value and function due to the lack of plant diversity and the relatively high frequency of disturbance; however, agricultural lands are utilized by wildlife, with the species composition often depending on the type of crop being cultivated, the time of year, and methods of harvesting. Croplands offer refuge and foraging areas for a variety of small mammals, birds, and reptiles and, following harvesting, offer foraging for white-tailed deer and migrating waterfowl.

3.12.5.4 Brush / Old Field

Approximately 3,171 acres of brush and old fields are located within the study area. Typically these areas have been abandoned or were timbered, grazed, or utilized as cropland in the past. The old field areas further indicate the shift in land use from large agricultural operations to residential and commercial uses or smaller farming operations.

3.12.5.4.1 Plant Communities

The brush and old field communities are usually formed from timbering activities or from fallow fields left to revegetate through natural succession. The timbered areas are often dominated by the tree species that were cut

along with opportunistic early successional species such as black locust, tree-of-heaven, Japanese honeysuckle, blackberries (*Rubus* spp.), and greenbriers (*Smilax* spp). They are typically dominated by herbaceous plant species such as various grasses, goldenrods (*Solidago* spp.), and thistles (*Carduus* spp.).

3.12.5.4.2 Wildlife Associated with Brush / Old Field Communities

The edge habitat between the brush/old field communities and adjacent forest lands offer a diverse composition of species. The dense regrowth in these areas offers forage and cover for the white-tailed deer and for a variety of smaller mammals. Predators and birds of prey frequent these communities in search of prey. Various bird species also utilize the brush and old field communities in the study area.

3.12.5.5 Terrestrial Invasive Species

The Virginia Department of Conservation and Recreation – Division of Natural Heritage (DCR-DNH) in conjunction with the Virginia Native Plant Society have identified invasive plant species that threaten Virginia. Table 3.12-5 lists plant species that are considered highly invasive and occur in the Piedmont of Virginia. Although current information pertaining to regional distribution of these species indicates a probability that they could be found within portions of the study area, the specific location of populations is not presently known. In addition, the law identifies the Restricted Noxious – Weed Seeds found in seed mixes for sale, including restricted noxious weed seeds for lawn and turf use. These noxious weed must be labeled under the heading "noxious weed seeds" or "undesirable grass seed" when present in bentgrasses, Kentucky bluegrass, chewnings fescue, red fescue, varieties of perennial ryegrass, varieties of named turf type tall fescue, and/or mixtures containing these grasses. In Virginia, the Virginia Seed Law defines the Prohibited Noxious-Weed Seeds as follows in Table 3.12-6.

TABLE 3.12-5
INVASIVE PLANT SPECIES IN VIRGINIA

TYPE	SPECIES
Trees	tree-of-heaven (Ailanthus altissima)
Vines	Japanese honeysuckle (Lonicera japonica)
	kudzu vine (Pueraria lobata)
	oriental bittersweet (Celastrus orbiculatus)
	porcelain-berry (Ampelopsis brevipedunculata)
Shrubs	autumn olive (Elaeagnus umbellate)
	Chinese privet (Ligustrum sinense)
	Morrow's honeysuckle (Lonicera morrowii)
	multiflora rose (Rosa multiflora)
	Standish's honeysuckle (Lonicera standishii)
	wine berry (Rubus phoenicolasius)
	winged burning bush (Euonymus alatus)
Herbaceous Plants	aneilima (Murdannia keisak)
	Canada thistle (Cirsium arvense)
	Chinese lespedeza (Lespededeza cuneata)
	Chinese yam (Dioscorea batatas)
	common reed (Phragmites australis)
	European water-milfoil (Myriophyllum spicatum)
	garlic mustard (Alliaria petiolata)
	Japanese knotweed (Polygonum cuepidatum)
	Japanese stilt grass (Microstegium vimineum)

TYPE	SPECIES
	Johnson grass (Sorghum halapense)
	parrot's feather (Myriophyllum aquaticum)
	purple loosestrife (Lythrum salicaria and virgatum)
	spotted knapweed (Centeurea maculosa)
	white sweet clover (Melilotus alba)
	yellow sweet clover (Melilotus officinalis)

Source: Virginia Department of Conservation and Recreation – Division of Natural Heritage (2002)

TABLE 3.12-6
PROHIBITED NOXIOUS-WEED SEEDS IN VIRGINIA

balloonvine (*Cardiospermum halicacabum)*
Canada thistle (*Cirsium arvensis*)
field bindweed (*Convolvulus arvensis*)
johnsongrass, perennial Sudangrass, *Sorghum almum*, and hybrids derived therefrom (*Sorghum* spp.)
plumeless thistles (*Carduus* spp.), which includes musk thistle and curled thistle
quackgrass (*Agropyron repens*)
serrated tussock (*Nassella trichotoma*)
sicklepod (*Cassia tora*)

Source: Virginia Seed Law, Sections 3.1-262 through 3.1-275.1 of Chapter 16 of Title 3.1 of the Code of Virginia.

3.12.6 Threatened or Endangered Species

Three federal-listed threatened or endangered species and four state-listed threatened or endangered species have been reported in Fairfax, Loudoun, and Prince William counties. A preliminary survey of the study area combined with site reconnaissance of forestlands was conducted to identify suitable habitat for those threatened or endangered species reported to occur within the Tri-County region. Because of the sensitivity of protected species populations and the resulting desire of state and federal agencies to not disclose locations of these populations, specific locations of populations have not been graphically depicted as part of this study. Instead, Conservation Sites and Stream Conservation Units defined by DCR-DNH are utilized to depict critical areas within which threatened or endangered species have been reported. A discussion of threatened and endangered species reported for the region, primary reasons for their listing, and recovery/management goals is provided in the Natural Resources Technical Report (VDOT, 2004).

3.12.6.1 Federal Listed Threatened or Endangered Species

The investigation of federally listed threatened and endangered species within the study area was based on the listings provided by FWS (FWS; 22 April 2002 letter), DCR-DNH (DCR-DNH, 3 May 2002 e-mail), and the Virginia Fish and Wildlife Information Service (FWIS) database maintained by VDGIF (VDGIF, accessed 9 August 2002).

3.12.6.1.1 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle (*Haliaeetus leucocephalus*) is presently listed as threatened (proposed for de-listing) by the FWS and the Commonwealth of Virginia. The bald eagle forages along coastal areas, rivers, and large bodies of water. Nesting sites are commonly located in large forested areas adjacent to marshes, on farmland, or in seed tree cut-over areas. According to the county-wide lists of natural heritage resources provided by DCR-DNH, the bald eagle has been documented in Fairfax and Loudoun counties. In addition, the VDGIF FWIS database lists the bald eagle as occurring within the study area.

3.12.6.1.2 Small Whorled Pogonia (*Isotria medeoloides*)

The small whorled pogonia (*Isotria medeoloides*) is a perennial plant presently listed as threatened by the FWS and endangered by the Commonwealth of Virginia. The small whorled pogonia usually occurs in third-generation upland forests with relatively open understories. According to the county-wide lists of natural

heritage resources provided by DCR-DNH, the small whorled pogonia has been documented in Prince William County; however, the small whorled pogonia is not known to occur within the study area. In addition, a small whorled pogonia survey was conducted in Bull Run Regional Park. No individuals were sighted and the possibility of occurrence was considered extremely low (Donna M.E. Ware, 13 December 2001). The FWS recommends that a detailed survey of the selected alternative be conducted by a certified biologist prior to issuance of a Record of Decision.

3.12.6.1.3 Dwarf Wedgemussel (*Alasmidonta heterodon*)

The dwarf wedgemussel (*Alasmidonta heterodon*) is a small fresh water mussel that is presently listed as endangered by the FWS and the Commonwealth of Virginia. The dwarf wedgemussel usually occurs in running waters of small brooks to large rivers. Preferred bottom substrates include silt, sand, and gravel, which may be distributed behind boulders. According to the county-wide lists of natural heritage resources provided by DCR-DNH, the dwarf wedgemussel has not been documented in Fairfax County, Loudoun County, or Prince William County. In addition, the VDGIF FWIS database does not list the dwarf wedgemussel as occurring in the study area. FWS does, however, list dwarf wedgemussel as being present in Prince William County, and recommends that a detailed survey be conducted by a certified biologist once stream crossings are identified for the selected alternative. Such surveys will be completed prior to issuance of a Record of Decision.

3.12.6.2 State Threatened and Endangered Species

3.12.6.2.1 Upland Sandpiper (*Bartramia longicauda*)

Upland sandpiper (*Bartramia longicauda*) is a migrant bird that is presently listed as threatened in the Commonwealth of Virginia. Upland sandpiper typically occurs in upland grasslands and pastures and commonly nests in open farmed areas exhibiting mixed habitat. The nesting habitat varies from medium to tall pastures or hay fields and fallow early-stage fields. In addition, plowed fields, short-grass fields, heavily grazed pastures, as well as airports are utilized by upland sandpiper, particularly during migration. According to the county-wide lists of natural heritage resources provided by DCR-DNH, upland sandpiper has been documented in Loudoun County. In addition, the VDGIF FWIS database lists the upland sandpiper as occurring within the study area.

3.12.6.2.2 Henslow's Sparrow (*Ammodramus henslowii*)

Henslow's sparrow (*Ammodramus henslowii*) is a migrant bird presently listed as threatened by the Commonwealth of Virginia. The sparrow usually occurs in pastures, meadows, and uncultivated fields and prefers mesic or wet habitats with tall and somewhat dense, patchy vegetation. Nesting sites are typically located in deep cut grasses. According to the county-wide lists of natural heritage resources provided by DCR-DNH, Henslow's sparrow is not documented in Fairfax, Loudoun, or Prince William counties; however, according to the VDGIF FWIS database, the Henslow's sparrow is reported to occur within the study area.

3.12.6.2.3 Wood Turtle (*Clemmys insculpta*)

Wood turtle (*Clemmys insculpta*) is presently listed as threatened in the Commonwealth of Virginia. Wood turtle usually occurs in or in close proximity to clear brooks and streams flowing through deciduous forested areas. Hibernation commonly occurs in deep pools or under sand or mud substrates, or under overhanging roots and under-cut stream banks. Wood turtle will also utilize submerged logs, beaver lodges, and muskrat burrows as wintering sites. According to the county-wide lists of natural heritage resources provided by DCR-DNH, the wood turtle has been documented in Fairfax and Loudoun counties; however, according to the VDGIF FWIS database, the wood turtle is not reported to occur within the study area.

3.12.6.2.4 Brook Floater (*Alasmidonta varicose*)

The brook floater (*Alasmidonta varicose*) is a freshwater mussel that is presently listed as endangered by the Commonwealth of Virginia. The brook floater usually occurs in medium-sized streams and rivers with clean, swift waters and gravel or sandy substrates. According to the county-wide lists of natural heritage resources provided by DCR-DNH, the brook floater has been documented in Prince William County. In addition, according to the VDGIF FWIS database, the brook floater occurs within the study area.

3.12.7 Other Rare, Unique, or Limited Resources

3.12.7.1 Chesapeake Bay Preservation Areas (CBPAs)

The Chesapeake Bay Preservation Act of 1988 authorized tidewater localities to develop and adopt local programs designed to protect water quality in the Chesapeake Bay and associated tributaries. Fairfax and Prince William counties have established Resource Protection Areas (RPAs), which buffer environmentally sensitive areas that lie alongside or near shorelines of streams, rivers, and other waterways in the Chesapeake Bay watershed. RPAs are important resources for water quality value and biological value by acting as a stream buffer, a filter, a nutrient sink, and a food source for wildlife. The RPA designation includes tidal wetlands, tidal shores, non-tidal wetlands that are connected by surface flow to tidal wetland and/or streams, and a minimum 100-foot buffer landward along both sides of a tributary stream. Resource Management Areas (RMAs) designated by Fairfax County include floodplains, highly erodible soils, steep slopes, highly permeable soils, and non-tidal wetlands not designated RPAs. Although public transportation projects are exempt from the Chesapeake Bay Preservation Act regulations, VDOT has a policy to avoid or minimize impacts to RPAs wherever practicable. In addition, appropriate erosion and sediment controls and stormwater management plans will be implemented in the planning process. See Figure 4.12-16 of Chapter 4 for locations of potentially affected RPAs. A more-detailed discussion of RPAs is presented the Natural Resources Technical Report (VDOT, 2004).

3.12.7.2 Coastal Zone Management Resources

The Coastal Zone Management Act of 1972 enabled the Commonwealth of Virginia to develop the Virginia Coastal Resources Management Program (CRMP) in 1986. The focus of the CRMP is to create more vital and sustainable coastal communities and ecosystems by utilizing a network of state laws and policies. Coastal zone resources and issues of concern addressed under Virginia's CRMP are listed in Table 3.12-7. State laws and policies pertinent to Virginia's CRMP are administered by a network of regulatory and advisory agencies, with the Virginia Department of Environmental Quality (DEQ) having lead administrative responsibility. Federal agencies and applicants for federal approvals and/or funding must comply with the Virginia CRMP. Fairfax and Prince William counties, including the cities of Manassas and Manassas Park, are covered under Virginia's CRMP. The following resources subject to Virginia's CRMP are present within the study area: fisheries, nontidal wetlands, and underwater lands. Distribution of these resources within the study area are discussed in sections 3.12.2 and 3.12.3, respectively.

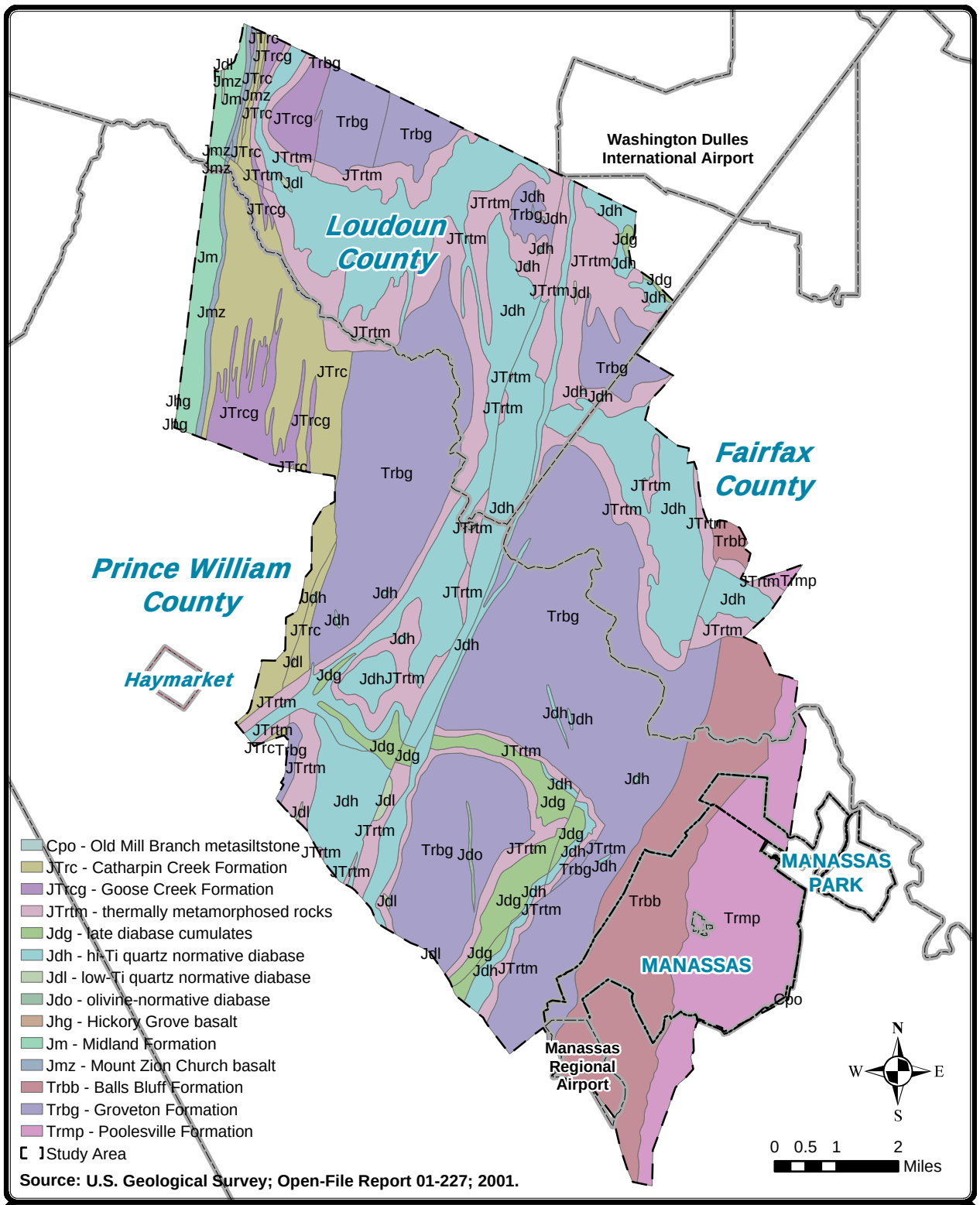
TABLE 3.12-7
COASTAL ZONE MANAGEMENT RESOURCES AND ISSUES OF CONCERN

Resource Areas	Issues of Concern
• Coastal primary sand dunes	• Point and nonpoint source water pollution
• Tidal and nontidal wetlands	• Point and nonpoint source air pollution
• Underwater lands	• Shoreline sanitation
• Fisheries	• Coastal lands management

Source: Virginia Department of Environmental Quality, 1986.

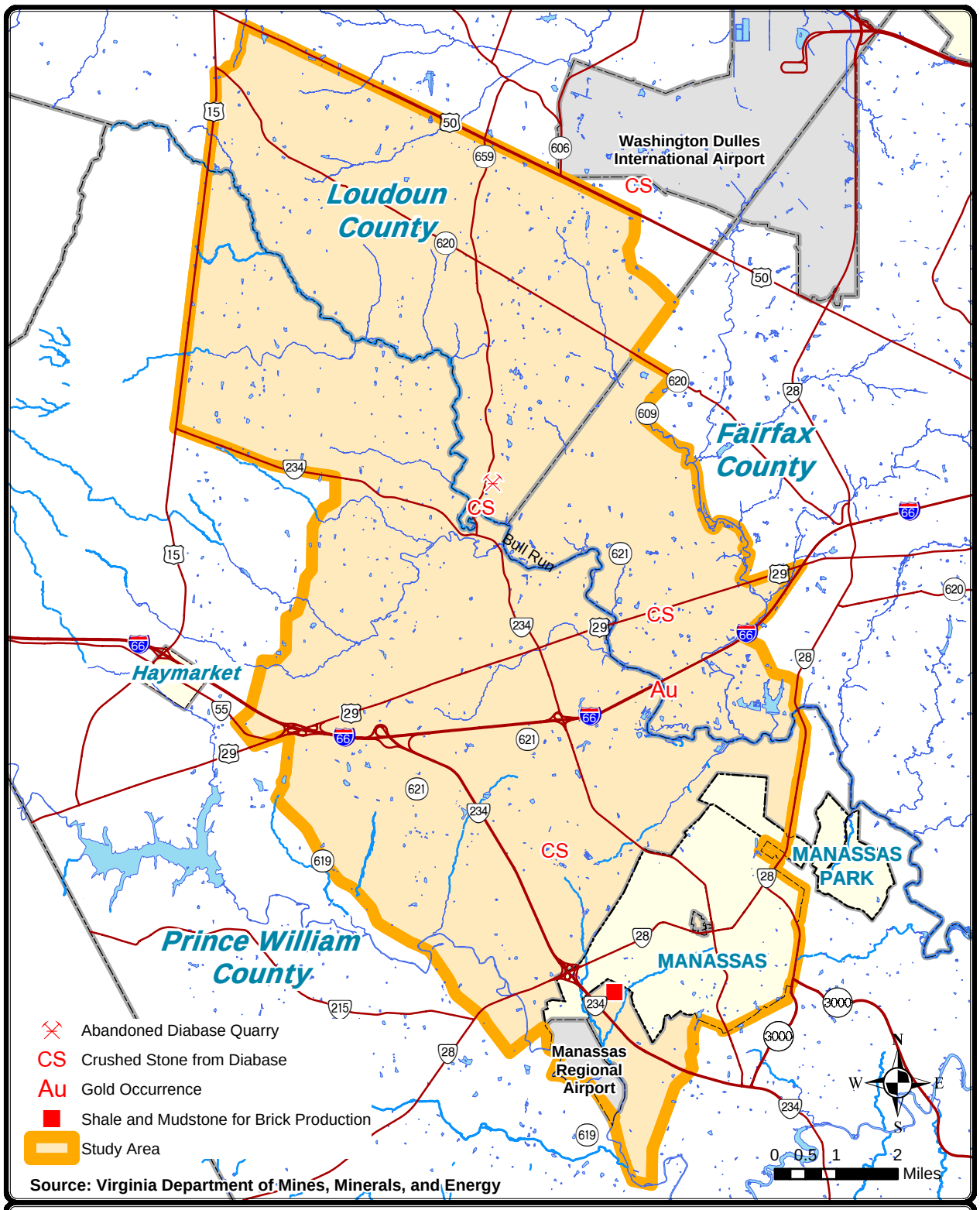
3.12.7.3 Mineral Resources and Unique Geology Features

The study area is located in the Piedmont Physiographic Province in a region of modest relief and low slopes underlain by Mesozoic sedimentary and igneous rocks. The Piedmont extends eastward from the Blue Ridge to the Fall Line, where Paleozoic-age and older igneous and metamorphic rocks are covered by unconsolidated sediments of the Atlantic Coastal Plain. The Piedmont is characterized by deeply weathered, poorly exposed bedrock of Triassic and Jurassic strata. The Triassic-age Culpeper Basin, is a geologic structure of the study area and is a sub-province of the Piedmont Upland. The geology consists largely of red and gray sedimentary rocks (shale, siltstone, sandstone, and conglomerate) locally containing diabase and basalt intrusions (Figure 3.12-1). Of the seven mineral/rock resource sites located within the study area, five are active quarries that mine diabase or mudstone and shale (VDMME – DMR, July 2004). One abandoned diabase quarry and an occurrence of gold are also located within the study area. Active quarries and other sites of economic mineral resources are shown on Figure 3.12-2.



Tri-County PARKWAY Location Study

FIGURE 3.12-1
BEDROCK GEOLOGY



Tri-County PARKWAY Location Study

FIGURE 3.12-2
ACTIVE QUARRIES AND OTHER SITES OF ECONOMIC MINERAL RESOURCES

3.13 CUMULATIVE IMPACTS OF PAST ACTIONS

Council of Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR §§ 1500-1508) require federal agencies to address and consider cumulative impacts of proposed actions. In order to determine the cumulative impacts associated with a proposed action, an understanding of past cumulative impacts is needed to asses the incremental effects of the proposed action. The following is a summary of past population growth trends and resulting development that has occurred within the study area and surrounding region. This discussion serves as a baseline for the determination of cumulative impacts associated with present and foreseeable future actions presented in section 4.13 of this EIS. The conversion of the natural environment (i.e., forests and wetlands, etc.) to the built environment (i.e., residential development, etc.) is strongly correlated with those population growth trends shown in Table 3.13-1, More-detailed discussion of past cumulative impacts is presented in the Indirect Effects and Cumulative Impacts Technical Report (VDOT, 2004).

TABLE 3.13-1
HISTORIC CENSUS DATA

Year	Jurisdiction				
	Fairfax	Loudoun	Prince William	City of Manassas	City of Manassas Park
1790	12,320	18,962	11,615	- -	- -
1800	13,317	20,523	12,733	- -	- -
1810	13,111	21,338	11,311	- -	- -
1820	11,404	22,702	9,419	- -	- -
1830	9,204	21,939	9,330	- -	- -
1840	9,370	20,431	8,144	- -	- -
1850	17,430	22,079	8,129	- -	- -
1860	11,834	21,774	8,565	- -	- -
1870	12,952	20,929	7,504	- -	- -
1880	16,025	23,634	9,180	- -	- -
1890	16,655	23,274	9,805	- -	- -
1900	18,580	21,948	11,112	- -	- -
1910	20,536	21,167	12,026	- -	- -
1920	21,943	20,577	13,660	- -	- -
1930	25,264	19,852	13,951	- -	- -
1940	40,929	20,291	17,738	- -	- -
1950	98,557	21,147	22,612	- -	- -
1960	275,002	24,549	50,164	- -	- -
1970	455,021	37,150	111,102	- -	- -
1980	596,901	57,427	144,703	15,438	6,524
1990	818,584	86,129	215,686	27,957	6,734
2000	969,749	169,599	280,813	35,135	10,290

US Historical Census Browser, Geospatial and Statistical Data Center, University of Virginia Library (http://fisher.lib.virginia.edu/collections/stats/histcensus/), Accessed June 2004.
US Bureau of the Census, Population of Counties by Decennial Census: 1900 to 1990 – VIRGINIA, Richard L. Forstall, Washington, DC 20233. Accessed June 2003

Human occupation of the region dates back to the Paleoindian period, which began about 10,000 B.C.; however, it was not until the Late Woodland period (from 900 A.D. to 1600 A.D.) that settlement patterns became more sedentary and populations began to dramatically grow. During this period, the landscape was dominated by forests. It is estimated that as much of 95 percent of the Chesapeake Bay Region was occupied by old growth forests during the 1500s (Chesapeake Bay Heritage Context Project, 2000). These forests were often interspersed with large expanses of prairies, fields, or meadows. This pattern of forest and open space was the result of land management practices of the Native Americans who used fire as the chief land management tool. Fire was used to clear land for settlements, provide a buffer for defense, clear land for farming, and create wildlife habitat for hunting.

European colonization of the region began in the early 1600s. The development of land-companies and stock-companies for trading and colonizing, and significant business expansion occurred in the region during the mid-seventeenth century. By 1775, it is estimated that 67 percent of the old growth forest that existed prior to European settlement still existed in the Chesapeake Bay region (Chesapeake Bay Heritage Context Project, 2000). Because the many rivers made it possible for ships to reach plantations, there was little need to develop towns as trading centers during the early years of settlement (Clark and Arrington 1933). Virginia had depended on an extensive river system to facilitate commercial interests throughout the state; however, navigation inland was halted at the fall line. The growing movement west after the Revolutionary War, (often away from the waterways) necessitated an organized program of canals, river navigations, railroads, turnpikes, and bridges. The lack of adequate roads was still a hindrance to settlement during this period. As late as 1751, records indicate that a road had yet to be cleared from the Little River in Alexandria to Ashby's Gap less than 20 miles to the west (Scheel 1987). This road (now US 50) had been constructed by the time Loudoun County was formed, but by 1758 the population of the southern portion of Loudoun County is estimated to have reached only approximately six people per square mile and only one town (Leesburg) had been established in the county (Scheel 1987; Osbourn 1998). Many of the roads constructed during this period were designed to link one water-powered mill with another (Marsh 1998). Overland transportation through some parts of the project area was improving during this time period, and the eastern portions of the region began experiencing an increase in population (Clark and Arrington 1933; Hagemann 1988). All major roads of the region passed through Alexandria, and commercial opportunities were abundant (Sweig 1992). By the end of the 1700's, Alexandria and Fairfax County had grown substantially.

During the early 1800s, the upper Piedmont of Virginia was becoming less exclusively rural and agricultural. Towns and villages grew in size and, as a result, public buildings associated with governmental, religious, and educational activities became more common. By the 1830s, it is estimated that only about 40 percent of the old growth forest that existed prior to European settlement still existed in the Chesapeake Bay region (Chesapeake Bay Heritage Context Project, 2000). Overland transportation in the more heavily populated part of the area improved dramatically during the late eighteenth and early nineteenth centuries. The earliest private turnpike charter (the Fairfax and Loudoun Turnpike Road) was granted in 1796 (Sweig 1992:148); however, this road was not actually built until after the turn of the century. Roads in more sparsely populated regions were still a major concern around the turn of the century. The Little River Turnpike, one of the oldest roads in the United States, was completed in 1806. The road extended west from Washington through the lower portion of Loudoun County, passing the northern boundary of the current study area where US 50 is located today (Virginia Historic Landmarks Commission Staff, 1970). Railroads reached Virginia in 1827 when the Baltimore and Ohio Railroad Company entered the state. During this period, improvements to transportation brought about by railroads were heavily influencing growth of the region. Dairy farming began to gain in importance in Prince William County during the 1850s, with the railroad facilitating the distribution of products (Ratcliffe 1978). Prince William County was devastated by the Civil War and reconstruction required considerable effort. The location of Manassas at the junction of two important railroads allowed the town to prosper and grow rapidly at a time when other towns in Virginia were still struggling with the after-effects of war (Evans 1989). The establishment of several rail lines through the county provided a major boost for the economy. By the early 1870s, three rail companies had established lines in Fairfax County (Reed 1992a). Although wagons continued to carry large quantities of goods to the markets in Washington, the railroads played a major role in the economic development of the county.

During the first several decades of the twentieth century, much of the region was still primarily rural. Although farming was the main occupation, the lumbering industry was also important to local economies. During the first two decades of the twentieth century, the Fairfax County economy began to grow. The emergence of the county as a leading dairy producer spawned the construction of better roads and rail services to enhance the business connection with the Washington, D.C., area. As late as the time of World War I, however, cattle herds were still moved along roads in Fairfax and Loudoun counties. The new transportation services brought more residents and businesses to Fairfax County and, by 1925, it was a top producer of dairy products and its economy was stabilizing (Steadman 1964). In 1900, the population of Prince William County was approximately 11,000 people, no larger than it had been in 1790 (Evans 1989).

As the region emerged from the depression of the 1920s and 1930s, the agricultural economy was faltering and there was an influx of residents due to the expansion of the federal bureaucracy. By 1945, land in Fairfax County was being appraised on residential rather than farm value (Netherton 1992). During the Depression,

agricultural prices dropped, and many residents of Prince William County were forced to find work to supplement their farm incomes. Some residents were employed building roads, such as Route 55 through Haymarket. After the effects of the Depression had subsided, many residents of the area found work in the city of Washington, and the region became home to a large population of commuters (Bowers 1990). By 1930, it is estimated that less than 30 percent of the old growth forest that existed prior to European settlement still existed in the Chesapeake Bay region (Chesapeake Bay Heritage Context Project, 2000).

By 1950, the population of Prince William County had grown to approximately 21,000 people. This represented a growth of nearly 100 percent over the population at the turn of the century. The growth of suburbs in the county was facilitated by the construction of Interstate 95 in the 1950s (Evans 1989). After World War II, the city of Fairfax and the surrounding county were transformed into one of the major suburbs of the Washington, D.C. area. Family farms began disappearing, and commercial farming and urban lifestyles become more widespread. During the 1940s and 1950s, the county's population grew from 40,900 to 98,500. New subdivisions were constructed, especially to the east of the current study area in areas closer to the capital, and the demand for paved streets, schools, libraries, sewer systems, and other amenities increased. By the mid-1960s, Fairfax County had 454,300 residents and was continuing to attract newcomers. By the early 1970s, the county's population stood at nearly half a million people, and a mass transportation system became a necessity. Satellite/commuter parking lots were established and bus/commuter lanes were designated on the major highways (Netherton and Netherton 1992). In the 1950s Loudoun County contained areas of "outer suburbia" with relatively expensive land, as well as significant areas with rural types of settlement. The county experienced population growth of 40 percent in the 1960s, however, with parts of the county experiencing more intensive suburban growth related to the Washington, D.C. metropolitan area. Though the growth rate has been comparably less than that of Prince William and Fairfax counties, suburban sprawl and the addition of major zones of development associated with the Dulles International Airport have contributed to losses in the rural character of some parts of Loudoun County (Gottmann 1969).

For most of its history, the study area was dominated by forest. Although small suburban settlements were common by the early 1900's, the economy of the study area was based on agricultural and forestry products until the middle of the century. The population boom in the post-World War II years, the growth of the federal government, and the advent of the automobile as the primary mode of personal transportation spurred the suburbanization process and much of the study area evolved into residential communities for Washington, D.C. Today, much of the study area is densely populated and is fully integrated into the regional economy. A study of forest change in Northern Virginia indicates that areas experiencing development patterns and growth rates representative of the Tri-County Parkway study area have lost significant forest lands and agricultural lands between 1937 and 1998. During this period forest cover fell from approximately 70 percent to 20 percent, while agricultural lands fell from approximately 30 percent to less than five percent (Mid-Atlantic Regional Earth Science Applicatios Center, 1998). Prior studies by the U.S. Fish and Wildlife Service and others indicate that the contiguous United States has lost over 50 percent of its wetlands since the 1780's. These studies indicate that Virginia has lost approximately 42 percent of its wetlands over that same time period.

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4.0 ENVIRONMENTAL CONSEQUENCES

Potential impacts are described in following sections using a 600-foot-wide assessment corridor. The exception to this standard is waters of the U.S. which, because site-specific delineations were conducted, allowed a discussion of effects within a 200-foot-wide average limits of construction. The probable footprint of construction will vary throughout the selected corridor; however, it is known that the average width of construction and right-of-way will be significantly narrower than the 600-foot-wide assessment corridor. Although this use of a 600-foot-wide assessment corridor results in an over-statement of reasonably expected impacts, subjecting all alternatives to a standardized assessment area of uniform width allows the alternatives to be assessed on the basis of their comparative merits. If a CBA is selected for construction, future design efforts would provide opportunities to further avoid and minimize impacts within the 600-foot-wide corridor.

4.1 TRANSPORTATION AND TRAFFIC

4.1.1 Average Daily Traffic Volumes - No-Build Alternative

ADT volumes were determined for the future year, 2030, No-Build Alternative using the Tri-County Parkway model network. The No-Build alternative includes planned and programmed highway and transit improvements from the most recently adopted Constrained Long Range Plan for the metropolitan Washington region. Table 4.1-1 presents forecast ADT for the No-Build Alternative compared to existing condition volumes. The year 2030 No-Build Alternative forecasts indicate that the highest north-south volumes in the study area occur on the VA 234 Bypass and VA 28 just south of Interstate 66. I-66 carries the highest east-west volumes among all study area roadways. There are large increases in traffic on several roadways that are programmed for capacity improvements in the No-Build Alternative (VA 28 and VA 234 Bypass). The upgrading of VA 234 Bypass to full-freeway status and adding one lane in each direction is responsible for the reduction of traffic on some north-south facilities in the City of Manassas, including Godwin Drive.

TABLE 4.1-1
FORECAST AVERAGE DAILY TRAFFIC VOLUMES - NO-BUILD ALTERNATIVE

Route and Location	Existing Conditions	No-Build/
Segment E (existing Godwin Drive) – VA 28 to Wellington Drive	20,000	11,100
Segment E (existing Godwin Drive) – Wellington Drive to VA 234 Business	37,600	11,300
Segment E – VA 234 Business to Lomond Drive	N/A	N/A
Segment E – Lomond Drive to I-66	N/A	N/A
Segment F – I-66 to US 29	N/A	N/A
Segment F – US 29 to Segment F'	N/A	N/A
Segment F' – Segment F to Braddock Road	N/A	N/A
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	7,500	26,200
Segment C – I-66 to US 29	N/A	N/A
Segment C – US 29 to VA 234	N/A	N/A
Segment C – VA 234 to Segment G/D	N/A	N/A
Segment G – Segment C to Gum Springs Road	N/A	N/A
Segment G – Gum Springs Road to Segment F'	N/A	N/A
Segment D – Segment C to Braddock Road	N/A	N/A
Segment D – Braddock Road to US 50	N/A	N/A
VA 234 Bypass – Balls Ford Rd to Wellington Rd	21,700	91,200
VA 234 Bypass – south of I-66	29,000	105,800
VA 28 – VA 234 Bypass to Wellington Road	17,000	19,600
VA 28 – North of Lomond Dr/Liberia Ave	41,100	57,100
VA 28 – South of I-66	62,000	121,500
I-66 – West of US 29 interchange (Centreville)	41,400	188,600
I-66 – West of VA 234 Bypass interchange	78,600	199,200
VA 234 Business – north of Godwin Drive	24,000	27,000

Route and Location	Existing Conditions	No-Build/
VA 234 Business – south of Godwin Drive	34,200	22,500
Braddock Road – east of Gum Springs Road	8,000	17,100
US 50 – east of Gum Springs Road	16,200	32,900
Proposed VA 659 Relocated – north of US 50	N/A	30,400
Loudoun County Parkway – north of US 50	15,700	35,900
US 29 – east of I-66/Gainesville interchange	6,700	19,300
US 29 – east of I-66/Centreville interchange	36,200	36,200

4.1.2 Average Daily Traffic Volumes - Build Alternative

The projected 2030 ADT volumes on the proposed Build Alternative options are shown in Table 4.1-2 as compared to existing conditions and the No-Build Alternative. Table 4.1-3 shows these volumes in south-to-north order by build segment.

TABLE 4.1-2
BUILD ALTERNATIVE FORECAST ADT VOLUMES FOR STUDY AREA ROADWAYS

Route and Location	Existing Conditions	No-Build	Compre-hensive Plan CBA	West Four CBA	West Two CBA
Segment E (existing Godwin Drive) – VA 28 to Wellington Drive	20,000	11,100	37,600	10,600	11,100
Segment E (existing Godwin Drive) – Wellington Drive to VA 234 Business	37,600	11,300	43,600	10,600	11,100
Segment E – VA 234 Business to Lomond Drive	N/A	N/A	91,500	N/A	N/A
Segment E – Lomond Drive to I-66	N/A	N/A	105,700	N/A	N/A
Segment F – I-66 to US 29	N/A	N/A	24,500	N/A	N/A
Segment F – US 29 to Segment F'	N/A	N/A	33,800	N/A	N/A
Segment F' – Segment F to Braddock Road	N/A	N/A	33,800	26,000	N/A
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	7,500	26,200	32,500	31,500	31,000
Segment C – I-66 to US 29	N/A	N/A	N/A	41,000	41,200
Segment C – US 29 to VA 234	N/A	N/A	N/A	38,100	39,100
Segment C – VA 234 to Segment G/D	N/A	N/A	N/A	36,100	31,400
Segment G – Segment C to Gum Springs Road	N/A	N/A	N/A	36,600	N/A
Segment G – Gum Springs Road to Segment F'	N/A	N/A	N/A	24,600	N/A
Segment D – Segment C to Braddock Road	N/A	N/A	N/A	N/A	31,700
Segment D – Braddock Road to US 50	N/A	N/A	N/A	N/A	33,000
VA 234 Bypass – Balls Ford Rd to Wellington Rd	21,700	91,200	59,900	100,400	100,700
VA 234 Bypass – south of I-66	29,000	105,800	73,000	116,300	116,800
VA 28 – VA 234 Bypass to Wellington Road	17,000	19,600	21,000	19,000	19,400
VA 28 – North of Lomond Dr/Liberia Ave	41,100	57,100	31,900	42,800	43,400
VA 28 – South of I-66	62,000	121,500	111,000	121,300	121,200
I-66 – West of US 29 interchange (Centreville)	41,400	188,600	221,400	188,500	188,100
I-66 – West of VA 234 Bypass interchange	78,600	199,200	196,600	184,300	185,300
VA 234 Business – north of Godwin Drive	24,000	27,000	22,100	26,400	26,000
VA 234 Business – south of Godwin Drive	34,200	22,500	44,000	22,500	22,100
Braddock Road – east of Gum Springs Road	8,000	17,100	16,100	10,500	16,600
US 50 – east of Gum Springs Road	16,200	32,900	30,300	29,600	36,200
Proposed VA 659 Relocated – north of US 50	N/A	30,400	30,300	31,000	36,000
Loudoun County Parkway – north of US 50	15,700	35,900	36,600	36,700	36,600
US 29 – east of I-66/Gainesville interchange	6,700	19,300	17,300	23,300	24,300
US 29 – east of I-66/Centreville interchange	36,200	36,200	37,800	34,300	35,100

TABLE 4.1-3
BUILD ALTERNATIVE: FORECAST ADT VOLUMES

The Comprehensive Plan CBA	ADT
Segment E (existing Godwin Drive) – VA 28 to Wellington Drive	37,600
Segment E (existing Godwin Drive) – Wellington Drive to VA 234 Business	43,600
Segment E – VA 234 Business to Lomond Drive	91,500
Segment E – Lomond Drive to I-66	105,700
Segment F – I-66 to US 29	24,500
Segment F – US 29 to Segment F'	33,800
Segment F' – Segment F to Braddock Road	33,800
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	32,500

The West Four CBA	ADT
Segment C – I-66 to US 29	41,000
Segment C – US 29 to VA 234	38,100
Segment C – VA 234 to Segment G/D	36,100
Segment G – Segment C to Gum Springs Road	36,600
Segment G – Gum Springs Road to Segment F'	24,600
Segment F' – Segment F to Braddock Road	26,000
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	31,500

The West Two CBA	ADT
Segment C – I-66 to US 29	41,200
Segment C – US 29 to VA 234	39,100
Segment C – VA 234 to Segment G/D	31,400
Segment D – Segment C to Braddock Road	31,700
Segment D – Braddock Road to US 50	33,000

4.1.2.1 The Comprehensive Plan CBA

The Comprehensive Plan CBA segment volumes for the year 2030 range from 24,500 to 105,700 ADT. The lowest ADT volumes for The Comprehensive Plan CBA occur just north of I-66, as the majority of vehicles utilize Segment E as a feeder to eastbound I-66 (in the morning peak) and from westbound I-66 (in the evening peak). There are relatively low through volumes between Segment E south of I-66 and Segment F north of I-66. The Comprehensive Plan CBA draws a large amount of traffic from VA 234 Bypass south of I-66 as compared to the No-Build scenario, and has the greatest impact on lowering volumes along VA 28 south of I-66 within the study area. I-66 volumes increase substantially east of the proposed interchange with Segments E and F. This is the only option which substantially affects volumes on VA 234 Business north and south of existing Godwin Drive, increasing volumes south of Godwin Drive and decreasing volumes north of Godwin Drive. Volumes on the existing Loudoun County Parkway segment between Braddock Road and US 50 increase over the No-Build to the same degree as under the West Four CBA and the West Two CBA.

4.1.2.2 The West Four CBA

The West Four CBA segment volumes for the year 2030 range from 24,600 to 41,000 ADT. While a similar situation to the Comprehensive Plan CBA exists where volumes on the connecting roadway (VA 234 Bypass) south of I-66 carry much higher volumes than on Build Segment C north of I-66, there is a greater overall volume of through traffic between VA 234 Bypass south of I-66 and Build Segment C north of I-66 under the West Four CBA than the Comprehensive Plan CBA. The lowest volumes in the West Four CBA occur along Segment G east of Gum Springs Road. The West Four CBA increases volumes on VA 234 Bypass over the No-Build Scenario and affects an intermediate decrease on VA 28 volumes north of Lomond Drive/Liberia

Avenue. VA 28 volumes south of I-66 are basically unchanged as compared to No-Build. Volumes on the existing Loudoun County Parkway segment between Braddock Road and US 50 increase over the No-Build scenario to the same degree as under the Comprehensive Plan CBA and the West Two CBA.

4.1.2.3 The West Two CBA

The West Two CBA segment volumes for the year 2030 range from 31,400 to 41,200 ADT. Again, as in the West Four CBA, there is a greater overall volume of through traffic between VA 234 Bypass south of I-66 and Build Segment C north of I-66 under the West Two CBA than the Comprehensive Plan CBA. The lowest volumes in the West Two CBA occur along Segment C just north of VA 234. The West Two CBA has the least variation in volumes along its segments of any of the Build Options. The West Two CBA increases volumes on VA 234 Bypass over the No-Build Scenario to the same degree as the West Two CBA and affects an intermediate decrease on VA 28 volumes north of Lomond Drive/Liberia Avenue. VA 28 volumes south of I-66 are basically unchanged as compared to No-Build. Volumes on the existing Loudoun County Parkway segment between Braddock Road and US 50 increase over the No-Build scenario to the same degree as under the Comprehensive Plan CBA and the West Four CBA.

4.1.3 Highway LOS and Capacity

The 2030 peak hour LOS for the highway segments for each alternative was evaluated within the study area. The LOS is an indication of the operation and performance of a facility. Highway capacity and overall operational performance are typically directly related to the traffic volume-to-capacity, design speed of the facility, profile grades, distance to obstructions, shoulder widths and percentage of heavy vehicle traffic. The LOS is calculated for each facility to describe its expected quality of operation. LOS calculations were developed for the highway segments according to each project alternative using a spreadsheet called ENTRADA developed by Ed Azimi of the VDOT Northern Virginia District. This is an automated version of the techniques documented in the 2000 Highway Capacity Manual (HCM). Table 4.1-4 summarizes the service levels for each year 2030 alternative on the highway network in the study area.

TABLE 4.1-4
LOS ANALYSIS FOR BUILD ALTERNATIVE SEGMENTS

Route and Location	Peak Hour LOS (Peak Hour Direction 2030)				
	2005	No-Build	Compre-hensive Plan CBA	West Four CBA	West Two CBA
Segment E (existing Godwin Drive) – VA 28 to Wellington Drive	B	A	C	A	A
Segment E (existing Godwin Drive) – Wellington Drive to VA 234 Business	B	A	D	A	A
Segment E – VA 234 Business to Lomond Drive	N/A	N/A	E[1]	N/A	N/A
Segment E – Lomond Drive to I-66	N/A	N/A	F[1]	N/A	N/A
Segment F – I-66 to US 29	N/A	N/A	B	N/A	N/A
Segment F – US 29 to Segment F'	N/A	N/A	B	N/A	N/A
Segment F' – Segment F to Braddock Road	N/A	N/A	B	C	N/A
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	A	B	C	C	C
Segment C – I-66 to US 29	N/A	N/A	N/A	D	D
Segment C – US 29 to VA 234	N/A	N/A	N/A	C	D
Segment C – VA 234 to Segment G/D	N/A	N/A	N/A	D	C
Segment G – Segment C to Gum Springs Road	N/A	N/A	N/A	D	N/A
Segment G – Gum Springs Road to Segment F'	N/A	N/A	N/A	C	N/A
Segment D – Segment C to Braddock Road	N/A	N/A	N/A	N/A	C
Segment D – Braddock Road to US 50	N/A	N/A	N/A	N/A	C

Notes for Preceding Table:

[1] Additional analysis will be conducted to identify improvements to the operating conditions in this segment during the FEIS preparation. In heavily developed metropolitan areas, the minimum LOS that must be designed for is LOS D. This may require a design exception. An evaluation (more detailed traffic analysis) will be provided to determine if LOS deficiencies are occurring at just interchanges or along the main line as well. Prince William County has programmed these segments in their county plan as an eight-lane cross section, which would result in LOS C between VA 234 Business and Lomond Drive and LOS D between Lomond Drive and I-66.

4.1.4 No-Build Alternative

The planned upgrade in the CLRP of VA 234 Bypass south of I-66 to a six-lane full freeway facility has a substantial impact of drawing traffic out of the City of Manassas. This condition is present in the No-Build and in all three CBAs, and is responsible for the reduction of traffic and improved LOS on existing Godwin Drive.

4.1.5 Build Alternative

The 2030 peak hour LOS for the CBAs are shown in Table 4.1-5. A summary of the LOS for each CBA is provided below.

TABLE 4.1-5
BUILD ALTERNATIVES: FORECAST ADT VOLUMES

The Comprehensive Plan CBA	LOS (peak hour)
Segment E (existing Godwin Drive) – VA 28 to Wellington Drive	C
Segment E (existing Godwin Drive) – Wellington Drive to VA 234 Business	D
Segment E – VA 234 Business to Lomond Drive	E
Segment E – Lomond Drive to I-66	F
Segment F – I-66 to US 29	B
Segment F – US 29 to Segment F'	B
Segment F' – Segment F to Braddock Road	B
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	C
The West Four CBA	LOS (peak hour)
Segment C – I-66 to US 29	D
Segment C – US 29 to VA 234	C
Segment C – VA 234 to Segment G/D	D
Segment G – Segment C to Gum Springs Road	D
Segment G – Gum Springs Road to Segment F'	C
Segment F' – Segment F to Braddock Road	C
Segment F' (existing Loudoun County Parkway) – Braddock Road to US 50	C
The West Two CBA	LOS (peak hour)
Segment C – I-66 to US 29	D
Segment C – US 29 to VA 234	D
Segment C – VA 234 to Segment G/D	C
Segment D – Segment C to Braddock Road	C
Segment D – Braddock Road to US 50	C

4.1.5.1 The Comprehensive Plan CBA

Forecast traffic conditions for the Comprehensive Plan CBA indicate that the LOS of the proposed Tri-County Parkway segments would range between LOS B and F, as indicated in Table 4.1-5. In the segments south of I-66, LOS on existing Godwin Drive deteriorates from the No-Build due to the additional traffic drawn by the Build Segments. North of VA 234 Business, Segment E carries an increasing amount of traffic as it approaches I-66, and the LOS drops to E and F as the roadway approaches its capacity during the peak hour. Additional analysis will be conducted during the FEIS preparation to improve the operating conditions in these sections.

4.1.5.2 The West Four CBA

Under the West Four CBA, all build segments would experience a peak period LOS between C and D. These are indicative of moderate, but not severe congestion during the peak hour. The segments show less variation in LOS over the length of the roadway than those in the Comprehensive Plan CBA.

4.1.5.3 The West Two CBA

The West Two CBA is anticipated to have service levels ranging between C and D over its entire length. These are indicative of moderate, but not severe congestion during the peak hour. The segments show less variation in LOS over the length of the roadway than those in the Comprehensive Plan CBA.

4.1.6 Interchange Discussion

The Comprehensive Plan CBA alignment includes four potential interchanges, at Wellington Road, VA 234 Business, Lomond Drive, and Interstate 66. The I-66 interchange carries by far the most volume, both from the Tri-County Parkway and through volumes on I-66. Forecast ADT volumes on I-66 east of the Segment E interchange are greater than those for I-66 in the No-Build Alternative. This indicates that a substantial amount of traffic is forecast to utilize Segment E as a feeder toward I-66 eastbound (especially during the a.m. peak) and from I-66 westbound (especially during the p.m. peak). This interchange carries relatively little through traffic north of I-66 compared to the volumes accessing I-66.

The West Four CBA and the West Two CBA include a potential interchange only at their southern terminus with I-66. An interchange in this location results in a slight decrease in traffic volumes on I-66 in the vicinity compared to the No-Build Alternative. Unlike the Comprehensive Plan CBA, higher volumes in both the West Four CBA and the West Two CBA travel through the interchange than utilize the I-66 ramps. Also, the volumes are more balanced directionally and do not exhibit the large a.m. and p.m. directional peaking characteristics of the Comprehensive Plan CBA.

Analysis of projected turning volumes at the intersection of Segment C and US 29 in the West Four CBA and the West Two CBA show a large demand for a left turn movement from northbound Segment C to westbound US 29 especially during the p.m. peak. Turning movement volumes in the regional model are sometimes affected in a disproportionate way to small differences in travel time on certain roadway paths. In this situation, the large left-turn volumes are primarily destined for the developments along Heathcote Blvd and Catharpin Road north of US 29. A more logical path for these vehicles would be to access I-66 for the short segment to the Gainesville interchange which offers direct access to Heathcote Blvd. Due to congestion on I-66 westbound during the p.m. peak, the model calculates a short time savings for vehicles avoiding this I-66 segment and instead turning left on US 29. In reality, delay at the proposed Segment C/US 29 intersection would make this a less appealing option for drivers to choose. For these reasons, an interchange at Segment C and US 29 is not believed to be necessary to handle the peak traffic movements.

4.1.7 Screenline Analysis

An analysis of the traffic generated through the study area was conducted via a screenline analysis. In this type of analysis, the study area is subdivided into large sections by imaginary screenlines. The screenlines could be natural or man-made barriers, such as rivers, railway tracks, or existing roadways. For the purposes of this study, the screenlines extended from US 15 to the west and VA 28 to the east, encompassing traffic on both roadways. Screenlines chosen for analysis are Bull Run, Southern Railroad, I-66 south of all interchanges, I-66 north of all interchanges, US 50 north of all intersections, US 50 south of all intersections, US 29 north of all intersections, and US 29 south of all intersections. Additionally, there is a screenline along the north and west of VA 28 in Manassas and Prince William County and along the west side of VA 28 in Fairfax County.

Table 4.1-6 summarizes the identified screenline volumes for comparative purposes. ADT volumes associated with the three options are in most cases higher than the No-Build Alternative. The exceptions are at US 29 North, where the Comprehensive Plan CBA shows a decrease of 3,300 vehicles daily. This reduction is primarily due to a decrease in ADT on VA 234 at the US 29 North screenline in the Build Options

as compared to the No-Build. There are also small reductions on the VA 28 West Fairfax screenline in the West Four CBA and the West Two CBA of 4,000 and 5,000 vehicles daily, respectively. These reductions are primarily due to lower volumes on I-66 at this screenline as compared to the No-Build.

TABLE 4.1-6
2030 SCREENLINE FORECASTS COMPARISON ANALYSIS (TOTAL ADT)

Screenline	No-Build	Comprehensive Plan CBA	West Four CBA	West Two CBA
Bull Run	340,900	364,300	355,200	353,500
Southern Railroad	372,300	382,300	378,300	379,600
I-66 South	502,400	548,500	510,400	509,200
I-66 North	377,200	391,900	406,300	407,000
US 50 North	330,300	333,300	332,900	339,300
US 50 South	327,100	330,100	329,700	338,800
US 29 North	566,200	562,900	584,600	586,200
US 29 South	535,300	566,400	550,200	552,400
VA 28 West Prince William	206,100	235,800	209,100	208,800
VA 28 West Fairfax	429,400	445,100	425,400	424,400

The largest differences between options occur at I-66 South, I-66 North, US 29 South, and VA 28 West Fairfax. At I-66 South, the Comprehensive Plan CBA has a much greater increase in screenline volume than the West Four CBA and the West Two CBA. This can be attributed to the greater volumes carried on Segment E in the Comprehensive Plan CBA versus a smaller increase in volume on VA 234 Bypass south of I-66 in the West Four CBA and the West Two CBA. At I-66 North, the West Four CBA and the West Two CBA have higher screenline volumes than does the Comprehensive Plan CBA. This is due to greater traffic volumes on the Build segments north of I-66 in the West Four CBA and the West Two CBA versus the Comprehensive Plan CBA. Most of the large increase in the VA 28 West Fairfax screenline in the Comprehensive Plan CBA versus the West Four CBA and the West Two CBA is due to I-66 carrying a greater volume over this screenline.

4.1.8 Travel Time Analysis

A summary of the forecast travel times (shortest time path) between three trip origins inside the study area and three trip destinations to the north of the study area is shown in Table 4.1-7. The a.m. peak and p.m. peak travel times for the O-D pair are averaged in order to estimate the time spent by a typical round-trip commuter in each direction. Trip origins are Downtown Manassas (near the intersection of Nokesville Road and Grant Avenue), Manassas Airport, and Sudley Manor Square (at VA 234 Business and Sudley Manor Road). Trip destinations are Dulles Airport, the Worldcom Campus north of Dulles, and the Lansdowne Center north of VA 7 between Belmont Ridge Road and Ashburn Road. The analysis uses constrained highway times on the network between each O-D pair. In most pairings, the Comprehensive Plan CBA reduces average travel time between the selected origin-destination pair by the greatest amount as compared to the No-Build Alternative. The Comprehensive Plan CBA and the West Two CBA reduce travel time in all cases over the No-Build Alternative. In no case does the West Four CBA reduce travel time more than the Comprehensive Plan CBA or the West Two CBA, though it does reduce travel time in most pairings over the No-Build Alternative. The West Two CBA does provide a greater time savings than the Comprehensive Plan CBA in the Manassas Airport/Worldcom pair and the Manassas Airport/Lansdowne pair. The travel time savings are a result of more direct travel paths along the Build Option segments and reduced congestion on existing facilities.

TABLE 4.1-7
TRAVEL TIME COMPARISON (MINUTES)

Origin	Destination	No-Build	Comprehensive Plan CBA	West Four CBA	West Two CBA
		Travel Time	Travel Time (savings)	Travel Time (savings)	Travel Time (savings)
Downtown Manassas	Dulles Airport	66	62 (-4)	67 (+1)	65 (-1)
Downtown Manassas	Worldcom	73	64 (-9)	69 (-4)	67 (-6)
Downtown Manassas	Lansdowne	76	70 (-6)	74 (-2)	72 (-4)
Sudley Manor Square	Dulles Airport	62	60 (-2)	63 (-4)	61 (-1)
Sudley Manor Square	Worldcom	68	61 (-7)	64 (-4)	62 (-6)
Sudley Manor Square	Lansdowne	71	65 (-6)	68 (-3)	66 (-5)
Manassas Airport	Dulles Airport	69	65 (-4)	69 (0)	68 (-1)
Manassas Airport	Worldcom	74	67 (-7)	68 (-6)	65 (-9)
Manassas Airport	Lansdowne	77	71 (-6)	73 (-4)	69 (-8)

4.1.9 VMT Comparison

An analysis of forecast VMT (vehicle miles traveled) through the study area was conducted for use in comparing the alternatives. The result of the VMT analysis is summarized in Table 4.1-8. As indicated, along study area roadways, VMT currently stands at 5.47 million vehicle miles per day. Future No-Build conditions indicate that VMT will increase to 8.55 million vehicle miles per day.

TABLE 4.1-8
VEHICLE MILES TRAVELED

Portion of Study Area	2030 Measured VMT (millions)				
	2005	No-Build	Comprehensive Plan CBA	West Four CBA	West Two CBA
Manassas Area	1.62	2.13	2.35	2.12	2.13
Gainesville/Catharpin Area	1.29	2.38	2.15	2.50	2.58
Centreville Area	2.20	2.97	3.05	2.93	2.92
South Riding Area	0.35	1.08	1.09	1.16	1.07
Study Area Total	5.47	8.55	8.65	8.71	8.70

The West Four CBA and the West Two CBA result in similar increases in study area VMT as compared to No-Build, approximately 160,000 and 150,000 vehicle miles daily, respectively. The Comprehensive Plan CBA results in the smallest increase in VMT, approximately 100,000 vehicle miles per day.

4.1.10 VHT Comparison

An analysis of forecast VHT (vehicle hours traveled) throughout the study area was conducted. Results of the VHT analysis are summarized in Table 4.1-9. VHT is an indication of the congested travel times (in the peak periods) or uncongested travel times (in the off-peak period) multiplied by the traffic volumes along the roadways within a defined study area. As indicated in table 4.1-9, VHT values are similar between the No-Build Alternative and all three CBAs. This value is in the range of 259,700 hours to 262,000 hours. As the

entire study area in 2030 is highly congested, no single option will change the total number of hours drivers are expected to travel in 2030. VHT will increase approximately 68 percent from 2005 to 2030 regardless of the alternative selected.

TABLE 4.1-9
COMPARISON OF FORECAST VHT

	2005	2030 No-Build	2030		
			Comprehensive Plan CBA	West Four CBA	West Two CBA
Study Area	155,600	261,500	262,000	261,600	259,700

Note: Values shown in VHT traveled per day.

4.1.11 Peak Deficient VMT and Vehicle Hours of Delay inside the Study Area

Due to the inconclusive results shown in the VHT Comparison, a better and more useful comparison between alternatives can be shown by examining peak deficient VMT (defined as VMT at LOS D, E, F, or G) and vehicle hours of delay (defined as the number of extra hours drivers spend in congested conditions versus free-flow conditions on all roadways within the study area). Lower peak deficient VMT values illustrate that drivers are driving less distance in highly congested conditions, and lower vehicle hours of delay are a measure of drivers spending less time in highly congested conditions (Table 4.1-10 and Table 4.1-11).

TABLE 4.1-10
COMPARISON OF FORECAST PEAK DEFICIENT VMT

	2030 No-Build	2030		
		Comprehensive Plan CBA	West Four CBA	West Two CBA
Study Area	1.61	1.54	1.63	1.61

Notes: Values shown in million VMT at LOS D, E, F, or G per day.

TABLE 4.1-11
COMPARISON OF PEAK VEHICLE HOURS OF DELAY

	2030 No-Build	2030		
		Comprehensive Plan CBA	West Four CBA	West Two CBA
Study Area	66,300	64,700	64,700	63,400

Notes: Values shown in vehicle hours of delay per day.

The Comprehensive Plan CBA is the only alternative which reduces the amount of peak deficient VMT as compared to the No-Build Alternative. There is a 4.4 percent decrease in peak deficient VMT for the Comprehensive Plan CBA. The West Four CBA actually increases the amount of peak deficient VMT by about one percent. The West Two CBA affects the largest decrease in the hours of peak delay as compared to the No-Build Alternative. There is a 4.4 percent decrease in the hours of peak delay for The West Four CBA. The Comprehensive Plan CBA and the West Two CBA also decrease the hours of peak delay to approximately the same degree, an improvement of 2.4 percent over the No-Build Alternative; however, when these two measures are combined, the Comprehensive Plan CBA is the only alternative which is an improvement over the No-Build Alternative in both peak deficient VMT and hours of peak delay.

4.1.12 Safety Effects of Alternatives

There are a number of safety concerns inside the Tri-County Parkway study area. These are detailed in section 3.1 of this document. In future years, reductions in traffic on two important north-south roadways (VA 234 Business and VA 28) should cause the number of crashes, injuries, and vehicular deaths on these segments to decrease.

4.1.12.1 No-Build Alternative

The No-Build Alternative provides no improvements to the safety issues outlined in section 3.1. As the traffic volumes on the existing roadways in the study area are expected to increase, safety situations could be expected to worsen.

4.1.12.2 Candidate Build Alternatives (CBAs)

A limited access facility, as currently proposed under all three CBAs, would have a lower accident rate as compared to existing VA 234 Business and VA 28 and would divert motorists from both of these north-south roadways. As a result, reductions in traffic volumes along existing VA 234 Business and VA 28 would result in a reduction in the number of accidents forecast to occur along the roadways. All of the CBAs reduce the forecast traffic volumes on VA 234 Business north of Godwin Drive to I-66 (Table 4.1-12) and on VA 28 within the City of Manassas from VA 234 Bypass to Old Centreville Road (Table 4.1-13). Both of these existing roadway segments have crash rates above the average Northern Virginia regional incident rates for similar types of facilities; the VA 234 Business segment selected has the highest crash and injury rate of all roadway segments analyzed inside the study area.

TABLE 4.1-12
PROJECTED ACCIDENT, INJURY, AND FATALITY COMPARISON
ON EXISTING VA 234 BUSINESS

VA 234 Business from Godwin Drive to I-66	1997-2000	2030[1.]			
	Average Existing	No-Build	Comprehensive Plan CBA	West Four CBA	West Two CBA
Accidents	218	366	234 (-132)	363 (-3)	360 (-6)
Injuries	96	161	103 (-58)	159 (-2)	158 (-3)
Fatalities	1	1	1 (0)	1 (0)	1 (0)

Notes: [1.] 234 (-132) = forecast # accidents, injuries, and fatalities (amount less than No-Build Alternative)

TABLE 4.1-13
PROJECTED ACCIDENT, INJURY, AND FATALITY COMPARISON ON EXISTING VA 28

VA 28 from VA 234 Bypass to Old Centreville Rd	1997-2000	2030[1.]			
	Average Existing	No-Build	Comprehensive Plan CBA	West Four CBA	West Two CBA
Accidents	134	183	173 (-10)	182 (-1)	184 (+1)
Injuries	49	67	63 (-4)	67 (0)	67 (0)
Fatalities	0	0	0 (0)	0 (0)	0 (0)

Notes: [1.] 173 (-10) = forecast # accidents, injuries, and fatalities (amount less than No-Build Alternative)

By far, the greatest impact on crash reduction on both selected roadway segments is in the Comprehensive Plan CBA. This is a result of the Comprehensive Plan CBA diverting the greatest amount of traffic from the selected segment of VA 234 Business. There are minor reductions in accidents and injuries in the West Four CBA and the West Two CBA on the VA 234 Business segment, but the VA 28 segment is mostly unaffected under these CBAs.

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4.2 LAND USE

4.2.1 Land Use and Public Facility Consequences

4.2.1.1 No-Build Alternative

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no substantial change in existing land uses is anticipated due to these improvements. By not providing needed regional traffic improvements, the No-Build Alternative could ultimately adversely affect current access to emergency response facilities (police, fire, and medical), utility services, schools, colleges, or libraries in the study area. Response times in the urbanized areas may deteriorate due to increased congestion; otherwise, rural response times may incur only minor delay. No utility service interruptions or rerouting of existing water, sewer, or electric lines would occur. Access to solid waste collection points and disposal sites would not substantially change.

4.2.1.2 Candidate Build Alternatives (CBAs)

Table 4.2-1 presents the acres of land by land use category that would be converted to a new transportation use by each CBA.

West Two CBA: The West Two CBA would affect 767 acres - the lowest of all the CBAs. Less than half of this total (353 acres) consists of agricultural land conversion. About 270 acres are transitional lands - agricultural land primed for urban and suburban uses. The 621 acres that make up these two land uses have relatively low impact from a socioeconomic perspective; however, 45 acres are comprised of higher developed land uses (residential, commercial, industrial).

West Four CBA: The West Four CBA is intermediate with respect to impacts. This CBA does not affect as many commercial parcelsor residential parcels (95 acres) as the Comprehensive Plan CBA, but it affects more than the West Two CBA. It would affect the same amount of public facilities (one acre) and parklands (42 acres), and has similar impacts to transitional lands and forestlands.

Comprehensive Plan CBA: At 1,135 acres, the Comprehensive Plan CBA affects the most land. This CBA affects over 460 acresof residential land and 212 acres of parklands - the highest of the three CBAs. With the exception of agriculture and transitional lands, this alternative affects the greatest acreage of each land use. The relatively large acreage of developed lands affected may prove to be problematic from a socioeconomic perspectve.

Public facility impacts range from one acre for the West Two and West Four CBAs, to 60 acres for the Comprehensive Plan CBA. Forty acres of the public facility land identified in the Comprehensive Plan CBA are edge impacts along the Upper Occoquan Sewage Authority. The remainding 20 acres, a narrow strip of land south of Fairmont Park, is vacant land owned by Prince William County. No exisiting facilities or structures occupy this land. The 600-foot-wide assessment corridors clip the edges of the Massassas Battlefield. The Comprehensive Plan CBA also affects portions of the Bull Rull Regional Park.

TABLE 4.2-1
LAND USE ACREAGE BY CANDIDATE BUILD ALTERNATIVE

CBA	Residential (acres)	Commercial / Industrial (acres)	Public Facilities (acres)	Parks (acres)	Agriculture (acres)	Forest (acres)	Transitional (acres)	Total (acres)
West Two	3	42	1	42	353	58	268	767
West Four	95	91	1	42	281	60	261	831
Comp Plan	463	150	60	212	0	69	181	1,135

Note: All numbers rounded to nearest whole number.

4.2.2 Residential Development Consequences

Residential Development impacts vary from one neighborhood to twelve neighborhoods for the CBAs. The No-Build Alternative has little or no affect upon residential development.

4.2.2.1 No-Build Alternative

Although small amounts of new right-of-way may be required for and temporary disruptions in traffic may occur during implementation of programmed improvements associated with the No-Build Alternative, no substantial neighborhood impacts are anticipated due to these improvements. By not providing needed regional traffic improvements, the No-Build Alternative could, however, adversely affect neighborhood accessibility on a long-term basis.

4.2.2.2 CBAs

Table 4.2-2 lists residential developments by jurisdiction potentially affected by CBAs. The total number of relocations projected under each of the CBAs and associated findings are presented in section 4.6-1.

TABLE 4.2-2
AFFECTED RESIDENTIAL DEVELOPMENTS BY CBA

Build Alternative		
West Two CBA	**West Four CBA**	**Comprehensive Plan CBA**
Old South Estates	South Riding	South Riding
Forest Hills of Virginia		Cedar Crest Estates
Byrne Division		John Farr Property
Kirkpatrick Farms		Fox Division
		North Riding
		Ashton Glen
		Bannerwood
		Fairmont
		Loch Lomond
		Sudley
		Sunnybrook Estates
		Westgate of Lomond

West Two CBA: Four neighborhoods are affected by the West Two CBA. Two of the subdivisions are in Prince William County, just south of the Loudoun County line (Bull Run). This CBA results in minor edge impacts to the Prince William County neighborhoods, which have come into existence over the past twenty years. Most of the area in which the CBA lies is sparsely populated. Several areas just outside the assessment corridor contain subdivisions, but the alignment has been strategically placed for minimal impact (edge impacts only).

West Four CBA: The West Four CBA affects the South Riding neighborhood - a large planned community with its own services established in 1995 (South Riding Proprietary). A portion of the community lies west of the CBA; however, parcel maps indicate that a linear parcel of land has been set aside to accommodate future roadway construction, such as the proposed Loudoun County Parkway (this would be the Tri-County Parkway if this CBA is selected). Although South Riding would be bisected by the Parkway or any future roadway constructed within the linear parcel, this division would not be considered a neighborhood cohesion impact because subdivision plans had no provisions for the establishment of formal designated transportation facilities designed to provide and maintain connectivity (such as a bikepath, sidewalk, or nature trail) between the phases of development located on each side of the parcel reserved for a future roadway. In addition, reservation of the linear strip of undeveloped land for a future transportation corridor points to an intent to anticipate and allow for future bisection of the phases of development.

Comprehensive Plan CBA: Because if would affect neighborhoods just north of the cities of Manassas and Manassas Park, the Comprehensive Plan CBA would result in the highest number of impacts. The Comprehensive Plan CBA also traverses the portion of Prince William County that contains greater concentrations of subdivisions, most of which are older and more established. All of the residential impacts would, however, be edge impacts. The South Riding neighborhood would be bisected by the Comprehensive Plan CBA; however, as discussed above for the West Four CBA, this division would not be considered a neighborhood cohesion impact.

4.2.3 Adopted Goals and Policies

4.2.3.1 Compatibility with Adopted Goals and Policies

The No-Build Alternative is not compatible with any of the jurisdictions' comprehensive plans. All plans call for either a new north-south roadway, a road to divert through-traffic around the cities of Manassas and Manassas Park, or a by-pass to mitigate traffic along VA 28. By doing nothing, the No-Build Alternative would not improve north-south access nor would it improve access around Manassas and Manassas Park.

Compatibility of a CBA (in its entirety) with each and every local comprehensive plan is unlikely. It is also difficult to generalize the compatibility of a proposed CBA across the length of an entire county, as the alignment crosses several land use designations. Table 4.2-3 summarizes the compatibility of each CBA with respect to each particular goal set forth in the comprehensive plan adopted by each jurisdiction. More-detailed discussion regarding the relative compatibility of each CBA is provided in following sections.

TABLE 4.2-3
CBA COMPATIBILITY WITH COMPREHENSIVE PLANS

CBA	Jurisdiction				
	Prince William County	Fairfax County	Loudoun County	City of Manassas	Manassas Park
West Two	Yes	----	Yes	Yes	Yes
West Four	Yes	----	Yes	Yes	Yes
Comprehensive Plan	Yes	Yes	Yes	Yes	Yes

Note: Compatibility is based on the majority of the segmental compatibility determinations within a single jurisdiction.

West Two CBA: For Prince William County, the West Two CBA has already been incorporated into its *Thoroughfare Plan* portion of the *Comprehensive Plan* under the name of the (former) Western Transportation Corridor study area. This corridor starts in the southwest corner of the county, extending north to the current end of the VA 234 Bypass at Interstate 66. The Corridor continues north, now along a similar alignment to the West Two CBA. Loudoun County's *Revised General Plan,* refers to the Lower Bull Run Area (the study area portion of Loudoun County) as a "transitional area." As such, several roadways are noted for expansion or creation. The Tri-County Parkway is listed as one of these roadways. No specifics or preferences for the location of the Parkway were made nor suggested. The *Comprehensive Plan for the City of Manassas* makes no reference to the Tri-County Parkway, nor does it mention a transportation goal that would make one of the Tri-County Parkway alignments stand out from the rest. It does, however, mention the overburdening of roads due to through-traffic, making the West Two and West Four CBAs more attractive. These alternatives would allow north-south through-traffic to bypass the city. West Two CBA does not extend into Fairfax County, and its *Comprehensive Plan* does not state if it is a necessity for the parkway to be located within the county.

West Four CBA: The southern portion of the West Four and West Two CBAs share the same alignment. This portion is part of the former Western Transportation Corridor study area, and would be compatible with Prince William County's comprehensive plan. The southern portion of the Loudoun County Parkway is planned to connect VA 7 near Sterling (outside the study area) to the Prince William Parkway. The northern half of the West Four CBA would be on a portion of the planned Loudoun County Parkway extension. Since the southern portion would connect to VA 234, and eventually the Prince William Parkway, the CBA is compatible. The West Four CBA does not extend into Fairfax County, and its *Comprehensive Plan* does not state if it is a necessity for the parkway to be located within the county.

Comprehensive Plan CBA: Four of the five jurisdictions make specific references to the Tri-County Parkway. Fairfax, Loudoun, and Prince William counties depict alignments on their respective transportation plans. The *Comprehensive Plan for the City of Manassas* makes no reference to the Tri-County Parkway, but the Comprehensive Plan CBA would take the burden off local Manassas roads – a goal set forth in the comprehensive plan. The City of Manassas Park stresses the need for a bypass around VA 28. Although all three CBAs would divert traffic from VA 28, the Comprehensive Plan CBA would help to alleviate congestion on VA 28 and could still be used by local residents.

4.3 FARMLANDS

4.3.1 Farmlands Consequences

The Farmland Protection Policy Act (FPPA) requires that federal actions identify and consider adverse affects on protected farmland. According to the FPPA, protected farmland includes prime farmland soils, unique soils, or statewide or locally important soils. In Virginia, the NRCS makes no distinction between prime farmland soils and unique, statewide, or locally important soils. VDOT coordinated with the NRCS to assess the impacts of the project to farmlands in the study area. NRCS-CPA-106 forms were completed to determine the Farmlands Conversion Impact Rating for the project. The Farmland Conversion Impact Rating is based on an assessment of the quality of the prime farmlands soils in the area of the project and an assessment of the suitability of the land in the corridor for protection of farmland. The FPPA states that "increasingly higher levels of consideration for protection" be given to farmlands impacted by projects that have a Farmland Conversion Impact Rating exceeding a total score of 160. Each alternative scored below 160 and, therefore, no further action is recommended to mitigate farmland conversion. The NRCS-CPA-106 forms are provided in Appendix B of the Land Use, Parklands, and Farmlands Technical Report (VDOT, 2004).

4.3.1.1 No-Build Alternative

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no substantial conversion of existing prime farmland soils are anticipated due to these improvements.

4.3.1.2 CBAs

Construction of any of the CBAs will convert soils mapped as prime farmlands soils by the NRCS to roadway surface and right-of-way. Areas of prime farmland soils converted are presented in Table 4.3-1. The majority of the prime farmland soil conversions would occur in Prince William County, which also contains the largest amount of non-converted prime farmland soils in the study area (see Section 3.3). The CBA having the greatest potential conversion of prime farmland soils is the West Two CBA, which includes the conversion of 132.1 acres of prime farmland soils (most of which are located within Prince William County).

TABLE 4.3-1
ACRES OF PRIME FARMLAND SOILS CONVERTED

Jurisdiction	Converted Area (acres)		
	West Two CBA	West Four CBA	Comprehensive Plan CBA
Fairfax County	0	0	5.1
Loudoun County	1.7	0	0
Prince William County	130.4	101.1	73.9
TOTAL	132.1	101.1	79.0

4.3.2 Agricultural and Forestal Districts Consequences

The study area contains six Agricultural and Forestal (A&F) Districts. Two are located in Loudoun County and four are located in Fairfax County. The A&F District program is designed to preserve and protect open spaces, forested areas and agricultural lands in the state of Virginia.

4.3.2.1 No-Build Alternative

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no impacts to existing A&F Districts are anticipated.

4.3.2.2 CBAs

Two of the three CBAs affect A&F Districts. The number of affected acres is presented in Table 4.3-2. The Comprehensive Plan CBA affects the most acres (65.7 acres). No A&F Districts are affected by the West Two CBA.

TABLE 4.3-2
AFFECTED AGRICULTURAL AND FORESTAL DISTRICTS

	Affected Area (acres) of Agricultural / Forestal Districts		
	West Two CBA	**West Four CBA**	**Comprehensive Plan CBA**
FAIRFAX COUNTY			
Cox	0	0	0
Stone Bridge	0	0	36.7
Smith	0	0	0
Richardson	0	0	7.1
LOUDOUN COUNTY			
Pretty Chicks Welcome	0	21.9	21.9
Super Cal	0	0	0
TOTAL	0	21.9	65.7

Figure 4.3-1 shows the locations of CBAs relative to A&F Districts. The West Four CBA and Comprehensive Plan CBA each affect 21.9 acres of the "Pretty Chicks Welcome" A&F District in Loudoun County. The alignment follows an area along the northeastern edge of the A&F District. The Stone Bridge district in Fairfax County is bisected by the Comprehensive Plan CBA, resulting in an impact of 36.7 acres.

To use A&F District land for roadway improvements, conversion of land in the A&F District would be required. This is a local process conducted separately for each jurisdiction (County) containing the affected land. The process includes verification of a legitimate reason to remove the land for the District, followed by a public hearing by the local Planning Commission, and approval by the local Board of Supervisors. The West Two CBA would not require any conversion. The West Four CBA would require conversion of land in one district in Loudoun County. The Comprehensive Plan CBA would require conversion of the land in two districts in Fairfax County and one district in Loudoun County.

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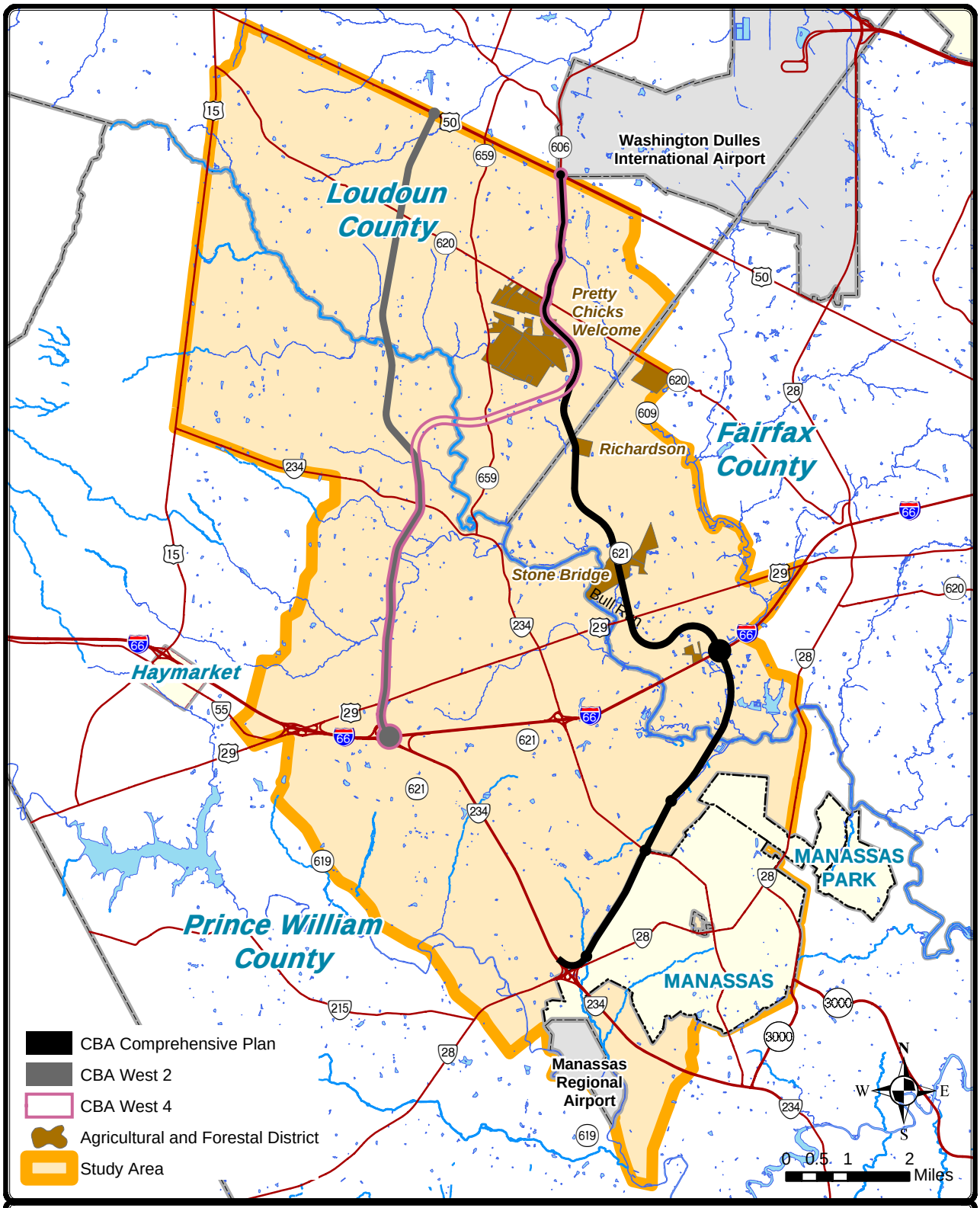

Tri-County PARKWAY Location Study

FIGURE 4.3-1
AFFECTED AGRICULTURAL AND FORESTAL DISTRICTS

4.4 PARKLANDS, RECREATION AREAS, AND OPEN SPACE EASEMENTS

See the Land Use, Farmlands, and Parklands Technical Report (VDOT, 2004) for more information related to these impacts.

4.4.1 Environmental Consequences

Although small amounts of new right-of-way may be required for and although temporary disruptions to traffic may occur during implementation of programmed improvements associated with the No-Build Alternative, no substantial conversion of or disruption to any park or recreation area is anticipated. By not providing needed regional traffic improvements, the No-Build Alternative could, however, fail to address parkland and recreation area accessibility needs on a long-term basis.

The construction of any of the CBAs will result in the direct use of property associated with either the Manassas National Battlefield Park, Bull Run Regional Park, Ben Lomond Regional Park, and/or Fairmont Park (Figure 4.4-1). Table 4.4-1 lists those roadway segments associated with each of the CBAs that potentially will affect these resources. The actual construction footprint will be considerably less than the 600-foot-wide assessment corridor, thus, it is feasible that the final design for a CBA could avoid a direct impact to these resources. See the Section (f) Evaluation (section 4.15) of this EIS for a more-detailed discussion of effects to parklands determined to be Section 4(f) properties and consideration of minimization and avoidance alternatives.

TABLE 4.4-1
PARKLAND AND RECREATIONAL IMPACTS BY CBA

Resource	CBA	Segment	Impact Total (acres)
Manassas National Battlefield Park	Comprehensive Plan	F	9.5
	West Two	C	42.1
	West Four	C	42.1
Bull Run Regional Park	Comprehensive Plan	E	127.7
Ben Lomond Regional Park	Comprehensive Plan	E	70.4
Fairmont Park	Comprehensive Plan	E	4.6

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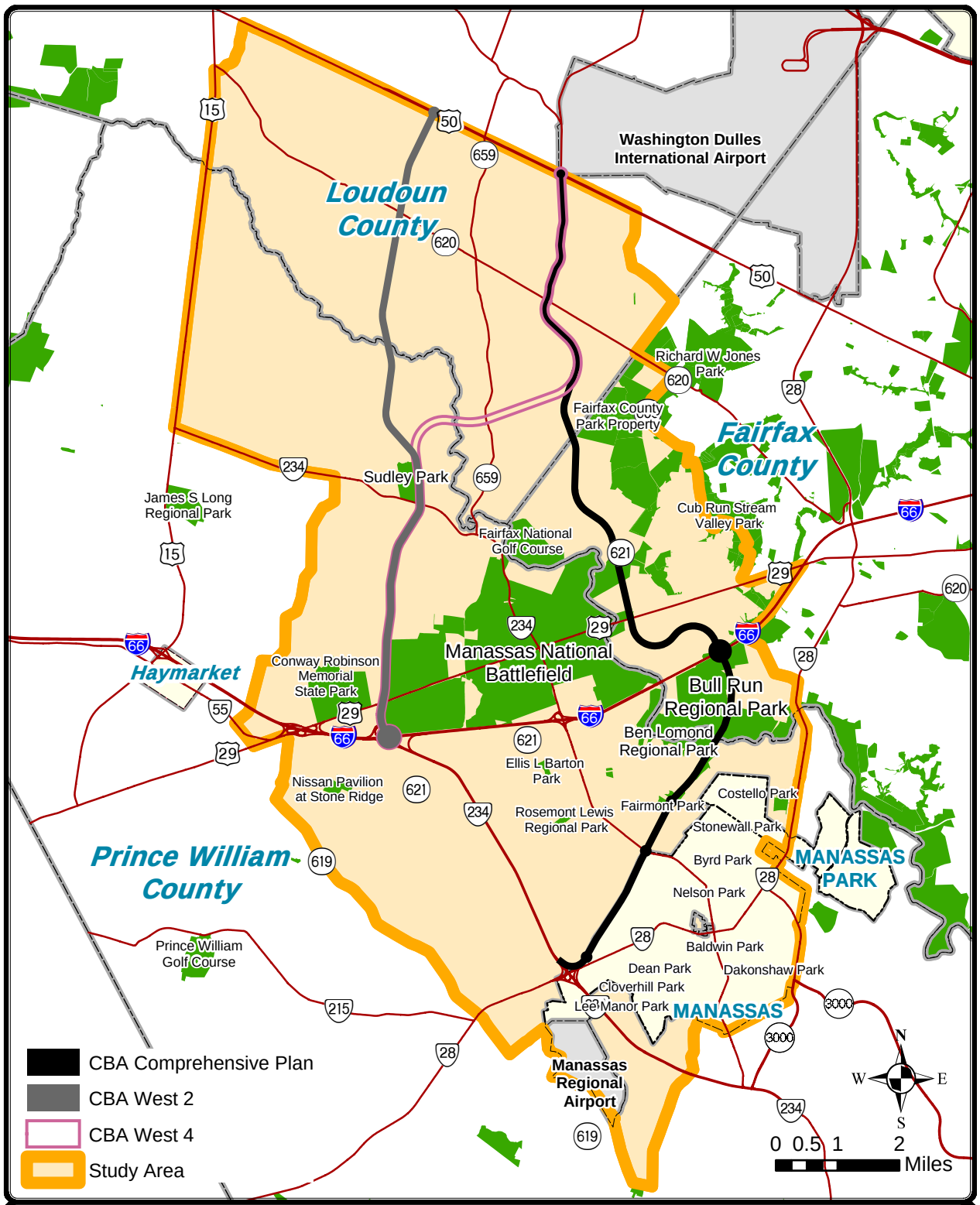

Tri-County PARKWAY Location Study

FIGURE 4.4-1
AFFECTED PARKLAND AND RECREATION AREAS

4.5 VISUAL QUALITY

4.5.1 Introduction

A discussion of the methodologies and findings pertaining to assessment of visual quality are presented in the Visual Quality Technical Report (VDOT, 2004).

4.5.1.1 Impacts

The visual impact assessment was conducted based on FHWA's Visual Impact Assessment for Highway Projects, 1999. The major components of this assessment include the establishment of baseline conditions, such as assessment of the project area's visual resources and identifying viewer response to those resources. Impacts with respect to the view from the road and with respect to the view of the road are quantified into the following categories:

- **No Impact –** Viewers will experience no visual involvement between the resource and the proposed project or the view of the road would be so far in the background that it would go almost unnoticed.
- **Impact, Not Adverse -** There are dominating visual intrusions in the viewshed from other sources, such as topography, vegetation, structures, or distance; the sensitive resource's affected viewshed is limited in importance; the level and nature of viewer activity would not be adversely affected; or, there was a weak visual contrast between the proposed facility and the existing landscape.
- **Adverse Impact -** The visibility and proximity of the project would be incompatible with existing visual qualities that contribute to the site's importance; the proposed project would be incompatible with visual expectations of the public; the visibility and proximity of the project would be in strong contrast with the existing landscape; or the project would be in an area of substantial visual importance with few other visual intrusions.

The following tables summarize the potential visual quality impacts associated with views of the road (Table 4.5-1) and views from the road (Table 4.5-2) for the two visually affected areas identified for their importance to the region in Section 3.5 of this document. The location of these areas are shown in Figure 4.5-1. The potential impacts associated with these and other visually sensitive areas are described in greater detail in the Visual Quality Technical Report (VDOT, 2004). The Technical Report also includes the data sheets used to evaluate these visual resources.

TABLE 4.5-1
VISUAL QUALITY IMPACTS AS SEEN FROM THE POINT OF ASSESSMENT

Site No.	Visual Resource #	Segment	Alternative			
			No-Build	CBAs		
				West Two	West Four	Comp Plan
14	Manassas National Battlefield Park and Historic District	C, F	No Impact	Adverse Impact	Adverse Impact	Adverse Impact
17	Bull Run Regional Park	E	No Impact	N/A	N/A	Adverse Impact

TABLE 4.5-2
VISUAL QUALITY IMPACTS AS SEEN FROM THE PROPOSED ROADWAY

Site No.	Visual Resource #	Segment	Alternative			
			No-Build	CBAs		
				West Two	West Four	Comp Plan
14	Manassas National Battlefield Park and Historic District	C, F	No Impact	No Impact	No Impact	No Impact
17	Bull Run Regional Park	E	No Impact	N/A	N/A	No Impact

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no substantial visual impacts are anticipated due to these improvements.

4.5.1.2 Mitigation

Once the preferred alignment is selected for further study, efforts will be made to avoid impacts to these visual resources or, if this can not be done, to minimize impacts. Mitigation measures may include landscaping (i.e. plantings and/or berms) to screen the resource from the proposed roadway or lowering the elevation (depressing) of the roadway so that it will not be viewed from the resource. In any event, all mitigation efforts will be coordinated with the appropriate local, state, or federal agency to ensure that the proposed project will lessen any impacts to these resources.

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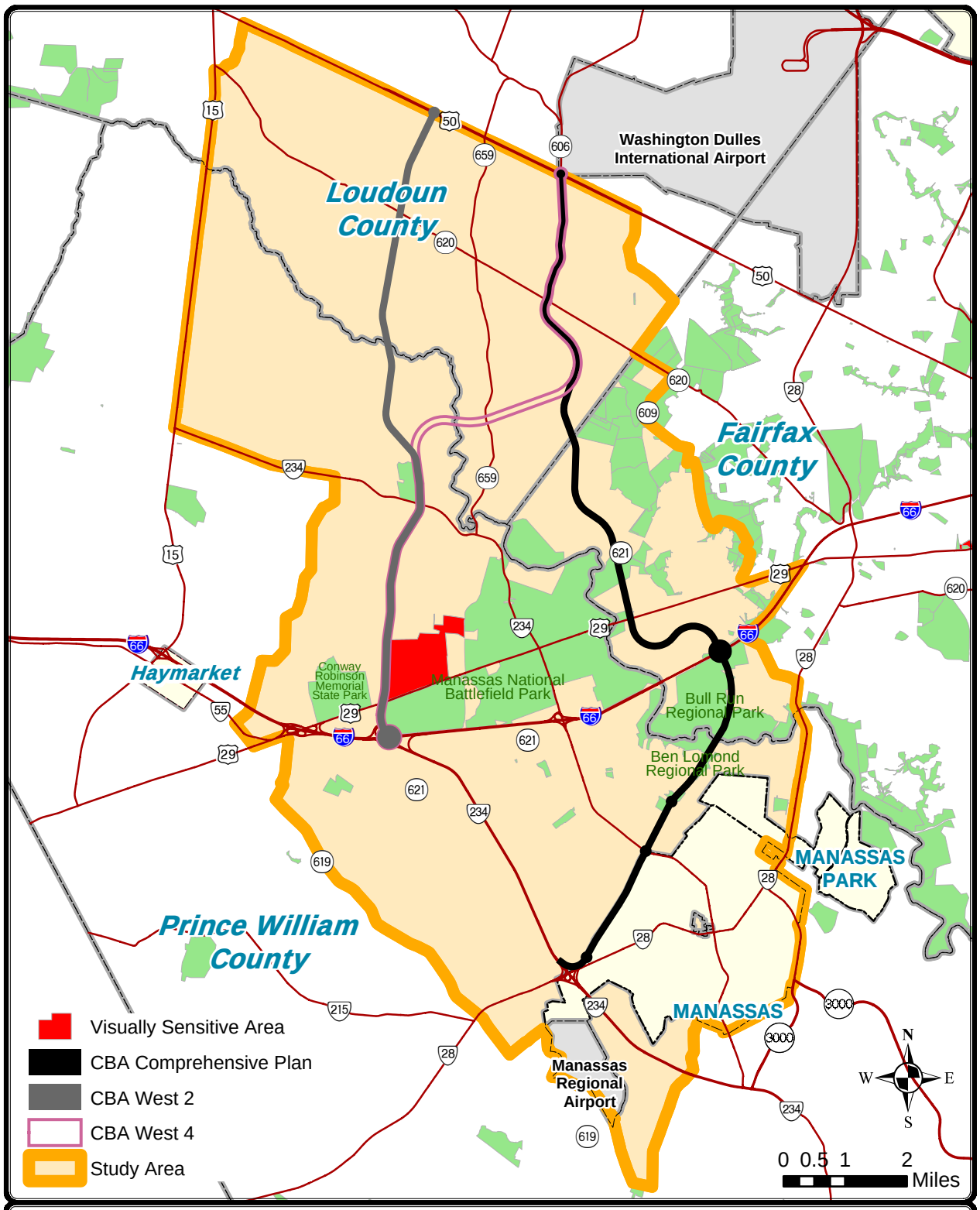

Tri-County PARKWAY Location Study

FIGURE 4.5-1
VISUALLY AFFECTED AREAS OF REGIONAL IMPORTANCE

4.6 SOCIOECONOMICS

Socioeconomic consequences include direct and indirect impacts. Direct impacts include relocations, environmental justice, and economic consequences; these issues are discussed in following sections. Indirect impacts, which include community cohesion, are found in the Indirect and Cumulative Impacts section of this document and in the Socioeconomics Technical Report (VDOT, 2004).

4.6.1 Relocations

4.6.1.1 No-Build Alternative

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no substantial direct social consequences are anticipated.

4.6.1.2 CBAs

Table 4.6-1 lists the number of residential units and non-profit organizations that would be displaced under each CBA. As indicated, the lowest amount of displacements would occur with the West Four CBA and the greatest number of displacements would occur with the West Two CBA. Although these displacements were calculated using the probable limits of construction rather than the 600-foot-wide assessment corridor and although no significant reduction in relocations is anticipated following reduction of corridor width during the final design, further means to reduce displacements will be assessed during later design phases. Data from Census 2000 indicates that most of the houses taken are owner occupied. The average number of owner occupied houses is approximately 80 percent for Fairfax County, 86 percent for Loudoun County, 60 percent for Prince William County, and 79 percent for the City of Manassas. Right-of-Way Stage I Relocation Reports prepared for the project find that the displacement of families will have minimal impact on neighborhoods and the local housing market, and that ample housing exists for the displacees to buy or rent (VDOT, 2004).

TABLE 4.6-1
RESIDENTIAL UNITS AND NON-PROFIT ORGANIZATIONS DISPLACED

CBA	Residential Units Displaced[1]	Non-Profit Organizations Displaced
West Two	21	0
West Four	13	0
Comprehensive Plan	22	1

[1] Every residential unit within the estimated limits of construction is considered a residential unit relocation. Units located close to, but not inside of the construction limits, or land-locked units, were considered in the damages estimate but not included in the total number of displaced residential units.

4.6.1.3 Potential Mitigation

Due to minimal social and economic impacts, no mitigation is proposed for the No-Build Alternative. The following mitigation measures are applicable to CBAs.

- The Virginia Department of Transportation's right-of-way acquisition and relocation program will be conducted in accordance with the Federal Uniform Relocation Assistance and real Property Acquisition Act of 1970, as amended and with the Surface Transportation and Uniform Relocation and Assistance Act of 1987 (STURRA). A relocation assistance and payment program is available through VDOT to aid displaced residents. Relocation payments and advisory assistance are offered in addition to the state's payment for real property. The construction authorization for this project will not be granted until VDOT is satisfied that there is sufficient decent, safe, and sanitary housing in the area available to the families and that they have been informed of its availability. Also, VDOT must be satisfied that supplemental payments, if any, have been made available, that the affected occupants have received sufficient time to obtain possession of housing which is within their financial means, and that replacement housing is open and fair to all persons regardless of race, color, religion, sex or national origin.
- Impacts to social consequences may vary depending on the CBA selected. Minimization of the effects has been evaluated but specific mitigation recommendations will not be developed until an alternative is

selected by the CTB. Once a decision is made, specific mitigation recommendations will be more fully addressed in the Final EIS.

4.6.2 Environmental Justice

Executive Order 12898 requires Federal agencies to "achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects, including the interrelated social and economic effects of their programs, policies, and activities on minority populations and low-income populations in the United States." According to Federal guidelines, disproportionately high and adverse effect means "an adverse effect that (1) is predominately borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or nonlow-income population."

4.6.2.1 No-Build Alternative

Although small amounts of new right-of-way may be required for and although temporary disruptions to traffic may occur during implementation of programmed improvements associated with the No-Build Alternative, no disproportionate effects on low-income or minority populations are anticipated.

4.6.2.2 Build Alternative

Table 4.6-2 and Table 4.6-3 list the estimated number of minority and low-income impacts by CBA. An analysis of Census 2000 data determined the number of minority and low-income populations for the block/block groups contained by each CBA. Percentages of those particular populations were applied to the number of relocations. In most cases, the number of relations was less than one; therefore, the number was rounded to one. The number of minority and low-income relocations is an estimate and should only be used a guideline. The Comprehensive Plan CBA will affect the highest population of minorities, reflecting the concentration of minority and low-income occupied residential units in the City of Manassas.

TABLE 4.6-2
MINORITY CONCENTRATIONS

CBA	Minority Population [1]	Percentage Minority [2]	Minority Relocations [3]
West Two	96	0.3%	1
West Four	273	0.8%	0
Comprehensive Plan	1,581	4.9%	1

TABLE 4.6-3
LOW-INCOME CONCENTRATIONS

CBA	Low-Income population [1]	Percentage of population with Low-Income [2]	Relocations [3]
West Two	93	1.6%	1
West Four	197	3.4%	0
Comprehensive Plan	1,611	28%	5

[1] Total of blocks/block groups that contained the alternative
[2] Percentage of population in block/block groups that contained the alternative
[3] Percentages applied to the total displaced residential units
Source: US Census, Virginia Department of Transportation, Parsons Brinckerhoff

4.6.2.3 Potential Mitigation

Due to minimal impacts, no mitigation for environmental justice consequences is proposed for the No-Build Alternative. The following mitigation is applicable to CBAs:

- Relocation impacts on low income or minority populations are not disproportionate to the general low income or minority population in the study area. No specific mitigation strategies, therefore, are being considered at this time to address impacts to low-income and minority populations. Consistent with general mitigation procedures that will be applied to all populations in the study area, the following is proposed: sound barriers, landscaping, and temporary relocation (USDOT, 2004).

- VDOT's right-of-way acquisition and relocation program will be conducted in accordance with the Federal Uniform Relocation Assistance and real Property Acquisition Act of 1970, as amended and with the STURRA. Relocation resources will be available without discrimination.

4.6.3 Economic Consequences

4.6.3.1 No-Build Alternative

The No-Build Alternative would not improve regional access to any of the identified activity centers, industrial parks, enterprise zones, tourist attractions, or other economic incentive areas within the study area. No relocation or loss of local property tax revenues would occur. Travel time between economic growth incentive areas will increase because of increased congestion.

4.6.3.2 CBAs

Capital costs for each of the CBAs are summarized in Table 4.6-4. Additional information pertaining to capital costs is presented in the Capital Cost Estimate and Methodology Technical Report (VDOT, 2005).

TABLE 4.6-4
CAPITAL COSTS

CBA	Total Project Estimate	Length (miles)	Cost per Mile
Comprehensive Plan	$547,826,000	11.68	$46,902,911
West Two	$201,174,000	10.46	$19,232,696
West Four	$176,674,000	9.21	$19,182,845

Segment effects were aggregated for each CBA. Table 4.6-5 presents economic opportunity area summaries by CBA. The combined effects of individual segments result in a regional snapshot of what would benefit and what would not benefit if Tri-County Parkway were introduced. Activity centers in this study area include the termini of the Tri-County Parkway corridor (the Dulles Corridor to the north, and extensive centers—such as Potomac Mills—to the south and east). The economic effects expected from the CBAs include a tradeoff between the loss of fewer existing businesses with the proximity of a proposed options to existing and planned industrial and commercial growth areas. Improvement in travel time within the study area is expected. The traffic and transportation technical memorandum provides a regional and interstate travel time saving analysis for the No-Build and a generic CBA. Lost tax revenue for each alternative is considered a temporary effect. All impacted businesses will be compensated for search, moving, and reestablishment expenses or will be given an in-lieu of payment if they prefer.

West Two Build CBA: The West Two CBA would not require the relocation of businesses but would access only two of the three activity centers. The West Two CBA does not pass through the main urban areas in Manassas or Manassas Park. The Manassas National Battlefield Park, the Conway Robinson Memorial State Forest, and Sudley Park are accessible with this alternative.

West Four Build CBA: The West Four CBA would not require the relocation of businesses. The CBA traverses the South Riding community, giving the area improved access to activity centers, but does not traverse the cities on the southern portion of the study area. The Manassas National Battlefield Park, the Conway Robinson Memorial State Forest, and Sudley Park are accessible with under this CBA.

Comprehensive Plan CBA: This CBA would relocate three businesses. At the time of this report, the nature of the business requiring relocation were not identified. This alternative, like the West Two CBA, links South Riding and the Dulles Corridor. It also provides access to several parks, including Bull Run Regional Park. This CBA would also provide access to the greatest amount of activity centers in the study corridor. Because the alternative runs through portions of the City of Manassas and Manassas Park, access to their urban centers is greatly improved.

TABLE 4.6-5
SUMMARY OF ECONOMIC OPPORTUNITY AREAS

CBA	Growth Areas	Tourist Attractions	Number of Businesses Relocated	Annual Lost Tax Revenue	Source of Lost Tax Revenue
West Two	Office parks along VA 234-Business	Manassas Battlefield, Conway Robinson Memorial State Forest, Sudley Park	0	$210,206[1]	Agricultural
West Four	South Riding	Manassas Battlefield, Sudley Park	0	$194,641[2]	Agricultural
Comprehensive Plan	South Riding	Manassas Battlefield, Bull Run Regional Park, Ben Lomond Regional Park	3	$399,509	Agricultural, Commercial

Source: Virginia Department of Transportation, Parsons Brinckerhoff

Notes: [1] Loss of tax revenue attributed to the fact that this alternative would access only two of three business activity centers within the study area.
[2] Loss of tax revenue attributed to the fact that this alternative would not traverse business activity centers associated with the cities on the southern portion of the study area

4.6.3.3 Potential Mitigation

No mitigation is proposed for the No-Build Alternative. For the Build Alternative, VDOT's right-of-way acquisition and relocation program will be conducted in accordance with the Federal Uniform Relocation Assistance and real Property Acquisition Act of 1970, as amended and with the STURRA. Relocation resources will be available without discrimination.

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4.7 HAZARDOUS MATERIALS

4.7.1 Identified Hazardous Materials Sites

Based on the database search and cursory field reconnaissance described in the Hazardous Materials Technical Report (VDOT, 2004), potential hazardous materials sites were identified within the 600-foot-wide assessment corridor for the proposed CBAs. Figures identifying these sites were previously presented in Section 3.7.2 of this EIS. A complete list of potential hazardous materials sites that are located in the study area is included in the Hazardous Materials Technical Report. A list of sites that have potential impact to the CBAs is also included in the Technical Report. In addition to identified sites associated with the built environment, certain areas within the study area are underlain with rock formations comprised, in part, of asbestos-containing minerals; consequently, some soil types in the study area contain naturally occurring asbestos.

4.7.1.1 No-Build Alternative

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, environmental consequences regarding hazardous materials cannot be assessed given the limited level of plan development at this point in time. Evaluation of the potential effects of hazardous materials sites may be required if any programmed improvements associated with the No-Build Alternative involves property acquisition or new sub-grade construction.

4.7.1.2 Build Alternatives

Database search results and field reconnaissance identified hazardous materials sites that could potentially affect the design and construction of a CBA. Because certain segments are shared between CBAs, each CBA was evaluated by segment with regard to number, type, and location of hazardous materials sites. Because much of the property included within the CBA assessment corridors is located in mostly undeveloped areas, there are few hazardous materials sites of concern within the 600-foot-wide corridor. The one exception is Segment E of the Comprehensive Plan CBA, which is located within a commercially developed area of the study area.

4.7.1.2.1 Identified Sites Associated with the Built Environment

Table 4.7-1 lists the number of occurrences of potential hazardous materials sites identified within the 600-foot-wide assessment corridor and “near” (within approximately 0.5 miles) each CBA corridor. Hazardous materials sites identified within the 600-foot-wide assessment corridor were considered to be within the segment boundary and could possibly affect design and construction depending on the nature and location of the site. Sites near a CBA, but not within the boundaries of the assessment corridor, could result in potential contamination of the study area, depending on the site characteristics (i.e., nature of the release, direction of groundwater flow, and topography). A number of these sites are located along the southern portion of Segment E of the Comprehensive Plan CBA in an area of industrial and commercial activity.

Depending on the CBA selected and the specific placement of construction limits (to be determined during later phases of design), the Build Alternative could potentially be affected by the presence of hazardous materials. Maps delineating the CBAs and the hazardous material sites of concern (sites located near and within the 600-foot-wide assessment corridor) are shown in Figure 4.7-1 through Figure 4.7-3. A total of 118 database occurrences were identified within and near CBA assessment corridor boundaries. These occurrences include sites plotted from the database research results along with field-located sites. Of the 118 occurrences, six occurrences are reported to occur within the 600-foot-wide assessment corridor of a particular CBA. The remaining occurrences are reported to occur within approximately one-half mile (0.8 kilometer) of a 600-foot-wide assessment corridor. A list of hazardous materials occurrences within approximately 0.5 miles of CBA assessment corridors is provided in Appendix 2 of the Hazardous Materials Technical Report (VDOT, 2004).

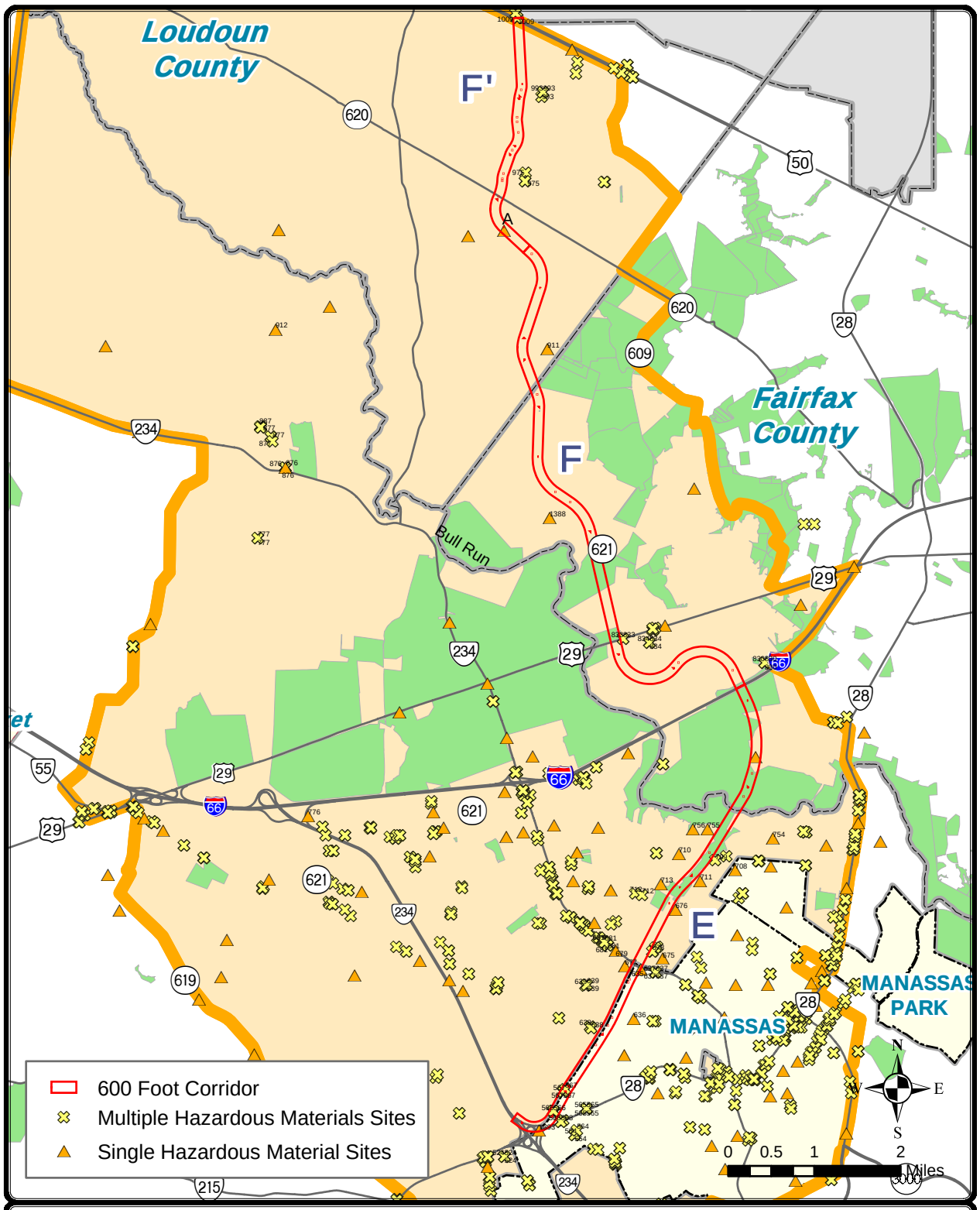

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FIGURE 4.7-1
HAZARDOUS MATERIALS SITES
COMPREHENSIVE PLAN CBA

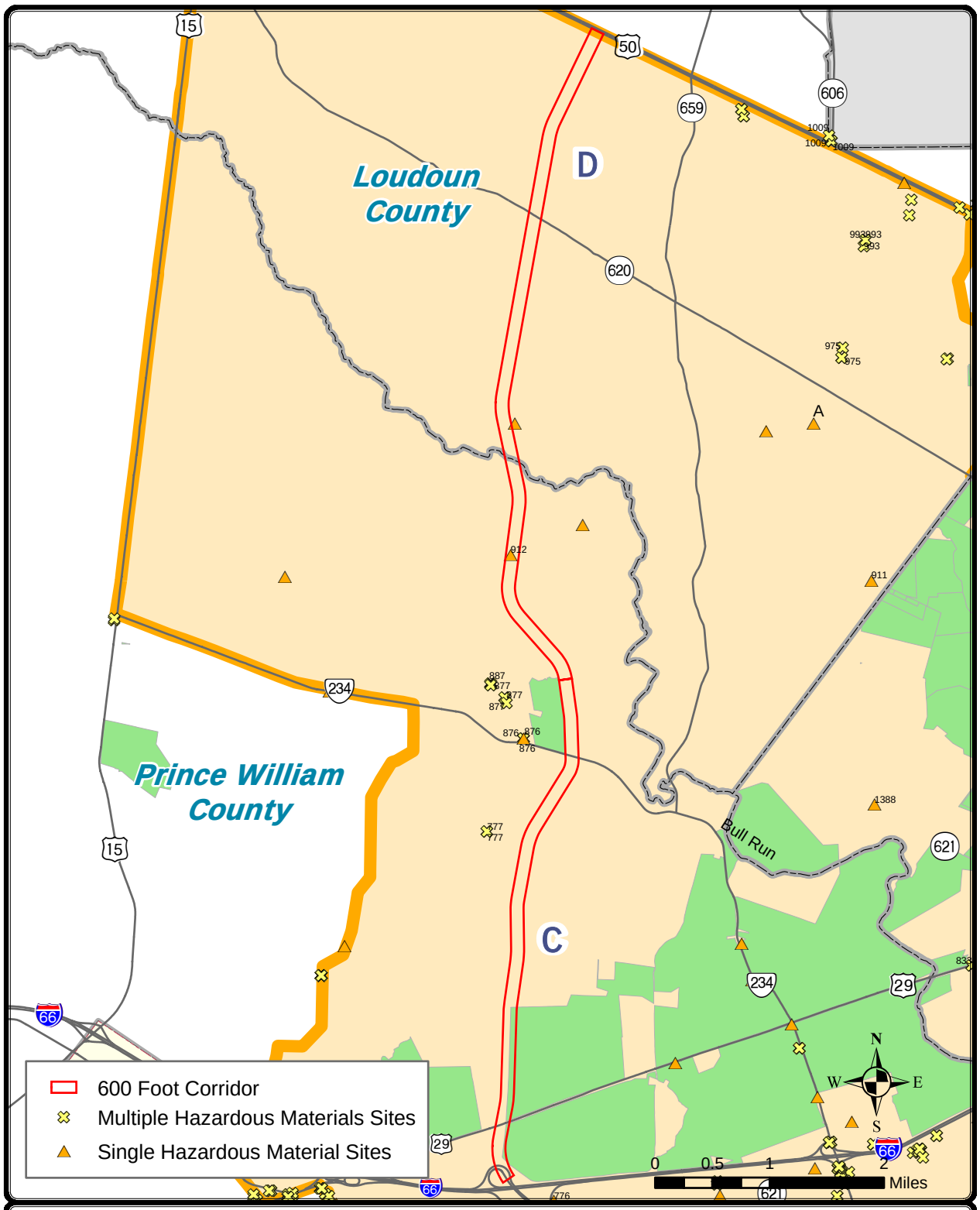

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FIGURE 4.7-2
HAZARDOUS MATERIALS SITES
WEST TWO CBA

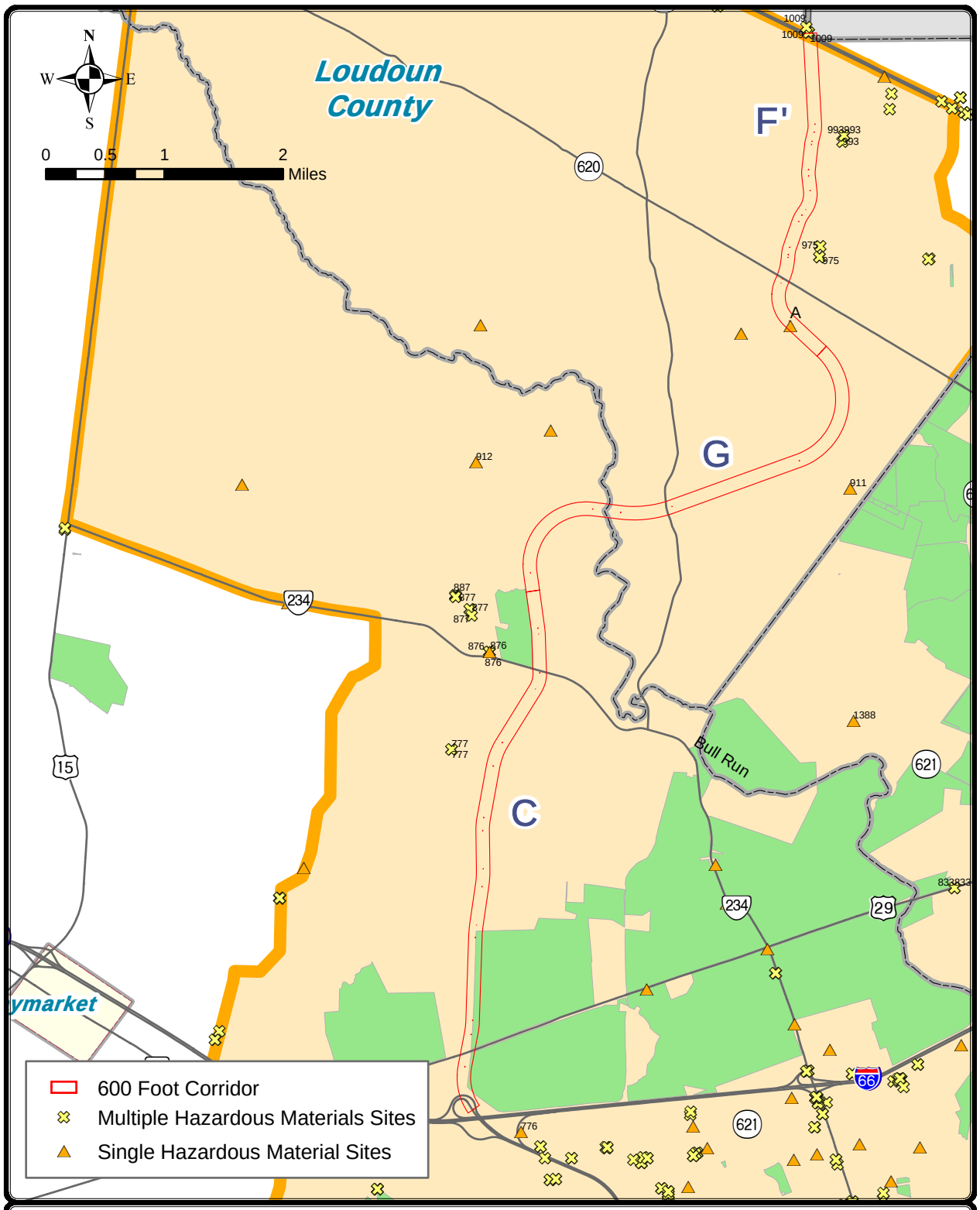

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FIGURE4.7-3
HAZARDOUS MATERIALS SITES
WEST FOUR CBA

TABLE 4.7-1
NUMBER OF HAZARDOUS MATERIALS OCCURRENCES IDENTIFIED FOR EACH CBA

Alternative	Total Number of Occurrences[1]	Total Occurrences of Sites Within 600-foot Corridor	Total Occurrences of Sites Near[2] 600-foot Corridor
West Two CBA	20	1	19
West Four CBA	30	1	29
Comprehensive Plan CBA	96	5	91

[1] Includes occurrences within 600-foot-wide corridor and within approximately 0.5 miles of corridor
[2] Within approximately 0.5 miles of CBA corridor

The number of identified sites (i.e., those potentially associated with hazardous materials occurrences) identified by the environmental search report and field observations are summarized by segment in Table 4.7-2. The types of occurrences identified within and near segment boundaries are summarized by segment in Table 4.7-3 and Table 4.7-4. A list of hazardous materials occurrences identifying those sites of most interest or concern to design and construction within a CBA is included as Appendix 2 of the Technical Report. These sites are located within the 600-foot-wide assessment corridor and within approximately 200 feet of the corridor boundary.

TABLE 4.7-2
NUMBER OF HAZARDOUS MATERIAL OCCURRENCES
IDENTIFIED BY SEGMENT WITHIN 600-FOOT CORRIDORS

Segment	CBA(s) Containing this Segment	Total Number of Occurrences	Total Occurrences of Sites Within 600-foot Assessment Corridor	Total Occurrences of Sites within 0.5 mile of a 600-foot Assessment Corridor
Segment C	West Two / West Four	17	0	17
Segment D	West Two	3	1	2
Segment E	Comprehensive Plan	76	4	72
Segment F	Comprehensive Plan	9	0	9
Segment F'	Comprehensive Plan / West Four	11	1	10
Segment G	West Four	2	0	2

TABLE 4.7-3
NUMBER AND TYPES OF HAZARDOUS MATERIALS OCCURRENCES
IDENTIFIED FOR EACH SEGMENT NEAR[1] 600-FOOT CORRIDOR

Segment	CBA(s) Containing this Segment	LUST	UST	SPILL	GNRTR	ERNS	COR-RACT	CERCLIS	AST	SWLF	Other[2]
Segment C	West Two/West Four	15	1	1	0	0	0	0	0	0	0
Segment D	West Two	0	0	2	0	0	0	0	0	0	0
Segment E	Comprehensive Plan	17	13	22	8	3	2	1	5	1	0
Segment F	Comprehensive Plan	4	3	1	0	0	0	0	1	0	0
Segment F'	Comprehensive Plan / West Four	7	2	1	1	0	0	0	0	0	0
Segment G	West Four	0	0	1	0	0	0	0	0	0	0

[1] Within approximately 0.5 miles of segment boundary
[2] Sites identified from field reconnaissance
LUST = Leaking Underground Storage Tank
UST = Underground Storage Tank – registered
SPILL = Pollution Complaint Database
GNRTR = EPA RCRA Large Quantity Generator or Small Quantity Generator
ERNS = Emergency Response Notification System
CORRACT = RCRA Corrective Actions
CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Information System
AST = Aboveground Storage Tank – registered
SWLF = Solid Waste Landfills
Other = potential hazardous materials sites identified from field reconnaissance

TABLE 4.7-4
NUMBER AND TYPE OF HAZARDOUS MATERIALS OCCURRENCES IDENTIFIED BY SEGMENT WITHIN 600-FOOT CORRIDOR

Segment	CBA(s) Containing this Segment	LUST	UST	SPILL	GNRTR	ERNS	COR-RACT	CERCLIS	AST	SWLF	Other[2]
Segment C	West Two / West Four	0	0	0	0	0	0	0	0	0	0
Segment D	West Two	1	0	0	0	0	0	0	0	0	0
Segment E	Comprehensive Plan	1	1	1	0	0	0	0	0	0	1
Segment F	Comprehensive Plan	0	0	0	0	0	0	0	0	0	0
Segment F'	Comprehensive Plan / West Four	0	0	0	0	0	0	0	0	0	1
Segment G	West Four	0	0	0	0	0	0	0	0	0	0

* Sites identified from field reconnaissance

***Comprehensive Plan CBA*:** The Comprehensive Plan CBA consists of Segments F', F, and E. For Segment E (Figure 4.7-4), 76 hazardous materials occurrences were identified within or near the 600-foot-wide assessment corridor. Four of the occurrences are located within the corridor. The occurrences consist of one each: LUST, UST, SPILL, and an open undocumented dumpsite identified from field observation. The LUST site is a closed site. The UST site is a registered multiple tank gas station site. The SPILL site is reported as a vehicle hydraulic spill. The open dumpsite appears to be a household dumpsite, although several 55-gallon drums are present. For Segment F (Figure 4.7-5), nine hazardous materials occurrences were identified near the 600-foot-wide assessment corridor. No occurrences were identified within the corridor._ For Segment F' (Figure 4.7-6), 12 hazardous materials occurrences were identified within or near the 600-foot-wide assessment corridor. One occurrence was identified from field observation within the corridor that consisted of a site on which abandoned cars, trucks, and other machinery are stored.

***West Two CBA**:* The West Two CBA consists of Segments D and C. For Segment C (Figure 4.7-7), 14 hazardous materials occurrences were identified near the 600-foot-wide assessment corridor. No occurrences were identified within the corridor. For Segment D (Figure 4.7-8), 3 hazardous materials occurrences were identified near the 600-foot-wide assessment corridor. One occurrence, a closed LUST site, was identified within the corridor.

***West Four CBA**:* The West Four CBA consists of Segments F', G, and C. For Segment C (Figure 4.7-7), 14 hazardous materials occurrences were identified near the 600-foot-wide assessment corridor. No occurrences were identified within the corridor. For Segment G (Figure 4.7-9), one hazardous materials occurrence was identified near the 600-foot-wide assessment corridor. No occurrences were identified within the corridor. For Segment F' (Figure 4.7-6), 12 hazardous materials occurrences were identified within or near the 600-foot-wide assessment corridor. One occurrence within the corridor (identified from field observation) consists of a site on which abandoned cars, trucks, and other machinery are stored.

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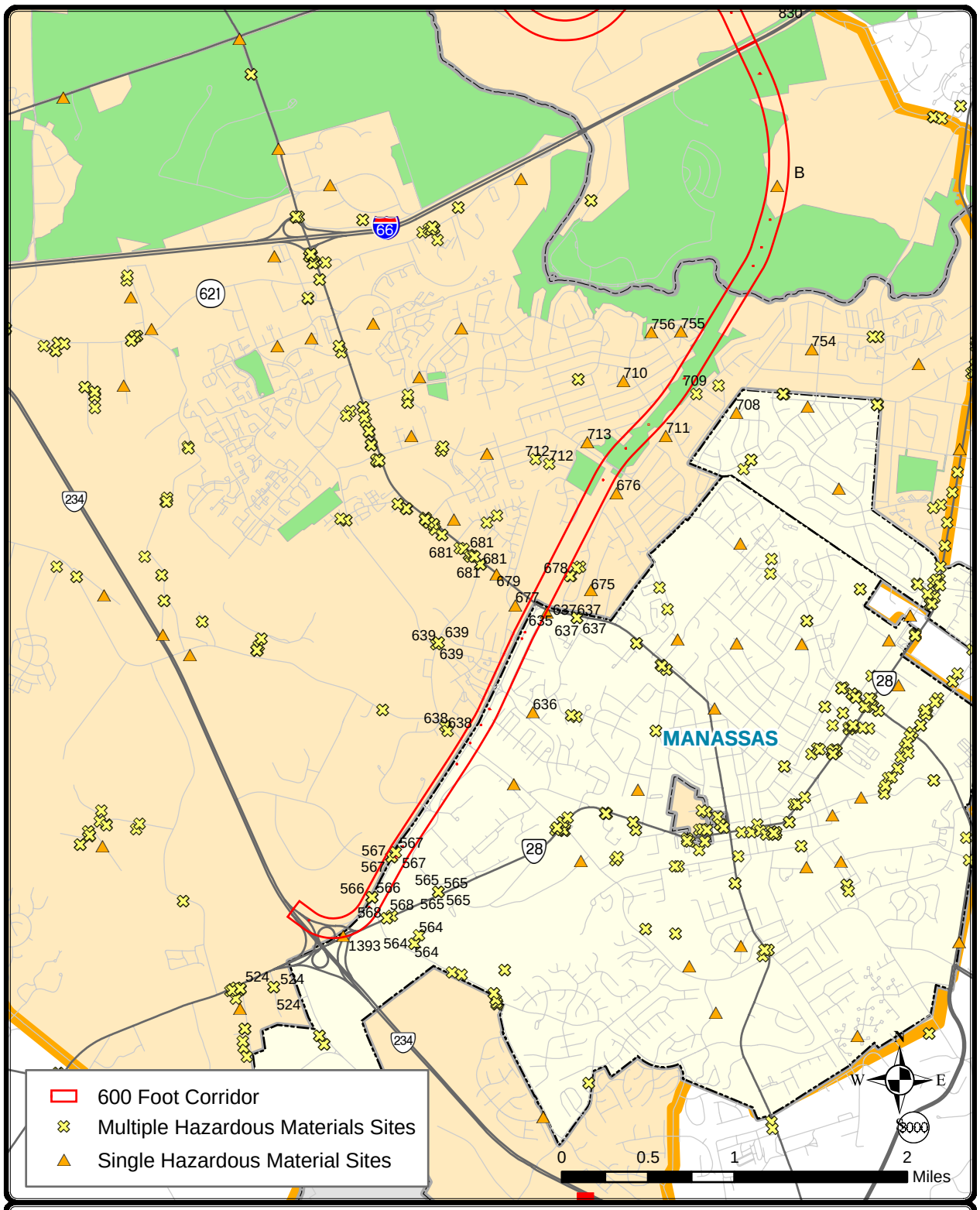

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FIGURE 4.7-4
HAZARDOUS MATERIALS SITES
SEGMENT E

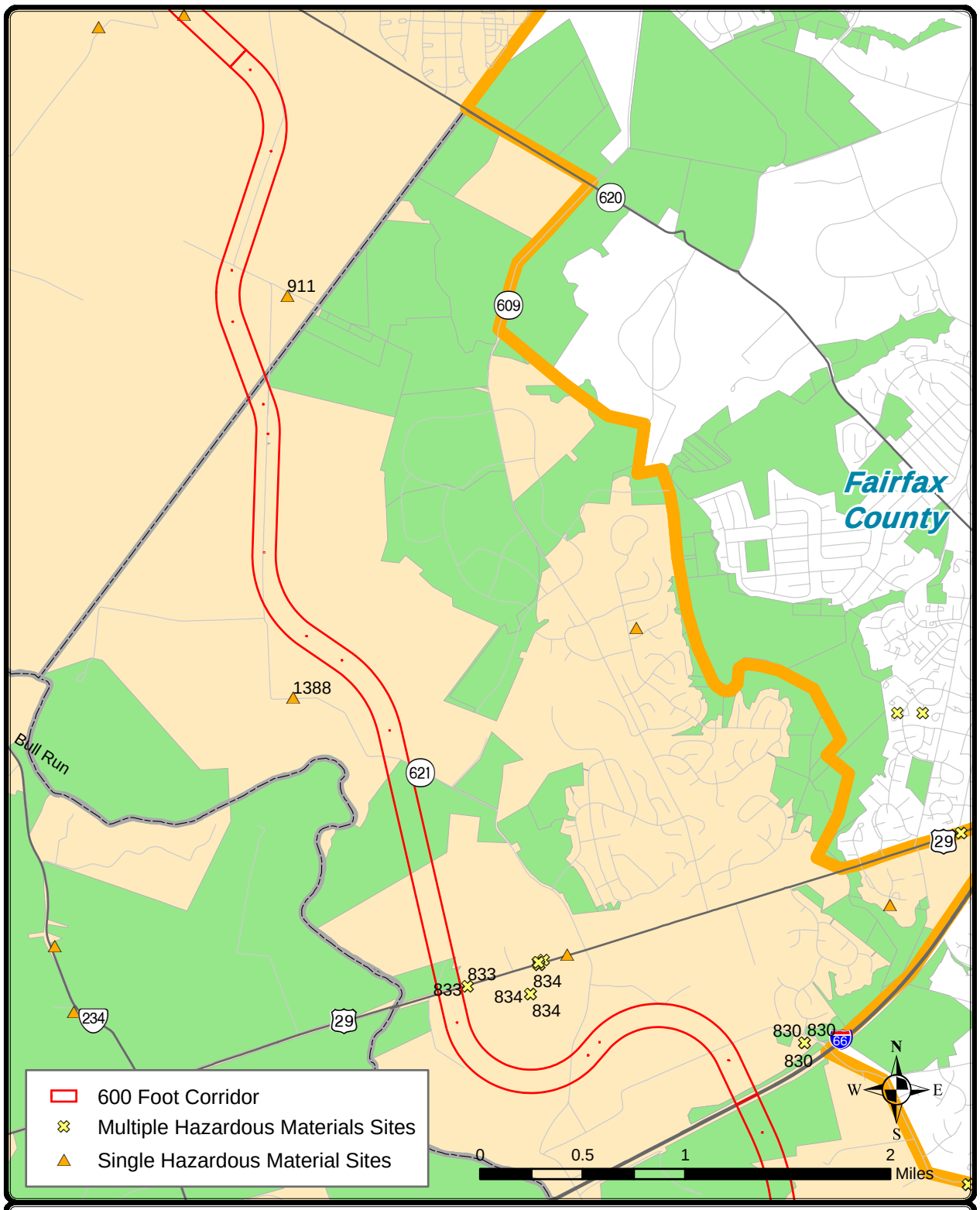

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FIGURE 4.7-5
HAZARDOUS MATERIALS SITES
SEGMENT F

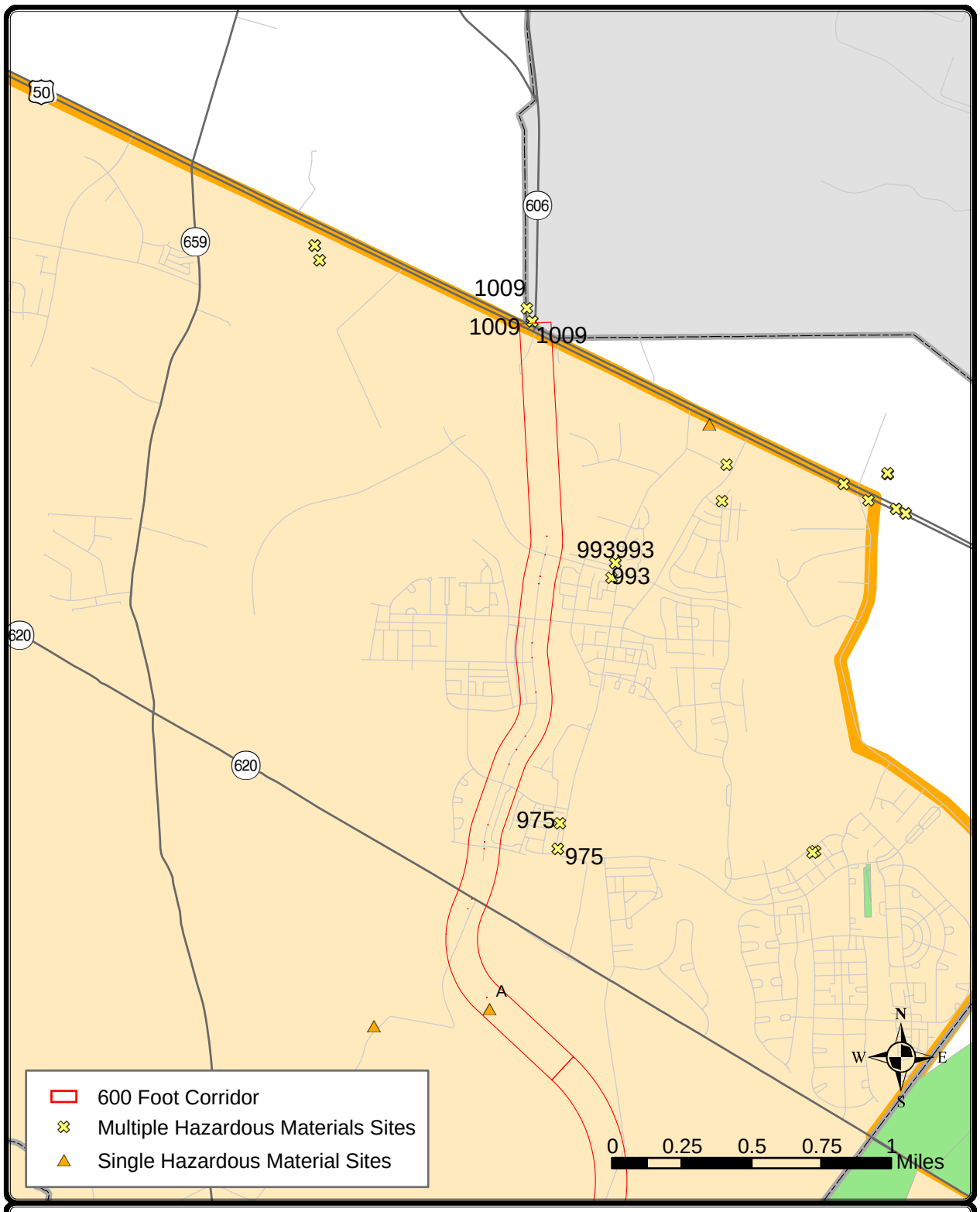

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FIGURE 4.7-6
HAZARDOUS MATERIALS SITES
SEGMENT F'

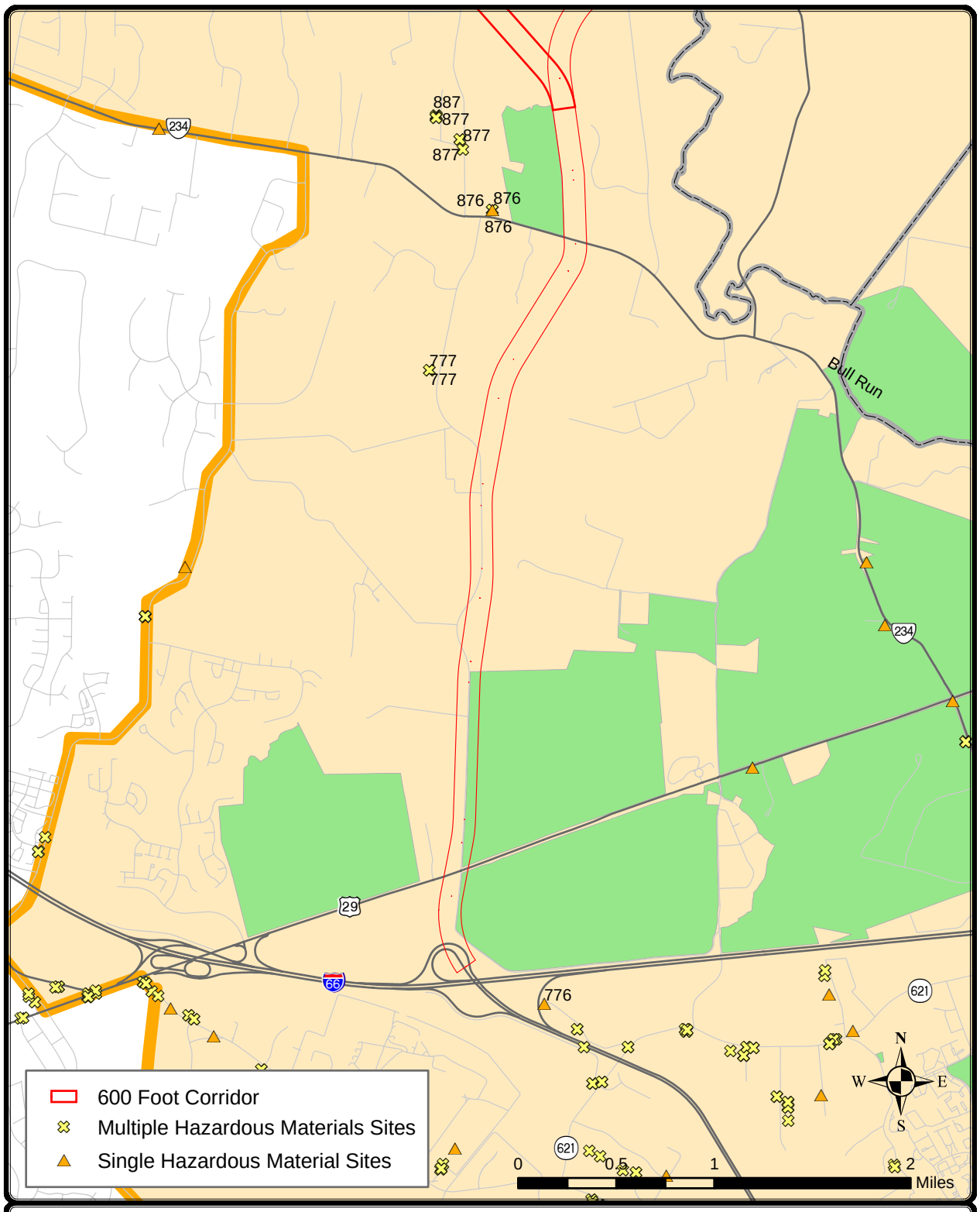

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FIGURE 4.7-7
HAZARDOUS MATERIALS SITES
SEGMENT C

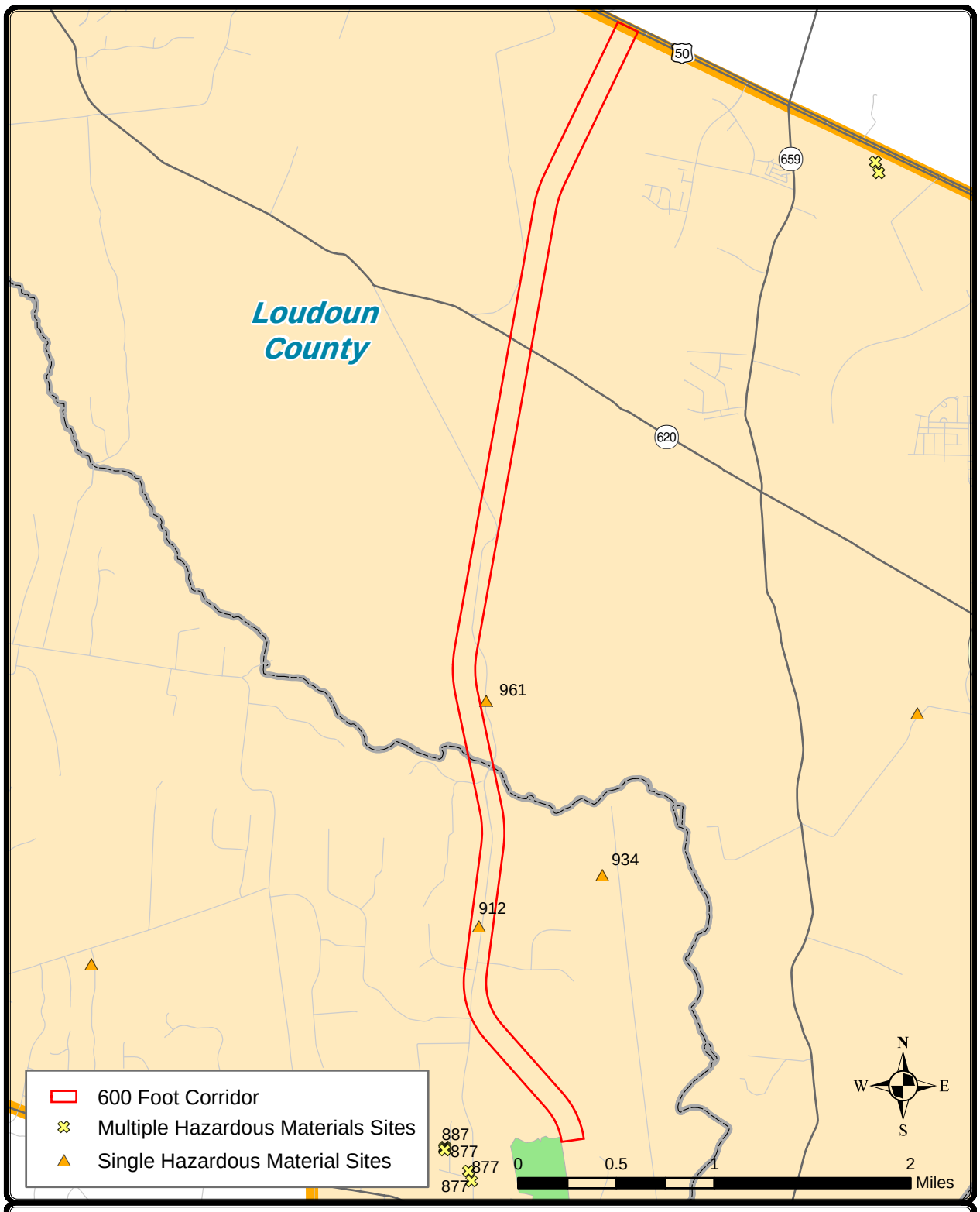

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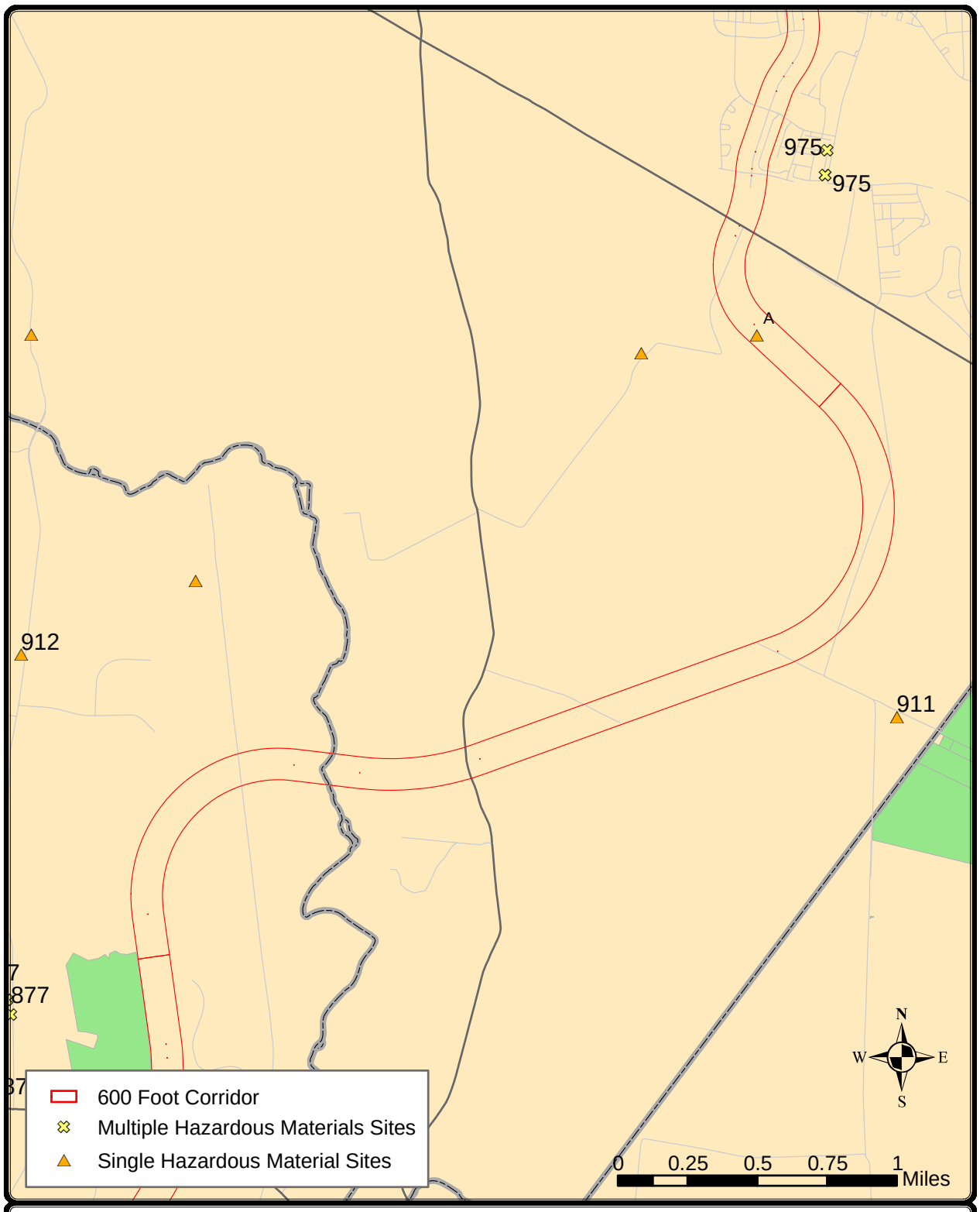
FIGURE 4.7-8
HAZARDOUS MATERIALS SITES
SEGMENT D



Tri-County PARKWAY Location Study

FIGURE 4.7-9
HAZARDOUS MATERIALS SITES
SEGMENT G

4.7.1.2.2 Identified Sites Associated with the Natural Environment

The geologic map of the study area (see Natural Resources Technical Report (VDOT, 2004)) provides an overview of bedrock conditions. The areas most likely to contain naturally occurring asbestos are areas underlain by diabase bedrock; therefore, the areas most likely to have naturally occurring asbestos are located along the southern half of Segment C of the West Four CBA, the northern part of Segment D of the West Two CBA, and much of Segment F' of the Comprehensive Plan and West Four CBAs. If a Build Alternative is selected, VDOT will coordinate with VDEQ to determine the need for further evaluation of bedrock and soil containing asbestos.

4.7.2 Mitigation

4.7.2.1 Identified Sites Associated with the Built Environment

Depending on which alternative is selected, additional evaluation of identified hazardous materials sites may be required. These additional evaluations would be utilized to develop mitigation measures that can be incorporated into the design and construction phases of the project to ensure that there would be no significant impact from hazardous materials. If a known or potential hazardous material site may effect a build alternative segment, information about the site, environmental impacts, and public health concerns of the affected alternative(s) and the proposed mitigation measures to eliminate or minimize impacts or public health concerns would be addressed. Although all hazardous materials sites provide a possible source of contamination, the adverse affects that a site might have on the alternatives being evaluated would be dependent upon a number of different variables, including:

- type of hazardous material,
- site location,
- surface water and groundwater depth and flow direction relative to site,
- has a spill occurred,
- status of the spill,
- has spill been conveyed to adjacent properties,
- location of the preferred alternative relative to the site, and
- the proposed construction activities within the area of the site.

Much of the property included within the 600-foot-wide assessment corridor of a CBA is undeveloped or sparsely developed and, therefore, it is unlikely issues associated with hazardous materials would present a significant consequence for construction. VDOT's Road and Bridge Specifications also includes provisions for handling some hazardous materials, such as asbestos, lead-based paint, petroleum contamination, and USTs that are encountered during construction.

Two sites of particular concern were observed during a windshield survey field reconnaissance. Within Segment E of the Comprehensive Plan CBA, a site less than an acre in size was apparently used as a private open dumping area (undocumented) for household and other debris. Another site located within Segment F' of the West Four CBA and Comprehensive Plan CBA is an open storage area several acres in size on which discarded vehicles, machinery, and other new and used construction materials are stored. Although additional evaluation may be warranted at the storage/dump sites, it may be possible to avoid these sites during future design phases; however, some sites may require some form of mitigation. Other documented hazardous materials sites, although considered closed or requiring no further regulatory action (i.e., SPILL and LUST sites located within the 600-foot-wide assessment corridor) may need additional construction procedures (e.g., construction specification for encountering and managing potentially impacted soil) should construction activities disturb these sites.

Table 4.7-5 describes the potential hazardous materials sites identified within CBA corridors that are recommended for additional evaluation if they cannot be avoided during the future design phases. Subsurface exploration or site-specific analysis may be required to assess the extent of any potential contamination and to evaluate public health or environmental concerns. Other site-specific analysis may become necessary as a result of migration from sites located nearby a selected corridor boundary.

The selection of mitigation measures for specific sites would consider avoidance, minimizing impacts through redesign or alignment shift, and remediation/closure. Any site remediation/closure would be performed in

accordance with applicable state and federal laws. Performance of such measures would occur prior to, or during, the course of construction, depending on site conditions.

TABLE 4.7-5
POTENTIAL HAZARDOUS MATERIALS SITES RECOMMENDED FOR FURTHER EVALUATION

CBA	Segment	Hazardous Materials Site #	Description	Mitigation
Comprehensive Plan	Segment E	From field observation Site # B	Private open dump/storage area containing several empty 55-gallon drums, household appliances, glass, cans, and other household trash. Approximately area: 1,000 to 3,000 sq. ft.	Conduct site specific investigation - avoid or remediate
West Four and Comprehensive Plan	Segment F'	From field observation Site # A	Storage area for old building materials/supplies, farm equipment, and 5 to 10 abandoned vehicles. Approximate area: several acres.	Conduct site specific investigation - avoid or remediate

4.7.2.2 Identified Sites Associated with the Natural Environment (Geologic Hazards)

Construction disturbance of soils and rock units in some parts of the study area could generate airborne material including asbestos (posing potential human health risks). If a CBA or another alternative with a construction component is selected, construction activities in areas with rock likely to contain naturally occurring asbestos may require the preparation of a compliance plan for the local authority (e.g., Fairfax County Health Department). A compliance plan of this type would address standard operating procedures, dust control, air monitoring, asbestos soils disposal issues, and possibly capping exposed areas of rock/soil containing asbestos. Because plans would be implemented in accordance with the local health department to contain and control fugitive asbestos containing materials, the presence of asbestos-containing soil and rocks should not have a major effect on any build alternative.

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4.8 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The impacts of the project to historic and archaeological resources eligible for or potentially eligible for the NRHP are being assessed in accordance with the requirements of Section 106 of the NHPA. According to 36 CFR Part 800.5(a)(1), an adverse effect occurs when an undertaking "may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

4.8.1 Architectural Resources

Five architectural resources of present or recommended eligibility are located within the APE and are being evaluated for Section 106 effects. These include one battlefield, an airport, a church, and two domestic buildings or farmsteads. TABLE 4.8-1 lists each resource by CBA and segment, and each resource is shown in FIGURE 4.8-1.

TABLE 4.8-1
ELIGIBLE RESOURCES BY SEGMENT AND OPTION

Resource Name	DHR #	CBA/Segment	Potential Impacts
Dulles International Airport Historic District	053-0008	Comprehensive Plan & West Four CBAs / F'	No Effect
Gallagher Farm	053-6040	Comprehensive Plan & West Four CBAs / F'	No Adverse Effect
Putnam-Patton House/Deseret	076-0179	West Two CBA / D	Adverse Effect
Manassas National Battlefield and Historic District	076-0271	All CBAs / C, F	Adverse Effect
Cub Run Primitive Baptist Church	029-5321	Comprehensive Plan / F	No Effect

Detailed engineering analyses are on-going to determine if a project segment could be constructed to avoid a direct use of property or an adverse effect. As a result, properties identified to date as being eligible for listing or recommended for listing could be avoided under the various build scenarios. At present, only functional design has been completed on each of the CBAs. Because VDOT's design considerations are on-going, potential effects to each resource are preliminary based on professional judgment. A final Determination of Effect for the project will be made and coordinated with the SHPO once more-detailed design has been completed that allows for better assessment of impacts. The No-Build Alternative, if selected, will not affect any significant architectural resources.

4.8.2 Resources Associated With Candidate Build Alternatives

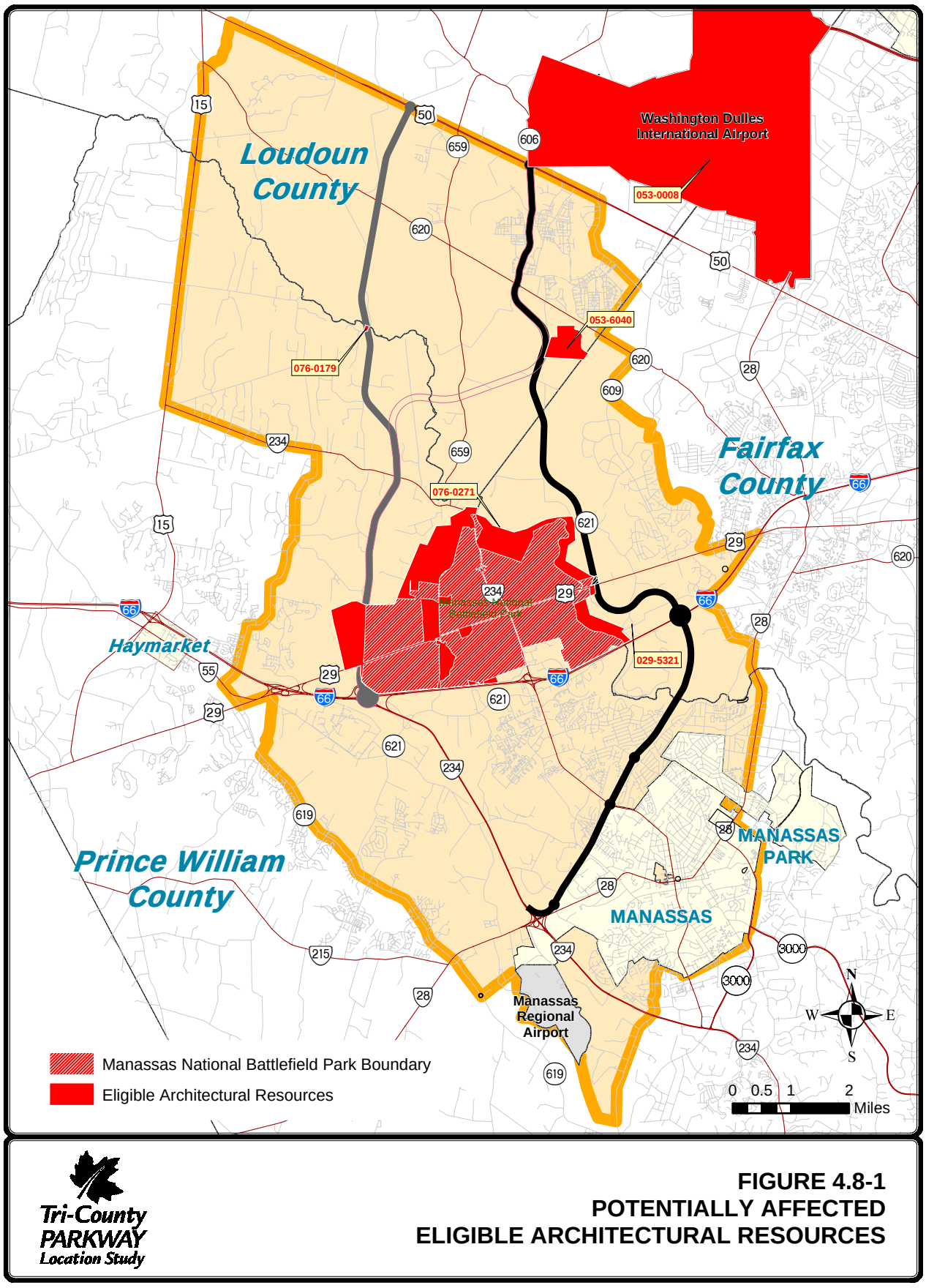
The architectural resources associated with the CBAs were examined for potential visual impacts and impacts that might compromise their setting.

Dulles International Airport Historic District (053-0008). There will be no direct effect upon the historic district, and the southern boundary of the district is dominated by heavily traveled US 50. It is not anticipated that the CBAs will introduce any visual impacts to this already compromised setting.

Gallagher Farm (053-6040). This mid-eighteenth century farmstead is vacant, and the vegetation is overgrown. While the National Register-boundary is adjacent to the CBAs, it appears that visual impacts can be avoided by appropriate landscape screening methods, and a no adverse effect on the resource achieved.

Putnam-Patton House (076-0179). This resource will be directly impacted by the West Two CBA alignment as currently proposed. However, there appears to be a prudent and feasible avoidance alternative that will shift the alignment off of the property approximately 800 feet to the west (see Section 4(f) Evaluation), thereby, avoiding an adverse effect.

Manassas Battlefield Historic District (component of 076-0271). This resource will be directly impacted by all CBAs resulting in an adverse effect. Design alternatives have been considered that would avoid direct impacts to this resource, but none of them appear prudent and feasible (see the Section 4(f) Evaluation); therefore, any consideration of visual impacts are secondary to the direct impacts that the CBAs



Tri-County PARKWAY Location Study

FIGURE 4.8-1
POTENTIALLY AFFECTED
ELIGIBLE ARCHITECTURAL RESOURCES

would have on the historic district. All adverse effects will be addressed through consultation with the SHPO and any consulting parties that are identified.

Manassas National Battlefield Park (component of 076-0271). As originally proposed, the Comprehensive Plan CBA would impact Manassas National Battlefield Park resulting in an adverse effect; however, it appears that there is a prudent and feasible avoidance alternative that shifts the Comprehensive Plan CBA alignment to the east side of the quarry operation located north and south of U.S. Route 29 (see Section 4(f) Evaluation). At its closest point, the avoidance alternative would be approximately 1,400 feet from the boundary of the Manassas National Battlefield Park resulting in a no effect or no adverse effect on the resource. On the west side of Manassas National Battlefield Park, the West 2 and West 4 CBA alignments would run along Pageland Lane, which is located immediately adjacent to the park. While the West 2 and West 4 CBAs avoid a direct use of the Manassas National Battlefield Park, introducing the Tri-County Parkway into the setting would likely result in an adverse effect on the Park. All adverse effects will be addressed through consultation with the SHPO and any consulting parties that are identified.

Cub Run Primitive Baptist Church (029-5321). This resource is located approximately 1,000 feet west of the Comprehensive Plan CBA, and is currently screened by a wooded area. There should be no effect on this resource.

4.8.3 Archaeological Resources

The review of the archaeological sites previously recorded in the study area provides an idea of the types and quantities of sites likely to be identified during any future archaeological survey. Sites of all prehistoric periods have been found in the study area; however, the agricultural practices and land clearing of the early European settlers, as well as the erosion of soils in much of the area, have more than likely disturbed and, in some cases, destroyed, many of these early sites. Types of Native American sites identified in the study area include lithic concentrations and scatters, campsites, and quarries. Some Woodland period components may represent seasonal encampments or villages. Although European settlement in the region began as early as the 1650s, the first substantial growth in population did not occur until the eighteenth century. Because of the early settlement of the area, it is likely that early historic sites existed in the current study area; however, many of these sites may have been destroyed by land development and by the practices of the continuing agricultural and forest industries. A wide variety of historic sites have been previously identified in the project area including artifact scatters, domestic sites, farmsteads, plantation buildings, schools, marked and unmarked cemeteries, roads, a mill, a possible mine or quarry, and sites associated with the Civil War (rifle pits, lunettes, cemeteries, encampments, railroad grades, fortifications, and house sites). Other specific sites types, such as African-American schools and cemeteries, have also been recorded. The archaeological sites that have been previously recorded are not evenly distributed throughout the project area. Prince William County contains approximately 60 percent of the sites within the study area. This is not surprising, however, since the county comprises the largest portion of the study area, has had more extensive development leading to archaeological work, and includes numerous sites that have been recorded within the Manassas Battlefield Historic District. The proportion of sites in the smaller Fairfax County portion of the study area (30 percent) reflects similar trends and appears significantly high when compared to the roughly 10 percent of sites within the study area in Loudoun County. The areas covered within the Fairfax and Loudoun county areas are roughly similar, but the less-developed character of the Loudoun County section appears to have contributed to the identification of relatively fewer sites. A limited number of archaeological sites have been previously recorded within the proposed corridor options (TABLE 4.8-2). Segment C contains seven sites; Segment D contains four; Segment E contains 13 sites; and Segment F contains ten sites. No previously recorded archaeological sites occur along Segment G.

TABLE 4.8-2
PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES

Site Number	CBA/Segment	Comments
44PW80	West Two and West Four CBAs /C	H - 18th to 19th c., associated with Monroe House , #076-0147, ELIGIBLE
44PW579	West Two and West Four CBAs /C	Dunklin Monument, ELIGIBLE
44PW580	West Two and West Four CBAs /C	H - 19th c. Unfinished Railroad, ELIGIBLE

Site Number	CBA/Segment	Comments
44PW593	West Two and West Four CBAs /C	H - Civil War Burials
44PW594	West Two and West Four CBAs /C	H - Early 20th c. Army Latrine
44PW623	West Two and West Four CBAs /C	H - Unknown Cemetery
44PW968	West Two and West Four CBAs /C	H - Early to Late 20th c.
44LD459	West Two CBA / D	NA/H - Early Archaic, Late Archaic, Early, Middle, and Late Woodland/Unknown, ELIGIBLE
44LD724	West Two CBA / D	H-Late 19thc to Early 20th c. NA/H-Late Archaic to Early Woodland/18th c.
44PW525	West Two CBA / D	NA/H - Late Archaic to Early Woodland/18th c
44PW541	West Two CBA / D	NA - Unknown
44FX1228	Comprehensive Plan CBA / E	H - Civil War Camp
44FX1512	Comprehensive Plan CBA / E	NA - Unknown
44FX1513	Comprehensive Plan CBA / E	NA - Unknown
44FX1520	Comprehensive Plan CBA / E	NA - Unknown
44FX1521	Comprehensive Plan CBA / E	NA - Unknown
44FX1522	Comprehensive Plan CBA / E	NA - Unknown
44FX1523	Comprehensive Plan CBA / E	NA - Unknown
44FX1524	Comprehensive Plan CBA / E	NA - Unknown
44FX1525	Comprehensive Plan CBA / E	NA - Unknown
44FX1526	Comprehensive Plan CBA / E	NA - Unknown
44FX1527	Comprehensive Plan CBA / E	NA - Unknown
44FX1543	Comprehensive Plan CBA / E	H - Civil War Camp
44FX1544	Comprehensive Plan CBA / E	NA - Middle Archaic
44LD363	Comprehensive Plan CBA / F	NA/H - Unknown/Late 18th c.
44LD401	Comprehensive Plan CBA / F	NA - Unknown
44LD402	Comprehensive Plan CBA / F	NA - Unknown
44LD403	Comprehensive Plan CBA / F	NA - Unknown
44LD404	Comprehensive Plan CBA / F	NA - Unknown
44LD534	Comprehensive Plan CBA / F	NA - Unknown
44LD564	Comprehensive Plan CBA / F	H - Late 18th to 19th c.
44FX1229	Comprehensive Plan CBA / F	H - 1875 to 1975 Cub Run Memorial Cemetery
44FX1230	Comprehensive Plan CBA / F	H - 1875 to 1975 Robinson Cemetery
44FX1371	Comprehensive Plan CBA / F	H - Compton Road Cemetery

In accordance with 36 CFR Part 800.4(b)(2) and by agreement executed between VDOT and the VDHR for large-scale projects involving multiple alternatives, an archaeological identification survey will only be conducted on the selected alternative if that alternative is a build alternative.

4.8.4 Resolution of Potential Adverse Effects

The Section 106 process requires the FHWA to notify the Advisory Council on Historic Preservation (ACHP) if a project will adversely affect a historic property, so they can determine the need to be involved in consultation. If the selected concept adversely affects historic properties, a Memorandum of Agreement (MOA) must be executed which documents how the adverse effect will be taken into account. It the ACHP chooses not to participate in consultation, the Section 106 process is considered complete when an MOA has been executed between the FHWA and the SHPO and is filed with the ACHP. If the selected concept results in a no adverse effect on historic resources, the Section 106 process is considered complete when the FHWA and the SHPO concur on the no adverse effect determination.

4.9 AIR QUALITY

A microscale air quality analysis was conducted to determine the potential effects of the CBAs on local air quality. The "worst-case" project level carbon monoxide (CO) concentrations were determined for the existing (2005), interim (2011), and design (2030) years. These CO concentrations were then compared to the National Ambient Air Quality Standards (NAAQS). The maximum one-hour and eight-hour CO levels predicted were below NAAQS maximum levels, thus, the proposed Tri-County Parkway would not cause a violation of the NAAQS. The project conforms to the State Implementation Plan (SIP) and the goals set forth in the Clean Air Act Amendments (CAAA) and the Final Conformity Rule.

4.9.1 Methodology

Microscale air quality modeling was performed using VDOT's VACALN6A program. Emission factors within VACALN6A are based on the EPA mobile source emission factor model (MOBILE 6.2). Dispersion parameters within the program are based on EPA's CALINE3 air quality dispersion model. Following the guidelines set forth in VDOT's Project Air Quality Analysis Consultants Guide, Revision 11, CO levels in the study area were estimated along each segment for each CBA. Sites were selected on the basis of existing and estimated future traffic conditions and their location relative to the alignment where the highest CO concentrations could be expected and where the general public would have access during the analysis periods (i.e. sidewalks and bike lanes).

Maximum one-hour and eight-hour CO levels were estimated at each site for the existing year (2005), interim or completion year (2011 Build and No-Build scenarios) and the design year (2030 Build and No-Build scenarios).

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made. A CO "background level" must be added to this value to account for CO entering the area from environmental and other non-mobile sources upwind of the receptors. Based upon VDOT recommendations, a one-hour background and eight-hour background concentrations of 6 ppm and 3 ppm, respectively, were applied to all analysis sites.

Emission factors within the VACALN6A program are based on EPA's MOBILE6.2 mobile source emission factor model and accounts for the inspection maintenance program implemented by the State of Virginia for the Northern Virginia region. Traffic data used for the air quality analysis was developed as part of an overall traffic analysis for this study. The microscale CO analysis was performed for the peak one-hour and eight-hour traffic periods. These are the periods when the greatest air quality effects of the proposed project are expected. The average number of vehicles per hour during the peak eight-hour period was calculated as 0.7 percent of the average daily traffic. This persistence factor was recommended by VDOT.

4.9.2 Impacts

Maximum one-hour and eight-hour CO levels predicted for each segment are shown in Table 4.9-1 through Table 4.9-4, respectively. These tables also include the predicted CO levels expected to occur for the No-Build Alternatives. All predicted concentrations are below the applicable Federal Standards.

TABLE 4.9-1
INTERIM YEAR (2011): ONE HOUR PREDICTED CO CONCENTRATIONS (PPM)

SEGMENT	RECEPTOR DISTANCE		EXISTING	ALTERNATIVES			
	EXISTING ROADWAY	PROPOSED ROADWAY		NO-BUILD	COMP PLAN	WEST 4	WEST 2
C	60	77	6.9	6.6	N/A	7.0	6.8
D	15	77	6.1	6.2	N/A	N/A	6.8
E	60	90	7.1	6.8	9.5	N/A	N/A
F	20	77	7.5	7.2	6.8	N/A	N/A
F'	20	50	6.9	7.5	7.1	7.1	N/A
G	20	77	7.0	6.9	N/A	6.8	N/A

TABLE 4.9-2
DESIGN YEAR (2030): ONE-HOUR PREDICTED CO CONCENTRATIONS (PPM)

SEGMENT	RECEPTOR DISTANCE		EXISTING	ALTERNATIVES			
	EXISTING ROADWAY	PROPOSED ROADWAY		NO-BUILD	COMP PLAN	WEST FOUR	WEST TWO
C	60	77	6.9	6.6	N/A	6.9	6.9
D	15	77	6.1	6.7	N/A	N/A	6.7
E	60	90	7.1	6.3	8.6	N/A	N/A
F	20	77	7.5	7.1	6.7	N/A	N/A
F'	20	50	6.9	7.6	7.2	7.1	N/A
G	20	77	7.0	6.4	N/A	6.8	N/A

TABLE 4.9-3
INTERIM YEAR (2011): EIGHT HOUR PREDICTED CO CONCENTRATIONS (PPM)

SEGMENT	RECEPTOR DISTANCE		EXISTING	ALTERNATIVES			
	EXISTING ROADWAY	PROPOSED ROADWAY		NO-BUILD	COMP PLAN	WEST FOUR	WEST TWO
C	60	77	3.6	3.4	N/A	3.6	3.6
D	15	77	3.1	3.5	N/A	N/A	3.5
E	60	90	3.8	3.2	4.2	N/A	N/A
F	20	77	4.1	3.8	3.5	N/A	N/A
F'	20	50	3.6	4.1	3.8	3.8	N/A
G	20	77	3.7	3.3	N/A	3.6	N/A

TABLE 4.9-4
DESIGN YEAR (2030): EIGHT HOUR PREDICTED CO CONCENTRATIONS (PPM)

SEGMENT	RECEPTOR DISTANCE		EXISTING	ALTERNATIVES			
	EXISTING ROADWAY	PROPOSED ROADWAY		NO-BUILD	COMP PLAN	WEST FOUR	WEST TWO
C	60	77	3.6	3.4	N/A	3.7	3.6
D	15	77	3.1	3.1	N/A	N/A	3.6
E	60	90	3.8	3.6	5.5	N/A	N/A
F	20	77	4.1	3.8	3.6	N/A	N/A
F'	20	50	3.6	4.1	3.8	3.8	N/A
G	20	77	3.7	3.6	N/A	3.6	N/A

The highest predicted one-hour and eight-hour CO concentrations occurr along Segment E of the Comprehensive Plan CBA. The receptor for this site is relatively close to the roadway (14 feet from the edge of the roadway and 90 feet from the roadway centerline). This location also has the highest hourly volume of vehicles (over 9,000 in all future scenarios) of all sites analyzed. Recognizing that the predicted concentrations of CO include background concentrations of 3 and 6 ppm for the eight- and one-hour levels, respectively, the proposed project will have little effect on existing levels of localized pollution. At several sites, CO concentrations will decrease in the design year compared to the existing conditions. At those sites where the project will increase existing CO concentrations, the increase is less than 1 ppm with the exception of one site. Regardless, CO concentrations will still be well below the NAAQS for CO at all sites. The temporary air quality impacts from construction are not expected to be significant. Construction activities are to be performed in accordance with VDOT's *Road and Bridge Specifications*. The Specifications are approved as conforming with the SIP and require compliance with all applicable local, state, and federal regulations.

4.9.3 Project-Level Conformity

The purpose and need of the study focuses on meeting the current and future regional transportation needs of the area. The Tri-County Parkway is currently included for construction in the constrained Long-Range Plan for the region, and the plan has been found to conform with the State Implementation Plan under the one-hour ozone standard by FHWA and FTA. No phases of the project are currently included in the region's Transportation Improvement Program with the exception of the environmental study.

4.10 NOISE

4.10.1 Noise Model and Projections

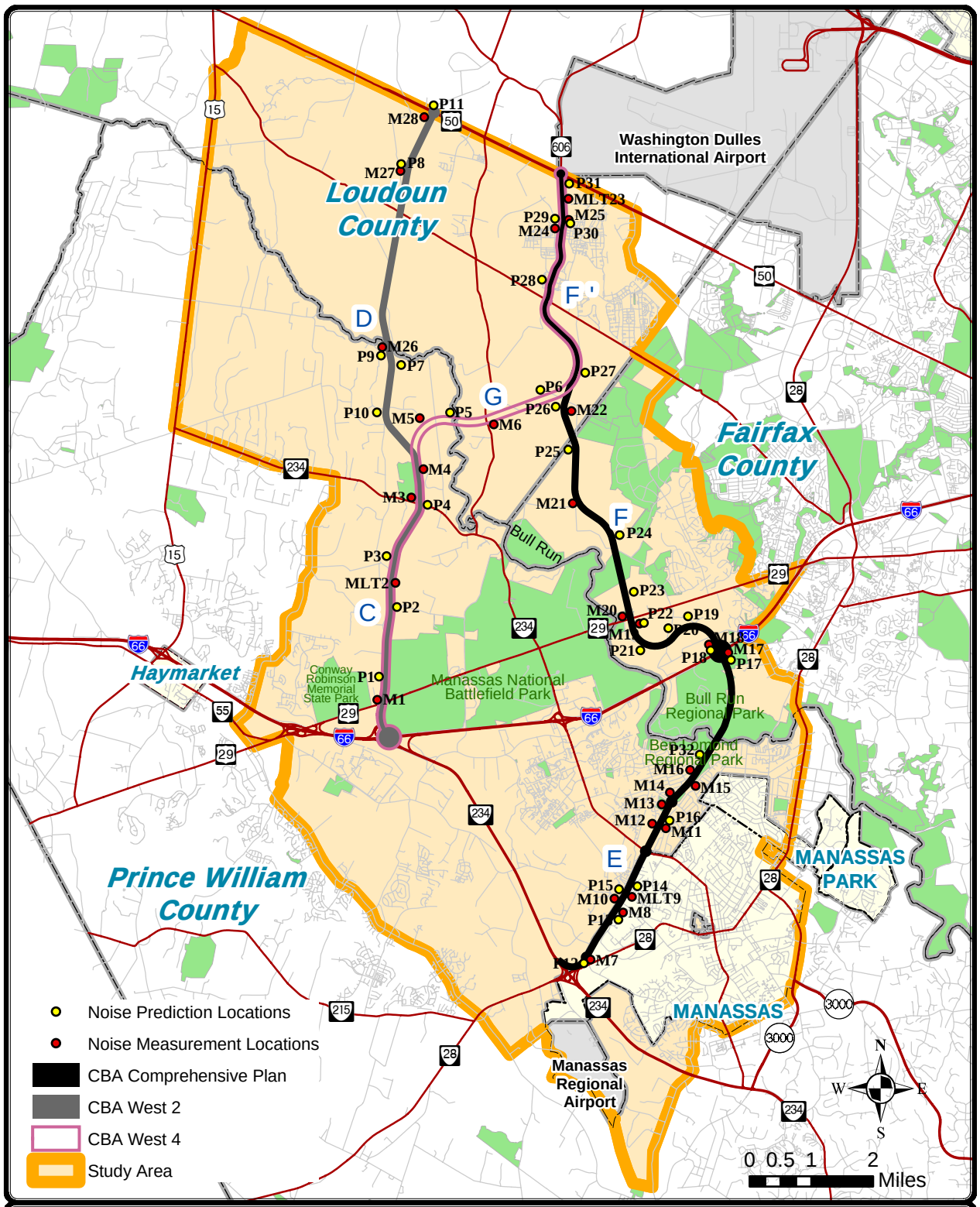
All traffic-noise computations for this study were conducted using the latest version (version 2.5) of the FHWA Traffic Noise Model (FHWA TNM)[3]. The TNM noise modeling accounted for such factors as ground type, elevated roadway sections, shielding from local terrain and structures, traffic speeds, and hourly traffic volumes including percentages of medium and heavy trucks. The geometric model was taken from Microstation files showing roadway alignment, property boundaries, buildings, parks, and existing ground elevation contours. Noise-sensitive land uses were identified from existing mapping and the windshield survey conducted during the noise measurement program.

Traffic data for traffic noise computations were supplied as hourly volumes and running speeds by roadway segment for the 2005 existing condition, and design-year 2030 No-build and three CBAs. Separate medium and heavy truck percentages were provided by roadway segment and by alternative for a.m. peak, p.m. peak, and off-peak periods. As required by FHWA and VDOT, the noise analysis was performed for the loudest hour of the day. The loudest hour for each alternative was determined with a spreadsheet that computes the overall traffic noise level from each roadway segment at a reference distance for each hour of the day. The loudest hour for the existing condition and the No-build alternative is 10 a.m. to 11 a.m.. For the Comprehensive Plan CBA, the loudest hour is 9 a.m. to 10 a.m., and for both the West Four and West Two CBAs, 8 a.m. to 9 a.m. represented the loudest hour of the day. Traffic data used as input to the noise prediction model are summarized in the Noise Technical Report (VDOT, 2004).

A number of locations were added to the 28 measurement sites for purposes of noise prediction. These sites were added to provide a comprehensive basis for the analysis of noise impact for the design-year Build alternatives; all noise-sensitive areas were represented by prediction locations. Figure 4.10-1 shows a selection of these additional "Prediction-only" sites along with the measurement sites; the measurement sites are shown with an "M" prefix, and the prediction-only sites are shown with a "P" prefix.

Table 4.10-1 shows the computed loudest-hour noise levels at the measurement and selected prediction-only sites. All noise levels computed were the A-weighted equivalent sound level, or L_{eq}, in dBA (the Noise Technical Report provides a discussion of this descriptor). As described above, loudest-hour noise levels were computed with TNM for the design-year Build alternatives, and for the existing condition and the No-build alternative near roadways for which traffic data were developed. For areas away from these roadways, the averaged measured L_{eq} was 44 dBA for areas away from roads, and 52 dBA for areas within 300 feet (or one row of homes) of a local connector road. These values were then used as representative of the *existing* noise level for each of the measurement and prediction-only sites away from roads for which traffic data were provided. Where the representative existing noise levels are given in Table 4.10-1, they are shown for both the existing condition and the No-build alternative. The existing sound levels in each noise-sensitive area, whether computed or representative, become the basis for evaluating *substantial increase impact* in comparson to build year noise levels. Table 4.10-1 also lists the noise-sensitive land use represented at each site; commercial, and industrial land uses were not selected for noise analysis.

Projected sound levels are given only for the Build alternatives with roadway segments near the measurement or prediction site. Blanks indicate that no roadways for that Build alternative are nearby. Computed future Build sound levels in the study corridor depend significantly on the distance to the roadway and on any noise shielding that may exist from terrain or buildings. Noise predictions were performed only in noise-sensitive areas within 1,000 feet of a project alternative consistent with VDOT's Noise Policy. The FHWA TNM is not considered to be especially reliable beyond 1,000 feet, since sound levels are subject to large variations due to atmospheric and terrain effects; therefore, no analysis was conducted at those distances.



Tri-County PARKWAY Location Study

FIGURE 4.10-1
NOISE MEASUREMENT AND PREDICTION SITES

TABLE 4.10-1
COMPUTED EXISTING AND FUTURE NOISE LEVELS

Site Number	Description	Land Use*	Loudest-Hour Leq (dBA)				
			Existing	No-Build	Comp. Plan	West Two	West Four
M1	6621 Lolan Street	Res	59	59		59	59
MLT2	5675 Pageland Lane	Res	52	52		68	68
M3	Sudley Park future ballfields	Pk/Rec	52	52		50	50
M4	12191 Richland	Res	44	44		58	58
M5	12410 Boxwood Farms Rd	Res	44	44			47
M6	27022 Gum Spring Road	Res	52	52			53
M7	Smith Baseball Park	Pk/Rec	62	62	66		
M8	Confederate Trail	Res	64	64	68		
MLT9	8902 Sweetbriar Street	Res	64	64	65		
M10	Ashville Street	Res	66	66	69		
M11	8237 Sunset Drive	Res	45	45	62		
M12	9855 Nimitz Court	Res	44	44	66		
M13	9701 Lomond Drive	Res	66	66	66		
M14	7912 Norfolk Court	Res	44	44	65		
M15	7814 Amherst Drive	Res	48	48	62		
M16	9325 King George Drive	Res	44	44	70		
M17	Bull Run Park Events Center	Pk/Rec	59	59	64		
M18	15211 Compton Road	Res	56	56	58		
M19	15901 Lee Highway	Res	65	65	65		
M20	Manassas Battlefield Park Stone Bridge	Pk/Rec	64	64	64		
M21	Sudley Forest Court	Res	55	55	55		
M22	26821 Bull Run P.O. Road	Res	53	53	53		
MLT23	25045 Impala Court	Res	47	47	55		
M24	25465 Beresford Drive	Res	52	52	62		62
M25	Ashbury Dr/Astell Street	Res	53	53	58		58
M26	12750 Chatter Brook Drive	Res	48	48		51	
M27	25005 Goshen Drive	Res	52	52		59	
M28	41753 John Mosby Highway	Res	54	54		59	
P1	Pageland Road	Res	52	52		73	73
P2	Pageland Road	Res	52	52		74	74
P3	Pageland Road	Res	44	44		55	55
P4	Sudley Road	Res	52	52		66	66
P5	Aldie Road	Res	44	44			72
P6	Gum Spring Road	Res	44	44			63

Site Number	Description	Land Use*	Loudest-Hour Leq (dBA)				
			Existing	No-Build	Comp. Plan	West Two	West Four
P7	Sanders Lane	Res	52	52		74	
P8	Goshen Road	Res	44	44		57	
P9	Sanders Lane	Res	52	52		64	
P10	Sanders Lane	Res	52	52		70	
P11	John Mosby Highway	Res	69	71		71	
P12	Smith Park ballfields	Pk/Rec	60	60	64		
P13	Milroy Court	Res	63	63	67		
P14	Sweetbriar Street	Res	62	62	67		
P15	Sunnygate Drive	Res	65	65	68		
P16	Highland Street	Res	44	44	59		
P17	Bull Run Park - Amphitheater	Pk/Rec	59	59	68		
P18	Compton Road	Res	56	56	69		
P19	Bull Run P.O. Road	Res	44	44	54		
P20	Bull Run P.O. Road	Res	52	52	63		
P21	Bull Road P.O. Road	Res	44	44	55		
P22	Lee Highway	Res	57	57	69		
P23	Bull Run P.O. Road	Res	44	44	60		
P24	Bull Run P.O. Road	Res	44	44	56		
P25	Bull Run P.O. Road	Res	44	44	60		
P26	Holly Spring Lane	Res	44	44	54		
P27	Bull Run P.O. Road	Res	52	52	63		
P28	Howerton Drive	Res	47	47	58		58
P29	Crossfield Drive	Res	47	47	58		58
P30	Ashbury Drive	Res	47	47	57		57
P31	John Mosby Highway	Res	66	66	68		68

* Land Use codes: Res - residential; Pk/Rec – Park and Recreation

Computed project sound levels vary considerably throughout the study area, primarily due to variations in distance between the noise-sensitive receivers and the roadway itself. Some homes along Pageland Road (Segment C), which would be in close proximity to the Parkway, would experience Build alternative sound levels in the low 70s dBA. Other homes set back from the project would experience significantly lower levels, in the low to mid 50s dBA.

4.10.2 Noise Impact Assessment

The potential noise impact of alternatives under consideration was assessed in accordance with FHWA and VDOT noise assessment guidelines, which are described in detail in Section 3.9. Residential noise impact in the study area is expected to be greater with any of the future Build alternatives than for Existing or No-build conditions. In the following tables, noise impact is summarized for three separate categories of noise impact; these impact categories, or "types," are used throughout the noise impact discussion. "Approach or Exceed NAC only" impact, or "Type 1" impact occurs where Project noise levels approach or exceed the FHWA Noise Abatement Criteria (see Section 3.9), but the increase above existing is less than 10 dB. "Substantial Increase Only" impact, or "Type 2" impact, occurs where the Project alternative causes a substantial increase

in the existing noise level – 10 dB or more – but the future level is less than 66 dBA L_{eq}. "Type 3," or "Both NAC and Subs. Increase" impact is assessed where both conditions exist; i.e. a 10 dB or more increase above the existing noise level and the predicted future noise levels approach or exceed 67 dBA L_{eq}.

Table 4.10-2 provides a summary of the noise impact throughout the study corridor for each CBA by section of the project, and by type of impact. Noise impact has also been tabulated for the 2005 Existing condition and 2030 No-build alternative in the same study corridor as traversed by the associated CBA. Each of the three CBAs exhibit more noise impact than either the Existing condition or No-build alternative. Since the southernmost section of the Comprehensive Plan CBA (Segment E) extends through much high-density residential development, existing and future noise impact is considerably higher with the Comprehensive Plan CBA than with the other two CBAs.

In the Comprehensive Plan CBA corridor under the Existing and No-build conditions, noise impact includes 45 dwelling units and the playground between the Ashton Glen apartments and townhomes. With the Comprehensive Plan CBA, a total of 852 dwelling units and 5 recreation areas will be impacted by noise in the loudest hour in 2030. All but one of the 129 dwelling units exposed to Type 1 impact (approach or exceed NAC only) are in the densely developed section of the corridor between Wellington Road and Rt. 234-Business along existing Godwin Drive. Recreation areas exposed to Type 1 impact include Smith Baseball Park, the Ashton Glen playground and basketball/tennis courts, and the amphitheater at the Bull Run Special Events Center. The 621 residences exposed to Type 2 impact (substantial increase only) are scattered throughout the study corridor, but 536 of them are concentrated between Rt. 234 Business and Bull Run, south of I-66. Most of this residential impact occurs in the Iron Gate, Highland Park, Fairmont, Wolf Run, West Gate of Lomond, Cedar Park, and Loch Lomond communities. Sixty-seven of the Type 2 impacted homes are located in the South Riding community just south of Route 50. The Fairmont Neighborhood Park, located just south of Lomond Drive, is the only recreation area exposed to Type 2 impact. One hundred and two residences and the Ben Lomond Regional Park will be exposed to Type 3 noise impact (both NAC and substantial increase) under the Comprehensive Plan CBA, with 76 of the impacts occurring between Lomond Drive and Bull Run, predominantly in the West Gate of Lomond and Cedar Park communities, west of the project roadway.

In the West Two CBA corridor, only one residence is exposed to noise impact under Existing and future No-build conditions. With the West Two CBA in the 2030 design year, 66 dwelling units and Sudley Park will be impacted by noise in the loudest hour. Of the residential properties, one will be exposed to Type 1 impact, 43 will be exposed to Type 2 impact, and 22 plus Sudley Park will be exposed to Type 3 impact. Most of the impact will occur between Artemus Road and Braddock Road.

In the West Four CBA corridor, only one residence is exposed to noise impact under Existing and future No-build conditions. With the West Four CBA in the 2030 design year, 115 dwelling units and Sudley Park will be impacted by noise during the loudest hour. Of the residential properties, one will be exposed to Type 1 impact, 102 will be exposed to Type 2 impact, and 12 plus Sudley Park will be exposed to Type 3 impact. Most of the impact will occur in the South Riding community between Braddock Road and Rt. 50, with scattered residential impact occurring between Artemus Road and Braddock Road.

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TABLE 4.10-2
NOISE IMPACT SUMMARY

CBA	Section of Corridor[1]	Number of Dwelling Units or Other Land Use Exposed to Noise Impact				
		Exist (2005)	No-build (2030)	Build (2030)		
				Approach or Exceed NAC only	Substan. Increase Only	Both NAC and Subs. Increase
Compre-hensive Plan	Rt. 234/Rt. 28 to Wellington	0	0	1 ball field	0	0
	Wellington to Rt. 234 Business	44 DU 1 play area	44 DU 1 play area	128 DU 1 play area	4 DU	0
	Rt. 234 Business to Lomond Drive	0	0	0	179 DU 1 park	24 DU
	Lomond Drive to I-66	0	0	Amphi-theater	357 DU	76 DU 1 park
	I-66 to Rt. 29	0	0	0	5 DU	2 DU
	Rt. 29 to Braddock Road	0	0	0	9 DU	0
	Braddock Road to Rt. 50	1 DU	1 DU	1 DU	67 DU	0
	TOTAL – Comprehensive Plan	45 DU 1 Rec	45 DU 1 Rec	129 DU 3 Rec	621 DU, 1 Rec	102 DU,1 Rec
				852 DU, 5 Rec		
West Two	I-66 to Rt. 29	0	0	0	0	0
	Rt. 29 to Artemus Rd.	0	0	0	0	5 DU
	Artemus Rd. to Rt. 234	0	0	0	14 DU	4 DU
	Rt. 234 to Braddock Road	0	0	0	26 DU	13 DU,1 park
	Braddock Road to Rt. 50	1 DU	1 DU	1 DU	3 DU	0
	TOTAL – West Two	1 DU	1 DU	1 DU	43 DU	22 DU,1 Rec
				66 DU, 1 Rec		
West Four	I-66 to Rt. 29	0	0	0	0	0
	Rt. 29 to Artemus Rd.	0	0	0	0	5 DU
	Artemus Rd. to Rt. 234	0	0	0	14 DU	4 DU
	Rt. 234 to Gum Spring Rd	0	0	0	10 DU	2 DU,1 park
	Gum Spring Rd. to Braddock Road	0	0	0	9 DU	1 DU
	Braddock Road to Rt. 50	1 DU	1 DU	1 DU	69 DU	0
	TOTAL – West Four	1 DU	1 DU	1 DU	102 DU	12 DU,1 Rec
				115 DU, 1 Rec		
Note: Rec (Recreation) includes parks, ball fields, play areas, and an amphitheater.						

4.10.3 Noise Abatement

FHWA has identified certain noise abatement measures that may be incorporated in projects to reduce traffic noise impact. Mitigation measures that have been considered for this project include alternative measures

(traffic management and the alteration of horizontal and vertical alignment), and the construction of noise barriers.

4.10.3.1 Alternative Noise Abatement Measures

Traffic management measures that have been considered for noise abatement include reduced speeds and truck restrictions for the CBAs. Reduced speeds are not an effective noise mitigation measure since a substantial decrease in speed is necessary to provide a significant noise reduction. A 10 mph (16 kph) reduction in speed will result in only a 2 dB decrease in noise level. Truck restrictions would not significantly reduce noise levels since automobiles are a major contributor to peak hour traffic noise levels. Since automobiles comprise over 90 percent of vehicle volume during the loudest hour, only modest reductions in noise levels could be achieved by totally eliminating truck traffic. Further, such traffic management measures are in conflict with the intended use of the Project alternatives.

Preliminary corridor locations were chosen to avoid existing, proposed, and planned noise sensitive development adjacent to the roadway. The alteration of horizontal alignment is limited by the available right-of-way along the project corridors. Significant noise reduction at noise sensitive locations would require large alignment shifts which would necessitate additional property takings and could expose additional sites to project noise. Also, the alteration of vertical alignment of the proposed roadway is not considered to be a feasible noise abatement measure. Depressing the roadway would require taking of additional property for the sloped embankments, or excessive costs for the construction of sound-absorptive retaining walls; elevating the roadway could allow noise to propagate farther into the community at higher levels.

4.10.3.2 Noise Barriers

The only remaining abatement investigated was the construction of noise barriers. The feasibility of noise barriers was evaluated at all locations where noise impact is expected to occur for each of the CBAs. Where the construction of noise barriers was found to be physically practical, barrier noise reduction was estimated based on roadway, barrier, and receiver geometry as described below.

4.10.3.2.1 Noise computation model

All noise barrier feasibility analysis was performed using TNM 2.5 using the alignment and typical sections of the Project roadways provided. Barrier heights and lengths were adjusted within TNM to provide the minimum noise reduction of 5 dB at all noise sensitive locations where noise impact is expected to occur. The resulting barrier heights are typically between 10 and 20 feet.

4.10.3.2.2 Feasibility and reasonableness

FHWA and VDOT require that noise barriers be both “feasible” and “reasonable” to be recommended for construction. To be feasible, a barrier must be effective, that is it must reduce noise levels at noise sensitive locations by at least 5 decibels, thereby “protecting” or “benefiting” the property. A residential property is “protected” if it will be exposed to future noise impact and will receive at least 5 decibels of noise reduction from a barrier. By comparison, a residential property is “benefited” if it is *not* exposed to future noise impact, but will still receive at least 5 decibels of noise reduction from a barrier designed to protect impacted properties.

Barrier reasonableness, which is based on “cost-effectiveness,” is not evaluated in this study, since the barrier unit cost (dollars per square foot of surface area) cannot accurately be determined during the Location Study stage of a project. Once the final project alignment has been approved, the appropriate barrier unit cost specific to that location will be determined and then barrier reasonableness will be computed. Costs can include but are not limited to costs for barrier materials and installation, for additional right-of-way to accommodate the barriers, for the resolution of utility and drainage conflicts with the barriers, and for dealing with safety issues created by the barriers. To be “reasonable,” a barrier cannot cost more than $30,000 per protected or benefited residential property. A barrier not found to be reasonable due to cost can still be constructed if a third party (other than FHWA or VDOT) funds the amount above $30,000 per residential property. The reasonableness determinations for non-residential properties such as parks and other recreational areas are made on a case-by-case basis. The determinations are based not only on the barrier

cost, but also on the type and duration of the activity taking place, the size of the affected area, the severity of the impact, and the amount of noise reduction provided.

4.10.3.2.3 Details of Evaluated Barriers

Details of each of the evaluated barriers are given in Table 4.10-3. Details include the applicable CBA and segment, reference site numbers where applicable, length, height range, range of computed noise reduction, total surface area in square feet, and the land use protected and benefited. Figure 4.10-2 provides a graphical depiction of each barrier location as colored lines along the roadways.

Substantial portions of the study area are rural with a relatively low density of noise-sensitive land use. Many of the barriers summarized in Table 4.10-3 protect only one home, and such barriers are unlikely to benefit additional homes. Nevertheless, after a roadway alignment is approved, impacted and potentially benefited receivers will be re-evaluated, when cost reasonableness is computed.

For purposes of comparing the potential total cost of noise barriers for each of the three CBAs under consideration, estimates of the approximate cost of the barriers evaluated are provided in this report. This information is preliminary and should be considered to be very approximate since the project is not developed to a stage where a reliable cost estimate can be provided in regard to determining cost-effectiveness. The final costs cannot be determined and cost-effectiveness and feasibility investigations cannot be completed until after the selected alternative has received design approval. Table 4.10-4 provides protection, total surface area, and cost information totaled by project alternative.

4.10.4 Construction Noise

An increase in project area noise levels will occur during the construction of the proposed project improvements. Mitigation measures and VDOT specifications concerning construction noise are discussed in greater detail in the Noise Technical Report (VDOT, 2004).

TABLE 4.10-3
DETAILS OF EVALUATED NOISE BARRIERS BY ALTERNATIVE

Barrier Description		Site No.	Barrier Length (ft)	Range Barrier Height (ft)	Range Noise Reduction (dB)	Surface Area (sq. ft.)	Noise-sensitive land use Protected/ Benefited
No.	Build Alt., Segment						
1	Comp Plan, E	M7, P12	400	15	8	5,995	Smith Baseball Park
2	Comp Plan, E	M8, P13	808	15	5 to 8	12,118	18/28 DU
3	Comp Plan, E	M9, P14	2,397	10	5 to 9	23,966	14/25 DU
4	Comp Plan, E	M10, P15	3,001	15	5 to 13	45,011	100/183 DU Ashton Glen Rec
5	Comp Plan, E	M11, P16	4,791	10 to 15	5 to 9	59,890	120/18 DU
6	Comp Plan, E	M12	2,401	15	5 to 10	36,021	80 DU Fairmont Park
7	Comp Plan, E	M15	6,199	10 to 15	5 to 9	85,915	71/140 DU
8	Comp Plan, E	M14	7,414	10 to 15	5 to 12	99,242	362/6 DU
9	Comp Plan, E	M17, P17	1,817	10 to 20	5 to 9	34,326	Amphitheater
10	Comp Plan, F	M18, P18	388	10	6	3,875	1 DU
11	Comp Plan, F	P19	1,858	20	5	37,162	2 DU
12	Comp Plan, F		1,201	10 to 15	5	12,993	1 DU
13	Comp Plan, F	P20	596	15	5	8,933	1 DU
14	Comp Plan, F	P21	1,251	10	5	12,514	1 DU

Barrier Description		Site No.	Barrier Length (ft)	Range Barrier Height (ft)	Range Noise Reduction (dB)	Surface Area (sq. ft.)	Noise-sensitive land use Protected/ Benefited
No.	Build Alt., Segment						
15	Comp Plan, F	P22	200	15	5	3,002	1 DU
16	Comp Plan, F		1,401	15 to 20	5	24,024	1 DU
17	Comp Plan, F	P23	999	10 to 15	5	11,987	1 DU
18	Comp Plan, F	P24	1,198	15	5	17,975	1 DU
19	Comp Plan, F	P25	578	10	5	5,776	1 DU
20	Comp Plan, F	P26	1,443	10 to 15	5	16,518	1 / 2 DU
21	Comp Plan, F		1,224	15	5	18,353	1 DU
22	Comp Plan, F	M22	960	15	5	14,394	1 DU
23	Comp Plan, F	P27	1,000	10 to 15	5 to 6	11,006	2 DU
24	Comp Plan West Four, F'	P28	1,416	10	5 to 7	14,155	19 DU
25	Comp Plan West Four, F'	M24, P29	1,219	10 to 15	5 to 10	14,266	28/2 DU 30 DU
26	Comp Plan West Four, F'	M25, P30	1,792	10	5 to 6	17,924	20/24 DU
27	Comp Plan West Four, F'	P31	1,230	10	5 to 8	12,301	1 / 2 DU
28	West Two, West Four, C		900	15	5	13,500	1 DU
29	West Two, West Four, C	P3	2,000	25	5	50,000	1 DU
30	West Two, West Four, C		1,000	20	5	20,000	2 DU
31	West Two, West Four, C	M3	2,900	10 to 20	5 to 9	57,300	1 DU, Sudley Park ball fields
32	West Two, West Four, C	M4, P4	3,800	15	5 to 12	57,000	8 DU
33	West Four, G		1,200	15	5	18,000	1 DU
34	West Four, G		300	20	8	6,000	1 DU
35	West Four, G		1,200	10	5	12,000	1 DU
36	West Four, G	M6	700	15	5	10,500	1 DU
37	West Four, G		1,400	10	5	14,000	3 DU
38	West Four, G		1,200	20	5 to 6	24,000	2 DU
39	West Four, G		200	10	6	2,000	1 DU
40	West Four, F'		600	10-15	5	6,800	1 DU
41	West Two, D		1,200	14	5	16,600	1 DU
42	West Two, D		1,000	12	9 to 12	11700	2 DU
43	West Two, D	P7	4,200	12-14	6 to11	51,000	12/1 DU

Barrier Description		Site No.	Barrier Length (ft)	Range Barrier Height (ft)	Range Noise Reduction (dB)	Surface Area (sq. ft.)	Noise-sensitive land use Protected/ Benefited
No.	Build Alt., Segment						
44	West Two, D		1,400	12-14	5	18,400	2 DU
45	West Two, D		1,992	16	5	31,900	3 DU
46	West Two, D		1,600	12-14	5 to 7	20,800	2/3 DU
47	West Two, D	P10	1,000	12	7	12,000	1/1DU
48	West Two, D		2,200	12	5 to 9	26,500	4/6 DU
49	West Two, D	P9, M26	600	12	5	7,400	1 / 2 DU
50	West Two, D	P8, M27	1,600	14	6	22,600	1 DU
51	West Two, D		2,400	14-16	6	34,800	2/2 DU

TABLE 4.10-4
TOTAL PROTECTION, SURFACE AREA AND ESTIMATED COST OF EVALUATED NOISE BARRIERS BY ALTERNATIVE

Candidate Build Alternative	Number of Dwelling Units Protected / Benefited	Total Surface Area (sq. ft.) of Noise Barriers	Total Estimated Cost*
Comprehensive Plan	879 / 432 Dus 4 / 1 Pk-Rec	659,642	$13,192,840
West Two	44 / 15 Dus 1 / 0 Pk-Rec	451,500	$9,481,500
West Four	122 / 30 Dus 1 / 0 Pk-Rec	349,746	$7,694,412

* Note: Total cost assumes a square foot cost of $20 to $22, which approximates the square foot cost being used for existing construction bids in Northern Virginia.

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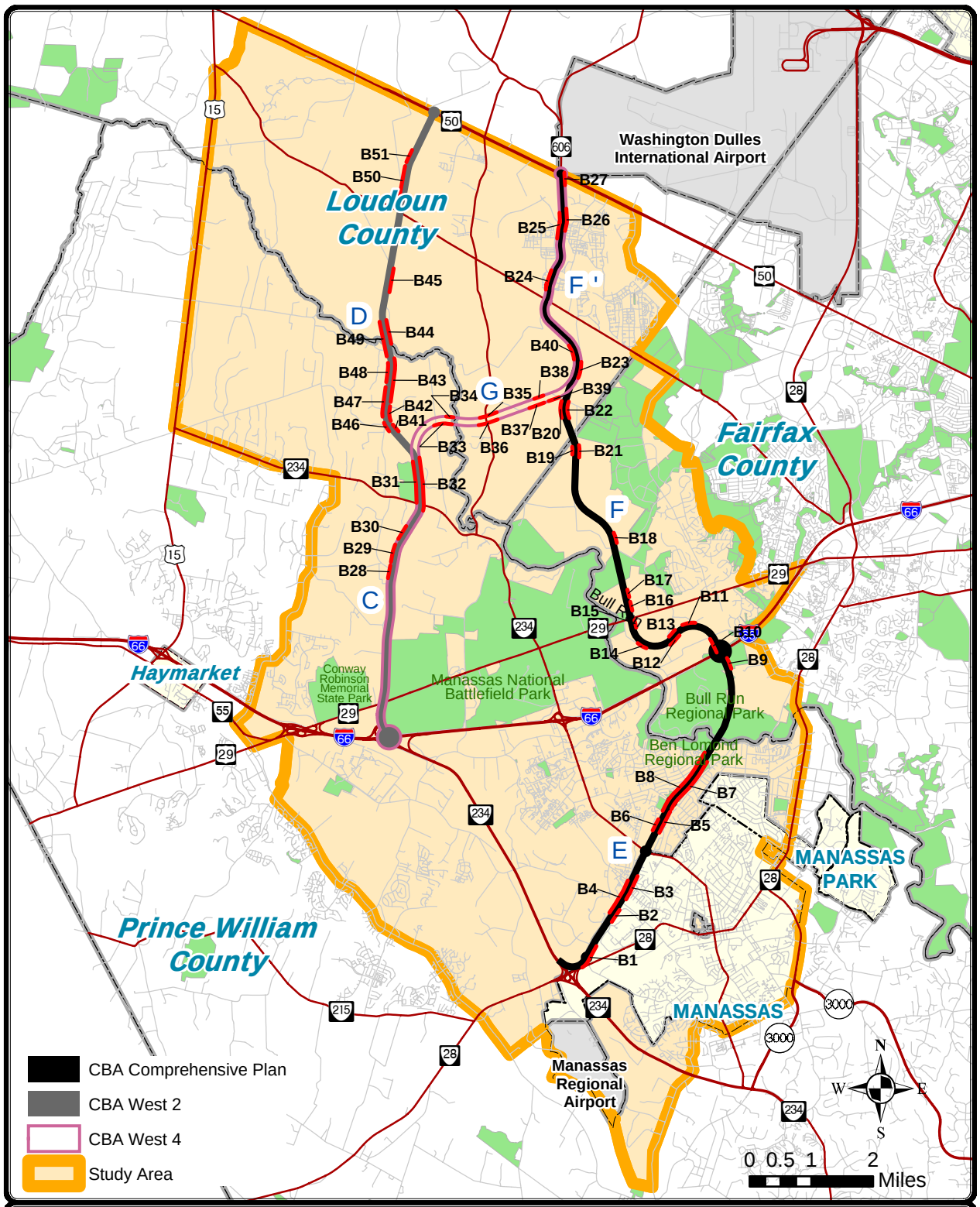


Tri-County PARKWAY Location Study

FIGURE 4.10-2
EVALUATED NOISE BARRIER LOCATIONS

4.11 WATER QUALITY

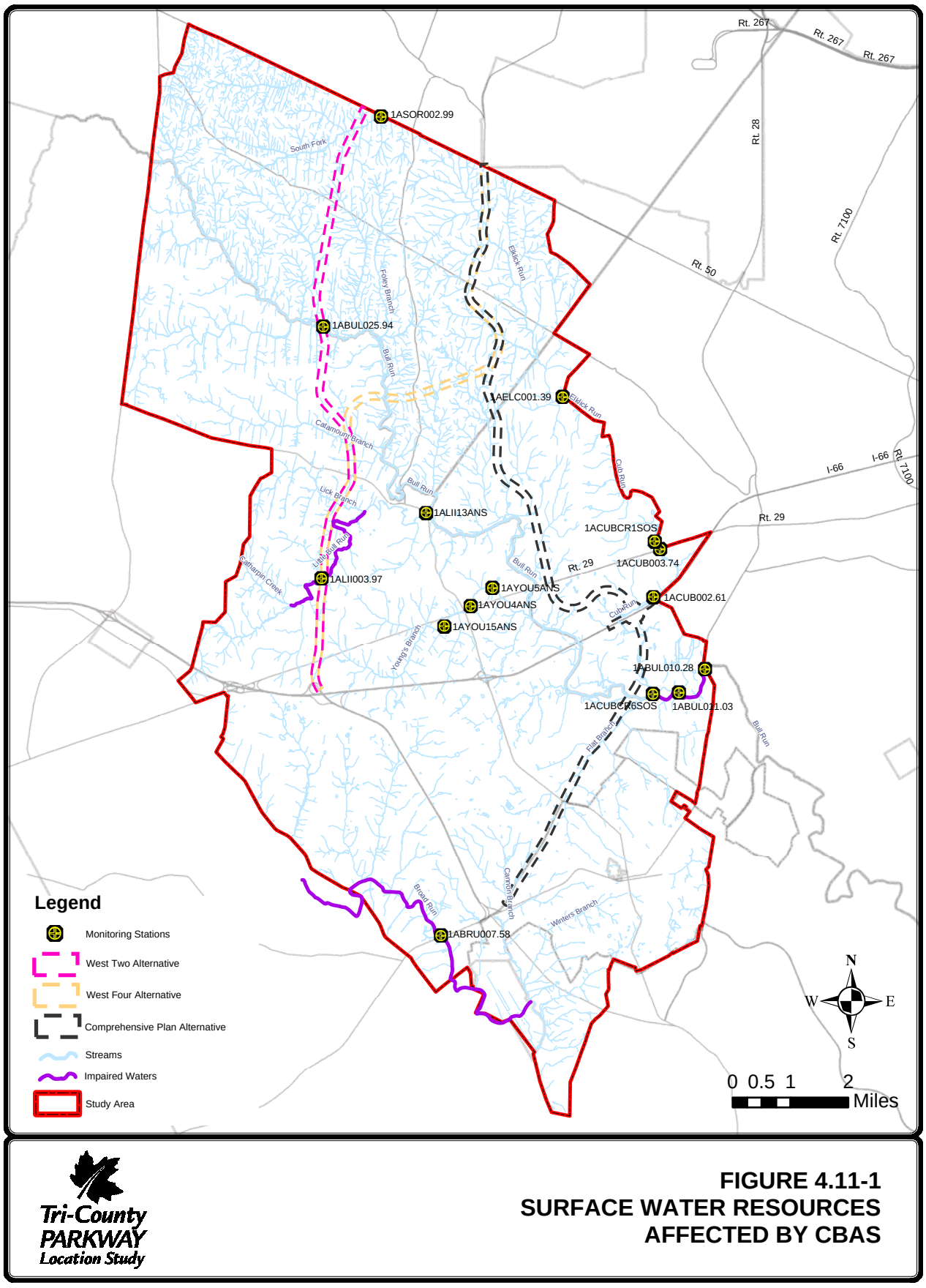
4.11.1 Surface Water Resources

Construction of a CBA or programmed improvements associated with the No-Build Alternative has the potential to affect local and regional water quality in surface waters by increasing impervious surfaces and increasing loading of pollutants to study area surface waters. The CBAs also involve stream crossings which, in the absence of best management practices, can be loci for sediment discharge and pollutant contamination. In addition, the CBAs intersect source water protection areas for public drinking water supplies. These surface water resource impacts are summarized in following sections and are discussed in greater detail in the Water Quality Technical Report (VDOT, 2004).

4.11.1.1 Stormwater Pollution Loads

Pollutants most often present in stormwater runoff from highways, roads, and bridges include: sediment; nutrients; toxic metals including zinc, copper, cadmium, lead, chromium, and mercury; polycyclic hydrocarbons (PAH); oil and grease; MTBE, a gasoline additive; chloride, sodium and calcium incident to salting and sanding processes; pesticides; and road debris. Increases in concentrations of these pollutants in surface water can result in disruption of significant life processes for aquatic organisms including reproduction, can be toxic to aquatic life, or can decrease habitat suitability. Stream crossings on new highway alignment are a water quality concern since, even with implementation of best management practices at the construction phase, highway stream crossings can over time contribute to pollutant loading within the streams they span. Chemically adverse affects associated with stream crossings include inputs of pollutants into the water column from maintenance activities, chemical spills, in-stream scour, and bank incision and erosion due to normal infrastructure drainage. Post-construction impervious areas, water quality volumes, and estimated basin excavation volumes for affected study area watersheds are discussed in the Hydrologic and Hydraulics Technical Report (VDOT, 2004). Existing water quality data obtained for the study area (presented in section 3.11 of this EIS and discussed in detail in the Water Quality Technical Report (VDOT, 2004)) shows higher concentrations of typical highway runoff constituents including total solids, total volatile solids, chloride, and nitrates at the lower Bull Run monitoring station (BUL010.28) than at upper Bull Run, Broad Run, Cub Run, and Little Bull Run (Figure 4.11-1). Concentrations of these constituents are two to six times greater at BUL010.28 than at other sampling locations. Data collected at this location would be equally applicable to all proposed CBAs, since the BUL010.28 station is located downstream of all CBA crossings.

Construction of a CBA will result in minimal net increases in impervious or paved area within the study area. The potential increase in paved area is proportional to length for a CBA. Beyond the spatial and temporal effects to surface water quality resulting from initial roaday construction, longer-term effects associated with presence of the roady would also result. Best management practices (BMPs) including stormwater management and erosion and sediment control regulations mandate that post-development peak discharge of stormwater from construction sites to receiving waters be at least equal to pre-development conditions; therefore, if properly maintained, the implementation of stormwater and erosion and sedimentation control BMPs for any CBAs would likely result in minimal water quality impacts. Implementation of a build alternative does, however, have the potential to contribute to adverse indirect effects and cumulative impacts related to increases in impervious cover (and associated water quality changes) by potentially influencing or affecting zoning and land use policies of local jurisdictions (see section 4.13 of this EIS). All CBAs cross Bull Run, identified as a waterway of concern by the VDEQ. Because concentrations of pollutants typically present in highway runoff are already present in elevated concentrations in this stream, implementation of a CBA could potentially adversely affect this sensitive surface water resource. Implementation of the Comprehensive Plan CBA, however, could potentially also result in further degradation of water quality in Flat Branch and, thus, has a greater likelihood than either of the remaining CBAs to adversely affect water quality in lower Bull Run through increased non-point source pollutant loading. Alternatively, stormwater runoff associated with the West Two and West Four CBAs would also have the potential to affect Little Bull Run, a currently degraded waterway.



Tri-County PARKWAY Location Study

FIGURE 4.11-1
SURFACE WATER RESOURCES AFFECTED BY CBAS

Comprehensive Plan CBA: Using a 200-foot-wide average limits of construction, the Comprehensive Plan CBA would result in the greatest increase in impervious cover (0.64 sq miles or 0.6 percent). Surface waters potentially impacted by implementation of the Comprehensive Plan CBA include Cannon Branch (Broad Run/Kettle Run watershed); and Flat Branch, Bull Run; Cub Run, and Elklick Run within the Bull Run watershed (Figure 4.11-1). These streams already show evidence of degraded in-stream habitat and/or degraded water quality. An area of particular concern with regard to stormwater issues is a long section of Flat Branch, near the mouth of Cub Run along Interstate 66 and along Bull Run through Bull Run Regional Park. A 4.8-mile segment of Bull Run, downstream of the Cub Run-Bull Run confluence, is currently listed as impaired by the Virginia Department of Environmental Quality (VDEQ) for not supporting aquatic life or macrobenthics and as a result of fecal coliform exceedances. An additional 0.95 miles of Bull Run (5.75 miles in total) is also listed as a result of toxic levels of PCBs measured in fish tissues (VDEQ, 2004). Degraded water quality in this Bull Run stream reach is attributed, in part, to inputs of pollutants from Flat Branch. Elklick Run has also been identified as having some degree of biological impairment by the Fairfax County Department of Public Works and Environmental Services (DPWES, 2003) and has been prioritized for restoration by Fairfax County.

West Four and West Two CBAs: Using a 200-foot-wide average limits of construction, the West Two CBA would result in the least increase (0.43 sq miles or 0.4 percent). Using a 200-foot-wide average limits of construction, the West Four CBA would result in intermediate potential increases in imperviousness (0.45 sq miles or 0.4 percent). Development of the West Four CBA would impact Bull Run and its western tributaries north of Interstate 66 and south of Chestnut Lick, including Lick Branch, Catamount Branch, and Little Bull Run (Figure 4.11-1). In the Cub Run watershed, the West Four CBA would affect Elklick Run. The West Two CBA has the potential to affect the same surface waters as the West Four CBA, with the exception of Elklick Run. Additionally, the West Two CBA would potentially contribute stormwater runoff to South Fork (Broad Run/Potomac River watershed). According to the Fairfax County Health Department (2002), water quality in the upper Bull Run watershed is generally considered good for physical and chemical parameters. Stormwater planning issues associated with the West Two and West Four CBAs, include single crossings of Bull Run (Segment D of the West Two CBA; Segment G of the West Four CBA) and a proposed crossing of Little Bull Run in a relatively undeveloped area; 3.03 miles of Little Bull Run has been listed as impaired by the VDEQ for fecal coliform bacteria (Figure 4.11-1).

The No-Build Alternative: As only minor increases in impervious surfaces and stormwater runoff resulting from implementation of programmed improvements associated with the No-Build Alterntive would occur, no substantial impacts would result.

4.11.1.2 Waterway and Water Body Modifications at Stream Crossings

Potential physically adverse affects associated with stream crossings include temporary disruption of stream bed and bank conditions during construction and changes in channel morphology which, on a longer-term basis, can lead to in-stream scour, bank incision, and erosion. For build alternatives under consideration, certain lesser stream crossings would entail the placement of fill and culverts, whereas other major stream crossings would be spanned on-structure (bridged). For culverted stream crossings and for bridged crossings involving the unavoidable placement of fill for abutmets, physical changes to stream morphology and/or overbank-conveyance morphology would occur. The installation of piers and approach embankments to proposed bridges can reduce the conveyance capacity of the floodway and floodplains and can propagate increases in backwater upstream of the bridge. The result can be an increase in velocity through the bridge waterway opening, which has the potential to increase the likelihood of scouring damage.

The Comprehensive Plan CBA would include two major bridge crossings at Elklick Run and Cannon Branch, as well as two minor stream crossings at tributaries of Elklick and Bull Runs. In addition, a major crossing spanning approximately 15,000 linear feet over Cub Run, Bull Run, and Flat Branch, and traversing Bull Run Regional Park appears to be required at the proposed Interstate 66 interchange. In large part due to this crossing, the Comprehensive Plan CBA (Segment E) encompassing the Flat Branch-Bull Run-Cub Run crossing is cited in agency comments as having “the potential for greater impacts to aquatic resources than other Tri-County Parkway segments” (COE, 2003). Major crossings at Little Bull Run, Lick Branch, Bull Run, and Elklick Branch would be required to implement the West Four CBA. Additionally, two minor crossing at

tributaries of Bull Run and Elklick Run would be required. Development of the West Two CBA would create three major and two minor stream crossings. Major crossings would span Little Bull Run, Lick Branch, and Bull Run. Minor crossings would span South Fork (Broad Run/Potomac River) and a Bull Run tributary. The West Two and West Four CBAs have comparable potential to further degrade water quality in Little Bull Run; however, the West Four CBA would create one additional major stream crossing at Elklick Run (Cub Run watershed). In all other respects, water quality and habitat variables appear to be comparable in stream systems potentially affected by the West Four and West Two CBAs.

Table 3.2-1, Table 3.3-1, and Appendix 1 of the Hydrologic and Hydraulic Technical Report (VDOT, 2004) present major bridge and culvert crossings proposed for the build alternatives under consideration. In some cases, these facilities are located parallel to streams in the floodplain, and a bridge is provided to limit encroachment and to provide protection or mitigation of wetlands or environmentally sensitive areas. Proposed crossings were categorized as follows:

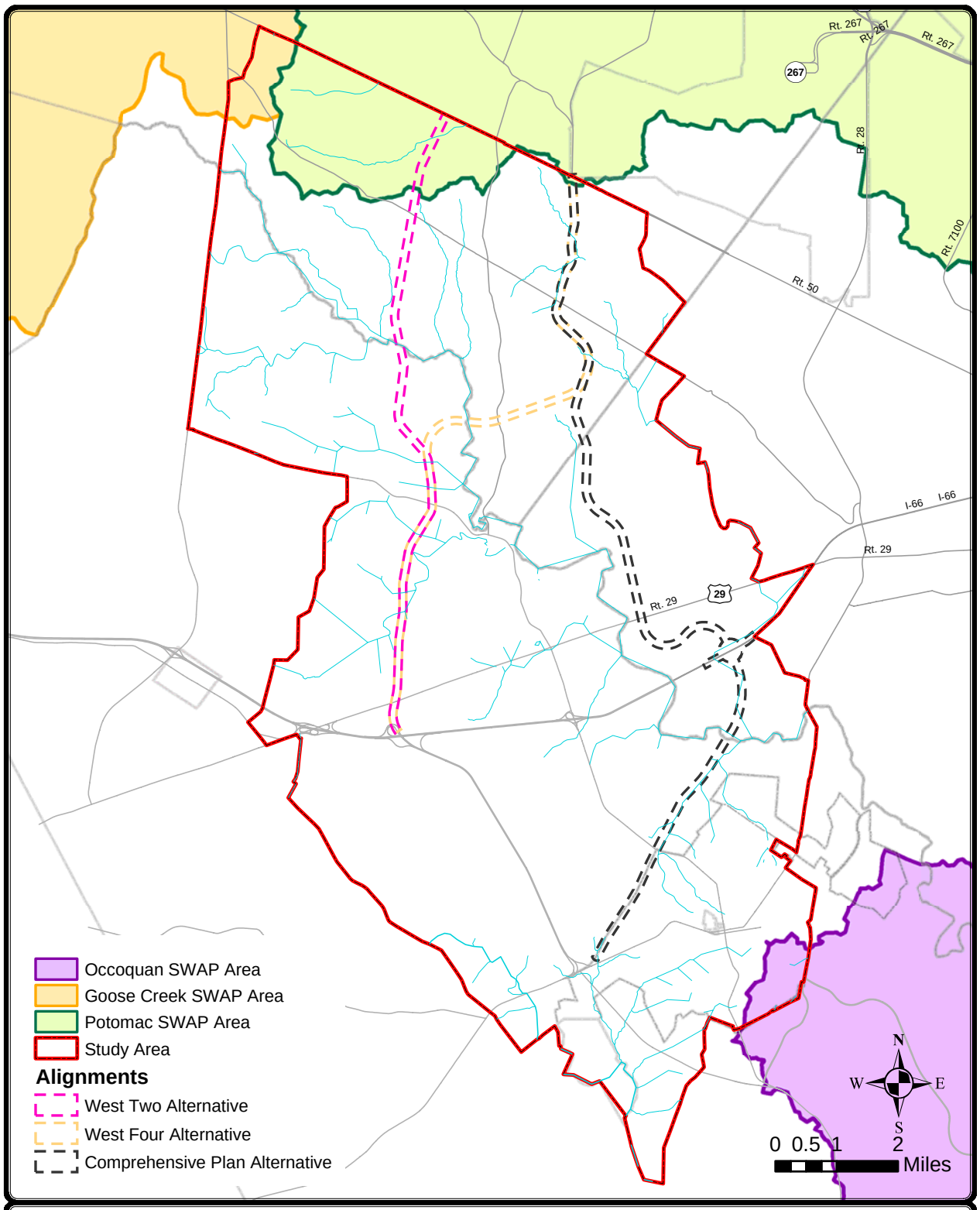
- Minor Drainage Facilities – Generally a drainage area of less than 225 acres or less than 500 cubic feet per second (cfs) for the 100 year (1 percent chance of occurrence) storm peak discharge from the watershed. These facilities would be designed in detail after additional data is obtained.
- Major Drainage Facilities but not in the floodplain – Generally a drainage area greater than 225 acres or more than 500 cfs for the 100 year (1 percent chance of occurrence) storm peak discharge from the watershed. These facilities would be further refined as the design process moves toward preliminary and final design.
- Major Drainage Facilities in floodplain areas. These are generally significant streams that have a definable floodplain. They would have a drainage area greater than 225 acres to over 20 square miles and have a peak discharge greater than 500 cfs for the 100 year (one percent chance of occurrence) storm peak discharge.

Hydraulic analysis was performed to determine the water surface profile and impact from a proposed bridge. For those Major Drainage Facilities in Floodplain Areas, HECRAS was used to model the reach at the bridge site. For Major Drainage Structure not in a floodplain, the discharge was computed using TR55 method. Results of the hydraulic analysis of each bridge is shown in Table 3.15-1 of the Hydrologic and Hydraulic Technical Report. Table 3.15-1 of the Technical Report shows the bridge and the downstream and upstream water surface elevations with and without the bridge being in place. The plan, cross sections, and profiles are available for each bridge in the Technical Report appendices. Table 3.15-1 of the Technical Report also shows the velocity through the bridge section. The preliminary results show no significant impact on the water surface profiles due to the preliminary bridge opening sections.

Provided that all programmed improvements associated with the No-Build Alternative are constructed within existing rights-of-way, no additional stream crossing would be required and no substantial impacts would result.

4.11.1.3 Construction Within Drainage Areas Important to Public Surface Water Supplies

Each of the three CBAs would require a single crossing of Bull Run (an upstream source for the Occoquan Reservoir, which is a major source of drinking water for the study area and surrounding region); however, the intake for the water supply is located 17 river miles downstream of the nearest study area stream crossing. Approximately 1.2 mile of the West Four CBA and approximately 0.2 mile of the West Two CBA traverse the headwaters of the Potomac intake source water protection area; however, both CBAs are located approximately 24 miles from the nearest point along the Potomac River. VDOT would not acquire sites or begin construction on sites containing potential contamination sources (PSCs) until such time that the sites have been cleaned-up or measures have taken to prevent the off-site migration of contaminants. Given the relatively large distances to nearest public water supply intakes and considering proposed implementation of best management practices, no direct effects to present public surface waters are expected; however. implementation of a build alternative does have the potential to contribute to adverse indirect effects and cumulative impacts related to water quality of public water supplies by potentially influencing or affecting zoning and land use policies of local jurisdictions (see section 4.13 of this EIS).



Tri-County PARKWAY Location Study

FIGURE 4.11-2
PUBLIC SURFACE WATERS
IN THE VICINITY OF CBAS

Impacts associated with implementation of programmed improvements associated with the No-Build Alternative can expected to be noticeably less than those estimated for the CBAs given the smaller amount of land disturbing activities anticipated. No significantly adverse water quality impacts are anticipated provided these programmed improvements make use of best management practices during their implementation.

4.11.1.4 Mitigation

Bridges would be constructed at appropriate stream crossings to avoid or minimize effects to water resources. Proposed bridge locations by CBA segment are listed in Table 3.3-1 of the Hydrology and Hydraulics Technical Report (VDOT, 2005) and are shown in Appendix 1 of the Technical Report. Based on preliminary engineering, five bridges would be constructed along the West Two CBA, 13 along the West Four CBA, and 15 along the Comprehensive Plan CBA. At proposed bridge crossings, the minimum number of piers to ensure structural stability will be placed channelward of the ordinary water line. Feasible construction methods that would not require the placement of construction causeways would be evaluated during the design phase. Should it become necessary, fill placed for temporary construction causeways or work bridges would be removed and preconstruction streambed conditions will be restored immediately following construction. Breastwalls and fill placed for bridge abutments would be placed landward of the ordinary water line, where practicable. Practicable measures to provide for the upstream/downstream movement of aquatic species at proposed sites of culvert installation would be considered during later phases of project design. This would be accomplished through installation of counter-sunk pipes and culverts or maintenance of a permanent to semi-permanent wetted surface within select pipes or culverts..

During construction of the selected alternative, erosion and sediment controls would be implemented to minimize and reduce water quality impacts in accordance with the Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation (9 VAC 25-31-10 et seq.), and Virginia Erosion and Sediment Control Handbook. Land disturbance boundaries associated with clearing and grading would be limited to the maximum extent practicable. Additionally, the amount of roadway alignment cut-and-fill could be reduced by implementing specialized engineering programs designed for this purpose. Stream relocations would be avoided to the extent practicable. Stream relocation would be conducted during dry conditions and channels would have a stable geometry. All construction-related dredging and/or filling would be accomplished so as to minimize disturbance of the bottom and minimize turbidity. Issued water quality permits contain general and site-specific special conditions for construction impact mitigation. Construction contractors will be required to comply with requirements and special conditions of any required permits for work in and around surface waters and with pollution control measures specified in the approved construction plans. Staging areas for construction materials and equipment would not be located adjacent to surface waters and deposition of dredge or excavated materials and all earthwork operations will be carried out in such a manner as to prevent erosion of the material and its entry into State waters. Where feasible, streams would be crossed with temporary bridges as opposed to culverts or cofferdams to minimize disturbance to the stream channel. Clean non-erodible materials would be used for causeway construction and every very reasonable precaution would be taken to ensure that no spill of fuels, lubricants, or other pollutants enter surface waters. Construction site contingency plans for spill accidents are typically a required by permit.

In accordance with the *Virginia Stormwater Management Handbook*, temporary and permanent stormwater management measures (including detention basins, vegetative controls, and other measures) would also be implemented to minimize potential degradation of water quality related to volume and chemical quality of discharge. Porous pavement could be used on detention basin and utility access roads, bike paths, pedestrian crosswalks, ancillary parking lots, or any other paved area intended for limited vehicle or pedestrian traffic to limit increases in imperviousness. Under certain circumstances, bridges can be a major source of heavy metal concentration in suspension and in stream sediment; however, as part of the Outer Connector project near Fredericksburg, VDOT conducted studies of runoff from the existing I-95 bridge over the Rappahannock River and found little difference in the water quality paramerters of bridge runoff before, during, or after a rain event. During ensuing bridge design, treatment of bridge runoff in sensitive receiving streams using scupper collector technology or no-discharge retention and infiltration basins would be implemented should site-specific conditions warrant. The implementation of infrastructure retrofitting and construction of new BMPs within right-of-way would further minimize water quality impacts to receiving waters, and could present a cost-effective option for all or portions of CBAs (particulary in the vicinity of

environmentally sensitive areas). Stormwater management facilities will be placed adjacent to the proposed roadway right-of-way and will be positioned generally to treat just the roadway runoff to the maximum extent practical. Candidate BMPs include, but are not limited to grassed swales, vegetated buffers and filter strips, check dams, extended detention basins, water quality structures, retention basins, enhanced basins, forebays, bioretention facilities, and regional facilities.

To mitigate long-term impacts to aquatic habitats and water quality, appropriate maintenance procedures would be implemented. Application of pesticides would be restricted, especially in and around bridges and stream culverts. Special containment measures would be implemented at bridges for painting, repair, and sandblasting materials. To reduce re-discharge of pollutant-laden sediments to streams, clean-out materials from culverts, drains, and pipes would be disposed of off-site and would not be discharged to areas adjacent to surface waters. Adverse effects of winter maintenance procedures such as sanding and deicing of roadways would be reduced through use of deicing chemicals, such as calcium magnesium acetate and potassium acetate, which are biodegradable and are the most environmentally benign (FHWA, 1999). Sand used during winter maintenance ultimately accretes in detention basins necessitating periodic dredging of accumulated sediment. Dredged material would be disposed of elsewhere in an environmentally responsible manner.

4.11.2 Groundwater Resources

Potential impacts to public or private groundwater wells require careful avoidance, minimization, and mitigation procedures to prevent contamination/displacement of existing wells, and lowering of existing water tables, or degradation of groundwater quality; however, many of these variables cannot be determined quantitatively until a highway design is developed. As discussed in Chapter 3, no sole-source aquifers occur within the study area.

4.11.2.1 Environmental Consequences

Although the majority of the study area is served by public surface water supplies, 23 groundwater wells within the study area are permitted as public drinking water systems, including three wells that are part of the municipal water system of the City of Manassas Park. Figure 4.11-3 shows the location of public groundwater supply wells in the study area in relation to CBAs. Data provided by VDH indicate that public groundwater well depths are significantly greater (155 to 520 feet) than those of most residential domestic wells (typically less than 100 feet) and, therefore, are at less risk from surface contamination. Although contamination risks are substantially lower for deep wells, construction activities occurring within the wellhead protection area (defined by VDH as a one-mile fixed radius around each well) have the potential to adversely affect these public groundwater supplies (Figure 4.11-3).

The Comprehensive Plan CBA would have the greatest affects on groundwater resources by decreasing infiltration rates and resulting in construction and/or non-point source related contamination within the study area. As the longest of the proposed alignments (15.99 miles), this CBA would result in the greatest increase in impervious cover and thus, has the potential to decrease the recharge capabilities of groundwater aquifers. In addition, the Comprehensive Plan CBA would intersect the greatest number of public groundwater wellhead protection areas (seven wells; Figure 4.11-3) including protection areas for wells providing water to residents of the City of Manassas Park (Well #9) and facilities in Bull Run Regional Park. Without implementation of a pollution prevention plan, contamination of these groundwater resources could occur during construction and, subsequently, as a result of incidental non-point source pollution. The West Two and West Four CBAs would each intersect three wellhead protection areas and, thus, also have the potential to adversely affect groundwater resources; however, the affects are likely to be less. Specific impacts and the need for best management practices would be determined during the design and engineering phase of the project. As the shortest route, West Two CBA would likely result in slightly fewer impacts resulting from increases in imperviousness.

The need for local borrow pits to obtain earth materials during construction has not been determined at this phase of the project. If such a need is ascertained during the design and permitting phase of project development, borrow pits will be advanced in accordance with necessary VPDES General Permits (which will include a Pollution Prevention Plan) and other applicable state regulations and local ordinances.

Adverse affects resulting from implementation of programmed improvements associated with the No-Build alternative are possible, but cannot be quantified until more-detailed design is completed. Increases in impervious surfaces and stormwater runoff resulting from construction of supplemental turning lanes, minor adjustments to roadway construction prisms, bike and pedestrian pathways are anticipated. Such effects would be proportional to the net increase in paved surfaces and the effectiveness of best management practices employed, but are likely less than would result from implementation of any CBA.

4.11.2.2 Mitigation

Mitigation for the loss of private groundwater resources resulting from displacement or potential contamination identified during the design phases would be implemented on a case-by-case basis to any adversely affected property owner within a CBA construction area. Impacts to these resources are, however, routinely investigated during the design phase of highway projects and impacts to these local resources would be avoided or minimized to the extent practicable. Adverse affects on public groundwater resources resulting from construction can be diminished by the implementation of standard construction site BMPs. The implementation of standard construction site BMPs, including required compliance with erosion and sediment control and stormwater management regulations, would minimize or altogether preclude adverse affects related to groundwater resources. Through appropriate siting of equipment, chemical, and material storage/staging areas, construction impacts to groundwater resources would be further ameliorated. Except within low relief areas along streams and other water bodies, water tables are generally going to exist at depths below the lowest depths of typical highway construction excavation; therefore, little, if any, direct impacts are anticipated to groundwater resources at construction and excavation sites. Adverse effects to groundwater tables due to reduced infiltration capacity could be mitigated by using bio-retention, rain garden, or other infiltration technologies, which simultaneously improve stormwater quality and mitigating potential changes to peak discharges. In addition to infiltration technologies, installation of structural BMPs including detention and retention ponds and filtering systems (which include pre-treatment capabilities) would reduce pollutant loading and mitigate potential groundwater contamination. Implementation and management of appropriate short- and long-term maintenance procedures for BMPs would be necessary to maintain the stormwater retention and non-point source pollution reduction functions of these features. Public groundwater wells would not likely be displaced by any CBA; however, should displacement or contamination of a public groundwater source occur, well replacement or provision for extension of or connection to an alternate surface water supply could be implemented on a case-by-case basis. Provided all mitigation measures are implemented, negligible impact to public groundwater supplies would likely result from development of a CBA.

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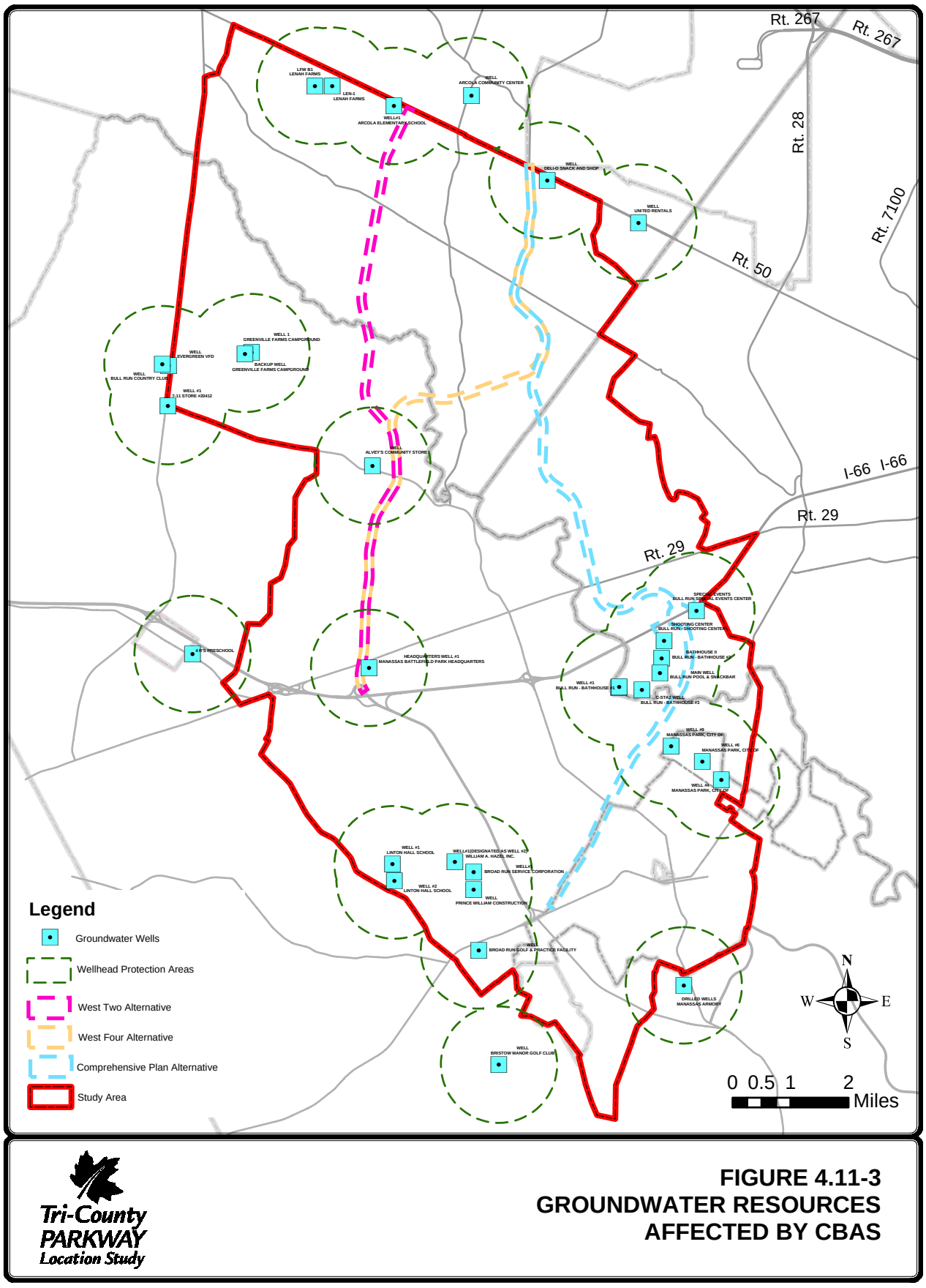


Tri-County PARKWAY Location Study

FIGURE 4.11-3
GROUNDWATER RESOURCES AFFECTED BY CBAS

4.12 NATURAL RESOURCES

More-detailed discussion of methods and finding pertaining to natural resources of the study area is provided in the Natural Resources Technical Report (VDOT, 2004).

4.12.1 Invasive Species

The introduction of non-native flora and fauna can cause significant changes to regional ecology and impact agricultural resources and recreational opportunities. Transportation systems can facilitate the spread of invasive species that could harm the environment, human health, or the economy. The disturbance associated with new construction for highways and their mitigation sites can create additional colonization potential for terrestrial and aquatic invasive species (Forman and Alexander, 1998). The land disturbance may enable invasive species to acquire a foothold in ecosystems in new areas by reducing competition, adversely affecting surface texture of soils, and changing the relative availability of life history resources including nutrients, water and light (Hobbs and Huenneke, 1992; McIntyre and Lavore, 1994). Recent discoveries of the Asian snakehead and the zebra mussel in Northern Virginia demonstrate that invasive species can occur without warning and without adequate time to react to their presence. The time, labor, and expense of controlling and managing invasive species have created a critical need to better manage construction areas to prevent and control undesirable colonization (McKnight, 1993).

4.12.1.1 Invasive Plant Species

Table 3.2-2 of the Natural Resources Technical Report (VDOT, 2004) lists invasive plant species that have been observed or have potential to occur within or near study area aquatic habitats. The checklist includes the relative invasiveness of each species, as well as the general habitat in which these species are likely to be an invasive species of management concern. Approximately 25 of the 58 species (43 percent) included on the checklist have only occasional to moderate invasiveness, and are considered less a threat to natural habitats. It is believed that, with implementation of integrated pest management and regular monitoring, populations of these 25 species would never rise to a threshold requiring more aggressive management. If encountered in the vicinity during construction phases, the remaining 33 plant species would require active management and aggressive monitoring to remain at low levels. Nine species (indicated with an asterisk in Table 3.2-2) require less vigorous management, but there are 24 species (in bold type) that likely require a concentrated effort to maintain construction areas at acceptable management levels for invasive plant species populations.

The degree to which a particular CBA is vulnerable to aquatic invasive species would be most closely correlated to the level of land disturbance, especially grading depth, and deposition of fill for above-grade structures. Proximity to the closest waterbody would also be a significant colonization factor. For purposes of this study, wetland impacts have been used as a surrogate indicator for vulnerability potential for aquatic nuisance plant species. Assuming that the frequency distribution for any invasive species colonization potential is also related to the overall length of the proposed CBA across the entire landscape, the number and area (in acres) of relative wetland fills and the number and length (in linear feet) would serve as a reasonable surrogate for potential of vulnerability. Also, the amount of land area disturbance for each alternative and corridor, both including and excluding previously developed areas can be estimated. These surrogate indicators are shown in Table 4.12-1. These data indicate that invasive species vulnerability could be closely surrogate to a number of other relative impact metrics, including alternative length, number and acreage of wetland impacts, and acreage of disturbance. The potential for invasive species colonization would be greatest for the Comprehensive Plan CBA and the least for the West Two CBA. The West Four CBA has the least risk of any CBAs. Implementation of programmed improvements associated with the No-Build Alternative would result in less impacts than conventional CBAs since the amount of infrastructure within an acquired right-of-way would not likely lead to an increased likelihood of invasive species if best management practices and invasives control measures are implemented to deter colonization and spread.

TABLE 4.12-1
INVASIVE PLANT SPECIES COLONIZATION (SURROGATE INDICATORS OF PROBABILITY)

Alternative	600-Foot-Wide Corridor		
	Stream Crossings	Wetland Impacts	Disturbance
West Two CBA	30	22.7	761.1
West Four CBA	33	36.4	823.7
Comprehensive Plan CBA	72	43.0	1,216.0
No Build	minor	minor	minor

4.12.1.2 Invasive Animals

Transportation systems can facilitate the spread of invasive animal species outside their natural range. The potential of spreading invasive species within the region would exist under each of the CBAs. Public access to stormwater management infrastructure implemented under a particular CBA will be restricted and, thus, it is not likely that inadvertent introduction vectors for invasive animals would be a significant environmental concern for any CBA. Current VDOT policies restrict stormwater managment ponds and other facilities from public use. This would have a favorable effect of restricting the possibility of accidental introductions of undesirable animals such as beavers, Canada geese, and nutria. Efforts to control water-dependent nuisance animals would be included in any construction contract documents. Should invasive animal species get introduced into a new CBA right–of-way, VDOT would implement contract special conditions, or agencies could impose permit special conditions to monitor and manage any constructed water resources and or drainage infrastructure for aquatic invasive species. The CBA requiring the least number of stormwater management facilities and stream crossings will have the least potential risk of accidental invasive animal introductions, even with access restrictions and implementation of best management practices. Contract special provisions and monitoring requirements would have the net effect of identifying and controlling invasive animals before a population of invasive aquatic nuisance species becomes established. The spread of invasive species in the study area is unlikely to occur under implementation of programmed improvements associated with the No-Build Alternative. Evaluation of the potential effects of invasive species would be addressed for each programmed improvement during permitting and design phases of development.

4.12.1.3 Mitigation of Invasive Species Mitigation

Appropriate preventative measures would be implemented for any CBA so that invasive plant species and weed seed would not be introduced into a corridor during construction on equipment or through the use of imported mulch, soil, gravel, or sod. Potential methods to eliminate and control invasive plant and animal species are inherent in VDOT's *Road and Bridge Specifications* (the "Specifications Manual"). In using the Specifications Manual, construction of a CBA or any programmed improvements associated with the No-Build Alternative, would minimize the potential for encroachment or establishment of invasive species. In order to effectively control invasive species, contractors' bidding packages must include specific provisions that manage acquired rights-of-way for invasive species control by implementing the VDOT *Road and Bridge Specifications* applicable to the circumstances. While rights-of-way are at risk from invasive species colonization from adjacent properties, implementing these provisions would reduce or minimize potential for introduction, proliferation, and spread of invasive species. VDOT will not plant prohibited noxious-weed seeds along the corridor of a CBA, should one be selected as the preferred alternative. All seeds used by VDOT are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications to ensure that there are no prohibited noxious-weed seeds in the seed mixes. VDOT would work with the Virginia Department of Agriculture and Consumer Services to implement a plan to restrict the spread of any invasive species found to be present within a corridor prior to construction. Preventative measures that would be employed include the inspection and cleaning of construction equipment, commitments to ensure the use of invasive species-free mulches, topsoils and seed mixes, the VDOT requirement that cut slopes be seeded within 48 hours of being exposed, and eradication strategies to be deployed should invasion occur.

4.12.2 Terrestrial Ecology, Biodiversity and Wildlife Habitat

The study area provides a wide range of habitat for wildlife. The following sections describe the potential effects to the various terrestrial habitats and community types by each alternative under consideration.

4.12.2.1 Environmental Consequences

Figure 4.12-1 illustrates types of forest lands located within CBA assessment corridors. Figure 4.12-2 illustrates agricultural lands and transitional lands (primarily old fields) located within CBA assessment corridors. No National Forests, National Wildlife Refuges, or known unique or significant communities ("unique or state significant natural communities" of VDCR, Division of Natural Heritage terminology) would be affected by any of the CBAs.

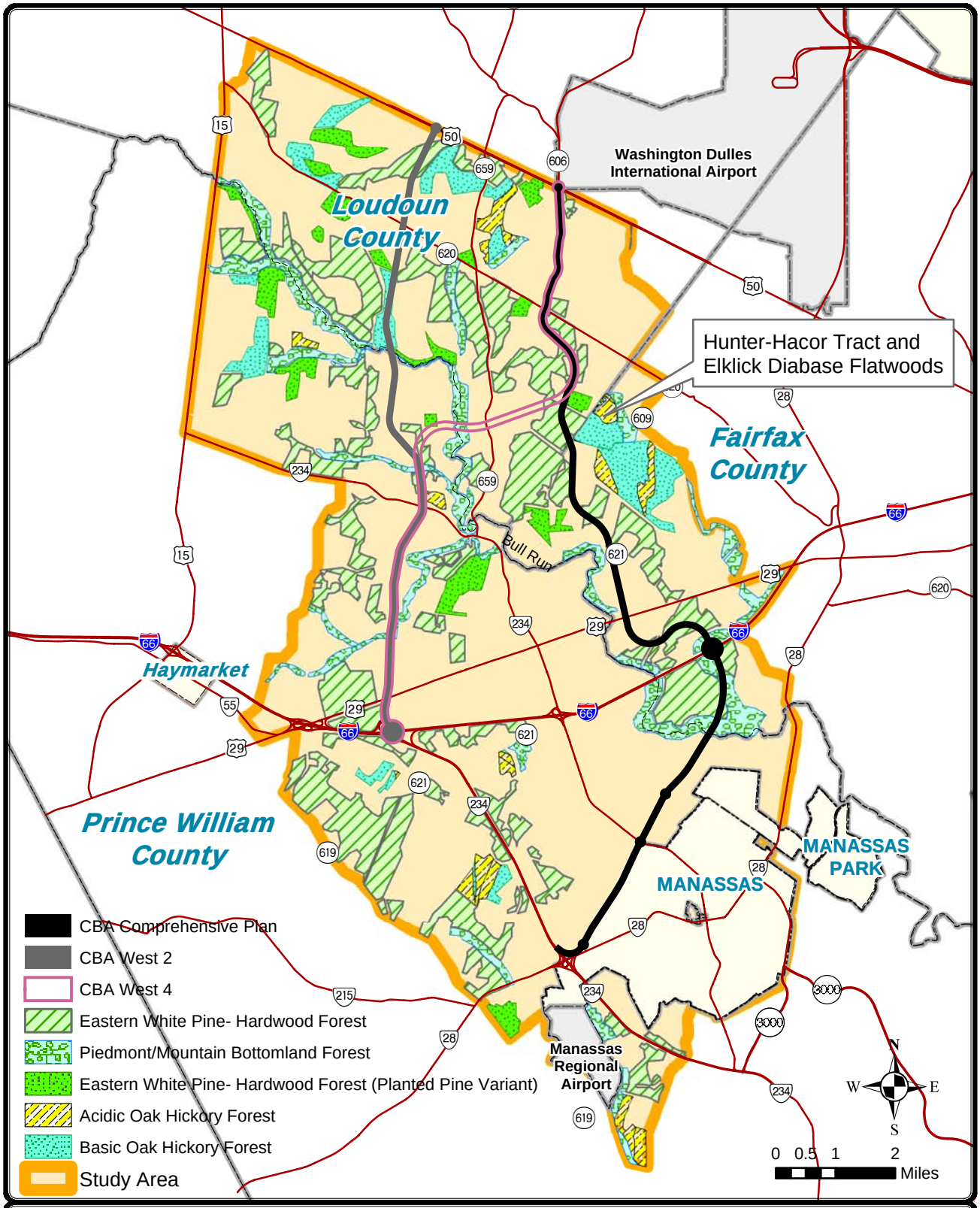
Construction of any of the CBAs would result in affects to forest lands, agricultural lands (primarily crop and pasture), and transitional lands. In addition, the wildlife habitat associated with these land cover types and the regional biodiversity would also be affected by construction and operation of the roadway. The CBAs would affect the terrestrial plant communities and the associated wildlife habitat due to the conversion of the existing land to paved road surfaces and maintained right-of-way. This conversion would result in the permanent loss of wildlife habitat, timber, and agricultural resources. Using a 600-foot-wide assessment corridor, the areas affected under each of the CBAs are provided according to land cover classification in Table 4.12-2. Overall, the Comprehensive Plan CBA would result in the greatest total of combined affects to terrestrial habitat at approximately 701.1 acres. In addition, the Comprehensive Plan CBA would likely have the greatest impact on biodiversity because it would cause the greatest amount of conversion of natural communities of the CBAs.

It is reasonable to assume that a certain amount of minor effects to forest lands, agricultural lands, and transitional lands will occur during implementation of programmed improvements associated wit the No-Build alternative; however, the current level of design for such improvements does not allow for quantification of such effects at this point in time.

TABLE 4.12-2
TERRESTRIAL ECOLOGY AND HABITAT

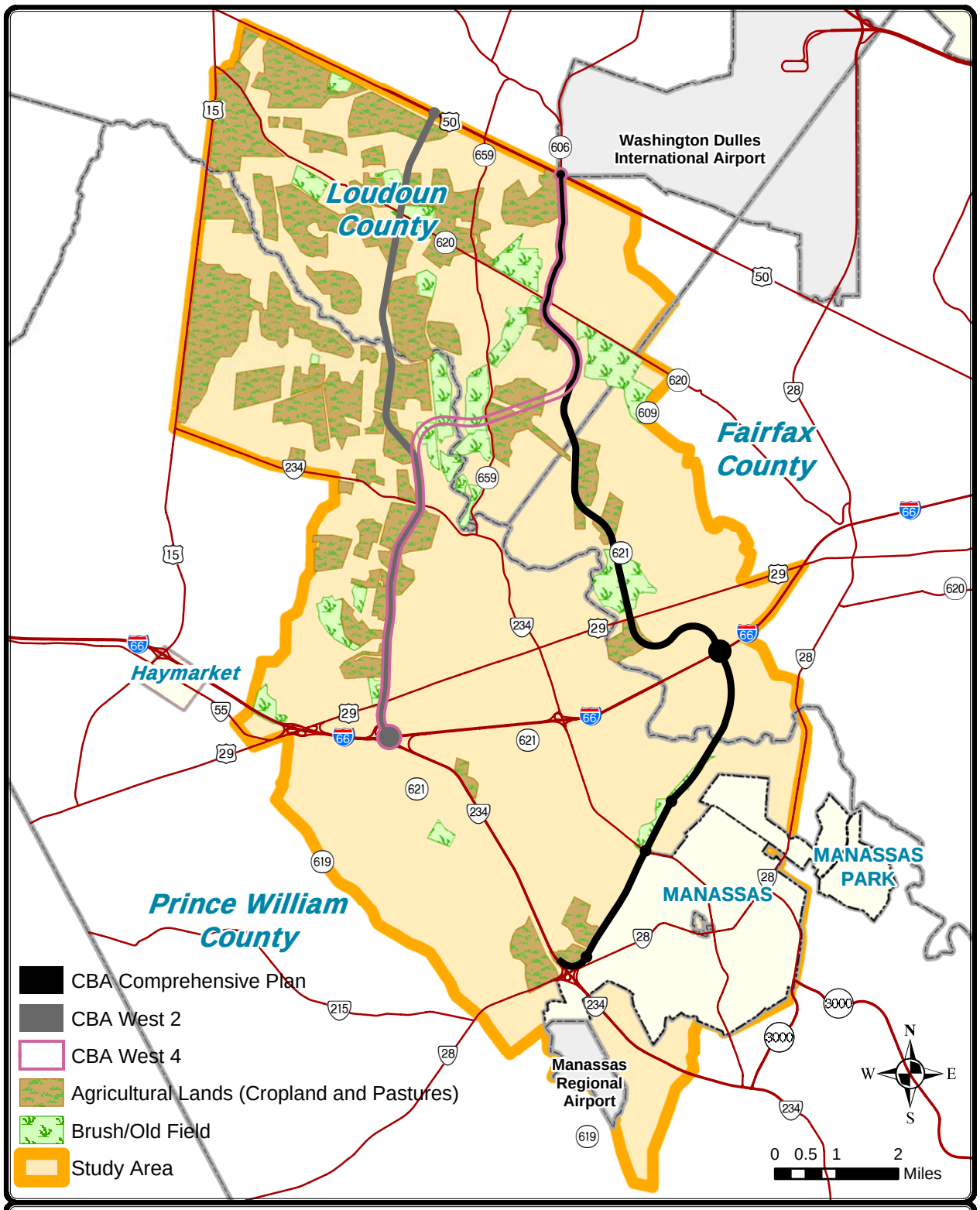
Alternative	Forest Type In Acres				Agricultural Lands in Acres	Transitional Lands In Acres
	Deciduous (Upland & Bottomland Hardwood)	Evergreen (Primarily Pine/Cedar Forests)	Mixed Hardwood/ Pine	Total		
West Two CBA	152.0	96.3	89.8	338.2	202.4	31.5
West Four CBA	138.3	72.0	67.1	277.5	223.8	81.1
Comprehensive Plan CBA [1]	179.2	154.5 (63.7)	118.7	440.3	140.2	137.8
No-Build	minor	minor	minor	minor	minor	minor

[1]Includes impacts associated with proposed interchange at Interstate 66.



Tri-County PARKWAY Location Study

FIGURE 4.12-1
FOREST TYPES



Tri-County PARKWAY Location Study

FIGURE 4.12-2
AGRICULTURAL AND TRANSITIONAL LANDS

Total forest resources in the Tri-County region is estimated at 280,000 acres (VDF, 2003). Forest communities lost through conversion to highway right-of-way would represent about 0.1 percent of the regional total under the West Two CBA, about 0.1 percent under the West Four CBA, and about 0.2 percent under the Comprehensive Plan CBA. The conversion of forest due to construction of any of the CBAs would represent a relatively small percentage of the forest lands in the Tri-County region. The potential loss of the timber resources associated with the forest lands would be offset by other benefits to the regional economy following the completion of the roadway construction. Forest communities that would not be affected by the construction of the roadway are widespread throughout the Tri-County region; thus mobile wildlife species inhabiting affected areas could be absorbed into adjoining forest communities with no long-term adverse affects.

The construction of any of the CBAs would have direct and indirect effects to migratory birds and wildlife corridors due to habitat fragmentation from the construction of a roadway, from vehicle collisions with birds and wildlife, and from noise impacts. Although, wildlife corridors and foraging and nesting areas would be disrupted, most of the species living in this area have already adapted to this type of fragmented environment and most of the migratory birds and wildlife could be absorbed into adjoining communities. Some bird species that are regulated under the Migratory Bird Treaty Act could lose foraging and nesting sites from the construction of a roadway. The single-most valuable type of habitat for migratory birds of the region is interior forest habitat. The Comprehensive Plan CBA would result in the loss or alteration of approximately 87 acres of interior forest habitat (within the Bull Run Regional Park and within forests along the Loudoun/Farifax county line), while the West Two CBA would affect approximately 12 acres of interior forest habitat just south of Route 50. The West Four CBA would affect edge and outer forest habitat only.

No raptor nesting sites were observed during the field reconnaissance of the CBAs. Compared to the regional total, only a small percentage of forest land would be converted to highway and associated right-of-way; however, a new highway would serve as a physical barrier to most wildlife species. It can be expected that the frequency of wildlife-vehicle collisions would increase as additional roadway is added to the regional transportation network and additional land is converted as a result of secondary development. Segments of CBAs constructed on new alignment would affect existing wildlife corridors located in the study area. The most extensive wildlife corridors that would be bisected by new alignment are as follows:

- Bull Run Regional Park from Bull Run north to Interstate 66 in Fairfax County, which is bisected by Segment E of the Comprehensive Plan CBA;
- Route 234 north to Catamount Creek in Prince William County, which is bisected by Segment C of the West Two and the West Four CBAs;
- Bull Run east to Route 659 in Prince William County, which is bisected by Segment G of the West Four CBA; and
- Bull Run north to Route 705 in Loudon County, which is bisected by Segment D of the West Two CBA.

Implementation of programmed improvements associated with the No-Build Alternative should not significantly impact the terrestrial ecology, biodiversity, or wildlife habitat in the project area; however, evaluation of the potential effects to terrestrial ecology, biodiversity, and wildlife habitat would be required if any future component involves major new construction.

4.12.2.2 Mitigation

Construction of new highway would convert both forest lands and agricultural lands to maintained vegetation communities and pavement. The remaining vegetated area within the right-of-way would provide limited and undesirable wildlife habitat, particularly for bird and insect species. Use of plantings that will not attract wildlife to rights-of-way, construction of wildlife fences, and construction of wildlife crossings will serve to minimize right-of-way impacts to wildlife. Cut and fill would be minimized to the maximum extent necessary to ensure structural stability of the slope and appurtenant features. The implementation of BMPs, erosion and sediment control, and minimizing the roadway footprint would minimize the impacts to adjoining communities and habitat.

Where feasible, passageways for terrestrial and riparian wildlife will be maintained beneath proposed bridges and certain elevated structures to help minimize effects of wildlife corridor bisection. Fencing will be employed to help minimize vehicle-wildlife collisions and to help direct wildlife towards maintained

passageways. Practicable mitigation measures to minimize effects of habitat fragmentation will be further developed and designed prior to preparation of permit applications. FWS typically recommends that direct effects to terrestrial natural communities and associated adverse effects upon regional biodiversity be mitigated through such means as habitat restoration/ enhancement, conservation initiatives, riparian corridor restoration, establishing vegetated buffers along field edges for edge habitat, and upland forest corridor restoration. Opportunites for restoration of degraded stream segments and their riparian buffers exist along Flat Branch, Russia Branch, and several unnamed tributaries within and adjoining the cities of Manassas and Manassas Park. Payment-in-lieu to the Virginia Department of Game and Inland Fisheries for purchase of lands for enlargement of Wildlife Management Areas will be considered as one means of mitigation that could be reasonably pursued under the current regulatory environment. Such acquisition would be targeted at restoring, enhancing, or preserving forest lands critical to establishment or maintenance of wildlife corridors and migratory bird habitat within the region, as set forth in the "Resource Protection" mission goal of the Blueprint for the Future of Migratory Birds: Migratory Bird Program: Strategic Plan 2004-2014 (U.S. Dept. of the Interior, Fish and Wildlife Service, 2004). Mitigation measures such as expanding the size of existing Natural Area Preserves (NAPs) also will be considered in cooperation with the Virginia Division of Natural Heritage and The Nature Conservancy.

Mitigation (in the form of impact minimization) for loss of interior forest habitat valuable to migratory birds under the Comprehensive Plan CBA could be provided by selecting either the West Two or West Four CBA or through preservation of similar habitat within the region. Mitigation (in the form of impact avoidance) for loss of interior forest habitat under the Comprehensive Plan and West Two CBAs could be provided by selecting the West Four CBA.

4.12.3 Aquatic Ecology and Wildlife Habitat

Aquatic wildlife in the study area includes many common species that are generally adaptable to disturbed, suburban areas; however, other animals are also present that are more indicative of more-natural habitats. The existing wildlife assemblage within the study area has a variable degree of dependence on existing land use and vegetation cover in the area. Potential impacts to wildlife dependent upon aquatic resources including wetlands, streams, and ponds are described below and in more detail in the Natural Resources Technical Report (VDOT, 2004).

Of the aquatic biota potentially affected by implementation of a CBA, macrobenthic organisms, fish, and freshwater mussels would be the most sensitive to direct highway construction impacts and aquatic ecosystem degradation. Mussels were found at many larger perennial stream crossing locations on all CBAs throughout the study area. Macrobenthic organisms were also observed in larger and smaller stream crossing locations. In the absence of erosion and sediment control measures, these groups would be vulnerable to stream siltation during construction.

Temporary impacts to aquatic wildlife would be primarily related to land disturbance activities that remove vegetative cover of wetlands, streams, and ponds. Removal of cover would result in animal migration away from disturbance, creating competitive advantage for edge-dwelling organisms. Incidental mortality from construction activity may result in a temporary decrease in populations in some groups. Removal of riparian vegetation would pose a long-term adverse effect upon in-stream habitat by reducing or eliminating sources of snags and course bottom detritus (Angermeier, et al, 2004).

With respect to evaluation of each CBA, a reasonable analog for aquatic wildlife impacts can be made by substituting anticipated floodplain impacts (see section 4.12.5), since most aquatic animals would optimally utilize areas comprising the floodplain for many of their life history requirements. The comparative data support this theory. Previous investigations indicate that, in northern Virginia, a relationship between wetland and stream impacts and quality of aquatic wildlife habitat exists (Jones *et al.*, 1996; 1997). Impacts to benthic macroinvertebrates, fish, and crustaceans which rely primarily on in-stream resources can also be related to estimates of linear stream impacts within the proposed construction footprint, as well as analyzed in light of existing habitat quality and benthic community data. Impacts to benthic and in-stream communities are discussed separately below.

4.12.3.1 Aquatic Habitat Impacts

Using floodplain encroachments as an indicator of reasonably foreseeable effects to aquatic habitat, the West Two CBA would result in the least number of floodplain encroachments (eight) and the least amount of overall impact (26.4 acres) (see Figure 4.5-1 of the Natural Resources Technical Report (VDOT, 2004)). The West Four CBA would result in 11 encroachments or 36.3 acres of encroachment. As the longest alternative, the Comprehensive Plan CBA involves the greatest number of crossings (12) and the greatest acreage of encroachment (281.1 acres).

The net increase in impervious surfaces resulting from the construction of a CBA or construction of a programmed improvement associated with the No-Build Alternative could increase peak rates of discharge to receiving waters, thus resulting in an increased amount of stormwater to retain and treat. Increased volumes of stormwater resulting from any additional infrastructure or impervious surfaces does not, however, necessarily translate into worse water quality in receiving waters when appropriate best management practices are employed.

More-meaningful consideration of any impacts resulting from implementation of a programmed improvement associated with the No-Build Alternative requires specific preliminary engineering and design plans; however, displacement of wetlands or waters of the U.S. are a foreseeable indirect impact with implementation of any improvements that require additional infrastructure within acquired right-of-way. Increased volumes of stormwater could result from additional infrastructure or impervious surfaces, such as satellite parking lots, HOV lanes, utility extension, hiker/biker trails, etc.

4.12.3.2 Benthic and In-Stream Communities

The Comprehensive Plan CBA will result in the greatest impacts to benthic and in-stream resources within the study area. Implementation of the Comprehensive Plan CBA could result in water quality degradation, potential loss of species from the study area, reduction of genetic diversity in remaining populations, and loss of aquatic life. Aquatic habitat losses of 46,875 linear feet of stream would be impacted as a result of Comprehensive Plan CBA implementation, compared to 22,410 linear feet for the West Four CBA. Stream impacts associated with the West Two CBA would be 24,291 linear feet. Greater stream impacts under the Comprehensive Plan CBA is due to the need for a major crossing (spanning approximately 15,000 linear feet over Cub Run, Bull Run, and Flat Branch) for construction of the proposed Interstate 66 interchange. Impacts to benthic communities or fish are anticipated to be minimal for any programmed improvements associated with the No-Build Alternative, as they are not anticipated to require additional stream crossings.

4.12.3.3 Aquatic Wildlife Resources Mitigation

Options for mitigation include restoration and/or reforestation of habitat, riparian communities, and floodplain or the establishment of vegetated buffers along field edges (USFWS, 2002). Opportunites for restoration of degraded stream segments exist along Flat Branch, Russia Branch, and several unnamed tributaries within and adjoining the cities of Manassas and Manassas Park. Should one of the CBAs be selected, areas suitable for riparian buffer establishment will be further evaluated during the preliminary design phase for purposes of on-site habitat restoration.

Essential Fish Habitat (EFH) is not designated for any waterways within the study area; however, the Potomac River, which is the receiving tributary for study area streams, does have EFH designation. Due to comparatively large distances between the CBAs and EFH of the Potomac River and due to anticipated implementation of best management practices during construction, none of the CBAs are expected to adversely affect Potomac River EFH. The COE may make a preliminary determination that implementation of a CBA would not have a substantial adverse effect on EFH and, therefore, further EFH consultation would not be required during the permit process. Depending on comments that may be received from the National Marine Fisheries Service in response to any COE permit Public Notice, further EFH consultation may be necessary. With the exception of the American eel (Appendix C of the Natural Resources Technical Report (VDOT, 2004)), no other anadromous fish appear to create a significant fisheries concern with respect to special construction affects from implementation of any CBAs.

All aquatic impacts will not necessarily be permanent. Highway crossings of streams can obstruct movements of aquatic organisms by altering flow velocity, stream geometry, and gradients. Due to the standard regulatory requirement of countersinking road crossing culverts, hydrologic connectivity can be maintained so as to reduce the mortality of and increase mobility of affected aquatic organisms. Additionally, culverts would be designed to maintain low-flow channels to minimize the possibilities for obstructing aquatic organism passage. Integrated aquatic organism movements are discussed in detail by National Research Council (1992), and measures to ameliorate unavoidable impacts to aquatic resources could be implemented for the CBAs. Through such means, affected aquatic and benthic organism populations could recover and re-establish in some areas to a measurable degree compared to prior existing conditions. The success of this recovery will be enhanced by implementation and maintenance of both erosion and sediment control and stormwater best management practices. Additionally, the FHWA has developed resources that implement well-researched practices, structures, and engineering solutions in order to reduce aquatic wildlife resource impacts (FHWA, 2000; 2004). To avoid or minimize localized temporary siltation of streams, site-specific measures to monitor and control siltation would be required in VDOT contract bid packages and water quality permits issued by the regulatory agencies. At the design phase, VDOT will assess appropriate means to incorporate cost-effective features into the highway design.

4.12.4 Waters of the U.S., Including Wetlands

Potential affects to waters of the U.S., including wetlands, were determined both quantitatively and qualitatively for each CBA (for a 200-foot-wide average limits of construction and a 600-foot-wide study assessment corridor) and the No-Build (Table 4.12-1). Included in the Natural Resources Technical Report (VDOT,2004) is a detailed description of the methods used to identify and delineate CBAs for the 600-foot-wide corridors. Also included in the Technical Report is an assessment of the wetland functions and values that are adversely affected by implementation of each CBA based on a 200-foot corridor.

Table 4.12-1
SUMMARY OF EFFECTS TO WATERS OF THE U.S. BY ASSESSMENT CORRIDOR WIDTH

ALTERNATIVE	200-FOOT AVERAGE LIMITS OF CONSTRUCTION			600-FOOT STUDY CORRIDOR		
	No. Stream Crossings	Streams Affected (acres)	Wetlands Affected (acres)	No. Stream Crossings	Streams Affected (acres)	Wetlands Affected (acres)
West Two CBA	26	9,585	9.8	30	24,077	22.7
West Four CBA	23	7,823	9.6	33	22,196	36.4
Comprehensive Plan CBA	41	15,188	17.8	72	48,767	49.3
No-Build	undetermined	minor	minor	undetermined	minor	minor

4.12.4.1 Navigable Waters

During the early coordination and scoping process, the Norfolk District COE did not identify any waters within the study area as navigable waters of the U.S. There is a low likelihood that any U. S. Coast Guard approvals for crossings of navigable waters would be necessary because there does not appear to be any navigable waters in the study area subject to permit requirements of the 1899 Rivers and Harbors Act, as amended. Final determination about the existence of navigable waters would be determined during the permit application process for the selected alternative.

4.12.4.2 Wetlands

Wetland impacts for each CBA are depicted in Figure 4.12-1 through Figure 4.12-14. Potentially affected wetlands are tabulated by alternative, assessment corridor width, cover type, and area in Table 4.12-4.

The Comprehensive Plan CBA includes construction of a new interchange at I-66. The COE typically considers all aquatic resources located within loop-and-ramp interchange footprints to be impacted for permitting purposes. Accordingly, impacts to resources within proposed interchange loops and intra-ramp areas are categorized as losses as part of this assessment. Considering a minimum circumferential interchange construction footprint of 1,000 feet to account for loops, ramps, retaining walls, approaches, elevated fills, crossovers and similar infrastructure, wetland impacts were estimated at 6.3 acres. Of this 6.3 acres, approximately 3.3 acres are forested wetlands and 3.0 acres are emergent wetlands. In total, the 600-foot-wide assessment corridor and the new I-66 Interchange footprint for the Comprehensive Plan CBA contain the most wetland impacts (49.3 acres). Applying a 200-foot-wide average limits of construction, 17.8 acres of wetlands would be affected by construction of the Comprehensive Plan CBA.

Approximately 36.4 acres of wetlands are located within the 600-foot-wide study assessment corridor of the West Four CBA. Applying a 200-foot-wide average limits of construction, approximately 33 acres of wetlands would be affected by construction of the West Four CBA. At approximately 22.7 acres within the 600-foot-wide study assessment corridor and 9.8 acres within the 200-foot-wide average limits of constructin, the West Two CBA would result in the least amount of wetland impacts.

The effect of proposed wetland impacts resulting from implementation of each alternative varies both among wetland cover type, acreage, and by watershed. In terms of relative wetland cover type, the wetland type most adversely affected by any of the CBAs would be palustrine forested (PFO) wetlands. The wetland type with the least amount of impact would be the palustrine scrub-shrub (PSS) type. The majority of potential impacts would be to PFO wetlands for the Comprehensive Plan CBA and the West Four CBA; however, the majority of impacts to the West Two CBA would be palustrine open water (PUBh/POWh). Palustrine emergent (PEM) impacts are approximately one acre greater for the Comprehensive Plan CBA than the other two CBAs, and most significantly, the Comprehensive Plan CBA and The West Four CBAs have more than 20 times greater the amount of palustrine scrub-shrub (PSS) wetland impacts than the West Two CBA (Table 4.12-4). The vast majority of impacts occur in jurisdictional wetlands, which are regulated by both the COE and VDEQ. Isolated wetlands and waterbodies that will be determined to be non-jurisdictional by the COE are regulated by the VDEQ. The areas of isolated wetlands impacted by the CBAs in aggregate are estimated at only 0.20 acres.

Within the study area, the Bull Run watershed would be disproportionately affected by the implementation of the CBAs, while relatively small impacts would occur as a result of implementation of CBAs that affect the Broad Run and South Fork watersheds This summary analysis has significant implications for the relative practicability and cost effectiveness of compensatory mitigation, as the standard ratios for impacts are twice as great for palustrine forested wetlands as compared to impacts to open water systems. Additionally, the cost to mitigate for open water impacts would be far less and have a far greater chance of success than those associated with palustrine forested wetlands, which are the most difficult type to recover lost functions and values for highway project impacts (National Research Council, 1996; 2002). Additionally, the potential for successful on-site open water habitat mitigation is far greater than those for other vegetated habitats.

Based on the current level of plan development, it cannot be determined whether any programmed improvement associated with the No-Build Alternative would result in wetland impacts. Development scenarios for such improvements could cause wetland and stream impacts although it is expected that impacts would be much less than the those associated with the CBAs. Examples of additional aquatic resource impacts might include ancillary fills associated with signal technologies, utility access roads, additional drainage required for added impervious surfaces, or satellite parking lots, access ramps, and bus lane extensions. Actual impacts to aquatic resources resulting from implementation of any programmed improvement associated with the No-Build Alternative may only be relatively minor, but could foreseeably exceed general permit thresholds for these features. Additional studies during preliminary design would be required to quantify any impacts associated with such improvements.

4.12.4.3 Wetlands on National Park Service Property

Table 4.12-3 summarizes the Director's Order 77-1 wetlands determinations for NPS property on the West Two and West Four CBAs. There are no wetland impacts on the Comprehensive Plan CBA and No-Build Alternatives affecting NPS property, thus Director's Order 77-1 does not apply to these CBAs. Approximately 3,695 linear feet of two perennial stream channels (mean 4 to 5 feet width) that occupy approximately 0.08

acre fall within the 600-foot-wide assessment corridors, while 418 linear feet (0.03 acre) fall within the 200-foot-wide average limits of construction. Five wetland systems, totaling approximately 2.53 acres, would be affected within the 600-foot-wide assessment corridors. Within the 200-foot-wide average limits of construction, the West Two CBA would affect 0.34 acres of wetlands while the West Four CBA would affect 0.33 acres of wetlands. However, there appear to be prudent and feasible alternatives that avoid any use of property from the Manassas National Battlefield Park (see Section 4(f) Evaluation) that would eliminate these wetland and stream impacts. Should comments be submitted on the DEIS that raise questions about the prudence and feasibility of the avoidance alternatives, then coordination with the NPS will be required pursuant to Director's Order 77-1 requirements to finalize compensatory mitigation for the displacement of these resources on NPS property as a result of implementation of either the West Two or West Four CBAs.

TABLE 4.12-3
SUMMARY OF DIRECTOR'S ORDER 77-1 WETLANDS ON NPS PROPERTY
WITHIN AFFECTED ALTERNATIVES

Resource	200-Foot-Wide Average Limits of Construction			600-Foot-Wide Study Assessment Corridor		
	No-Build	West Two	West Four	No-Build	West Two	West Four
Vegetated Wetlands (acres)	0.00	0.34	0.33	0.00	2.53	2.53
Streams (acres)	0.00	0.03	0.03	0.00	0.09	0.09
Streams (linear feet)	0.00	418	418	0.00	3,695	3,695
Open Waters	0.00	0.00	0.00	0.00	0.00	0.00

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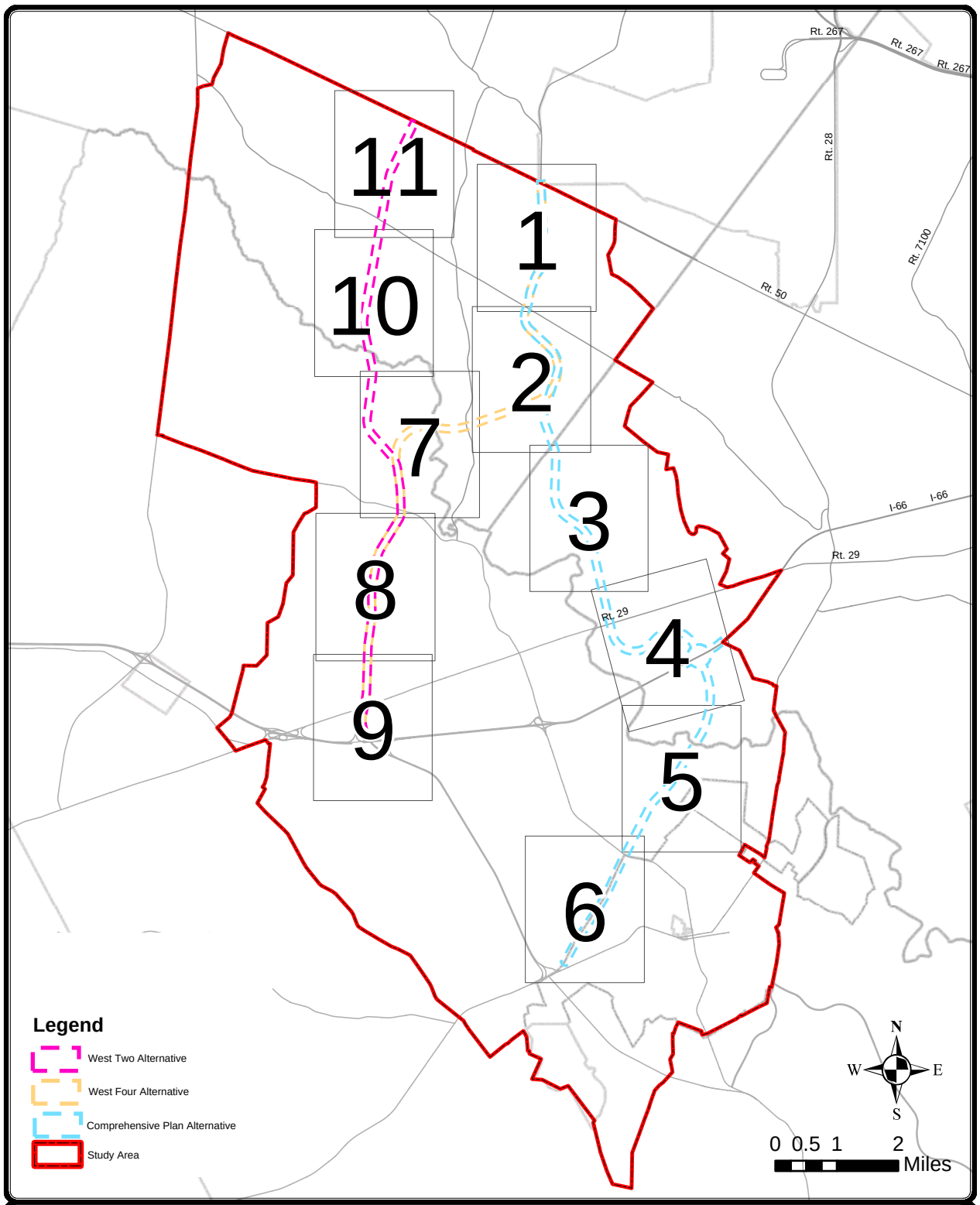
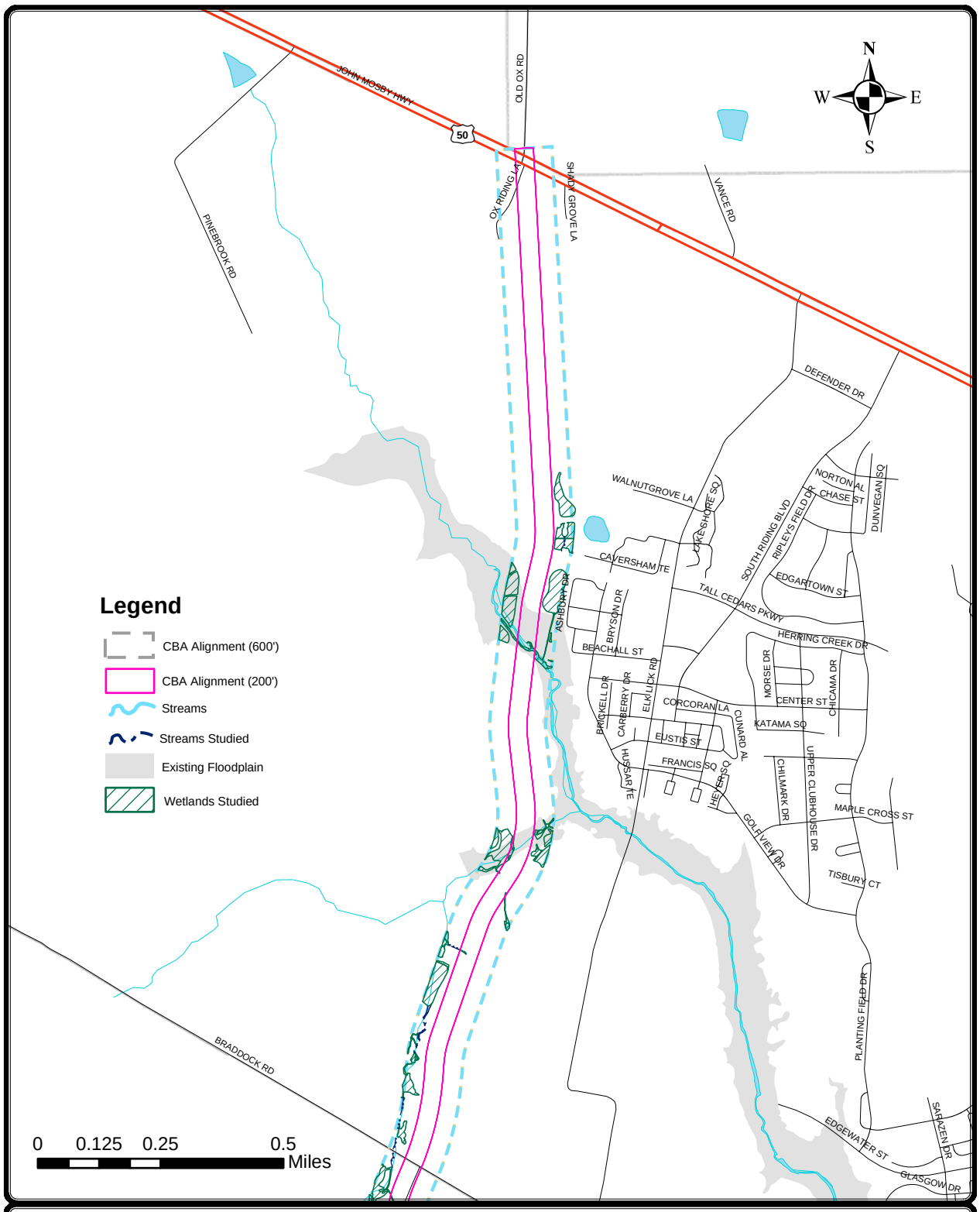


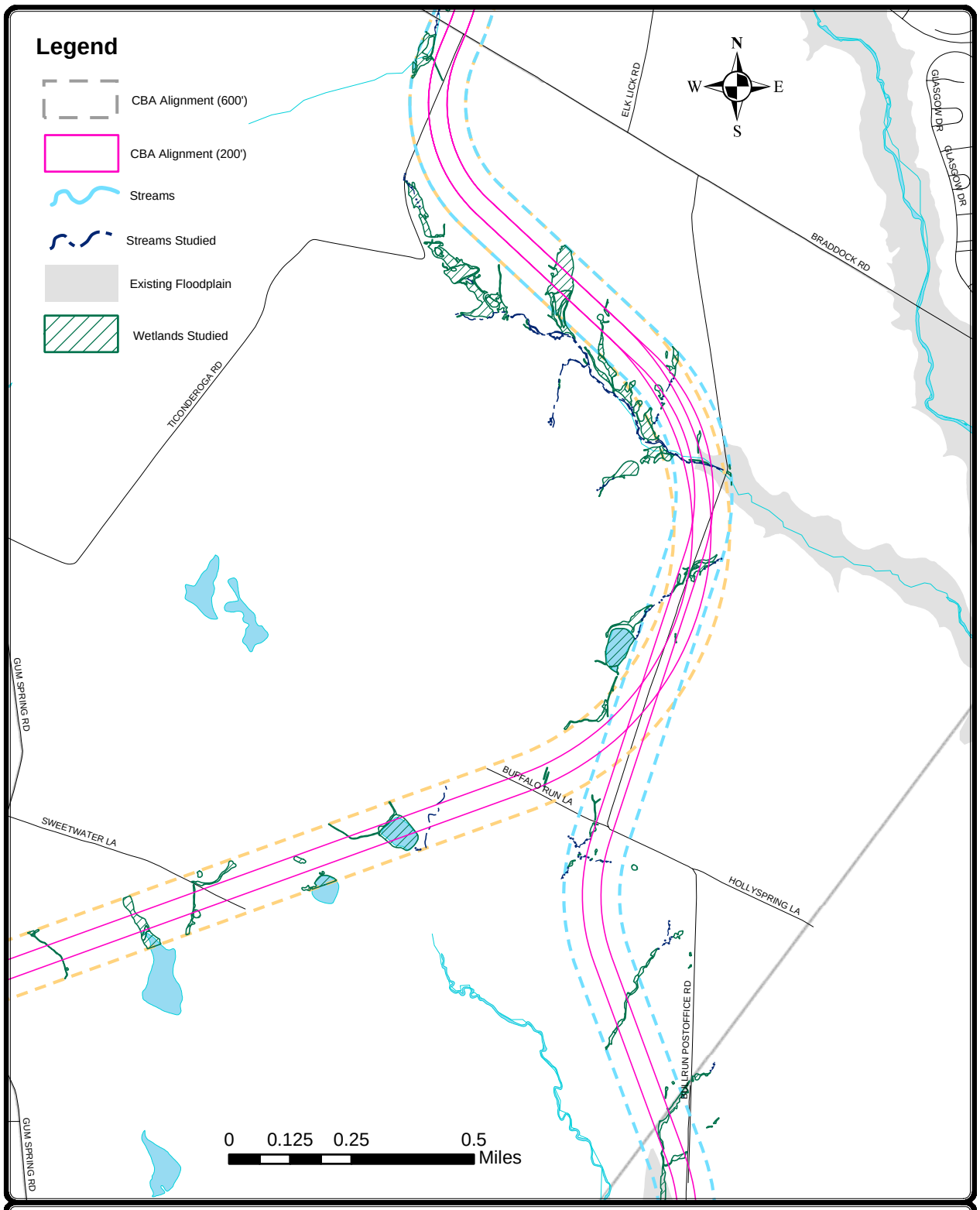
Tri-County PARKWAY Location Study

FIGURE 4.12-3
DELINEATED WATERS OF THE U.S.
MAP INDEX SHEET



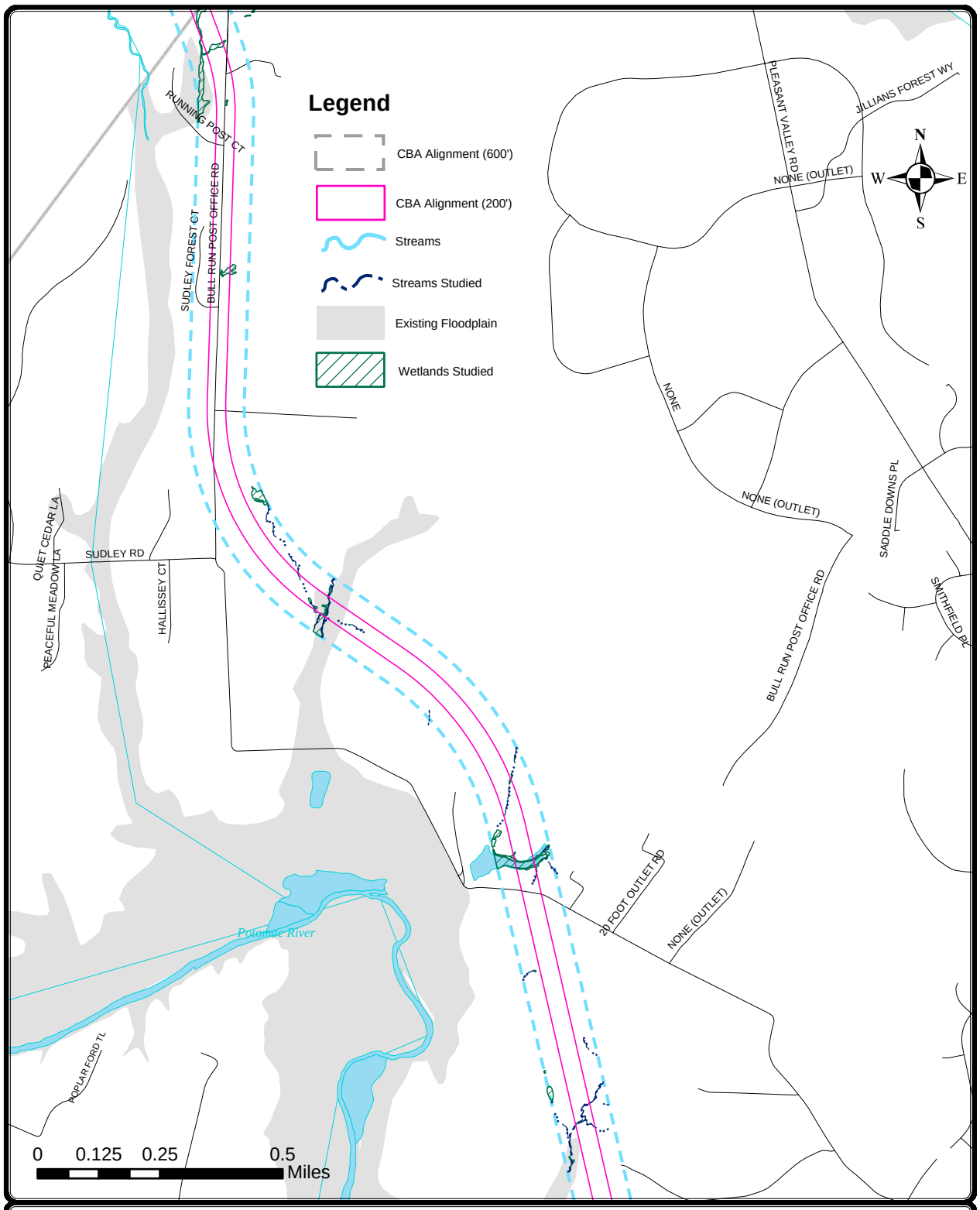
Tri-County PARKWAY Location Study

FIGURE 4.12-4
DELINEATED WATERS OF THE U.S.
SHEET 1



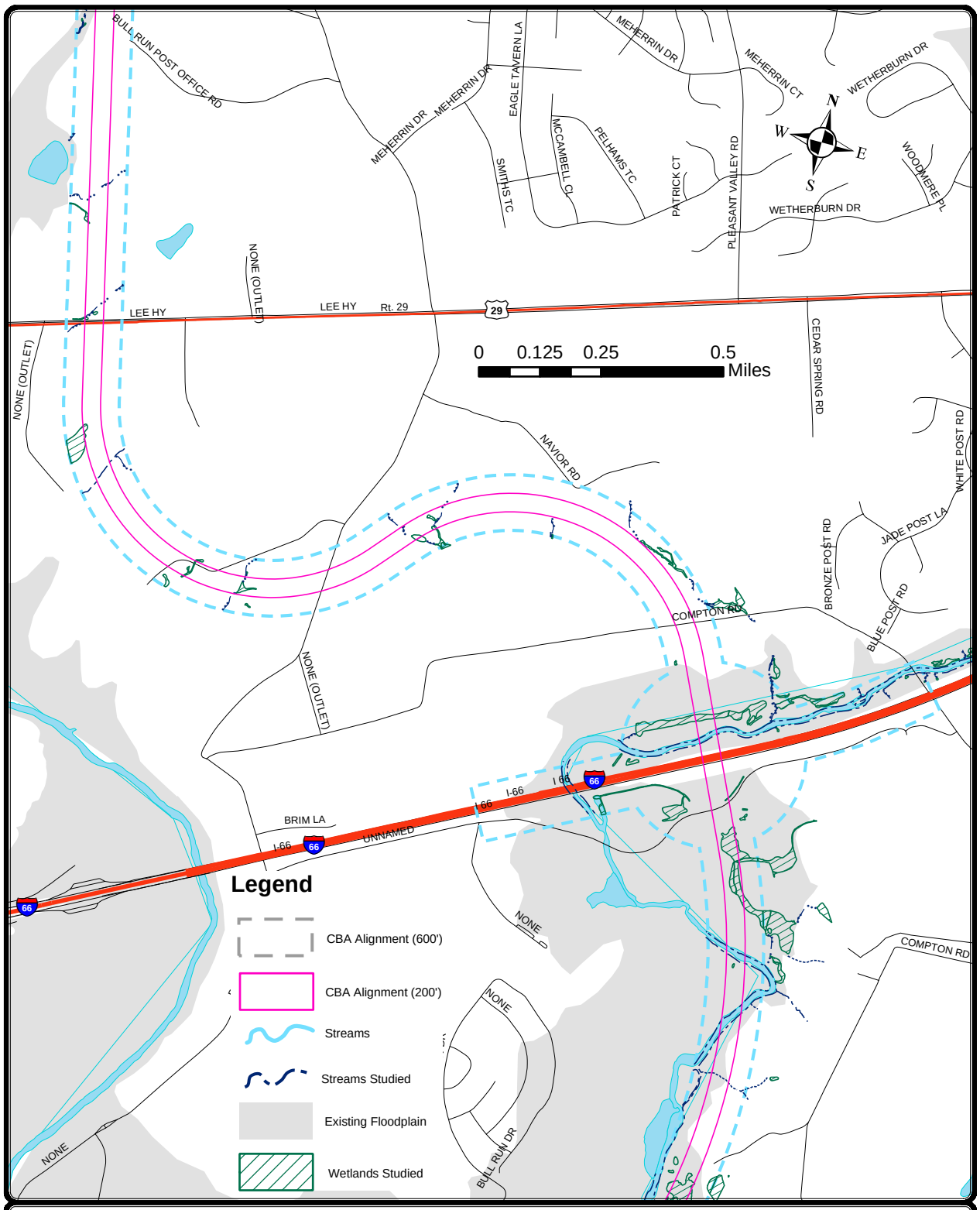
Tri-County PARKWAY Location Study

FIGURE 4.12-5
DELINEATED WATERS OF THE U.S.
SHEET 2



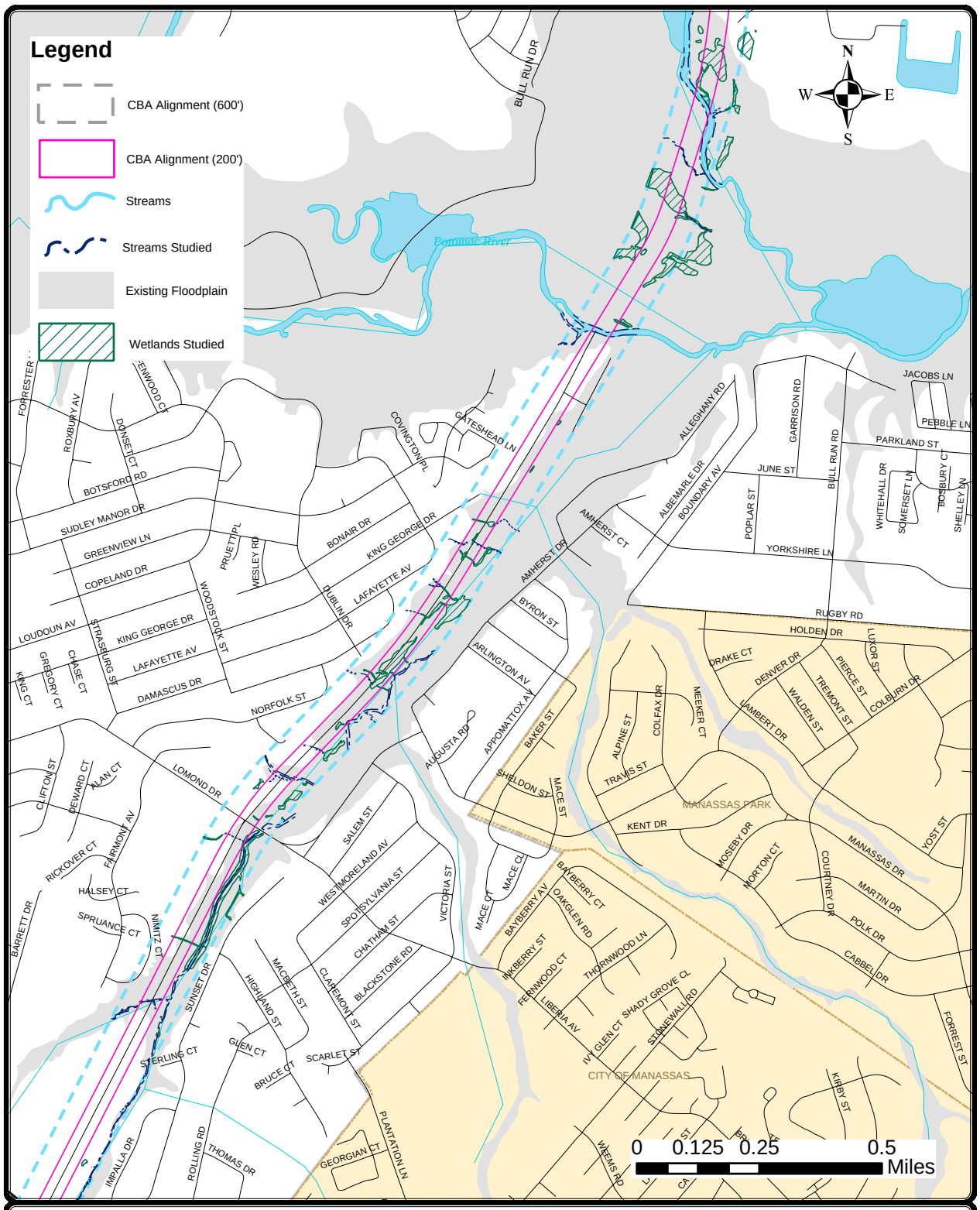
Tri-County PARKWAY Location Study

FIGURE 4.12-6
DELINEATED WATERS OF THE U.S.
SHEET 3



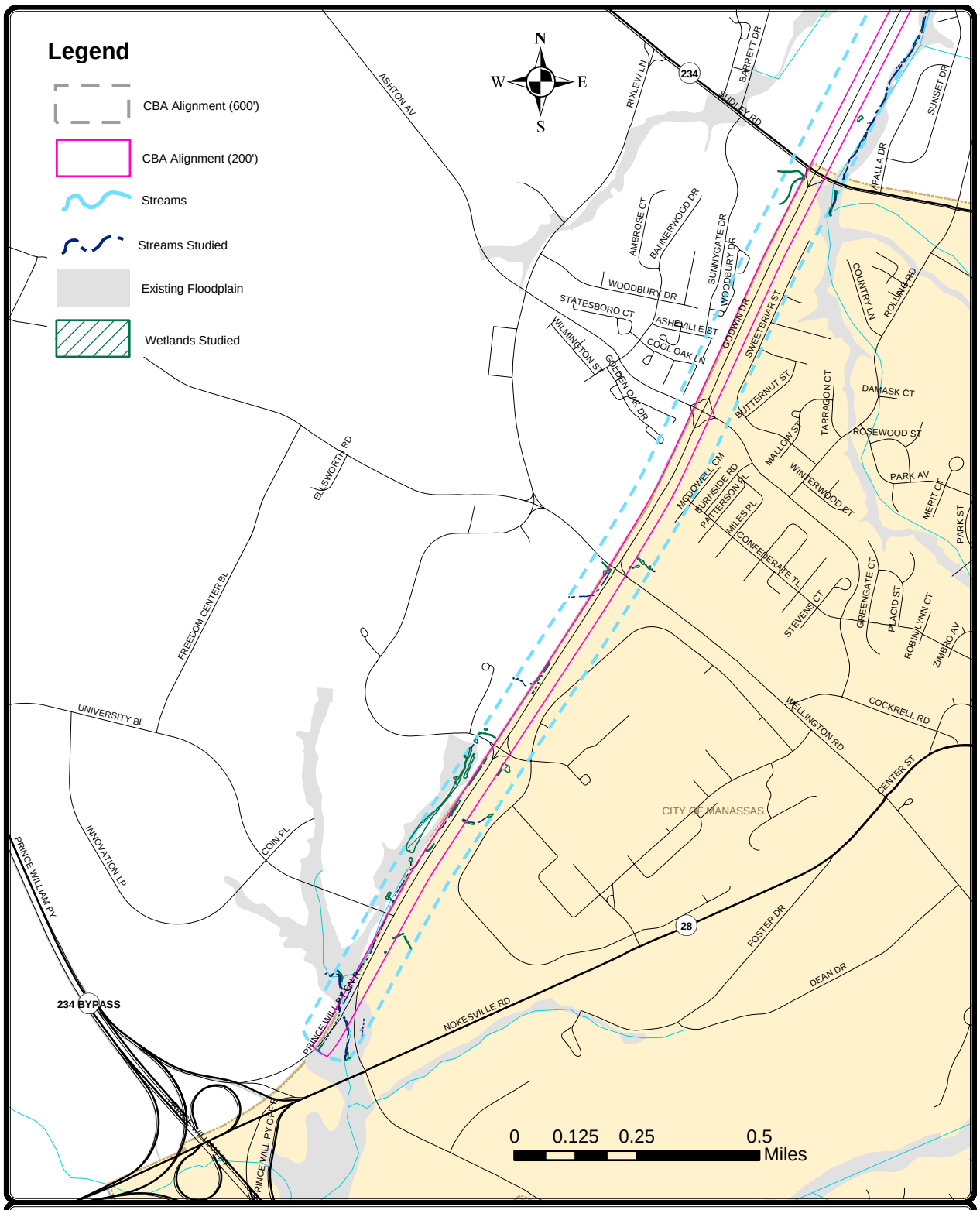
Tri-County PARKWAY Location Study

FIGURE 4.12-7
DELINEATED WATERS OF THE U.S.
SHEET 4



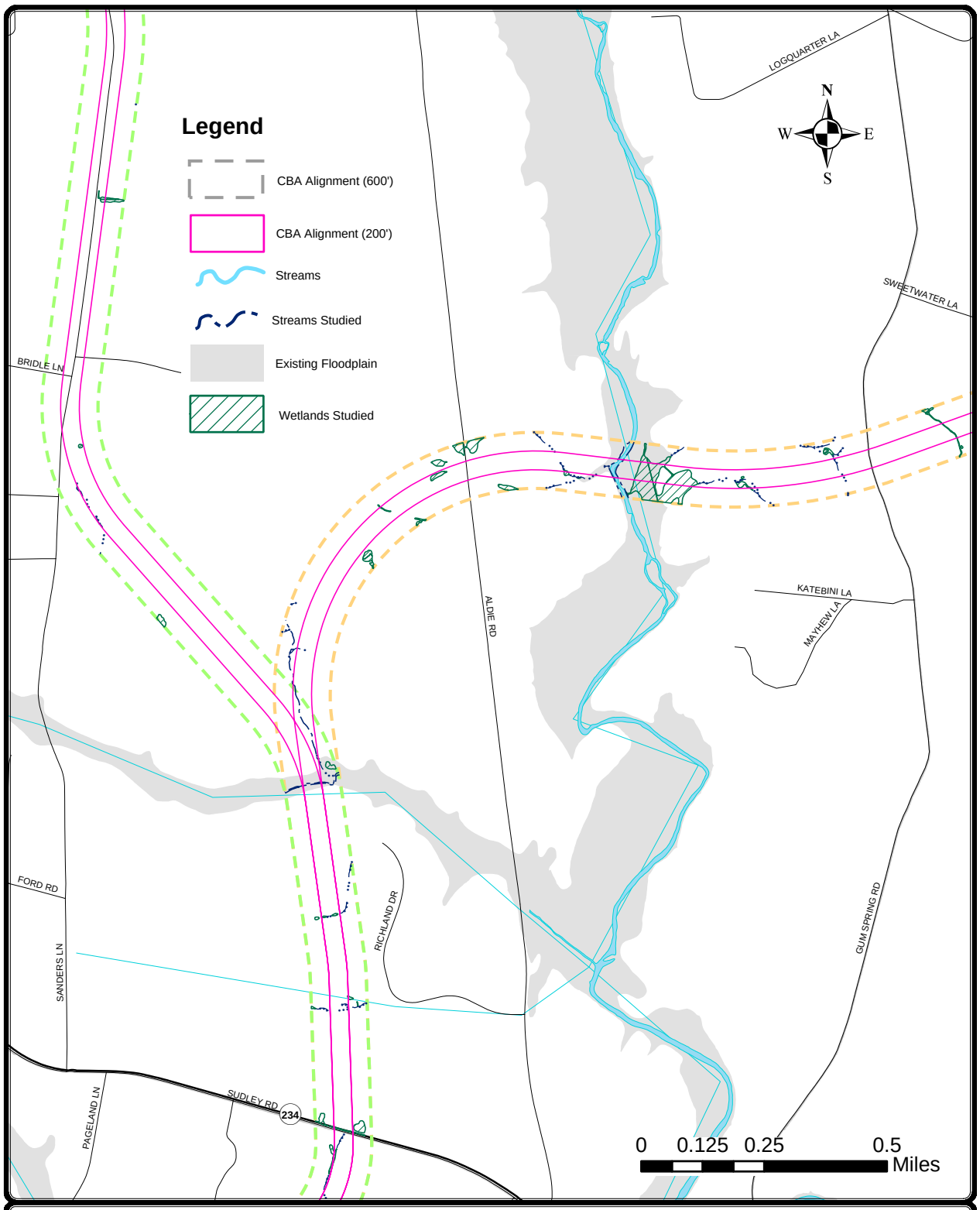
Tri-County PARKWAY Location Study

FIGURE 4.12-8
DELINEATED WATERS OF THE U.S.
SHEET 5



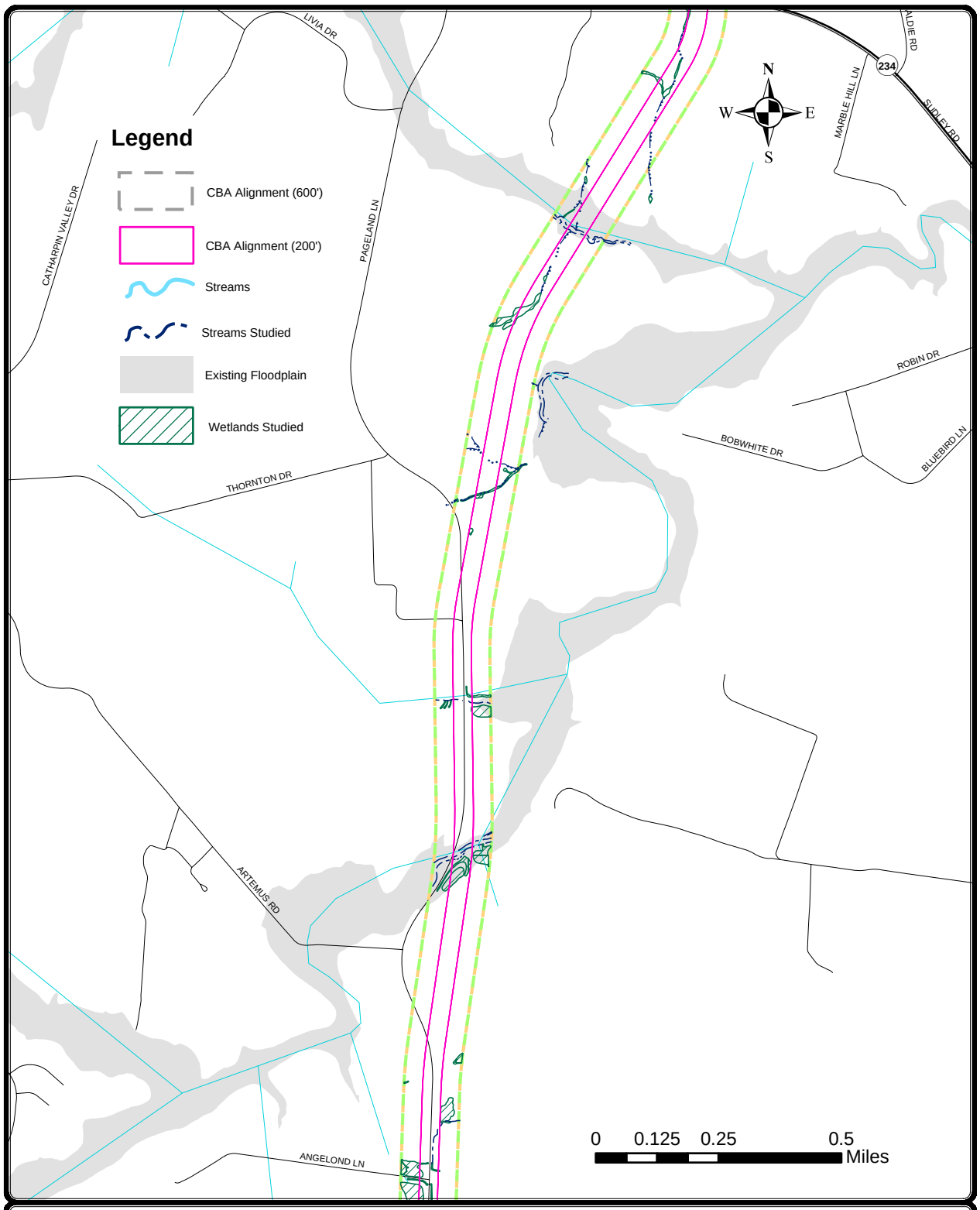
Tri-County PARKWAY Location Study

FIGURE 4.12-9
DELINEATED WATERS OF THE U.S.
SHEET 6



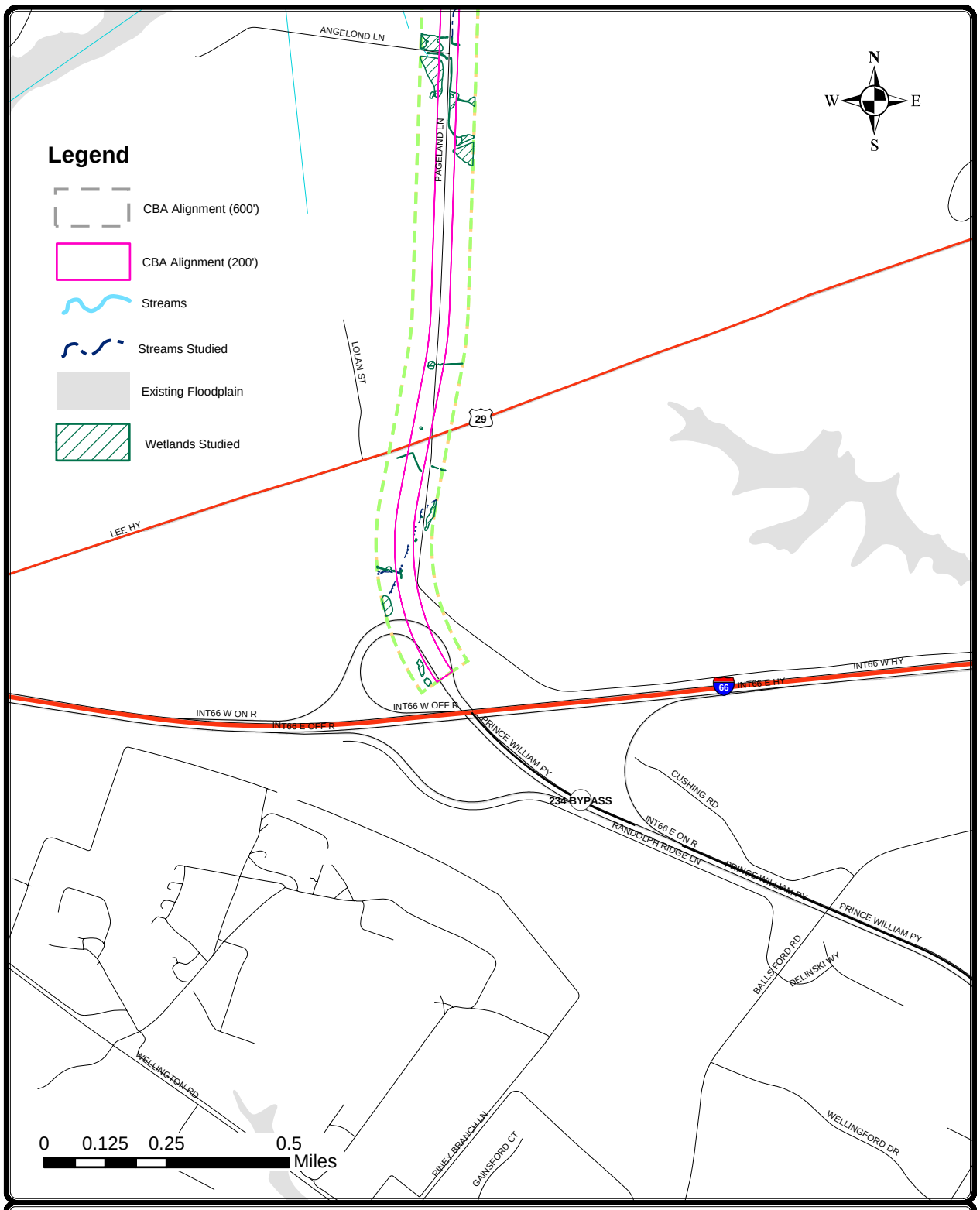
Tri-County PARKWAY Location Study

FIGURE 4.12-10
DELINEATED WATERS OF THE U.S.
SHEET 7



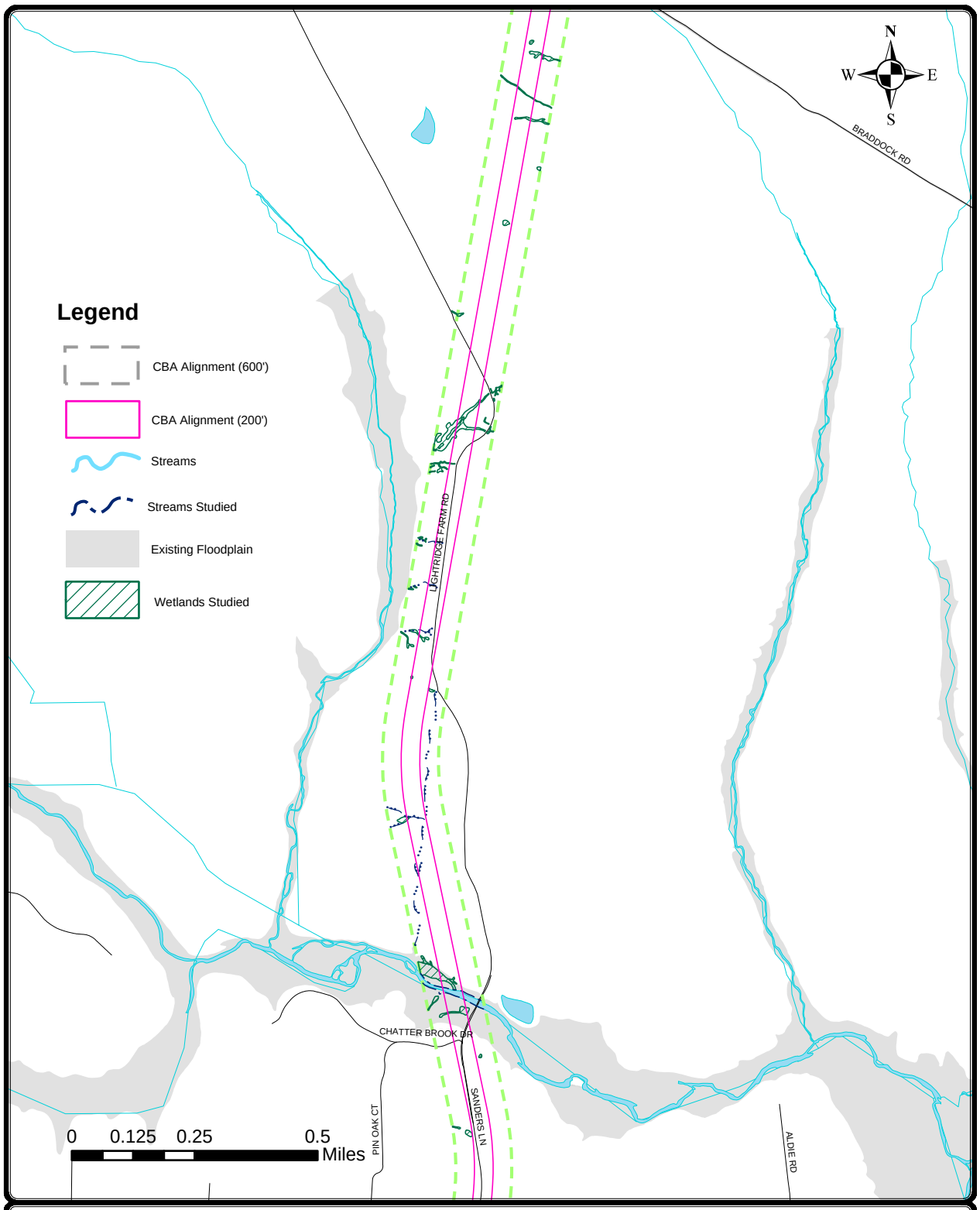
Tri-County PARKWAY Location Study

FIGURE 4.12-11
DELINEATED WATERS OF THE U.S.
SHEET 8



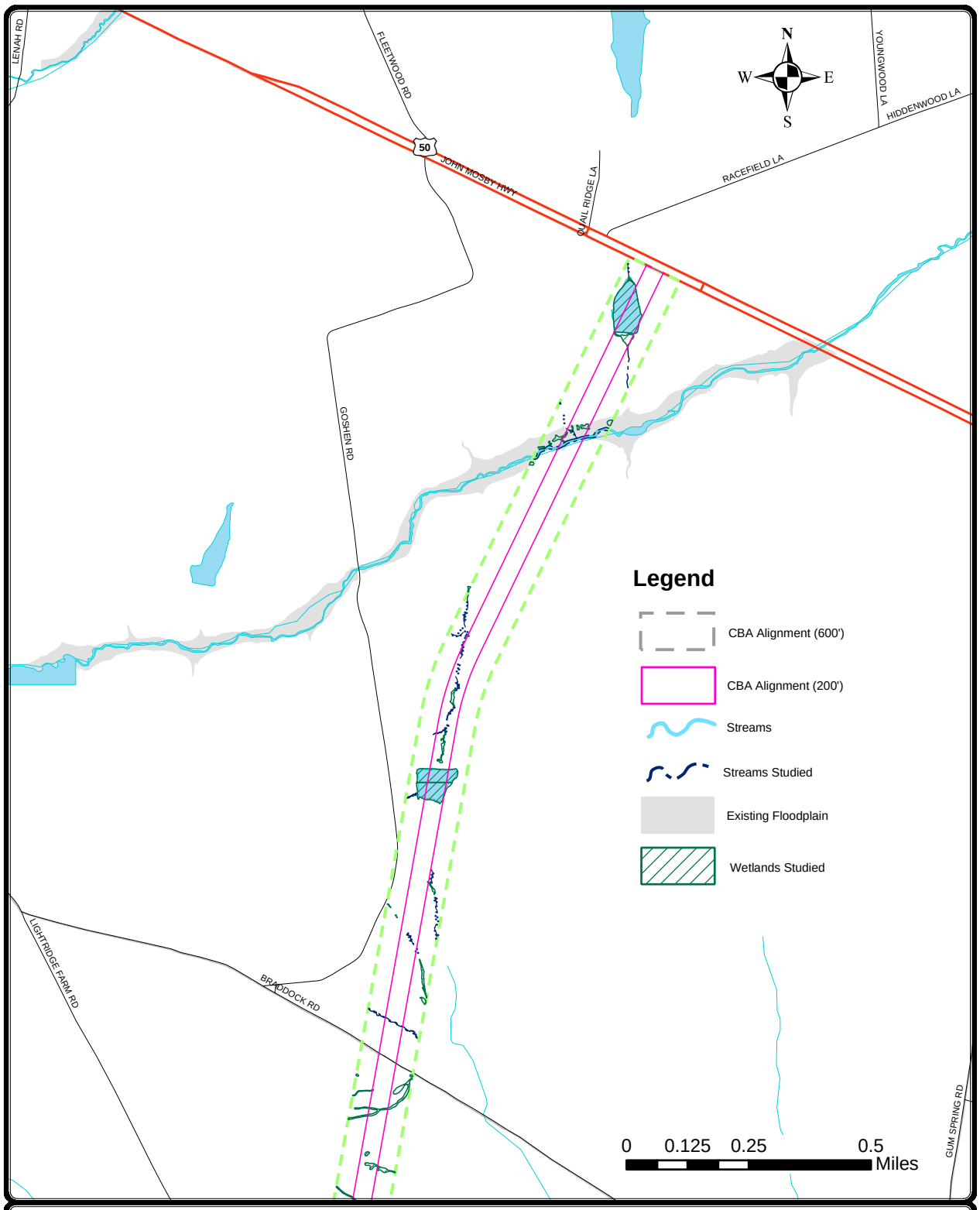
Tri-County PARKWAY Location Study

FIGURE 4.12-12
DELINEATED WATERS OF THE U.S.
SHEET 9



Tri-County PARKWAY Location Study

FIGURE 4.12-13
DELINEATED WATERS OF THE U.S.
SHEET 10



Tri-County PARKWAY Location Study

FIGURE 4.12-14
DELINEATED WATERS OF THE U.S.
SHEET 11

TABLE 4.12-4
SUMMARY OF IMPACTS TO WATERS OF THE U.S. (WETLANDS COMPONENT)

Cowardin Classification	Alternative / Description	Affected Area (acres)	
		200-Ft.	600-Ft.
NO-BUILD			
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	minor	minor
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	minor	minor
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	minor	minor
POWh	Palustrine, Open Water, Unknown Bottom, Impounded	minor	minor
Total Area		not applicable	not applicable
COMPREHENSIVE PLAN CBA			
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	5.52	14.15
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	10.59	24.32
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	1.21	2.35
POWh	Palustrine, Open Water, Unknown Bottom, Impounded	0.37	8.10
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	0.12	0.33
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	0.00	0.02
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	0.00	0.02
POWh	Palustrine, Open Water, Unknown Bottom, Impounded	0.00	0.00
Total Area		17.81	49.29
WEST TWO CBA			
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	1.58	3.89
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	2.30	8.42
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	0.06	1.23
POWh	Palustrine, Open Water, Unknown Bottom, Impounded	5.74	9.10
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	0.00	0.00
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	0.07	0.07
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	0.00	0.00
POWh	Palustrine, Open Water, Unknown Bottom, Impounded	0.01	0.01
Total Area		9.76	22.72
WEST FOUR CBA			
PEM1A/C	Palustrine, Emergent, Persistent, Temporarily/Seasonally Flooded	1.58	5.35
PFO1A/C	Palustrine, Forested, Broad-leaved Deciduous, Temp./ Season. Flooded	4.34	14.83
PSS1A/C	Palustrine, Scrub-Shrub, Broad-leaved Dec., Temp. / Season. Flooded	1.32	2.84
POWh	Palustrine, Open Water, Unknown Bottom, Impounded, Other Open Water	2.37	13.33
Total Area		9.61	36.35

Notes: Comprehensive Plan CBA includes impacts associated with a new interchange at I-66. Totals include Director's Order 77-1 wetlands.

4.12.4.4 Deepwater Habitats

Open water impoundments, farm and stormwater ponds, beaver impoundments, and water-filled depressions occupy approximately 30.5 acres within the CBA assessment corridors. This includes isolated wetlands and other areas not yet verified as "waters of the U. S." by the regulatory agencies (Table 4.12-4). A number of these deepwater habitats have important functions and values because they support complexes of aquatic habitats. Vegetated wetlands associated with open water systems frequently have measurably higher value, particularly for wildlife, than those wetlands composed of only one or two cover types. The West Two CBA would affect 9.11 acres of deepwater habitats within the 600-foot-wide study assessment corridor and 5.75 acres within the 200-foot-wide average limits of construction. The West Four CBA would affect 13.3 acres of deepwater habitats within the 600-foot-wide study assessment corridor and 2.37 acres within the 200-foot-wide average limits of construction. The Comprehensive Plan CBA would affect 8.1 acre of deepwater habitats within the 600-foot-wide study assessment corridor and 0.37 acres within the 200-foot-wide average limits of construction. Final jurisdictional determinations for all deepwater habitats affected by the the selected alternative will be ascertained through further coordination with the regulatory agencies, and the jurisdictional determination will be documented in the FEIS.

4.12.4.5 Streams

Bridges would be constructed at appropriate stream crossings to avoid or minimize effects to streams. Proposed bridge locations by CBA segment are listed in Table 3.3-1 and are shown in Appendix 1 of the Hydrology and Hydraulics Technical Report (VDOT, 2005). Based on preliminary engineering, five bridges would be constructed along the West Two CBA, 13 along the West Four CBA, and 15 along the Comprehensive Plan CBA. For those stream crossings which do not warrant construction of a bridge, the installation of new drainage structures or extensions of existing ones would displace sections of streams. These displacements would result in the direct loss of aquatic habitat. Sections of streams that would be piped would be functionally isolated from much of the biological and geomorphological activity present in open channel systems. Without use of best management practices, long-term water quality effects could be expected as a result of increases in impervious pavement surfaces, increases in traffic volumes, and resultant increases in pollutants washed from road surfaces into receiving streams. Pollutants might include grease and oil, metals, nitrogenous fertilizers, deicing salts, chemicals, and suspended solids. It would be expected that some of these materials would enter affected waterways, but the concentrations which result from runoff after implementation of BMPS may not be particularly significant and likely not toxic to aquatic life. The temporary siltation of streams might occur during clearing, grading, and construction, but this adverse affect will be avoided or minimized by aggressive implementation and monitoring or erosion and sedimentation control plans that will be incorporated into design considerations for any CBA.

Table 4.12-4 summarizes the anticipated impacts to waters of the U.S. identified within each CBA assessment corridor. Estimates of stream impacts are summarized in Table 4.12-5 for each CBA. The estimates provided do not include drainage infrastructure design considerations or stormwater management facilities, which will typically add up to 10 to 15 percent more impacts. The estimates also do not include any design-specific avoidance and minimization techniques designed to reduce pipe lengths, culvert sizes, number and configurations of streams, etc., which would reduce potential impacts by approximately the same amount. Most of the anticipated stream impacts are associated with Flat Branch and multiple crossings of Bull Run. Stream impact data summary and catalogue for all CBAs is provided in the Natural Resources Technical Report (VDOT, 2004).

Including a new interchange at I-66, the Comprehensive Plan CBA would affect of 52,275 linear feet of stream within the 600-foot-wide study assessment corridor and 16,490 linear feet within the 200-foot-wide average limits of construction. Of this total, approximately 4,400 linear feet of perennial stream and 1,000 linear feet of intermittent stream are found within the interchange footprint. Some of these streams may be directly impacted by fill to accommodate a final design for the interchange; other areas could be spanned by bridging or possibly altogether avoided or minimized by retention walls or steeper fill slopes. It is also likely that certain major stream segments within the proposed interchange could require relocation due to hydraulic

constraints. In addition, most of the interchange occupies a 100-year floodplain. As a result, additional scour analyses, hydraulics and hydrology studies, compliance documentation, and bridging feasibility studies would likely be required prior to regulatory agency approval of the Comprehensive Plan CBA. The West Two CBA would affect 24,291 linear feet of stream within the 600-foot-wide study assessment corridor and 9,769 linear feet within the 200-foot-wide average limits of construction. The West Four CBA would impact 22,410 linear feet within the 600-foot-wide study assessment corridor and 8,007 linear feet within the 200-foot-wide average limits of construction; however, the West Two CBA would affect fewer linear feet of *perennial* stream than would the West Four CBA or the Comprehensive Plan CBA. When compared with the original study corridor established in February 2004, the impacts to streams were substantially reduced (over 10 percent) by changing preliminary centerlines to avoid and minimize the potential footprint for right-of-way acquisition estimates.

Most anticipated stream impacts are associated with Flat Branch and crossings of Bull Run. Further investigation of particular stream reach impacts would be required in conjunction with a highway design that could accurately identify impact areas. In addition, streams totaling 3,695 linear feet (1,126 meters) which also occur on NPS lands for the West Two and West Four CBAs would be impacted (Table 4.12-3). These impacts would have to be avoided and minimized and, if determined unavoidable, mitigated in accordance with NPS guidance and regulations implementing Director's Order 77-1. A Statement of Findings would have to be prepared by the NPS for inclusion into the FEIS to document compliance with Director's Order 77-1. It is expected that implementation of any programmed improvements associated with the No-Build Alternative would negilgibly impact streams.

TABLE 4.12-5
SUMMARY OF IMPACTS TO WATERS OF THE U.S. (STREAM COMPONENT)
BY ALTERNATIVE AND COVER TYPE

Cowardin Classification	Alternative/Description	Amount of Streams Affected (linear feet)	
		200-Ft	600-Ft
	NO-BUILD ALTERNATIVE		
R3	Riverine, Upper Perennial	0	0
R4	Riverine, Intermittent	0	0
RE	Riverine, Ephemeral	0	0
	Total	0	0
	COMPREHENSIVE PLAN CBA		
R3	Riverine, Upper Perennial	10,063	31,470
R4	Riverine, Intermittent	5,125	17,297
RE	Riverine, Ephemeral	1,302	3,508
	Total	16,490	52,275
	WEST TWO CBA		
R3	Riverine, Upper perennial	2,753	7,503
R4	Riverine, Intermittent	6,832	16,574
RE	Riverine, Ephemeral	184	214
	Total	9,769	24,291
	WEST FOUR CBA		
R3	Riverine, Upper perennial	2,899	8,431
R4	Riverine, Intermittent	4,924	13,765
RE	Riverine, Ephemeral	184	214
	Total	8,007	22,410

Note: Quantities provided for the Comprehensive Plan CBA include approximately 4,400 linear feet of potential effects to perennial streams and 1,000 linear feet of potential effects to intermittent streams within the proposed Interstate 66 interchange footprint.

4.12.4.6 Wetland Functions and Values Assessment

Each of the impacted wetlands investigated in the study area was evaluated for the following eight functions: floodflow alteration, groundwater interchange, nutrient removal/retention/transformation, sediment/toxicant retention, production export, sediment/shoreline stabilization, fish and shellfish habitat, and wildlife habitat. In addition, wetlands were also evaluated for the following five values: endangered species habitat, visual quality/aesthetics, educational/scientific value, recreation, and uniqueness/heritage. A total of 165 individual vegetated aquatic habitats were investigated. Functions and values of these habitats are tabulated in the Natural Resources Technical Report (VDOT, 2004). For this evaluation, the study focused on impacted wetlands within a 200-foot-wide corridor along the centerline of the CBAs. This narrower footprint was used because it more closely represents the probable footprint of construction. Fifty impacted wetland habitats occur along the Comprehensive Plan CBA. The West Two and West Four CBAs have 35 and 33 wetland systems intersected by the 200-foot corridor, respectively. The mapping developed and investigated using GIS techniques for the wetland assessment effectively documents avoidance and minimization of significant acreages of aquatic habitats; therefore, both the importance of the wetlands affected, as well as the severity of the impact are sufficiently documented, for the alternatives presented in the DEIS in accordance with the Technical Advisory T 6640.8A (FHWA, 1987).

4.12.4.6.1 Summary of CBA Impacts to Wetland Functions

The wetlands, including their identification number, areas, cover types, and the function and/or values that they provide, that are located within the 200-foot-wide footprint of probable construction for each CBA are summarized in Tables 4.4-6 through 4.4-9 of the Natural Resources Technical Report (VDOT, 2004). A total of 118 wetland habitats are identified within potentially affected areas. All eight of the principal wetland functions are provided at some location within the study area by the impacted wetlands. In terms of the number of impacted wetland areas that provide a particular function, both nutrient reduction and groundwater interchange are provided by approximately two-thirds (64 to 66 percent) of the wetland areas, ranking them as the predominant wetland functions within the study area. Other wetland functions are present in over one-half of the impacted wetlands including sediment/toxicant reduction (57 percent) and wildlife habitat (54 percent). Minor wetland functions impacted within in the study area are floodflow alteration (23 percent), sediment and shoreline stabilization (11 percent), production export (8 percent), and fish and shellfish production (7 percent).

4.12.4.6.2 Wetland Functions and Values Impact Alternatives Analysis

Tables 4.4-6 through 4.4-8 of the Natural Resources Technical Report (VDOT, 2004) summarize the differences between the CBAs for wetland functions likely affected within probable limits of construction. The text below describes the affected wetland functions (from greatest to least adverse effects) and values for each of the CBAs.

The Comprehensive Plan CBA would affect a total of 50 individual wetland systems. Within these affected areas, both the nutrient reduction and groundwater interchange functions are the most affected, followed closely by wildlife habitat and sediment/toxicant retention functions. Floodflow alteration is also adversely affected in approximately one-quarter of the wetlands for this CBA. The floodflow alteration function, the wildlife habitat, and groundwater interchange functions are also affected the most by this CBA compared to other CBAs; however, this is likely associated with the greater number of relative impacts. Minor functions affected are production export, sediment and shoreline stabilization, and fish and shellfish production. The Comprehensive Plan CBA has six higher quality wetland systems that are affected. These wetlands are generally comprised of a complex of cover types, and have exceptional values associated with aesthetics, educational and/or scientific opportunity, potential recreational value and unique attributes in the regional context. Relatively greater effects (over one acre) are predicted to occur within approximately half of the wetlands with having exceptional values; whereas, smaller effects (all less than 0.33 acre) are predicted to occur within the other half.

West Four CBA would impact a total of 35 individual wetland systems. Within these impact areas, groundwater interchange and sediment/toxicant retention functions are the most adversely affected, followed very closely by the wildlife habitat functions. Nutrient reduction function is the also affected in approximately 42 percent of the wetlands for this CBA, followed by the floodflow alteration function in 28 percent of the

impacted wetlands. Minor effects to the following functions are predicted: production export, sediment and shoreline stabilization, and fish and shellfish production. In comparison with the West Two CBA, the West Four CBA has far more impacts to the groundwater interchange functions, and somewhat more impacts to the wildlife habitat and floodflow alteration functions, but is otherwise fairly similar with respect to impacts relative to the Comprehensive Plan CBA. One considerable difference is with the nutrient removal function; the West Four CBA has significantly less impact than the West Two CBA for the nutrient reduction function. The West Four CBA also has twice as many impacts to the production export function than the West Two CBA, but has the same amount of impacts for the production export function as the Comprehensive Plan CBA. The West Four CBA would affect five higher quality wetland systems. These five wetlands are mostly comprised of a complex of cover types, and have exceptional values associated with aesthetics (all), educational and/or scientific opportunity and potential recreational value. Relatively greater effects (over one acre) are predicted to occur within four of the five wetlands with having exceptional values; whereas, smaller effects (all less than 0.33 acre) are predicted to occur within one.

The West Two CBA impacts a total of 33 individual wetland systems. Within these impact areas, nutrient reduction and sediment/toxicant retention functions are the most affected, followed closely by the wildlife habitat and groundwater interchange functions. Minor (less than 18 percent each) functions affected for this CBA are sediment/shoreline stabilization, floodflow alteration, fish and shellfish, and production export. In comparison with the West Four CBA, the West Two CBA has far less impacts to the floodflow and groundwater interchange functions, and somewhat fewer impacts to the wildlife habitat, but is otherwise fairly similar with respect to impacts relative to the Comprehensive Plan CBA. One difference is with the nutrient removal function; the West Four CBA has significantly more impact than the West Four CBA for the nutrient reduction function. The West Two CBA also has half as many impacts to the production export function than the West Four CBA, but has the same amount of impacts for the production export function as the Comprehensive Plan CBA. The West Two CBA four higher quality wetland systems that are impacted. Two wetlands are also impacted by the West Four CBA. Three of these four wetlands are comprised of a complex of cover types, and all have exceptional values associated with aesthetics values. One wetland has educational and/or scientific opportunity value. The majority (3 of 4) of the impacted wetlands with exceptional values have relatively higher impact acreages (over one acre) but one has slightly smaller impacts (impacts slightly less than one acre).

It is reasonable to expect that implementation of programmed improvements associated with the No-Build Alternative would result in minor direct effects to wetlands, thus their functions and values would remain relatively unaffected.

4.12.4.7 Compensatory Wetland Mitigation

Compensation for implementation of each CBA was determined using mitigation ratios conventionally prescribed by regulatory agencies multiplied by estimated impact acreages (Table 4.12-6). To allow comparative analysis between CBAs, mitigation requirements were determined based on the assumption that all wetlands within the 600-foot-wide assessment corridor would be impacted. As previously discussed, this assumption results in an over-statement of reasonably expected construction impacts. It is anticipated that actual wetland impacts and mitigation requirements will be substantially less than those acreages described for the 600-foot-wide study assessment corriodor once a construction footprint is established (see values associated with the 200-foot-wide average limits of construction).

Based on the aforementioned assumptions, the Comprehensive Plan CBA would require 82.46 acres of compensation (assuming a 600-foot-wide study assessment corridor) or 31.95 acres of compensation (assuming a 200-foot-wide average limits of construction). The West Four CBA would require 55.28 acres of compensation (assuming a 600-foot-wide study assessment corridor) or 15.57 acres of compensation (assuming a 200-foot-wide average limits of construction). West Two CBA would require 33.71 acres of compensation (assuming a 600-foot-wide study assessment corridor) or 12.93 acres of compensation (assuming a 200-foot-wide average limits of construction). It is reasonable to expect that implementation of programmed improvements associated with the No-Build Alternative would result in minor direct effects to wetlands and that mitigation requirements would be specified during later phases of design and construction.

Mitigation for losses of Director's Order 77-1 wetlands (which also include streams) would be required as a part of implementation of either the West Two or West Four CBAs. The estimated totals presented for DO 77-

1 wetlands in Table 4.12-3 assume that the wetland and stream impacts cannot be avoided and do not include any additions to or reductions of acreage resulting from avoidance and minimization, stormwater facility planning, drainage infrastructure planning, right-of-way acquisition, utilities, etc.; therefore, efforts to design a highway corridor construction footprint without impacting any wetlands on NPS property may be feasible. Documentation of efforts to eliminate or further reduce Director's Order 77-1 wetlands impacts will be required in the Statement of Findings to be included in the Final EIS.

TABLE 4.12-6
SUMMARY OF IMPACTS AND COMPENSATION REQUIREMENTS FOR WETLANDS

EFFECTS AND REQUIRED COMPENSATION	WETLAND AREA BY ALTERNATIVE (ACRES)						
	No-Build Alternative	West Two CBA		West Four CBA		Comp Plan CBA	
		200	600	200	600	200	600
Effects to palustrine emergent (PEM)	Minor	1.49	3.89	1.67	5.35	5.64	14.52
Compensation required at 1.5 to 1 ratio	*To be determined*	*2.23*	*5.84*	*2.50*	*8.03*	*8.46*	*21.78*
Effects to palustrine forested (PFO)	Minor	2.40	8.42	4.30	14.83	10.59	24.32
Compensation required at 2 to 1 ratio	*To be determined*	*4.80*	*16.84*	*8.60*	*29.66*	*21.18*	*48.64*
Effects to palustrine scrub shrub (PSS)	Minor	0.06	1.23	1.40	2.84	1.21	2.35
Compensation required at 1.5 to 1 ratio	*To be determined*	*0.09*	*1.85*	*2.10*	*4.26*	*1.81*	*3.53*
Effects to Pal. Open Water (PUB/POW)	Minor	5.74	9.10	2.37	13.33	0.37	8.10
Compensation required at 1 to 1 ratio	*To be determined*	*5.74*	*9.10*	*2.37*	*13.33*	*0.37*	*8.10*
Total Habitat Displaced	Minor	**9.69**	**22.64**	**9.74**	**36.35**	**17.81**	**49.29**
Total Compensation Required	*To be determined*	***12.86***	***33.63***	***15.57***	***55.28***	***31.82***	***82.05***
Isolated wetland compensation required at 1 to 1 ratio	*Minor*	*0.07*	*0.08*	*0.00*	*0.00*	*0.13*	*0.41*
Total Area Affected	Minor	**9.76**	**22.72**	**9.74**	**36.35**	**17.94**	**49.70**
Total Compensation Required	*To be determined*	***12.93***	***33.71***	***15.57***	***55.28***	***31.95***	***82.46***

Notes: Figures include potentially affected areas associated with the Interstate 66 interchange.

Three options are typically available to accomplish compensation for unavoidable project impacts. A project proponent may construct mitigation projects themselves using any practicable method of compensation, including creation, restoration, enhancement, preservation, and other options. Project proponents may also purchase mitigation bank credits from an approved commercial or private mitigation bank. Project proponents may also offset their impacts through exchange of cash payments for mitigation credits established through an in-lieu fee (ILF) program. Using an ILF program is efficient and can save them time, and often money, in fulfilling mitigation requirements.

Should a CBA be selected, the alternative would be developed further through advanced design and engineering techniques to avoid wetland and other aquatic resource encroachments and displacements where feasible, and to the maximum extent practicable. Avoidance measures might include minor alignment relocations, or use of bridging rather than placement of fill or excavation. Minimization steps might include span bridging versus fill approach aprons, narrowing of encroachment footprints, and use of retaining walls and increased gradients of side slopes. After all direct impact avoidance and minimization measures are implemented, unavoidable impacts would be appropriately mitigated through compensatory mitigation procedures.

VDOT may also choose to mitigate for proposed action impacts through a combination of aquatic resource creation, restoration, enhancement, and/or preservation. Wetland compensation requirements and permitting details will be determined through continuing coordination with regulatory agencies based on the selected

alternative and its final design. Mitigation banking is currently a practicable method of highway project impact mitigation in urban and suburban areas due to high land costs and scarcity of available mitigation sites (National Research Council, 2002); however mitigation banking can only be pursued once it has been shown that there are no practicable on-site/in-kind or on-site/out-of-kind mitigation alternatives .

A total of 29 stream segments having stream restoration potential and 49 wetland compensation sites (some having both stream restoration and wetland compensation components) have been identified within the study area. Locations of prospective "on-site" wetland mitigation sites are shown on Figure 4.12-15. Preliminary site search identified six potential wetland compensation sites whose acreage could exceed 100 acres (W9, W10, W16, W20, W34, and W35). Most individual wetland compensation sites would have a size ranging from 20 to 50 acres. Assuming optimally favorable site conditions and maximized economy of scale, even most wetland compensation sites (identified using methods similar to those described) have historically managed to utilize only approximately 65 percent of the available acreage as mitigation credit. Loss of area for use in mitigation in a selected mitigation site is often due to unsuitable or unforeseen site conditions for wetlands restoration/creation (e.g., deeper than expected or inconsistent water table elevations, the presence of bedrock, buried materials, unsuitable subsoils, archeological resources, access problems, etc.). Considering the estimated amount of wetland compensation required to implement the worst-case scenario (i.e., the Comprehensive Plan CBA at 82 acres of impact), one large or several smaller wetland compensation sites would have to be developed to satisfy the project's wetland compensatory wetland mitigation requirement. A feasibility study to further evaluate and design on-site and off-site compensation sites will be conducted during the final design and permitting phases of the project to ascertain which conceptual mitigation option or combination of conceptual mitigation options set forth in this EIS best address specific unavoidable impacts.

4.12.4.8 Stream Mitigation

Based on preliminary engineering, five bridges would be constructed along the West Two CBA, 13 along the West Four CBA, and 15 along the Comprehensive Plan CBA. At proposed bridge crossings, the minimum number of piers to ensure structural stability will be placed channelward of the ordinary water line. Feasible construction methods that would not require the placement of construction causeways would be evaluated during the design phase. Should it become necessary, fill placed for temporary construction causeways or work bridges would be removed and preconstruction streambed conditions will be restored immediately following construction. Breastwalls and fill placed for bridge abutments would be placed landward of the ordinary water line, where practicable. Assuming a 200-foot-wide average limits of construction and assuming that all bridges tentatively identified in the Hydrology and Hydraulics Technical Report are constructed, effects to streams could be minimized by as much as 1,000 linear feet for CBA Two, 2,600 linear feet for CBA Four, and 3,000 linear feet for the Comprehensive Plan CBA.

Compensation of stream impacts will likely be required as part of the acquisition process for federal and state water quality permits. Because regulatory agencies would determine the specific stream compensation requirements on a case-by-case basis, the quantitative requirements for implementation for any CBA would be negotiated during the permitting process. The Virginia Water Protection General Permit regulation for Linear Transportation Projects requires a minimum 1:1 replacement to loss ratio via stream relocation, restoration, riparian buffer creation, restoration, and/or enhancement. The COE generally requires mitigation for impacts to streams that are perennial (R3) and intermittent (R4). The VDEQ requires stream mitigation for all types of streams, including ephemeral (RE) streams.

The current regulatory climate allows for both on-site and off-site mitigation for stream impacts. Generally, stream mitigation banks are an effective means to accomplish compensatory mitigation requirements off-site when on-site compensation is not practicable or advisable, or when the use of the mitigation bank is environmentally preferable to on-site compensation. Additionally, the COE regulatory guidance letter (RGL) 02-2 states that off-site mitigation may be used when there is no practicable opportunity for on-site mitigation, or when off-site mitigation provides more watershed benefits than on-site options. Furthermore, RGL 02-2 directs COE Districts to evaluate compensatory mitigation options with consideration of the likelihood of ecological success and sustainability, practicability of monitoring and maintenance, the proximity to the watershed where the impacts occur, and economics and cost. Use of established stream mitigation banks is both feasible and ecologically preferable, since the entire project impacts would occur in the same HUCs as

those of available mitigation banks. Depending on the availability of credits at the time of project construction, compensation at any one or more mitigation banks with available stream mitigation credits in the northern Virginia region could offset all or a portion of unavoidable impacts associated with implementation of a CBA.

Urbanization within the southern portion of the study area has resulted in degradation of a large number of streams. In addition to the use of regional mitigation banks, opportunites for restoration of degraded stream segments exist along Flat Branch, Russia Branch, and several unnamed tributaries within and adjoining the cities of Manassas and Manassas Park. Of the 29 prospective "on-site" stream restoration sites shown on Figure 4.12-15, site search identified seven longer potential stream restoration segments having a single reach available for restoration equal to at least 5,000 linear feet (S5/6, S8, S15/16, S18, S24, S25, and S27). The longest single reach in an identified stream compensation site is approximately 7,750 linear feet (S25). Assuming maximal capacity for the best reaches available and considering the estimated stream impacts for the worst-case scenario (the Comprehensive Plan CBA), all longer stream segments plus several other shorter stream segments would need to be developed to satisfy the stream compensation requirement for the project. Stream compensation techniques include multiple actions that are taken to improve water quality, improve wildlife habitat, and increase the productivity and functioning of flowing water bodies as a healthy part of the aquatic environment. In addition to stream improvements brought about by supplemental plantings of riparian buffers, other bioengineering techniques would likely be implemented to improve stream functional quality. A number of techniques will be evaluated during project design, including in-stream structural features (such as rip-rap, gabions, barriers, wiers, j-hooks, revetments, wing deflectors, pool formers, shelters, and vegetative structures such as facines, waddles, and stock bundles) and construction enhancements (including grading, terracing, and berming). Other techniques, such as diversion channels and stream channel relocations where channel geometry factors necessitate, may also be implemented and would be developed in conjunction with standard avoidance and minimization requirements in preliminary engineering and final design phases. Other simple techniques that can be included in the final stream mitigation plan might include cattle exclusion fencing, livestock grazing restrictions, spot improvements of stream crossings in pasture and loafing areas, and watershed-level pasture management agreements. Conservation easements to protect stream buffers and stream restoration areas in perpetuity are inherent in stream mitigation plans. These would be negotiated in final design plans, in accordance with applicable water quality permitting requirements. A feasibility study to further evaluate and design on-site and off-site stream restoration sites will be conducted during the final design and permitting phases of the project.

Temporary siltation of streams during clearing, grading, and construction, will be avoided or minimized by implementation and monitoring of erosion and sedimentation control plans that will be incorporated into design considerations for any CBA.

4.12.4.8.1 In Lieu Fee Compensation

In Lieu Fee Compensation (ILF) occurs when an entity issued a water quality permit pays funds to an ILF sponsor instead of either completing project-specific mitigation or providing credits from an existing mitigation bank approved under the Federal Interagency Wetland Banking Guidance. The use of the trust fund for compensatory mitigation will occur only after the relevant permitted activity has complied with COE and VDEQ regulations and policies regarding avoidance and minimization of impacts. During final design, applicability of any ILF mitigation will be determined through agency coordination.

4.12.4.8.2 Wetland Mitigation Banks and Compensation Sites

Wetland mitigation banks constructed or restored wetlands consisting of quantified value units (credits) that can be purchased concurrently or in advance of anticipated losses due to construction activities. Identified mitigation banks service the HUCs for the watersheds within the study area (HUC 02070010 and HUC 02070008). Prince William County mitigation banks within the project's service area (the Julie J. Metz Wetlands Bank and the 125-acre North Fork Wetlands Bank) are fully subscribed, and mitigation credits are no longer available. Several mitigation banks capable of servicing the study area are under development at the present time. Each of the facilities is described below.

- The Bull Run Wetland Mitigation Bank (BRWMB) is located approximately one mile north of the intersection of Aldie Road and Sudley Road in Prince William County. Once completed, this facility will

contain approximately 26 acres of constructed wetlands, including forested, scrub/shrub, and emergent communities, and approximately 0.94 acres of preserved existing wetlands along Bull Run. As of June 30, 2004 remaining mitigation credits at the BRWMB were 1.38 PFO credits and 5.24 PFO credits for phased projects.

- The 300-acre Cedar Run Wetlands Bank, located in southern Prince William County, has a service area that includes the study area. As of June 30, 2004 remaining mitigation credit at Cedar Run was PFO 1.43 credits, 2.20 phased project PFO credits, and 0.28 open water credit.
- The Northern Virginia Stream Restoration Bank is under development on 29 miles of impaired and degraded streams within the planned community of Reston. Phases 1 and 2 of the bank total almost 70 acres on two parcels located along Goose Creek south of Oatlands Mill Road, east of U. S. Route 15. This bank will serve the entire study area HUCs.
- The Potomac River Wetland Mitigation Bank in Fauquier County is under development. It consists of two properties: (1) the 125-acre Pandora Farms property along Cedar Run in Fauquier County, Virginia and (2) the 79-acre Licking Run Mitigation Site located southeast of Calverton.
- The Northern Virginia Regional Environmental Bank is planning to be operational for the Tri-County service area. The facility occupies two Fauquier County sites: (1) the Miller Farm, a 30-acre parcel on Town Run, located about four miles southeast of Catlett, and (2) the Keaton Mitigation Bank Site, a 50-acre tract off Bristerburg Road (County Route 616), along Licking Run, about 1.5 miles southeast of Calverton. This bank will offer 43 acres of wetland creation credit and an additional 58 acres of upland buffer credits.
- VDOT operates the Great Oaks Mitigation Bank on a 27-acre tract along South Run, one mile northeast of New Baltimore in Fauquier County. Available credit for VDOT projects at the site is approximately 16.3 acres of PFO creation, 1.9 acre of PFO enhancement credit, and preservation of approximately 0.34 acre of PFO and 0.9 acre of upland buffer preservation.
- The Markham Wetland Bank is located in Fauquier County along Harry's Run and Mitchells Branch, on a 322-acre tract north of Interstate 66 on County Route 688. The proposed mitigation bank will involve the restoration of 5.75 acres of palustrine forested wetlands and 1.62 acres of palustrine emergent wetlands, creation of 8.18 acres of forested wetlands and 1.34 acres of palustrine emergent wetlands, and enhancement of 4.38 acres of palustrine emergent wetlands and 0.11 acre of palustrine scrub-shrub wetlands.
- The 39-acre Foggy Bottom Wetland Farm is located within pastureland along the Cedar Run floodplain, southeast of Aden in Prince William County. This bank lies entirely within the service area for the project. Available mitigation credits at this facility have not been determined.
- The Tri-County Stream Mitigation Bank is proposed to be operational in the near future for use as compensatory stream impact mitigation. Sites in Loudoun, Prince William, and Fairfax counties, totaling 12,000 linear feet of restoration credit (in-stream condition units) will be available for impacts within three HUCs, including those contained within the study area.
- The Broad Run Wetlands and Stream Bank is proposed to be operational in the near future for compensatory stream and wetland mitigation. The 60-acre site is located in the Broad Run watershed, north of Interstate 66, and west of Old Tavern Road near the Plains. The bank will provide approximately five acres of wetland creation, and 27 acres of preservation credit, in addition to approximately 8,000 linear feet of stream and riparian buffer credit. The bank will service the two HUCs within the study area.

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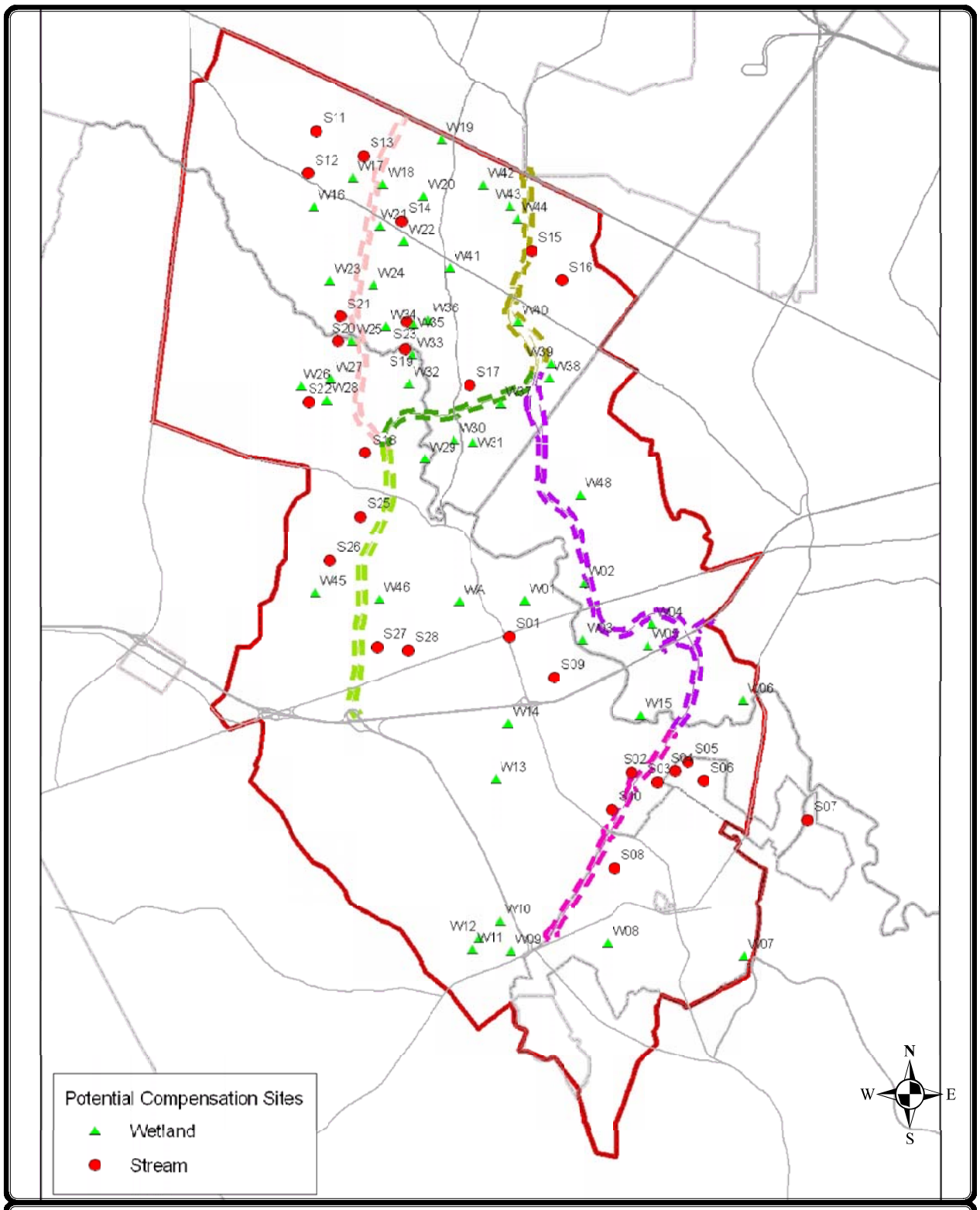

Tri-County PARKWAY Location Study

FIGURE 4.12-15
PROSPECTIVE "ON-SITE" WETLAND AND STREAM MITIGATION SITES

4.12.5 Floodplains (100-Year) and Regulated Floodplains

Potential impacts to the 100-year floodplain were assessed in accordance with Executive Order 11998 and FHWA's Location and Hydraulic Design for Encroachments on Floodplains (Program Manual 6-7-3-2) for each of the CBAs and the No-Build Alternative. Preliminary project designs and infrastructural configurations were developed to minimize and avoid impacts to floodplains by including floodplains as evaluation criteria in the alternatives development process.

4.12.5.1 Environmental Consequences

Each CBA would span the 100-year floodplain at multiple locations. There are five proposed floodplain spans associated with the West Two CBA, six associated with the West Four CBA, and seven proposed floodplain spans associated with the Comprehensive Plan CBA. Proposed spans are associated with Bull Run (3 locations), Little Bull Run, Cub Run, Lick Branch, Catamount Branch, Cannon Branch, Flat Branch, Elklick Run (2 locations), and South Fork as well as an unnamed Bull Run tributary. Each of the CBAs would further encroach upon these floodplains at various locations. TABLE 4.12-7 presents floodplain encroachment data by CBA, stream, and watershed. A summary of floodplain encroachments associated with the proposed action are included in TABLE 4.12-8. Floodplain encroachments are depicted in FIGURE 4.12-16.

The range of individual encroachments range from 0.001 acres for the West Two CBA at, Bull Run (ID#16 of Figure 4.11-15) to 151.8 acres for the Comprehensive Plan CBA at Cub Run at the interchange of Interstate 66 and Cub Run (ID#22 of Figure 4.11-15); however, significant floodplain encroachments (248 acres) are associated with the Comprehensive Plan CBA where it intersects the Flat Branch/Cub Run/Bull Run confluence at Interstate 66. The least encroachment, in terms of numbers of acres and number of encroachments, is associated with the West Two CBA.

The estimates presented in TABLE 4.12-7 and TABLE 4.12-8 do not include efforts to avoid and minimize impacts because there are no preliminary engineered drawings of the proposed highway sections yet prepared. Thus, the estimates presented in this section represent the greatest potential encroachment possible associated with the proposed action. Lateral encroachments, where new pavement spans or runs perpendicular to existing floodplain, cannot be completely avoided through design efforts to minimize or avoid floodplain impacts. Additionally, major longitudinal encroachments, where existing and proposed roadway encroachment occurs parallel to existing floodplain, associated with fill to support new pavement area, may also not be completely avoidable by bridging as the encroachment is or would be the result of a lateral extension of highway roadbed fill. TABLE 4.12-8 presents floodplain encroachments associated with CBAs as potentially avoidable or unavoidable impacts. Calculations presented in TABLE 4.12-8 indicates that decreases, ranging from two to eight percent, in impact acreage will result when avoidance and minimization procedures are implemented.

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no major impacts to floodplains are anticipated; however, evaluation of the potential effects to floodplains may be required if any programmed improvement involves major new construction.

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Tri-County PARKWAY Location Study

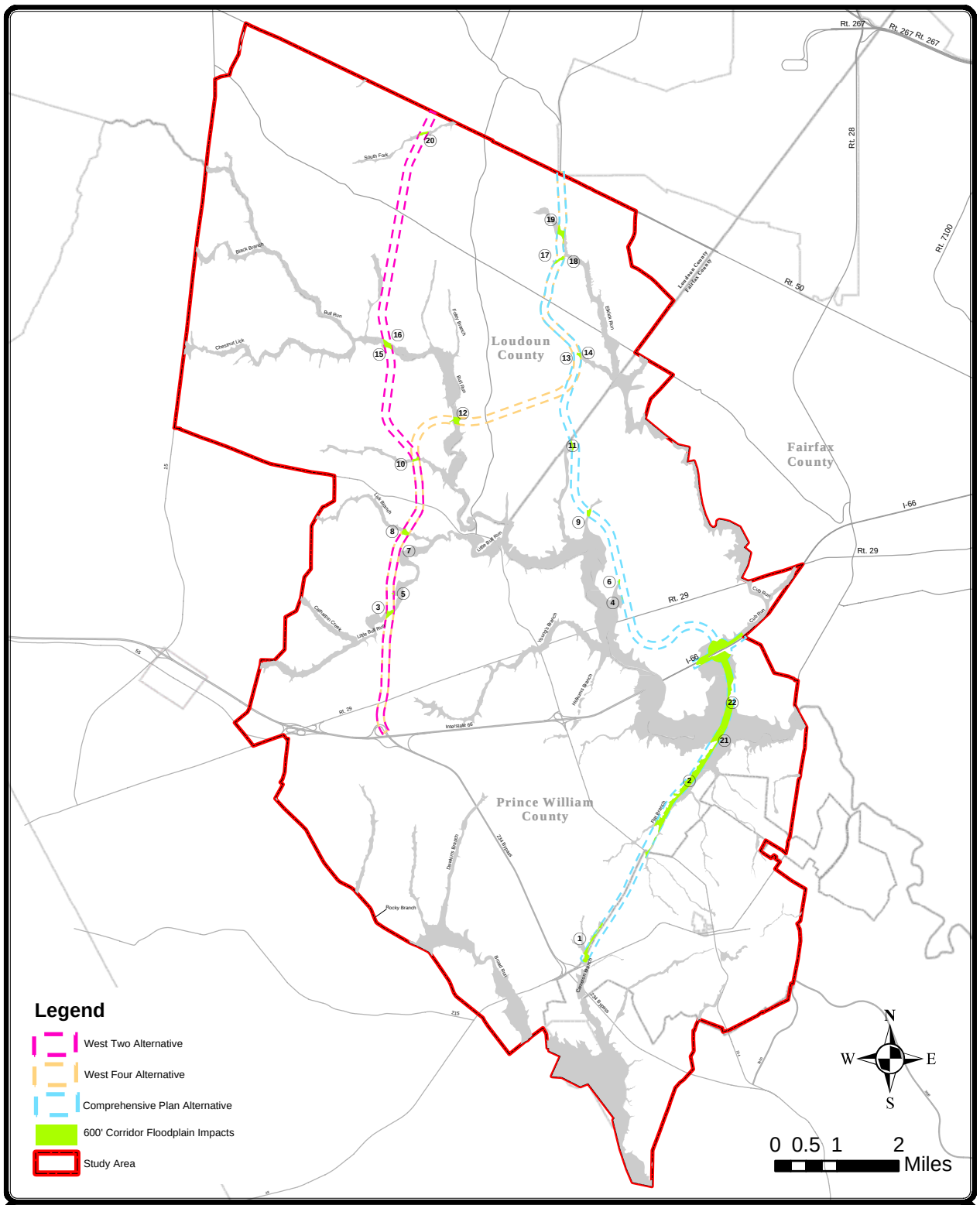
TABLE 4.12-7
FLOODPLAIN ENCROACHMENTS BY ALTERNATIVE, STREAM, WATERSHED, AND TYPE:
600-FOOT CORRIDOR

Alternative	Stream Name	HUC Code	# of Encroachments	Location ID#(s)	Acres	Latitudinal/ Longitudinal	Avoidable/ Unavoidable
West Two CBA	Little Bull Run	02070010	3	3	5.984	LAT	U
	Little Bull Run	02070010		5	0.546	LONG	A
	Little Bull Run	02070010		7	0.003	LONG	A
	Lick Branch	02070010	1	8	5.523	LAT	U
	Unnamed Bull Run Trib.	02070010	1	10	3.172	LAT	U
	Bull Run	02070010	2	15	8.039	LAT	U
	Bull Run	02070010		16	0.001	LONG	A
	South Fork	02070008	1	20	3.637	LAT	U
West Four CBA	Little Bull Run	02070010	3	3	5.984	LAT	U
	Little Bull Run	02070010		5	0.546	LONG	A
	Little Bull Run	02070010		7	0.003	LONG	A
	Lick Branch	02070010	1	8	5.523	LAT	U
	Unnamed Bull Run Trib.	02070010	1	10	3.290	LAT	U
	Bull Run	02070010	1	12	7.970	LAT	U
	Unnamed Trib of Elklick Run	02070010	2	13	0.006	LONG	A
	Unnamed Trib of Elklick Run	02070010		14	2.539	LONG	A
	Elklick Run	02070010	3	17	4.356	LAT	U
	Elklick Run	02070010		18	0.002	LONG	A
	Elklick Run	02070010		19	9.181	LAT	U
Comprehensive Plan CBA	Cannon Branch	02070010	1	1	15.681	LAT AND LONG	U
	Flat Branch	02070010	1	2	77.165	LAT AND LONG	U
	Bull Run	02070010	3	21	18.751	LAT	U
	Bull Run	02070010		4	0.296	LONG	A
	Bull Run	02070010		6	1.269	LONG	A
	Cub Run	02070010	1	22	151.766	LAT AND LONG	U
	Unnamed Bull Run Trib.	02070010	1	9	4.196	LAT	U
	Unnamed Trib of Elklick Run	02070010	2	13	0.006	LONG	A
	Unnamed Trib of Elklick Run	02070010		14	2.539	LONG	A
	Elklick Run	02070010	3	17	4.356	LAT	U
	Elklick Run	02070010		18	0.002	LONG	A
	Elklick Run	02070010		19	9.181	LAT	U

Note: Calculations presented above do not include efforts to avoid and minimize impacts because there are no preliminary engineered drawings of the proposed highway sections yet prepared. Engineering and design efforts to minimize and avoid impacts could result in reductions to encroachment acreages.

A = Encroachment is potentially avoidable for the CBA

U = Encroachment is unavoidable for the CBA



Tri-County PARKWAY Location Study

FIGURE 4.12-16
POTENTIAL FLOODPLAIN IMPACTS

TABLE 4.12-8
SUMMARY OF FLOODPLAIN ENCROACHMENTS
BY ALTERNATIVE, STREAM, AND WATERSHED

Alternative	Streams Impacted	HUC Code	# of Encroach-ments	Location (ID# of Figure 4.12-15)	Acres	Acres Unavoidable Impacts
West Two CBA	Little Bull Run, Lick Branch, unnamed Bull Run trib., Bull Run, South Fork	02070008, 02070010	8	3, 5, 7-8, 10, 15, 16, 20	26.905	26.355
West Four CBA	Little Bull Run, Lick Branch, unnamed Bull Run trib., Bull Run, unnamed Elklick Run trib., Elklick Run	02070010	11	3, 5, 7-8, 10, 12-14, 17-19	39.400	36.304
Comprehensive Plan CBA	Elklick Run, unnamed Elklick Run trib., unnamed Bull Run trib., Cub Run, Bull Run, Flat Branch, Cannon Branch	02070010	12	1-2, 4, 6, 9, 11, 13-14, 17-19, 21-22	287.840	281.096

4.12.5.2 Floodplain Mitigation

As previously discussed, comparative analysis among considered alternatives has been conducted using a standardized 600-foot-wide assessment foot corridor. Based on preliminary engineering, five bridges would be constructed along the West Two CBA, 13 along the West Four CBA, and 15 along the Comprehensive Plan CBA. At proposed bridge crossings, the minimum number of piers to ensure structural stability will be placed within floodways. Feasible construction methods that would not require the placement of construction causeways would be evaluated during the design phase. Should it become necessary, fill placed for temporary construction causeways or work bridges would be removed and preconstruction floodplain conditions will be restored immediately following construction. Breastwalls and fill placed within floodplains for bridge abutments would be minimized.

At 281 acres, the Comprehensive Plan CBA would affect the largest acreage of floodplains. This is due to the fact that the Comprehensive Plan CBA would entail longitudinal encroachments along Flat Branch and Cub Run and would result in substantial encroachment within the Flat Branch, Bull Run, Cub Run floodplain complex in the vicinity of the proposed I-66 interchange. Because the actual footprint of the construction would be much narrower (between 200 and 300 feet in width), some of these floodplains would be avoided and spanned with bridges (see Hydrology and Hydraulics Technical Report) as a result of future design steps should this CBA be selected. Future design would focus on avoiding and minimizing floodplain encroachment to ensure this CBA is consistent with Executive 11998 and FHWA policy as set forth in 23 CFR 650. The design would include detailed hydraulic evaluation to ensure that increases in flood risk and impacts to floodplain values would not result from construction of this CBA. The proposed I-66 interchange is located within Ben Lomond and Bull Run Regional Parks. Both of these facilities provide value to the study area as recreational and aesthetic resources. Additionally, Bull Run Regional Park contains significant wildlife, natural heritage, and wetland resources. The confluence of Flat Branch, Bull Run, and Cub Run has also been identified as a critical area with regard to water quality. Because floodplain vegetation retains and filters sediment and nutrients associated with upland runoff, encroachment of the magnitude associated with the Comprehensive Plan CBA is likely to affect water quality in Bull Run (Federal Interagency Floodplain Management Task Force, 1996), a waterway which has already been identified as impaired by the VDEQ.

Assuming a 600-foot-wide corridor, eleven encroachments, totaling 39.4 acres would result from development of the West Four CBA. Five of the eleven encroachments associated with the West Four CBA are avoidable provided minimization and avoidance procedures are implemented during engineering and design of the roadway prism. The six remaining encroachments are latitudinal; the floodplain could be spanned by bridging at these locations (see Hydrology and Hydraulics Technical Report); thus, floodplain impacts resulting from implementation of the West Four CBA could be mitigated by avoidance-oriented engineering and design.

Floodplain encroachments associated with the West Two CBA could be mitigated. Of the eight encroachments, three are avoidable if engineering and design procedures for minimizing floodplain impacts are implemented (such as use of steeper-than-conventional slopes and use of vertical retaining walls in lieu of earthen embankments). The remaining five encroachments involve stream crossings and can be avoided if the floodplain is spanned by bridging (see Hydrology and Hydraulics Technical Report). The West Two CBA would involve a maximum of 26.9 acres of impact. The West Two CBA would result in the least floodplain impacts and the fewest stream crossings among the CBAs considered.

In addition to mitigation and avoidance procedures related to encroachment acreage minimization, Sections 107 and 303 of VDOT's highway construction specifications require implementation of stormwater management practices to address concerns such as post-development runoff associated with storm events and downstream channel capacity. These standards require that stormwater management ponds be designed to reduce stormwater flows to pre-construction conditions for up to a 10-year storm event. VDOT and its construction contractors would adhere to the specifications to prevent an increase in flooding risks associated with proposed highway construction. For the majority of encroachments, and likely for all encroachments associated with the West Two and West Four CBAs, it is anticipated that backwater elevations and waterbody flow velocity increases at the floodplain encroachments would be minimal if present.

During final design, a detailed hydraulic survey and hydrology study would evaluate the effect of the proposed roadway improvements on stormwater discharge. The hydraulic study would ensure that no substantial increase in downstream flooding would occur. Design modifications to eliminate or minimize encroachments to the extent practicable are required by Executive Order 11988. For these reasons, it is likely that the West Two and West Four CBAs would have negligible impacts to natural and beneficial floodplain values.

4.12.6 Threatened and Endangered Species

Field reconnaissance for federal and state listed threatened or endangered species within the CBAs was based on the information provided by the FWS (FWS; 22 April 2002 letter), the DNR-DNH (DCR-DNH, 03 May 2002 email), and the wildlife species database maintained by the VDGIF (VDGIF, 9 August 2002). The 600-foot-wide assessment corridor of each of the CBAs was traversed by foot to identify the presence of threatened or endangered species and any potential habitat within the corridors for special status species. This evaluation was a planning level of effort and did not entail formal surveys.

4.12.6.1 Federal Listed Threatened or Endangered Species

4.12.6.1.1 Environmental Consequences

TABLE 4.12-9 summarizes the field reconnaissance findings and locations of potential habitat for federally threatened and endangered species.

TABLE 4.12-9
POTENTIALLY AFFECTED FEDERAL THREATENED AND ENDANGERED SPECIES

Candidate Build Alternative	Location of Proposed Construction in or Near Potential Habitat or Population		
	Small Whorled Pogonia (*Isotria medeoloides*)	**Dwarf Wedgemussel (*Alasmidonta heterodon*)**	**Bald Eagle (*Haliaeetus leucocephalus)***
West Two CBA	No known populations affected (Potential habitat located north of Bull Run in Loudoun County & located north of Rt 234 in Prince William Co)	No known populations affected	No known populations affected
West Four CBA	No known populations affected (Potential habitat located north of Route 234 in Prince William County)	No known populations affected	No known populations affected
Comp. Plan CBA	No known populations affected	No known populations affected	No known populations affected
No Build	No known populations affected	No known populations affected	No known populations affected

Construction of any of the CBAs should result in no direct effect or no adverse effect on threatened and endangered species or critical habitat, and would be in compliance with the Federal and State Endangered Species Acts. No direct impacts to known populations or critical habitats for Federal endangered or threatened species should result from the construction of any of the CBAs; however, one area of potential habitat for the small whorled pogonia was observed north of Route 234 within the West Two and West Four CBAs (Segment C) during the field reconnaissance. Another area of potential habitat for the small whorled pogonia was observed north of Bull Run adjacent to Route 705 within the West Two CBA (Segment D). No small whorled pogonia individuals were observed during the field reconnaissance. According to the Bull Run Regional Park 2001 Natural Resources Inventory, no suitable habitat for the small whorled pogonia is present within the park boundaries. In addition, no threatened or endangered mussels where identified in the project area. Continued coordination with the DCR, Division of Natural Heritage, DACS, DGIF, and FWS will occur to determine if further studies or a full survey are needed for the CTB-selected alternative. Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no impacts to federal listed threatened or endangered species are anticipated; however, evaluation of the potential effects may be required if any programmed improvement comes to involve major new construction.

4.12.6.1.2 Mitigation

Indirect impacts to any populations located downstream of affected streams would be mitigated through restoration of disturbed stream banks/substrate and land surfaces immediately following the construction of any of the CBAs. The terrestrial lands would be seeded immediately following the completion of the construction activities. Fill placed in riverine habitat for temporary construction causeways or work bridges would be removed and preconstruction streambed conditions would be restored immediately following construction. Fill placed for bridge abutments would be placed landward of the ordinary water line, where practicable. Permits would be obtained from the VDEQ, the VMRC, and the COE for impacts to regulated streams and appropriate mitigation would be offered to compensate for the impacts. Silt fences, siltation curtains, stormwater management basins and other practicable means to provide erosion and sedimentation control and stormwater management would be implemented during construction. Following selection of a preferred alternative but prior to issuance of a Record of Decision, further coordination with the FWS and NMFS will occur to determine if further studies or comprehensive surveys for special status species are needed in order to comply with the Federal Endangered Species Act.

4.12.6.2 State Listed Threatened or Endangered Species

4.12.6.2.1 Environmental Consequences

TABLE 4.12-10 summarizes the field reconnaissance findings and locations of potential habitat for state-listed threatened and endangered species.

TABLE 4.12-10
POTENTIALLY AFFECTED STATE THREATENED AND ENDANGERED SPECIES

CBA	Location of Proposed Construction in or Near Potential Habitat or Population			
	Upland Sandpiper (*Bartramia longicauda*)	Henslow's Sparrow (Ammodramus henslowii)	Wood Turtle (*Clemmys insculpta*)	Brook Floater (*Alasmidonta varicose*)
West Two CBA	No known populations affected	No known populations affected	No known populations affected	No known populations affected
West Four CBA	No known populations affected	No known populations affected (documented 0.75 miles from segment)	No known populations affected	No known populations affected

CBA	Location of Proposed Construction in or Near Potential Habitat or Population			
	Upland Sandpiper (*Bartramia longicauda*)	Henslow's Sparrow (Ammodramus henslowii)	Wood Turtle (*Clemmys insculpta*)	Brook Floater (*Alasmidonta varicose*)
Comprehen-sive Plan CBA	No known populations affected (documented 1.5 miles to the south of southernmost point)	No known populations affected	No known populations affected	No known populations affected
No-Build	No known populations affected	No known populations affected	No known populations affected	No known populations affected

According to VDGIF, the Henslow's sparrow has been documented approximately 0.75 miles from the West Four CBA where Segment G crosses Route 659. In addition, VDGIF indicated that the state threatened upland sandpiper had been documented approximately 1.5 miles from the southernmost point of Segment C (near the Route 28/Route 234 intersection). Neither species was observed during the field reconnaissance of the 600-foot-wide corridors of the CBAs although no comprehensive survey was conducted. The Henslow's sparrow prefers mesic transitional, old brush fields, and pastures. The upland sandpiper prefers drier upland pastures and transitional fields. The Comprehensive Plan CBA would result in the greatest amount of impacts to transitional land area and potentially suitable habitat at approximately 120.6 acres. The West Four CBA would result in the greatest amount of impacts to agricultural land area and potentially suitable habitat at approximately 223.8 acres.

The wood turtle has been documented in Cub Run by the DCR–DNH approximately four miles upstream from the Comprehensive Plan CBA crossing of Cub Run. The wood turtle prefers deciduous forest cover near perennial creeks or streams. Construction of the Comprehensive Plan CBA would result in the greatest amount of impacts to deciduous forest land area and potentially suitable habitat at approximately 171.8 acres. No wood turtle individuals were observed during the field reconnaissance of the 600-foot-wide corridors of the CBAs.

No direct impacts to known populations or critical habitats for state-listed endangered or threatened species would result from the construction of any of the CBAs. The construction of any of the CBAs will result in no adverse effects to state listed species. The stream crossings within the CBA corridors were investigated for the presence of the state endangered brook floater. Mussel shells were collected from the perennial streams and identified. No brook floater individuals were identified.

Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no impacts to state listed threatened or endangered species are anticipated; however, evaluation of the potential effects may be required if any programmed improvement comes to involve major new construction.

4.12.6.2.2 Mitigation

Continued coordination with the DCR-DNH, VDACS, and VDGIF will occur to determine if further studies for state designated special status species are needed for the selected alternative. VDOT will take all practicable steps to avoid or minimize impacts to state listed species downstream of or in the vicinity of a construction area. Silt fences, siltation curtains, stormwater management basins, and other practicable means to provide erosion and sedimentation control and provide stormwater management would be implemented during construction.

4.12.7 Wild and Scenic Rivers

As discussed in Chapter 3, no National Wild and Scenic Rivers are designated in Virginia and no Virginia Scenic Rivers are designated within the study area.

4.12.8 Coastal Zone Management

The construction of any of the CBAs would be consistent with Virginia's Coastal Zone Management Plan (CZMP) by securing all appropriate environmental permits and ensuring compliance with the enforceable programs that comprise Virginia's program. In accordance with requirements for a consistency determination, potential project effects have been assessed with respect to the eight program components.

Fisheries Management: The CBAs would impact aquatic habitat due to the unavoidable crossing of several water bodies. VDOT would take all practicable and appropriate steps to avoid or minimize impacts to the water bodies crossed by the CBAs. VDOT will continue to coordinate with the DGIF and VMRC during design and permitting phases of the project. The project will not produce, sell, or use any tributyltin (TBT) boat paints and therefore will be consistent with the State TBT Regulatory Program.

Subaqueous Lands Management: Each of the CBAs would impact subaqueous lands and would require a permit from the VMRC. VDOT would secure the required permits for the project if a CBA is selected as the preferred alternative.

Tidal and Non-Tidal Wetlands Management: Each of the CBAs would impact non-tidal wetlands and would require a Virginia Water Protection Permit from the Virginia DEQ and a Section 404 Permit from the USACE. No Tidal Wetland Permit will be required. VDOT will secure the required permits for the project if a CBA is selected as the preferred alternative.

Dunes Management: None of the CBAs will impact dunes regulated under the Primary Sand Dune Protection Act.

Non-point Source Water Pollution Control and Coastal Land Management: Each of the CBAs will impact Resource Management Areas (RMAs) and Resource Protection Areas (RPAs) designated under the Chesapeake Bay Preservation Act. To comply with the Chesapeake Bay Preservation Act regulations, VDOT will minimize and avoid impacts to RMAs and RPAs wherever practicable and will develop appropriate erosion and sediment control and stormwater management plans during the design phase of the project. Compliance with these requirements will serve to control non-point source runoff.

Point-Source Pollution Control: Construction of each of the CBAs would create multiple point source discharges and would require a Virginia Pollutant Discharge Elimination System General Permit (VPDES) from the Virginia DEQ for the stormwater discharges from construction activities. VDOT take all practicable and appropriate steps to avoid or minimize impacts to the water bodies affected by stormwater runoff from any of the CBAs.

Shoreline Sanitation: None of the CBAs would use a septic system and, therefore, none would require a septic system permit from the Virginia Department of Health. The project would not affect shoreline sanitation.

Air Pollution Control: Each of the CBAs would affect air quality in the area. The project construction would require the use of fossil-fuel burning equipment for excavation and for transport of materials used in the project. Vehicles used by construction personnel would produce emissions, including carbon monoxide, hydrocarbons, and nitrogen oxides. In addition to vehicle emissions, the project construction would generate low levels of dust and wind-borne particulates from soils exposed during grading. The Tri-County Parkway is located within a maintenance area for ozone. Section 4.10 of this EIS evaluates air quality impacts and concludes that each of the CBAs will be consistent with the State Implementation Plan for achieving compliance with the Clean Air Act.

Construction of each of the CBAs will require coordination and consultation with state agencies to be consistent with the CZMP. VDOT will secure all appropriate permits and approvals for the construction of a CBA, if selected. VDOT will mitigate for unavoidable impacts to aquatic resources and abide by the conditions set forth by the permits and approvals; therefore, any of the CBAs would be consistent with the Virginia CZMP. Although small amounts of new right-of-way may be required for implementation of programmed improvements associated with the No-Build Alternative, no major impacts to coastal zone resources are anticipated; however, evaluation of the potential effects to coastal zones may be required if any programmed improvement involves major new construction.

4.12.9 Chesapeake Bay Preservation Act Resource Protection Areas

Anticipated encroachments into Chesapeake Bay Preservation Act Resource Protection Areas (RPAs) were calculated for each alternative under consideration as shown in Table 4.12-11. The West Two CBA would entail the least encroachment (55.3 acres), the Comprehensive Plan CBA would entail the most (240.5 acres), and the West Four CBA would entail encroachments that are intermediate to the other two CBAs (58.5 acres). The significantly higher impact amount for the Comprehensive Plan CBA is attributable to a single large encroachment in Bull Run Regional Park (168 acres) on Segment E; this single encroachment accounts for 77 percent of the total for this CBA.

TABLE 4.12-11
SUMMARY OF RPA ENCROACHMENTS (ACRES)

West Two CBA	West Four CBA	Comprehensive Plan CBA	No-Build
55.3	58.5	240.5	minor

Notes: The base digital RPA mapping used for the calculations in Prince William and Fairfax counties are dated 1991 and 1993, respectively. Estimated calculations are based on 2003 Fairfax County field-delineated mapping revisions. Prince William County estimates are based on Wetland Studies and Solutions proprietary GIS data.

Analysis of alternatives demonstrates that avoidance of RPAs within a 600-foot-wide assessment corridor is currently not feasible. Minimization would, therefore, be required to reduce the maximum footprints of the anticipated encroachments using design engineering to avoid as much encroachment to the maximum extent possible. Construction limits within encroachments should be as limited as possible, and equipment/storage and stormwater/erosion control infrastructure should be restricted or limited as applicable within identified construction footprints for any selected CBA. Linear transportation projects are conditionally exempt from Chesapeake Bay Resource Preservation Act regulations, provided avoidance and minimization procedures to reduce encroachments into RPAs are implemented to the greatest extent practicable. VDOT's *Road and Bridge Specification Manual* provisions will be implemented in all contractor bid packages and construction documents including special provisions in order to fully adhere to CBPA conditional exemption requirements.

Implementation of programmed improvements associated with the No-Build Alternative would likely not entail substantial encroachment into RPAs unless indirect, off-site design options such as satellite lots, bus terminals, etc. are considered within an RPA. Estimates of encroachment areas could be calculated at the preliminary design phases to determine any additional encroachment impacts for each programmed improvement.

4.12.10 Mineral Resources and Geology

Seven economic mineral resource sites are located within the study area. Five of these sites are active quarries that mine diabase or mudstone and shale. One abandoned diabase quarry and an occurrence of gold are also located within the study area. Current economic mineral resources consist of crushed stone for roadbeds and asphalt, and shale and mudstone for brick production.

Economic mineral resources located nearby CBAs are listed in Table 4.12-12. None of the CBAs would have a direct affect on known mineral resources located in the study area; however, development of traffic maintenance plans may be needed to preclude adverse effects to access and operations. Implementation of programmed improvements associated with the No-Build Alternative should not impact mineral resources or unique geologic features in the project area; however, evaluation of the potential effects to mineral resources or unique geologic features may be required if a programmed improvement involves major new construction.

TABLE 4.12-12
POTENTIALLY AFFECTED MINERAL RESOURCE OPERATIONS

Name of Mineral Resource	Location	Resource	Nature of Effects of CBAs
Luck Stone Quarry	Hwy 29 west of Hwy. 621	Crushed stone from diabase for roadbeds and asphalt stone.	The southern portion of Segment F of the Comprehensive Plan CBA skirts around to the south and west of current quarry boundaries and operations. No direct effects expected; however traffic maintenance plans may be required.
Bull Run Gold Occurrence	300 meters south of I-66 in Bull Run	Several gold flakes were panned in stream gravel (1980)	No effect. Segment E of the Comprehensive Build Alternative crosses I-66 well to the east of this location. No commercial economic value is reported for this site and no effect is expected.
Bull Run Stone Company (recently acquired by Luck Stone Corporation)	Hwy. 659 north of Hwy. 234	Crushed stone from diabase for roadbeds and asphalt stone, concrete aggregate, and local stone.	Site is located east of Segment C and south of Segment G of the West Two and West Four CBAs. No direct effect; however traffic maintenance plans may be required
Abandoned diabase quarry (possibly operational in 1940's)	Hwy. 659 north of Hwy. 234	Most likely crushed stone at one time.	No effect. Site is located east of Segment C and south of Segment G of the West Two and West Four CBAs
Vulcan Material Company	Vulcan Drive between Hwy. 234 and Goodwin Drive	Crushed stone from diabase for road stone and asphalt stone.	Site is located west of Segment E of the Comprehensive Plan CBA. No direct effect; however traffic maintenance plans may be required
Glen Gery Brick Company	South of Hwy 28 and east of Goodwin Drive.	Triassic shale and mudstone for brick production	No effect. Site is located southeast of Segment E of the Comprehensive Plan CBA. No direct effect; however traffic maintenance plans may be required

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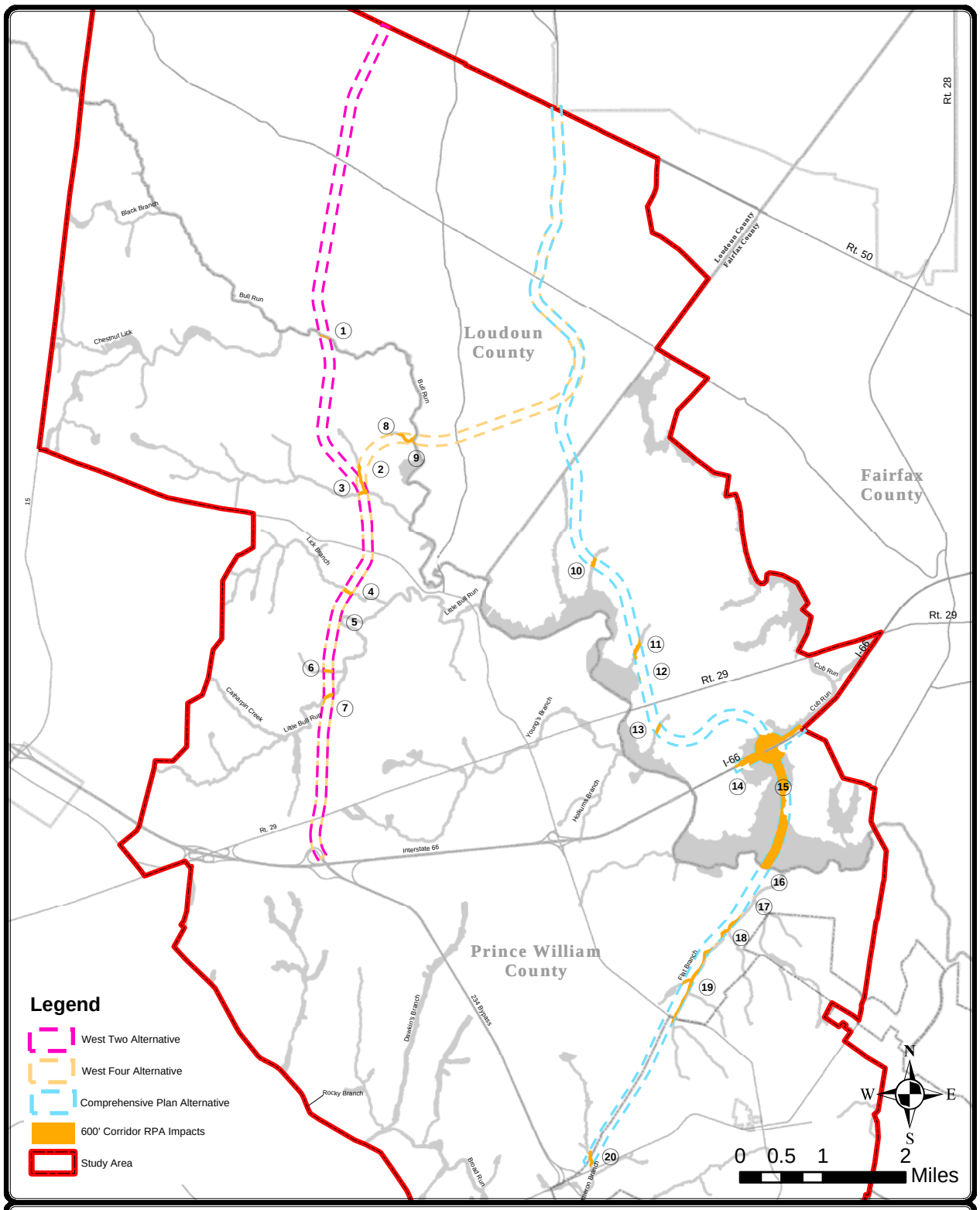


Tri-County PARKWAY Location Study

FIGURE 4.12-17
POTENTIALLY AFFECTED RESOURCE PROTECTION AREAS (RPAS)

4.13 INDIRECT EFFECTS AND CUMULATIVE IMPACTS

Indirect effects and cumulative impacts associated with the construction of the proposed Tri-County Parkway have been assessed in accordance with the Council of Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR §§ 1500-1508). More-detailed discussion is presented in the Indirect Effects and Cumulative Impacts Technical Report (VDOT, 2004).

4.13.1 Indirect Effects

Primary factors affecting growth and land management practices specific to the proposed action were identified in order to guide an analysis of reasonably foreseeable indirect effects at each proposed interchange/intersection location within the study area. Existing land use maps were reviewed to identify a general inventory of currently developed and undeveloped land within the project impact zone. The most recently updated county comprehensive plans were used to estimate future land uses within the study area through year 2030. Coordination with the local government representatives was also conducted to obtain any information that might not be addressed in the most recently available comprehensive plans.

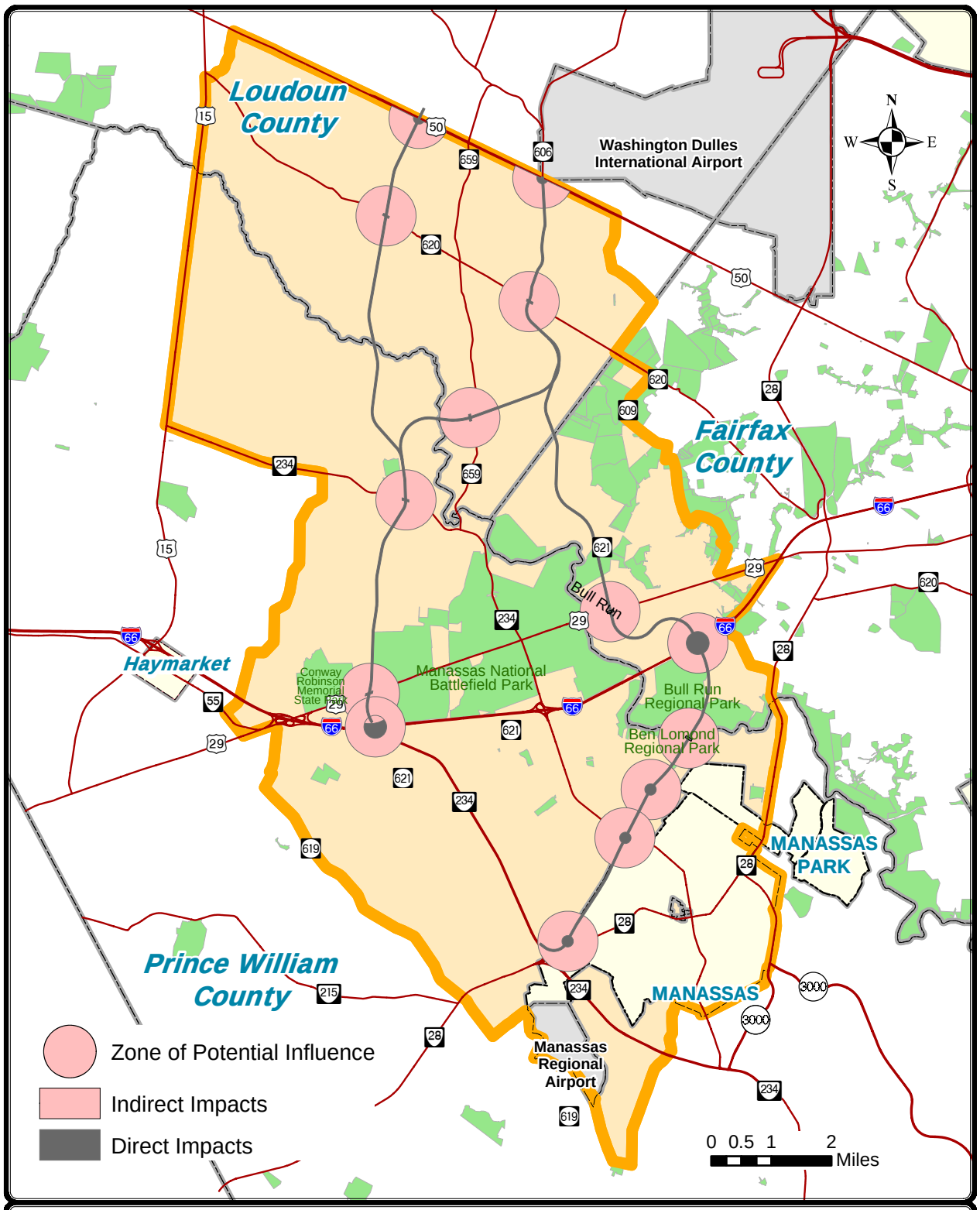
It is reasonable to assume that a certain degree of development will ultimately occur in the vicinity of those interchanges/intersections proposed within the study area. A zone of potential influence having a one-half-mile radius around each proposed interchange/intersection was used to estimate the amount of undeveloped land that could be developed for non-highway use that is not accounted for in the various county comprehensive plans. As previously discussed, each county is responsible for zoning and their decisions pertaining to allowable population density will be the primary determinant of the magnitude of future growth within the study area.

Seven grade-separated interchanges and seven at-grade intersections have been assessed with respect to indirect effects and cumulative impacts for the various CBAs. The locations of these interchanges/intersections are shown in FIGURE 4.13-1. In order to determine the indirect effects associated with these interchanges/intersections, the direct effects associated with the construction of the proposed roadway and interchange ramps (where applicable) must be accounted for. The total amount of land required for each interchange/intersection is then subtracted from each zone of potential influence to determine the amount of undeveloped land that could be developed for non-highway use. The amount of direct effects associated with these interchanges/intersections is dependant upon the type of interchange/intersection proposed and the alignment of the roadway.

The locations of assessed grade-separated interchanges and the CBA(s) under which they are proposed are as follows:

- VA 234 (Comprehensive Plan CBA, Segment E)
- VA 234 Business (Comprehensive Plan CBA, Segment E)
- Lomond Drive (Comprehensive Plan CBA, Segment E)
- I-66 east of the MNBP (Comprehensive Plan CBA, Segments E and F)
- US 50 east of the MNBP– (Comprehensive Plan CBA and West Four CBA, Segment F')
- I-66 east of the MNBP (West Two CBA and West Four CBA, Segment C)
- US 50 east of the MNBP (West Two CBA,, Segment D)

The direct effects associated with these interchanges assume an average limit of construction width of 200 feet for the proposed roadway and a 500-foot radius for the construction associated with the interchange itself; however, the radius associated with the construction of the I-66 interchanges assumes a 1,000-foot radius which accounts for the larger area required to construct the ramps associated with these interchanges.



Tri-County PARKWAY Location Study

FIGURE 4.13-1
PROPOSED INTERCHANGE/INTERSECTION LOCATIONS

The direct effects associated with the at-grade intersections also assume an average limit of construction width of 200 feet for the proposed roadway. Since these intersections do not involve the construction of ramps, no radius was needed to account for additional impacts; however, in order to account for additional turning lanes associated with these intersections, a 200-foot-wide limit of construction was applied to the existing crossroads for a distance of 200 feet on either side of the proposed roadway. The seven at-grade intersections proposed for the various CBAs would be located at:

- Ben Lomond Park Access (Comprehensive Plan CBA, Segment E)
- US 29 east of the MNBP (Comprehensive Plan CBA, Segment F)
- Braddock Road east of the MNBP (Comprehensive Plan CBA and West Four CBA, Segment F')
- US 29 west of the MNBP (West Two CBA and West Four CBA, Segment C)
- Sudley Road (West Two CBA and West Four CBA, Segment C)
- Gum Spring Road (West Four CBA, Segment G)
- Braddock Road west of the MNBP (West Two CBA, Segment D)

4.13.1.1 Land Use Conversions

Existing land use within each intersection/interchange assessment area (zone of potential influence) described above is provided in Table 4.13-1. Direct effects associated with construction of intersections/interchanges under consideration are shown in Table 4-13-2. The remaining area within each zone of potential influence was then analyzed to determine the amount of undeveloped land that could be developed for non-highway use in accordance with local comprehensive plans. Table 4.13-4, Table 4.13-5, and Table 4.13-6 show indirect effects associated with induced or accelerated development (i.e., the conversion of forests to commercial areas, etc.) that construction of intersections or interchanges might bring under implementation of the West Two CBA, the West Four CBA, and the Comprehensive Plan CBA, respectively. Differences shown reflect the relative degree of current land development within portions of the study area traversed by each of the CBAs (with the West Two CBA corridor currently being the least developed and the Comprehensive Plan CBA corridor currently being the most developed).

Under the build condition, the amount of undeveloped land that would be available for other types of development is less than what is currently available because construction of an intersection or an interchange would consume a portion of this land. The conversion of remaining undeveloped land is not a result of the proposed project, but rather the result of the future land use proposed by the various county and city comprehensive plans. Given the degree of land use conversions projected under local comprehensive plans (i.e., from undeveloped to developed), the nature of land use would not change substantially following implementation of a CBA and the type of projected development would occur with or without the project. Although provision of intersections or interchanges may serve to accelerate land conversions shown in Table 4.13-4, Table 4.13-5, and Table 4.13-6, it is concluded that land use conversions in the vicinity of intersections/interchanges proposed under each of the CBAs will be comparable to those projected under the No-Build condition. As such, indirect effects is not a critical factor in selecting an alternative. While development will occur at a slower rate for undeveloped lands located further away from existing or proposed roadways, development is expected to continue as it has for the past several decades. This trend is expected to continue regardless of whether the Tri-County Parkway is constructed or not.

TABLE 4.13-1
EXISTING LAND USE ACREAGE WITHIN INTERSECTION/INTERCHANGE ASSESSMENT AREAS

Land Use	Proposed Intersection or Interchange													
	VA 234	VA 234 Business	Lomond Drive	*Ben Lomond Park Access*	I-66 (East of MNBP)	*US 29 (East of MNBP)*	*Braddock Road (East of MNBP)*	US 50 (East of MNBP)	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Gum Spring Road*	*Braddock Road (West of MNBP)*	US 50 (West of MNBP)
Agriculture	158.0	42.3	34.9	0.1	50.5	89.0	135.6	156.3	94.9	73.6	153.0	203.4	302.9	120.0
Commercial	11.0	95.3	1.5	0.5	0	20.9	0	0.6	3.6	9.8	11.5	0	46.0	18.7
Forest	0	19.9	3.7	0.5	47.8	8.9	138.7	29.2	130.1	48.0	70.7	87.8	82.1	31.3
Industrial	208.2	4.4	0	32.9	46.8	111.7	0	16.6	85.5	0	0	96.7	0	0

Land Use	Proposed Intersection or Interchange													
	VA 234	VA 234 Business	Lomond Drive	*Ben Lomond Park Access*	I-66 (East of MNBP)	*US 29 (East of MNBP)*	*Braddock Road (East of MNBP)*	US 50 (East of MNBP)	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Gum Spring Road*	*Braddock Road (West of MNBP)*	US 50 (West of MNBP)
Park	0	15.2	19.9	241.5	166.9	47.2	6.2	0	108.1	269.9	0	0	0	0
Public	62.6	37.5	29.5	0	7.5	16.6	0.7	0	0.7	0.8	3.2	0	6.1	0
Residential	24.1	251.8	377.2	201.3	96.5	182.0	194.3	23.0	0	74.5	238.4	88.8	40.3	53.0
Transitional	38.5	36.0	35.7	25.6	86.4	26.1	26.9	17.4	79.5	25.8	25.6	25.7	25.0	18.6
Total	502.4	502.4	502.4	502.4	502.4	502.4	502.4	243.1	502.4	502.4	502.4	502.4	502.4	241.6

Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

TABLE 4.13-2
DIRECT EFFECTS WITHIN INTERSECTION/INTERCHANGE ASSESSMENT AREAS

Land Use	Proposed Intersection or Interchange													
	VA 234	VA 234 Business	Lomond Drive	*Ben Lomond Park Access*	I-66 (East of MNBP)	*US 29 (East of MNBP)*	*Braddock Road (East of MNBP)*	US 50 (East of MNBP)	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Gum Spring Road*	*Braddock Road (West of MNBP)*	US 50 (West of MNBP)
Agriculture	17.4	19.8	13.6	0	33.8	13.2	8.6	17.2	4.3	3.5	11.0	7.3	15.4	13.5
Commercial	0.4	4.2	0	0	0	1.1	0	0	0	0.1	0	0	5.8	0.6
Forest	0	0	13.6	3.5	5.3	0	12.7	0	70.0	13.4	0.6	4.6	4.4	2.7
Industrial	5.2	2.1	0	1.4	2.1	0	0	0	0	0	0	0	0	0
Park	0	0.3	6.5	9.7	41.2	0	0.3	0	5.7	3.3	0	0	0	0
Public	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	8.7	11.2	4.0	11.6	5.1	12.4	5.9	0.4	0	6.1	14.7	14.4	0	0.3
Transitional	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	31.7	37.6	37.7	26.2	87.5	26.7	27.5	17.6	80	26.4	26.3	26.3	25.6	17.1

Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

TABLE 4.13-3
INDIRECT EFFECTS TO FUTURE LAND USE
WITHIN INTERSECTION/INTERCHANGE ASSESSMENT AREAS

Land Use	Proposed Intersection or Interchange													
	VA 234	VA 234 Business	Lomond Drive	*Ben Lomond Park Access*	I-66 (East of MNBP)	*US 29 (East of MNBP)*	*Braddock Road (East of MNBP)*	US 50 (East of MNBP)	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Gum Spring Road*	*Braddock Road (West of MNBP)*	US 50 (West of MNBP)
Agriculture	0	0	0	0	0	4.3	0	0	0	83.8	397.5	0	0	0
Commercial	300.6	123.3	0	0	0	0	0	225.1	87.4	101.7	4.2	0	0	110.0
Forest	13.8	30.5	31.2	0	0	0	0	0	0	2.6	9.0	2.6	0	0
Industrial	40.7	0	0	58.9	0	12.5	0	0.4	222.3	0	0	21.6	0	0
Park	14.2	11.8	31.2	228.6	206.8	95.6	0	0	111.5	282.8	65.3	0	0	0
Public	30.4	49.9	21.9	6.1	33.4	0	0.1	0	1.1	5.0	0	0	1.1	0
Residential	0	229.7	380.4	182.6	146.3	353.1	235.6	0	0	0	0	0	113.2	0
Transitional*	71.0	19.6	0.03	0	28.4	10.2	239.2	0	0.1	0.1	0.1	451.9	362.5	114.5
Total	470.7	464.8	464.73	476.2	414.9	475.7	474.9	225.5	422.4	476	476.1	476.1	476.8	224.5

* - Only the future land use associated with each county's comprehensive plan includes a category for transitional land.
Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

TABLE 4.13-4
UNDEVELOPED LANDS SUBJECT TO INDUCED OR ACCELERATED DEVELOPMENT *
WEST TWO CBA

Land Use	Proposed Intersection or Interchange					
	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Braddock Road (West of MNBP)*	US 50 (West of MNBP)	TOTAL
Agriculture	0	83.8	397.5	0	0	481.3
Forest	0	2.6	9.0	0	0	11.6
Park	111.5	282.8	65.3	0	0	459.6
Transitional*	0.1	0.1	0.1	362.5	114.5	477.3
Total	422.4	476	476.1	476.8	224.5	2075.8

* In conformance with local comprehensive plans.
Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

TABLE 4.13-5
UNDEVELOPED LANDS SUBJECT TO INDUCED OR ACCELERATED DEVELOPMENT *
WEST FOUR CBA

Land Use	Proposed Intersection or Interchange						
	Braddock Road (East of MNBP)	US 50 (East of MNBP)	I-66 (West of MNBP)	*US 29 (West of MNBP)*	*Sudley Road*	*Gum Spring Road*	TOTAL
Agriculture	0	0	0	83.8	397.5	0	481.3
Forest	0	0	0	2.6	9.0	2.6	14.2
Park	0	0	111.5	282.8	65.3	0	459.6
Transitional*	239.2	0	0.1	0.1	0.1	451.9	691.4
Total	239.2	0	111.6	369.3	471.9	454.5	1646.5

* In conformance with local comprehensive plans.
Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

TABLE 4.13-6
UNDEVELOPED LANDS SUBJECT TO INDUCED OR ACCELERATED DEVELOPMENT *
COMPREHENSIVE PLAN CBA

Land Use	Proposed Intersection or Interchange								
	VA 34	VA 234 Business	Lomond Drive	*Ben Lomond Park Access*	I-66 (East of MNBP)	*US 29 (East of MNBP)*	*Braddock Road (East of MNBP)*	US 50 (East of MNBP)	TOTAL
Agriculture	0	0	0	0	0	4.3	0	0	4.3
Forest	13.8	30.5	31.2	0	0	0	0	0	75.5
Park	14.2	11.8	31.2	228.6	206.8	95.6	0	0	588.2
Transitional*	71.0	19.6	0.03	0	28.4	10.2	239.2	0	368.43
Total	99	61.9	62.43	228.6	235.2	110.1	239.2	0	1036.43

* In conformance with local comprehensive plans.
Note: Headings shown in italics denote at-grade intersections. Non-italicized headings denote interchanges on structure.

4.13.1.2 Effects On Water Quality

Urban development affects the physical and chemical characteristics of streams, thereby altering aquatic habitat. Increases in impervious surface result in proportional increases in runoff volume, thus, leading to erosion, stream widening, and incision, as well as increased contributions of pollutants (particularly sediment) to surface waters. In northern Virginia, pollutants and nutrients from nonpoint sources have been directly identified or indirectly suspected as potential causes for loss of biotic integrity in urban and suburban streams.

Pollutants most often present in stormwater runoff from highways, roads, and bridges include: sediment; nutrients; toxic metals (including zinc, copper, cadmium, lead, chromium, and mercury); polycyclic hydrocarbons (PAH); oil and grease; MTBE (a gasoline additive); chloride, sodium, and calcium (incident to salting and sanding processes); pesticides; and road debris. Increases in concentrations of these pollutants in surface water can result in disruption of life processes for aquatic organisms (including reproduction), can be toxic to aquatic life, or can decrease habitat suitability.

The proposed action has the potential to result in indirect effects related to increases in impervious cover accelerating and minimally inducing development adjacent to a selected alternative and within the study area as a whole. When impervious cover exceeds ten percent within a given watershed, negative effects on in-stream habitat are typically observed; at 25 percent, the watershed becomes severely degraded (Center for Watershed Protection, 2003). Using roadways along with residential, commercial, industrial, and institutional development as an indicator of net impervious coverage, the watershed comprising nearly all of the study area (the Middle Potomac-Anacostia-Occoquan Subarea or Hydrologic Unit Code 02070010), is presently comprised of 30,660 acres (or 43 percent) of land uses that substantially contribute to impervious surface. Although the majority but not all of this 30,660-acre total is comprised of impervious surface, it is reasonable to assume that the ten percent threshold and possibly the 25 percent threshold have already been exceeded for the watershed. Based on future land use projected under local comprehensive plans, portions of this watershed potentially affected by intersection/interchange zones of influence will be comprised of 592.1 acres of impervious surface contributing land uses under implementation of the West Two CBA (for a net increase of 1.9 percent), 848.7 acres of impervious surface contributing land uses under implementation of the West Four CBA (for a net increase of 2.8 percent), and 2,055 acres of impervious surface contributing land uses under implementation of the Comprehensive Plan CBA (for a net increase of 6.7 percent) by year 2030. Although these increases in impervious land surfaces are projected to occur under local comprehensive plans with or without the project, any inducement or acceleration of land conversions associated with the provision of new intersections or interchanges would be of greatest concern under implementation of the Comprehensive Plan CBA.

4.13.1.3 Effects On Wildlife Habitat

Indirect effects to aquatic habitat would consist of stormwater runoff from the new roadway along with potential long-term increases in impervious surfaces resulting from development accommodated by or accelerated by roadway construction. Indirect impacts to aquatic habitat located downstream of streams affected by the road would be mitigated through restoration of disturbed stream banks/substrate and land surfaces immediately following the construction of any of the CBAs and through provision of stormwater management facilities designed to address water quantity and water quality both. Mitigation of effects associated with subsequent development will be spatially and temporally variable, and will be the responsibility of localities under each of their respective ordinances. Mitigation of effects attributable to roadway construction can be assured under the build scenario; however, under the No-Build scenario, such areas could be subject to types of development that may not require comparatively stringent mitigation measures and the requirement for such mitigation would be totally within the control of local jurisdictions.

Of those bisected wildlife corridors discussed in section 4.12 of this EIS, the following would be further affected by accelerated or minimally induced development due to their proximity to a proposed intersection or interchange:

- Bull Run Regional Park from Bull Run north to Interstate 66 in Fairfax County,
- Bull Run east to Route 659 in Prince William County, and
- to a lesser degree, Bull Run north to Route 705 in Loudon County.

Using forest lands as a primary indicator, portions of wildlife corridors potentially affected by intersection/interchange zones of influence will be 11.6 acres under implementation of the West Two CBA, 14.2 acres under implementation of the West Four CBA, and 75.5 acres under implementation of the Comprehensive Plan CBA by year 2030. Although a certain proportion of these effects to wildlife habitat and corridors are projected to occur under local comprehensive plans with or without the project, any inducement or acceleration of land conversions associated with the provision of new intersections or interchanges would be of greatest concern under implementation of the Comprehensive Plan CBA. Over this time, it can be expected that the frequency of wildlife-vehicle collisions would increase as additional roadway is added to the

regional transportation network and additional land is converted as a result of secondary development. Other indirect effects would consist of increased noise pollution associated with vehicle traffic and accelerated or minimally induced development in them vicinity of new intersections and interchanges..

4.13.1.4 Effects On Wetlands, Floodplains, and Other Environmentally Sensitive Areas

As a function of those land use conversions discussed above, it is reasonable to expect that increased development would, over time, place additional stressors on environmentally sensitive areas through:

- encroachment into wetland buffers and increase the probability of applications requesting authorization to fill wetlands;
- encroachment into 100-year floodplains;
- encroachment into buffers of riparian systems and waters critical to populations of threatened or endangered species located downstream.

Although the aforementioned land use conversions are projected to occur under local comprehensive plans with or without the project, any inducement or acceleration of land conversions within buffers or floodplains (associated with the provision of new intersections or interchanges) would be of greatest concern under implementation of the Comprehensive Plan CBA.

4.13.2 Cumulative Impacts

Past, present, and foreseeable future actions have been investigated in order to determine the cumulative impacts associated with construction of the Tri-County Parkway. Cumulative impacts have been evaluated for those resources for which sufficient information exists regarding future conditions to draw meaningful conclusions. The evaluation of these cumulative impacts has been limited to the study area. Past actions have previously been discussed in Section 3.13 (Cumulative Impacts of Past Actions) of this EIS. Present and foreseeable future actions located in the study area are discussed below. Cumulative impacts are assessed from the perspective of reasonably foreseeable major public projects (as identified in regional transportation plans and local master plans) and from the perspective of reasonably foreseeable residential, commercial, and industrial development (as identified in local comprehensive plans and by local planning departments).

4.13.2.1 Current and Reasonably Foreseeable Actions

A proposed action must be far enough along in the planning process that its implementation is reasonably foreseeable. For this analysis, a reasonably foreseeable action is one that is funded regardless of whether it has obtained local, state, or federal approval. Table 4.13-7 presents major transportation projects listed in the 2003 Constrained Long Range Plan (CLRP) scheduled to be constructed by the design year for the project. Table 4.13-8 presents platted or locally approved subdivisions currently listed by local planning departments. Current growth trends within the study area are expected to continue throughout the next several decades: therefore, it is expected that many if not all of those residential developments listed in Table 4.13-8 will be constructed prior to construction of the Tri-County Parkway. Because development within the study area is continually changing at a substantial rate and because growth is expected to continue at or near current rates, it is reasonable to expect that residential, commercial, and industrial growth areas shown in local comprehensive plans reflect reasonably foreseeable cumulative impacts with respect to overall development. As with indirect effects (discussed in the preceding section), land use patterns projected under local comprehensive plans have been used as a measure of cumulative impacts for certain resources.

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TABLE 4.13-7
2003 CLRP TRANSPORTATION PROJECTS LOCATED WITHIN THE STUDY AREA

Facility	Improvement	Location		Number of Lanes		Completion Date
		From	To	From	To	
Major Highway Improvements						
I-66 Interchange	Reconstruct	@ US 29 (Gainesville)	- -	- -	- -	2011
US 29	Widen	Pleasant Valley Drive	VA 28	4	6	2010
US 29	Widen	Virginia Oaks Drive	I-66	4	6	2011
US 29 Interchange	Construct	@ VA 55/VA 619	- -	- -	- -	2011
US 29 (add NB Lane)	Construct	I-66	Entrance to Conway Robinson MSF	4	6	2011
VA 55	Widen	Gainesville UM Church	US 29 @ VA 619	2	4	2011
East-West Connector	Construct	VA 674 (Wellington Road)	US 29 @ Entrance to Conway Robinson MSF	- -	4	2011
US 29 Grade Separation	Construct	@ N-S Railroad	- -	- -	- -	2011
US 50	Reconstruct	@ VA 609 Pleasant Valley Road	- -	4	4	2005
US 50	Widen	Loudon County Line	VA 661 (Lee Road)	4	6	2020
VA 28	Widen	N. City Limits of Manassas Park	Old Centerville Road	4	6	2025
VA 28	Widen	Residency Road	WCL of Manassas (Vicinity of VA 234 Bypass)	2	4	2002
VA 28	Reconstruct /Widen	Bridge over Broad Run	Replace/Widen to Ultimate Width	2	6	2005
VA 28	Widen	VA 215 (Vint Hill Road)	Residency Road	2	4	2005
VA 28	Widen	VA 215 (Vint Hill Road)	VA 234 Bypass	4	6	2015
VA 234 (Manassas Bypass)	Widen/Upgrade	VA 234 S. of Manassas	I-66	4	6	2020
VA 234 (Manassas Bypass)	Construct	I-66	Loudon County Line	- -	4	2010
Major HOV and Transit Improvements						
I-66 HOV During Peak	Widen	US 15 (includes interchange reconstruction)	US 29 (Gainesville)	4	6	2015

TABLE 4.13-8
REASONABLY FORESEEABLE RESIDENTIAL DEVELOPMENT IN THE STUDY AREA

Development	Housing Types	Development	Housing Types
Baker Division [1]	Single Family	Lenah Run Hamlet E [1]	Single Family
Blue Spring Farm [1]	*	The Marches [1]	Single Family
Buck Division of Land [1]	*	MBP, LLC [1]	Single Family
Byrne Division [1]	Single Family	McIntosh Division [1]	Single Family
Cedar Crest [1]	Single Family	Miller Division [1]	Single Family
Duffield Division [1]	Single Family	Owens Division [1]	Single Family
Fox Division [1]	Single Family	Rendzio Division [1]	Single Family
Fox Division [1]	Single Family	Rexrode Division [1]	Single Family
Fraser Division [1]	Single Family	Ridings at Blue Spring [1]	Single Family
Gulick Division Of Land [1]	*	Savoy Woods Estates [1]	*
Harmon Easement [1]	Single Family	Smith Division [1]	*
Herndon Subdivision [1]	Single Family	South Auburn [1]	*
Hoffberger Family Subdivision [1]	Single Family	Twin Pond Acres [1]	*
Huntingdonshire Hills [1]	*	Wates Family Subdivision [1]	*
Hutcheson Subdivision [1]	*	Woodburn Division [1]	*
Hutchinson Division [1]	*	Bull Run Development Corp.	*
Hutchison Family Subdivision [1]	*		
Latham Division [1]	*		

[1] Source: Loudoun County parcel data

[2] Source: Prince William County parcel data

* Information unavailable at the time of this study..

4.13.2.2 Evaluation of Cumulative Impacts

The evaluation of the cumulative impacts associated with the proposed action has considered the total impacts to each resource that have occurred, are occurring, and will likely occur as a result of the proposed project. This evaluation also includes both indirect and direct effects, which are a subset of cumulative impacts. Finally, this evaluation needs to be considered in conjunction with Section 3.13 which addresses cumulative impacts from past and present actions in the study area, thereby establishing the context of the cumulative impacts. The following is a discussion of the cumulative impacts that are likely to occur as a result of constructing the Tri-County Parkway assuming that no other regional highway projects would be co-located upon any portion of the project alignment. Cumulative impacts considering possible co-location of the Manassas National Battlefield Park Bypass and the Route 234 North Bypass Extension are presented in section 4.13.2.3.

4.13.2.2.1 Land Use Impacts

Tri-County Parkway may influence the location, intensity, and nature of development that could occur near the proposed interchanges; however, based on future land uses projected under local comprehensive plans, the type of projected development would occur with or without the project. Specifically, land use conversions from (undeveloped to developed) is projected to be 30,660 acres by year 2030. By comparison the amount of land use conversion resulting from implementation of a CBA will comprise 1.1 percent of this total (or 348 acres) for the West Two CBA, 1.2 percent of this total (or 370 acres) for the West Four CBA, and 1.7 percent of this total (or 532 acres) for the Comprehensive Plan CBA. This project has been developed and designed

to address the cumulative impact from land use decisions which have placed increasing pressure on the existing transportation system and the need for additional development.

4.13.2.2.2 Socioeconomic Impacts

The construction of the Tri-County Parkway will not result in a disproportionate impact to either minority or low-income populations in the study area. Based on population and employment projections set forth in sections 3.6 and 4.6 of this EIS, the type of projected changes would occur with or without the project. By connecting various commerce centers, each of the CBAs would cumulatively enhance economic development of the study area to varying degrees .

4.13.2.2.3 Energy Impacts

Although energy use for the existing roadway network and the network that can be expected to be in place over the reasonably foreseeable future was not calculated, the energy that is expected to be used to construct, maintain, and operate the proposed project (Section 4.14) is considered to be a minor contribution to the cumulative energy usage for this roadway network given the number of lanes miles and vehicle miles traveled associated with it.

4.13.2.2.4 Farmland Impacts

It is expected that the Tri-County Parkway will influence the location, intensity, and nature of development that could occur near the proposed interchanges but as the distance from the interchange grows, the influence of the Tri-County Parkway on development will decrease as existing roads and access exercise greater influence over developmental location, intensity, and nature. Based on future land uses projected under local comprehensive plans, the type of projected development would occur with or without the project. Specifically, farmland loss is projected to be 7,865 acres by year 2030. By comparison the amount of land use conversion resulting from implementation of a CBA will comprise 1.7 percent of this total (or 132 acres) for the West Two CBA, 1.3 percent of this total (or 101 acres) for the West Four CBA, and 1.0 percent of this total (or 79 acres) for the Comprehensive Plan CBA. Further, in Section 3.13, it was documented that there has been a significant reduction in agricultural lands due to past and present actions.

4.13.2.2.5 Relocation Impacts

Under the No-Build Alternative (which assumes that all roadway and transit projects programmed for construction in the region's CLRP will be implemented except the Tri-County Parkway), it is expected that there will be numerous relocations of residences and businesses in the study area; however an exact number cannot be determined because all of those projects have not gone forward for development yet. Construction of the Tri-County Parkway would result in the relocation of residences and businesses also. Because of all of the residential and commercial development that is occurring in the study area and is planned to occur, there will be a net increase in residential and commercial property; it is expected that any individual or family relocated as a result of this project will have ample opportunity to find replacement housing in the study area if they so desire.

4.13.2.2.6 Air Quality Impacts

The air quality conformity analysis that was prepared for the Washington, D.C. Metropolitan Area by the Transportation Planning Board (MPO) is a cumulative impact analysis. This analysis takes into account the existing transportation network consisting of highway, transit, and bicycle/pedestrian components (which is a result of past and present actions), and determines through modeling the level of volatile organic compounds and nitrous oxides (ozone precursors) that can be expected to be produced on a regional basis if all reasonably foreseeable regionally significant future transportation improvements are made to the transportation network. The Tri-County Parkway was included in the most recent conformity analysis for the region. That analysis showed that, when all of the reasonably foreseeable regionally significant future transportation improvements are taken into account, the cumulative impact in terms of the regional air quality emissions that will result from their implementation will not exceed the SIP budgets established for the area under the Clean Air Act. As a result, it has been concluded through the conformity process that the cumulative air quality impact from the implementation of these improvements will not increase the number or

severity of violations which have caused the area to be designated nonattainment. Further, the conformity analysis lists hundreds of transportation improvements that are taken into account by the analysis. The Tri-County Parkway is just one improvement and its contribution to regional vehicle miles traveled is insignificant compared to the cumulative total of vehicle miles traveled forecasted for the region.

4.13.2.2.7 Noise Impacts

Existing noise levels at noise-sensitive sites adjacent to each corridor were calculated as part of the noise analysis up to 1,000 feet from the proposed location of each CBA. These noise levels essentially represent the cumulative localized impact on noise levels from past and present transportation-related actions and local land use decisions. The proposed project would add to these existing noise levels and in some instances, create localized noise impacts. In some rare instances, the project may even reduce noise levels at some noise receptors by moving traffic further away from it. Whether or not the contribution that the Tri-County Parkway will have on localized noise levels is an issue depends upon these existing noise conditions. For example, generally speaking, the increase from the construction of the project on localized noise levels will likely not be significant for those receptors that are located adjacent to or in close proximity to existing and high-volume roadways and/or areas characterized by commercial development. In contrast, noise increases from the project will have a greater impact on those receptors that are not located near high volume roads or existing commercial development where existing noise levels approach ambient noise levels. See Sections 3.10 and 4.10 of this EIS for more-specific details for localized noise impacts that can be expected as a result of the project. On a regional basis, major contributors to existing noise levels in the study area include Washington Dulles International Airport (located at the northern end of the project) and quarry operations located off Route 29 and east of Manassas National Battlefield Park (towards the southern end of the study area). Other major contributors to existing noise levels in the study area include the Interstate and primary highway systems - consisting of Interstate 66, Route 29, Route 28, Route 50, and Route 234. The Tri-County Parkway would become part of the primary system; however, its contribution to cumulative noise levels will be minor on a regional basis given the number of lane miles that it would add to the highway network compared to the number currently available.

4.13.2.2.8 Water Quality Impacts

Based on future land uses projected under local comprehensive plans, the type of projected development would occur with or without the project, albeit, probably at a different pace should a CBA be implemented. Specifically, land use conversions (from undeveloped parcels to developed parcels contributing to net increase in impervious surfaces) is projected to be 30,660 acres by year 2030. By comparison the amount of new impervious surface resulting from implementation of a CBA will comprise 1.1 percent of this total (or 348 acres) for the West Two CBA, 1.2 percent of this total (or 370 acres) for the West Four CBA, and 1.7 percent of this total (or 532 acres) for the Comprehensive Plan CBA. Secondary development that will likely occur at interchanges or be accelerated at those locations because of the project will add to this total (as documented in Section 4.13 of this EIS). Many past actions occurred at a time when no consideration was given to stormwater runoff and water quality impacts nor allowances made for them. As already documented in Section 3.13, past and present actions are responsible for the conversion of a large percentage of forest land, which historically exposed soils to runoff, as well as the conversion of wetlands, which significantly reduced the function and effectiveness of nutrient removal and floodflow alteration that these wetlands addressed, in part. Conseqently, the cumulative impact of past and present actions have already resulted in serious water quality degredation. Mandatory requirements for stormwater management presently implemented at both the state and local level would help to reduce cumulative impacts that can be expected in the study area over the life of the project.

4.13.2.2.9 Wildlife Habitat

Based on future land uses projected under local comprehensive plans, the type of projected development would occur with or without the project. Using forest lands as the single-most important component of regional wildlife habitat, forest loss within the study area is projected to be 8,979 acres by year 2030. By comparison the amount of forest loss resulting from implementation of a CBA will comprise 3.8 percent of this total (or 338 acres) for the West Two CBA, 3.1 percent of this total (or 278 acres) for the West Four CBA, and 4.9 percent of this total (or 440 acres) for the Comprehensive Plan CBA. Secondary development that will

likely occur at interchanges or be accelerated at those locations because of the project will add to this total (as documented in Section 4.13 of this EIS). As documented in Section 3.13, between 1937 and 1998, forest cover in the study area has fell from approximately 70 percent to 20 percent.

4.13.2.2.10 Wetland Impacts

Under the No-Build Alternative (which assumes that all roadway and transit projects programmed for construction in the regions CLRP will be implemented except the Tri-County Parkway), it is expected that there will be wetland impacts in the study area; however, an exact number cannot be determined because all of those projects have not yet gone forward for development. Additionally, wetland impacts can be expected to occur from the residential, commercial, and retail development that is planned for the study area. The loss of wetlands on a national scale (as well as a statewide scale) has been well documented, although the rate of loss has slowed considerably the past fifteen years. Prior studies by the U.S. Fish and Wildlife Service and others indicate that the contiguous United States has lost over 50 percent of its wetlands since the 1780's. These studies also indicate that Virginia has lost approximately 42 percent of its wetlands over that same time period. Construction of the Tri-County Parkway would result in additional impacts to wetlands. Assuming a 200-foot-wide average limits of construction, the proposed project would affect between 10 and 18 acres of wetlands (0.2 percent and 0.4 percent, respectively, of the regional wetlands total) depending which CBA is selected.

4.13.2.2.11 Floodplain Impacts

Historically, people have congregated around water because it provided a convenient means of transportation and became a source of commerce. Naturally, development occurred around water and spread out from there and, with this development, came impacts to floodplains and wetlands. Because wetlands are often associated with floodplains, the trend in floodplain impacts has followed the trend in wetland impacts. The Comprehensive Plan CBA would impact 287.8 acres of floodplains (4.1 percent of the total study area floodplain acreage) compared to 26.9 acres (0.4 percent of the total study area floodplain acreage) for the West Two CBA, and 39.4 acres (0.6 percent of the total study area floodplain acreage) for the West Four CBA.

4.13.2.2.12 Park, Recreation, & Open Space Impacts

Parkland acreage within the study area is projected to increase by 2,378 acres by year 2030. The amount of parkland loss resulting from implementation of a CBA will comprise a 1.8 percent decrease in this proposed of this total (or 42 acres) for the West Two CBA, a 1.8 percent decrease in this total (or 42 acres) for the West Four CBA, and a 8.9 percent decrease in this total (or 212 acres) for the Comprehensive Plan CBA (using the 600 foot study corridor). While it is true that the percent decrease is minor compared to the total acreage of parkland that will be available in the study area, the impact attributed to the Tri-County Parkway for purposes of cumulative impacts is significant because historically, there have been few impacts to established parks in the study area. Impacts that have occurred have been minor and in the form of sliver takes to accommodate minor roadway improvements. Historically, parks have been established and greenspace has been protected as people and concerned citizens saw the need to preserve land for future generations as development put increasing pressure on existing resources. Cultural Resource Impacts

Construction of the Tri-County Parkway has the potential to impact architectural and archaeological sites located within the study area. Depending on the alternative selected, the Putnam-Patton House and Manassas Battlefield Historic District could be directly impacted by the project. In addition, the Dulles International Airport Historic District and Gallagher Farm could be effected by the project because of its proximity to these resources. Several archeological sites deemed important primarily for the information that can be gathered from them also have the potential of being impacted by each CBA. Past and present actions in the form of roadway projects and residential, commercial, and industrial development have eliminated many architectural and archeological resources in the study area. Reasonably foreseeable future actions will place additional pressure on those resources that remain as development occurs around them - compromising their setting. As the study area continues to evolve from one characterized by rural development, agriculture, and forested lands to one characterized by residential, commercial, and industrial development, the area will continue to lose its sense of history, which will be increasingly confined to isolated locations. Construction of the Tri-County Parkway will certainly facilitate this evolution.

4.13.2.3 Shared Location Effects

The cumulative effects associated with reasonably foreseeable actions were analyzed with regard to two transportation projects that share a portion of their alignment with the CBAs proposed for the Tri-County Parkway. These projects include the Manassas National Battlefield Park Bypass and the Route 234 North Bypass Extension.

The Manassas National Battlefield Park (MNBP) Bypass will reroute portions of Route 29 and Route 234 around Manassas National Battlefield Park and provide alternatives for the traffic traveling through the Park. Only four alternatives being studied for of the MNBP Bypass share a portion of their alignment with Tri-County Parkway's West Two and West Four CBAs. Alternatives A and C of the MNBP Bypass will extend north along Pageland Lane and then turn to the east along the western edge of the Park. Alternatives B and D of the MNBP Bypass will also extend north along Pageland Lane, but will continue north until they intersect Route 234 before turning east along Bull Run. All alternatives being studied for of the MNBP Bypass project share a portion of their alignment with Tri-County Parkway's Comprehensive Plan CBA. Alternative A, B C, and D of the MNBP Bypass would intersect the Comprehensive Plan CBA north of Route 29 and Alternative G of the MNBP Bypass would intersect the Comprehensive Plan CBA south of Route 29.

The Route 234 Bypass North Extension is proposed as a continuation of the Route 234 Bypass to a point just east of Sudley Park in Prince William County. The Route 234 Bypass North Extension would share the same alignment with Tri-County Parkway's West Two and West Four CBAs, extending north along Pageland Lane to Route 234. The Route 234 Bypass Northern Extension is included in the Prince William Comprehensive Plan and on regional transportation plans.

The Manassas National Battlefield Park Bypass and the Route 234 North Bypass Extension have the greatest potential for cumulative effects to socioeconomic and natural resources located in the study area and as such are assumed to be built in the future conditions under the No-Build condition. The shared location effects associated with these projects are shown in Table 4.13-9 (West Two CBA), Table 4.13-10 (West Four CBA), and Table 4.13-11 (Comprehensive Plan CBA). Review of findings set forth in Tables 4.13-9 through 4.13-11 indicate that it could be beneficial to co-locate portions of facilities to reduce overall regional cumulative effects.

4.13.3 Conclusion

Given the history of the area (as presented in Section 3.13 of this EIS), it is clear that much of the natural environment in the study area has been and continues to be substantially degraded as a result of past and present actions. With the projected increases in employment, resource use, and population within the Tri-County Parkway study area, there is significant pressure to continue the existing trend for additional commercial, industrial, and residential development. In order to meet the increasing need for services such as transportation, water, sewer, utilities, housing, etc., a large number of public and private projects are currently planned or underway within the study area. Given that access is already provided to undeveloped lands, most of this development has already been planned and will occur regardless of whether or not the proposed action is implemented. There is little development that will occur solely as a result of the project. Although the proposed project may accelerate planned development within the study area, should it be implemented, this development would still be expected to occur within the analysis years of this EIS. Because much of the natural environment has been and continues to be substantially degraded by past and present actions, it is expected that this trend will continue as reasonably foreseeable future actions are implemented. The overall general socioeconomic benefit of improving the regional transportation system is critical for satisfying the purpose and need of the proposed action, while meeting the projected traffic demands wrought by other projects currently underway or planned by VDOT and others.

TABLE 4.13-9
CUMLATIVE EFFECTS ASSUMING SHARED LOCATION WITH WEST TWO CBA

Resource	MNBP Bypass		Route 234 Bypass	TCP West Two CBA	
	Alternative	Impacts Shared with TCP	Impacts Shared with TCP	Project Impacts if MNBP and Route 234 Bypasses are not Constructed	Project Impacts if MNBP and Route 234 Bypasses are Constructed
Residential Relocations	Alternative A	0	7	22	22
	Alternative B	7			15
	Alternative C	0			22
	Alternative D	7			15
	Alternative G	7			15
Commercial Relocations	Alternative A	0	0	0	0
	Alternative B	0			0
	Alternative C	0			0
	Alternative D	0			0
	Alternative G	0			0
Rural / Undeveloped Land (acres)	Alternative A	46.7	83.6	572.1	525.4
	Alternative B	83.6			488.5
	Alternative C	46.7			525.4
	Alternative D	83.6			488.5
	Alternative G	85.9			486.2
Parklands (acres)	Alternative A	0	0	0	0
	Alternative B	0			0
	Alternative C	0			0
	Alternative D	0			0
	Alternative G	0			0
MNBP	Alternative A	10.8	11.2	42.1	31.3
	Alternative B	11.2			30.9
	Alternative C	10.8			31.3
	Alternative D	11.2			30.9
	Alternative G	11.2			30.9
Stream Crossings (linear feet)	Alternative A	930	2854	24,077	23,147
	Alternative B	2854			21,223
	Alternative C	930			23,147
	Alternative D	2854			21,223
	Alternative G	2854			21,223
100-Year Floodplains (acres)	Alternative A	0	3.6	26.9	26.9
	Alternative B	3.5			23.4
	Alternative C	0			26.9
	Alternative D	3.6			23.3
	Alternative G	3.6			23.3
Resource Protection Areas (acres)	Alternative A	0	2.7	55.3	55.3
	Alternative B	2.7			52.6
	Alternative C	0			55.3
	Alternative D	2.7			52.6
	Alternative G	2.7			52.6
Farmlands (acres)	Alternative A	14.8	36.6	132.1	117.3
	Alternative B	36.6			95.5
	Alternative C	14.8			117.3
	Alternative D	36.6			95.5
	Alternative G	35.6			95.5

TABLE 4.13-10
CUMLATIVE EFFECTS ASSUMING SHARED LOCATION WITH WEST FOUR CBA

Resource	MNBP Bypass		Route 234 Bypass	TCP West Four CBA	
	Alternative	Impacts Shared with TCP	Impacts Shared with TCP	Project Impacts if MNBP and Route 234 Bypasses are not Constructed	Project Impacts if MNBP and Route 234 Bypasses are Constructed
Residential Relocations	Alternative A	0	7	18	18
	Alternative B	7			11
	Alternative C	0			18
	Alternative D	7			11
	Alternative G	7			11
Commercial Relocations	Alternative A	0	0	0	0
	Alternative B	0			0
	Alternative C	0			0
	Alternative D	0			0
	Alternative G	0			0
Rural / Undeveloped Land (acres)	Alternative A	46.7	83.6	582.4	535.7
	Alternative B	83.6			498.8
	Alternative C	46.7			535.7
	Alternative D	83.6			498.8
	Alternative G	85.9			496.5
Parklands (acres)	Alternative A	0	0	0	0
	Alternative B	0			0
	Alternative C	0			0
	Alternative D	0			0
	Alternative G	0			0
MNBP	Alternative A	10.8	11.2	42.1	31.3
	Alternative B	11.2			30.9
	Alternative C	10.8			31.3
	Alternative D	11.2			30.9
	Alternative G	11.2			30.9
Stream Crossings (linear feet)	Alternative A	930	2854	22,196	21,266
	Alternative B	2854			19,342
	Alternative C	930			21,266
	Alternative D	2854			19,342
	Alternative G	2854			19,342
100-Year Floodplains (acres)	Alternative A	0	3.6	39.4	39.4
	Alternative B	3.5			35.9
	Alternative C	0			39.4
	Alternative D	3.6			35.8
	Alternative G	3.6			35.8
Resource Protection Areas (acres)	Alternative A	0	2.7	58.5	58.5
	Alternative B	2.7			55.8
	Alternative C	0			58.5
	Alternative D	2.7			55.8
	Alternative G	2.7			55.8
Farmlands (acres)	Alternative A	14.8	36.6	101.1	86.3
	Alternative B	36.6			64.5
	Alternative C	14.8			86.3
	Alternative D	36.6			64.5
	Alternative G	35.6			65.5

TABLE 4.13-11
CUMLATIVE EFFECTS ASSUMING SHARED LOCATION WITH COMPREHENSIVE PLAN CBA

Resource	MNBP Bypass		TCP Comprehensive Plan CBA	
	Alternative	Impacts Shared with TCP	Project Impacts if MNBP Bypass is not Constructed	Project Impacts if MNBP Bypass is Constructed
Residential Relocations	Alternative A	0	23	23
	Alternative B	0		23
	Alternative C	0		23
	Alternative D	0		23
	Alternative G	4		19
Commercial Relocations	Alternative A	1	1	0
	Alternative B	1		0
	Alternative C	1		0
	Alternative D	1		0
	Alternative G	0		1
Rural / Undeveloped Land (acres)	Alternative A	24.9	701.1	676.2
	Alternative B	24.3		676.8
	Alternative C	4.1		697.0
	Alternative D	4.1		697.0
	Alternative G	17.8		683.3
Parklands (acres)	Alternative A	8.5	202.7	194.2
	Alternative B	8.5		194.2
	Alternative C	0		202.7
	Alternative D	0		202.7
	Alternative G	0		202.7
MNBP	Alternative A	0	9.5	9.5
	Alternative B	0		9.5
	Alternative C	0		9.5
	Alternative D	0		9.5
	Alternative G	2.5		7.0
Stream Crossings (linear feet)	Alternative A	2981	43,367	40,386
	Alternative B	1300		42,067
	Alternative C	670		42,697
	Alternative D	670		42,697
	Alternative G	1301		42,066
100-Year Floodplains (acres)	Alternative A	7.8	287.8	280.0
	Alternative B	7.7		280.1
	Alternative C	0		287.8
	Alternative D	0		287.8
	Alternative G	3.5		284.3
Resource Protection Areas (acres)	Alternative A	8.9	240.5	231.6
	Alternative B	8.7		231.8
	Alternative C	0		240.5
	Alternative D	0		240.5
	Alternative G	0.7		239.8
Farmlands (acres)	Alternative A	6.1	79.0	72.9
	Alternative B	10.6		68.4
	Alternative C	0		79.0
	Alternative D	0		79.0
	Alternative G	0.6		78.4

4.14 ENERGY

In accordance with FHW'A's Technical Advisory T 6640.8A, an energy analysis was conducted for each of the CBA's to address the potential energy consumption resulting from the operation, maintenance, and construction of the proposed alignments. The energy impacts of the proposed alignments reflect both direct and indirect energy consumption. Direct energy impacts are attributable to fuel consumption by vehicles traveling within the study area. Indirect energy consumption includes energy expended for both construction and maintenance of the facility. The total energy consumption is also provided to allow for comparison of each CBA.

4.14.1 Methodology

Construction-related energy consumption is based on the construction cost of the proposed alignments. The energy analysis methodology, contained in *Energy and Transportation Systems* (July 1983), was developed for the FHWA by the California Transportation (CALTRANS) Laboratory. It determines the total amount of British Thermal Units (BTUs) required for the production and placement of materials (asphalt, structures, cut, fill, etc.) based on the project's construction cost. These BTU estimates are then converted to liters of gasoline. Approximately 125,000 BTU's equals approximately 1 gallon (3.8 liters) of fuel.

Maintenance and operational energy consumption were calculated using the manual, *Energy Requirements for Transportation Systems* (June 1980), prepared by the US Department of Transportation (USDOT), FHWA, and the Office of Environmental Policy (OEP). Maintenance energy for the CBA's was based on an annual consumption factor of 1.20×10^8 BTU per 1.7 lane km (per lane mile).

Vehicular operational energy consumption is influenced by vehicle size and vehicle weight, traffic conditions, engine size, vehicle accessories, roadway design, and driving mode (highway vs. city). Vehicle Miles Traveled (VMTs) was developed for the proposed alignments for the year 2030. This data was combined with vehicle fuel consumption tables to develop vehicle consumption totals for the CBA's.

Each CBA's total energy requirement equals the sum of the energy required for construction, maintenance, and operation of the proposed facility.

4.14.2 Existing Environment

The energy consumption for the existing roadway network was not analyzed for this project. The Tri-County Parkway was designed to provide access and increase mobility to areas with no direct access to the freeway network. As a result, no existing roadway or roadway network exist for comparison with regard to energy consumption; therefore, only the CBA's were analyzed and compared for the design year 2030.

4.14.3 Impacts

Each of the CBA's requires substantial one-time energy expenditure related to the manufacture of construction materials, transporting the materials to the site, and construction of the new facility. TABLE 4.14-1 summarizes construction, maintenance and operational energy requirements for each of the CBA's. There does not appear to be any appreciable difference between the CBAs that would influence decision making.

TABLE 4.14-1
CONSTRUCTION, MAINTENANCE, OPERATIONAL AND TOTAL ENERGY (FUEL) CONSUMPTION

Alternative	Construction Energy		Maintenance Energy		Operational Energy		Total Energy	
	Annual Gallons	Annual Liters	Annual Gallons	Annual Liters	Annual Gallons	Annual Liters	Annual Gallons	Annual Liters
Comprehensive Plan	299,023,718	1,133,299,893	71,424	270,697	342,242,298	1,295,528,028	641,337,440	2,429,098,618
West 4	320,727,053	1,215,555,530	76,608	290,344	367,082,412	1,389,558,088	687,886,073	2,605,403,962
West 2	291,789,274	1,105,881,347	69,696	264,148	333,962,217	1,264,184,512	625,821,187	2,370,330,007

4.15 SECTION 4(F) EVALUATION

4.15.1 Section 4(f) Resources

Section 4(f) of the 1966 U.S. Department of Transportation Act is applicable only to agencies within the U.S. Department of Transportation and applies to publicly owned parks, recreation areas, and wildlife and waterfowl refuge areas, as well as historic sites (i.e. cultural resources listed or eligible for listing on the NRHP, 23 CFR 771.135(e)). This could be a fee simple taking, a temporary or permanent easement, or a constructive use as defined in 23 CFR 771.135(p)(2).

The CBAs have the potential to use land associated with ten Section 4(f) resources, listed in Table 4.15-1. For each resource, the table identifies the segments that would either directly use the resource, or would have the potential for a constructive use. Figure 4.14-1 shows the locations of these Section 4(f) resources.

TABLE 4.15-1
SECTION 4(F) USES BY ALTERNATIVE, TYPE AND SEGMENT

No.	Section 4(f) Resource	Direct Use	Constructive Use	CBA / Segment
1	Manassas National Battlefield Park (076-0271)	Yes	N/A	Comprehensive Plan / Segment F
2	Manassas National Battlefield Park Historic District (076-0271)	Yes	N/A	West Two and West Four CBAs / Segment C
3	Bull Run Regional Park	Yes	N/A	Comprehensive Plan / Segment F
4	Ben Lomond Regional Park	Yes	N/A	Comprehensive Plan / Segment F
5	Fairmont Park	Yes	N/A	Comprehensive Plan / Segment F
6	Dulles International Airport (053-0008)	No	No	Comprehensive Plan And West Four / Segment F'
7	Gallagher Farm (053-6040)	No	No	Comprehensive Plan And West Four CBAs / Segment F'
8	Putnam-Patton House/Deseret (076-0179)	Yes	N/A	West Four / Segment D
9	Sudley Park	No	No	West Two and West Four / Segment C
10	Newly Acquired Fairfax County Park Authority	No	No	Comprehensive Plan / Segment F

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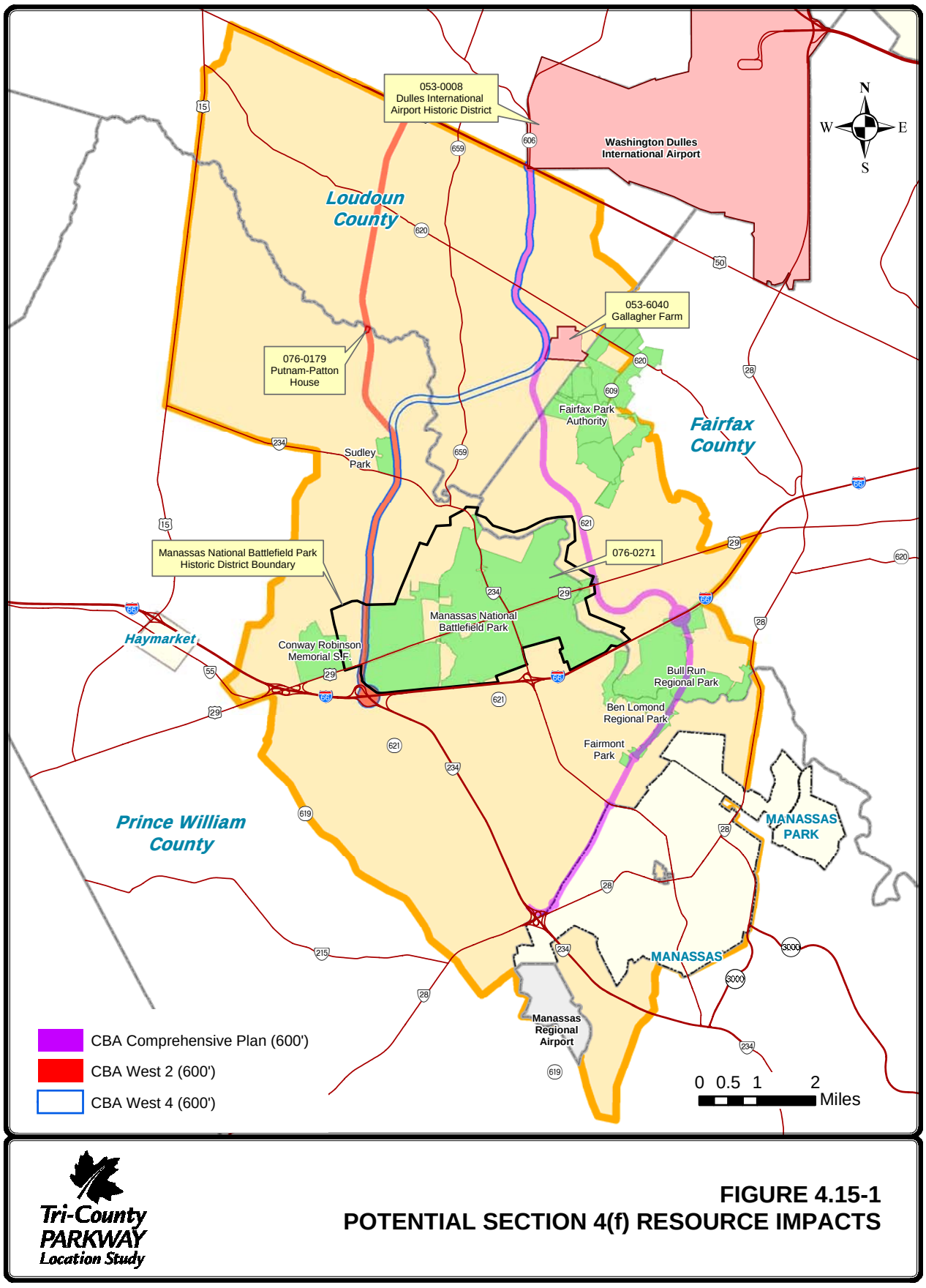

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FIGURE 4.15-1
POTENTIAL SECTION 4(f) RESOURCE IMPACTS

4.15.2 Manassas National Battlefield Park (076-0271) Section 4(f) Evaluation

4.15.2.1 Description

The Manassas National Battlefield Park (Battlefield) is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a historic site listed to the NRHP under Criterion A. The Battlefield was established in 1940 to preserve the scene of two major Civil War battles. These battles occurred to the north of a vital railroad junction at Manassas, Virginia on fields overlooking Bull Run. The Battle of First Manassas occurred in July 1861 and marked the first major clash between the armies of the North and South. The Battle of Second Manassas occurred in August of 1862. Both battles resulted in Confederate victories. Today, the landscape within the Battlefield still retains much of its wartime character.

(a) Location: The Battlefield is located at the intersection of US Route 29 and Route 234 in Prince William County, Virginia. The location of this resource is shown in Figure 4.15-2. This figure also shows the relationship of this resource to Segment C of the West Two and West Four CBAs and Segment F of the Comprehensive Plan CBA.

(b) Size: The Battlefield is a 5,074-acre National Park.

(c) Ownership: The Battlefield is owned and administered by the U.S. Department of the Interior, National Park Service. The Battlefield is part of the National Park System, and was established in May of 1940.

(d) Function: The Battlefield operates as part of the National Park System. The purpose of Manassas National Battlefield Park is to preserve the nationally significant lands containing historic sites, buildings, objects and views associated with the First and Second Battles of Manassas for the use, inspiration, and benefit of the public.

(e) Existing and planned facilities: Existing facilities within this Battlefield include two visitor centers (Henry Hill and Stuart's Hill), a network of roadways and walking trails, and picnic areas. Contributing elements of the Battlefield include Bull Run Stone Bridge (029-0084), Dogan House (076-0005), Stone House (076-0028), Sudley United Methodist Church (076-0062), M.E. Dogan House (076-0167), Brawner House/Douglas Hall (076-0168), Mineral Spring (076-0169), Sudley Post Office (076-0170), Wheeler/Lewis Farm (076-0205), Henry House (076-0208), Hazel Plain Site (076-0209), Brownsville (076-0216), J. Robinson House (076-0217), Brawner Farm (076-0257), Hooe Family Cemetery (076-0272), Pittsylvania (076-0330), and Swart Family Cemetery (076-0441). The NPS is in the process of conducting a General Management Plan (GMP) to direct the future of the park. Completion of the GMP is anticipated in 2005. There are no other existing facilities or any know planned facilities within the property.

(f) Access and usages: Official access to the Battlefield is provided by the Henry Hill Visitor Center located on Sudley Road and the Stuart's Hill Center located at the intersection of US Route 29 and Pageland Lane. The Battlefield can also be accessed by US Route 29, Route 234, Route 622, and Route 705. Usage is available to the general public. Approximately 800,000 patrons visit the Battlefield annually.

(g) Relationship to other similarly used lands in the vicinity: The Battlefield is the only National Park located within the study area; however, other Civil War battlefields are located within the study area. These include the battles of Manassas Station, Bristow Station, and Centreville. A small encounter also occurred at Thoroughfare Gap; however, this resource is not opened to the public.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with the Battlefield.

4.15.2.2 Effect on the Section 4(f) Resource

Segment F of the Comprehensive Plan CBA would affect 2.9 acres of the Battlefield's eastern boundary. Based on a corridor width of 200 feet, the Comprehensive Plan CBA would require less than one percent of land associated with this resource. Figure 4.15-2 shows the location of this impact. This portion of the park is east of a parking lot and an associated walking trail that crosses Stone Bridge and connects to the 5.4-mile "First Manassas Trail" (a walking trail through the Battlefield).

4.15.2.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of the Battlefield. The West Two and West Four CBAs would also avoid a direct use of the Battlefield property by utilizing a 200-foot corridor along the west side of Pageland Lane.

An alignment shift was developed for the Comprehensive Plan CBA to avoid affects to the Battlefield. This alignment passes to the east of the resource and is shown in Figure 4.15-2. The alignment shift is approximately 4,090 feet shorter and would cost $21,668,820 less than the alignment as it is currently proposed. This estimate is based on an average cost of $5,298/linear foot for the Comprehensive Plan CBA. The unit costs associated with this CBA is more than the West Two and West Four CBAs due to the number of structures and interchanges associated with this alignment. The shifted alignment would use 11.3 acres of land associated with the Luck Stone quarry and would affect two residences and one business. The Comprehensive Plan CBA would also affect two residences and one business. The Comprehensive Plan CBA, as proposed, would use 2.9 acres of land associated with the Battlefield and 9.2 acres of land associated with the Luck Stone quarry. As a result, an alignment shift in the vicinity of the Battlefield appears prudent and feasible.

4.15.2.4 Measures to Minimize Harm and Coordination

Measures to minimize harm have not been fully explored at this time and would be developed through the Section 106 process. A number of possible measures are available to minimize effects to the Battlefield from the Comprehensive Plan CBA if it is determined that the resource can not be avoided, including reduced roadway profiles to minimize the roadway footprint, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise impacts.

Coordination with the National Park Service has occurred throughout the study to determine alternatives with minimal effect on the Battlefield. Specific mitigation measures (such as those listed above) would be assessed in coordination with the National Park Service if the Comprehensive Plan CBA goes forward for development.

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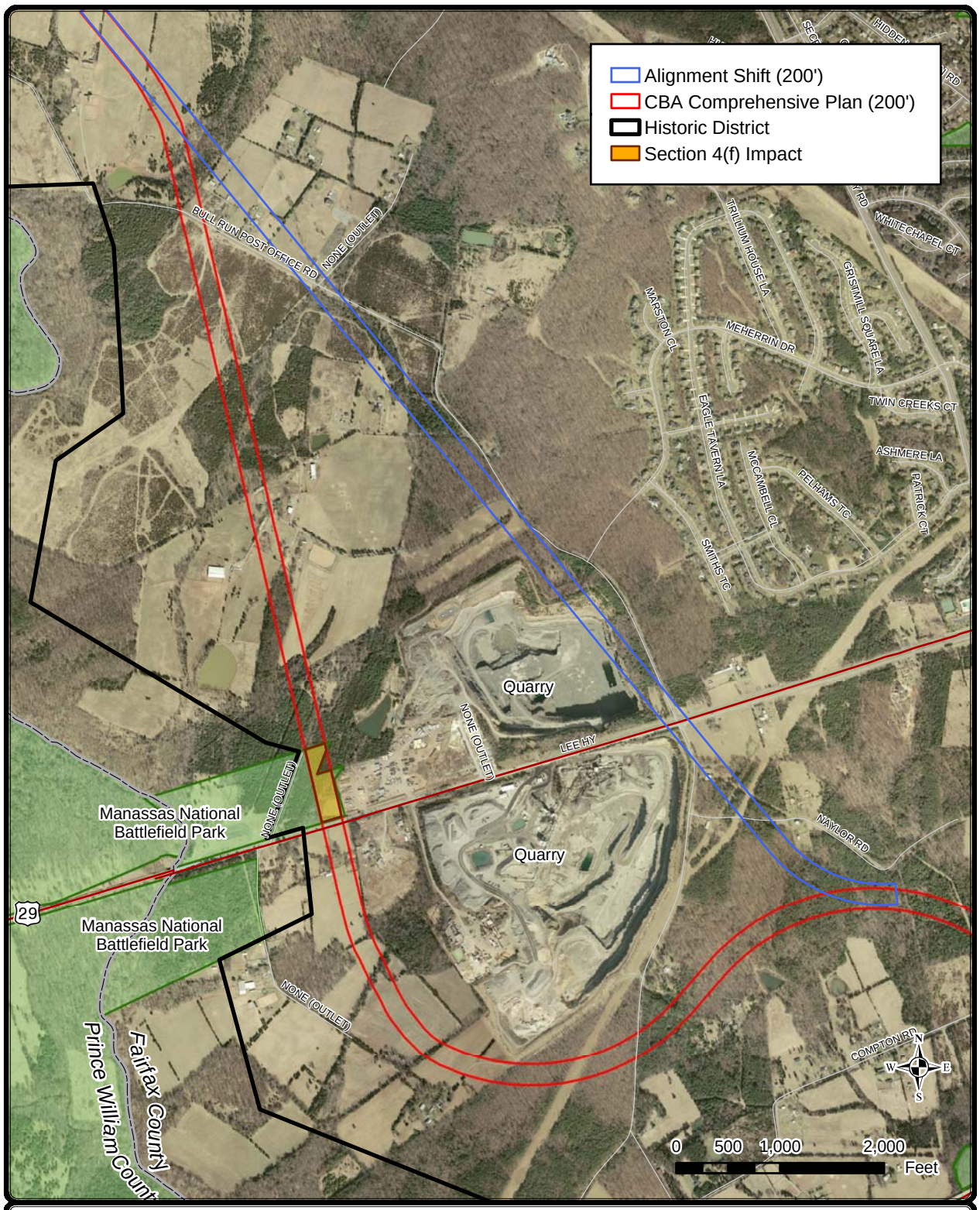

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FIGURE 4.15-2
MANASSAS NATIONAL BATTLEFIELD PARK
SECTION 4(f) USE

4.15.3 Manassas National Battlefield Park Historic District (076-0271) Section 4(f) Evaluation

4.15.3.1 Description

The Manassas National Battlefield Park Historic District is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a historic site listed to the NRHP under Criterion A. The Historic District was established in 1966 to preserve the landscape associated with the Civil War battles of First and Second Manassas. These boundaries where expanded in 1981 and again in October 2004. The current boundaries of this Historic District encompass the entire Manassas National Battlefield Park as well as surrounding properties, which are linked together through their association with the events of these battles.

(a) Location: The Historic District is located at the intersection of US Route 29 and Route 234 in Prince William County, Virginia. The location of this resource is shown in Figure 4.15-3. This figure also shows the relationship of this resource to Segment C of the West Two and West Four CBAs and Segment F of the Comprehensive Plan CBA.

(b) Size: The existing Historic District is slightly larger than the 5,074-acre Battlefield and includes areas east of Bull Run in Fairfax County, the Sun Rise Hill Farm area to the north of the Battlefield, as well as areas to the west of Pageland Lane, where it crosses a portion the of Conway Robinson Memorial State Forest. The Historic District is approximately 5,500 acres in size.

(c) Ownership: The Battlefield is owned and administered by the U.S. Department of the Interior, National Park Service. Ownership of the Conway Robinson Memorial State Forest is owned and operated by the Virginia Department of Forestry. The Historic District also includes approximately 90 privately owned properties in and around the Battlefield.

(d) Function: The Battlefield operates as part of the National Park System. The Conway Robinson Memorial State Forest operates as part of the State Forest System. Other lands in the Historic District currently function as private residences, and also include pastureland and fields.

(e) Existing and planned facilities: Existing facilities within this historic district include the Bull Run Stone Bridge (029-0084), Dogan House (076-0005), Stone House (076-0028), Sudley United Methodist Church (076-0062), Pageland Farm (076-0137), Honeywood/Pageland (076-138), M.E. Dogan House (076-0167), Brawner House/Douglas Hall (076-0168), Mineral Spring (076-0169), Sudley Post Office (076-0170), Wheeler/Lewis Farm (076-0205), Henry House (076-0208), Hazel Plain Site (076-0209), Brownsville (076-0216), J. Robinson House (076-0217), Brawner Farm (076-0257), Hooe Family Cemetery (076-0272), Pittsylvania (076-0330), and Swart Family Cemetery (076-0441). There are no other existing facilities or any know planned facilities associated with this Historic District.

(f) Access and usages: Vehicular access to the Battlefield is available via the following roadways: US Route 29, Route 234, Route 622, and Route 705. Access to the Conway Robinson Memorial State Forest is available via Pageland Lane. Usage of these properties is available to the general public; however, for those portions of the Historic District that are in private ownership, limited access is only provided by private drive and usage is limited to private use.

(g) Relationship to other similarly used lands in the vicinity: The Battlefield is the only National Park located within the study area; however, other Civil War battlefields are located within the study area. These include the battles of Manassas Station, Bristow Station, and Centreville. A small encounter also occurred at Thoroughfare Gap; however, this resource is not opened to the public. The only historic district associated with these battlefields is the Bristow Station Battlefield Historic District.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with the Battlefield or the District.

4.15.3.2 Effect on the Section 4(f) Resource

Segment C of the West Two and West Four CBAs would affect 26 acres of the Historic District located along Pageland Lane just west of the Battlefield property. The affected property consists of agricultural lands and fields with a few private residences. Based on a corridor width of 200 feet, the West Two and West Four

CBAs would require approximately five percent of land associated with this resource. Figure 4.15-3 shows the location of this effect, which lies outside the boundary of the park itself.

4.15.3.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of land associated with the Historic District, as would the Comprehensive Plan CBA.

An alignment shift was developed for the West Two and West Four CBAs to avoid effects to the Historic District. This alignment passes to the west of the resource and is shown in Figure 4.15-3. The alignment shift is approximately 3,140 feet longer and would cost $6,038,220 more than the alignment as it is currently proposed. This estimate is based on an average cost of $1,923/linear foot for the West Two and West Four CBAs. The unit costs associated with these CBAs is less than the Comprehensive Plan CBA due to the number of structures and interchanges associated with this alignment. It would use 26 acres of land associated with the Conway Robinson Memorial State Forest which is a multi-use facility serving as a wildlife and wildflower sanctuary and is used for environmental education, hiking, preservation of historic sites, watershed protection, and timber production. This avoidance alternative would affect trails within the park including the Historic Manassas Gap Railroad Trail which runs east-west in the park. The avoidance alternative would also affect six residences and two businesses (compared to only one residence and one business associated with the West Two and West Four CBAs as presently proposed). As a result of the increased cost and affects to resources protected by Section 4(f) within the State Forest, an alignment shift in the vicinity of the Historic District does not appear prudent or feasible.

A build alternative was also developed to avoid the use of the Conway Robinson Memorial State Forest. This western avoidance alternative is shown in Figure 4.15-4. The western avoidance alternative is approximately 8,290 feet longer and $18,047,606 more than the portion of the West Two and West Four CBAs it would replace. While this avoidance alternative would not use land associated with any Section 4(f) property, it would affect 116 residences, many associated with the Heritage Hunt retirement community. It would also affect the Heritage Hunt Golf and Country Club. In contrast, the West Two and West Four CBAs, as proposed, would use 26 acres of land associated with the Historic District and displace ten residences and three businesses. Because the western avoidance alternative would result in significant costs and environmental and social impacts, it is not a prudent alternative to avoid the use of Section 4(f) properties.

4.15.3.4 Measures to Minimize Harm and Coordination

Measures to minimize harm have not been fully explored at this time and would be developed through the Section 106 process. A number of possible mitigation measures are available to minimize effects to the Historic District including reduced roadway profiles which reduce the footprint of the roadway, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise impacts. Coordination with the National Park Service has occurred throughout the study to determine alternatives with minimal affect on the Battlefield.

Specific mitigation measures (such as those listed above) would be assessed in coordination with the National Park Service if the West Two or West Four CBA go forward for development.

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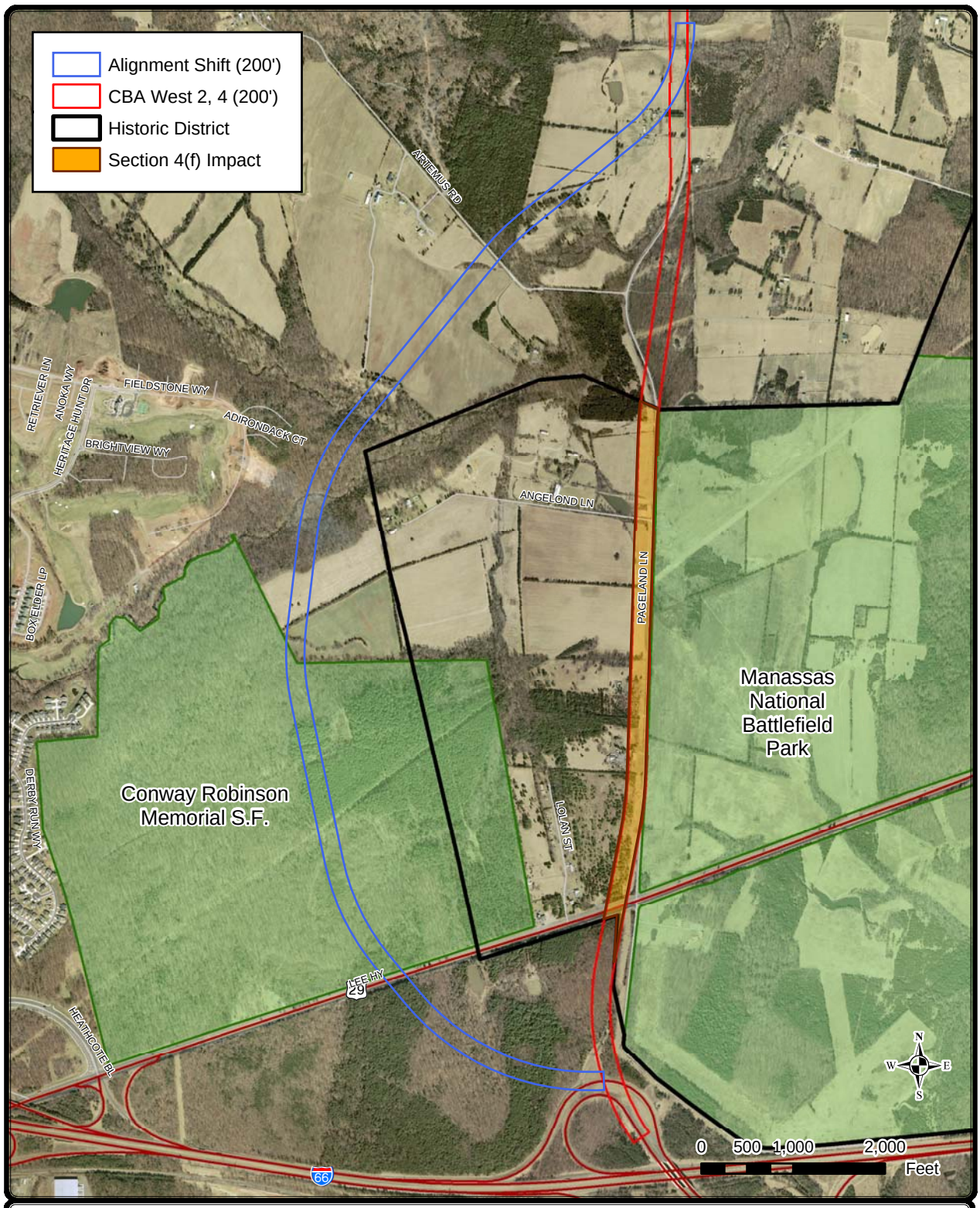

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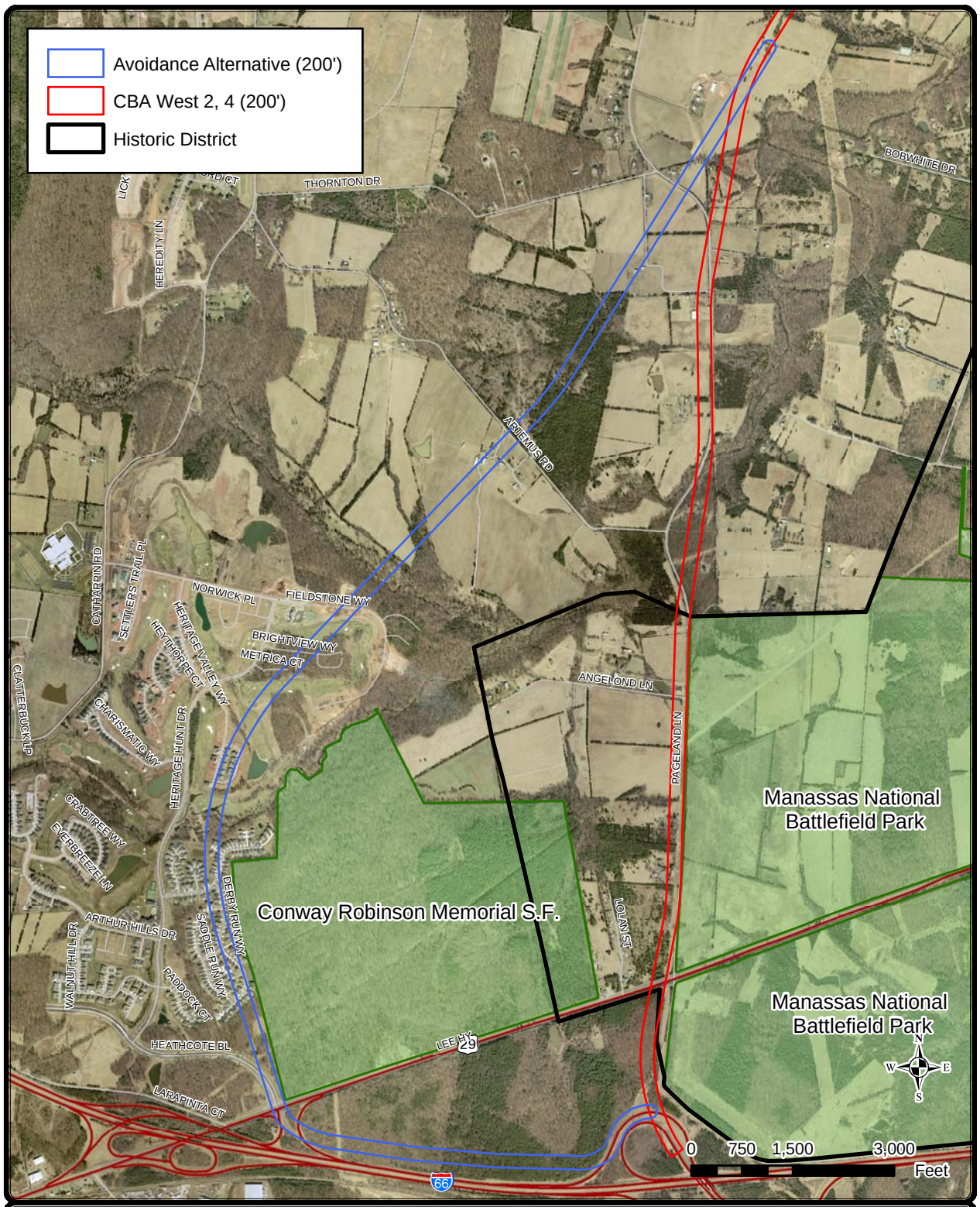
FIGURE 4.15-3
MANASSAS NATIONAL BATTLEFIELD PARK HISTORIC DISTRICT SECTION 4(f) USE



Tri-County PARKWAY Location Study

FIGURE 4.15-4
THE WESTERN AVOIDANCE ALTERNATIVE

4.15.4 Bull Run Regional Park Section 4(f) Evaluation

4.15.4.1 Description

As a publicly owned park, Bull Run Regional Park (BRRP) is afforded protection under Section 4(f) of the U.S. Department of Transportation Act. BRRP was the first of the nineteen parks acquired by Northern Virginia Regional Park Authority (NVRPA) in the 1960's in an effort to preserve and protect riparian lands and drinking water resources for the region and to provide the public access to these lands for recreational enjoyment and use. It is the northernmost in a series of adjacent park properties now comprising approximately 5,000 acres along the Fairfax County shoreline of Bull Run and the Occoquan River.

(a) Location: BRRP is located in western Fairfax County, Virginia. Figure 4.15-5 depicts the relationship between Segment E of the Comprehensive Plan CBA and BRRP.

(b) Size: BRRP is approximately 900 acres.

(c) Ownership: BRRP is owned and administered by the Northern Virginia Regional Park Authority.

(d) Function: The mission of Bull Run Regional Park is to provide regionally significant opportunities for public enrichment through recreational activity, education, and scenic enjoyment, while conserving riparian lands and other natural and cultural resources of the Occoquan watershed. Bull Run Regional Park also functions as part of a larger greenway that extends more than 25 miles, from the upper reaches of the Cub Run Stream Valley to the Town of Occoquan, where it joins the Potomac River.

(e) Existing and Planned Facilities: The core of the developed recreational facilities located in the northeast and central sections of BRRP includes: a tournament soccer field complex (drawing soccer teams from throughout northern Virginia and the region); a public shooting center for skeet, trap, sporting clays and indoor archery that provides opportunities for shooting and instruction; a swimming pool complex; a miniature golf course; a family and a group campground; and the Bull Run Special Events Center (an outdoor arena for performing arts, festivals and other large events). Two major trails for hikers and equestrians traverse the park, allowing visitors to experience the varied topography, flora, and fauna of BRRP. A General Management Plan (GMP) is being developed for the park. There are no other existing facilities or any know planned facilities within the property.

(f) Access and usage: BRRP is accessible from Bull Run Drive via Route 29.

(g) Relationship to other similarly used lands in the vicinity: BRRP is the largest regional park within the study area, although there are several others in the vicinity linked by Bull Run. Other regional parks include Ben Lomond Regional Park, Hemlock Overlook Regional Park, Bull Run Marina Regional Park, and Fountainhead Regional Park.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with BRRP.

4.15.4.2 Effect on the Section 4(f) Resource

Segment E of the Comprehensive Plan CBA would affect 52.9 acres of BRRP, with an alignment that traverses the eastern central portion of the park property. Based on a corridor width of 200 feet, the Comprehensive Plan CBA would require approximately six percent of land associated with this resource. The alignment would cross the Bull Run-Occoquan Trail, near where the trial connects to the camping facilities of the park. The alignment is east of the campgrounds, public shooting range, and outdoor swimming pool. Figure 4.15-5 shows the location of this effect.

On December 21, 1994, the Fairfax County Board of Supervisors amended the Comprehensive Plan for Fairfax County to show the location of the Tri-County Parkway through Bull Run Regional Park. In amending the Plan, the Board also adopted Plan text emphasizing several conditions that must be met in conjunction with the future planning and design of this road. As a result, the location of the Comprehensive Plan CBA was established by the County through their comprehensive planning process.

4.15.4.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of this resource. The West Two and West Four CBAs would also avoid any use of BRRP given their location further to the west.

An alignment shift was developed for the Comprehensive Plan CBA to avoid effects to the Bull Run Regional Park. This alignment passes to the east of the resource and is shown in Figure 4.15-5. The alignment shift is approximately 12,270 feet longer and would cost $65,006,460 more than the alignment as it is currently proposed. This estimate is based on an average cost of $5,298/linear foot for the Comprehensive Plan CBA. The unit costs associated with this CBA is more than the West Two and West Four CBAs due to the number of structures and interchanges associated with this alignment. It would use land associated with the following 4(f) resources: Izaak Walton Park (22.8 acres), Cub Run Valley Stream Park (24.9 acres), and Ben Lomond Regional Park (3.4 acres). It would also affect 5.3 acres of land associated with the Upper Occoquan Sewage Authority, as well as affect 401 residences and 13 businesses. The Comprehensive Plan CBA, as proposed, would only displace two businesses and would use land associated with Ben Lomond Regional Park (0.3 acres), Bull Run Regional Park (52.9 acres), Upper Occoquan Sewage Authority (13.5 acres), and the Northern Virginia Electric Co-Op (0.3 acres). As a result, an alignment shift in the vicinity of the Bull Run Regional Park does not appear prudent or feasible.

4.15.4.4 Measures to Minimize Harm and Coordination

Coordination has occurred with the Northern Virginia Regional Park Authority throughout the course of the Location Study, but measures to minimize harm have not been fully explored at this time. A number of possible mitigation measures are available to minimize effects to the park including reduced roadway profiles which reduce the footprint of the roadway, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise issues. Specific mitigation measures (such as those listed above) will be assessed in coordination with the Park Authority if the Comprehensive Plan CBA goes forward for development.

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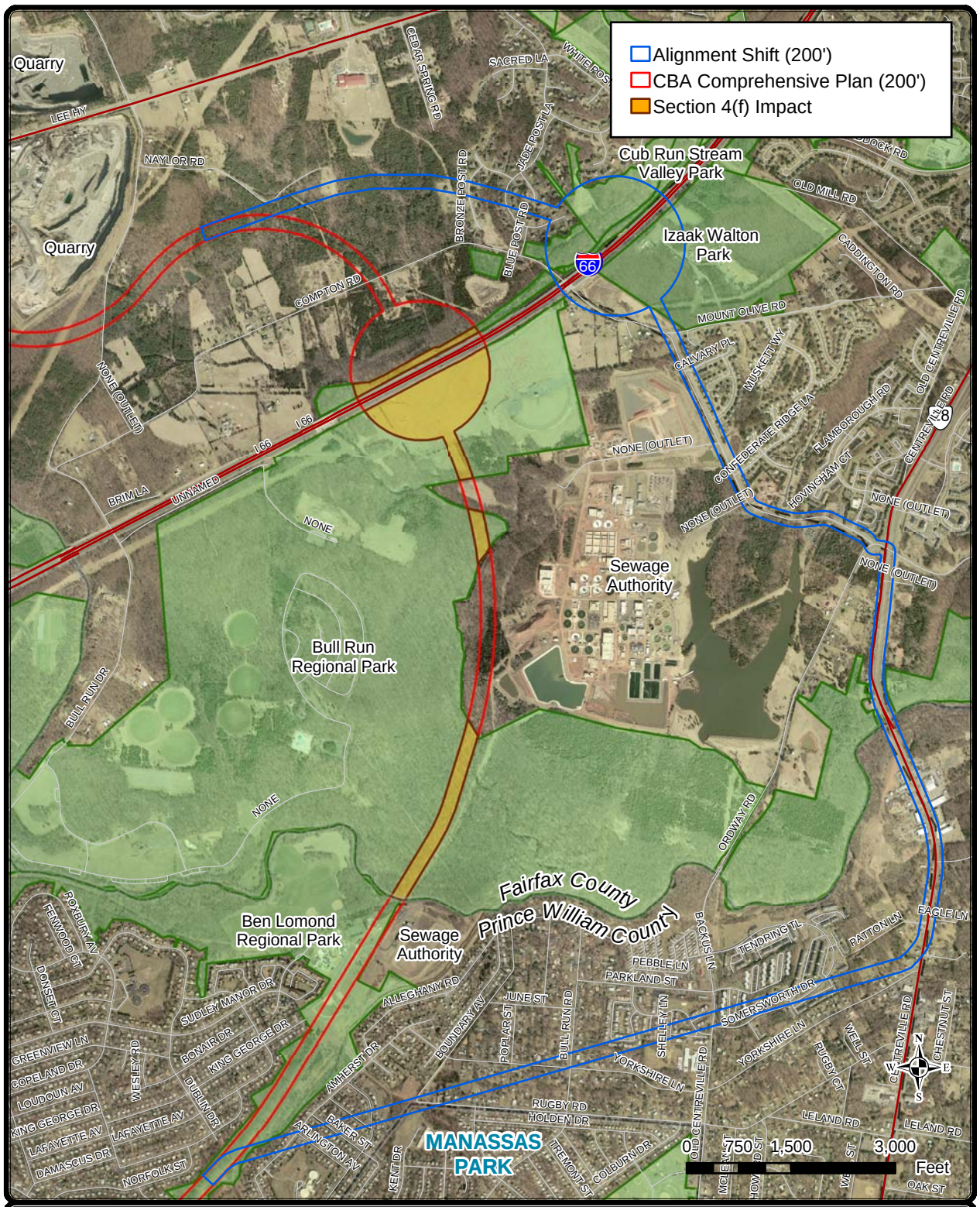

Tri-County PARKWAY Location Study

FIGURE 4.15-5
BULL RUN REGIONAL PARK
SECTION 4(f) USE

4.15.5 Ben Lomond Regional Park Section 4(f) Evaluation

4.15.5.1 Description

The Ben Lomond Regional Park/Splashdown Water Park is afforded protection under Section 4(f) of the U.S. Department of Transportation Act because it is a publicly owned park and recreational area. Ben Lomond Regional Park was opened in 1996. The Park offers softball and soccer fields; a Little League field, tennis, basketball and volleyball courts; a playground; picnic pavilions; and hiking trails. The Splashdown Water Park is part of the Ben Lomond Regional Park and includes a "lazy river", water slides, a children's pool, picnic pavilions (that are available for group rental), and a lap swimming pool (for those who enjoy traditional water activity).

(a) Location: The Park is located in at 7500 Ben Lomond Park Drive in Prince William County. The Park is immediately adjacent to Bull Run and Flat Branch, and lies just west of the Bull Run Regional Park (located in Fairfax County). Figure 4.15.6 shows the location of the Park in relationship to Segment E of the Comprehensive Plan alternative.

(b) Size: The Park is approximately 205 acres in size and includes the 13-acre “Splashdown Water Park.

(c) Ownership: The Park is owned by Prince William County, and operated by the Prince William County Park Authority.

(d) Function: The Park is a component of the Prince William County park system. It serves as an active outdoor recreational area for both local and regional visitors

(e) Existing and Planned Facilities: Splashdown Water Park includes several waterslides located in five water areas, a 25-meter lap pool, a “zero depth” beach area, a 770-foot long “lazy river”, children’s areas, volleyball courts, tennis courts, shower and locker facilities, a café, and shade pavilions. Other facilities located at the Park (but outside the Splashdown Water Park) include athletic fields for baseball, softball, tennis, football and soccer; a playground; and picnic tables. Additionally, large areas of the park remain as open space. These areas are adjacent to Bull Run. There are no other existing facilities or any know planned facilities within the property.

(f) Access and Usage: Vehicular access to the Park is available on Ben Lomond Park Drive, located off Sudley Manor Drive and Sudley Road (Business Route 234). Pedestrian and bicycle access to the Park is also accessible from the neighborhoods immediately surrounding it (Cedar Ark, Sudley Square, and West Gate of Lomond). Usage is available to the general public.

(g) Relationship to other similarly used lands in the vicinity. Ben Lomond Regional Park is immediately adjacent to the Bull Run Regional Park (Northern Virginia Regional Park Authority); however, no access is provided between the two parks. Both parks include large areas of undeveloped land that serve as open space. As a component of the Prince William County park system, there are several neighborhood and regional parks located throughout the county.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with the park.

4.15.5.2 Effects on the Section 4(f) Resource

Segment E of the Comprehensive Plan CBA would affect 6.7 acres of the Ben Lomond Regional Park/Splashdown Water Park. Figure 4.15-6 depicts the location of this effect. Based on a corridor width of 200 feet, the Comprehensive Plan CBA would require approximately three percent of land associated with this resource. The proposed alignment associated with this CBA would utilize an existing right-of-way easement reserved for the Tri-County Parkway. No affects to park facilities would occur. Affects would be limited to the proposed park access road and the proposed intersection at Lomond Drive.

4.15.5.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of the park. The West Two and West Four CBAs would also avoid any use of the Ben Lomond Regional Park/Splashdown Water Park given their location further to the west. Because of their proximity to one another, an alignment shift was developed for the Comprehensive Plan CBA to avoid effects to both the Ben Lomond Regional Park/Splashdown Water Park and Fairmont Park (Section 4.15.6). The Tri-County Parkway could be shifted onto the Upper Occoquan Sewage Authority property to avoid the 6.7-acre affect but, in so doing, it would remove the alignment from the reserved right-of-way corridor and affect park property that was not reserved for the alignment. This affect would be much greater than the 6.7 acres that would be affected with the Comprehensive Plan CBA, as proposed. Therefore, an avoidance alternative that completely avoids the park and not just the effect was considered. This alignment passes to the east of the resource and is shown in Figure 4.15-6. The alignment shift is approximately 885 feet longer and would cost $4,688,730 more than the alignment as it is currently proposed. This estimate is based on an average cost of $5,298/linear foot for the Comprehensive Plan CBA. The unit costs associated with this CBA is more than the West Two and West Four CBAs due to the number of structures and interchanges associated with this alignment. The shifted alignment would use 11.8 acres of land associated with the Bull Run Regional Park and 10.9 acres of land associated with the Upper Occoquan Sewage Authority; however, this alignment would affect 202 residences, two business, and two churches. The Comprehensive Plan CBA, as proposed, would displace eight residences and three businesses. It would also use land associated with Ben Lomond Regional Park (6.7 acres), Bull Run Regional Park (12.4 acres), Fairmont Park (1.8 acres), Upper Occoquan Sewage Authority (1.2 acres), and the Northern Virginia Electric Co-Op (0.3 acres). Due primarily to the social effects, an alignment shift in the vicinity of the Ben Lomond Regional Park does not appear prudent or feasible.

4.15.5.4 Measures to Minimize Harm and Coordination

Coordination has occurred with the Prince William County Park Authority throughout the course of the Location Study, but measures to minimize harm have not been fully explored at this time. A number of possible mitigation measures are available to minimize effects to the park including reduced roadway profiles which reduce the footprint of the roadway, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise issues. Specific mitigation measures (such as those listed above) will be assessed in coordination with the Park Authority if the Comprehensive Plan CBA goes forward for development.

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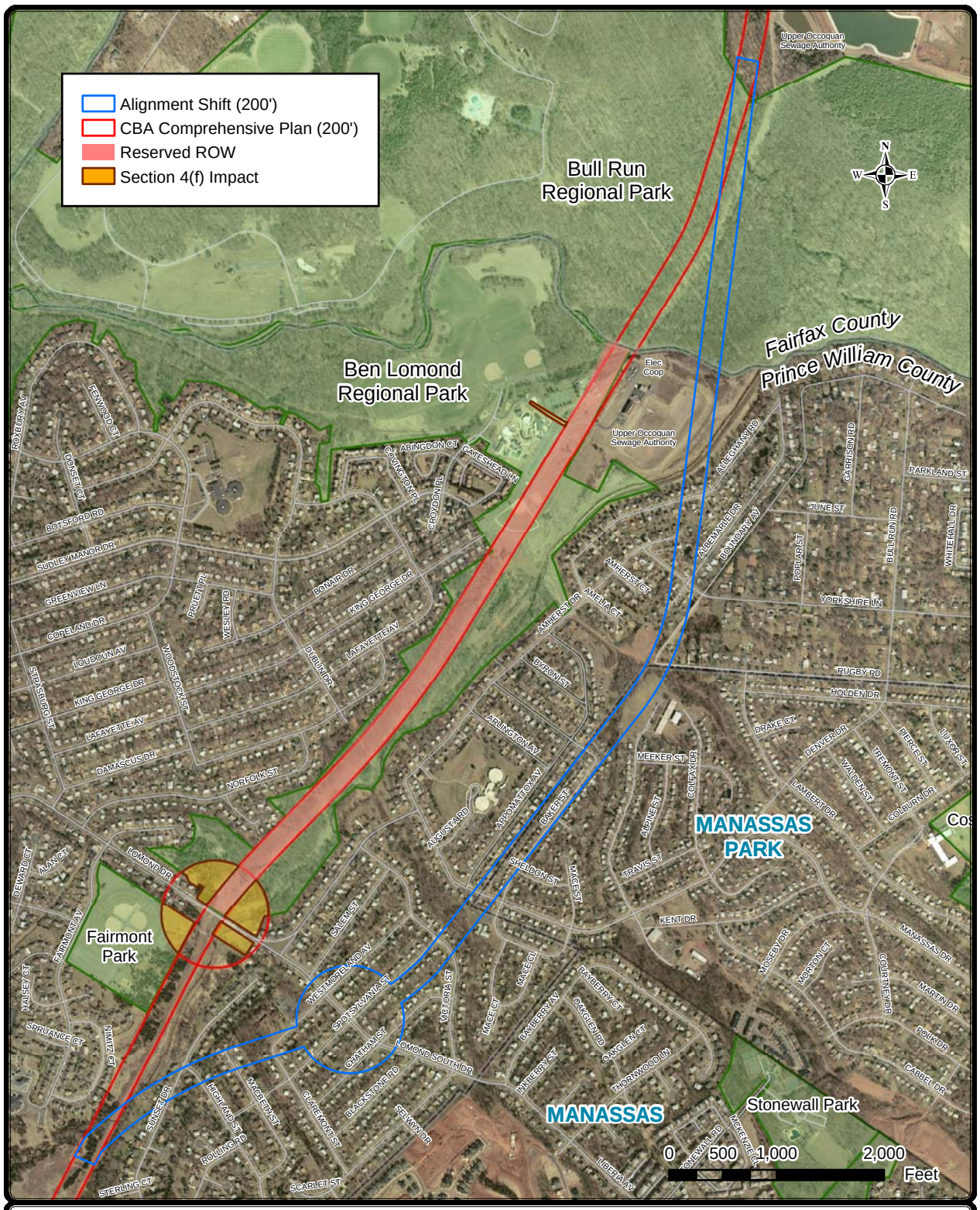

Tri-County PARKWAY Location Study

FIGURE 4.15-6
BEN LOMOND REGIONAL PARK / FAIRMONT PARK
SECTION 4(f) USE

4.15.6 Fairmont Park Section 4(f) Evaluation

4.15.6.1 Description

As a publicly owned park, Fairmont Park is afforded protection under Section 4(f) of the U.S. Department of Transportation Act. The park is a component of the Prince William County Park Authority's park system of neighborhood, community, and regional parks. Fairmont Park is defined as a neighborhood park designed to serve a densely populated area of the county. The facilities at this park include four softball fields, a playground, restrooms, a concession stand, and parking areas.

(a) Location: Fairmont Park is located in the Fairmont neighborhood in Prince William County. The park is adjacent to Lomond Drive, Fairmont Avenue, and the Flat Branch of Bull Run. Figure 4.15-6 depicts the location of the Park in relationship to Segment E of the Comprehensive Plan CBA.

(b) Size: Fairmont Park is a 20-acre neighborhood park.

(c) Ownership: Fairmont Park is owned by Prince William County and is operated by the Prince William County Park Authority.

(d) Function: Fairmont Park serves as an active outdoor recreational area that serves neighborhood visitors. It functions as a part of Prince William County's park system and, therefore, is of regional importance.

(e) Existing and Planned Facilities: Fairmont park includes four softball fields, a playground, restrooms, a concession stand, and parking areas. Given the relatively small size of the Park, there is limited available land for future planned facilities.

(f) Access and Usage: Vehicular access to Fairmont Park is available from Fairmont Avenue. Pedestrian and bicycle access to the Park is also accessible from the Fairmont neighborhood immediately surrounding it.

(g) Relationship to other similarly used lands in the vicinity. Fairmont Park lacks any distinct relationship with other land in the immediate vicinity. The Park is a neighborhood park focused on active recreation (softball and playgrounds). Other neighborhood parks in the project area in the vicinity of Fairmont Park include Costello Park, Stonewall Park, Byrd Park, Nelson Park, Baldwin Park, and Dakonshaw Park.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with the park.

4.15.6.2 Effects on the Section 4(f) Resource

Segment E of the Comprehensive Plan CBA would affect 1.8 acres of Fairmont Park. Figure 4.15-6 shows the location of this effect. Based on a corridor width of 200 feet, the Comprehensive Plan CBA would require approximately nine percent of land associated with this resource. This effect is located northeast of existing park facilities (four softball fields, playgrounds, and parking areas) and is associated with the proposed interchange at Lomond Drive. The affected portion of the Park is primarily landscaped open space.

4.15.6.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of the park. The West Two and West Four CBAs would also avoid any use of Fairmont Park because of their location further to the west.

An alignment shift was developed for the Comprehensive Plan CBA to avoid effects to Fairmont Park (which would also avoid any use of Ben Lomond Regional Park because of the proximity of the parks to one another). This alignment passes to the east of the resource and is shown in Figure 4.15-6. The alignment shift is approximately 885 feet longer and would cost $4,688,730 more than the alignment as it is currently proposed. This estimate is based on an average cost of $5,298/linear foot for the Comprehensive Plan CBA. The unit costs associated with this CBA is more than the West Two and West Four CBAs due to the number of structures and interchanges associated with this alignment. The shifted alignment would use 11.8 acres of land associated with the Bull Run Regional Park and 10.9 acres of land associated with the Upper Occoquan Sewage Authority; however, this alignment would affect 202 residences, two business, and two churches.

The Comprehensive Plan CBA, as proposed, would displace eight residences and three businesses. It would also use land associated with Ben Lomond Regional Park (6.7 acres), Bull Run Regional Park (12.4 acres), Fairmont Park (1.8 acres), Upper Occoquan Sewage Authority (1.2 acres), and the Northern Virginia Electric Co-Op (0.3 acres). As a result, an alignment shift in the vicinity of Fairmont Park does not appear prudent or feasible.

4.15.6.4 Measures to Minimize Harm and Coordination

Coordination has occurred with the Prince William County Park Authority throughout the course of the Location Study, but measures to minimize harm have not been fully explored at this time. A number of possible mitigation measures are available to minimize effects to the park including reduced roadway profiles which reduce the footprint of the roadway, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise issues. Specific mitigation measures (such as those listed above) will be assessed in coordination with the Park Authority if the Comprehensive Plan CBA goes forward for development .

4.15.7 Total Section 4(f) Avoidance Aternative

A build alternative was also developed to avoid all of the Section 4(f) resources affected by the Comprehensive Plan CBA; namely, the use of the Battlefield as well as Bull Run Regional Park, Ben Lomond Regional Park, and Fairmont Park. This eastern avoidance alternative is shown in Figure 4.15-7. The eastern avoidance alternative is approximately 9,240 feet longer and $192,354,640 more than the portion of the Comprehensive Plan CBA it would replace. It would use land associated with Izaak Walton Park (22.8 acres), Cub Run Valley Stream Park (24.9 acres), Luck Stone quarry (11.3 acres), and the Upper Occoquan Sewage Authority (5.3 acres). A total of 69 residences and 81 businesses would be affected, many of which are minority owned. The eastern avoidance alternative would also affect three churches and one school. The Comprehensive Plan CBA, as presently proposed, would displace 12 residences and two businesses. It would use land associated with Bull Run Regional Park (52.9 acres), Ben Lomond Regional Park (6.7 acres), Fairmont Park (1.8 acres), Luck Stone quarry (9.2 acres), Upper Occoquan Sewage Authority (13.5 acres), and Northern Virginia Electric Co-Op (0.3 acres).

Because the eastern avoidance alternative would result in significant costs and environmental and social effects, it does not appear to be a prudent alternative to avoid the use of all Section 4(f) properties affected by the Comprehensive Plan CBA. Going even further east to try and avoid all Section 4(f) resources is not practicable for two reasons: 1) the prevalence of Section 4(f) resources located further to the east and the linear nature of some of them makes total avoidance impossible; and 2) the Comprehensive Plan CBA is located near the eastern border of the study area. Going further east would take the avoidance alternative outside of the study area and obviate its ability to meet the purpose and need of the project.

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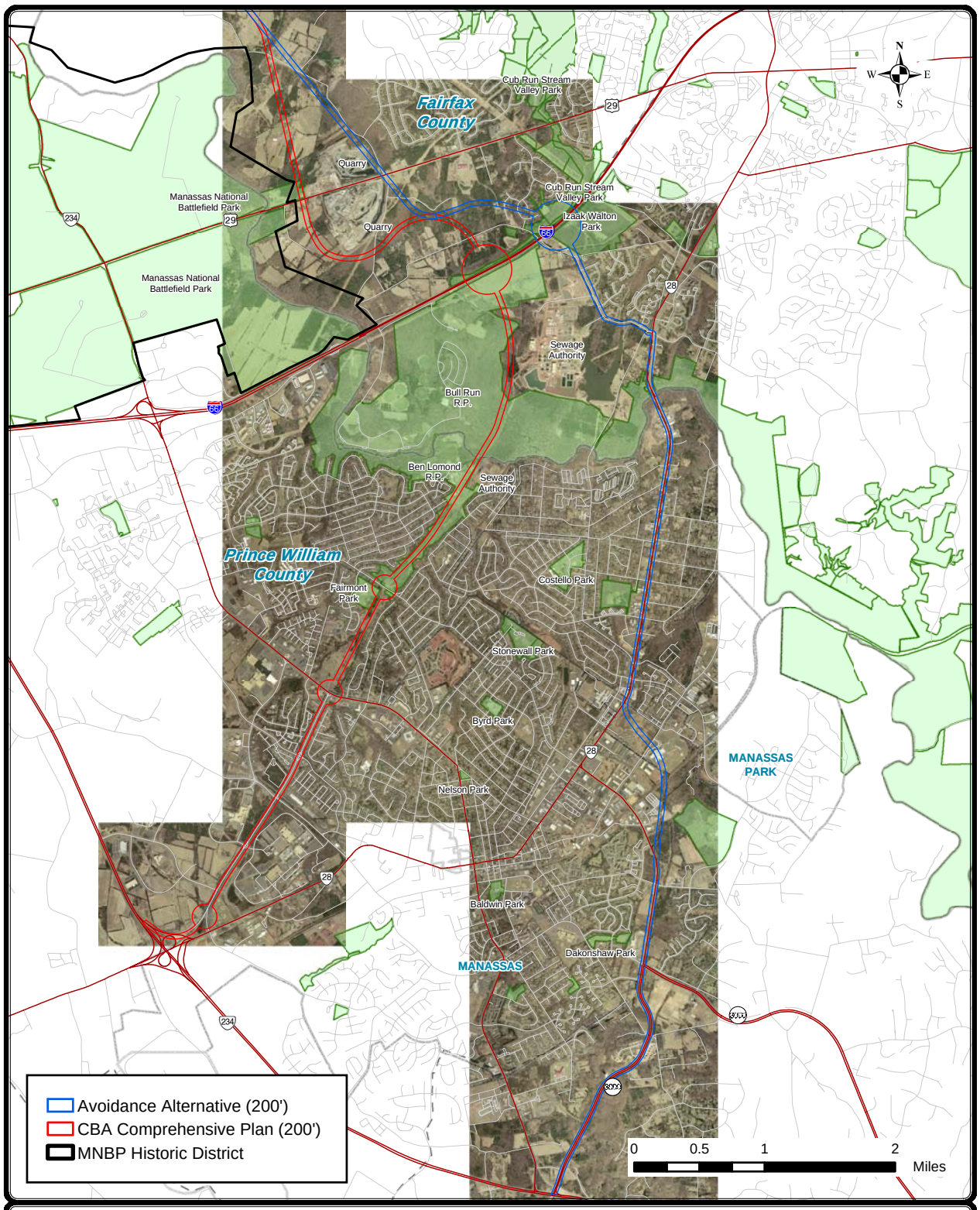


Tri-County PARKWAY Location Study

FIGURE 4.15-7
THE EASTERN AVOIDANCE ALTERNATIVE

4.15.8 Putnam-Patton House/Deseret (076-0179) Section 4(f) Evaluation

4.15.8.1 Description

The Putnam-Patton House/Deseret is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a historic site recommended as eligible for listing in the NRHP under Criterion C. This resource is a good example of a mid-nineteenth-century Italianate style house that maintains a high degree of overall integrity and embodies the distinct characteristics of the Italianate style. Built ca. 1860, the original form and plan of this house have been retained, which make it a good representative of a style that is not typical for the area. The interior of the house retains a high level of architectural integrity, and reflects the construction methods of the period (in the plastered walls, wooden floors, decorative mantels, doors, windows, and nine-foot ceilings).

(a) Location: The Putnam-Patton House is located just west of Sanders Lane on Chatter Brook Drive north of Manassas in Prince William County, Virginia. The location of this resource is shown in Figure 4.15-8 along Segment D of the West Two CBA.

(b) Size: The boundary associated with this resource is approximately four acres in size.

(c) Ownership: All the property associated with this historic structure is in private ownership.

(d) Function: The current function of the property is as a single-family residence

(e) Existing and Planned Facilities: Existing facilities within this historic property include the Putnam-Patton House and three associated outbuildings: a gas manufactory, a meat house, and a dairy house. There are no other existing facilities or any know planned facilities within the property.

(f) Access and Usage: Limited access to the property is provided by a private drive extending from Chatter Brook Drive. Usage is limited to private residential use.

(g) Relationship to other similarly used lands in the vicinity. The Putnam-Patton House is an example of a mid-nineteenth-century Italianate house. There are similar examples of Italianate architecture throughout the tri-county region.

(h) Applicable clauses affecting ownership: There are no known special covenants, restrictions, or deed conditions that would preclude the use of this real property.

(i) Unusual characteristics: There are no unusual characteristics associated with the park.

4.15.8.2 Effects on the Section 4(f) Resource

Segment D of the West Two CBA would affect 2.5 acres associated with this resource. The proposed alignment would directly use 2.08 acres and would separate 0.42 acres located in the northeast quadrant of the property and thereby disassociate this portion of the property from its historic context. The West Two CBA would not affect any of the structures associated with the house. Based on a corridor width of 200 feet, the West Two CBA would require approximately fifty percent of land associated with this historic resource. Figure 4.15-8 depicts the location of this impact.

4.15.8.3 Avoidance Alternatives

The No-Build Alternative would avoid Section 4(f) use of this resource as would the West Four CBA and Comprehensive Plan CBA.

An alignment shift was developed for the West Two CBA to avoid effects to the Putnam-Patton House. This alignment passes to the west of the resource and is shown in Figure 4.15-8. The alignment shift is approximately 205 feet longer and would cost $394,215 more than the alignment as it is currently proposed. This estimate is based on an average cost of $1,923/linear foot for the West Two and West Four CBAs. The unit costs associated with these CBAs is less than the Comprehensive Plan CBA due to the number of structures and interchanges associated with this alignment. It would not use land associated with any other Section 4(f) resource, but would affect two residences. The West Two CBA as presently proposed would

affect 13 residences and two businesses. As a result, an alignment shift in the vicinity of the historic site appears prudent and feasible.

4.15.8.4 Measures to Minimize Harm and Coordination

Measures to minimize harm have not been fully explored at this time and would be developed through the Section 106 process. A number of possible measures are available to minimize effects to the house from the West Two CBA if it is determined the house cannot be avoided, including reduced roadway profiles to minimize the roadway footprint, retaining walls to reduce the lateral limits of cut and fill slopes, landscaping to reduce visual impacts, and noise walls to address noise impacts. Specific mitigation measures (such as those listed above) would be assessed in coordination with the State Historic Preservation Officer should the West Two CBA be advanced for development.

4.15.9 Summary of Section 4(f) Effects

Section 4(f) of Department of Transportation Act of 1966 states that the U.S. Department of Transportation may not approve the use of land from a significant public park, publicly owned recreation area, wildlife and waterfowl refuge, or any significant historic site unless a determination is made that:

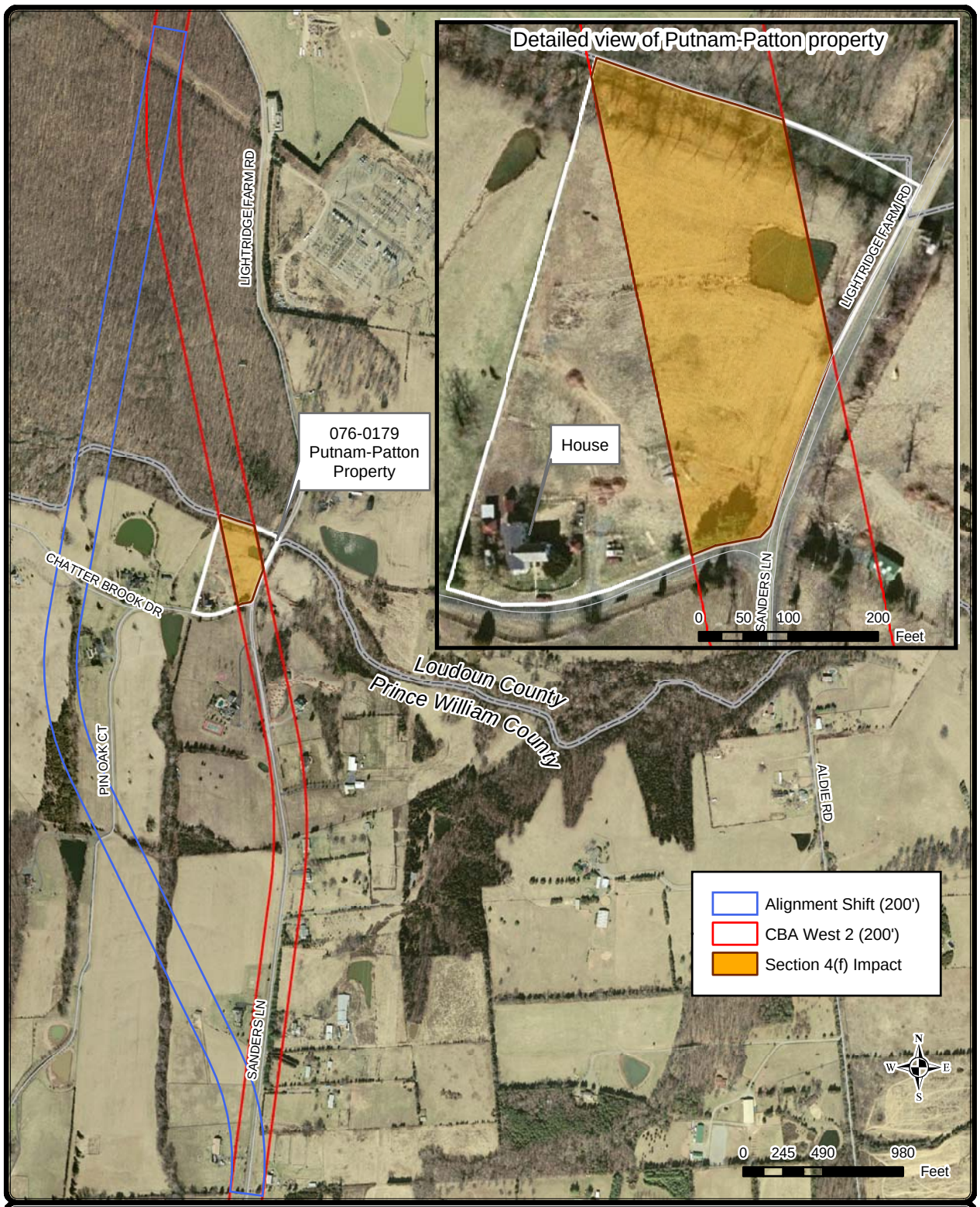
- there is no prudent and feasible alternative use of land from the property, and
- the action includes all possible planning to minimize harm to the property resulting from such use.

In accordance with 23 CFR 771.135(a)(2), a number of alignment shifts and avoidance alternatives were analyzed and compared to the CBAs to determine (1) if there are unique problems or unusual factors involved in the use of alternatives that would avoid these properties or (2) that the cost, social, economic, and environmental effects, or community disruption resulting from such alternatives reach extraordinary magnitudes. Table 4.15-2 summarizes the effects associated with these Section 4(f) resources.

TABLE 4.15-2
SUMMARY OF SECTION 4(F) EFFECTS

Resource	Candidate Build Alternative (CBA)		
	West Two	**West Four**	**Comprehensive Plan**
Manassas National Battlefield Park	No Use	No Use	2.9 acres
Avoidance Alternative	N/A	N/A	Prudent and Feasible
Manassas National Battlefield Park Historic District	26 acres	26 acres	No Use
Avoidance Alternative	Not Prudent and Feasible	Not Prudent and Feasible	N/A
Bull Run Regional Park	No Use	No Use	52.9 acres
Avoidance Alternative	N/A	N/A	Not Prudent and Feasible
Ben Lomond Regional Park	No Use	No Use	6.7 acres
Avoidance Alternative	N/A	N/A	Not Prudent and Feasible
Fairmont Park	No Use	No Use	1.8 acres
Avoidance Alternative	N/A	N/A	Not Prudent and Feasible
Putnam-Patton/Deseret	2.5 acres	No Use	No Use
Avoidance Alternative	Prudent and Feasible	N/A	N/A

N/A = Not Applicable



Tri-County PARKWAY Location Study

FIGURE 4.15-8
PUTNAM-PATTON HOUSE
SECTION 4(f) USE

4.15.10 Dulles International Airport Historic District (053-0008) Constructive Use Evaluation

Dulles International Airport is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a historic site listed to the NRHP under Criterion C and Criteria Consideration G for sites less than 50 years old. No CBA will cross any portion of land within the National Register Boundary established for the historic resource; therefore, the project will not result in a direct use of this resource.

4.15.10.1 Description of Property

The boundary of the Dulles International Airport (DHR #053-0008) Historic District encompasses the property of the Washington Dulles International Airport. The property is located immediately north of the terminus of Segment F' (West Four and Comprehensive Plan CBAs). The site of the Dulles Airport near Chantilly was selected in 1957 and land acquisition for the 10,000-acre facility began in January 1958. The airport opened in 1962. The centerpiece of what was then the world's largest jet airport is architect, Eero Saarinen's, glass-walled terminal building. The curved concrete roof is supported by 32 giant outward-leaning columns 64 feet high on one side of the building and 40 feet high on the other. The terminal was placed on the NRHP before it was 25 years old. Saarinen resolved that Dulles would be a different kind of airport, and designed the terminal for expansion. He incorporated safety features such as a tower with maximum vision of the airfield and expanded safety zones at the end of the runways. He also incorporated the mobile lounge, or shuttles, to move passengers to the planes. Saarinen designed the terminal for expansion (Cohan 1987), and it has been expanded since then. The most recent expansion in the late 1990s continued the design by adding additional units. In January of 2005, the Federal Aviation Administration issued a draft EIS for the proposed expansion of Dulles International Airport to add a new parallel north-south runway approximately 9,500 feet in length and a new parallel east-west runway approximately 10,500 feet in length. The expansion would also include development of associated taxiways and navigational aids as well as concourse development.

4.15.10.2 Visual

The project will be visible from the boundary of the property. FHWA regulations at 23 CFR 771.135(p)(4)(ii) state in part that if, "the proximity of the proposed project substantially impairs esthetic features of a resource protected by section 4(f) .....where the location of [the].....proposed facility substantially detracts from the setting of a .... historic site which derives its value in substantial part due to its setting", then a constructive use would occur. The Airport Historic District is located in a setting that is characterized by increasing residential, commercial, and industrial development. In addition, primary highway facilities located adjacent to and visible from the airport include heavily traveled U.S. 50 and Route 28. The airport does not derive its value in substantial part from its setting. Notwithstanding, the construction of the Tri-County Parkway will be consistent with the existing setting and not detract from it; therefore, the proposed project will not result in a constructive use of this historic district as defined at 23 CFR 771.135(p)(4)(ii).

4.15.10.3 Noise

FHWA Regulations at 23 CFR 771.135(p)(4)(i) state in part that if, "the projected noise level increase attributable to the project substantially interferes with the use and enjoyment of a noise-sensitive .... resource protected by section 4(f), such as .....enjoyment of a historic site where a quiet setting is a generally recognized feature or attribute of the site's significance" then a "constructive use" will occur. Because the airport is dominated by aircraft noise, a quiet setting is neither a feature nor an attribute of this historic district. The project will therefore not meet the conditions of "use" of the property as defined at 23 CFR 771.135(p)(4)(i).

4.15.10.4 Gallagher Farm (053-6040) Constructive Use Evaluation

The Gallagher Farm is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a historic site listed to the NRHP under Criterion A and C. The farm is located immediately east of the West Four and Comprehensive Plan CBAs. Neither CBA will cross any portion of land within the National Register Boundary established for the historic resource; therefore, the project will not result in a direct use of this resource.

4.15.10.5 Description of Property

The Gallagher Farm is located on a parcel of land that contains 193.5 acres, on the east side of Bull Run Post Office Road north of Manassas in Loudoun County, Virginia. Historic resources on the property include a vacant late-eighteenth-century house and farm buildings. The farm is eligible under Criterion A for its association with the settlement of Loudoun County and under Criterion C as a good example of a late eighteenth century style house that maintains a good level of integrity. Built ca. 1769, the original form and hall-and-parlor plan of this house have been retained, which make it a good representative of properties from the colonial period. Though an inspection of the interior was not permitted, the foundation and chimneys exemplify the methods and distinctive characteristics of folk dwellings in the region. The Gallagher House also demonstrates the transition of a linear plan home that was expanded with a rear shed roofed addition. This resource is significant at the local level for architecture for the period of 1769 to present.

4.15.10.6 Visual

The project will be visible from the Gallagher Farm. FHWA regulations at 23 CFR 771.135(p)(4)(ii) state in part that if, "the proximity of the proposed project substantially impairs esthetic features of a resource protected by section 4(f) .....where the location of [the].....proposed facility substantially detracts from the setting of a .... historic site which derives its value in substantial part due to its setting", then a constructive use would occur. The Gallagher Farm is eligible under Criterion A for its association with the settlement of Loudoun County, and under Criterion C as a good example of a late eighteenth century style house. While the setting helps convey its association with the landscape, its setting is not considered an integral part of its eligibility. The farm is located east and adjacent to Bull Run Post Office Road; however, its view of the road is shielded by brush growing along the edge of the property. This view would remain unaltered because the project would be located west of this road; therefore, the proposed project will not result in a constructive use of this historic district as defined at 23 CFR 771.135(p)(4)(ii).

4.15.10.7 Noise

FHWA Regulations at 23 CFR 771.135(p)(4)(i) state in part that if, "the projected noise level increase attributable to the project substantially interferes with the use and enjoyment of a noise-sensitive .... resource protected by section 4(f), such as .....enjoyment of a historic site where a quiet setting is a generally recognized feature or attribute of the site's significance" then a "constructive use" will occur. Because of its location close to heavily traveled Bull Run Post Office Road, a quiet setting is neither a feature nor an attribute of this historic site. The project will, therefore, not meet the conditions of "use" of the property as defined at 23 CFR 771.135(p)(4)(i).

4.15.11 Sudley Park Constructive Use Evaluation

Sudley Park is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a publicly owned public park. The property is located immediately west of Segment C of the West Two and West Four CBAs. No CBA will cross any portion of land within park boundaries; therefore, the project will not result in a direct use of this resource.

4.15.11.1 Description of Property

Sudley Park is a 101-acre park owned and operated by the Prince William Park Authority. The park is located adjacent to Route 234 and Sanders Road near Catharpin. Facilities at this park include soccer, softball, and baseball fields, as well as picnic facilities. The property is located immediately west of Segment C of the West Two and West Four CBAs.

4.15.11.2 Visual

The project will be visible from Sudley Park and, therefore, will have an effect on the resource. FHWA regulations at 23 CFR 771.135(p)(4)(ii) state in part that if, "the proximity of the proposed project substantially impairs esthetic features of a resource protected by section 4(f) .....where the location of [the].....proposed facility substantially detracts from the setting of a .... park which derives its value in substantial part due to its setting", then a constructive use would occur. The setting of the park is already bordered by the heavily traveled Route 234 and is visible from it; accordingly, the Tri-County Parkway will not add anything that is out

of character with this setting. The project will have no additional adverse effect to this property; therefore, the proposed project will not result in a constructive use of this park as defined at 23 CFR 771.135(p)(4)(ii).

4.15.11.3 Noise

FHWA Regulations at 23 CFR 771.135(p)(4)(i) state in part that if, "the projected noise level increase attributable to the project substantially interferes with the use and enjoyment of a noise-sensitive .... resource protected by section 4(f), such as .....enjoyment of an urban park where serenity and quiet are significant attributes" then a "constructive use" will occur. While the project may introduce some new audible elements, the elements will not be of an intensity to interfere with the use of the property since the activities that take place there are not noise sensitive. Further, because of its location relative to heavily traveled Route 234, a quiet setting is not currently a feature nor and attribute of Sudley Park. The project will, therefore, not meet the conditions of "use" of the property as defined at 23 CFR 771.135(p)(4)(i).

4.15.12 Unnamed Fairfax County Park Authority Property Constructive Use Evaluation

An unnamed park property recently acquired by the Fairfax County Park Authority is afforded protection under Section 4(f) of the U.S. Department of Transportation Act as a publicly owned public park. The property is located immediately east of Segment F' of the Comprehensive Plan CBA; however, the CBA will not cross any portion of land within park boundaries; therefore, the project will not result in a direct use of this resource.

4.15.12.1 Description of Property

The unnamed park property is an 838-acre regional park owned and operated by the Fairfax County Park Authority. It is located on the Fairfax County side of the Fairfax County/Loudoun County line. The property is bordered by Route 609, and a very small portion is bordered by Bull Run Post Office Road. Route 620 (Braddock Road) also traverses and borders part of the property. The South Riding neighborhood in Loudoun County is located northeast of the property and borders a portion of it. Finally, Washington Dulles International Airport is located several miles north of the property. While this park is still in the master plan phase of development, the property has been acquired by the county for the purpose of developing a regional park.

4.15.12.2 Visual

The project will be visible from the unnamed park and, therefore, will have an effect on the resource. FHWA regulations at 23 CFR 771.135(p)(4)(ii) state in part that if, "the proximity of the proposed project substantially impairs esthetic features of a resource protected by section 4(f) .....where the location of [the].....proposed facility substantially detracts from the setting of a .... park which derives its value in substantial part due to its setting", then a constructive use would occur. Only a small portion of the unnamed park would be located near the project, and this same area is adjacent to and visible from heavily traveled Bull Run Post Office Road. Because the setting of the property is already compromised by the existing transportation system and residential development, the location of the proposed project to the west will not result in a constructive use of this park as defined at 23 CFR 771.135(p)(4)(ii).

4.15.12.3 Noise

FHWA Regulations at 23 CFR 771.135(p)(4)(i) state in part that if, "the projected noise level increase attributable to the project substantially interferes with the use and enjoyment of a noise-sensitive .... resource protected by section 4(f), such as .....enjoyment of an urban park where serenity and quiet are significant attributes" then a "constructive use" will occur. Because of its proximity to heavily traveled Bull Run Post Office Road and Route 620 (as well as the location of the property in proximity to Washington Dulles International Airport), a quiet setting does not appear to be a feature nor an attribute of this park. The project will, therefore, not meet the conditions of "use" of the property as defined at 23 CFR 771.135(p)(4)(i).

4.15.13 Section 6(f) Resources

Section 6(f) of the Land and Water Conservation Fund (L&WCF) Act of 1965 was established to assist states and federal agencies meet present and future outdoor recreational needs. The purpose of the Act is to preserve, develop, and assure the quality and quantity of outdoor recreation resources by providing funds for

federal acquisition of park and recreational lands or matching grants to state and local governments for recreation planning, acquisition, and development. Properties purchased with these funds are protected form conversion to land uses other than public outdoor recreational uses without the approval of the U.S. Department of the Interior, National Park Service.

The Northern Virginia Regional Park Authority has received Section 6(f) funds for development of the Bull Run Regional Park in Fairfax County. The Comprehensive Plan CBA would use 52.9 acres of land associated with the Bull Run Regional Park. As a result, this Section 6(f) resource would require that land of equal value, location, and usefulness be provided to replace that portion of the Bull Run Regional Park converted to transportation use.

The Department of Conservation administers the L&WCF in the State of Virginia through its Virginia Outdoors Funds. Coordination has been initiated with the Department to identify replacement land for the Section 6(f) use of the Bull Run Regional Park. Given the current extent of development, locating replacement land of equal value, location, and usefulness in the vicinity of the existing park could be problematic and may delay the implementation of the project if the Comprehensive Plan CBA goes forward for development. Typically, a request to convert Section 6(f) property is not processed by the National Park Service until the NEPA process is completed for the project that would cause the Section 6(f) conversion. The National Park Service was afforded the opportunity to serve as a Cooperating Agency in the development of this EIS on the basis of Section 6(f) issues; however, they declined.

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5.0 LIST OF PREPARERS

This document was prepared by the Federal Highway Administration of the U.S. Department of Transportation and the Virginia Department of Transportation, with assistance from consulting engineers and planners from Parsons Brinckerhoff Quade & Douglas, Inc.; AECOM Consulting Transportation Group, Coastal Carolina Research, Inc.; Cordell and Crumley; EEE Consulting, Inc.; Harris Miller Miller & Hanson Inc., Land Planning & Design Associates, Inc.; and Wetland Studies and Solutions, Inc.

Virginia Department of Transportation

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Federal Highway Administration

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AECOM Consulting Transportation Group

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Susan Bamann	Ph.D, Anthropology, 13 years experience in archaeological research	Archaeological Principal Investigator
Bill Hall	B. A. History, 7 years experience in historical research	Historian

Cordell and Crumley Communication Specialists

Name	Experience	Responsibility
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Deborah Cordell	B.S. Communication Arts; 18 years in Communications field	Public participation
Deborah DeMarco	B.S. Secondary Education, Marketing Education; M.T.A, Destination Management; 17 years communications experience	Public participation

EEE Consulting, Inc.

Name	Experience	Responsibility
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Harris Miller Miller & Hanson Inc.

Name	Experience	Responsibility
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Christopher Menge	B.S., Physics 32 years experience highway noise analysis	Noise Analysis

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Name	Experience	Responsibility
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William Mechnick	BSLA plus 10 years diverse experience in landscape architecture	Parklands/recreational area and visual quality investigations

Wetlands Studies and Solutions, Inc.

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Robert Wright	M.S. Environmental Science, 16 years experience in NEPA documentation and natural resource management.	Natural resources and permitting investigations
Craig Turner	B.S. Biology, 15 years experience in wetland delineation and natural resources investigations.	Natural resources and permitting investigations
Christin Jolicoeur	M.S. Marine Science, 4 years experience in water quality and environmental assessment.	Natural resources and permitting investigations

6.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE EIS WERE DISTRIBUTED

The following is a list of agencies, organizations, and persons to whom copies of the EIS were distributed.

United States Congress

Honorable Jim Moran
Honorable Frank Wolf
Honorable Tom Davis

United States Senate

Honorable George Allen
Honorable John Warner

Federal Agencies

Advisory Council on Historic Preservation
Federal Emergency Management Agency
Federal Highway Administration, Virginia Division
Federal Transit Administration:
- Washington Metro Office
- Region III, Philadelphia

National Marine Fisheries Service, Northeast Region
National Oceanic and Atmospheric Administration
National Park Service, Manassas National Battlefield
Natural Resources Conservation Service
- Southeast Regional Office
- Virginia State Conservationist

U.S. Army Corps of Engineers
- Baltimore District
- Northern Virginia Field Office

U. S. Department of Interior
- Office of Environmental Compliance
- Fish and Wildlife Service (Virginia Field Office)

U.S. Environmental Protection Agency

Virginia Agencies

Chesapeake Bay Local Assistance Department
Commonwealth of Virginia Transportation Board
Virginia Department of Agriculture and Consumer Services
Virginia Department of Aviation
Virginia Department of Conservation and Recreation
- Division of Natural Heritage
- Division of Soil and Water Conservation
- Division of Planning and Recreation Resources

Virginia Department of Emergency Services
Virginia Department of Environmental Quality
- Air Program Coordination
- Water Program Coordination
- Environmental Impact Review Coordinator Northern Virginia Region

Virginia Department of Forestry
Virginia Department of Game and Inland Fisheries
Virginia Department of Health
Virginia Department of Historic Resources
Virginia Department of Housing and Community Development
Virginia Department of Rail and Public Transportation
Virginia Department of Transportation
Virginia Marine Resources Commission
Virginia Outdoors Foundation

Regional Agencies

Dulles Area Transportation Association
Metropolitan Washington Council of Governments
Northern Virginia Regional District Commission
Northern Virginia Regional Park Authority
Northern Virginia Soil and Water Conservation District
Northern Virginia Transportation Commission
Potomac and Rappahannock Transportation Commission
Virginia Railway Express
Washington Metropolitan Area Transit Authority

Fairfax County Agencies

Fairfax County Board of Supervisors

Loudoun County Agencies

Loudoun County Board of Supervisors

City of Manassas Agencies

City of Manassas City Manager
City of Manassas Mayor's Office

City of Manassas Park Agencies

City of Manassas Park City Manager
City of Manassas Park Mayor's Office

Prince William County Agencies

Prince William County Board of Supervisors
Prince William County Executive

Other Agencies

National Air & Space Museum
- Steven F. Udvar-Hazy Center

Transportation Coordinating Council of Northern Virginia

7.0 COMMENTS AND COORDINATION

On 1 March 2002, VDOT distributed a letter inviting federal, state, and local agencies along with political representatives to attend a 20 March 2002 Agency Scoping Meeting. The 1 March 2002 letter was accompanied by a March 2002 color brochure titled "Tri-County Parkway Location Study Scoping Information Document". The letter and brochure was distributed to the three representatives from the U.S. Congress, the two representatives of the U.S. Senate, 12 federal agencies (including their various divisions and field offices), 21 state agencies (including their various divisions and field offices), nine regional agencies, 66 agencies of the four local jurisdictions affected by the project, and two other uncategorized parties. Parties to who the invitation letter and information brochure were sent are listed in the "Distribution List" section of the March 2002 information brochure Section 6.0 of this EIS. A week prior to the Agency Scoping Meeting, similar material was sent to each of the County Board of Supervisor Chairpersons and Supervisors representing districts impacted by the project in Prince William, Fairfax, and Loudoun counties.

Additional project scoping was accommodated primarily through Inter-Agency Coordination Meetings (IACMs). Agencies participating in the IACMs included VDOT, FHWA, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (COE), U.S. Fish and Wildlife Service (FWS), National Marine Fisheries, Virginia Department of Environmental Quality (DEQ), Virginia Department of Game and Inland Fisheries (DGIF), Virginia Institute of Marine Sciences (VIMS), Virginia Marine Resources Commission (VMRC), Virginia Department of Historic Resources (DHR), and the Virginia Department of Conservation and Recreation (DCR). Additional agency coordination included meetings, phone conferences, and data exchanges with the National Park Service (NPS) and the Northern Virginia Regional Parks Authority (NVRPA). Coordination with the Natural Resources Conservation Service (NRCS) was provided to secure identification and rating of prime farmlands in the study area.

7.1 WRITTEN COMMENTS

The following section summarizes those comments set forth in the aforementioned comment letters.

7.1.1 U.S. Department of the Interior, Fish and Wildlife Service (FWS)

Federal Endangered Species Act: FWS-compiled lists of species with federal status and species of concern are provided for Loudoun, Fairfax, and Prince William counties. FWS recommends that surveys be conducted for dwarf wedgemussel (*Alasmidonta hertodon*) and small whorled pogonia (*Isotria medeoloides*). General survey requirements and a list of qualified surveyors are provided.

State Endangered Species Act: FWS points out that the bald eagle is protected under the Virginia Endangered Species Act and recommends that coordination be initiated with the Virginia Department of Game and Inland Fisheries. FWS points out that the small whorled pogonia is also protected under the Virginia Endangered Plant and Insects Act and recommends that coordination be initiated with the Virginia Department of Conservation and Recreations, Division of Natural Heritage.

Wetlands: FWS recommends avoidance of wetland impacts and adherence to the FWS's Mitigation Policy for unavoidable impacts. Compensation ratios of 1.5:1 for emergent wetlands and 2:1 for scrub/shrub and forested wetlands are recommended. Generic recommendations for habitat compensation are provided. Items to be addressed in a detailed compensation plan are listed. FWS states that detailed compensation plans should be published in the Record of Decision.

Floodplains: FWS states that floodplain impacts should be mitigated to the maximum extent possible. Compensation for unavoidable impacts should be provided using the same general recommendations that FWS listed for wetlands. Information to be provided for each alternative is listed.

Indirect, Secondary, and Cumulative Impacts: FWS states that indirect, secondary, and cumulative impacts to both upland and wetland habitat types should be assessed and discussed.

Forested Habitat and Farmland: FWS states (1) that forested habitat and farmland are valuable to fish and wildlife, (2) that candidate build alternatives would adversely impacts these areas, and (3) that "the Service

does not support the expenditure of federal funds that results in unmitigated destruction of fish and wildlife habitat".

Migratory Birds: FWS recommends habitat restoration/enhancement to offset adverse impacts to migratory birds, other fish and wildlife resources, and wildlife-related recreation. Suggested options include restoration/reforestation of riparian/floodplain habitat and establishment of vegetated corridors between two or more lager blocks of habitat.

Publicly-Owned Park Property: FWS notes that the project may affect publicly-owned park property and recommends that the National Park Service be contacted.

7.1.2 U.S. Department of the Interior, National Park Service (NPS), Philadelphia Support Office

Based on the information provided them, the Philadelphia Support Office of NPS states that the proposed Tri-County Parkway does not appear to be within one mile of a National Park or any known resource protected under legislation applicable to NPS responsibilities. Based on their determination, NPS states that they "continue to have no interest in being a cooperating agency or designating others". NPS refers FHWA to State Historic Preservation Officer, H. Alexander Wise, regarding impacts to resources protected under the Historic Preservation Act of 1966.

7.1.3 U.S. Department of Transportation, Federal Highway Administration (FHWA)

In response to the 27 March 2002 letter from NPS's Philadelphia Support Office stating that NPS would not be interested in serving as a cooperating agency, FHWA points out that the alignment for the Tri-County Parkway would impact Bull Run Regional Park and that Bull Run Regional Park has been the recipient of (federal) funds under the Land and Water Conservation Fund Act. FHWA further points out that Mr. Robert Sutton, Superintendent of the Manassas National Battlefield, has been invited to represent the park as a cooperating agency and that Ms. Susan Hinton of the Washington Office of NPS is involved in the development of the project as a member of the Technical Advisory Committee. FWHA requested that NPS's Philadelphia Support Office consider whether representation by these individuals appropriately represents NPS interests and to reiterate its position in writing if it still feels that there is no need for their office to be involved.

7.1.4 U.S. Environmental Protection Agency (EPA), Region III

Study Area: EPA states that the study area should be expanded to include the area west of Dulles Airport, north to the Dulles Greenway, and east to Route 28. Reasons given by EPA for expanding the study area include: (1) statements in the purpose and need suggesting that one aspect of the project is to improve access to Dulles Airport, (2) the fact that several related projects are planned or underway in the area west and south of Dulles Airport, and (3) the need to document cumulative effects of the Parkway and other related projects.

Purpose and Need: EPA recommends a thorough analysis of the purpose and need and the development of alternative locations. EPA states that the analysis should document in detail (1) the safety and carrying capacity of current roads, (2) future conditions of roads predicted under build-out scenarios that include high, medium, and low growth scenarios, and (3) the impact of "the many other proposed roadway improvements in the area" on the purpose and need.

Alternatives: EPA states that the corridors of several other north-south transportation improvements proposed in the approximately 10-mile-wide study corridor (including the Western Transportation Study, Route 659 improvements, the Route 234 Bypass, and "potentially others") should be studied as alternative corridors for the Tri-County Parkway to asses how they could individually or in combination address the purpose and need. EPA also states that an alternative that avoids Bull Run Park should be assessed as required under Section 4(f).

Cumulative Effects: EPA states that a fully developed cumulative effects analysis will be required. EPA recommends that the cumulative effects analysis include (1) the effects of the Parkway as well as other

transportation projects in the vicinity, (2) an assessment of effects to natural resources, open space, traffic, and congestion, (3) the effects of past and future road projects, commercial and residential development, mining, and other activities on Valued Environmental Components (VEC's). Some VEC's suggested by EPA for inclusion in the cumulative effects analysis include: wetlands; forest area and block size; open space; parkland; historic resources and affects; farms and farmlands, and; streams and rivers.

EPA recommends that the spatial and temporal boundaries of the cumulative affects analysis be determined by a team of agencies involved in the development or review of the DEIS and other potentially interested parties. EPA recommends that the spatial boundary for the cumulative effects analysis be expanded beyond the current study area to include the area west of Dulles Airport, north to the Dulles Greenway, and east to Route 28. EPA recommends that the temporal boundaries of the analysis be chosen to disclose long-term trends associated with past and reasonably foreseeable future projects.

The EPA comments provide further guidance regarding types of effects and significance of effects. EPA recommends that the Cumulative Effects portion of the Fredericksburg Outer Connector SDEIS be considered as a potential template for the Tri-County Parkway project.

7.1.5 Virginia Department of Agriculture and Consumer Services (VDACS)

VDACS expressed a general concern over the protection of agricultural lands and protection of endangered plant and insect species. VDACS stated that review of the EIS will be conducted by Mr. Keith Tignor of the Office of Plant and Pest Services.

7.1.6 Virginia Department of Conservation and Recreation (VDCR)

VDCR stated that they would be unable to provide representation during the 20 March 2002 scoping meeting. VDCR identified the Urban Compliance Engineer from the Potomac Watershed Office, Mr. Gary Switzter, as VCR's contact person for the Tri-County Parkway project.

7.1.7 Virginia Marine Resources Commission (VMRC)

VMRC stated that Environmental Engineer, Mr. Jay Woodward, will serve as VMRC's contact person for the Tri-County Parkway project. VMRC stated its responsibility for permitting encroachments over state-owned subaqueous beds where the upstream drainage area of the waterway is five square miles or greater and reminded readers that alternatives resulting in the encroachment over jurisdictional streams would require a permit from VMRC. VMRC stated that further comments will be provided upon their receipt of the Scoping Information Document.

7.1.8 Fairfax County Park Authority (FCPA)

FCPA states that the Tri-County Parkway shown on the adopted Fairfax County Transportation Plan may impact FCPA properties at two locations: (1) the Cub Run Stream Valley and (2) the northern portion of the Hunter-Hacor tract. FCPA states that Cub Run Stream Valley consists of natural resource areas and trails. FCPA states that the Hunter-Hacor tract contains one of Virginia's largest stands of globally rare oak-hickory forest on diabase soils (that is protected by a conservation easement) and that the tract covers a significant portion of the Occoquan watershed that drains to the Occoquan reservoir (the drinking water source for the majority of Fairfax County).

FCPA conducted an analysis of potential impacts to archeological resources and presented their analyses in several memoranda attached to their 25 April 2002 master letter. Issues addressed under each of these memoranda are summarized as follows:

19 April 2002 Memorandum from FCPA, Resource Management Division (RMD), Resource Stewardship Section (RSS), County Archeological Services (CSA), County Archeologist, Mike Johnson:

Mr. Johnson provided an assessment of archeological resources potentially affected along a 2,000-foot-wide corridor for the preliminary Tri-County Parkway centerline provided to Mr. Johnson by the Fairfax County

Department of Transportation. Results of the analysis are presented in a series of annotated maps and explanatory tables; however, findings are not summarized in the memorandum. Mr. Johnson recommends that VDOT staff and VDOT consultants use CSA's archives and that they consult with CSA staff. Mr. Johnson also recommends that the analysis and recommendations be forwarded to the Virginia Department of Historic Resources (DHR).

18 April 2002 Memorandum from FCPA, Cultural Resource Protection Group (CRP), County Representative, John Rutherford:

Mr. Rutherford states that an (archeological) assessment was conducted within a 1,000-foot buffer and a 2,000-foot buffer along the proposed location of the "Tri-County Connector" in western Fairfax County. Mr. Rutherford states that 23 known archeological sites were found within the 1,000-foot buffer and that 37 known archeological sites were found within the 2,000-foot buffer, none of which are within Fairfax County Park Authority property. Mr. Rutherford also states that the only FCPA property affected by the proposed corridor is the westernmost portion of the newly acquired Hunter-Hacor tract and that no archeological sites are known to exist within the affected portion of the tract. Mr. Rutherford states that CRP would recommend a survey of that portion of the FCPA property prior to any ground disturbance associated with the proposed project.

7.1.9 Fairfax County Police Department (FCPD)

FCPD acknowledged invitation to the 20 March 2002 Agency Scoping Meeting and stated that Master Police Officer, William Knost, will be representing FCPD as VDOT Laison Officer.

7.2 ORAL COMMENTS

Oral comments received and responded to during the 20 March 2002 Agency Scoping Meeting are summarized as follows:

- George Phillips, Loudoun County, questioned the source of the alternative illustrated on the map exhibit and asked for clarification regarding which "Plan" the alternative represented.
  Reply: The alternative represents a composite of the comprehensive plans of Loudoun, Fairfax, and Prince William counties.
- Delegate Robert Marshall, 13th House District, asked about linkage to Dulles International Airport and the provision of rail/light rail as an alternative.
  Reply: The Tri-County Parkway will connect to the Loudoun County Parkway which serves the west side of Dulles. Yes, mass transit options including rail feasibility will be evaluated in the alternatives analysis phase of the study.
- Mike Moon, City of Manassas, questioned the study window and the extension of the study to cover Route 28.
  Reply: The study area currently does not cover Route 28. Route 28 influences the study area and will be taken into account; however, Route 28 is not currently seen as an alternative to the Tri-County Parkway. The study will recognize the problems with Route 28 and the impact that Tri-County Parkway will have on addressing those conditions.
- Delegate Robert Marshall asked if Tri-County Parkway was in the constrained long range plan.
  Reply: Yes.
- Kathleen Donodeo, Washington Metropolitan Area Transit Authority, asked for clarification of the connection to the Loudoun County Parkway and the activity centers in the Dulles area.
  Reply: Tri-County Parkway is programmed to connect to on going construction underway in the South Riding area. This part of the Parkway is being provided by the developer of South Riding. This will extend the project to US Route 50. North of US Route 50 the facility becomes the Loudoun County Parkway extending to Route 7. Approximately 90 percent of the Loudoun County Parkway north of US Route 50 is committed (constructed, under design or proffered by developers).

- George Phillips confirmed the importance of Tri-County Parkway to the Loudoun County Parkway and the Dulles activity centers.
- Ellen Gallagher, Fairfax County DOT, observed that the Tri-County Parkway south of I-66 is shown in the Fairfax comprehensive Plan as 6–lanes, yet the Constrained Long range Plan provides for four lanes initially. The number of lanes needs to be considered, since it may not be desirable to disturb Bull Run Regional Park twice to build four lanes initially and later widen to six lanes.
  Reply: The capacity and typical section of the facility will be determined in the study. Parkland impacts and phased disruptions will be evaluated as part of the 4(f) process.
- Uwe Kirste, Prince William County Public Works, asked if the capital improvement plans of local government are considered. Prince William County has advanced plans for flood control improvements along Flat Branch.
  Reply: Yes, improvements already programmed will be incorporated into the study and where modifications are necessary a determination will be made regarding the allocation of capital costs. Several discussions occurred after the meeting between study area staff and Prince William Public Works staff. They have agreed to meet at the appropriate time and share data.
- Charlie Forbes, Virginia Department of Environmental Quality, asked to be copied on the Scoping Meeting attendance list.
  Reply: Yes, this will be provided with the meeting minutes to all who signed up on the attendance sheets. There were many attendees who arrived late and subsequently did not sign the attendance list. Subsequently, there will some attendees who were not recorded and will not be copied on the minutes.

INDEX

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S

T

W

APPENDIX A

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DRAFT EIS:
TRI-COUNTY PARKWAY LOCATION STUDY

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