

Tri-County Parkway Location Study

ENERGY TECHNICAL REPORT

Prepared for:

The Virginia Department of Transportation



Prepared by:

Parsons Brinckerhoff Quade and Douglas, Inc.

27 July 2004

(This page left blank intentionally)

TABLE OF CONTENTS

S.0	EXECUTIVE SUMMARY -----	1
1.0	INTRODUCTION -----	1-1
1.1	PROJECT DESCRIPTION AND HISTORY-----	1-1
1.2	PURPOSE AND NEED -----	1-4
2.0	ALTERNATIVES CONSIDERED -----	2-1
2.1	INTRODUCTION-----	2-1
2.2	ALTERNATIVES ELIMINATED FROM DETAILED STUDY-----	2-1
2.3	THE NO-BUILD ALTERNATIVE-----	2-1
2.4	CANDIDATE BUILD ALTERNATIVES-----	2-1
2.4.1	The Comprehensive Plan CBA-----	2-2
2.4.2	The West Two CBA-----	2-3
2.4.3	The West Four CBA-----	2-3
3.0	AFFECTED ENVIRONMENT -----	3-1
4.0	ENVIRONMENTAL CONSEQUENCES -----	4-1
4.1	METHODOLOGY -----	4-1
4.2	IMPACTS-----	4-1
5.0	REFERENCES -----	5-1

LIST OF TABLES

TABLE 4.2-1	CONSTRUCTION, MAINTENANCE, OPERATIONAL AND TOTAL ENERGY (FUEL) CONSUMPTION-----	4-1
-------------	--	-----

LIST OF FIGURES

FIGURE 1.1-1	REGIONAL LOCATION MAP-----	1-2
FIGURE 1.1-2	STUDY AREA -----	1-3
FIGURE 2.3-1	GENERAL DESIGN SEGMENTS TYPICAL SECTIONS -----	2-4
FIGURE 2.3-2	CANDIDATE BUILD ALTERNATIVES -----	2-5

(This page left blank intentionally)

S.0 EXECUTIVE SUMMARY

Project History and Overview

The Tri-County Parkway Location Study evaluates a new north/south transportation link in northern Virginia that will connect the City of Manassas with Interstate 66 (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 Bypass. 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. The three counties that the Tri-County Parkway will traverse are among the top ten fastest growing counties in the Commonwealth of Virginia. The City of Manassas and the City of Manassas Park have also experienced substantial population growth over the last ten years. Much of the growth in Northern Virginia can be attributed to the emergence of high-tech industries near the Washington Dulles International Airport. A second rapid growth corridor within the region is the I-66 corridor. The primary problem the Tri-County Parkway is intended to address is the lack of 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 link the spokes together - VA 28 (Sully Road), Route 7100 (Fairfax County Parkway), and VA 123. These north-south facilities are heavily congested and will deteriorate further by the year 2025.

Purpose and Need

The study area presently lacks adequate north-south transportation facilities linking the I-66 corridor with the Dulles area and VA 267. The purpose and need for the Tri-County Parkway is comprised of four key elements, namely:

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.

Each of the elements has equal value and importance in the overall transportation, environmental, economic, and quality of life objectives for the communities being served under the proposed action.

Alternatives

In accordance with NEPA requirements, alternatives initially considered for the Tri-County Location Study included the No-Build, Mass Transit, Transportation System Management (TSM), and Candidate Build Alternatives (CBAs). Each alternative was evaluated with respect to its potential impacts and its ability to address the project's purpose and need.

Alternatives Eliminated from Detailed Study

Assessments conducted as part of the Tri-County Parkway Location Study 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. No transit authority exists whose service area covers or would cover the entire study area, nor are there plans to establish such an authority. In addition, 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 was eliminated from further consideration.

There are no practicable Transportation System Management (TSM) measures beyond those already proposed in the CLRP and VDOT Six Year Plan which could reasonably be implemented to satisfy the



purpose and need for the Tri-County Parkway. TSM-type improvements programmed into the aforementioned plans do not satisfy the project's purpose and need when considered as a stand-alone alternative; therefore, the TSM Alternative was eliminated from further consideration.

The No-Build Alternative

The No-Build Alternative includes currently programmed committed and funded roadway and transit projects in the Virginia Department of Transportation (VDOT) Six Year Plan and the CLRP developed by the MWCOC. The No-Build Alternative, while having no direct construction costs, 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 Candidate Build Alternatives.

Candidate Build Alternatives (CBAs)

Three Candidate Build Alternatives (CBAs) have been identified for further evaluation in a Draft Environmental Impact Statement (EIS). These CBAs are referred to hereinafter as: (1) the "Comprehensive Plan" CBA, (2) the "West Two" CBA, and (3) the "West Four" CBA. Each of the CBAs is expected to be comprised of two or more facility types according to localized needs and goals. To assess environmental effects associated with a particular facility type along each CBA, three general design segments were developed. These general design segments and their relationship to each alternative assessed are described in the body of this Technical Report.

The Comprehensive Plan CBA

The Comprehensive Plan CBA would be located east of the Manassas National Battlefield. The Comprehensive Plan CBA would provide a new urban principal arterial roadway from the northern terminus at the intersection of US 50 and Route 606 (Old Ox Road) and the southern terminus at the Route 28 and Route 234 Bypass Interchange, and would consist of Segments F', F, and E. Segment F' between Route 50 and Route 620 would be comprised of improvements along an existing four-lane divided facility within an existing right-of-way on an existing alignment. Segment F' south of Route 620 would be a new four-lane divided facility within a new right-of-way on a new alignment. Three separate sections characterize segment E. The portion of Segment E between I-66 and the Fairfax/Prince William county line would be a new six-lane divided facility within a new right-of-way on a new alignment. The portion of segment E from the Fairfax/Prince William county line south to VA 234 would be a new six-lane divided facility within an existing right-of-way on an existing alignment. The portion of Segment E from VA 234 to the VA 234 Bypass would be comprised of improvements along an existing four-lane divided facility called Godwin Drive and would be widened to a six-lane divided facility within the existing right-of-way and on an existing alignment.

The West Two CBA

The West Two CBA is located west of the Manassas National Battlefield. The West Two CBA would provide a new urban principal arterial roadway from the northern terminus near the intersection of US 50 and Route 877 (Racefield Lane) and the southern terminus at the I-66 and Route 234 Interchange. The West Two CBA would be a new four-lane divided facility within a new right-of-way and on a new alignment, and would consist of Segments D and C.

The West Four CBA

The West Four CBA is also located west of the Manassas National Battlefield. The West Four CBA would provide a new urban principal arterial roadway from the northern terminus at the intersection of US 50 and Route 606 (Old Ox Road) and the southern terminus at the I-66 and Route 234 Interchange. The West Four CBA would consist of Segments F', G, and C. Segment F' between Route 50 and Route 620 (Braddock Road) would be comprised of improvements along an existing four-lane divided facility within an existing right-of-way on an existing alignment. Segment F' south of Route 620 would be comprised of a new four-lane divided facility within a new right-of-way on a new alignment.

Affected 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 CBAs were analyzed and compared for the design year 2030 (see section 4.2).

Environmental Consequences

Each of the CBAs 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. There does not appear to be any appreciable difference between the CBAs that would influence decision making.

(This page left blank intentionally)

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION AND HISTORY

The Tri-County Parkway Location Study evaluates a new north/south transportation link in northern Virginia that will connect the City of Manassas with Interstate 66 (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 Bypass. 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.

The Tri-County Parkway was first identified during the development of the transportation element of the comprehensive plans for Prince William, Fairfax, and Loudoun counties. The Tri-County Parkway has been the subject of many local studies and plans and has been known by many names throughout the years. In Prince William County, it has been referred to as the “Route 28 Bypass” and, in Loudoun County, the Tri-County Parkway has been known as the “Loudoun County Parkway”. Several conceptual alignments were considered through Fairfax County even before it was first proposed in their comprehensive plan. The Tri-County Parkway has been incorporated in the three counties’ comprehensive plans for over ten years. The Tri-County Parkway was adopted by the Metropolitan Washington Council of Governments (MWCOCG) and included in their Constrained Long-Range Plan (CLRP) and Transportation Improvement Program (TIP) in the early to mid 1990s. Figure 1.1-1 illustrates the Tri-County Parkway project from a regional perspective, while Figure 1.1-2 depicts the study area within which Tri-County Parkway alternatives will be evaluated.

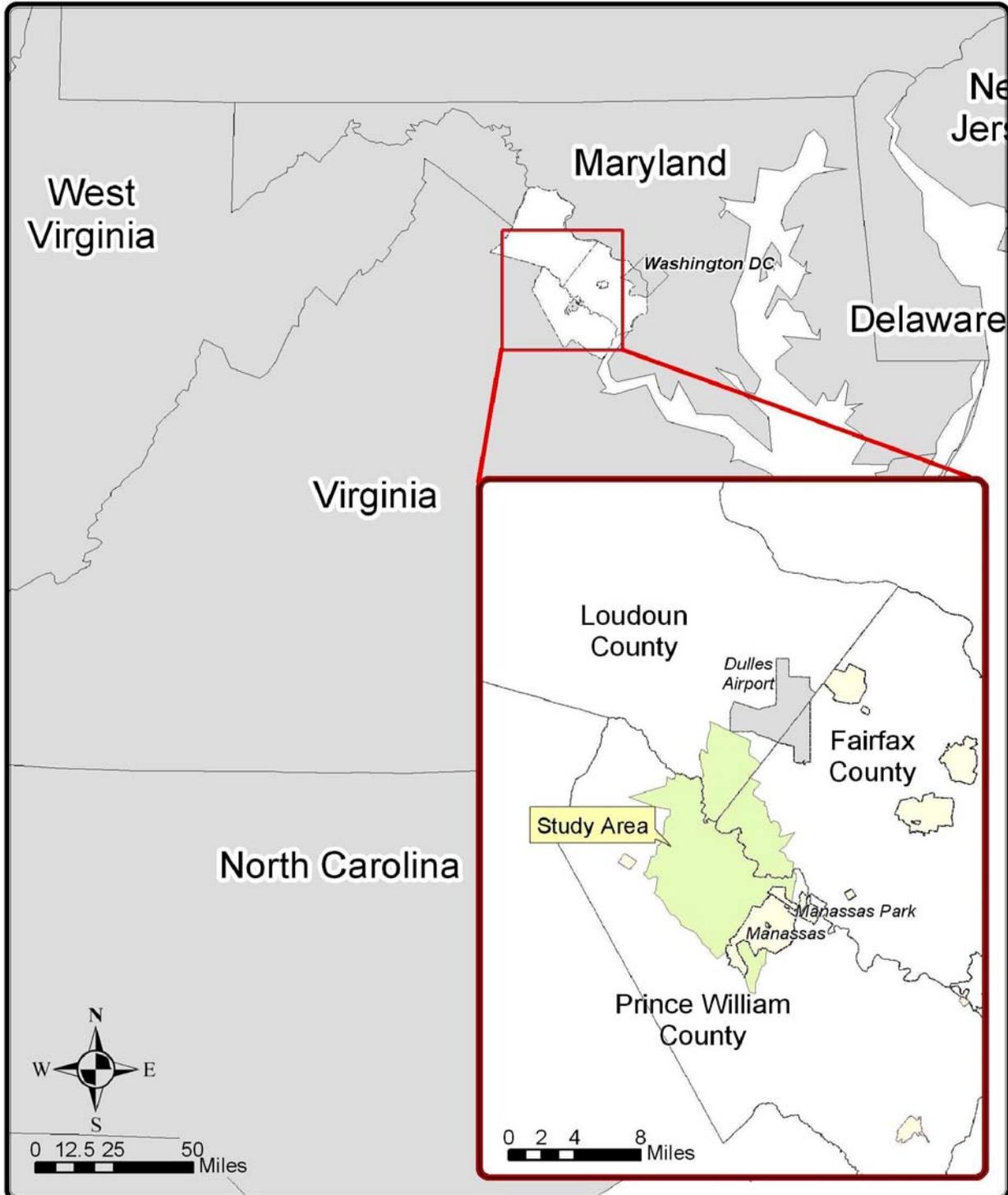
The three counties that the Tri-County Parkway will traverse are among the top ten fastest growing counties in the Commonwealth of Virginia. According to the 2000 Census, Loudoun County’s population grew by 97 percent from 1990 to 2000. Prince William County’s and Fairfax County’s population grew by 30 percent and 19 percent, respectively, during those same years. The City of Manassas and the City of Manassas Park are also located within the Tri-County Parkway study area. Both of these cities have experienced substantial population growth over the last ten years. The City of Manassas had a population growth of 26 percent and the City of Manassas Park grew by 53 percent.

Much of the growth in Northern Virginia can be attributed to the emergence of high-tech industries near the Washington Dulles International Airport. By the year 2025, employment in the Dulles/Tysons corridor is expected to reach 280,000 jobs - 71 percent more than current conditions. The Dulles/Tysons corridor will become the second largest employer in the Washington Metropolitan region, second only to downtown Washington D.C. Prince William County and the City of Manassas have also experienced significant high-tech industry growth. The Dulles area consists of the Dulles Greenway, VA 7, VA 28, and US Route 50.

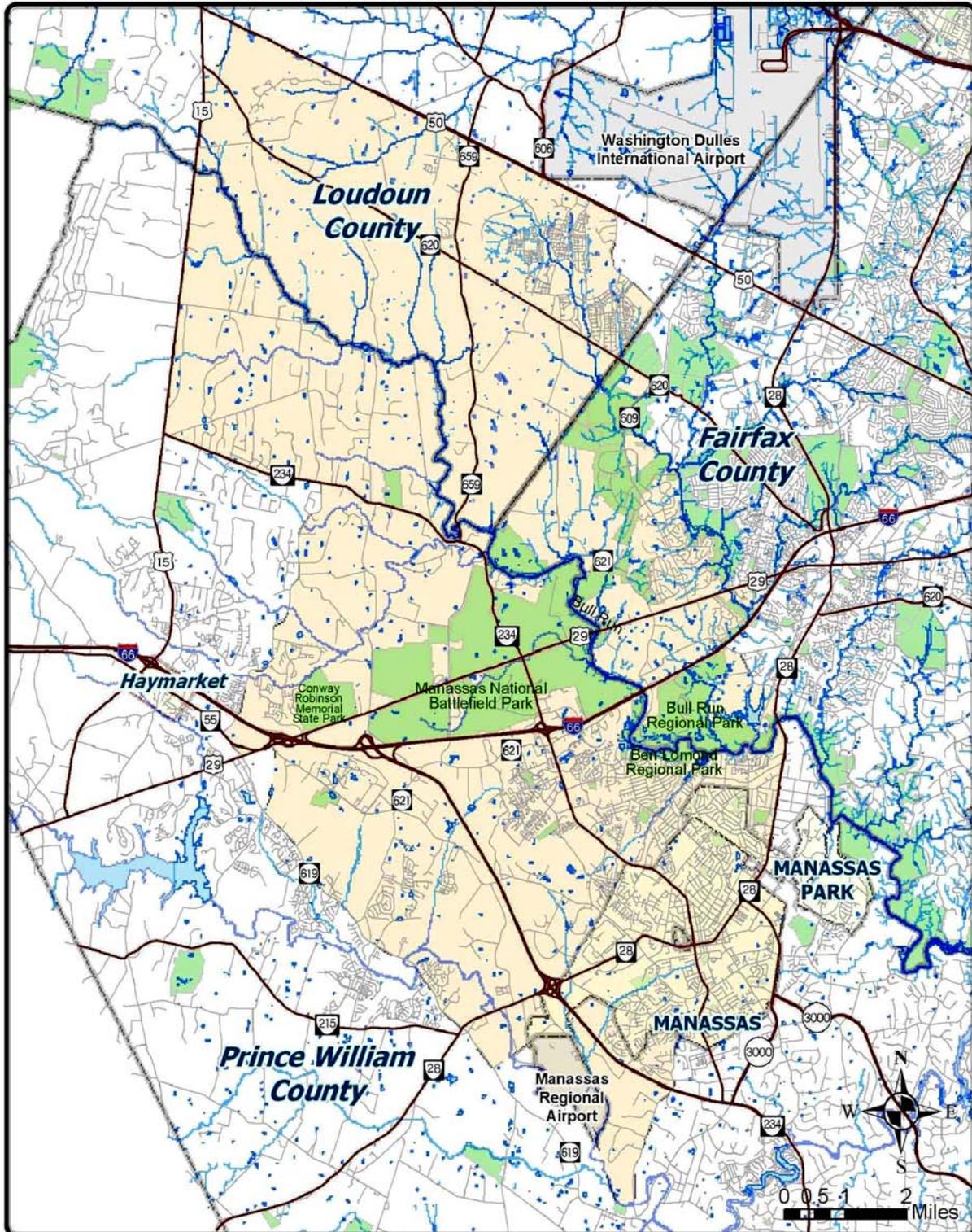
A second rapid growth corridor within the region is the I-66 corridor. Transportation improvements for the I-66 corridor from Interstate 495 (I-495) to the Gainesville area were evaluated in January 1999 as part of a comprehensive study entitled “The I-66 Corridor Major Investment Study (I-66 MIS).” Information from that study revealed that population in the I-66 corridor located within Fairfax, Prince William, and Loudoun counties is projected to increase from 269,000 persons in 1999 to 466,000 persons in 2020. This represents a 73 percent increase in population over the 22-year time frame. Employment is estimated to increase 83 percent in this same time period (from 162,000 jobs in 1999 to 296,000 jobs in 2020).

The primary problem the Tri-County Parkway is intended to address is the lack of 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 link the spokes together - VA 28 (Sully Road), Route 7100 (Fairfax County Parkway), and VA 123. These north-south facilities are heavily congested and will deteriorate further by the year 2025.

Level of service 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 (a severely congested state). Traveling south in the p.m. between the Fairfax County line



**FIGURE 1.1-1
REGIONAL LOCATION MAP**



**FIGURE 1.1.2
STUDY AREA**



and I-66, speeds are estimated to drop along VA 28 from an already slow 18 miles per hour (mph) to 13 mph between 2000 and 2025. The posted speed limit in this area is 45 mph. By 2025 the peak periods for a.m. and p.m. traffic on VA 28 could extend for over three hours each; however, improvements to VA 28 have been proposed under the Virginia Public-Private Transportation Act (VPPTA) of 1995 to convert the 14-mile stretch of VA 28 between I-66 and Route 7 to a limited access freeway. That project would involve widening VA 28 to an eight-lane section, as well as replacing up to ten signalized intersections with grade-separated interchanges. If the VA 28 improvements project is completed as planned, the added capacity should increase speeds and reduce congestion along VA 28 - in effect improving operating speeds in the a.m. and p.m. peak periods.

1.2 PURPOSE AND NEED

The study area presently lacks adequate north-south transportation facilities linking the I-66 corridor with the Dulles area and VA 267. The purpose and need for the Tri-County Parkway is comprised of four key elements. Each of the elements is a critical and salient factor to be addressed by the transportation alternatives. There is no attempt to weight one element over the others. Each of the elements has equal value and importance in the overall transportation, environmental, economic, and quality of life objectives for the communities being served under the proposed action. The four elements are listed below and are further elaborated in Sections 1.3 through 1.7 of the associated document titled Purpose and Need Statement (VDOT, 2003):

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.

(This area left blank intentionally)

2.0 ALTERNATIVES CONSIDERED

2.1 INTRODUCTION

In accordance with NEPA requirements, alternatives initially considered for the Tri-County Location Study included the No-Build, Mass Transit, Transportation System Management (TSM), and Candidate Build Alternatives (CBAs). Each alternative was evaluated with respect to its potential impacts and its ability to address the project's purpose and need.

2.2 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Assessments conducted as part of the Tri-County Parkway Location Study 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. No transit authority exists whose service area covers or would cover the entire study area, nor are there plans to establish such an authority. In addition, 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 was eliminated from further consideration.

There are no practicable Transportation System Management (TSM) measures beyond those already proposed in the CLRP and VDOT Six Year Plan which could reasonably be implemented to satisfy the purpose and need for the Tri-County Parkway. TSM-type improvements programmed into the aforementioned plans do not satisfy the project's purpose and need when considered as a stand-alone alternative; therefore, the TSM Alternative was eliminated from further consideration.

2.3 THE NO-BUILD ALTERNATIVE

Consistent with the requirements of the NEPA and related FHWA guidelines, full consideration is given to the environmental consequences of taking no action to meet future travel demand (hereinafter referred to as the "No-Build Alternative"). The No-Build Alternative includes currently programmed committed and funded roadway and transit projects in the Virginia Department of Transportation (VDOT) Six Year Plan and the CLRP developed by the MWCOG. The No-Build Alternative, while having no direct construction costs, 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 Candidate Build Alternatives. The following is a list of major projects identified in the CLRP which influence the Tri-County Parkway study area:

- Dulles/VA 7 Corridor
- VA 28 Corridor
- Prince William Parkway (VA 3000) Corridor
- Fairfax County Parkway (VA 7100) Corridor
- I-66/US 29/US 50 Corridor
- I-495 (Beltway) Corridor
- Manassas National Battlefield Park Bypass
- Western Transportation Corridor

2.4 CANDIDATE BUILD ALTERNATIVES

Three Candidate Build Alternatives (CBAs) have been identified for further evaluation in a Draft Environmental Impact Statement (EIS). These CBAs are referred to hereinafter as: (1) the

“Comprehensive Plan” CBA, (2) the “West Two” CBA, and (3) the “West Four” CBA. The process leading to the identification of these three CBAs is discussed in greater detail in the associated document titled Alternatives Identification, Development, and Screening Technical Report (VDOT, 2004). The northern and southern termini for these CBAs have been selected in accordance with FHWA Technical Guidelines for Termini development and are discussed in greater detail in the associated document titled Logical Termini Technical Memorandum (VDOT, 2003).

Each of the CBAs is expected to be comprised of two or more facility types according to localized needs and goals. To assess environmental effects associated with a particular facility type along each CBA, three general design concepts have been developed:

- General Design Segment 1 (hereinafter referred to as “Segment 1”).
- General Design Segment 2 (hereinafter referred to as “Segment 2”).
- General Design Segment 3 (hereinafter referred to as “Segment 3”).

The process leading to the development of these general design segments is presented in the associated document titled Study Location Report (VDOT, 2004). The three general design segments developed for purposes of this assessment are depicted in FIGURE 2.4-1 and are described as follows:

- *Segment 1.* *Segment 1* will provide a controlled access facility with four 12-foot lanes divided with a 42-foot graded grass median and 10-foot multi-use trail. The 42-foot wide median will allow for expanding to six lanes in the future. Segment 1 could either include (1) paved shoulders in areas where right-of-way is needed or (2) curb and gutter in areas where portions of the facility have been partially constructed and right-of-way exists. These design options are represented as Option 1 and Option 2, respectively. The median width will be transitioned to include additional width at all intersection approaches to allow for construction of dual left turn lanes, as necessary.
- *Segment 2.* *Segment 2* will provide a limited access facility with four 12-foot lanes divided with a 42-foot graded grass median, paved shoulders, and 10-foot multi-use trail. The median width will be transitioned to include additional width at all intersection approaches to allow for construction of dual left turn lanes, as necessary.
- *Segment 3.* *Segment 3* will provide a limited access facility with six lanes (four 12-foot outside lanes and two 13-foot inside lanes) divided with a 42-foot graded median, paved shoulders, and a 10-foot multi-use trail. The 13-foot inside lanes are adjacent to curbed median only.

2.4.1 The Comprehensive Plan CBA

The Comprehensive Plan CBA is so named because it incorporates certain alignments recognized in local Comprehensive Plans. The Comprehensive Plan CBA would be located east of the Manassas National Battlefield. The Comprehensive Plan CBA would provide a new urban principal arterial roadway from the northern terminus at the intersection of US 50 and Route 606 (Old Ox Road) and the southern terminus at the Route 28 and Route 234 Bypass Interchange, and would consist of Segments F', F, and E (see FIGURE 2.4-2). Segment F' between Route 50 and Route 620 would be comprised of improvements along an existing four-lane divided facility within an existing right-of-way on an existing alignment. Segment F' south of Route 620 would be a new four-lane divided facility within a new right-of-way on a new alignment. Three separate sections characterize segment E. The portion of Segment E between I-66 and the Fairfax/Prince William county line would be a new six-lane divided facility within a new right-of-way on a new alignment. The portion of segment E from the Fairfax/Prince William county line south to VA 234 would be a new six-lane divided facility within an existing right-of-way on an existing alignment. The portion of Segment E from VA 234 to the VA 234 Bypass would be comprised of improvements along an existing four-lane divided facility called Godwin Drive and would be widened to a six-lane divided facility within the existing right-of-way and on an existing alignment. The Comprehensive Plan CBA would consist of three of the aforementioned general design segments in the following areas:

- *Segment 1 (Options 1 and 2)* will extend from the intersection of US 50 and Route 606 (Old Ox Road) in Loudoun County to the Fairfax County Line.

- *Segment 2* will extend from the Fairfax County Line to I-66 (east of the Manassas National Battlefield).
- *Segment 3* will extend from I-66 in Fairfax County to Route 234 in Prince William County.

2.4.2 The West Two CBA

The West Two CBA is located west of the Manassas National Battlefield. The West Two CBA would provide a new urban principal arterial roadway from the northern terminus near the intersection of US 50 and Route 877 (Racefield Lane) and the southern terminus at the I-66 and Route 234 Interchange. The West Two CBA would be a new four-lane divided facility within a new right-of-way and on a new alignment, and would consist of Segments D and C (see FIGURE 2.4-2). The West Two CBA would consist of two of the aforementioned general design segments in the following areas:

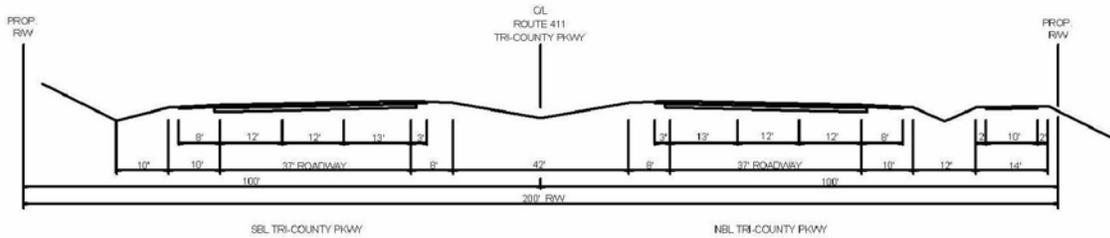
- *Segment 1 (Option 1)* will extend from the intersection of US 50 and 877(Racefield Road) in Loudoun County to the Prince William County Line.
- *Segment 2* will extend from the Prince William County Line to the interchange of I-66 and Route 234 (west of the Manassas National Battlefield).

2.4.3 The West Four CBA

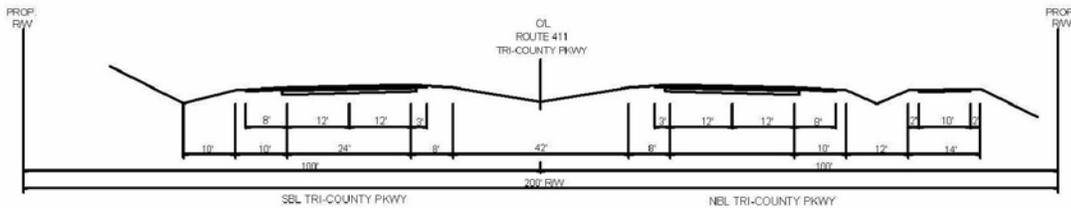
The West Four CBA is also located west of the Manassas National Battlefield. The West Four CBA would provide a new urban principal arterial roadway from the northern terminus at the intersection of US 50 and Route 606 (Old Ox Road) and the southern terminus at the I-66 and Route 234 Interchange. The West Four CBA would consist of Segments F', G, and C (FIGURE 2.4-2). Segment F' between Route 50 and Route 620 (Braddock Road) would be comprised of improvements along an existing four-lane divided facility within an existing right-of-way on an existing alignment. Segment F' south of Route 620 would be comprised of a new four-lane divided facility within a new right-of-way on a new alignment. The West Four CBA would consist of two of the aforementioned general design segments in the following areas:

- *Segment 1 (Option 1)* will extend from the intersection of US 50 and Route 606 (Old Ox Road) in Loudoun County to the Prince William County Line.
- *Segment 2* will extend from the Prince William County Line to the interchange of I-66 and Route 234 (west of the Manassas National Battlefield).

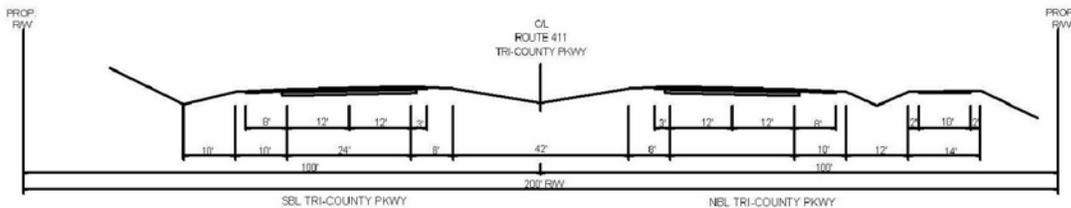
(This area left blank intentionally)



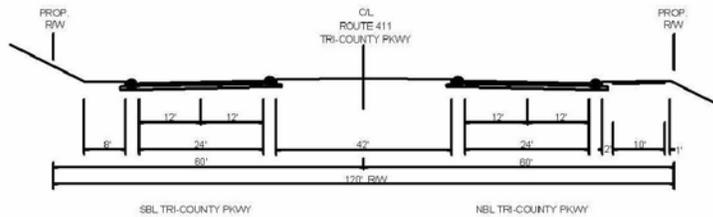
GENERAL DESIGN SEGMENT 3



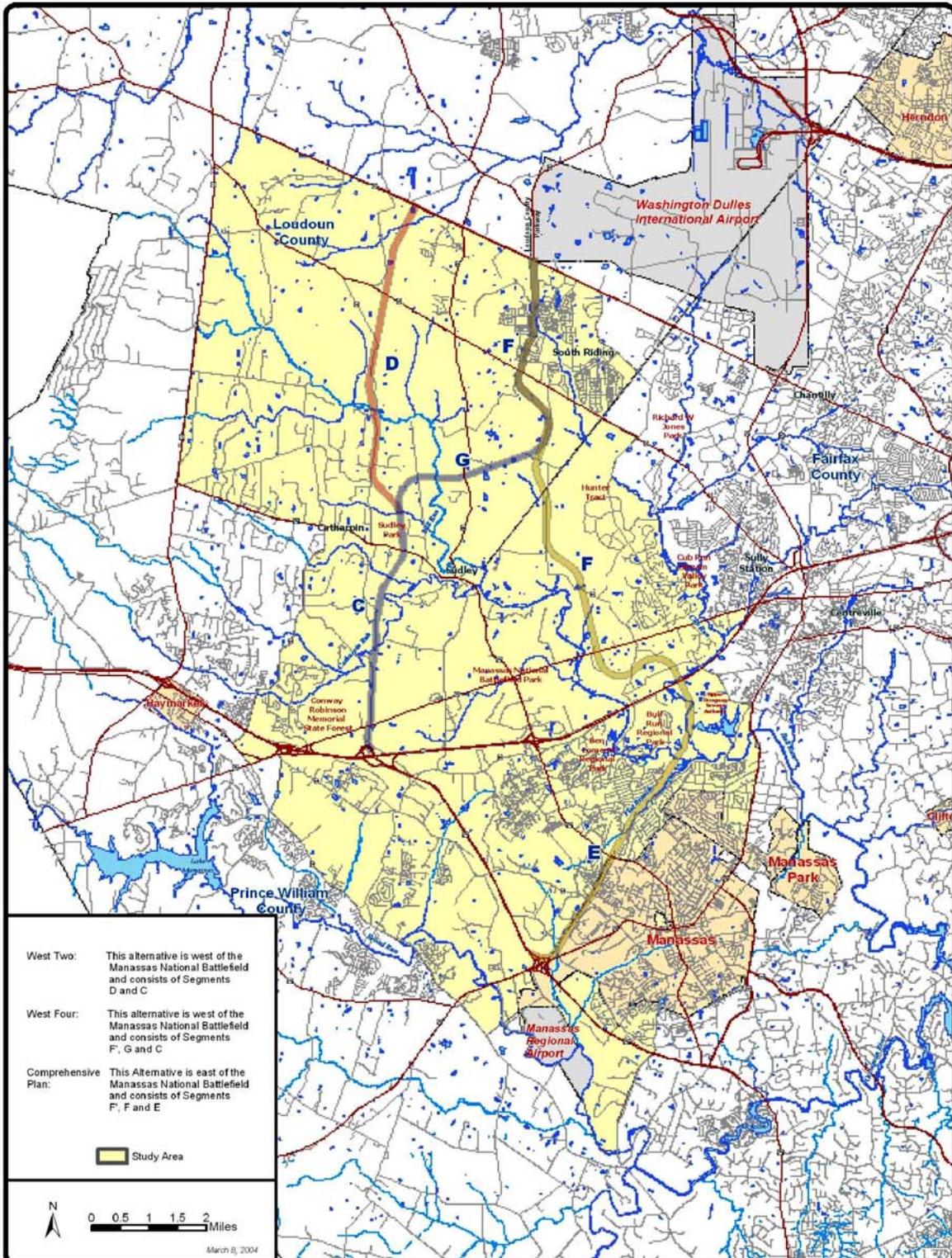
GENERAL DESIGN SEGMENT 2



GENERAL DESIGN SEGMENT 1, OPTION 1



GENERAL DESIGN SEGMENT 1, OPTION 2



**FIGURE 2.4-2
CANDIDATE BUILD ALTERNATIVES**

3.0 AFFECTED 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 CBAs were analyzed and compared for the design year 2030 (see section 4.2).

(This area left blank intentionally)

4.0 ENVIRONMENTAL CONSEQUENCES

In accordance with FHWA's Technical Advisory T 6640.8A, an energy analysis was conducted for each of the CBAs 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.

4.1 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 one 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 U.S. Department of Transportation (USDOT), FHWA, and the Office of Environmental Policy (OEP). Maintenance energy for the CBAs 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 versus 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 CBAs.

Each CBA's total energy requirement equals the sum of the energy required for construction, maintenance, and operation of the proposed facility.

4.2 IMPACTS

Each of the CBAs 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 4.2-1 summarizes construction, maintenance, and operational energy requirements for each of the CBAs. There does not appear to be any appreciable difference between the CBAs that would influence decision making.

**Table 4.2-1
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 Four	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 Two	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

5.0 REFERENCES

- California Department of Transportation, Division of Engineering Services, Office of Transportation Laboratory. 1983. Energy and Transportation Systems. Prepared for the Federal Highway Administration. Sacramento, California.
- U.S. Department of Transportation, Federal Highway Administration. 1987. Guidance for Preparing and Processing Environmental and Section 4(f) Documents. FHWA Technical Advisory T6640.8A. Washington, D.C.
- U.S. Department of Transportation, Federal Highway Administration, Office of Environmental Policy. 1980. Energy Requirements for Transportation Systems. Washington, D.C.