



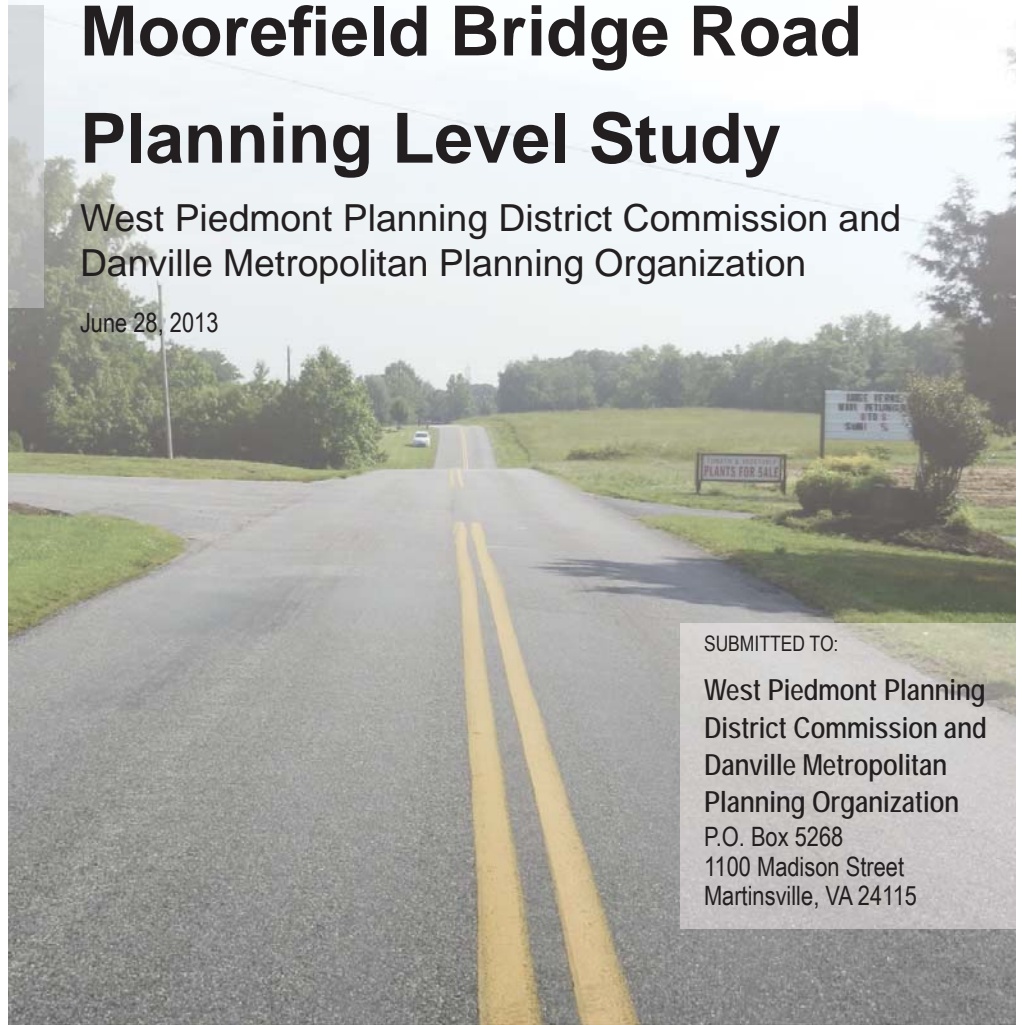
## Increasing Safety and Capacity



# Moorefield Bridge Road Planning Level Study

West Piedmont Planning District Commission and  
Danville Metropolitan Planning Organization

June 28, 2013



SUBMITTED TO:  
West Piedmont Planning  
District Commission and  
Danville Metropolitan  
Planning Organization  
P.O. Box 5268  
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# Planning Level Study – Moorefield Bridge Road

FINAL REPORT

Pittsylvania County and Danville, Virginia

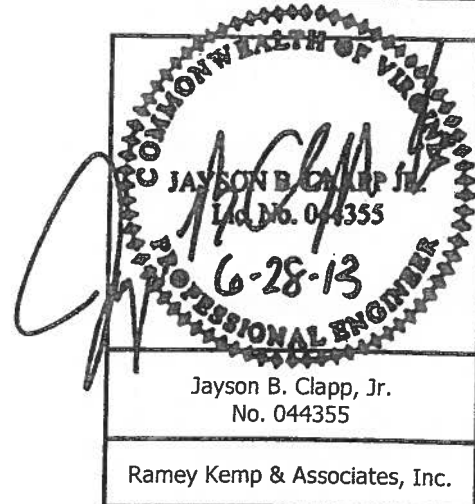
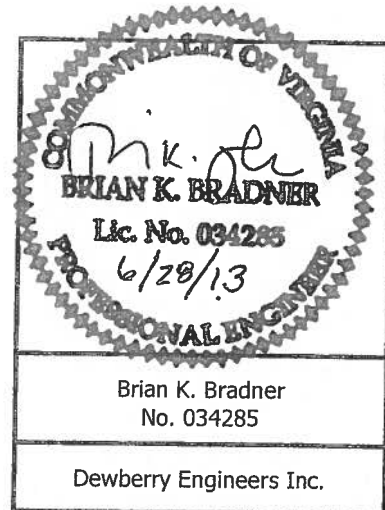
June 28, 2013

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## Executive Summary

Dewberry Engineers Inc. (Dewberry) and Ramey Kemp & Associates Inc. (RKA) have completed the Moorefield Bridge Road (Route 863) improvements study for the West Piedmont Planning District Commission (WPPDC) and the Danville Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation (VDOT), the City of Danville, and Pittsylvania County. The intent of this study is to define the most advantageous locations for spot improvements along Moorefield Bridge Road between the intersections with Mount Cross Road (CO RD 750) and Westover Drive (US 51), as well as to determine the need for signalized traffic control. Below is a summary of the conclusions and recommendations from this study.

1. Based on the analysis within this report, it is expected that due to the expected growth of this area and the existing crash rates, improvements to the existing roadway and associated intersections should be identified.
2. To deal with these deficiencies, three (3) locations for spot improvements have been identified. For each location different improvement alternatives were identified. The locations and associated improvements are listed below:
  - a. Along the curved sections of Moorefield Bridge Road, between River Ridge Road/Pinecrest Drive and Red Bud Lane.
    - i. Installation of Chevron Warning Signs utilizing Warning Signs W1-1 and W1-8 placed in strategic locations.
    - ii. Installation of the Warning Signs, as well as pavement widening to add four (4) foot paved shoulders on either side.
  - b. The intersection of Moorefield Bridge Road and Mount Cross Road.
    - i. Addition of 200 foot left turn lanes on the eastbound and westbound approaches and a 150 foot left turn lane on the northbound approach.
    - ii. Construction of a single lane roundabout with widened approaches of each leg.
    - iii. Addition of 100 foot left turn lanes on the eastbound, westbound and northbound approaches, as well as the installation of a traffic signal.
  - c. The intersection of Moorefield Bridge Road and Westover Drive.
    - i. Addition of 100 foot left turn lane on the southbound approach.
3. The alternatives for each location were evaluated using eight (8) criteria to determine the preferred alternative for the two spot improvements. The recommended spot improvements are listed below for each location.
  - a. Location 1: Installation of the Warning Signs, as well as pavement widening to add four (4) foot paved shoulders on either side.
  - b. Location 2: Addition of 100 foot left turn lanes on the eastbound, westbound and northbound approaches, as well as the installation of a traffic signal.
  - c. Location 3: Addition of 100 foot left turn lane on the southbound approach.
4. Through the implementation of these improvements, this segment of Moorefield Bridge Road will operate under capacity and with increased safety.



## MOOREFIELD BRIDGE ROAD – PLANNING LEVEL STUDY

### I. INTRODUCTION

Dewberry Engineers Inc. (Dewberry) and Ramey Kemp & Associates Inc. (RKA) have completed the Moorefield Bridge Road (Route 863) improvements study for the West Piedmont Planning District Commission (WPPDC) and the Danville Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation (VDOT), the City of Danville, and Pittsylvania County. The intent of this study is to define the most advantageous locations for spot improvements along Moorefield Bridge Road between its intersections with Mount Cross Road (County Road 750) and with Westover Drive (US 51), as well as to determine the need for signalized traffic control.

This section of Moorefield Road is in both Pittsylvania County and the City of Danville. This road crosses into Pittsylvania County approximately 300 feet north of the intersection with Westover Drive. (See Figure 1 for location of roadway section to be analyzed within this report.) This section of roadway was identified for improvement within the *Year 2035 Long Range Transportation Plan* prepared by URS on August 16, 2010. The improvements, listed within the Roadway Vision Plan include constructing a roadway on a new alignment to allow for better access from Route 863 to US 58 and the Danville Bypass. This need was identified in conjunction with the proposed Mega Park located along Berry Hill Road. For the purposes of this study, it is anticipated that Moorefield Bridge Road will remain on its current alignment.

This study will provide the WPPDC, MPO, and local governments with a planning level document that details multiple alternatives for improving the safety and capacity of Moorefield Bridge Road for the Year 2035. In order to determine these alternatives, the following are addressed within this study:

1. Identification of Existing Conditions;
2. Discussion of Possible Environmental Constraints;
3. Review of Existing Traffic Safety;
4. Analysis of the No-Build Alternative;
5. Statement of Purpose and Need; and
6. Improvement Alternatives.

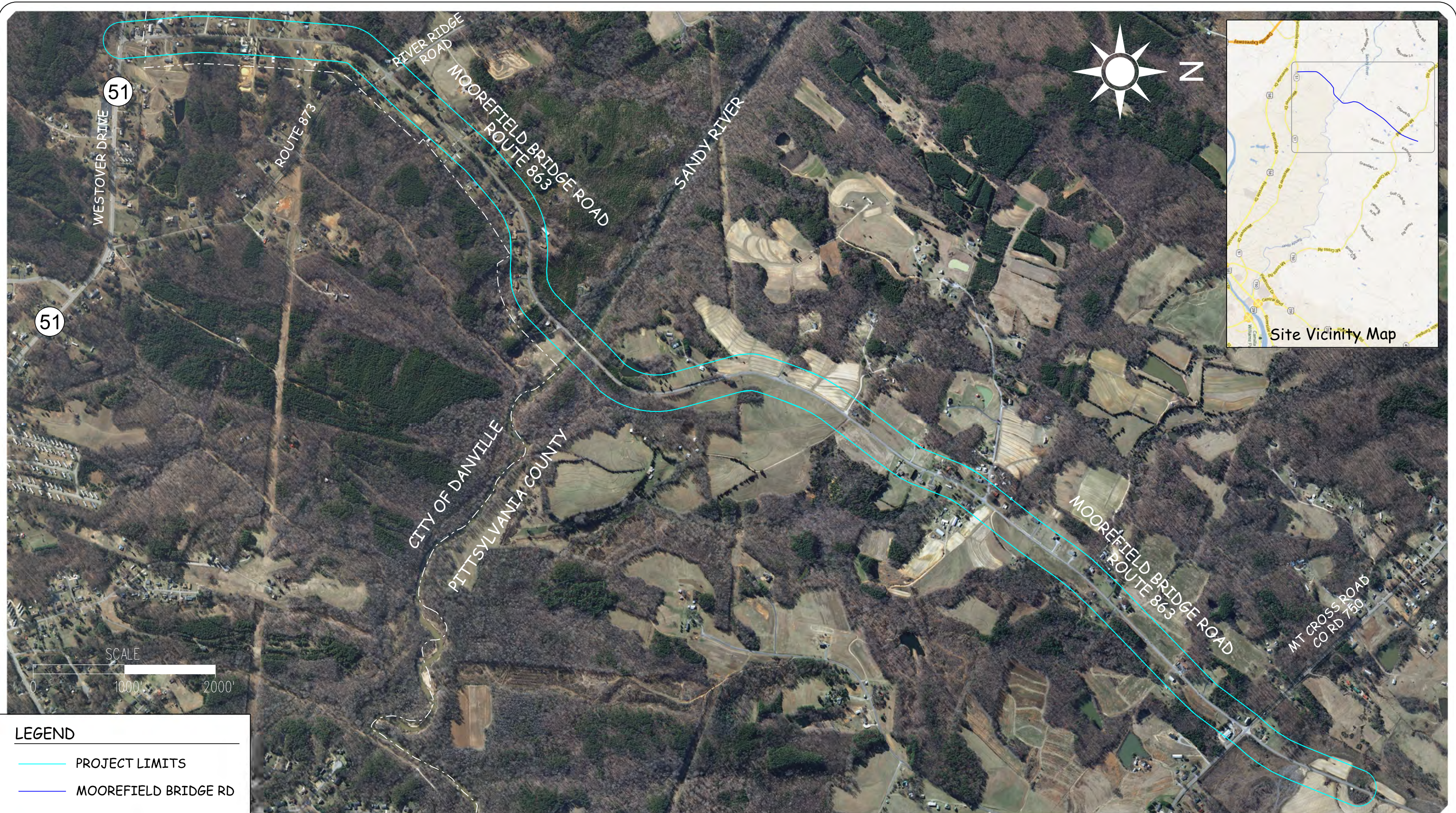
From the improvement alternatives developed within this report, one preferred alternative will be recommended for future design and construction.

### II. EXISTING TRAFFIC CONDITIONS

A description of each existing road within the study area is provided below.

**Moorefield Bridge Road (Route 863)** is classified as an Urban Minor Arterial from Westover Drive to Route 873, and is a Rural Major Collector from Route 873 to Mount Cross Road. The posted speed limit along this road is 45 miles per hour (MPH). The typical road section includes two 10-foot lanes with no shoulders. The horizontal and vertical alignments follow the natural terrain with limited passing zones or no passing zones.







**Westover Drive (US 51)** is classified as an Urban Minor Arterial with a posted speed limit of 40 MPH. The typical road section includes a four-lane undivided roadway (two lanes in each direction) with lane widths of 10 feet. The horizontal alignment is primarily straight, with very subtle horizontal curves. The vertical alignment generally approximates the adjacent rolling terrain.

**Pinecrest Drive/River Ridge Road (Route 873)** is a two-lane rural road with a posted speed limit of 45 MPH. The typical road section includes two lanes with a lane width of 10 feet. The shoulders along this road are limited. The horizontal alignment follows a windy path with multiple horizontal curves.

**Mount Cross Road (Route 750)** is a Rural Major Collector with a posted speed limit of 45 MPH. The typical road section includes 11-foot lanes with limited or no shoulder. This road serves as an east-west route for local traffic to Danville.

**Bicycle and pedestrian facilities** are not present within the project limits. Review of the *West Piedmont Regional Bicycle Plan*, prepared by Kimley-Horn & Associates and revised September 2007, revealed that Moorefield Bridge Road is not seen as a possible bicycle route. This study, however, will consider how to accommodate bicyclists and pedestrians so as to conform to the Commonwealth Transportation Board's (CTB) policy.

#### Existing Roadway Volumes and Levels of Service

To determine the peak hour volumes within the study area, turning movement counts for the AM and PM peak periods were conducted by RKA on February 5<sup>th</sup> and 6<sup>th</sup>, 2013, and are included in Appendix A for reference. A review of the traffic counts indicates the AM and PM peak hours occurred at different times at each intersection. It should be noted that for the purpose of this study, the peak hour volumes at each intersection were assumed to occur simultaneously. The turning movement counts were taken at the following intersections:

1. Moorefield Bridge Road and Westover Drive
2. Moorefield Bridge Road and River Ridge Road/Pinecrest Drive
3. Moorefield Bridge Road/Laniers Mill Road and Mount Cross Road

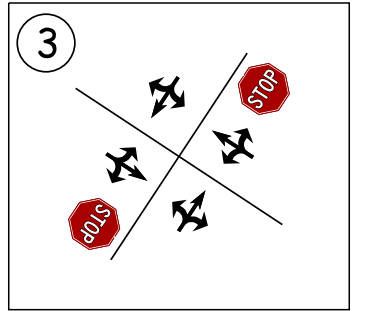
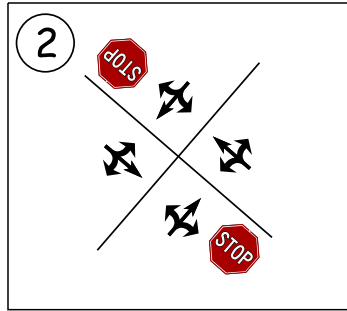
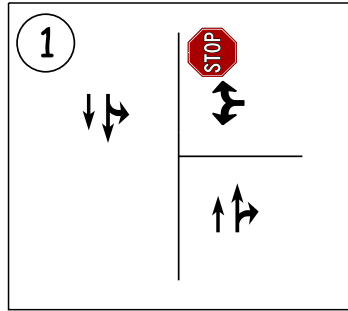
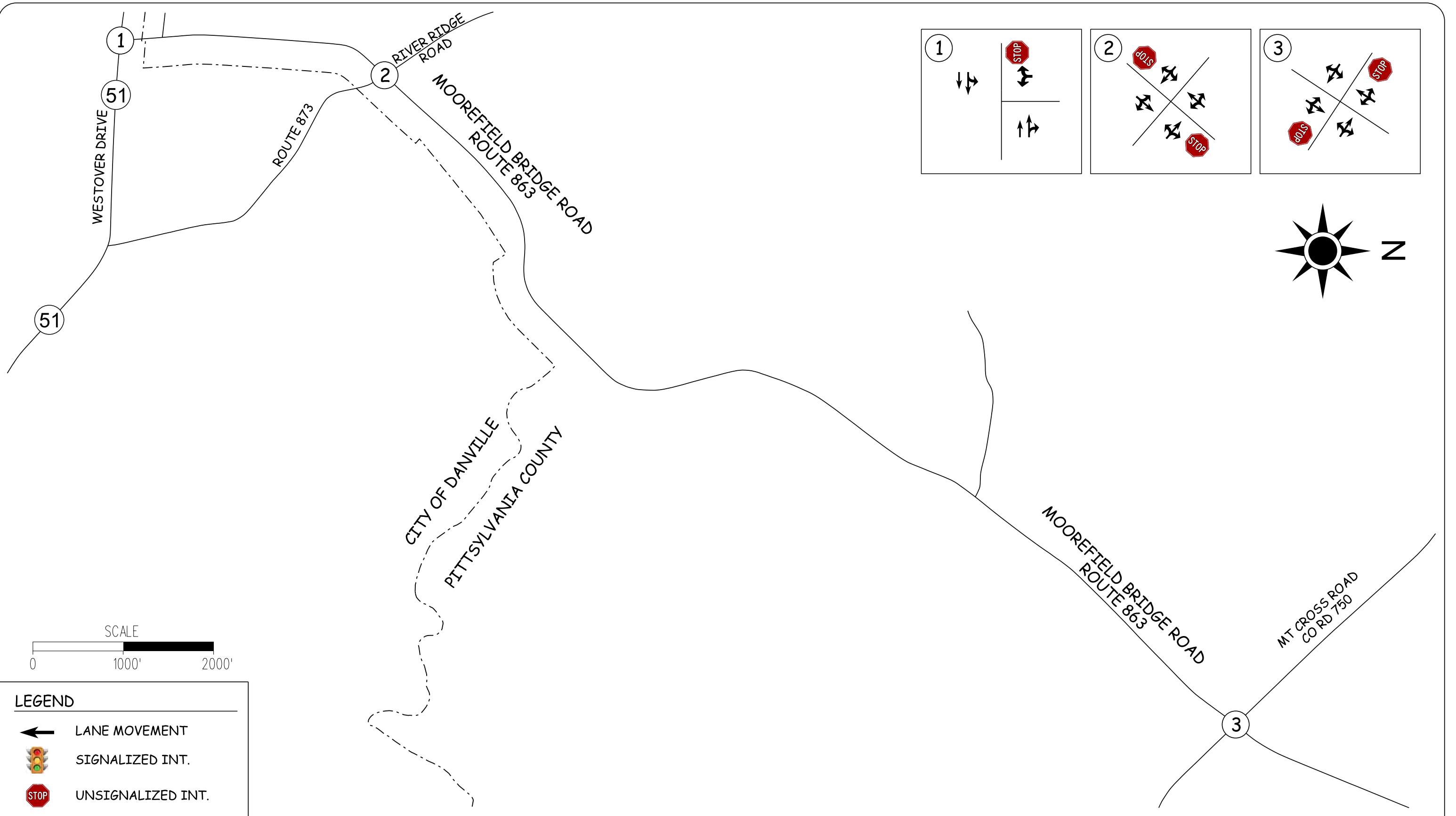
The existing intersection geometry and traffic control devices are presented in Figure 2; and the existing (2013) traffic volumes are presented in Figure 3.

Using the existing traffic volumes shown in Figure 3, the existing levels of service were determined for each intersection.

The levels of service for each intersection are shown in Figure 4. As can be seen, all approaches currently operate at acceptable levels of service and only the northbound (AM and PM peak hour) and southbound (PM peak hour) approaches at the intersection with Mount Cross Road operate at Level of Service (LOS) C.

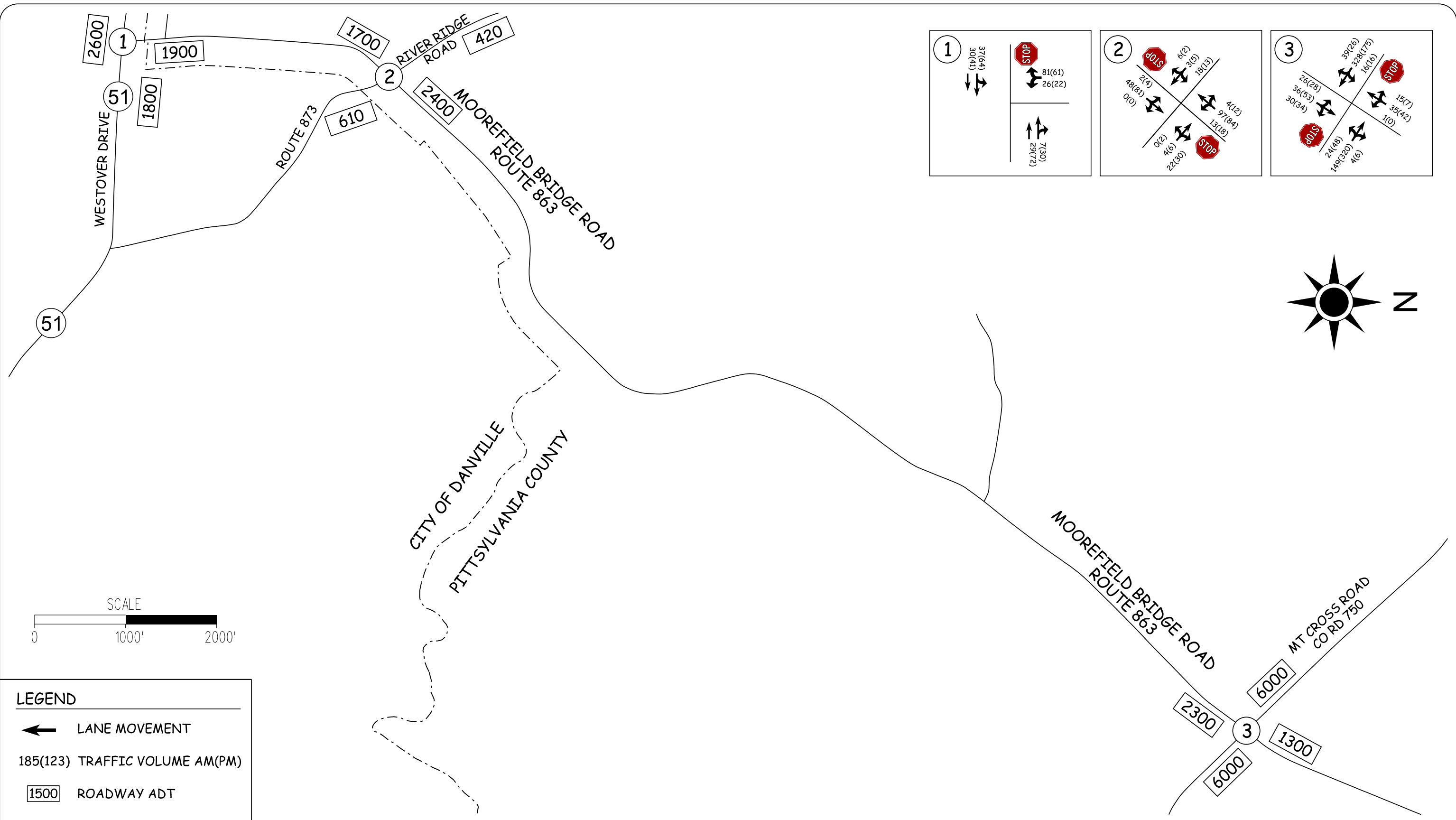
Table 1 also shows the existing LOSs for each intersection.





**LEGEND**

- ← LANE MOVEMENT
- 🚦 SIGNALIZED INT.
- 🛑 UNSIGNALIZED INT.



MOOREFIELD BRIDGE ROAD (RTE. 863) EXISTING TRAFFIC VOLUMES  
 AM & PM PEAK HOUR  
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

FIGURE  
**3**



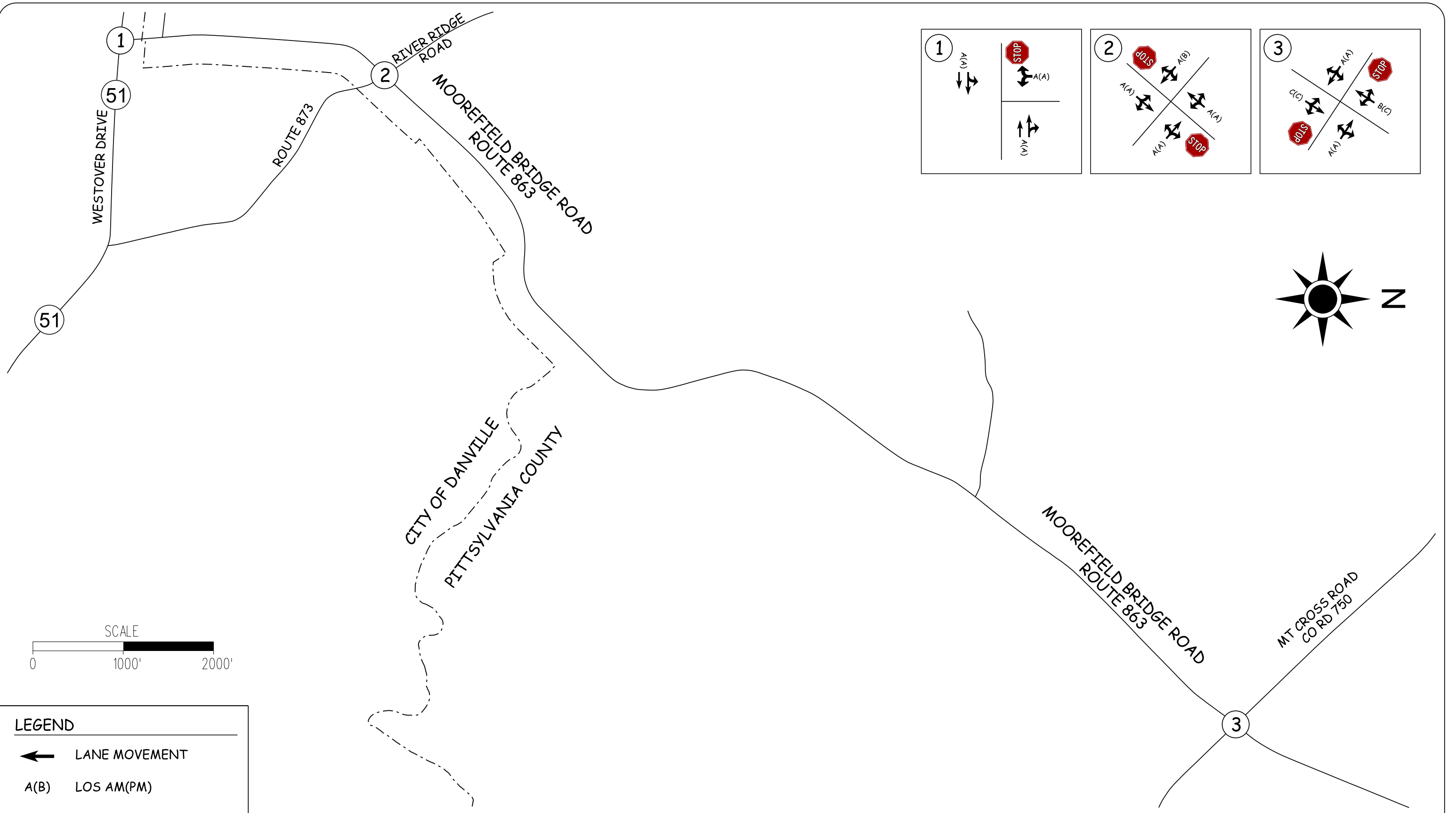


Table 1  
Year 2013 – Existing Intersection Level of Service

INTERSECTION	TYPE OF CONTROL	MOVEMENT APPROACH	AM PEAK HOUR		PM PEAK HOUR	
			LEVEL OF SERVICE*	DELAY (SEC/VEH)	LEVEL OF SERVICE*	DELAY (SEC/VEH)
Moorefield Bridge Road and Westover Drive	Unsignalized	EB	A	4.1	A	4.6
		WB	A	0.0	A	0.0
		SB	A	9.1	A	9.5
Moorefield Bridge Road and River Ridge Road	Unsignalized	EB	A	9.9	B	10.5
		WB	A	8.9	A	9.3
		NB	A	0.3	A	0.3
		SB	A	0.8	A	1.2
Moorefield Bridge Road and Mount Cross Road	Unsignalized	EB	A	0.3	A	0.6
		WB	A	1.1	A	1.0
		NB	C	16.4	C	18.8
		SB	B	14.3	C	16.9

\* Please note that the LOSs are reported in accordance with the Highway Capacity Manual 2010 designations.

The complete LOS analysis for the existing conditions is included in Appendix C for reference.

All analysis was performed utilizing the methodologies as defined in the Highway Capacity Manual (HCM). The measurement used to define the performance of an intersection is determined by LOS A through F. A LOS C or better will be considered an acceptable LOS for this area. See Appendix B for a more detailed explanation of the methodology and criteria used for the LOS analysis.

### Bicycle and Pedestrian

Currently Moorefield Bridge Road (Route 863) does not support bicycle or pedestrian traffic along the section analyzed within this report. This study will consider the accommodation of bicyclists and pedestrians along this section of road to adhere to CTB policy. Review of the *West Piedmont Regional Bicycle Plan*, revised September 2007, revealed that Moorefield Bridge Road is not a planned bike route.

### Environmental Resources

This section describes the potential environmental resources within the proposed project area. Table 2 summarizes potential environmental issues and recommendations on addressing potential impacts to those resources. Additional environmental resources that are not included in the table may exist within the proposed project area.



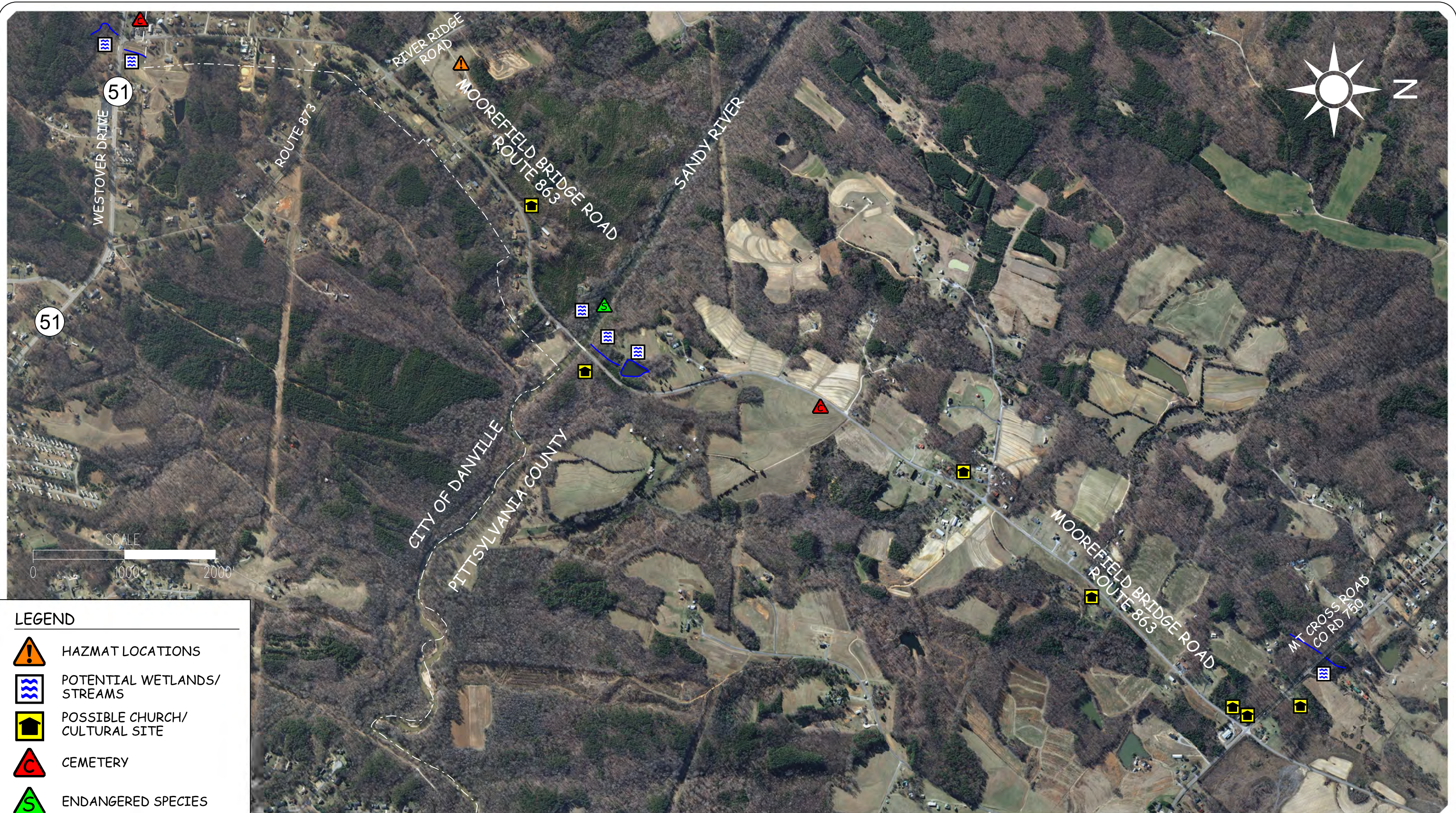
Table 2  
Environmental Issues

Resources/Issue	Comments
Cultural Resources	A review of U.S. Geological Survey (USGS) topographic maps and aerials identified three cemeteries within the study area. The first is located between Page Road and Westover Drive approximately 150 feet west of Moorefield Bridge Road, the second is located approximately 300 feet south of Red Bud Lane abutting the northbound lane of Moorefield Bridge Road, and the third is located abutting the eastbound lane of Mount Cross Road approximately 1,900 feet east of Moorefield Bridge Road. Further review of these resources should be conducted. We reviewed the Virginia Department of Historic Resources Data Sharing Service (DSS) database online and it noted no known or mapped resources within the project corridor. The absence of mapped resources does not mean resources are not present in the project corridor; the absence could be due to a lack of survey information. A Phase I survey should be conducted once the proposed improvements are identified.
Waters of the United States, including wetlands	We reviewed the National Wetland Inventory Geographic Information System (GIS) online mapper. It noted 7-10 adjacent Palustrine Open Water ponds located within the project corridor; note the absence of other wetland types mapped does not mean those resources are not present in the corridor. A Waters of the United States/Wetland delineation should be conducted once an alternative is identified. Review of U.S. Geological Survey (USGS) topographic maps and aerials indicated 3 or 4 locations, including the Sandy River, that likely contain unmapped jurisdictional waters/wetlands.
Water Quality Permits	This roadway appears to follow a topographic ridge and only minor drainage crossing and headwater wetland areas exist. Permitting scenarios will vary depending on verification of wetland and stream locations and the location of construction activities. In comparison to similar projects, impacts generally will fit general permits from both Virginia Department of Environmental Quality (DEQ) and the U.S. Army Corps of Engineers.
Agricultural and Forest Districts, Prime Farmland and Soil	Most of the project corridor is classified as prime farmland or farmland of statewide importance by the Natural Resources Conservation Services (NRCS). Coordination with NRCS may be necessary when an alternative is identified.

Table 2 (Cont.)  
Environmental Issues

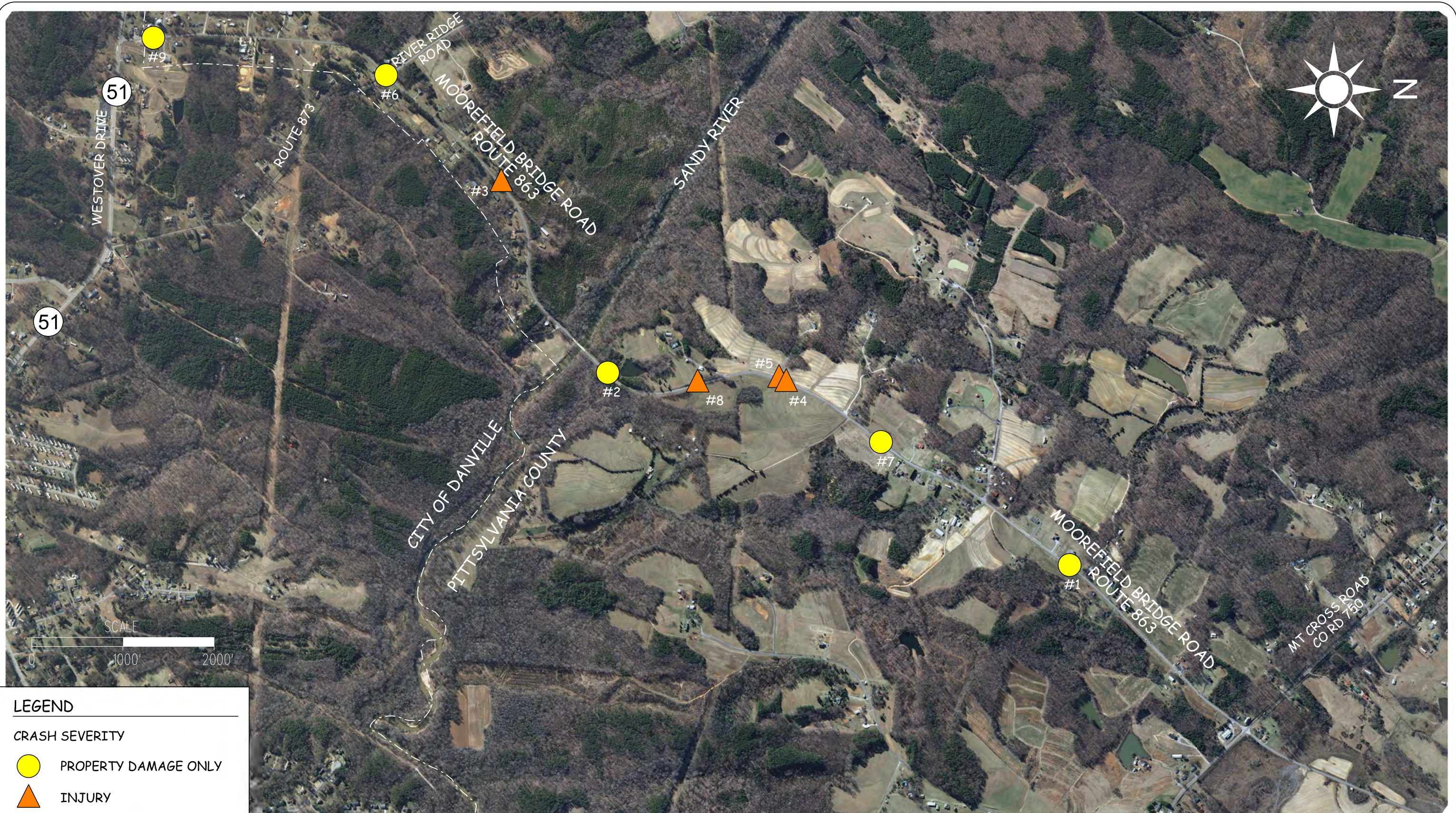
Threatened and Endangered Species/Wildlife and Waterfowl Refuges	The U.S. Fish and Wildlife Service data base (IPaC) documents the potential of the Federal Endangered/State Endangered (FESE) Roanoke Logperch to be located within the project corridor. Furthermore, there is a potential for critical habitat within the project corridor, and certain actions within the project corridor may also affect downstream species. A search of Virginia's Department of Conservation and Recreation (DCR), and the Virginia Department of Game and Inland Fisheries databases did not note any mapped observations of SE or State Threatened (ST) species within the project corridor. The absence of mapped species observation does not mean SE or ST species are not present. The absence may be related to the lack of a survey. No wildlife or waterfowl refuges are located within the project corridor. A search of DCR's Biotics Data System was submitted and resulted in no documented State-listed plants or insects in the project area.
Hazardous Materials	A review of the Environmental Protection Agency "Enviro-mapper" and the DEQ website "What's in my Backyard" indicates that there are known hazardous material sites (see Figure 5) within the project limits. Acquisitions of land that contain hazardous material will require, at minimum, a Phase I Environmental Site Assessment (ESA) report. Multiple Phase I ESA reports should be anticipated due to the past and current use of existing properties and observation that many areas are used as trash dump sites. Additionally, acquisition of residential or commercial buildings with lead based paint and/or asbestos-containing building materials and/or Recognized Environmental Condition would be considered an issue for the project, and further investigation would be required.
FEMA	This project crosses one tributary with a Federal Emergency Management Agency (FEMA) mapped floodplain, the Sandy River. The existing road bridges the Sandy River, and improvements within the floodplain may require a floodplain study and coordination with FEMA if there are impacts to the regulated floodplain or a rise in the 100-year water surface elevation.
Well and Septic	Well and septic locations within the project corridor are not known at this time. A request to the Virginia Department of Health for records of locations should be submitted once an alternative is identified. There is a potential for a complete parcel take if a septic system has to be removed and an alternative field and/or public utilities hook up cannot be provided.





- LEGEND**
- HAZMAT LOCATIONS
  - POTENTIAL WETLANDS/ STREAMS
  - POSSIBLE CHURCH/ CULTURAL SITE
  - CEMETERY
  - ENDANGERED SPECIES





**LEGEND**

CRASH SEVERITY

- PROPERTY DAMAGE ONLY
- ▲ INJURY



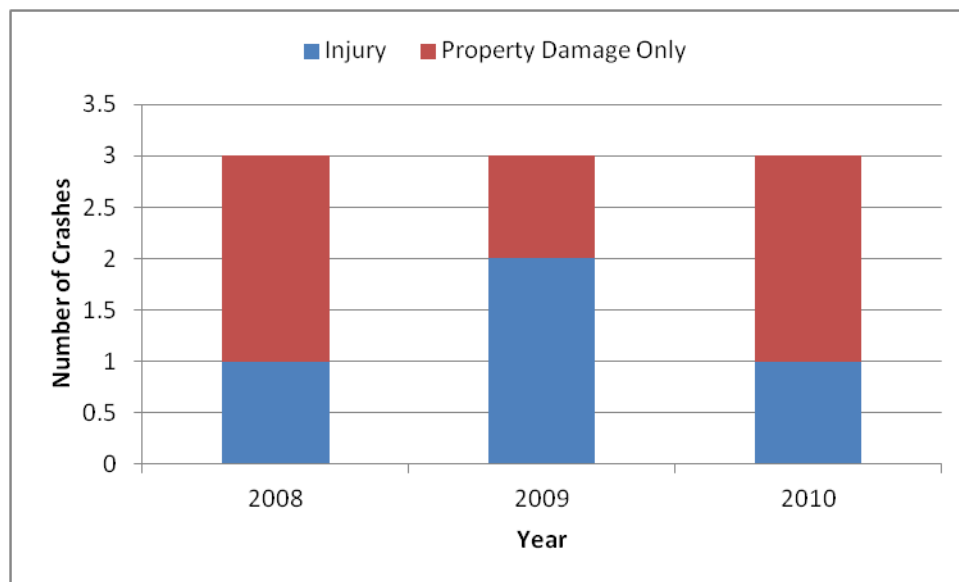
### Traffic Safety/Crash Data Analysis

Crash data from the most recent 3-year period (2008 to 2010) for the corridor were provided by VDOT. After review of the data, the results identified one location along the 2.99-mile segment of Moorefield Bridge Road where multiple crashes occurred. The segment is identified below:

1. Along Moorefield Bridge Road, just north of the Bridge over the Dan River and South of Red Bud Lane.

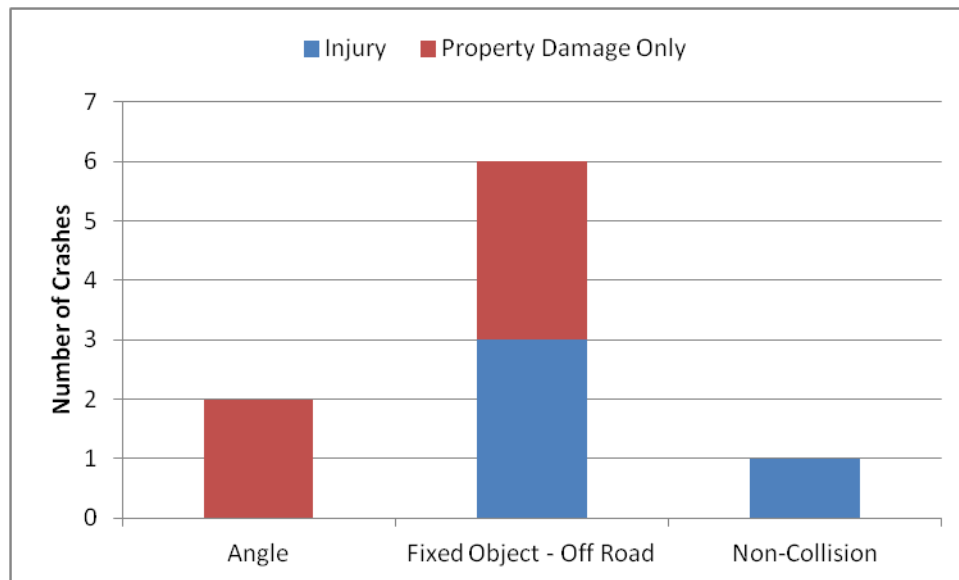
During this period, nine reported crashes occurred along the study corridor. Of the nine total reported crashes, five resulted in property damage only (PDO) and four involved at least one injury. No fatalities were reported. The locations of each individual accident along this section of roadway are shown in Figure 6. This figure also indicates whether the crash was a PDO or resulted in an injury. Figure 7 graphically summarizes the Moorefield Bridge Road crash history by year. Appendix E contains the crash data summary sheet.

Figure 7  
Severity of Crashes per Year



As displayed in Figure 7 above, an equal number of crashes occurred each year. The types of crashes, injury or PDO, were approximately equal as well. In addition to the crash severity and total number, the types and locations of accidents were also analyzed. Figure 8 graphically shows the type and severity of the nine crashes that occurred between 2008 and 2010.

Figure 8  
Type and Severity of Crashes



As displayed in Figure 8 above, most of the crashes were fixed-object, off-road crashes, including both injury and PDO cases. Probable causes for the high number of fixed object off road crashes could be factors such as inadequate signage, pavement markings, and/or roadway design. Potential solutions to consider are the installation of necessary signs, the removal of obstacles or the installation of guardrail, and the examination of existing roadway design factors such as superelevation.

As part of the safety analysis, the Moorefield Bridge Road corridor was analyzed at three intersections. The calculated crash rate for Moorefield Bridge Road between Westover Drive and Route 750 is 171.8 per 100 million (M) vehicle miles traveled. The entire corridor has a slightly lower crash rate compared to the 2008 Statewide Average crash rate of 185 per 100M vehicle miles traveled.

Intersections were examined based on factors such as traffic control method, lane geometry, and the number of approaches. According to the crash summary data sheet, only one of the accidents occurred at the three intersections analyzed within this report.

### III. FUTURE NO-BUILD ALTERNATIVE (YEAR 2035)

Utilizing information obtained from the regional traffic model received from VDOT for this area, RKA projected future no-build traffic volumes. Annual growth rates were approximated for the associated movements based on 2006 and 2035 average daily traffic data at the following intersections.

#### Intersection of Moorefield Bridge Road and Westover Drive

Eastbound and westbound through movements on Westover Drive: 1.0%

All remaining movements on Westover Drive and Moorefield Bridge Road: 4.9%

#### Intersection of Moorefield Bridge Road and River Ridge Road/Pinecrest Drive

Northbound and southbound through movements on Moorefield Bridge Road: 3.7%



All remaining movements on Moorefield Bridge Road, River Ridge Road, and Pinecrest Drive: 1.0%

Intersection of Moorefield Bridge Road/Laniers Mill Road and Mount Cross Road

Eastbound and westbound through movements on Mount Cross Road: 1.7%

Eastbound right-turn movement and westbound left-turn movement on Mount Cross Road, as well as

Northbound left and right-turn movements on Moorefield Bridge Road: 3.7%

All remaining movements on Mount Cross Road, Moorefield Bridge Road, and Lanier Mills Road: 4.1%

From the approximated annual growth rates, the future no-build traffic volumes were determined as shown in Figure 9. Utilizing these traffic volumes, the future no-build intersection LOS analysis was completed. As shown in Figure 10, the LOSs for some approaches will deteriorate to unacceptable levels (LOS D and below) at only one intersection. The LOSs for the no-build alternative are also shown in Table 3 below.

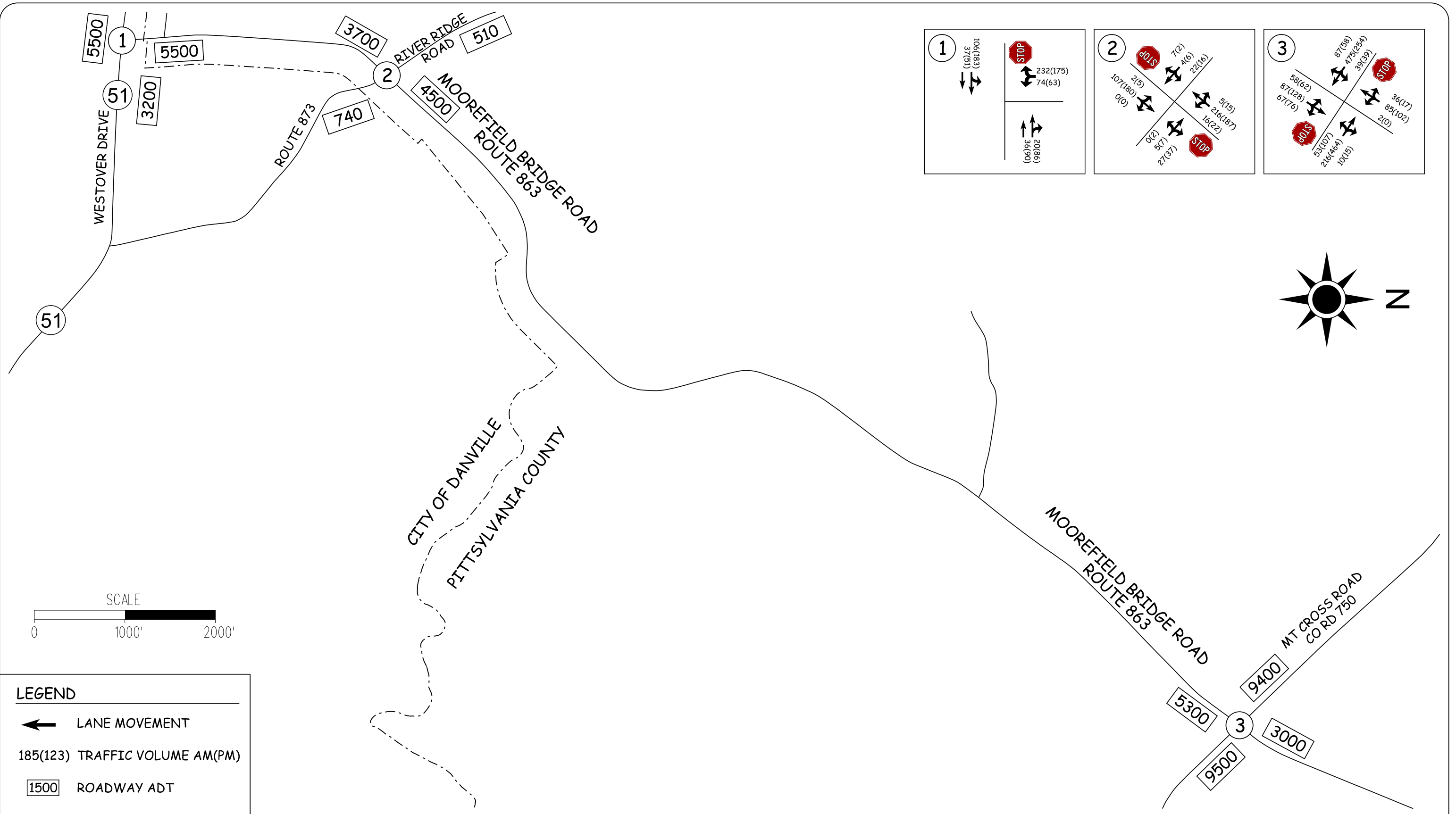
Table 3  
Year 2035 – Future No-Build Intersection Level of Service

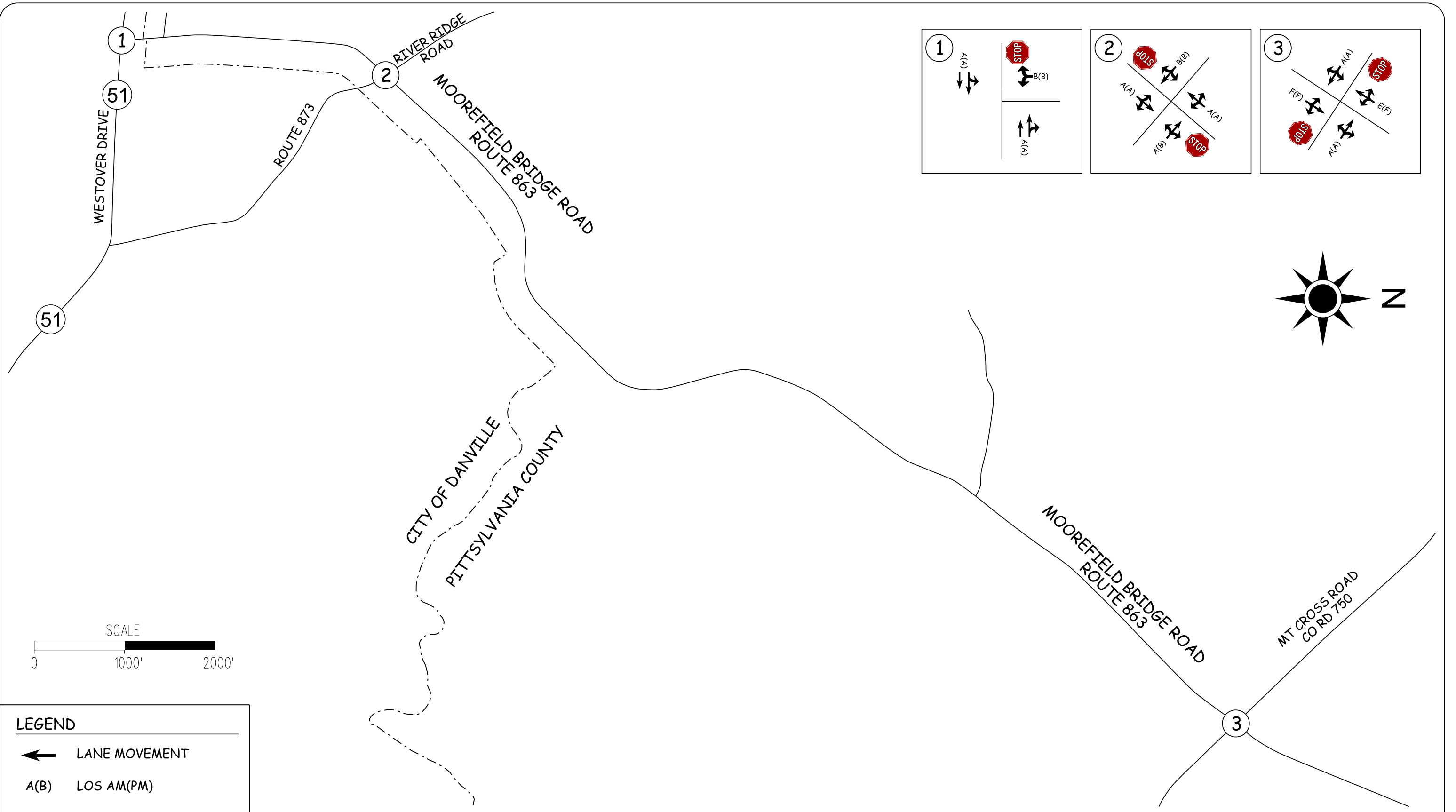
INTERSECTION	TYPE OF CONTROL	MOVEMENT APPROACH	AM PEAK HOUR		PM PEAK HOUR	
			LEVEL OF SERVICE*	DELAY (SEC/VEH)	LEVEL OF SERVICE*	DELAY (SEC/VEH)
Moorefield Bridge Road and Westover Drive	Unsignalized	EB	A	5.6	A	6.3
		WB	A	0.0	A	0.0
		SB	B	11.5	B	13.7
Moorefield Bridge Road and River Ridge Road	Unsignalized	EB	B	11.8	B	13.1
		WB	A	9.5	B	10.3
		NB	A	0.1	A	0.2
		SB	A	0.5	A	0.8
Moorefield Bridge Road and Mount Cross Road	Unsignalized	EB	A	0.5	A	1.0
		WB	A	1.7	A	1.5
		NB	F	186.0	F	668.2
		SB	E	36.5	F	73.6

\* Please note that the LOSs are reported in accordance with the HCM designations.

The complete LOS analysis for the future no-build condition is included in Appendix E.

The most severe deterioration is expected to occur at the intersection of Mount Cross Road on the northbound and southbound approaches. As shown in the table above, the highlighted LOSs are those that have been reduced to unacceptable levels. At this intersection, the poor service levels result from the increase in forecasted traffic volumes along Mount Cross Road, reducing the frequency of adequate gaps in the traffic stream and causing increased delays on the Moorefield Bridge Road approaches before motorists safely enter the traffic stream. As shown by this analysis, improvements to this intersection are required if acceptable LOSs are to be achieved in the year 2035.

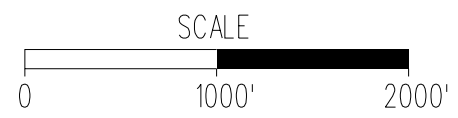




**LEGEND**

← LANE MOVEMENT

A(B) LOS AM(PM)





#### IV. STATEMENT OF PURPOSE AND NEED

Considering VDOT Access Management Standards and the results of the existing and forecasted (Year 2035) conditions analysis, the Statement of Purpose and Need for the Moorefield Bridge Road Evaluation of Improvements Study is based upon addressing the following issues:

1. LOSs at intersections, within the study limits, are anticipated to fall below acceptable levels unless improvements are made based on signal warrants and intersection analysis;
2. Safety and mobility shall be preserved or increased through implementation of identified spot improvements; and
3. Accommodations for bicyclists and pedestrians should be considered along Moorefield Bridge Road to adhere to CTB Policy.

The improvement alternatives will be developed to best satisfy the requirements of the above guidelines.

#### V. IMPROVEMENT ALTERNATIVES

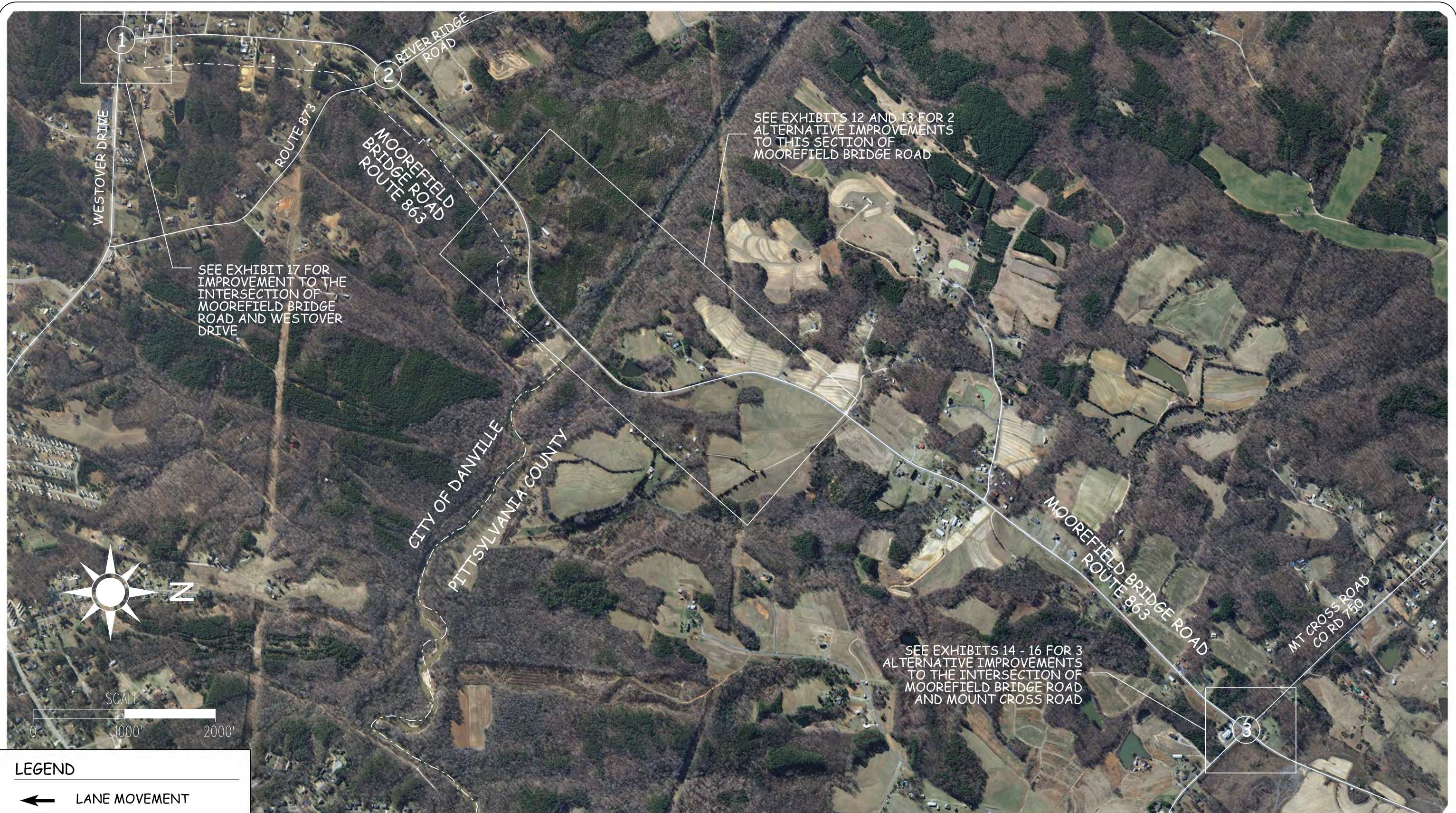
Multiple improvement alternatives to this section of Moorefield Bridge Road will be analyzed within this study. In order to determine which alternative best meets the needs of this section of roadway, evaluation criteria were developed. Eight factors were rated by importance on a scale of 1 to 5, with 5 being the most important. These items are shown in Table 4 below.

Table 4  
Evaluation Criteria

Criteria #	Criteria Description	Criteria Weight (5-1)
1	Traffic LOSs - Capacity	5
2	System Performance	5
3	Safety	5
4	Cost	5
5	Right-of-Way Impacts	4
6	Environmental Impacts	4
7	Preliminary Utility Impacts	3
8	Consistency with Local / Land Use Plans	2

Based on the findings of the future no-build capacity analysis, the Mount Cross Road intersection does not meet adequate capacity requirements. All other intersections analyzed within this study will still operate at acceptable levels in the Year 2035 with no improvements. In addition to the capacity analysis, a review of the crash data was completed and a need for improvements was identified. It is also understood that there are public concerns regarding the current operation at the intersection of Westover Drive and Moorefield Bridge Road. Three locations for alternative spot improvements have been identified along this corridor and are shown in Figure 11.







The alternative improvements shown in Figure 11 are divided into three locations. The first area is along the curved sections of Moorefield Bridge Road, between River Ridge Road/Pinecrest Drive and Red Bud Lane. The remaining two locations are at the intersections of Moorefield Bridge Road with Mount Cross Road and Moorefield Bridge Road with Westover Drive. Through the implementation of these improvements, the safety and capacity along this stretch of road should be improved. Because the remaining intersection analyzed within this report will operate at acceptable LOSs in the Year 2035, and the majority of crashes occur within the section identified above, no other improvements are suggested along this corridor.

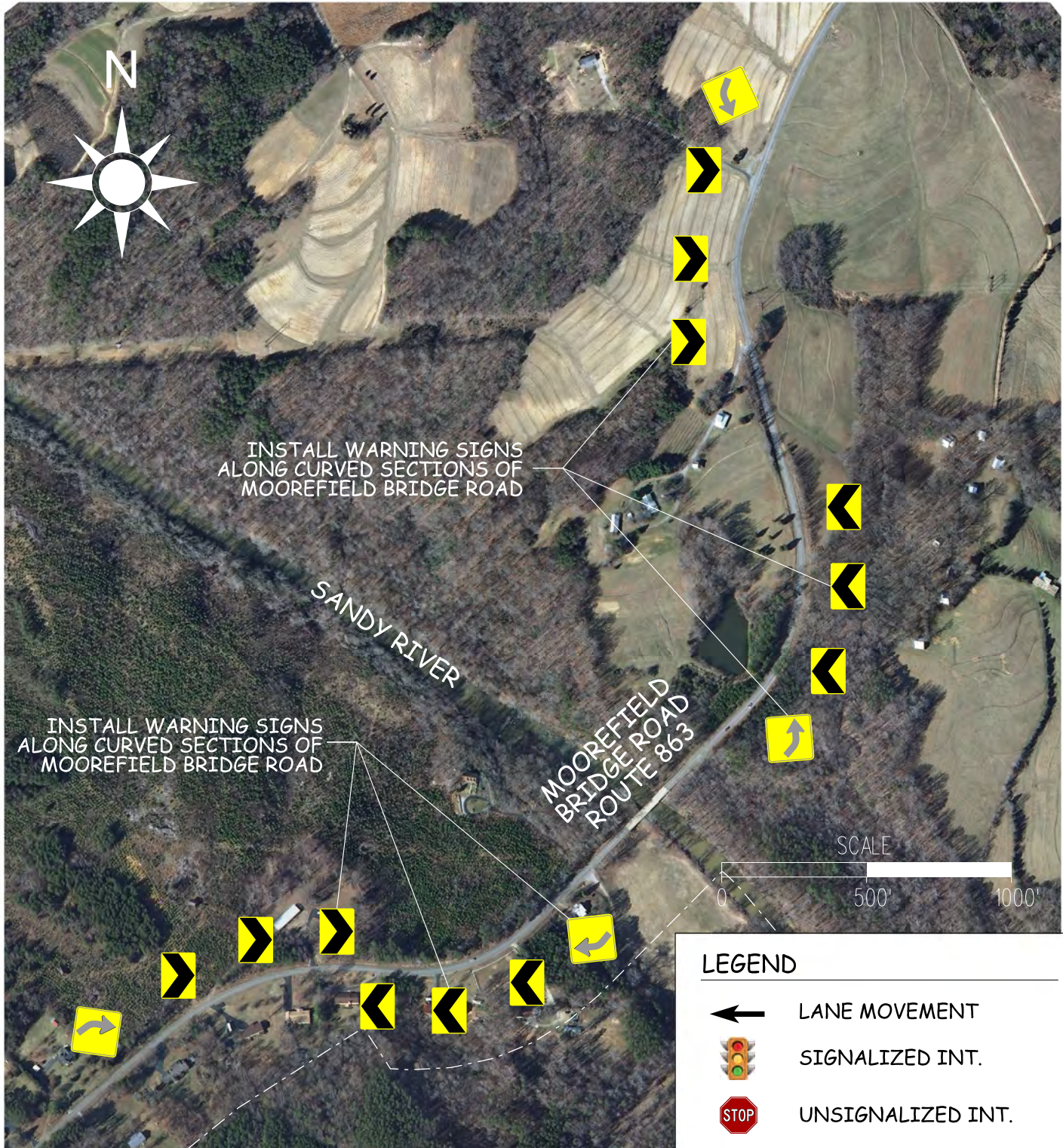
#### Roadway Spot Improvement Alternatives

As identified in Figure 11, two alternatives for roadway improvements along Moorefield Bridge Road between River Ridge Road/Pinecrest Drive and Red Bud Lane were developed. Alternative 1 consists of installing Chevron Warning Signs, specifically Warning Signs W1-2 and W1-8 from the 2009 Edition of the Manual of Uniform Traffic Control Devices (MUTCD), in strategic locations to inform drivers traveling in either direction of the upcoming horizontal curves. This alternative improvement is shown in Figure 12. With the installation of these signs, the potential for crashes is anticipated to decrease. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$22,300 to design and construct. A more detailed breakdown of the cost is included in Appendix F.

Alternative 2 consists of installing Chevron Warning Signs, as suggested in Alternative 1, as well as pavement widening to add 4-foot paved shoulders on both sides. The pavement widening will be limited to the section of road between River Ridge Road/Pinecrest Drive and Red Bud Lane. These improvements are shown in Figure 13. With the exception of one area, the paved shoulders will be widened from the existing edge of pavement. The one exception is a section of road located adjacent to a cemetery, where the alignment of Moorefield Bridge Road will have to be shifted to the northwest to avoid affecting the cemetery. In conjunction with the realignment and relocation, the vertical alignment in this area should be lowered to improve sight distance. Also, power utility poles are located along this stretch of road and will either need to be avoided or relocated. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$1,550,800 to design and construct. A more detailed breakdown of the cost is included in Appendix F.

In review of the two alternatives described above, both will increase safety, but only one will help increase capacity. Using the Evaluation Criteria identified in Table 4, the two alternatives were compared to determine the preferred alternative. Section VI of this report will show the details of this comparison and indicate the preferred alternative.

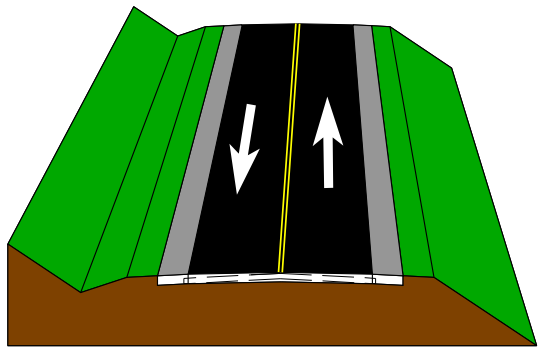




MOOREFIELD BRIDGE ROAD (RTE. 863)  
ROADWAY ALTERNATIVE 1 IMPROVEMENTS  
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



PROPOSED TYPICAL SECTION  
MOOREFIELD BRIDGE ROAD



4+4 EXISTING WIDTH 4+4

ROAD ALIGNMENT TO BE SHIFTED AWAY FROM THE CEMETERY TO ALLOW FOR WIDENING



INSTALL WARNING SIGNS ALONG CURVED SECTIONS OF MOOREFIELD BRIDGE ROAD

INSTALL WARNING SIGNS ALONG CURVED SECTIONS OF MOOREFIELD BRIDGE ROAD

SANDY RIVER




MOOREFIELD BRIDGE ROAD ROUTE 863

WIDEN MOOREFIELD BRIDGE ROAD ALONG CURVED PORTIONS PER TYPICAL SECTION SHOWN ABOVE

SCALE



LEGEND

-  LANE MOVEMENT
-  SIGNALIZED INT.
-  UNSIGNALIZED INT.

MOOREFIELD BRIDGE ROAD (RTE. 863)  
ROADWAY ALTERNATIVE 2 IMPROVEMENTS  
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



**Dewberry**



**RAMEY KEMP & ASSOCIATES**  
TRANSPORTATION ENGINEERS

FIGURE

13

Intersection of Moorefield Bridge and Mount Cross Road Improvement Alternatives

Three alternatives for improvements at the intersection of Moorefield Bridge Road and Mount Cross Road were developed. Alternative 1 consists of the addition of 200-foot left turn lanes on the eastbound and westbound approaches and a 150-foot left-turn lane on the northbound approach. As a result of adding these turn lanes, Mount Cross Road and Moorefield Bridge Road will be widened to the north and east, respectively. These improvements are shown in Figure 14. Because both roads will be widened, the existing power utility poles may have to be relocated, thereby adding to the cost of the improvements. The addition of these turn lanes will reduce delays and improve operation on the stop-controlled approaches, but the northbound approach of Moorefield Bridge Road is expected to operate at LOS E and F during the AM and PM peak hours. The southbound approach of Laniers Mill Road is expected to operate at LOSs D and F. The intersection LOSs are shown in Table 5 below.

Table 5  
Year 2035 – Alternative 1 Intersection Level of Service

<u>INTERSECTION</u>	<u>TYPE OF CONTROL</u>	<u>MOVEMENT APPROACH</u>	<u>AM PEAK HOUR</u>		<u>PM PEAK HOUR</u>	
			<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>	<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>
Moorefield Bridge Road and Mount Cross Road	Unsignalized	EB	A	0.5	A	1.0
		WB	A	1.7	A	1.5
		NB	F	59.2	F	223.3
		SB	D	34.8	F	65.3

\* Please note that the levels of service are reported in accordance with the HCM designations.

The LOSs for the minor road approaches will still be considered unacceptable for this location. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$1,470,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

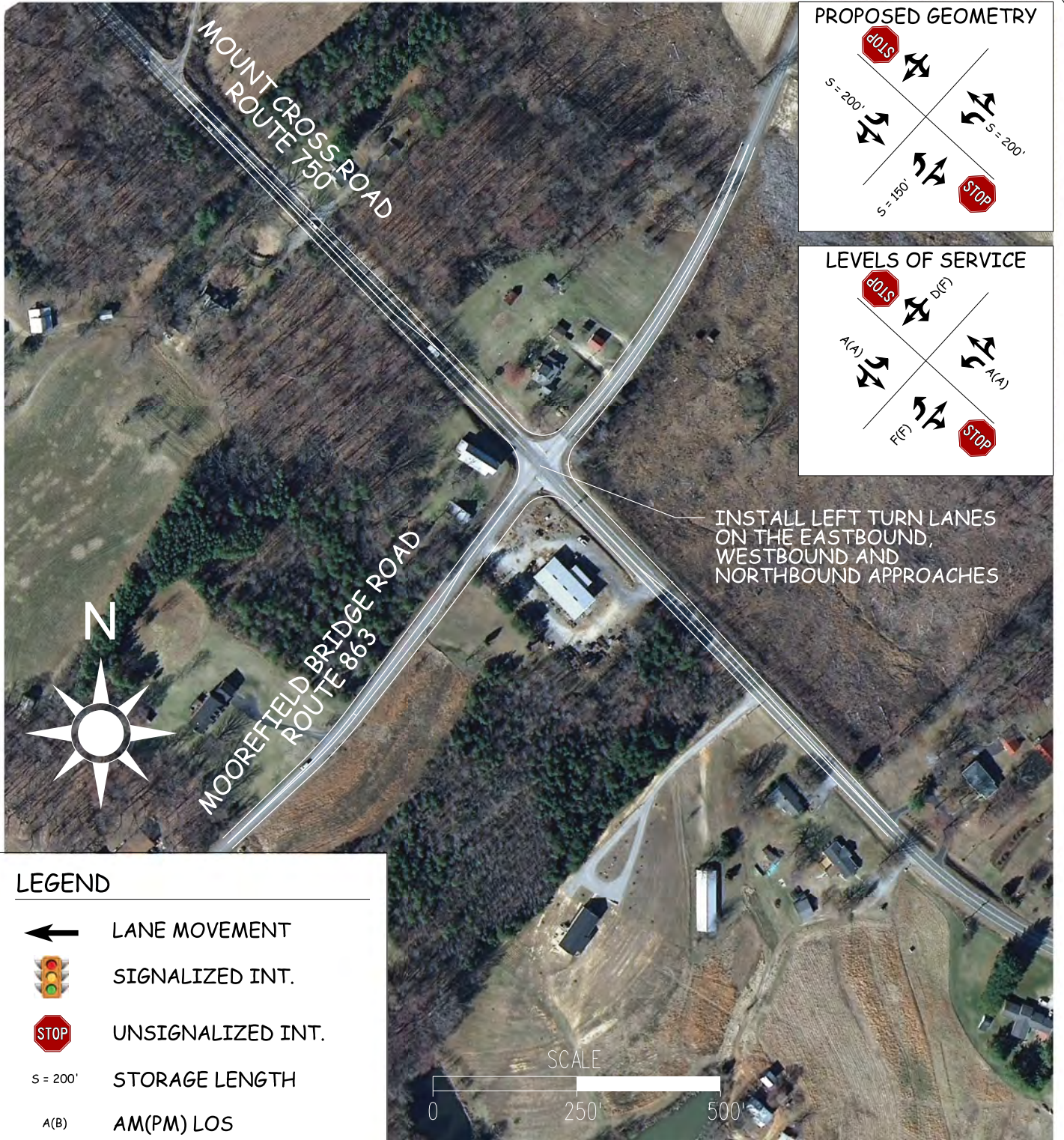
Alternative 2 consists of constructing a single-lane roundabout with widened approaches of each leg. See Figure 15 for an illustration of these improvements and associated LOSs. These improvements will raise the LOSs to the acceptable range, but will create many conflicts with the existing topography, existing properties, and existing utilities. In particular, the property located in the southwest quadrant of this intersection will be significantly affected. Specifically, the existing building located on this property will have to be removed, potentially requiring additional environmental research and analysis. The intersection LOSs resulting from these improvements are shown in Table 6 below.

Table 6  
Year 2035 – Alternative 2 Intersection Level of Service

<u>INTERSECTION</u>	<u>TYPE OF CONTROL</u>	<u>MOVEMENT APPROACH</u>	<u>AM PEAK HOUR</u>		<u>PM PEAK HOUR</u>	
			<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>	<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>
Moorefield Bridge Road and Mount Cross Road	Roundabout	EB	C	15.0	A	9.3
		WB	A	7.6	C	19.8
		NB	B	10.8	A	8.7
		SB	A	6.4	A	9.8

\* Please note that the LOSs are reported in accordance with the HCM designations.



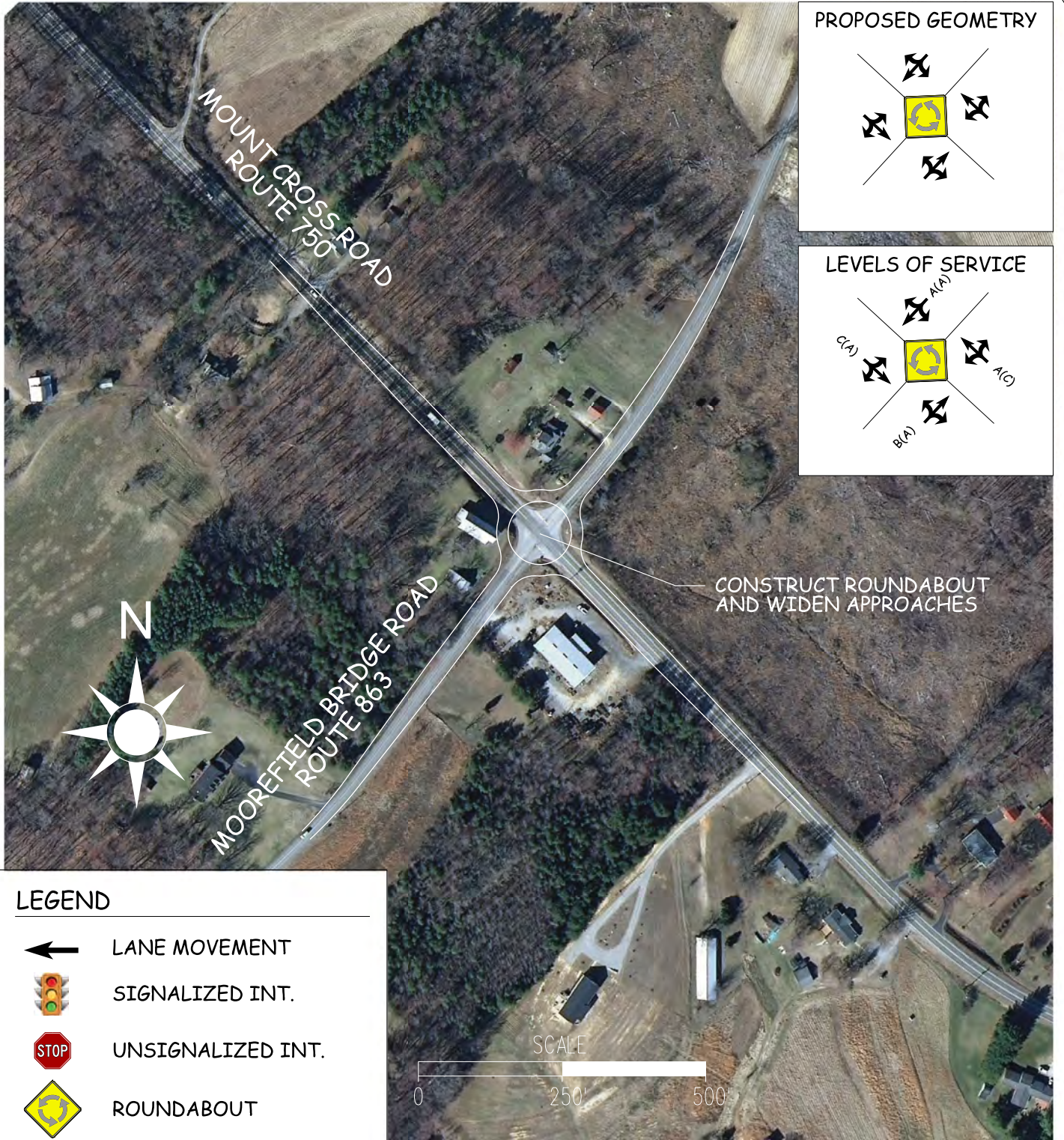


**LEGEND**





- LANE MOVEMENT
- SIGNALIZED INT.
- UNSIGNALIZED INT.
- S = 200' STORAGE LENGTH
- A(B) AM(PM) LOS

**MOOREFIELD BRIDGE ROAD AND MOUNT CROSS ROAD INTERSECTION ALTERNATIVE 1 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA**



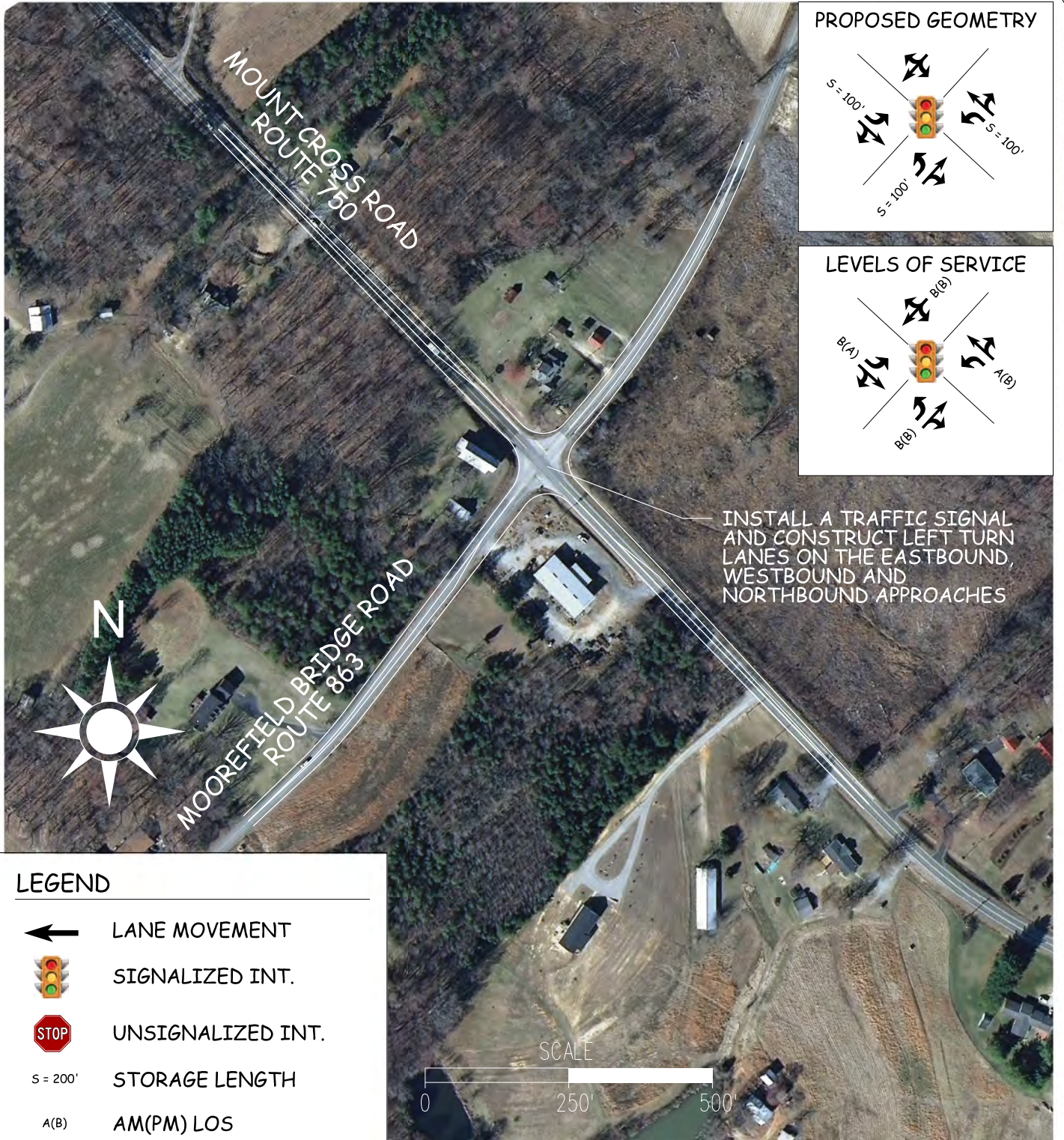


**LEGEND**

-  LANE MOVEMENT
-  SIGNALIZED INT.
-  UNSIGNALIZED INT.
-  ROUNDABOUT

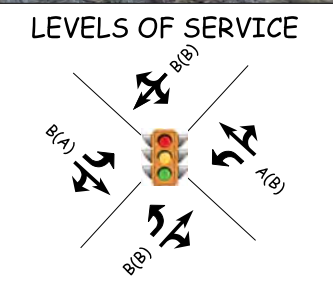
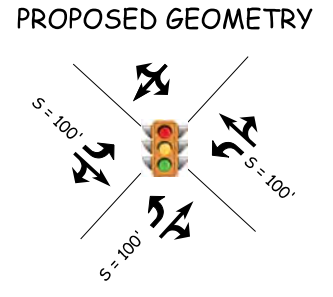
**MOOREFIELD BRIDGE ROAD AND MOUNT CROSS ROAD  
INTERSECTION ALTERNATIVE 2 IMPROVEMENTS  
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA**





**LEGEND**

- LANE MOVEMENT
- SIGNALIZED INT.
- UNSIGNALIZED INT.
- S = 200' STORAGE LENGTH
- A(B) AM(PM) LOS



INSTALL A TRAFFIC SIGNAL AND CONSTRUCT LEFT TURN LANES ON THE EASTBOUND, WESTBOUND AND NORTHBOUND APPROACHES

**MOOREFIELD BRIDGE ROAD AND MOUNT CROSS ROAD INTERSECTION ALTERNATIVE 3 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA**



As can be seen in Table 6, the construction of the roundabout will increase delays along the major route, Mount Cross Road, and reduce the LOS for the eastbound and westbound approaches to LOS C in the AM and PM peak hours, respectively. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$2,009,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

Alternative 3 consists of the addition of 100-foot left turn lanes on the eastbound, westbound, and northbound approaches, as well as the installation of a traffic signal. Based on an evaluation of the MUTCD Traffic Signal Warrants, Warrants 1A (8-Hour Vehicular Volume), 2 (4-Hour Vehicular Volume), and 3B (Peak Hour) are met. The traffic signal warrant analysis is included in Appendix I for reference. With the addition of these turn lanes, Mount Cross Road and Moorefield Bridge Road will be widened to the north and east, respectively. These improvements will create conflicts with the existing power utility poles, which will need to be relocated adding to the cost of the improvements. Figure 16 shows the improvements for this alternative. Based on these improvements, the LOSs will be increased to acceptable levels with no approaches below an LOS B. The intersection LOSs resulting from these improvements are shown in Table 7 below.

Table 7  
Year 2035 – Alternative 3 Intersection Level of Service

INTERSECTION	TYPE OF CONTROL	MOVEMENT APPROACH	AM PEAK HOUR		PM PEAK HOUR	
			LEVEL OF SERVICE*	DELAY (SEC/VEH)	LEVEL OF SERVICE*	DELAY (SEC/VEH)
Moorefield Bridge Road and Mount Cross Road	Signalized	EB	B	10.2	A	7.9
		WB	A	6.8	B	10.3
		NB	B	15.7	B	16.6
		SB	B	15.4	B	15.5

\* Please note that the LOSs are reported in accordance with the HCM designations.

As can be seen in the Table 7 above, the installation of the traffic signal will increase the delay along the major route, Mount Cross Road, and reduce the LOS for the eastbound and westbound approaches to LOS B in the AM and PM peak hours, respectively. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$1,709,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

In review of the three alternatives described above, all will increase the capacity of the intersection, but to different levels. Using the Evaluation Criteria identified in Table 4, the three alternatives were compared to determine the preferred alternative. Section VI of this report shows the details of this comparison and indicates the preferred alternative.

Intersection of Moorefield Bridge and Westover Drive Improvement Alternatives

It is our understanding that there are public concerns regarding the current operation of this intersection. Therefore, a traffic signal warrant analysis was performed at the intersection of Westover Drive and Moorefield Bridge Road as part of this study, although acceptable LOSs are expected. Based on an evaluation of the MUTCD Traffic Signal Warrants, no Warrants are met at this location. The traffic signal warrant analysis is included in Appendix L for reference. However, in order to alleviate these concerns, and separate the anticipated turn movements on Moorefield Bridge Road, Dewberry and RKA recommend that the southbound approach of Moorefield Bridge Road be widened to provide a 100-foot

left turn lane. After reviewing the existing site conditions, it was determined that the addition of a left-turn lane and associated widening to the east be recommended in lieu of a right turn. The right-turn lane would be widened to the west toward existing buildings that could be within the clear zone once the turn lane is constructed, thus increasing the mitigation and right-of-way costs.

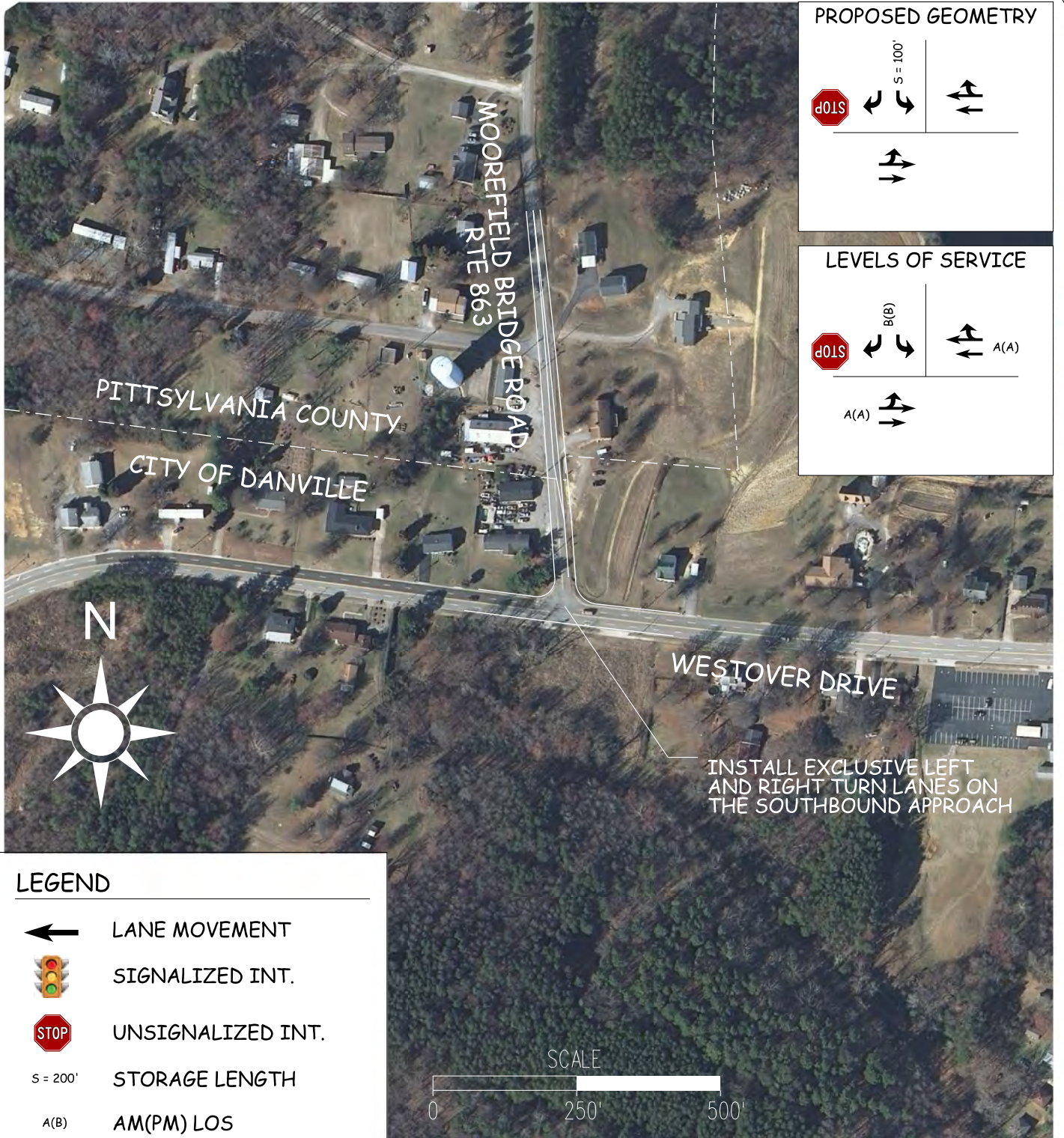
Along with the close proximity of existing buildings, existing utility poles run along the west side of Moorefield Bridge Road that would need to be relocated should the right-turn lane be installed, adding to the cost of the improvements. The recommendation to widen Moorefield Bridge Road to the east for the construction of a left-turn lane, as shown in Figure 17, was based on the lesser impacts to existing utilities and right-of-way, which ultimately would shorten the construction schedule. Because both roads would be widened, any conflicting power utility poles would have to be relocated, adding to the cost of the improvements. The addition of the turn lane will reduce delays and improve operation on the stop-controlled approach. The intersection LOSs are shown in Table 8 below.

Table 8  
Year 2035 – Alternative Intersection Level of Service




<u>INTERSECTION</u>	<u>TYPE OF CONTROL</u>	<u>MOVEMENT APPROACH</u>	<u>AM PEAK HOUR</u>		<u>PM PEAK HOUR</u>	
			<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>	<u>LEVEL OF SERVICE*</u>	<u>DELAY (SEC/VEH)</u>
Moorefield Bridge	Unsignalized	EB	A	5.5	A	6.3
Road and Westover		WB	A	0.0	A	0.0
Drive		SB	B	10.1	B	11.6

\* Please note that the LOSs are reported in accordance with the HCM designations.

The preliminary estimate of probable cost indicates that this improvement could cost approximately \$403,000 to design and construct. more detailed breakdown of the cost is included in Appendix K.



**LEGEND**

-  LANE MOVEMENT
-  SIGNALIZED INT.
-  UNSIGNALIZED INT.
- S = 200' STORAGE LENGTH
- A(B) AM(PM) LOS

**MOOREFIELD BRIDGE ROAD AND WESTOVER DRIVE  
INTERSECTION IMPROVEMENTS  
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA**



## VI. PREFERRED SPOT IMPROVEMENTS AND RECOMMENDATIONS

Three locations along this segment of Moorefield Bridge Road have been identified for improvement based on safety and capacity issues. The first area is along the curved sections of Moorefield Bridge Road, between River Ridge Road/Pinecrest Drive and Red Bud Lane. The remaining two locations are at the intersections of Moorefield Bridge Road with Mount Cross Road and Moorefield Bridge Road with Westover Drive. Two alternative improvements are shown for the first location, three alternative improvements are shown for the second location, and one alternative is shown for the third location. As described in the previous section, the alternatives will vary in cost and benefit to the roadway.

Beginning with Location 1, both alternatives will increase safety, but only one will help increase capacity. Dewberry and RKA recommend that Alternative 2 (Figure 13) be selected as the Preferred Alternative. This alternative includes the installation of Warning Signs, as well as pavement widening to add 4-foot paved shoulders on either side. These improvements will not only provide increased safety, but will also increase the capacity and system performance along this section of road. Even with the higher cost, these improvements will have long-lasting impacts. This improvement is primarily focused on increasing the safety along this stretch of road. The alternative improvements at Location 2 are focused on increasing the capacity and bringing the future no-build levels of service up to the acceptable range.

All three alternatives for Location 2 will increase the capacity of the intersection, but to differing levels and costs. Dewberry and RKA recommend that Alternative 3 (Figure 16) be selected as the Preferred Alternative. This alternative includes the addition of 100-foot left-turn lanes on the eastbound, westbound, and northbound approaches, as well as the installation of a traffic signal. These improvements will provide the highest increases in capacity and LOSs at this intersection. Also, based on an evaluation of the MUTCD Traffic Signal Warrants, Warrants 1A (8-Hour Vehicular Volume), 2 (4-Hour Vehicular Volume), and 3B (Peak Hour) are met at this intersection in the Year 2035. The alternative improvement at Location 3 is focused on increasing the capacity.

The alternative for Location 3 will increase the capacity and improve the LOSs on Moorefield Bridge Road at this intersection. This alternative includes the addition of a 100-foot left turn lane on the southbound approach.

With the implementation of these alternative improvements at the three locations, not only will the safety along this segment of Moorefield Bridge Road be improved, but each intersection will operate at an acceptable LOS in the Year 2035.