



Increasing Safety and Capacity



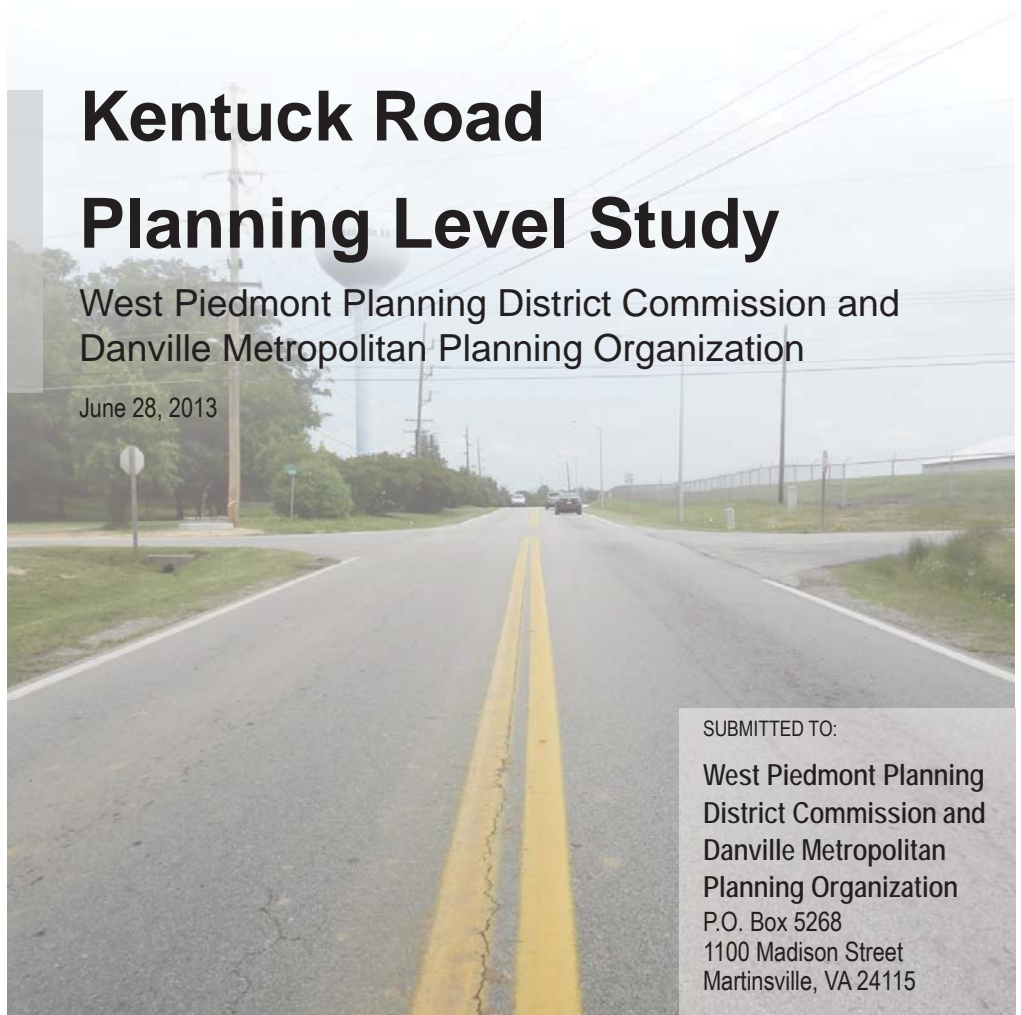
Kentuck Road Planning Level Study

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
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Planning Level Study - Kentuck Road

FINAL REPORT

Pittsylvania County and Danville, Virginia

June 28, 2013

Prepared for:
West Piedmont Planning District Commission and
Danville Metropolitan Planning Organization

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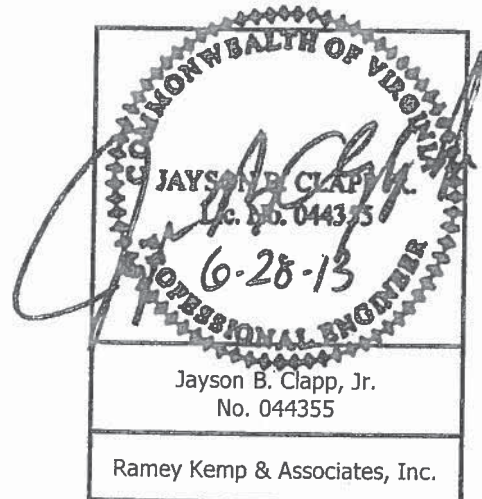
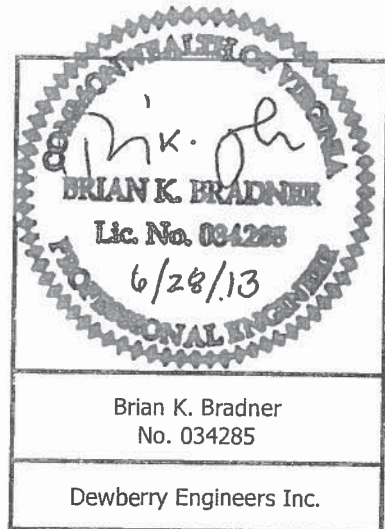


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Executive Summary

Dewberry Engineers Inc. (Dewberry) and Ramey Kemp & Associates Inc. (RKA) have completed the Kentuck Road (Route 729) 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 Kentuck Road between the intersections with South Boston Road (US 58) and Little Creek Road (Route 732), as well as to examine improvements to the existing signalized intersection at South Boston Road. 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. The intersection of Kentuck Road and Halifax Road.
 - i. Addition of a 200 foot left turn lane on the northbound approach and a 100 foot left turn lane on the southbound approach.
 - ii. Addition of 100 foot left turn lanes on the northbound and southbound approaches as well as the installation of a traffic signal.
 - iii. Construction of a single lane roundabout with widened approaches of each leg.
 - b. The intersection of Kentuck Road and Eagle Springs Road.
 - i. Addition of a 100 foot right turn lane on the northbound approach.
 - ii. Remove northbound channelization and install right turn on the northbound and westbound approaches.
 - c. The intersection of Kentuck Road and Little Creek / Fall Creek Road.
 - i. Construction of a center-turn lane on Kentuck Road between Fall Creek Road and Little Creek Road in addition to the construction of a 150 foot right turn lane on the eastbound approach and extension of the right turn lane on the southbound approach to provide 100 feet of storage.
 - ii. Shifting the alignments of Little Creek Road and Fall Creek Road, the installation of a traffic signal, the construction of 100 foot left turn lanes on the northbound and southbound approaches, and a 100 foot left turn lane on the eastbound approach will be constructed.
 - iii. Shifting the alignments of Little Creek Road and Fall Creek Road and the construction of a single lane roundabout with widened approaches.
3. The alternatives for each location were evaluated using eight (8) criteria to determine the preferred alternative for the three spot improvements. The recommended spot improvements are listed below for each location.

- a. Location 1: The construction of a single lane roundabout with widened approaches of each leg based upon the current data.
Note: As the time for implementation of this improvement approaches, the signal warrants should be reanalyzed. If a signal is warranted, the signalized intersection with the addition of 100 foot left turn lanes on the northbound and southbound approaches is the recommended alternative.
 - b. Location 2: Remove northbound channelization and install right turn on the northbound and westbound approaches.
 - c. Location 3: Shifting the alignments of Little Creek Road and Fall Creek Road, the installation of a traffic signal, the construction of 100 foot left turn lanes on the northbound and southbound approaches, and a 100 foot right turn lane on the eastbound approach will be included.
4. Through the implementation of these improvements, this segment of Kentuck Road will operate under capacity and with increased safety.

KENTUCK ROAD – PLANNING LEVEL STUDY

I. INTRODUCTION

Dewberry Engineers Inc. (Dewberry) and Ramey Kemp & Associates Inc. (RKA) have completed the Kentuck Road (Route 729) 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 Kentuck Road between the intersections with South Boston Road (US 58) and Little Creek Road (Route 732), as well as examine improvements to the existing signalized intersection at South Boston Road.

This section of Kentuck Road is divided at the intersection of Wilkerson Road (Route 730), where Pittsylvania County is to the north and the City of Danville is to the south. See Figure 1 for the locations of Kentuck Road and the limits of the analysis. The section within the City of Danville between the intersections with South Boston Road and Wilkerson Road was identified for improvement within the *Year 2035 Long Range Transportation Plan*. The proposed improvements, listed within the Roadway Vision Plan, were to widen the existing road to four lanes, matching the proposed R4D typical section. Such projects listed within the Transportation Vision Plan were indicated as having a lesser priority as funding is not available based on the Expected Funding Stream. For the purposes of this study, it is anticipated that Kentuck Road will remain a two-lane rural roadway.

Also noted in Figure 1 is the approximate location of the potential alignment of the Route 730 Connector Road. The preferred alignment, as shown in the Route 730 to Route 29 Connector Study, connects Route 29 to Kentuck Road and intersects with Kentuck Road between the Ringgold Industrial Parkway and Little Creek Road. In addition, turn lanes along Kentuck Road will be required at this intersection, which should be analyzed upon further development of the Connector Road. This potential alignment has been shown on the figure, but for purposes of this planning level study, its impacts have not been included in the analysis.

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

1. Identification of the 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;
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 listed below.



KENTUCKY ROAD (RTE. 729) SITE VICINITY MAP AND PROJECT LIMITS
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

FIGURE
1

Kentuck Road (Route 729) is classified as an Urban Minor Arterial within the Danville City limits and as a Rural Major Collector within Pittsylvania County. The posted speed limit along this road is 45 miles per hour (MPH). The typical road section includes two 11-foot lanes with no shoulders. The horizontal and vertical alignments follow the natural terrain with limited to no passing zones.

South Boston Road (US 58) is classified as an Urban Principal Arterial with a posted speed limit of 45 MPH. This road serves as the primary route between Danville and South Boston. The typical road section includes a four-lane divided roadway (two lanes in each direction) with lane widths of 12 feet. The horizontal alignment is primarily straight with subtle horizontal curves. The vertical alignment generally approximates the adjacent rolling terrain.

Halifax Road (Route 655) is a two-lane rural road with a posted speed limit of 45 MPH. The typical road section includes two 10-foot-wide lanes; and the shoulders along this road are limited. The horizontal alignment follows a winding path with multiple horizontal curves.

Wilkerson Road (Route 730) is classified as an Urban Collector with a posted speed limit of 45 MPH. This road serves as an east-west route for local traffic. The typical road section includes 11-foot-wide lanes. The horizontal alignment follows the natural terrain with a rolling vertical alignment.

Fall Creek Road is a two-lane rural road with a posted speed limit of 45 MPH. This road serves as an east-west route for local traffic in this area. The typical road section includes 10-foot lanes with limited or no shoulder. The horizontal and vertical alignments follow the natural terrain with limited to no passing zones.

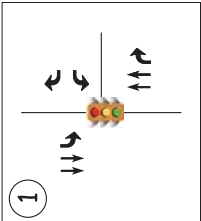
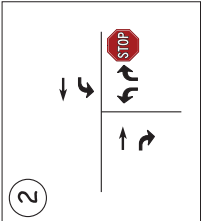
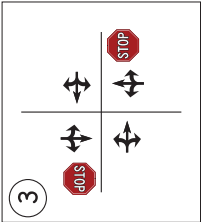
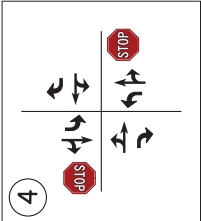
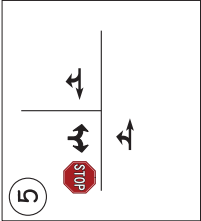
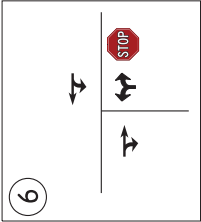
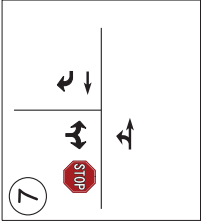
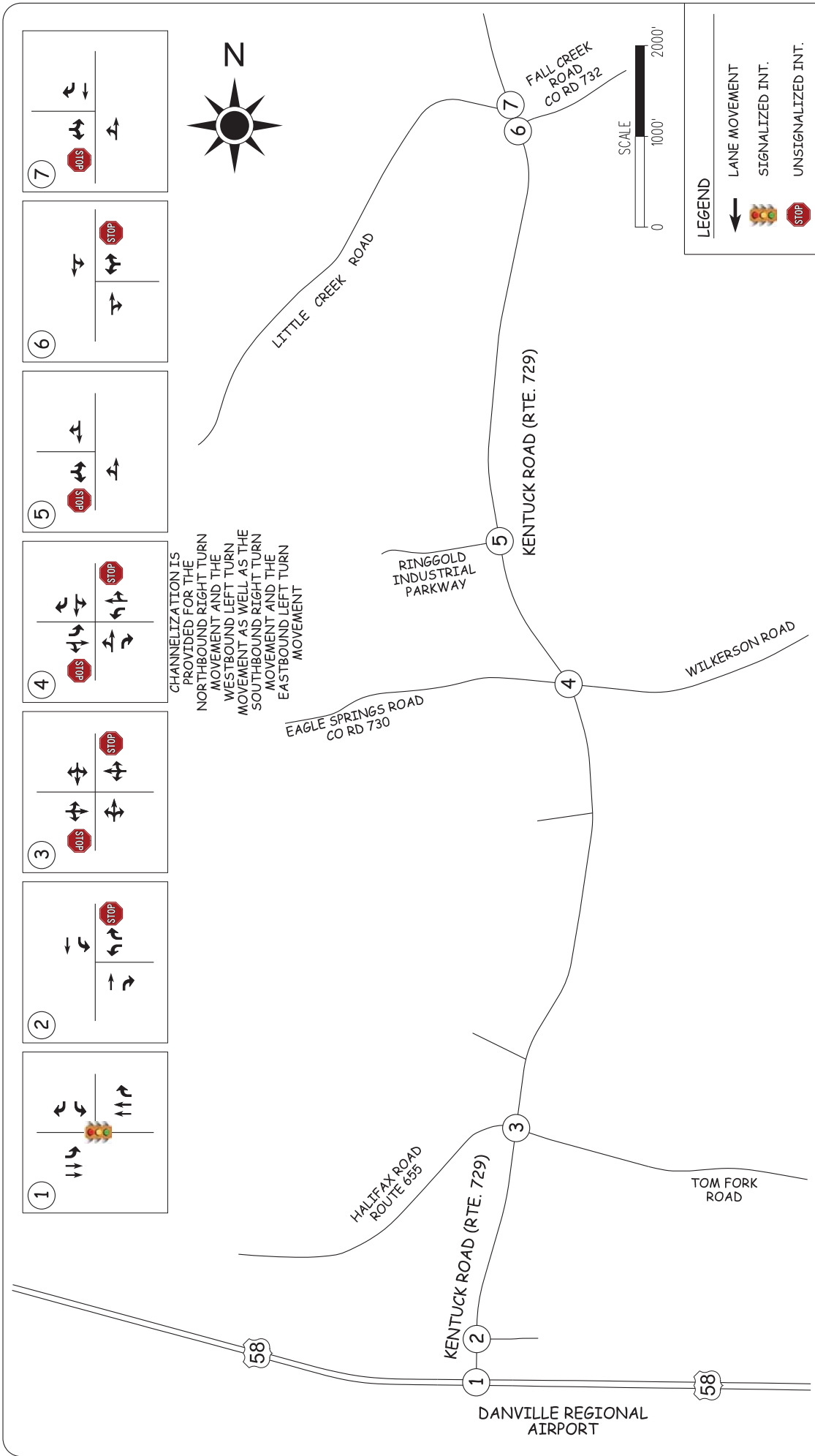
Little Creek Road (Route 732) is classified as a Rural Major Collector with a posted speed limit of 45 MPH. The typical road section includes 11-foot lanes with limited or no shoulder. This road serves as an east-west route for local traffic to the City of Danville.

Existing Roadway Volumes and Level of Service

To determine the peak hour volumes within the study area, on February 6 and 7, 2013, Ramey Kemp & Associates conducted turning movement counts for the AM and PM peak periods. These 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. Kentuck Road and South Boston Road
2. Kentuck Road and Shopping Center Entrance
3. Kentuck Road and Halifax Road
4. Kentuck Road and Eagle Springs/Wilkerson Road
5. Kentuck Road and Ringgold Industrial Park
6. Kentuck Road and Fall Creek Road
7. Kentuck Road and Little Creek 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.



CHANNELIZATION IS PROVIDED FOR THE NORTHBOUND RIGHT TURN MOVEMENT AND THE WESTBOUND LEFT TURN MOVEMENT AS WELL AS THE SOUTHBOUND RIGHT TURN MOVEMENT AND THE EASTBOUND LEFT TURN MOVEMENT

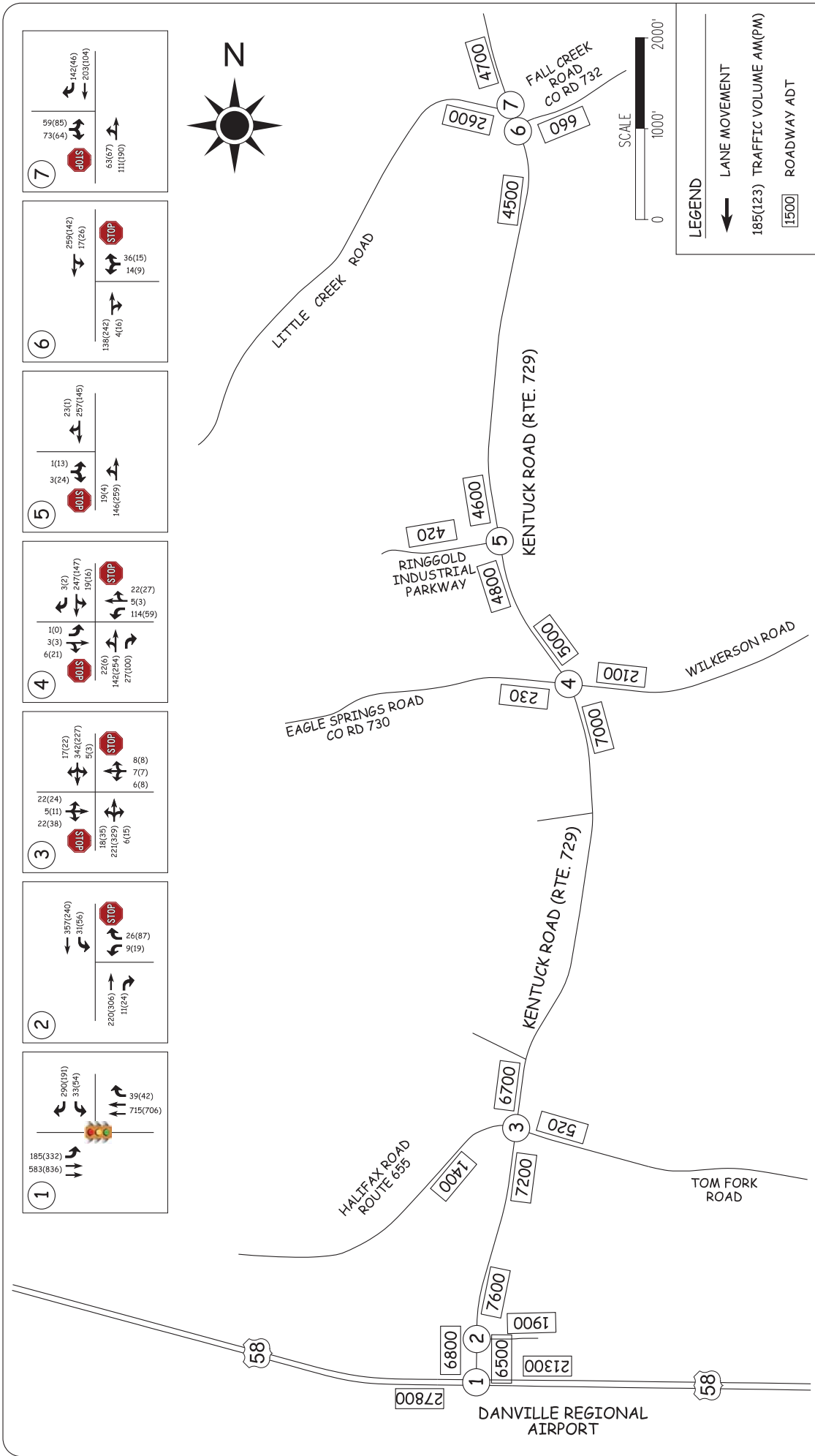
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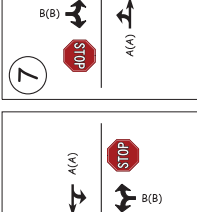
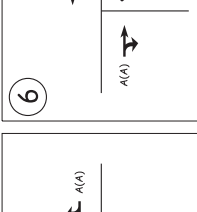
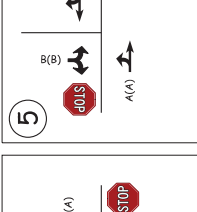
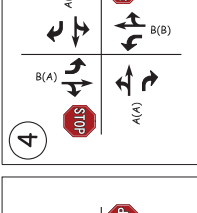
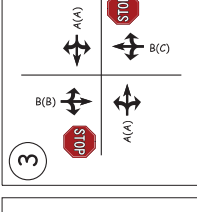
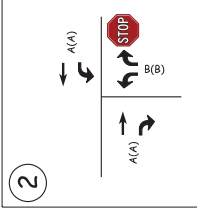
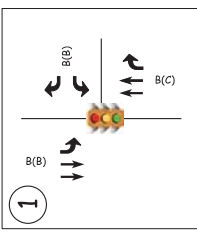
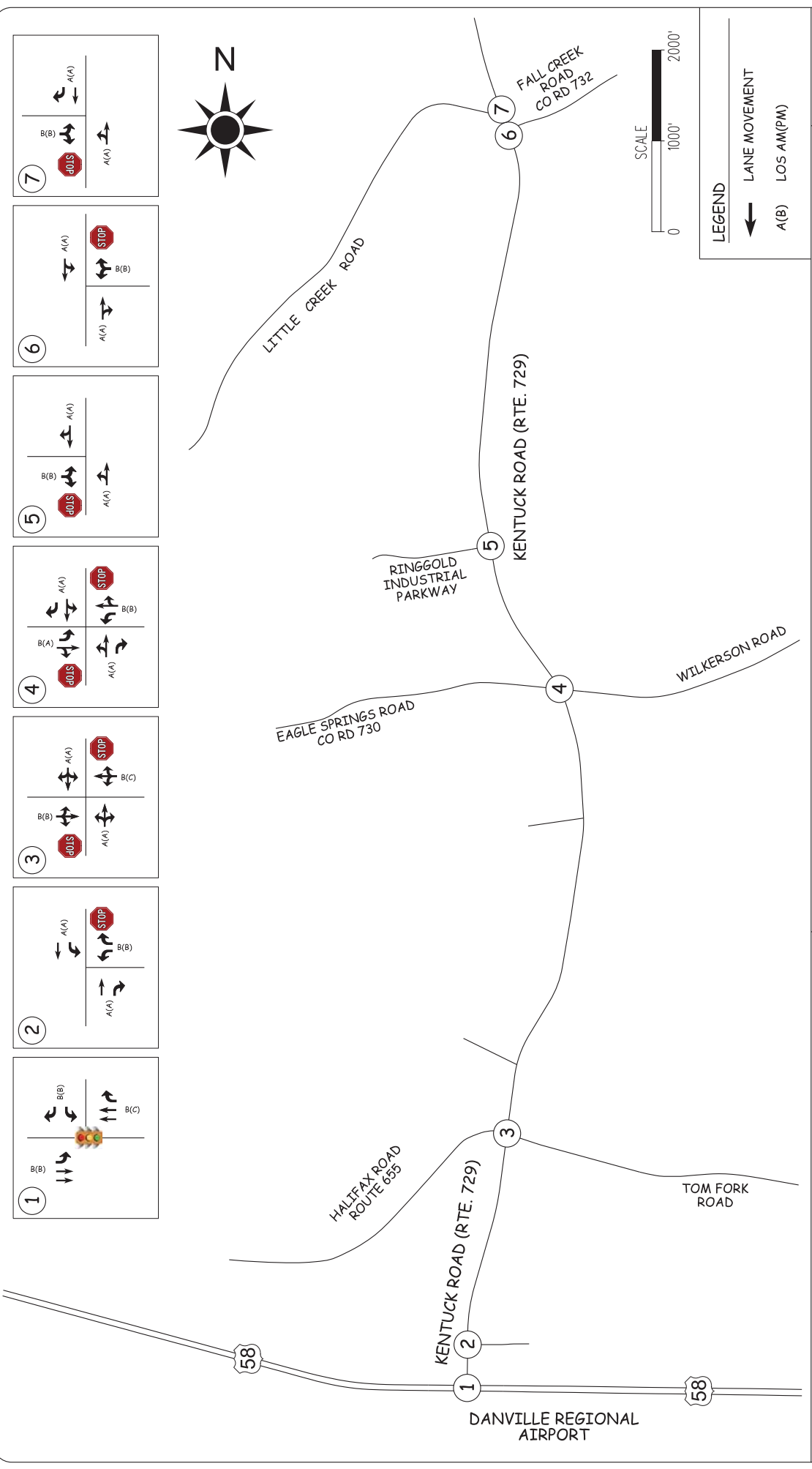
- LANE MOVEMENT
- 🚦 SIGNALIZED INT.
- 🛑 UNSIGNALIZED INT.

FIGURE 2

KENTUCKY ROAD (RTE. 729) EXISTING GEOMETRY AND TRAFFIC CONTROL
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA





The levels of service (LOS) for each intersection are shown in Figure 4. As can be seen in this figure, all approaches currently operate at acceptable LOSs and only the westbound approaches at the intersections with South Boston Road (Route 58) and Halifax Road operate at LOS C in the p.m. peak hour. Table 1 below also shows the existing LOSs for each intersection.

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)
Kentuck Road and South Boston Road	Signalized	EB	B	12.4	B	14.0
		WB	B	19.7	C	24.5
		SB	B	14.0	B	17.5
Kentuck Road and Shopping Center Entrance	Unsignalized	WB	B	10.9	B	11.7
		NB	A	0.0	A	0.0
		SB	A	0.6	A	1.5
Kentuck Road and Halifax Road	Unsignalized	EB	B	14.4	B	14.3
		WB	B	13.8	C	15.1
		NB	A	0.6	A	0.7
		SB	A	0.1	A	0.1
Kentuck Road and Eagle Springs Road	Unsignalized	EB	B	12.2	A	9.8
		WB	B	13.5	B	13.1
		NB	A	1.1	A	0.2
		SB	A	0.5	A	0.8
Kentuck Road and Ringgold Industrial Park	Unsignalized	EB	B	10.8	B	10.4
		NB	A	0.9	A	0.1
		SB	A	0.0	A	0.0
Kentuck Road and Fall Creek Road	Unsignalized	WB	B	10.1	B	10.7
		NB	A	0.0	A	0.0
		SB	A	0.5	A	1.2
Kentuck Road and Little Creek Road	Unsignalized	EB	B	12.2	B	12.5
		NB	A	2.8	A	2.0
		SB	A	0.0	A	0.0

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

The complete level of service analysis for the existing condition is included in Appendix C for reference.

All analysis was performed using 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. An 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 Level of Service analysis.

Bicycle and Pedestrian Facilities

Currently Kentuck Road (Route 729) does not support bicycle or pedestrian traffic along the section analyzed within this report. This study will consider the accommodations of bicycles and pedestrians along this section of road to adhere to the Commonwealth Transportation Board’s (CTB) policy.

In review of the *West Piedmont Regional Bicycle Plan*, revised September 2007, Kentuck Road north of the Danville City Line is indicated as a possible bicycle route connecting to the proposed mixed-use route along the existing railroad bed leading to the Ringgold Depot Trail. Four possible roadway sections are shown within this report and are included in Appendix D for reference. When developing the alternative improvements for this section of roadway, these different typical sections will be included in order to account for bicycle facilities along Kentuck Road.

Environmental Resources

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

Table 2
Environmental Issues

Resources/Issue	Comments
Cultural Resources	A review of U.S. Geological Survey (USGS) topographic maps and aerial photographs identified a cemetery located approximately 1,500 feet south of Lewis Lane and 200 feet west of Kentuck Road; further review of this resource should be conducted. A review of the Virginia Department of Historic Resources Data Sharing System (VDHR DSS) online database 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; it could be attributable to a lack of survey information. A Phase I survey should be conducted once an alternative is identified.
Waters of the U.S., including wetlands	A review of the National Wetland Inventory GIS online mapper noted no known or mapped wetlands within the project corridor. The absence of mapped wetlands does not mean resources are not present on site; a potential cause of the absence could be that a survey was never conducted. A Waters of the U.S. (WOUS)/Wetland delineation should be conducted once an alternative is identified. Three tributaries, Fall Creek and two unnamed tributaries to Cane Creek, are located within the project corridor. One of the tributaries of Fall Creek appears to originate at a culvert outfall under Kentuck Road. Further review of USGS topographic maps and aerial photographs indicate a few areas within the corridor, specifically adjacent to the road that could potentially contain jurisdictional waters/wetlands.

Table 2 (Cont.)
Environmental Issues

Resources/Issue	Comments
Water Quality Permits	This roadway appears to follow a topographic ridge and as such, 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 usually will fit general water quality permits from both the Department of Environmental Quality (DEQ) and the U.S. Army Corps of Engineers (USACE).
Agricultural and Forest Districts, Prime Farmland and Soil	The majority of the project corridor is classified as prime farmland or farmland of statewide importance by the Natural Resources Conservation Service (NRCS). However, a portion of the project corridor is classified by the U.S. Census Bureau as urbanized land and prime or state importance farmland does not apply. Urbanized land does not meet all the requirements set forth by governing bodies to be classified as prime or state important farmland. Coordination with NRCS may be necessary when an alternative is identified for areas classified as prime farmland or farmland of statewide importance located outside the urbanized land.
Threatened and Endangered Species/Wildlife and Waterfowl Refuges	The U.S. Fish and Wildlife Service database (IPaC), Virginia Department of Conservation and Recreation, and the Virginia Department of Game and Inland Fisheries did not note any mapped observations of Federal Endangered (FE), Federal Threatened (FT), State Endangered (SE) or State Threatened (ST) species within the project corridor. The absence of mapped species observation does not mean FE, FT, SE, or ST species are not present. The absence may be because a survey was never conducted. Additionally, the U.S. Fish and Wildlife Service did not list any designated critical habitat. No wildlife or waterfowl refuges are located within the project corridor. A search of the Department of Conservation and Recreation (DCR)'s Biotics Data System was submitted and resulted in the project not affecting any documented state-listed threatened plants or insects.
Hazardous Materials	A review of the Environmental Protection Agency "Enviro-mapper" and the Virginia DEQ website "What's in my Backyard" indicates that multiple known hazardous material sites exist within the project limits and are shown on Figure 5. Acquisitions of land that contains hazardous material will require, at a minimum, a Phase I Environmental Site Assessment (ESA) Report. Multiple Phase I ESA Reports should be anticipated as a result of the past and current use of existing properties and observation of many areas currently being used as trash dump sites. Additionally, acquisition of residential or commercial buildings with lead-based paint and/or asbestos-containing, and/or Recognized Environmental Condition (REC) building materials would be considered an issue for the project and further investigation would be required.

Table 2 (Cont.)
Environmental Issues

Resources/Issue	Comments
FEMA	There are no FEMA floodplains within the project corridor. An adjacent tributary, Cane Creek, has a FEMA-Mapped Floodplain but does not encroach into the corridor.
Well and Septic	Well and septic locations within the project corridor are not known at this time. A request for records of locations should be submitted to the health department once an alternative is identified. There is a potential for a complete parcel take if a septic system is required to be removed, and an alternative field and/or public utilities hookup cannot be provided.

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 three locations along the 2.73-mile-long segment of Kentuck Road where numerous crashes occurred, which are identified below:

1. Intersection of Kentuck Road and South Boston Road;
2. Intersection of Kentuck Road and the Shopping Center Entrance; and
3. Intersection of Kentuck Road and Halifax Road.

During this period, 48 reported crashes occurred along the study corridor. Of the 48 total reported crashes, 23 resulted in property damage only (PDO) and 25 involved at least one injury. No fatalities were reported. The locations of all individual accidents along this section of roadway are shown in Figure 6. This figure also indicates whether the crash was a PDO or if it resulted in an injury. Figure 7 graphically summarizes the Kentuck Road crash history by year and severity. Appendix F contains the crash data summary sheet.

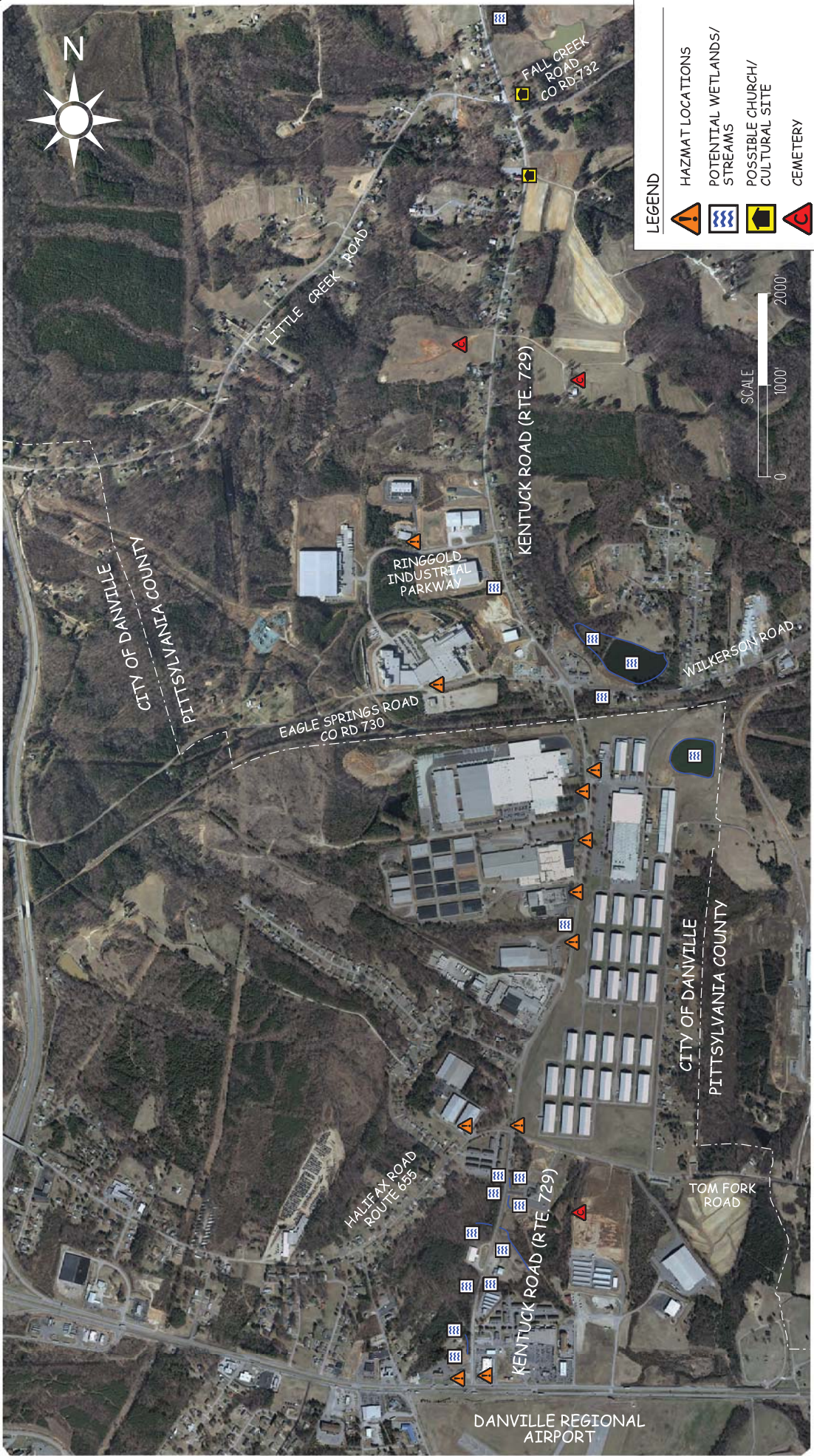


FIGURE 5

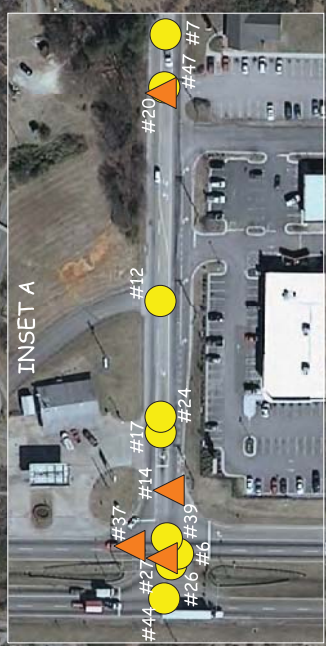
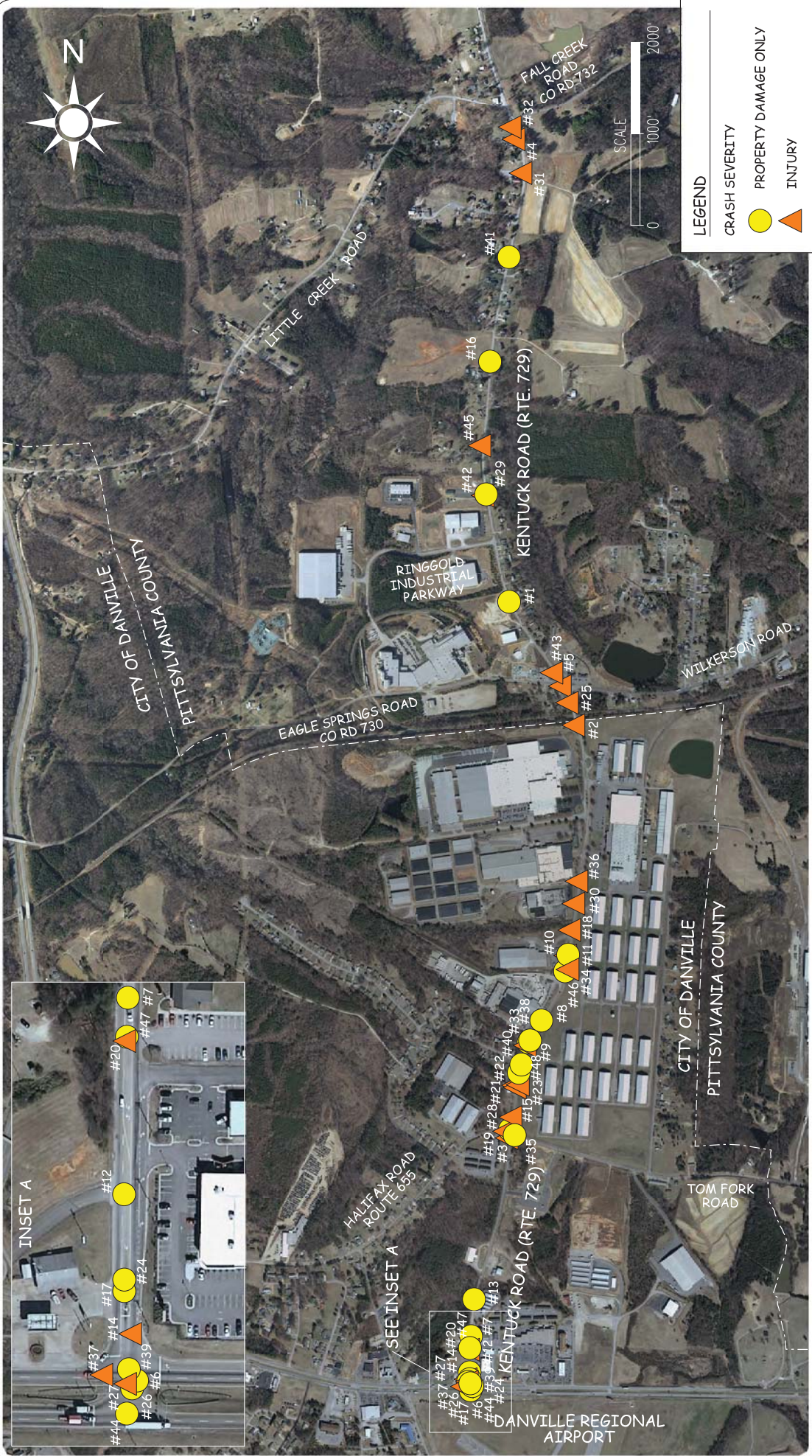
KENTUCKY ROAD (RTE. 729) EXISTING ENVIRONMENTAL CONCERNS LOCATIONS
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



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 TRANSPORTATION ENGINEERS



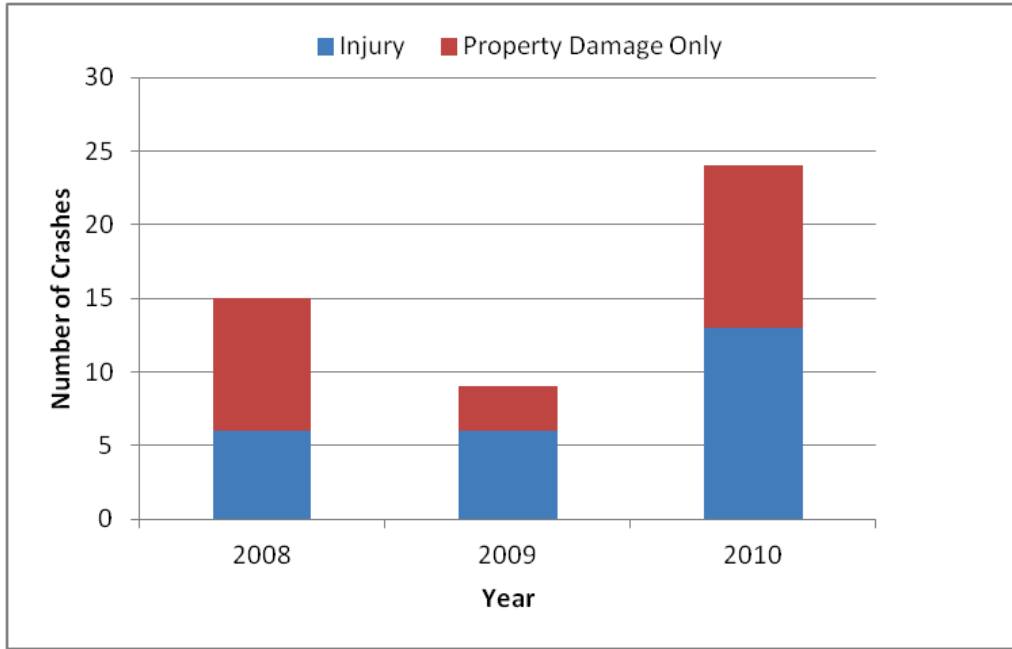
KENTUCKY ROAD (RTE. 729) EXISTING CRASH LOCATIONS AND SEVERITY
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

FIGURE 6

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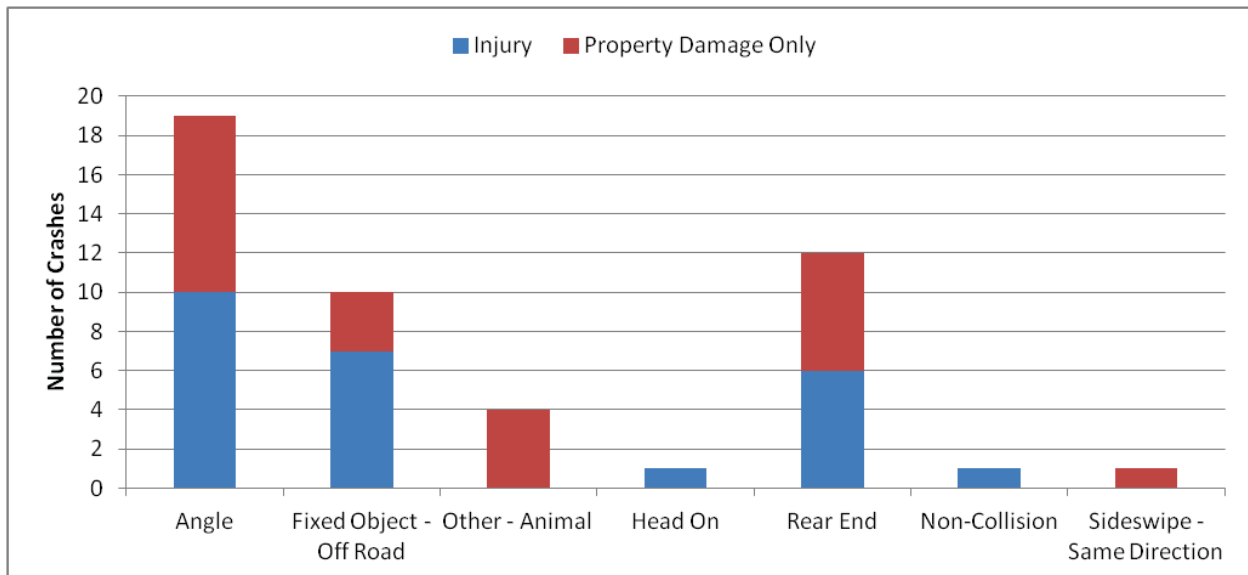
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TRANSPORTATION ENGINEERS

Figure 7
Severity of Crashes per Year



As displayed in Figure 7 above, more crashes were reported in 2010 than either 2008 or 2009 and both years combined. In addition to the crash severity and total number of crashes, the type and location of accidents were also analyzed. Figure 8 shows the type and severity of the 48 crashes that occurred between 2008 and 2010.

Figure 8
Type and Severity of Crashes



As displayed in Figure 8 on the previous page, a majority of the crashes were Angle crashes, including both injury and property damage only cases. Probable causes for the high number of Angle crashes could be attributed to various factors such as large intersection volumes, restricted sight distance, and excessive speed on approaches. Potential solutions to these contributing factors worth examining are installation of signalized intersections, appropriate warning signage, and/or paved shoulders and roadway widening.

As part of the safety analysis, the Kentuck Road corridor was studied as two segments, and more specifically at seven intersections. The segments along the corridor include (1) South Boston Road to the City Limit and (2) the City Limit to Route 732. The segments were created based on the classification of the roadway. The crash rates for these segments are listed below:

1. South Boston Road to City Limit: 276.1 per 100 million (100M) vehicle miles traveled
2. City Limit to Route 732: 145 per 100M vehicle miles traveled

The crash rates per the listed segments along Kentuck Road can be compared to the statewide average crash rate of 185 per 100M vehicle miles traveled. The majority of the corridor, from South Boston Road to the City Limit, has a significantly higher crash rate, while the remainder of the corridor from the City Limit to Route 732 is slightly lower compared to the statewide average. Because of the higher crash rate along most of the corridor, further consideration to improve existing conditions is necessary.

Intersections were examined based on factors such as the method of traffic control, lane geometry, and the number of approaches. According to the crash summary data sheet, 15 of the 48 reported accidents were at existing intersections. Of those 15 accidents, eight occurred at the intersection of Halifax Road and Kentuck Road. This intersection currently features two-way stop control. Because of the high number of accidents taking place at this intersection, improvements are required to increase traffic safety.

III. FUTURE NO-BUILD ALTERNATIVE (YEAR 2035)

Using information obtained from the regional traffic model received from VDOT for this area, Ramey Kemp & Associates, Inc. projected the future no-build traffic volumes. Through this model, the following annual growth rates were approximated for the associated movements at the following intersections based on 2006 and 2035 average daily traffic (ADT) data. If ADT data was not available, or decreased in the future year, a 1-percent growth rate was assumed.

Intersection of Kentuck Road and South Boston Road

Eastbound through movement on South Boston Road and southbound right-turn movement on Kentuck Road: 1.0 percent.

All remaining movements on South Boston Road and Kentuck Road: 1.1 percent.

Intersection of Kentuck Road and Shopping Center

All movements on Kentuck Road and Shopping Center: 1.0 percent.

Intersection of Kentuck Road and Halifax Road

All movements on Kentuck Road and Halifax Road: 1.0 percent.

Northbound right-turn movement and southbound left-turn movement on Kentuck Road as well as eastbound through movement and all westbound movements on Halifax Road also included half of the anticipated traffic that could be generated by a light-industrial site employing 111.

Intersection of Kentuck Road and Eagle Springs Road/Wilkerson Road

All movements on Kentuck Road, Eagle Springs Road, and Wilkerson Road: 1.0 percent.

Intersection of Kentuck Road and Ringgold Industrial Parkway

All movements on Kentuck Road and Ringgold Industrial Parkway: 1.0 percent.

Intersections of Kentuck Road and Little Creek Road and Fall Creek Road

Northbound left-turn movement and southbound right-turn movement on Kentuck Road as well as all eastbound movements on Little Creek Road and the westbound through movement on Fall Creek Road: 4.0 percent.

All remaining movements on Kentuck Road and Fall Creek Road: 1.0 percent.

From this software, the future no-build traffic volumes were determined as shown in Figure 9. Using these traffic volumes, the future no-build intersection level of service analysis was completed.

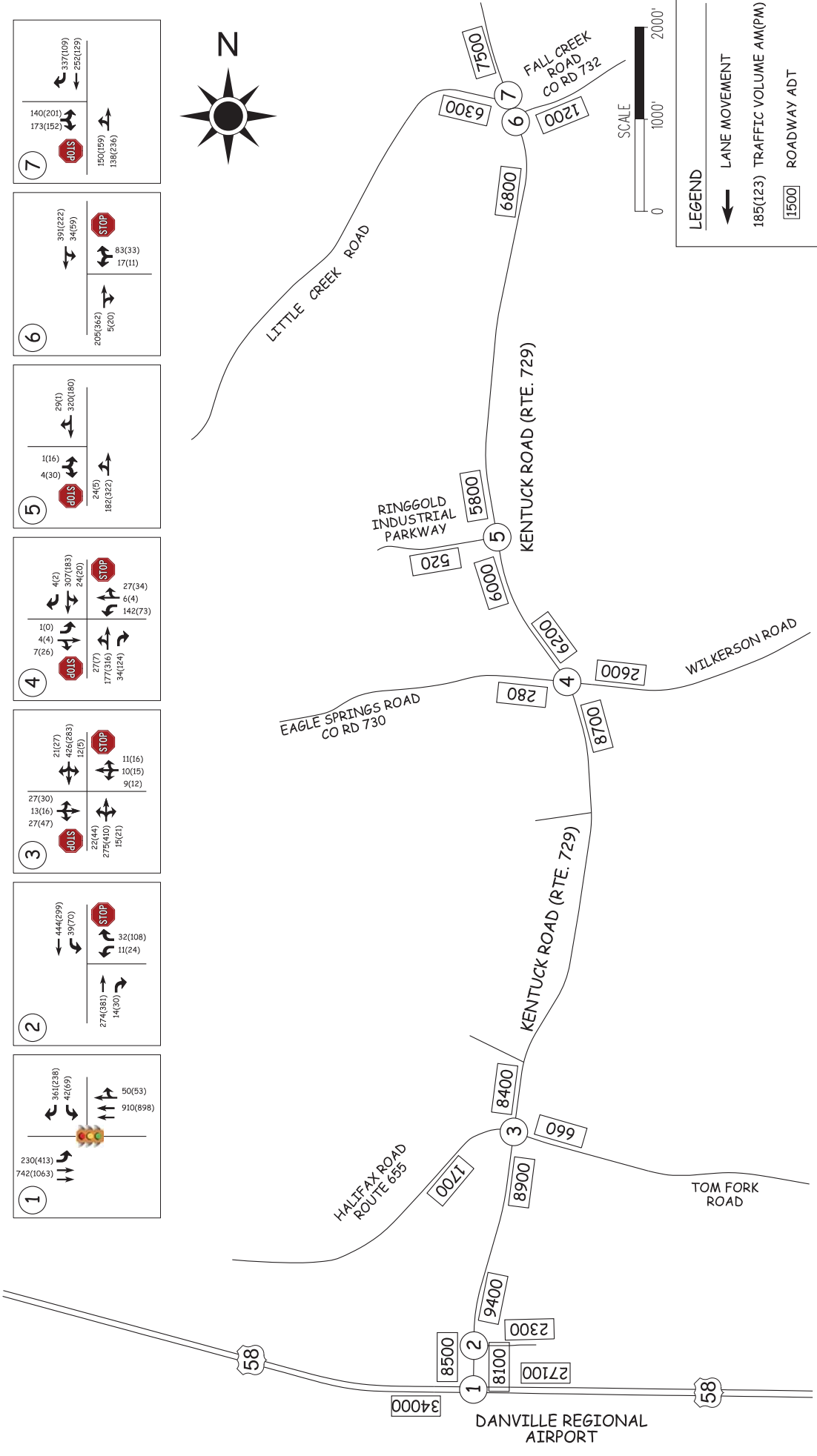


FIGURE 9

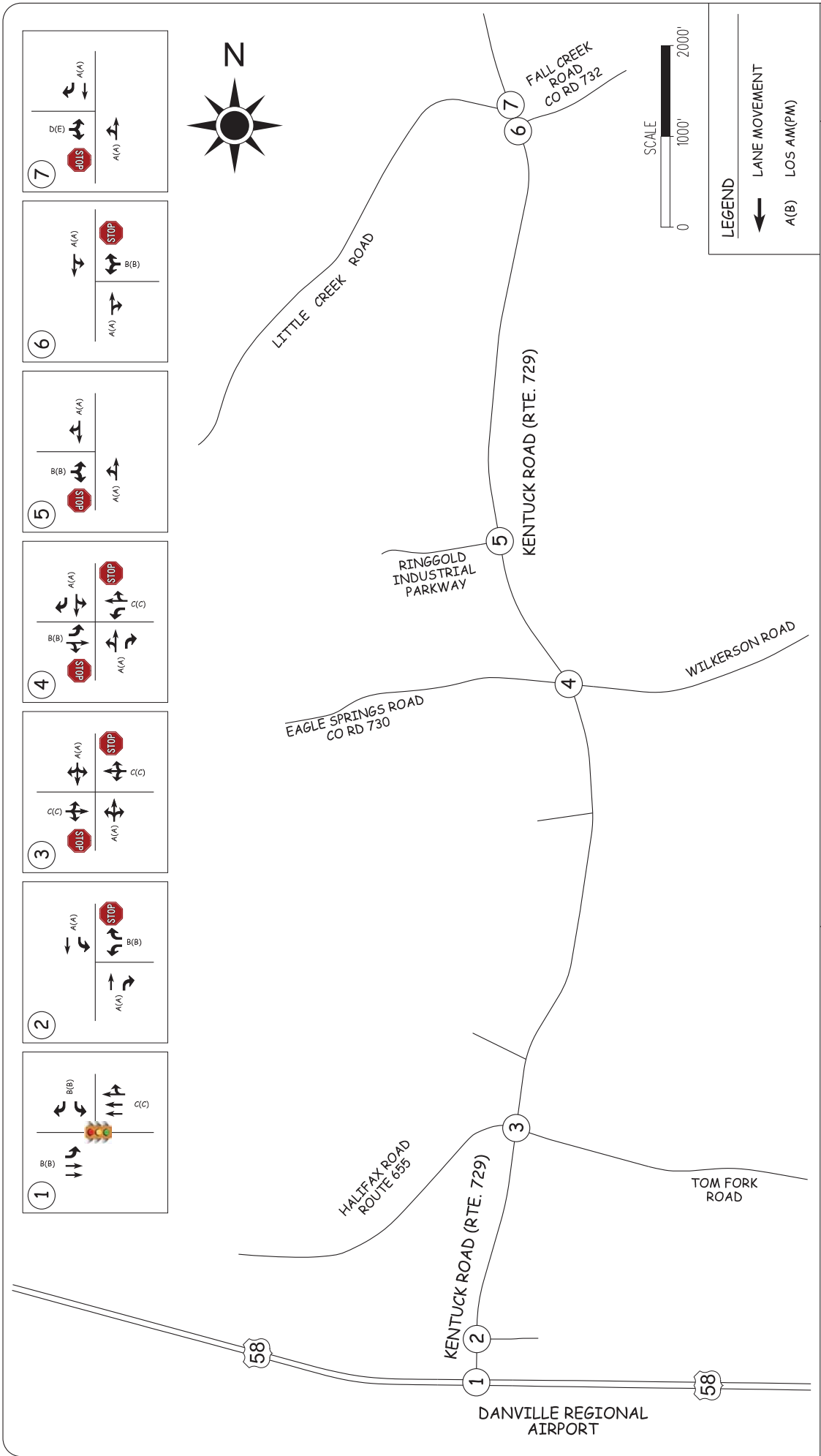
KENTUCKY ROAD (RTE. 729) FUTURE NO BUILD (YEAR 2035) TRAFFIC VOLUMES
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



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RAMEY KEMP ASSOCIATES
TRANSPORTATION ENGINEERS



KENTUCKY ROAD (RTE. 729) FUTURE NO BUILD (YEAR 2035) LEVELS OF SERVICE
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

FIGURE 10



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RAMEY KEMP ASSOCIATES
 TRANSPORTATION ENGINEERS

As shown in Figure 10 on the previous page, the LOSs for some approaches will deteriorate to unacceptable levels (LOS D and below) at several intersections. 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

<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>
Kentuck Road and South Boston Road	Signalized	EB	B	13.0	B	15.2
		WB	C	21.6	C	28.0
		SB	B	14.0	B	18.9
Kentuck Road and Shopping Center Entrance	Unsignalized	WB	B	11.9	B	13.3
		NB	A	0.0	A	0.0
		SB	A	0.6	A	1.6
Kentuck Road and Halifax Road	Unsignalized	EB	C	19.1	C	19.3
		WB	C	17.3	C	19.3
		NB	A	0.6	A	0.8
		SB	A	0.2	A	0.1
Kentuck Road and Eagle Springs Road	Unsignalized	EB	B	13.5	B	10.3
		WB	C	16.5	C	15.4
		NB	A	1.1	A	0.2
		SB	A	0.6	A	0.8
Kentuck Road and Ringgold Industrial Park	Unsignalized	EB	B	11.5	B	11.1
		NB	A	0.9	A	0.1
		SB	A	0.0	A	0.0
Kentuck Road and Fall Creek Road	Unsignalized	WB	B	11.4	B	12.6
		NB	A	0.0	A	0.0
		SB	A	0.6	A	1.7
Kentuck Road and Little Creek Road	Unsignalized	EB	D	31.3	E	48.6
		NB	A	4.3	A	3.2
		SB	A	0.0	A	0.0

* 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 G for reference.

The most severe deterioration is forecast to occur at Little Creek Road. Poor service levels are expected as a result of the increase in predicted traffic volumes along Kentuck Road. Reduced frequency of adequate gaps between vehicles may increase delays for motorists on secondary street approaches before they can safely enter the traffic stream. As shown by this analysis, improvements to these intersections are required if acceptable LOSs are planned for the year 2035.

IV. STATEMENT OF PURPOSE AND NEED

Considering VDOT Access Management Standards and the results of the analysis of the existing and future no-build (Year 2035) conditions, the statement of purpose and need for the Kentuck Road Evaluation of Improvements Study is based on addressing the following issues:

1. LOSs at intersections, within the study limits, are anticipated to decrease 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 bicycles and pedestrians should be considered along Kentuck Road to adhere to the CTB Policy.

The improvement alternatives will be developed to best satisfy the requirements in each of the three guidelines listed above.

V. IMPROVEMENT ALTERNATIVES

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

Table 4
Evaluation Criteria

Criteria #	Criteria Description	Criteria Weight (5-1)
1	Traffic Levels of Service - 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, most intersections will meet adequate capacity requirements and operate at acceptable LOSs, except for the intersection with Little Creek Road. In addition to the capacity analysis, the need for auxiliary turn lanes were evaluated using turn lane warrants contained within Appendix F of the VDOT Roadway Design Manual. Based on the capacity analysis and turn lane warrants, it was determined that no improvements are needed at the intersections of South Boston Road, the Shopping Center, and Ringgold Industrial Parkway on Kentuck Road. A review of the crash data was also completed and many accidents have occurred just north of the South Boston Intersection and at the intersections of Halifax Road and Eagle Springs Road. Given the number of accidents that have occurred along Kentuck Road, just north of South Boston Road, this area should be monitored and if accidents increase or become more severe, measures may need to be taken to restrict movements, such as constructing channelized islands within driveways, a median island on Kentuck Road, or even driveway closure. Three locations for alternative spot improvements have been identified along this corridor and are shown in Figure 11.



KENTUCK ROAD (RTE. 729) PROPOSED SPOT IMPROVEMENTS
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

These alternative improvements shown in Figure 11 are broken up into three locations. The first area is at the intersection of Kentuck Road and Halifax Road. The second spot is at the intersection of Kentuck Road and Eagle Springs Road. The last location is at the intersection of Kentuck Road and Fall Creek Road/Little Creek Road. Through the implementation of these improvements, the safety and capacity along this stretch of road will be increased.

Intersection of Kentuck and Halifax Road Improvement Alternatives

As identified on Figure 11, three alternatives for improvements at the intersection of Kentuck Road and Halifax Road were developed. Alternative 1 consists of the addition of a 200-foot left-turn lane on the northbound approach and a 100-foot left-turn lane on the southbound approach. Because of the addition of these turn lanes, Kentuck Road will be widened to the east. These improvements are shown in Figure 12. As a result of the widening of Kentuck Road, there are existing power utility poles in conflict, which will have to be relocated in conjunction with these improvements. The addition of turn lanes will reduce delays and improve operation on the stop-controlled approaches, but the eastbound and westbound approaches of Halifax Road will still operate at LOS C in both the AM and PM peak hours. The intersection LOSs are shown in Table 5 below.

Table 5
Year 2035 – Kentuck and Halifax 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>
Kentuck Road and Halifax Road	Unsignalized	EB	C	17.7	C	18.3
		WB	C	16.3	C	18.7
		NB	A	0.6	A	0.8
		SB	A	0.1	A	0.1

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

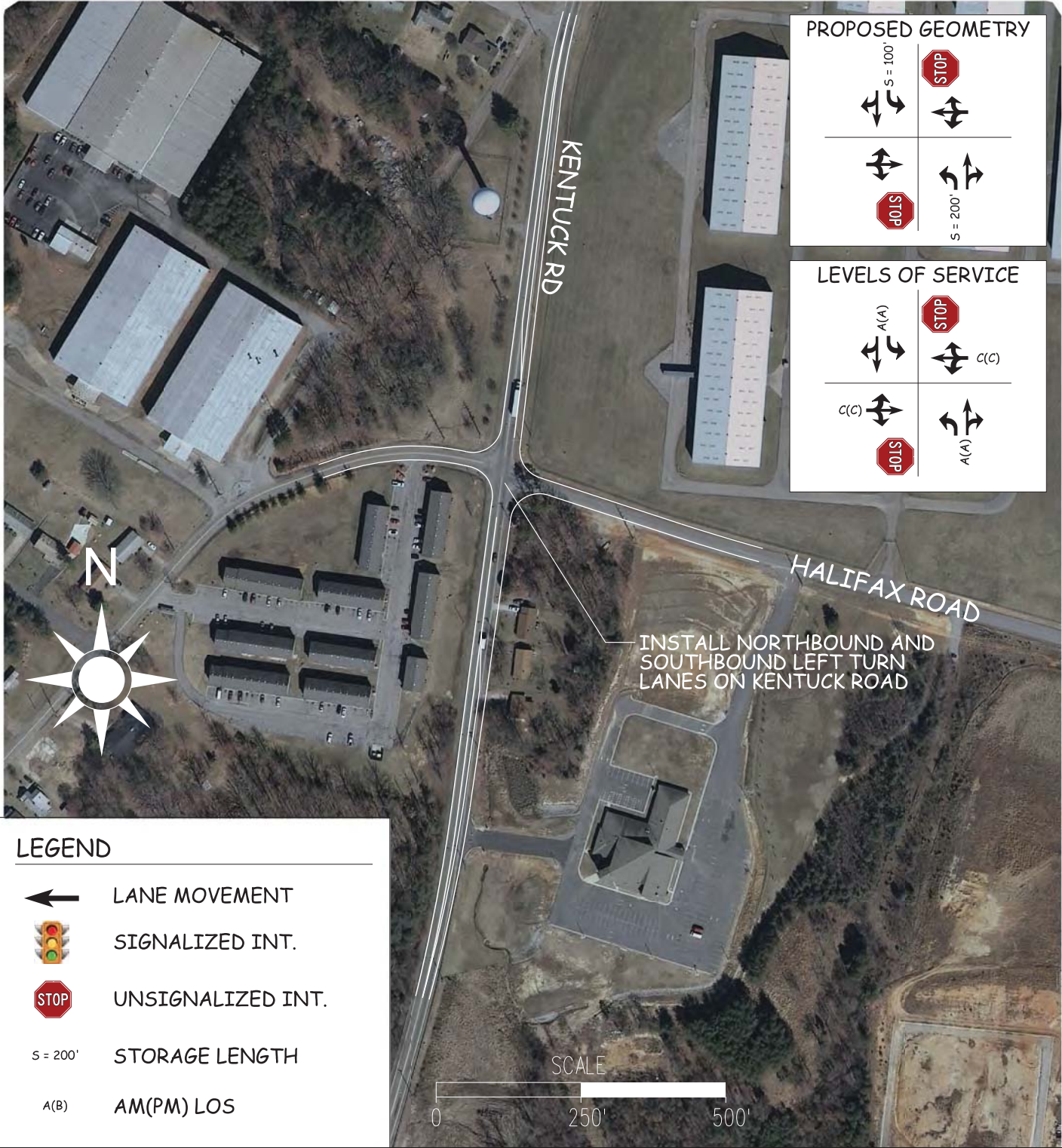
The preliminary estimate of probable cost indicates that these improvements could cost approximately \$927,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

Alternative 2 consists of the addition of 100-foot left-turn lanes on the northbound and southbound approaches as well as the installation of a traffic signal. However, based on an evaluation of the Manual on Uniform Traffic Control Devices (MUTCD) Traffic Signal Warrants and four-hour traffic data, no warrants are met at this location. The traffic signal warrant analysis is included in Appendix I for reference. These improvements are shown in Figure 13. The improvements will raise the LOSs for both the eastbound and westbound approaches to LOS B. The intersection LOSs resulting from these improvements are shown in Table 6 below.

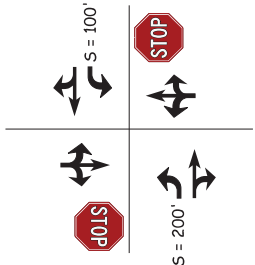
Table 6
Year 2035 – Kentuck and Halifax Alternative 2 Intersection Level of Service

<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>
Kentuck Road and Halifax Road	Signalized	EB	B	10.0	B	10.3
		WB	B	11.2	B	11.3
		NB	A	4.4	A	8.0
		SB	A	5.1	A	6.9

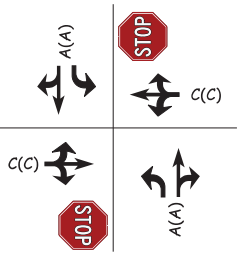
* Please note that the LOSs are reported in accordance with the HCM designations.



PROPOSED GEOMETRY



LEVELS OF SERVICE

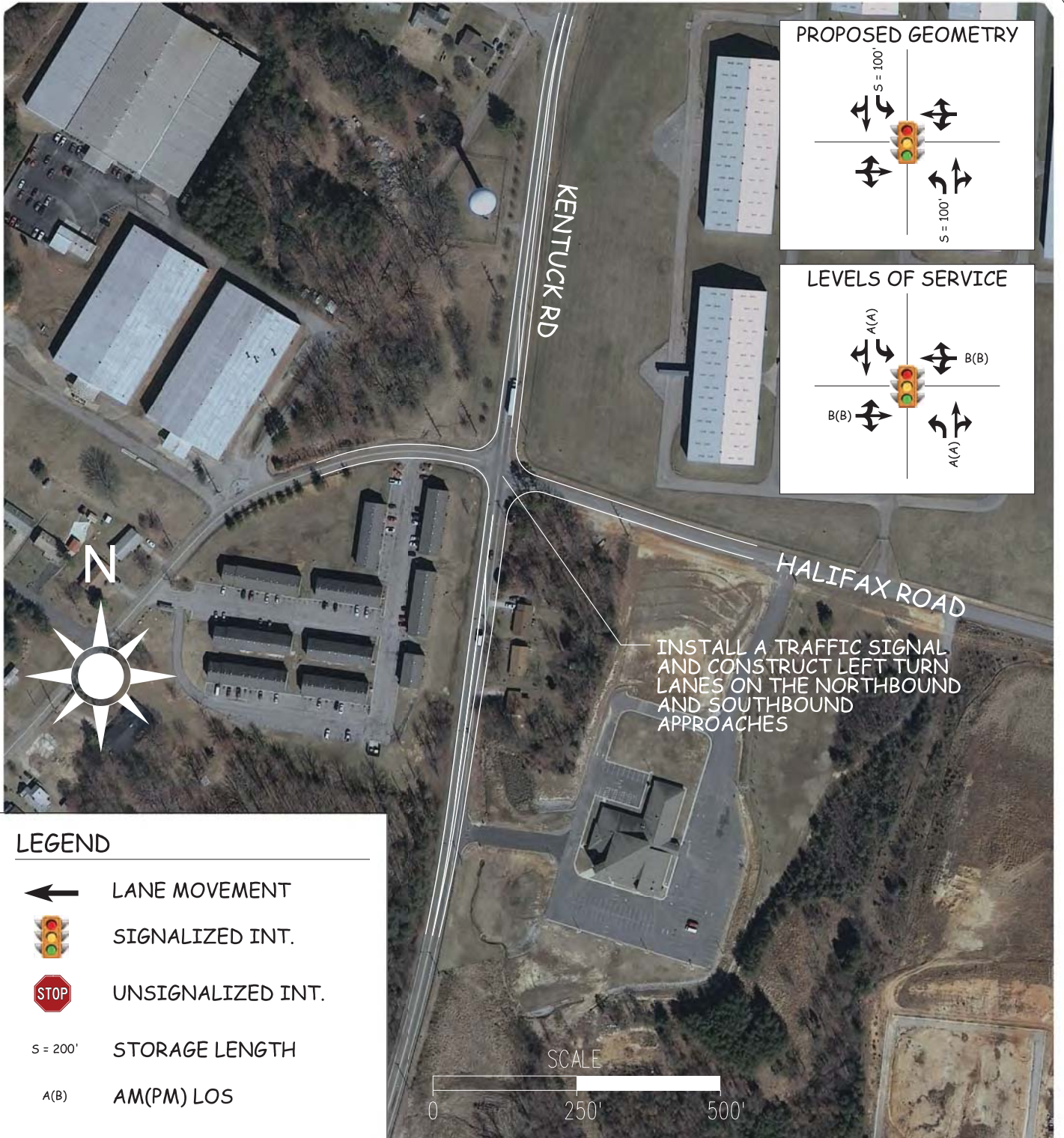


LEGEND

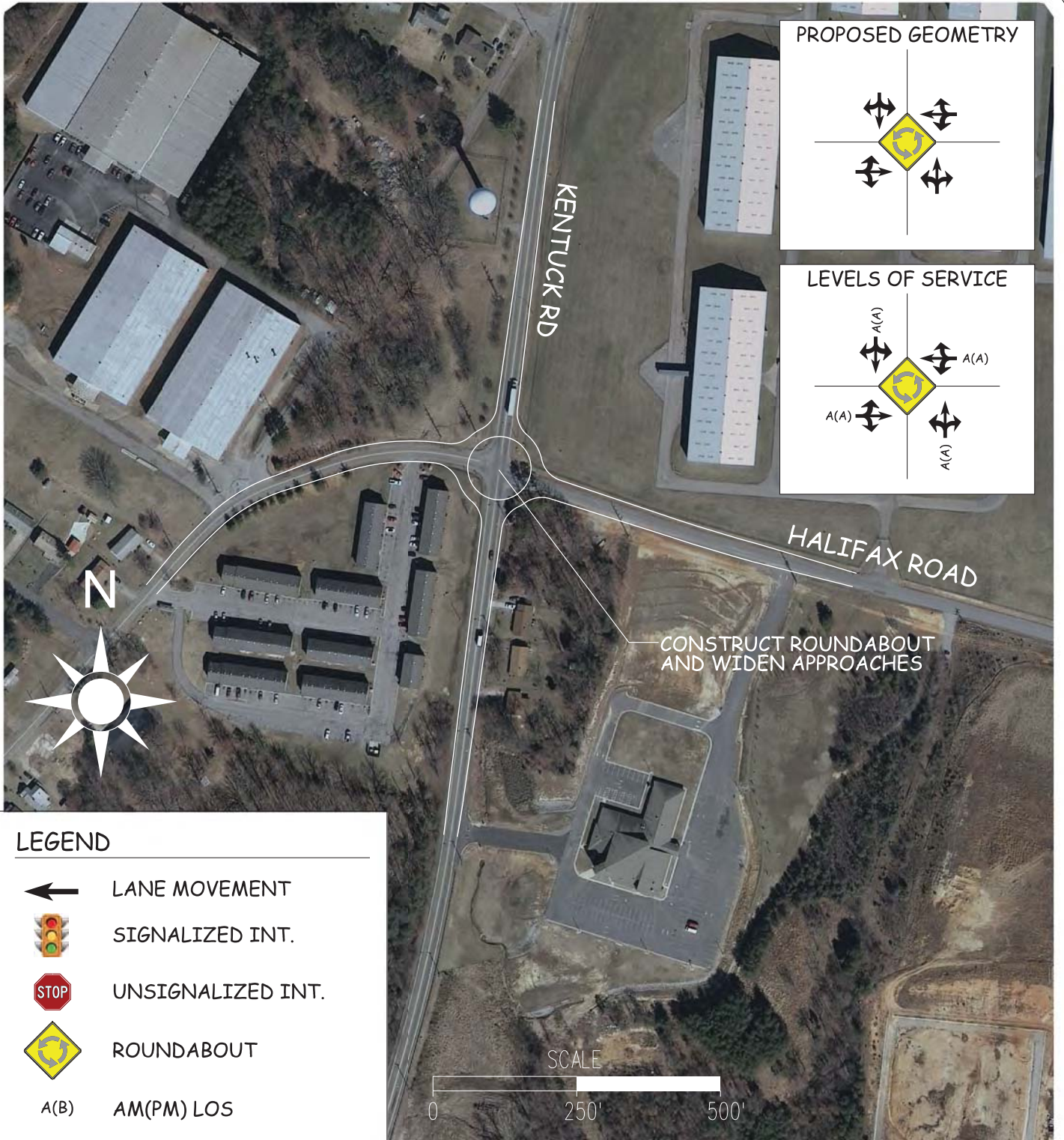
- LANE MOVEMENT
- SIGNALIZED INT.
- UNSIGNALIZED INT.
- $s = 200'$ STORAGE LENGTH
- A(B) AM(PM) LOS

INSTALL NORTHBOUND AND SOUTHBOUND LEFT TURN LANES ON KENTUCKY ROAD

KENTUCKY ROAD AND HALIFAX ROAD INTERSECTION ALTERNATIVE 1 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



KENTUCK ROAD AND HALIFAX ROAD
 INTERSECTION ALTERNATIVE 2 IMPROVEMENTS
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



KENTUCK ROAD AND HALIFAX ROAD
 INTERSECTION ALTERNATIVE 3 IMPROVEMENTS
 PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

As can be seen in Table 6, the addition of a traffic signal will increase the delay along the major route, Kentuck Road, but will raise the level of services for both the eastbound and westbound approaches. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$1,159,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

Alternative 3 consists of the construction of a single-lane roundabout with widened approaches of each leg. Figure 14 shows the improvements for this alternative. As a result of the construction of a roundabout, many conflicts with existing utilities will arise. The main conflicts exist with the overhead electric utility poles, but impacts to the underground water, gas or fiber optic lines could also occur. With these improvements, the LOSs for all approaches will be LOS A. These LOSs are shown in Table 7 below.

Table 7
Year 2035 – Kentuck and Halifax Alternative 3 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>
Kentuck Road and Halifax Road	Roundabout	EB	A	6.5	A	5.8
		WB	A	5.3	A	6.3
		NB	A	7.2	A	9.6
		SB	A	9.1	A	7.2

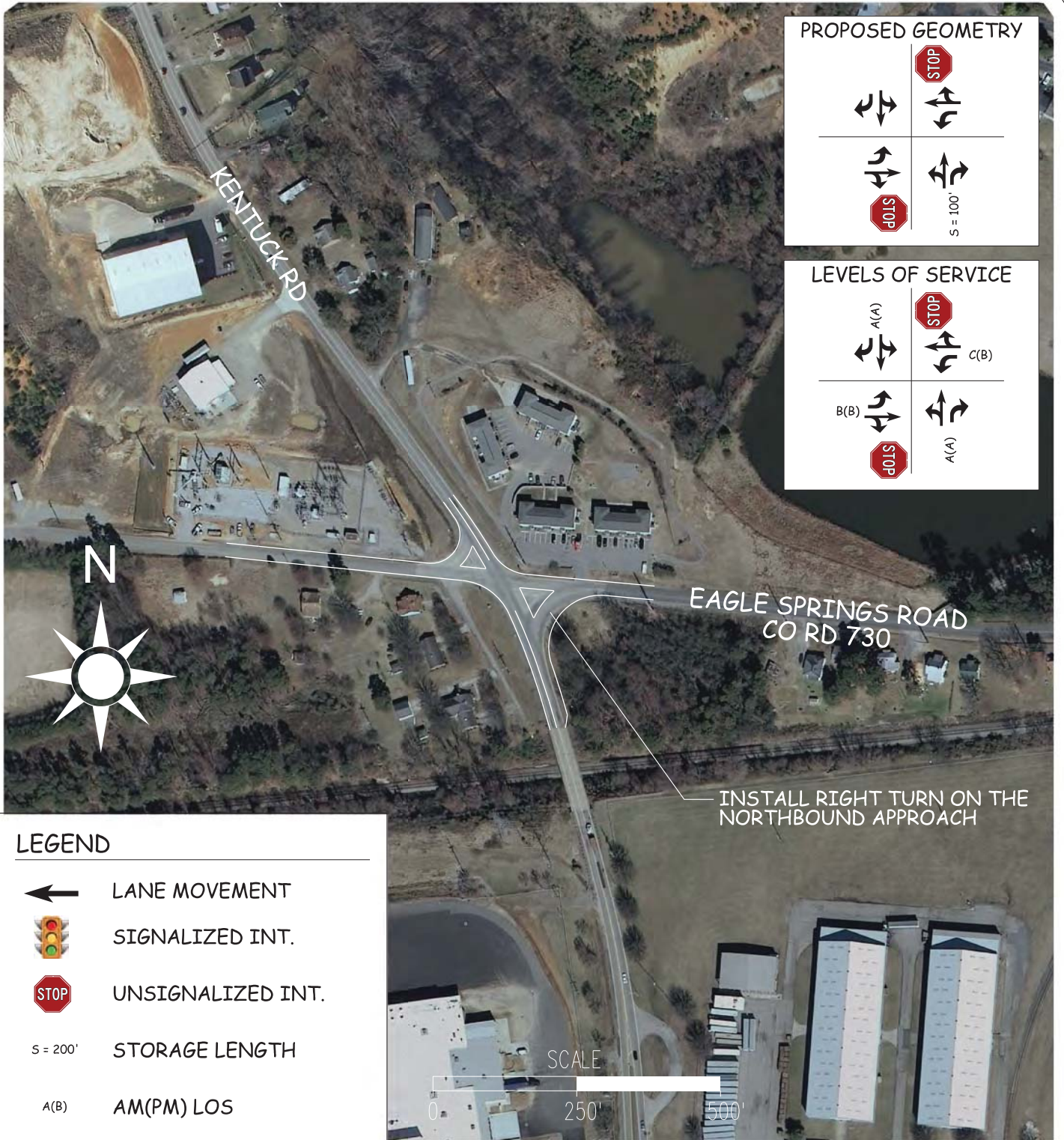
* Please note that the LOSs are reported in accordance with the HCM designations.

The construction of a roundabout will not only increase the LOSs at this intersection (as can be seen in Table 7) but should also help to reduce the frequency and severity of crashes. The preliminary estimate of probable cost indicates that these improvements could cost approximately \$2,539,000 to design and construct. A more detailed breakdown of the cost is included in Appendix H.

In review of these 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, and this comparison is shown in greater detail in Section VI of this report.

Intersection of Kentuck and Eagle Springs Road Improvement Alternatives

As identified on Figure 11, two alternatives for improvements at the intersection of Kentuck Road and Eagle Springs Road were developed. Alternative 1 consists of the addition of a 100-foot right-turn lane on the northbound approach. These improvements are shown in Figure 15. Because of this widening, the existing power utility poles that are in conflict will need to be relocated. These improvements will help reduce delays and improve operation on the stop-controlled approaches. The intersection LOSs are shown in Table 8.



KENTUCK ROAD AND EAGLE SPRINGS ROAD
INTERSECTION ALTERNATIVE 1 IMPROVEMENTS
PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



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**RAMEY KEMP
&
ASSOCIATES**
TRANSPORTATION ENGINEERS

FIGURE

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Table 8
Year 2035 – Kentuck and Eagle Springs 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>
Kentuck Road and Eagle Springs Road	Unsignalized	EB	B	13.5	B	10.3
		WB	C	16.1	B	14.3
		NB	A	1.1	A	0.2
		SB	A	0.6	A	0.8

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

The preliminary estimate of probable cost indicates that these improvements could cost approximately \$212,000 to design and construct. A more detailed breakdown of the cost is included in Appendix J.

Alternative 2 consists of the removal of the northbound channelization and the addition of a 100-foot right-turn lane on the northbound approach and a 100-foot right-turn lane on the westbound approach. These improvements are shown in Figure 16. Because of the addition of these turn lanes, the existing power utility poles that are in conflict will have to be relocated. The additions of these turn lanes will help reduce delays and improve operation on the stop-controlled approaches. The intersection LOSs are shown in Table 9.

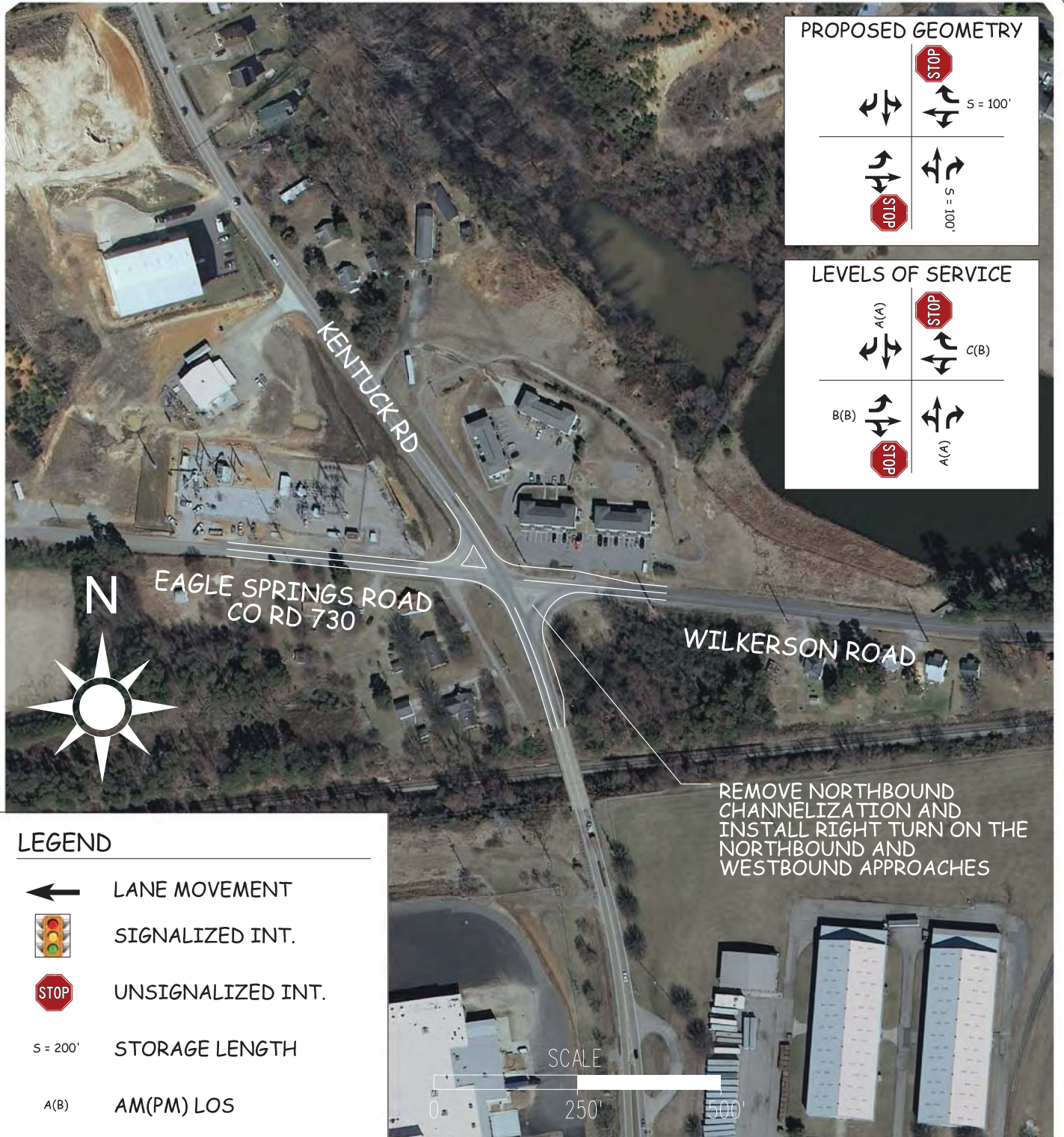
Table 9
Year 2035 – Kentuck and Eagle Springs Alternative 2 Intersection Level of Service

<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>
Kentuck Road and Eagle Springs Road	Unsignalized	EB	B	13.5	B	10.3
		WB	C	17.4	B	14.7
		NB	A	0.9	A	0.1
		SB	A	0.6	A	0.8

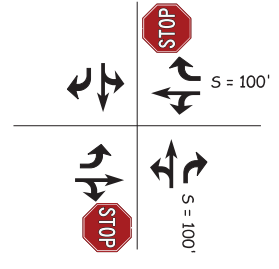
* Please note that the LOSs are reported in accordance with the HCM designations.

The preliminary estimate of probable cost indicates that these improvements could cost approximately \$267,000 to design and construct. A more detailed breakdown of the cost is included in Appendix J.

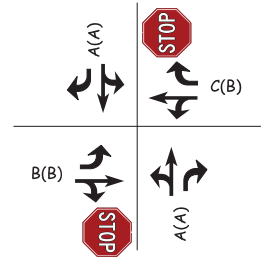
In review of these two alternatives described above, both will increase the capacity and safety of the intersection but to different levels. Using the Evaluation Criteria identified in Table 4, the two alternatives were compared to determine the preferred alternative, and this comparison is shown in greater detail in Section VI of this report.



PROPOSED GEOMETRY



LEVELS OF SERVICE



LEGEND

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

REMOVE NORTHBOUND CHANNELIZATION AND INSTALL RIGHT TURN ON THE NORTHBOUND AND WESTBOUND APPROACHES

KENTUCK ROAD AND EAGLE SPRINGS ROAD INTERSECTION ALTERNATIVE 2 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



Dewberry



RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

FIGURE

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Intersection of Kentuck and Fall Creek/Little Creek Road Improvement Alternatives

As identified on Figure 11, three alternatives for improvements at the intersection of Kentuck Road and Fall Creek Road/Little Creek Road were developed. Alternative 1 consists of the construction of a center-turn lane on Kentuck Road between Fall Creek Road and Little Creek Road in addition to construction of a 150-foot right-turn lane on the eastbound approach and extension of the right-turn lane on the southbound approach to provide 100 feet of storage. Because of the addition of this center-turn lane, Kentuck Road will be widened to the east. These improvements are shown in Figure 17. As a result of the widening of Kentuck Road, the existing power utility poles that are in conflict will have to be relocated. The addition of these turn lanes will help reduce delays and improve operation on the stop-controlled approaches. The intersection LOSs are shown in Table 10 below.

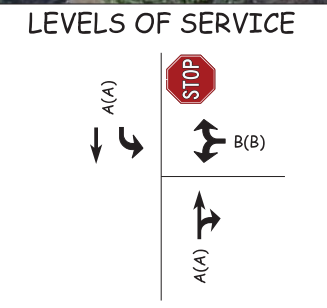
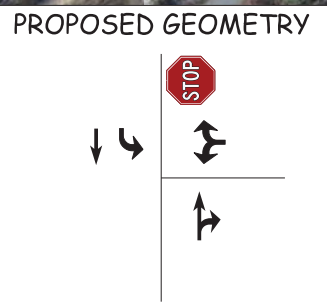
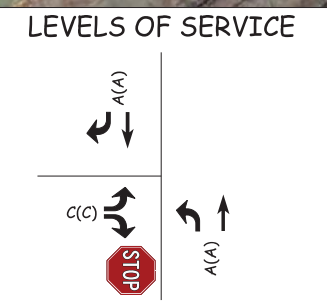
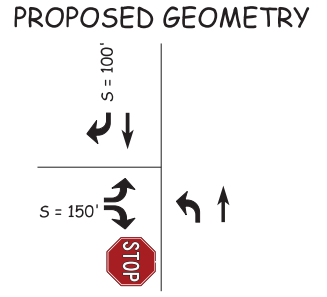
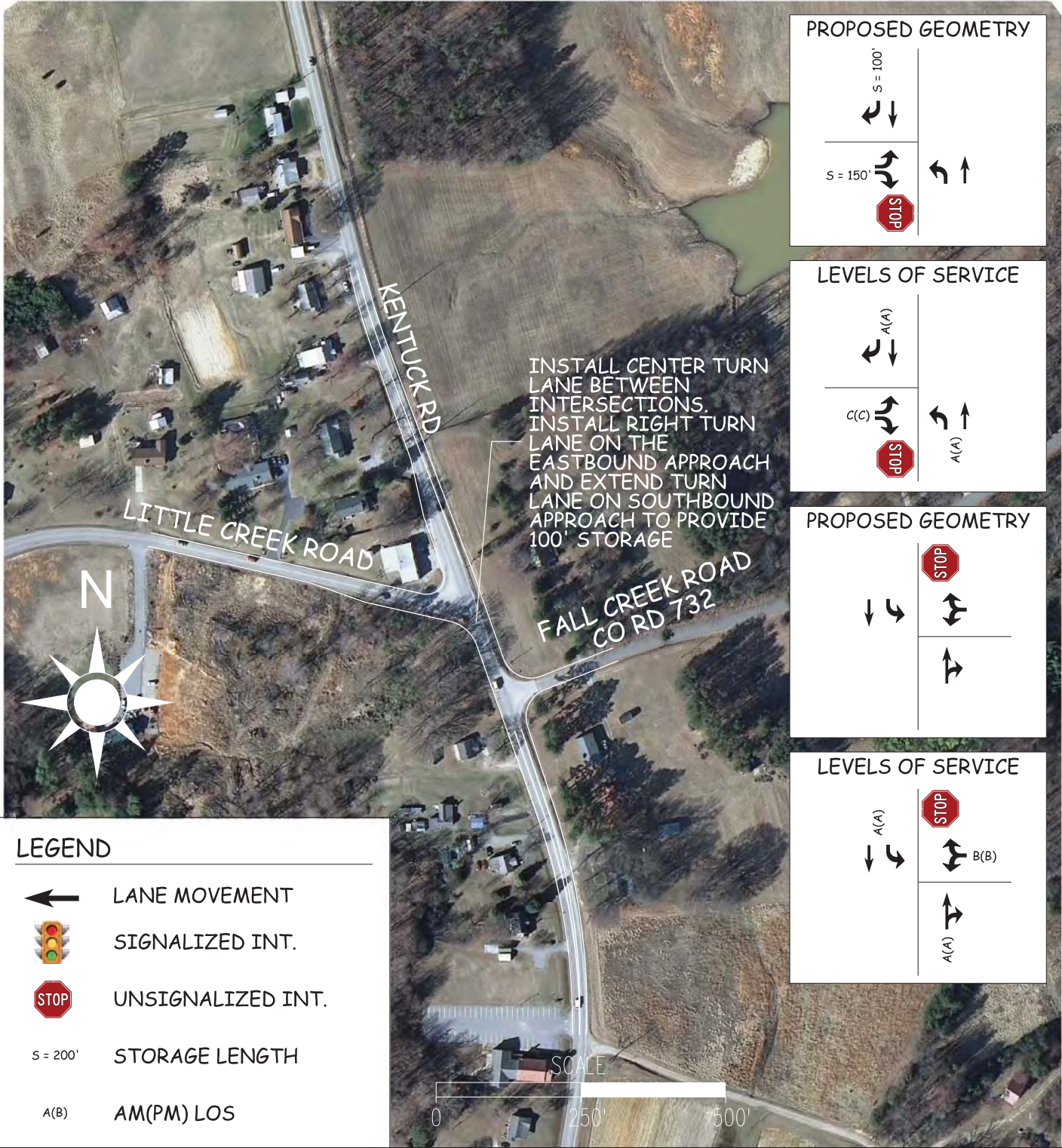
Table 10
Year 2035 – Kentuck and Fall Creek/Little Creek Alternative 1 Intersection Level of Service

<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>
Kentuck Road and Fall Creek Road	Unsignalized	WB	B	11.3	B	12.5
		NB	A	0.0	A	0.0
		SB	A	0.6	A	1.7
Kentuck Road and Little Creek Road	Unsignalized	EB	C	17.8	C	24.8
		NB	A	4.3	A	3.2
		SB	A	0.0	A	0.0

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

The preliminary estimate of probable cost indicates that these improvements could cost approximately \$1,318,000 to design and construct. A more detailed breakdown of the cost is included in Appendix L.

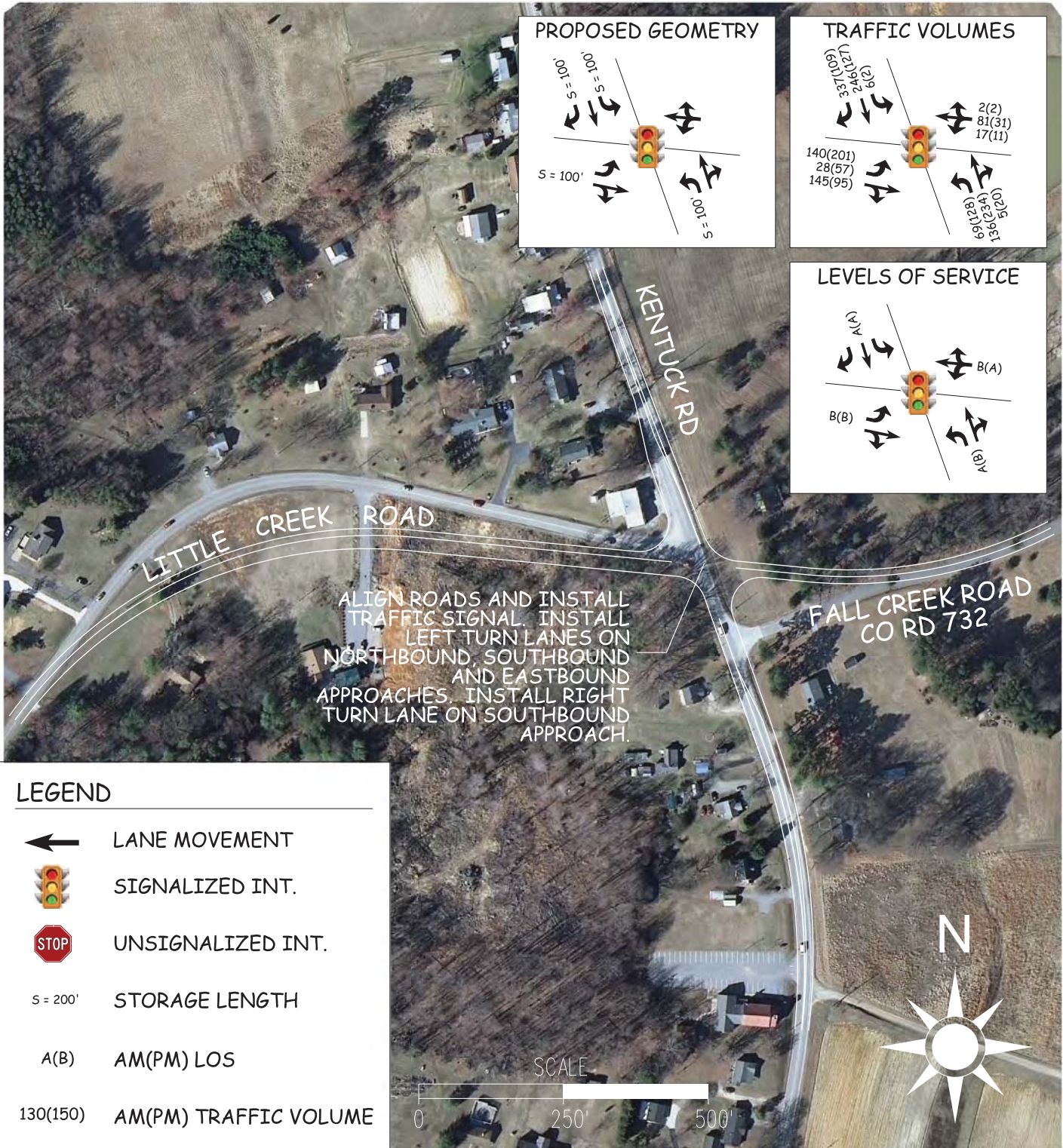
Alternative 2 consists of shifting the alignments of Little Creek Road and Fall Creek Road and the installation of a traffic signal. Based on an evaluation of the MUTCD Traffic Signal Warrants and four-hour traffic data, Warrants 2 (Four-Hour Vehicular Volume) and 3B (Peak Hour) are met at this location. The traffic signal warrant analysis is included in Appendix I for reference. In addition, the construction of 100-foot left-turn lanes on the northbound and southbound approaches as well as a 100-foot left-turn lane on the eastbound approach will be included. These improvements are shown in Figure 18. As a result of the widening of Kentuck Road and relocation of Little Creek Road and Fall Creek Road, many conflicts will arise with existing utilities and right-of-way acquisition. The addition of the turn lanes and a traffic signal will significantly reduce delays and improve operation at this intersection, while also increasing the safety along this section of roadway. The intersection LOSs are shown in Table 11.



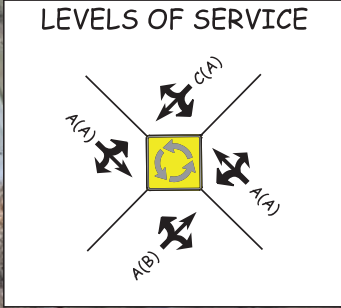
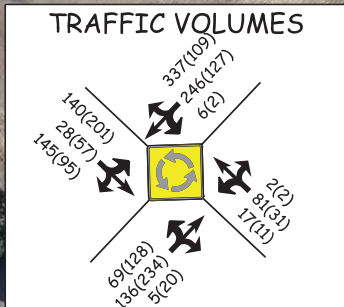
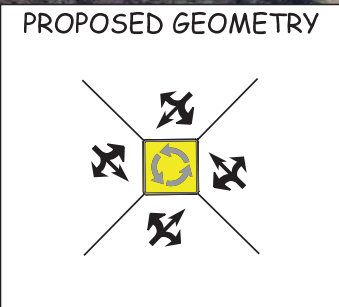
LEGEND

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

KENTUCK ROAD AND LITTLE CREEK/FALL CREEK ROAD INTERSECTION ALTERNATIVE 1 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



KENTUCK ROAD AND LITTLE CREEK/FALL CREEK ROAD INTERSECTIONS ALTERNATIVE 2 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA



CONSTRUCT ROUNDABOUT AND RELIGN LITTLE CREEK ROAD AND FALL CREEK ROAD

LEGEND

- LANE MOVEMENT
- SIGNALIZED INT.
- UNSIGNALIZED INT.
- ROUNDABOUT
- A(B) AM(PM) LOS
- 130(150) AM(PM) TRAFFIC VOLUME



KENTUCK ROAD AND LITTLE CREEK/FALL CREEK ROAD INTERSECTIONS ALTERNATIVE 3 IMPROVEMENTS PITTSYLVANIA COUNTY AND DANVILLE, VIRGINIA

Table 11
Year 2035 – Kentuck and Fall Creek/Little Creek 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>
Kentuck Road and Fall Creek/Little Creek Road	Signalized	EB	B	10.0	B	11.7
		WB	B	11.7	A	9.1
		NB	A	9.2	B	12.4
		SB	A	6.4	A	7.4

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

The preliminary estimate of probable cost indicates that these improvements could cost approximately \$2,553,000 to design and construct. A more detailed breakdown of the cost is included in Appendix L.

Alternative 3 consists of shifting the alignments of Little Creek Road and Fall Creek Road and construction of a single-lane roundabout with widened approaches. These improvements are shown in Figure 19. The roundabout will help reduce delays and improve operation at this intersection, while also increasing the safety along this section of roadway. The intersection LOSs are shown in Table XII.

Table 12
Year 2035 – Kentuck and Fall Creek/Little Creek Alternative 3 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>
Kentuck Road and Fall Creek/Little Creek Road	Roundabout	EB	A	9.4	A	8.4
		WB	A	6.2	A	6.9
		NB	A	6.5	B	11.2
		SB	C	16.1	A	6.8

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

The preliminary estimate of probable cost indicates that these improvements could cost approximately \$3,016,000 to design and construct. A more detailed breakdown of the cost is included in Appendix L.

In review of these three alternatives described above, all will increase the capacity and safety 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, and this comparison is shown in greater detail in Section VI of this report.

VI. PREFERRED SPOT IMPROVEMENTS AND RECOMMENDATIONS

Three locations along this segment of Kentuck Road have been identified for improvement as a result of safety and capacity issues. The first area is at the intersection of Kentuck Road and Halifax Road. The second spot is at the intersection of Kentuck Road and Eagle Springs Road. The last location is at the intersection of Kentuck Road and Little Creek/Fall Creek Roads. Three alternative improvements were analyzed for the first location, two alternative improvements were discussed for the second location, and three alternative improvements were shown for the last location. As described in the previous section, the alternatives will vary in cost and benefit to the roadway and intersection.

Beginning with Location 1, all of the alternatives will increase capacity and safety. The alternative selected should provide the greatest benefit in traffic flow and public safety based upon the most recent traffic data and design guidelines at the time of selection. Based upon the data and analysis included within this report, the recommended alternative is the installation of a single lane roundabout with widened approaches on each leg (Alternative 3). This improvement will increase the capacity of the intersection and enhance the safety along this section of road. The installation of a traffic signal with turn lanes (Alternative 2) is not recommended at this time because the signal is not warranted per VDOT criteria. However, as the time for implementation of improvements approaches, new accident data and traffic volumes can be collected to determine if signal warrants are met based on this new data. If a signal is warranted then Alternative 2 is recommended. The alternative improvements at Location 2 are also focused on increasing the capacity and bringing the future no-build LOSs up to the acceptable range.

Both alternatives for Location 2 will increase the capacity of the intersection but to differing levels and costs. Dewberry Engineers, Inc. and Ramey Kemp & Associates, Inc. recommend that Alternative 2 (Figure 16) be selected for the Preferred Alternative. This alternative includes the removal of the northbound channelization and the addition of a 100-foot right-turn lane on the northbound approach and a 100-foot right-turn lane on the westbound approach. These improvements will help reduce delays and improve operation on the stop-controlled approaches, specifically adding capacity on the left-turn movement on the westbound approach. The final recommendations along this segment of Kentuck Road are at the intersection of Kentuck Road and Little Creek Road and Fall Creek Road.

All three alternatives will increase the capacity and safety of this intersection, but not all will bring the LOSs to the acceptable range. Dewberry Engineers Inc. and Ramey Kemp & Associates Inc. recommend that Alternative 2 (Figure 18) be selected for the Preferred Alternative. These improvements will provide for the greatest increase in capacity and safety of this intersection while attempting to minimize the impacts to the adjacent property owners.

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