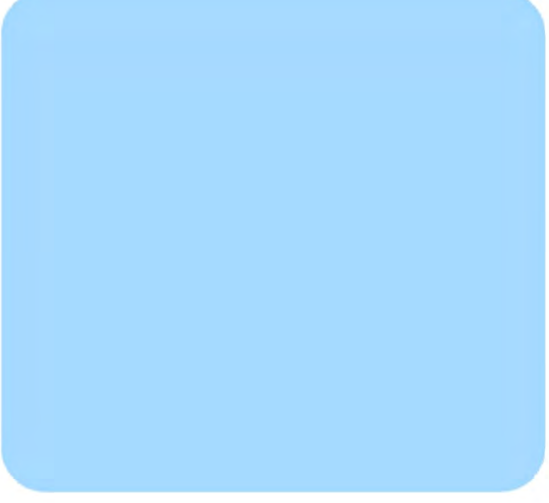
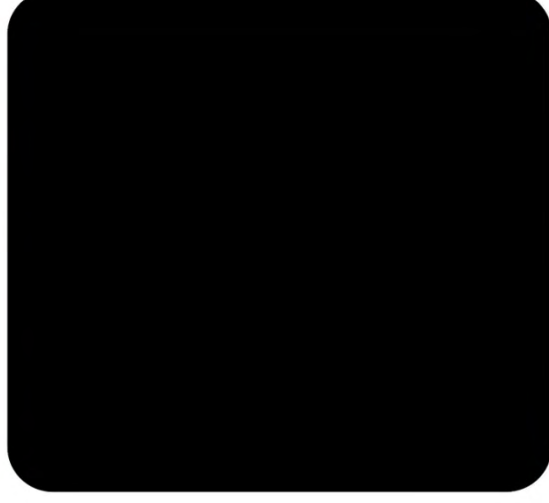
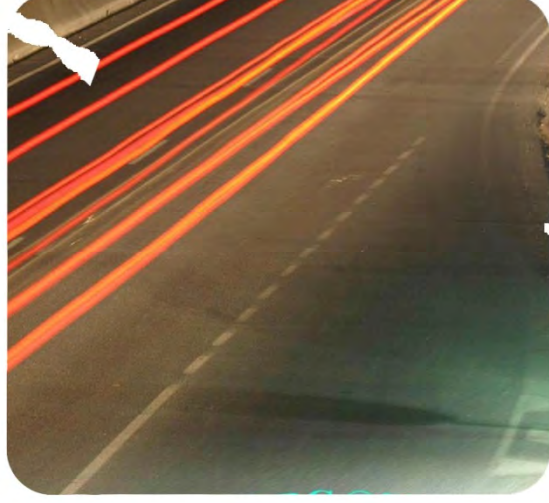
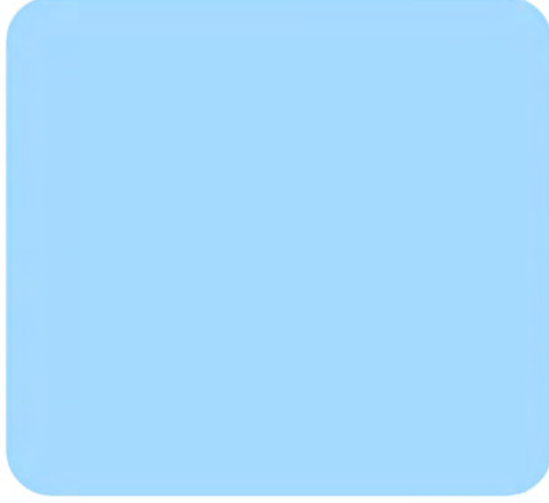


MOUNT CROSS ROAD IMPROVEMENT STUDY

FINAL REPORT FEBRUARY 2012



MOUNT CROSS ROAD IMPROVEMENT STUDY

FINAL REPORT

February 2012

**Prepared for:
DANVILLE-PITTSYLVANIA AREA
METROPOLITAN PLANNING ORGANIZATION**

**Prepared by:
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Richmond, Virginia**

The contents of this report reflect the view of the author(s) who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of the Federal Highway Administration and/or the Commonwealth of Virginia Transportation Board. This report does not constitute a standard, specification or regulation. FHWA acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental studies of alternatives may be necessary.

EXECUTIVE SUMMARY

The Danville-Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation (VDOT), the City of Danville, and Pittsylvania County engaged URS Corporation to conduct the Mount Cross Road (Route 750) Improvement Study. The goal of the improvement study is to define the optimal method for improving the existing two-lane section between the intersection with Lowes Drive to the east and the intersection with Whitmell School Road to the west.

The corridor through which Mount Cross Road passes is located in both the City of Danville to the east and Pittsylvania County to the west. Planning for improvements to this corridor has evolved up to and including the *Year 2035 Long-Range Transportation Plan* (August 2010 adoption), which recommended an improvement in the form of widening the existing pavement section in Danville to 4 lanes from the existing 2 lanes. The planned widening begins at Lowes Drive and ends at the Pittsylvania County line.

This improvement study is intended to provide the MPO and local governments with a detailed planning level assessment of the options for improving the roadway by providing conceptual alternatives for the MPO to consider.

EXISTING CONDITIONS

Volumes and Service Levels: Morning and afternoon peak hour turning movement traffic counts were conducted at 9 intersections. Volumes were estimated at an additional 16 intersections. Automated daily directional counts were also conducted at three corridor locations.

Capacity analysis results show that during the AM peak hour all of the intersections operate with adequate service levels, and during the PM peak hour two intersections exhibit deficiencies: 1) The Mill Creek intersection operates with LOS E; and, 2) the West Parker Road intersection operates with LOS F. These poor service levels are primarily a product of heavy through volumes on Mount Cross Road and not a product of insufficient capacity on the minor street approaches.

Queuing analysis shows that no major deficiencies occur at the unsignalized intersections. At the signalized intersection with Lowes Drive, queues become moderately lengthy during the heaviest (95th percentile) traffic volume conditions but do not extend beyond available storage during average (50th percentile) traffic volume conditions.

Safety: A three-year history of crash records was reviewed, and the results showed that the most frequent types of crashes involved rear end collisions and angle collisions. Crash locations are evenly distributed along the corridor.

When compared with statewide average crash rates for an urban minor arterial roadway, the rates on Mount Cross Road between Lowes Drive and Golf Club Road are substantially higher.

ENVIRONMENTAL RESOURCES

A detailed scan of environmental resources in the Mount Cross Road corridor study area was conducted, and known resources were mapped. This inventory does not indicate the presence of any constraints that are likely to compromise the ability of either VDOT or the County to implement recommended actions. In contrast, along the segment in the City of Danville, four sites of potential hazardous materials will need further documentation as design activities are initiated.

Four previously recorded cultural resource sites are located near the Mount Cross Road Improvement Study project area, but they are unlikely to be designated as significant historic resources. They may require more detailed evaluation associated with project development activities.

During the field reconnaissance, the archaeological sensitivity of the project area was also assessed. Generally, the project area is considered to have a low potential for containing intact archaeological sites.

YEAR 2035 FORECASTED CONDITIONS

No Build Alternative: Forecasts of year 2035 traffic volumes were developed. A major factor in the high rate of forecasted volume growth is the Mega Park, a major economic development site located along Berry Hill Road south of U.S. Route 58 West and west of the Danville Expressway.

When compared with existing conditions, forecasted service analyzed under the year 2035 No Build Alternative deteriorates by several levels. The most severe deterioration is forecast to occur at Whitmell School Road, Fox Trail Road, Oakland Drive, Mill Creek Road, West Parker Road, and Moorefield Bridge Road. Poor service levels are due to forecasted traffic volumes on Mount Cross Road becoming sufficiently high so that adequate gaps in the traffic stream will be less frequent, and motorists on the minor street approaches will encounter increased delay before safely entering the traffic stream.

Queuing analysis indicates that although vehicle queue lengths will increase, average queues at unsignalized intersections will not exceed storage capacity.

STATEMENT OF PURPOSE AND NEED

State regulation define Access Management as *"...the systematic control of the location, spacing, design, and operation of entrances, median openings, traffic signals, and interchanges for the purpose of providing vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system"* (See 24VAC30-72-10).

The goals of access management are to:

1. Reduce traffic congestion;
2. Help maintain levels of service;

3. Enhance public safety;
4. Support economic development;
5. Reduce the need for new highways;
6. Preserve investment in new highways; and,
7. Coordinate transportation and land use decisions.

After applying these goals within the regulatory definition of Access Management and considering the results of the analysis of existing and forecasted conditions, the statement of purpose and need for the Mount Cross Road Improvement Study is defined as addressing the following issues:

1. Along the segment Mount Cross Road located within the City of Danville, the *FY2012 Six-Year Transportation Improvement Program* provides for spot safety and access management improvements. These should be defined so that the City may pursue final design;
2. Pittsylvania County needs a guide to assist property owners and developers to understand the impacts of the application of access management regulations along a Urban Minor Arterial and a Rural Major Collector;
3. Frequencies of crashes along Mount Cross Road have the potential to increase as traffic volumes and development activity increases;
4. Service levels in the area of six intersections are forecast to deteriorate to inadequate levels unless improvements are developed and installed; and,
5. Capacity along the corridor should be preserved so that it can adequately serve traffic volumes associated with commuters to and from the Mega Park.

IMPROVEMENT ALTERNATIVES

As recommended in the *Long Range Transportation Plan*, the segment of Mount Cross Road in the City of Danville is to be widened. Initially, a 4-lane section (Alternative 1) with a divided median and a 5-lane section (Alternative 2) with a center two-way left turn lane were developed and presented to the study team. An interim improvement, Alternative 3, was also developed in order to have a design that might be implemented in the short term. Finally, a hybrid alternative, Alternative 4, was developed to control costs by widening only as far as the programmed \$6 million would finance. Instead of widening to the County limits, Alternative 4 terminates widening near Salem Road. West of Salem Road Alternative 4 provides for paved shoulders, each with a width of 8 feet, on the existing two-lane section.

For the segment of Mount Cross Road in Pittsylvania County, improvement alternatives focused on access management and safety measures. No widening is planned.

EVALUATION CRITERIA: Eight evaluation criteria were used to evaluate the improvement alternatives:

1. Capacity
2. System Performance
3. Safety
4. Cost
5. Right Of Way Impacts
6. Environmental Impacts
7. Financial Impacts
8. Consistency with Local Plans

COST ESTIMATES: Cost estimates were prepared for each proposed improvements related to the access management segments of the corridor (in Pittsylvania County)

Each of the proposed new traffic signals will cost approximately \$170,000 (in 2011 dollars). Traffic signals were warranted (based on 2035 volumes) at the following intersections:

- Whitmell School Road
- Moorefield Bridge Road
- Golf Club Road
- Mill Creek Road

Several turn lanes were warranted at study area intersections, and each of these will cost approximately \$120,000. Turn lanes were warranted at the following Mount Cross Road intersections based on forecasted 2035 volumes:

- Westbound right turn lane @ Whitmell School Road
- Westbound left turn lane @ Moorefield Bridge Road
- Eastbound left turn lane @ Moorefield Bridge Road
- Northbound left turn lane @ Moorefield Bridge Road
- Westbound left turn lane @ Pinecroft Road
- Westbound left turn lane @ Golf Club Road
- Westbound left turn lane @ Mill Creek Road

Cost estimates for the alternative improvements to Mount Cross Road in the City of Danville are as follows:

- Alternatives 1 & 2 \$7,500,000
- Alternative 3 \$2,030,000
- Alternative 4 \$6,000,000

In addition to the widening improvements on Mount Cross Road, a separate right turn lane with an estimated cost of \$190,000 was recommended on the westbound Mount Cross Road approach to Lowes Drive.

BUILD ALTERNATIVE: Capacity analysis of the Build Alternative was conducted for both a 4-lane (Alternative 1) and a 5-lane section (Alternative 2) on Mount Cross Road for the segment in the City. In the County, the Build Alternative consisted of turn lane improvements and the installation of traffic signals.

Based on the 4-hour traffic signal volume warrant, four intersections will meet the warrants for a traffic signal under forecasted year 2035 traffic volumes: Whitmell School Road, Moorefield Bridge Road, Golf Club Road, and Mill Creek Road. Based on the need for a traffic signal at the Moorefield Bridge Road intersection, left turn lanes will be required to achieve optimal signal operation on all approaches with the exception of the southbound approach.

CAPACITY ANALYSIS: The results of capacity analysis of the intersection of Lowes Drive and Mount Cross Road forecast adequate levels with level service at B and C in the AM and PM peak hours, respectively. Improvement over the No Build Alternative was achieved by applying a shorter traffic signal cycle length and by the reconfiguration of the westbound Lowes Drive approach lanes.

At the unsignalized intersections, with only one exception capacity analysis forecasts operations at service levels no lower D. The exception is the intersection of West Parker Road and Mount Cross Road. The low service level is a result of heavy through volumes on Mount Cross Road making it difficult for motorists on the minor street desiring to turn left to complete their maneuver. This intersection does not appear to have sufficient forecasted volumes to meet traffic signal warrants.

Finally, the results of the queuing analysis of the forecast year 2035 Build Alternative volumes indicate that no lengthy vehicle queues are likely to form on any of the intersection approaches.

PREFERRED ALTERNATIVE

After reviewing the impacts of the four improvement alternatives in the City of Danville and the safety improvements in Pittsylvania County, evaluating traffic operations and cost estimates, and considering concerns expressed by citizens, URS Corporation recommended to the Project Management Team that for the segment of Mount Cross Road in the City of Danville Alternative 4, providing for widening Mount Cross Road and shoulder improvements (shown in **Figures 12-A and 12-B** be selected as the Preferred Alternative. URS Corporation further recommended that for the segment of Mount Cross Road in Pittsylvania County the improvements shown in **Figures 13-16** be selected as the Preferred Alternative.

When compared with the other alternatives, including the No Build Alternative, the Preferred Alternative was selected because of the following principal reasons:

1. It (the Preferred Alternative) provides for the greatest extent of improvements within the budget for improvements as detailed in the current VDOT *FY2012-2017 Six-Year Improvement Program*;

2. It addresses all existing and forecasted deficiencies along the corridor, with emphasis on addressing safety and access management;
3. The environmental impacts of the Preferred Alternative are not anticipated to be either severe or extensive;
4. It provides the MPO and VDOT with the option to extend the length of the widening section to the Pittsylvania County limits if additional funding becomes available;
5. It provides the option to include added improvements (such as the northbound right turn lane on the Lowes Drive approach) either concurrently with the widening or at a later date; and,
6. It is consistent with the 2035 Long-Range Transportation Plan and the Six-Year Improvement Program.

FINANCIAL IMPACTS

Implementing the Preferred Alternative (including the westbound right turn lane) on the Mount Cross Road segments in the City of Danville will require that financing be provided to cover the estimated \$6.2 million cost.

The *Danville-Pittsylvania Area Long-Range Transportation Plan* identifies anticipated funding resources on an annual basis beginning in Fiscal Year 2010¹. The funding resources indicate that beginning in Fiscal Year 2016, construction funding for roadway improvements in the Danville-Pittsylvania urbanized area is anticipated to be approximately \$2.4 million per year. Of that total, \$75,658 is allocated for the secondary road system in Pittsylvania County, leaving approximately \$2.3 million for other improvements on the primary, secondary or urban system.

For the improvements to Mount Cross Road in Pittsylvania County, construction funding may be allocated from the secondary roadway fund, the MPO funds or from safety funds. Moreover, unlike the improvements in the City, the individual improvements in the County can be implemented at different times. With this flexibility, the improvements can be individually implemented when they achieve a sufficient level of priority relative to other needed improvements that the MPO in cooperation with Pittsylvania County and VDOT program the funds in the appropriate *SYIP* fiscal year.

PERMIT EVALUATION

For the segment of Mount Cross Road in Pittsylvania County, the data produced by the environmental resource scan does not indicate the presence of any constraints that are likely to compromise the ability of either VDOT or the County to implement recommended actions.

¹ *Danville-Pittsylvania Area Long-Range Transportation Plan*. Danville-Pittsylvania MPO. August 16, 2010. p.55.

In contrast, along the segment in the City of Danville, four sites of potential hazardous materials will need further documentation as design activities are initiated. Moreover, no significant cultural resource sites have been found to be located in the study area. Finally, the Preferred Alternative does not appear to involve activities in state waters and wetlands, so a permit will not be required.

PUBLIC INVOLVEMENT

The public involvement program conducted as part of the corridor study provided two opportunities for interested citizens to participate in the process.

The first Citizens Information Meeting was held on Monday, July 11, 2011 between 4 p.m. and 7 p.m. at Park Avenue Elementary School in Danville, Virginia. A total of twenty citizens signed the attendance sheet.

The second Citizen Information Meeting was conducted on Monday, September 19, 2011, between 4 p.m. and 6 p.m. at Park Avenue Elementary School in Danville, Virginia. A total

of nine citizens signed the attendance sheet. Four written comments were submitted, with one requesting more detail on the impacts the proposed improvements would have on a particular site, and the remaining three comments suggesting operational improvements (signals, warning signs, for example). No written or verbal comments expressed opposition to improvements to Mount Cross Road.

A summary presentation and discussion was conducted at an informal meeting of the Danville City Council on November 15, 2011 at Danville City Hall. Finally, an additional opportunity for citizen comment was provided at the public hearing, which was held immediately prior to the meeting of the MPO Board on January 19, 2012 at the Danville Regional Airport.

MOUNT CROSS ROAD IMPROVEMENT STUDY

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I. INTRODUCTION

The Danville-Pittsylvania Metropolitan Planning Organization (MPO) in cooperation with the Virginia Department of Transportation (VDOT), the City of Danville, and Pittsylvania County engaged URS Corporation to conduct the Mount Cross Road (Route 750) Improvement Study. The goal of the improvement study is to define the optimal method for improving the existing two-lane section between the intersection with Lowes Drive to the east and the intersection with Whitmell School Road to the west. The study area is shown in **Figure 1**.

The 6.3 mile long corridor through which Mount Cross Road passes is located in both the City of Danville to the east and Pittsylvania County to the west. Planning for improvements to this corridor has evolved up to and including adoption of the *Year 2035 Long-Range Transportation Plan* (August 2010 adoption), which recommended an improvement in the form of widening the existing pavement section in the City of Danville to 4 lanes from the existing 2 lanes¹. The planned widening begins at Lowes Drive and ends at the Pittsylvania County line. Funding in the Transportation Plan for the segment located within Danville includes completion of construction, but no schedule has been set. In contrast, no funding for widening Mount Cross Road in Pittsylvania County was included in the Transportation Plan.

In addition to providing for the eventual widening of Mount Cross Road in the City, the Long-Range Transportation Plan and VDOT's *FY2012-2017 Six-Year Transportation Improvement Program (SYIP)* includes the project, Mount Cross Road Spot Improvements and Access Management project (UPC 100822) from Lowes Drive to the West Corporate Limits of the City of Danville. This project provides for operational and safety improvements to reduce vehicle conflicts and preserve capacity along the corridor. It does not specifically provide for widening the existing two-lane facility.

The *SYIP* estimates the project cost at \$6,000,000, and schedules the start of construction in FY 2014. Of the project funding allocations, \$2,000,000 has been identified from previous allocations and the remaining \$4,000,000 funding allocation will be required after FY2017. It is expected that this schedule and funding allocation will be revised as additional funds become available. In summary, the Transportation Plan provides for two improvements to Mount Cross Road in the City of Danville: 1) Spot Improvements and Access Management, which is funded and scheduled in the *SYIP*, and 2) Widening, which is neither funded nor scheduled.

This improvement study is intended to provide the MPO and local governments with a detailed planning level assessment of the options for improving the roadway. It will provide conceptual alternatives for the MPO to consider. This report offers recommendations, plus details the other practical alternatives considered. Ideally, the

¹ *Technical Report, Danville-Pittsylvania Long-Range Transportation Plan: Year 2035*. Danville-Pittsylvania Metropolitan Planning Organization. August, 16, 2010. p. 47.

study will provide the MPO, the City and the County with recommendations that can be incorporated into local plans and policies so that the alignment of the preferred alternative can be preserved.

I.1 STUDY PURPOSE

The purpose of this study is to identify improvements that maintain or increase capacity and safety on Mount Cross Road. In Pittsylvania County the study considers access management applications (i.e. turn lanes, access spacing, signs, markings, etc.). In the City of Danville the study considers both access management techniques as well as widening Mount Cross Road to improve capacity.

I.2 PUBLIC INVOLVEMENT

The public involvement process included two Citizen Information Meetings. The first was held on July 18, 2011, and the second was held on September 19, 2011. Both meetings were informal and were held at Park Avenue Elementary School in Danville. At the first meeting, citizens were presented with basic information such as traffic volumes, crash data, and forecasts of year 2035 conditions without any improvements (the No Build Alternative). They were asked to provide comments and suggestions on what should be considered in the development of alternatives.

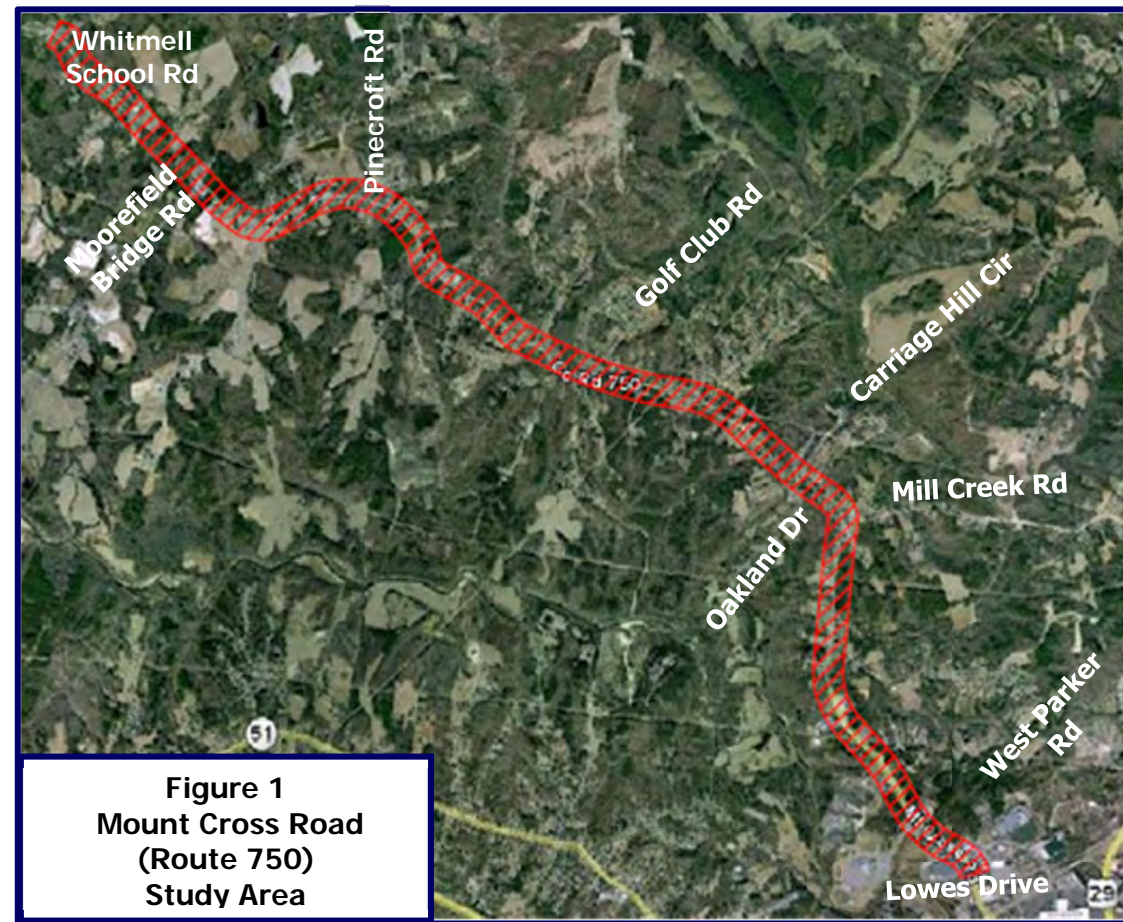
Approximately 10 days after the first Citizen Information Meeting, a website was established to provide citizens the opportunity to view study documents and provide comments. The website, which also provides information on three other MPO corridor studies, will remain active until June 30, 2012.

At the second Citizens Information Meeting, citizens were shown the alternatives, the results of their evaluation, the consultant's preferred alternative, and the reasons for the selection of the preferred alternative. Here again, they were asked to provide comments.

A summary presentation and discussion was conducted at an informal meeting of the Danville City Council on November 15, 2011 at Danville City Hall. Finally, an additional opportunity for citizen comment was provided at the public hearing, which was held immediately prior to the meeting of the MPO Board on January 19, 2012 at the Danville Regional Airport.

I.3 REPORT FORMAT

Following this introduction, Section II provides a summary of existing conditions. Environmental constraints are documented in Section III. The Year 2035 No Build Alternative will be described with a statement of the purpose and need for Mount Cross Road improvements in Section IV. Next, Section V summarizes the development and analysis of the alternatives, and Section VI summarizes the study's findings and confirms the recommended alternatives for Mount Cross Road.



7. Whitmell School Road
8. Moorefield Bridge Road
9. Carriage Hill Circle

The a.m. peak period occurs between 7:00-9:00 a.m. and the p.m. peak period occurs between 4:00-6:00 p.m. Traffic count data has been aggregated in 15-minute intervals during these periods, and the peak hour is defined as the four consecutive 15-minute intervals when traffic volumes are the highest during the 2-hour peak period.

Traffic signal timings used to conduct capacity analysis for the existing conditions were provided by the City of Danville, and the only existing traffic signal is located at the Lowes Drive intersection.

Traffic volumes on other streets and driveways that intersect Mount Cross Road within the study area were estimated. Estimates of traffic were based on the number of residences (determined from recent aerial photography) located on the side streets using trip rates published in *Trip Generation*. Traffic volumes on Mount Cross Road at these estimated intersections were derived from adjacent intersections that were counted as a part of this study. Estimates of traffic volumes were made for the following streets that intersect Mount Cross Road:

1. Womack Road
2. Rosewood Court
3. Carter Drive
4. Kerr Lane
5. Woodhaven Drive
6. Kent Lane
7. Carter Farms Lane
8. Brush Arbor Court
9. Deerfield Lane
10. Carriage Hill Drive
11. Astin Road
12. Carriage Hill Circle
13. Ottawa Lane
14. Olde Hunting Trail
15. Cedar Trail
16. Jamerson Road

Peak hour turning movement counts for study area intersections are summarized in **Figure 2: Existing Conditions Traffic Volumes and Service Levels.**

II. EXISTING CONDITIONS

Existing conditions on Mount Cross Road were documented using traffic count data collected in the field and through the review of traffic data and reports by others.

II.1 TRAFFIC COUNTS

Turning movement traffic counts were conducted during the AM and PM peak periods in April and May of 2011 at the following intersections:




1. Lowes Drive
2. West Parker Road/Dimon Drive
3. Mill Creek Road/Mount Olivet Lane
4. Oakland Drive
5. Golf Club Road
6. Pinecroft Lane

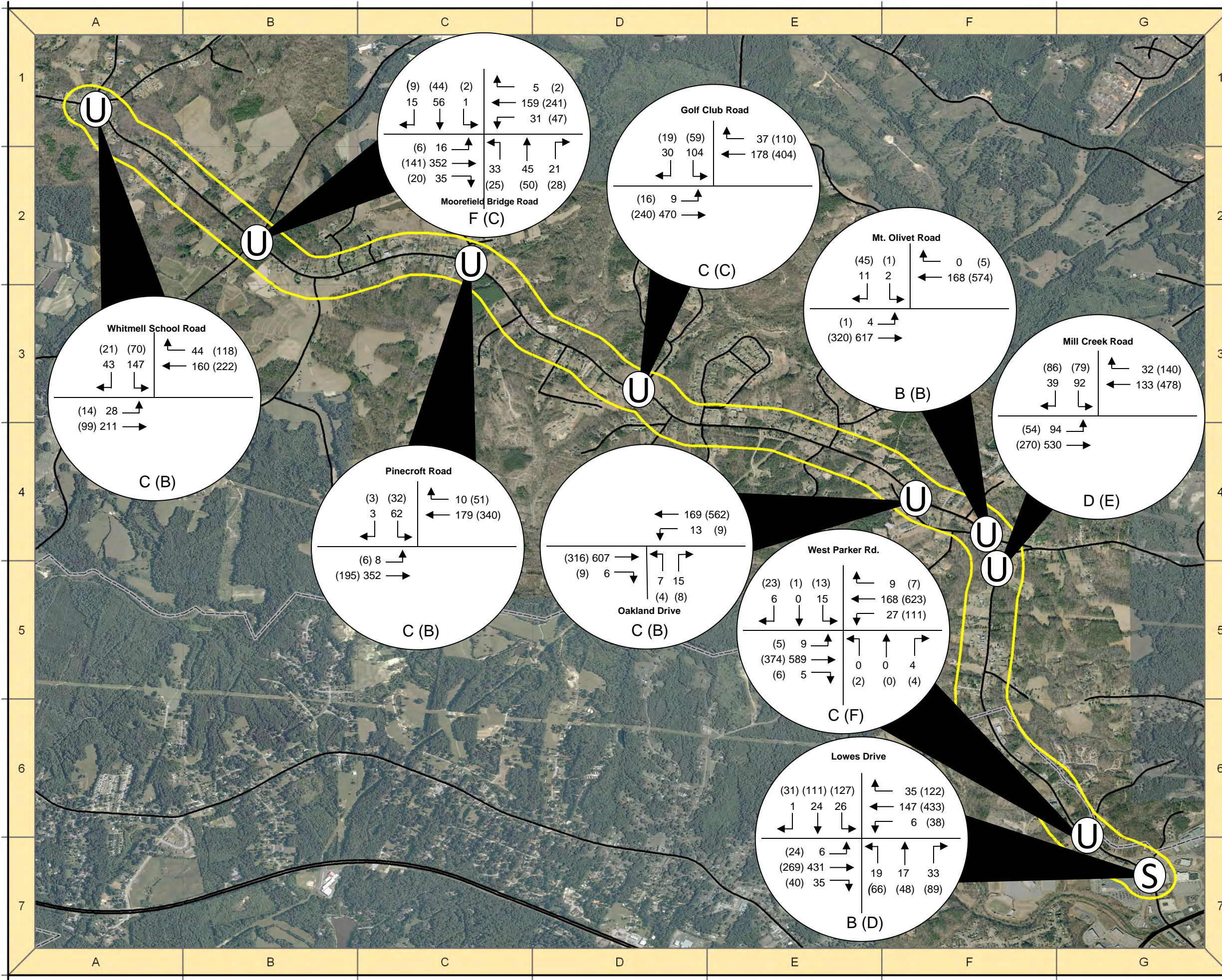
Mount Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
Danville, Virginia

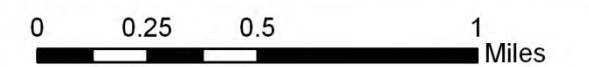
Figure 2: Existing Conditions Traffic Volumes and Levels of Service

Legend

-  – Study Area
- 54 (65) – AM (PM) Peak Hour Volumes
- B (C) – AM (PM) Level of Service
-  – Signalized Intersection
-  – Unsignalized Int.



February 2012



Automated daily directional traffic counts were collected on the following segment of Mount Cross Road:

1. Lowes Drive to West Parker Road
2. Carriage Hill Circle to Oakland Drive
3. Ottawa Drive to Whitmell School Road

Table 1 displays a summary of the daily directional traffic counts on Mount Cross Road.

TABLE 1 Daily and Peak Hour Traffic Volume Counts				
Mount Cross Road Segment	Direction	Daily Volume	AM Peak Hour	PM Peak Hour
Lowes Drive to West Parker Road	EB	5,869	624	414
	WB	6,176	219	740
	Total	12,045	843	1,154
Carriage Hill Circle to Oakland Drive	EB	4,997	613	351
	WB	5,051	172	613
	Total	10,048	785	964
Ottawa Drive to Whitmell School Road	EB	2,440	229	192
	WB	3,730	511	319
	Total	6,170	740	511

II.2 CAPACITY ANALYSIS

The intersection capacity analyses were performed using Synchro 7 software which develops estimates of service levels using the methodology developed in the *Highway Capacity Manual* (HCM 2000). Capacity analysis is used to determine a Level of Service (LOS) for a given intersection, and the analysis procedures differ depending upon the type of traffic control at the intersection - signalized or unsignalized. The LOS is based on estimated average vehicle delay, and service levels range from LOS A, the best, to LOS F, the worst. Table 2 provides a conceptual description of service levels.

TABLE 2 LEVELS OF SERVICE (LOS) CONCEPTUAL DESCRIPTIONS		
LOS A	Free-flow conditions	Vehicles can maneuver within the traffic stream and easily maintain the posted speed limit.
LOS B	Stable flow conditions	A spatial separation of vehicles allows easy maneuverability and drivers can maintain the posted speed.
LOS C	Stable flow conditions	Maneuverability and speeds are more restricted with higher traffic volumes.
LOS D	Approaches unstable flow conditions	Temporary restrictions to the traffic flow may cause substantial drops in operating speed and drivers have little freedom to maneuver.
LOS E	Represents the capacity of the facility	The traffic flow is unstable, vehicles are unable to pass, and there may be momentary stoppages in the traffic flow.
LOS F	Forced flow conditions	Traffic has low operating speeds and volumes exceeding capacity. This is often described as "stop and go" conditions.

In general, LOS A and LOS B indicate little or no delay, LOS C indicates modest delay, LOS D indicates delay is increasing and noticeable, LOS E indicates the limit of acceptable delay and LOS F is characteristic of over-saturated conditions. A graphic illustration of the concept of service is provided in Figure 3.

Table 3 shows the intervals of average vehicle delays (in seconds) and the resulting level of service for each interval. Service levels for signalized intersections are based on the average vehicle delay for all vehicles using the intersection. In contrast, service levels for unsignalized intersections are based on the longest average vehicle delay for a minor street approach movement. At unsignalized intersections the lowest individual movement level of service typically involves left turn movements from the minor street.



Source: Pictures provided by the Department of Transportation Bureau of Transportation Statistics and the MIT Center for Transportation Studies @1995

Figure 3: Conceptual Examples of Levels of Service

Level of Service	Unsignalized Intersections	Signalized Intersections
A	≤10	≤10
B	>10≤15	>10≤20
C	>15≤25	>25≤35
D	>25≤35	>35≤55
E	>35≤50	>55≤80
F	>50	>80

Source: Highway Capacity Manual

Table 4 presents a summary of the existing conditions levels of service for all of the unsignalized intersections on the Mount Cross corridor. Values shown in the table are for the worst individual movement level of service. The minor street left turn movement has the highest delay in most situations. The analysis shows that during the AM peak hour all of the intersections operate with adequate service levels (LOS C or better), with

the exception of the Mill Creek Road, which exhibits LOS D. Similarly, the analysis shows that all of the intersections in the PM peak hour operate with adequate service levels with the exception of two intersections: 1) The Mill Creek intersection operates with LOS E; and, 2) the West Parker Road intersection operates with LOS F. These poor service levels are primarily a product of heavy through volumes on Mount Cross Road and not a product of insufficient capacity on the minor street approaches.

Intersection	AM Delay	AM LOS	PM Delay	PM LOS
Whitmell School @ Mt. Cross Rd.	17.1	C	12.8	B
Pincroft Rd. @ Mt. Cross Rd.	15.9	C	13.5	B
Fox Trail Rd. @ Mt. Cross Rd.	21.1	C	19.4	C
Oakland Dr. @ Mt. Cross Rd.	15.6	C	13.7	B
Mt. Olivet Rd. @ Mt. Cross Rd.	11.2	B	14.9	B
Mill Creek Rd. @ Mt. Cross Rd.	31.0	D	35.1	E
West Parker Rd. @ Mt. Cross Rd.	21.7	C	70.3	F
Womack Dr. @ Mt. Cross Rd.	0.0	A	0.0	A
Carter Dr. @ Mt. Cross Rd.	13.9	B	13.7	B
Kerr Ln. @ Mt. Cross Rd.	14.5	B	17.9	C
Kent Ln. @ Mt. Cross Rd.	13.9	B	16.6	C
Brush Arbor Ct. @ Mt. Cross Rd.	15.1	C	17.3	C
Carriage Hill Dr. @ Mt. Cross Rd.	15.2	C	17.4	C
Carriage Hill Cir. @ Mt. Cross Rd.	14.6	B	16.8	C
Olde Hunting Tr. @ Mt. Cross Rd.	15.8	C	17.1	C
Cedar Tr. @ Mt. Cross Rd.	12.9	B	10.1	B
Rosewood Ct. @ Mt. Cross Rd.	13.5	B	12.6	B
Jamerson Rd. @ Mt. Cross Rd.	17.1	C	18.4	C
Woodhaven Dr. @ Mt. Cross Rd.	13.5	B	13.4	B
Deerfield Ln. @ Mt. Cross Rd.	12.0	B	9.2	A
Astin Ln. @ Mt. Cross Rd.	11.2	B	9.3	A
Ottawa Ln. @ Mt. Cross Rd.	11.0	B	9.3	A
Carter Farms Ln. @ Mt. Cross Rd.	11.8	B	11.3	B

Note: The individual approach movement with the lowest level of service and delay is shown for each unsignalized intersection.

Table 5 displays a summary of the service levels for the signalized intersection of Lowes Drive and Mount Cross Road. In the AM peak hour the overall intersection level of service is B, and several of the individual movements are operating with marginally adequate LOS D conditions. In the PM peak hour the overall intersection service level deteriorates to D, with many of the individual movements operating with LOS D and E. Poor service levels at these locations are a product of moderately high traffic volumes combined with a long traffic signal cycle length.

Table 5 Summary of Existing Conditions Capacity Analysis (HCM)				
Lowes Drive @ Mount Cross Road				
Movement	AM Delay	AM LOS	PM Delay	PM LOS
EB Lowes Drive – Left/Through	36.1	D	67.6	E
EB Lowes Drive - Right	33.9	C	55.1	E
WB Lowes Drive - Left/Through	39.9	D	68.8	E
WB Lowes Drive - Right	32.9	C	43.7	D
NB Mount Cross Road - Left	45.5	D	67.2	E
NB Mount Cross Rd. - Through/Right	10.0	A	25.4	C
SB Mount Cross Rd. - Left	49.7	D	70.0	E
SB Mount Cross Rd. - Through	11.0	B	23.0	C
SB Mount Cross Rd. - Right	9.3	A	21.3	C
Overall Intersection	17.0	B	40.8	D

SimTraffic was used to estimate vehicle queue lengths under existing conditions, and the results are shown in **Table 6**. *SimTraffic* is a microsimulation software package that is frequently used with *Synchro* as an analysis tool in traffic engineering. The queues shown in **Table 6** reflect the longest individual movement queue lengths at each intersection. The longest queue generally occurs at the minor street left turn movement. The results indicate queues are relatively short (less than 100 feet in length) at nearly all of the study area intersections. The longest estimated vehicle queue lengths tended to occur at the intersections with heavier left turn volumes from the minor street, such as at Whitmell School Road, Mill Creek Road, and Moorefield Bridge Road.

To convert queue lengths measured in feet to vehicles, the length of the queue is divided by 25 feet. *SimTraffic* also provides the estimated queue length both under average traffic volume conditions and under the heaviest (95th%) traffic volume conditions.

Table 6 Summary of Existing Conditions Queuing Analysis (SimTraffic) Longest Individual Movement Queue: Unsignalized Intersections				
Intersection	AM Average	AM 95%	PM Average	PM 95%
Whitmell School Rd. @ Mt. Cross Rd.	50	87	30	53
Pincroft Rd. @ Mount Cross Rd.	21	41	16	40
Fox Trail Rd. @ Mount Cross Rd.	42	68	32	56
Oakland Dr. @ Mount Cross Rd.	16	41	11	34
Mount Olivet Rd. @ Mount Cross Rd.	6	21	20	45
Mill Creek Rd. @ Mount Cross Rd.	46	72	62	106
West Parker Rd. @ Mount Cross Rd.	12	39	24	49
Womack Dr. @ Mount Cross Rd.	0	0	0	0
Carter Dr. @ Mount Cross Rd.	2	14	2	15
Kerr Ln. @ Mount Cross Rd.	4	20	5	23
Kent Ln. @ Mount Cross Rd.	6	25	3	18
Brush Arbor Ct. @ Mount Cross Rd.	13	37	9	32
Carriage Hill Dr. @ Mount Cross Rd.	11	34	11	34
Carriage Hill Cir. @ Mount Cross Rd.	9	32	9	31
Olde Hunting Tr. @ Mount Cross Rd.	22	48	19	44
Cedar Tr. @ Mount Cross Rd.	0	0	1	10
Rosewood Ct. @ Mount Cross Rd.	13	37	11	34
Jamerson Rd. @ Mount Cross Rd.	26	51	18	4
Woodhaven Dr. @ Mount Cross Rd.	10	32	10	33
Deerfield Ln. @ Mount Cross Rd.	11	34	7	28
Astin Ln. @ Mount Cross Rd.	11	33	7	27
Ottawa Ln. @ Mount Cross Rd.	9	33	5	23
Carter Farms Ln. @ Mount Cross Rd.	9	34	10	33
Moorefield Br. Rd. @ Mt. Cross Rd.	42	72	39	63

Table 7 presents a summary of the estimated queue lengths for the signalized intersection of Lowes Drive and Mount Cross Road. In the AM peak hour all movement had queue lengths below 100 feet in length. Heavier volumes during the PM peak hour produced longer queues. Longer queues are present on the eastbound and westbound through/left movements during the PM peak hour.

Table 7 Summary of Existing Conditions Queuing Analysis (SimTraffic) Lowes Drive @ Mount Cross Road				
Movement	AM Average	AM 95%	PM Average	PM 95%
EB Lowes Drive – Left/Through	26	63	85	146
EB Lowes Drive - Right	16	31	24	35
WB Lowes Drive - Left/Through	40	85	174	263
WB Lowes Drive - Right	1	10	38	174
NB Mount Cross Road - Left	7	26	40	92
NB Mount Cross Rd. - Through/Right	15	41	126	219
SB Mount Cross Road - Left	4	20	31	71
SB Mount Cross Road - Through	29	71	64	119
SB Mount Cross Road - Right	7	27	16	51

Table 8 summarizes the service levels for Mount Cross Road as a 2-lane facility from West Parker Road to the City/County line. This is the segment of Mount Cross Road that is being considered for widening and for which widening has been included in the Long Range Transportation Plan.

In capacity analysis, two-lane facilities like Mount Cross Road are evaluated based on the percent time the average motorist spends following another vehicle. Based on the “percent time spent following” (PTSF) a letter grade is defined for the level of service. Additionally, the analysis calculates the volume to capacity ratio (V/C = 1 is the capacity of the road). The analysis shows LOS C for both directions on Mount Cross Road in the AM peak hour and LOS D for both directions in the PM peak hour. It should be noted that this segment of Mount Cross Road does not provide any passing zones, a condition that has a significant influence on the percent time spent following and the resulting level of service.

Table 8
Existing Conditions Service Levels
Two-Lane Roadway

Mount Cross Rd. (from West Parker Dr. to City/County Line)			
Peak Hour/Direction	LOS	PTSF	V/C
AM/Northbound	C	60.0%	0.12
AM/Southbound	C	66.3%	0.44
PM/Northbound	D	77.7%	0.48
PM/Southbound	D	70.1%	0.25

11.3 CRASH FREQUENCIES

Study area crash records maintained by the City of Danville for the years 2007-2009 and crash records maintained by VDOT for the years 2005-2007 were reviewed. The results are summarized in **Figure 4: Crash Records Map**. A total of 100 crashes were reported on Mount Cross Road. The crashes resulted in 74 injuries and 1 fatality. City crash records do not include the type of crash (i.e. rear end, angle, etc.). VDOT crash rates in the County showed the most frequent types of crashes involved rear end collisions – 27, angle collisions – 14, and collisions with fixed-object off-road – 14 (out of 63 crashes in the County). Rear end crashes are the most frequent crash type due to a combination of frequent driveway access points, an absence of turn lanes and driver inattention.

From a corridor-wide perspective, the crashes exhibited in **Figure 4** show a relatively even distribution. That is, crashes are not clustered in certain locations – at intersections, for example. When combined with the relatively high percentage of crashes involving off-road obstructions, the crash patterns indicate that special attention should be placed on roadway geometry in developing improvement alternatives.

Table 9 presents a summary of the crash rates by segment, and the results indicate that crash rates vary. In considering the data in **Table 9**, it should be noted that the Mount Cross Road corridor west of Lowes Drive is grouped into two functional classifications. In the urbanized area (Lowes Drive to Golf Club Road) the classification is Urban Minor Arterial. Outside of the urbanized area (Golf Club Road to Whitmell School Road) the classification is Rural Major Collector. Average statewide crash rates for each functional classification differ.

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Figure 4: Crash Records Map

Legend

- - Property Damage Only Crash
- - Injury Crash
- - Fatal Crash

City Crash Data Dates – 2007-2009
County Crash Data Dates – 2005-2007

Statewide Average Crash Rates for Urban Minor Arterials (2005-2007)

- Crash Rate – 98.0 per 100 million miles traveled
- Injury Rate – 48.7 per 100 million miles traveled
- Fatality Rate – 0.4 per 100 million miles traveled

Statewide Average Crash Rates for Rural Major Collectors (2005-2007)

- Crash Rate – 143.7 per 100 million miles traveled
- Injury Rate – 84.3 per 100 million miles traveled
- Fatality Rate – 139.3 per 100 million miles traveled

Moorefield Bridge Rd. – Golf Club Rd.
Total Crashes – 14; Rate – 120.4
Injuries – 9; Rate – 77.4
Fatalities - 0

Whitmell School Rd. – Moorefield Bridge Rd.
Total Crashes – 15; Rate – 253.7
Injuries – 5; Rate – 84.6
Fatalities – 1; Rate – 4.0

Golf Club Rd. – Mill Creek Rd.
Total Crashes – 26; Rate – 154.0
Injuries – 28; Rate – 165.8
Fatalities - 0

Mill Creek Rd. – City Line
Total Crashes – 8; Rate – 88.6
Injuries – 9; Rate – 99.6
Fatalities - 0

City Line – Lowe's Dr.
Total Crashes – 37; Rate – 307.2
Injuries – 23; Rate – 191.0
Fatalities - 0

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Along the two segments of Mount Cross Road classified as Urban Minor Arterials, the segment in Pittsylvania County (City Limits to Mill Creek Road) exhibits a crash rate that is lower than the statewide average, but the injury rate is nearly double the statewide average. In contrast, along the segment in the City (Lowes Drive to County Line) both the crash rate and the injury rate are substantially higher than the statewide average and substantially higher than the rates exhibited by the segment immediately to the west in the County.

Along the two segments of Mount Cross Road classified as Rural Major Collectors, the eastern segment (Golf Club Road to Moorefield Bridge Road) exhibits crash and injury rates that are slightly below the statewide averages. However, the western segment (Moorefield Bridge Road to Whitmell School Road) exhibits a crash rate that is nearly double the statewide average. Injury rates from Moorefield Bridge Road to Whitmell School are equivalent to statewide average rates. The one fatality on this segment of road results in a very high fatality rate; however, this high rate is misleading because the segment is relatively short.

The generally higher crash and injury rates can be attributed to a segment of road that has rolling terrain, numerous horizontal curves, little to no paved shoulders, lack of turn lanes, and poor access management.

Table 9 Summary of Mount Cross Road Corridor Crash Frequency, Severity and Rate by Segment							
Segment	Length	Crashes	Injuries	Fatalities	Crash Rate	Injury Rate	Fatality Rate
Lowes Drive - City Line	1.0	37	23	0	307.2	191.0	0.0
City Line - Mill Creek	0.8	8	9	0	88.6	99.6	0.0
Mill Creek - Golf Club	1.6	26	28	0	154.0	165.8	0.0
Statewide Average (Urban Minor Arterial)					98.0	48.7	0.4
Golf Club Road - Moorefield Bridge	1.8	14	9	0	120.4	77.4	0.0
Moorefield Bridge Road - Whitmell School	0.9	15	5	1	253.7	84.6	16.9
Statewide Average (Rural Major Collector)					143.7	84.3	2.8

III. ENVIRONMENTAL RESOURCES

III.1 RESOURCE INVENTORY

A detailed scan of environmental resources in the Mount Cross Road corridor study area was conducted, and known resources were mapped. The constraint mapping will be used to develop roadway alternatives and to assess alternative impacts.

USGS topographic quadrangle blue line streams were digitized to improve the reliability of stream layers. Historic resources were also identified and evaluated.

The major environmental constraint was found to be stream and floodplain crossings and impacts. The preferred segments were chosen based on stream and floodplain impacts and parcel and/or relocation impacts.

The environmental resources are shown in the following figures: **Figure 5 – Hazardous Sites Map; Figure 6 – Environmental Constraints; and, Figure 7 – Cultural Resources Map.**

Considering that widening of Mount Cross Road is not being considered for the segments in Pittsylvania County, the information in **Figure 5 – Hazardous Sites Map, Figure 6 – Environmental Constraints** and **Figure 7 – Cultural Resources Map** do not indicate the presence of any constraints that are likely to compromise the ability of either VDOT or the County to implement recommended actions.

In contrast, along the segment in the City of Danville, four sites of potential hazardous materials will need further documentation as design activities are initiated.

A check of files at the Virginia Department of Historic Resources (VDHR) between May 31 and June 13, 2011 has identified previously recorded cultural resources in close proximity to the proposed Mount Cross Road improvements.

There are four previously recorded cultural resources near the Mount Cross Road Improvement project area. The locations of these resources have been digitized into Geographic Information System (GIS) data for the project. All four of these resources are classified as historic/architectural resources; no archaeological resources are present in or near the project area. Three of the four resources (071-0168, 071-0169, 071-0170) are dwellings that have not been formally evaluated for National Register of Historic Places (NRHP) eligibility. Data on their VDHR forms indicate all three are relatively modern, and therefore likely do not meet the age requirements to be considered historic. The fourth resource (071-5186) is a cemetery at the Mount Olivet Church. This cemetery has formally been determined as not eligible for the NRHP by VDHR staff.

Visual reconnaissance of the project area was conducted on June 14, 2011. During this reconnaissance, one potentially historic structure not listed in the VDHR files was noted. The structure is a small log cabin located on the northwest side of Route 863 (Moorefield Bridge Road), just southwest of its junction with Route 750 (Mount Cross Road). It is unlikely that any of these would constitute a significant historic resource, but they may require more detailed evaluation in the future.

During the field reconnaissance, the archaeological sensitivity of the project area was also assessed. Generally, the project area is considered to have a low potential to contain intact archaeological sites.

III.2 RESOURCE MAPPING

The baseline data described above were used to develop alternatives while avoiding major environmental constraints. Soils, stream, and census data were further manipulated to enhance the usefulness of the mapping. USGS topographic quadrangle blue line streams were digitized to improve the reliability of stream layers. Soils data were evaluated based on Prime Farmland and Farmland of Statewide Importance soil types provided by Pittsylvania County and the City of Danville, VA Soil and Water Conservation District. Census data were compared to minority and poverty rates for the City of Danville, Pittsylvania County and the state of Virginia to determine if the project would negatively impact minority or underprivileged neighborhoods.



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Figure 5: Hazardous Sites Map

Legend

- Mount Cross Road Improvements Study Area
- 1 Commercial
- 2 Residential
- 3 Commercial
- 4 Residential
- 5 Residential
- 6 Residential
- 7 Commercial
- 8 Commercial
- 9 Commercial
- 10 Commercial

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









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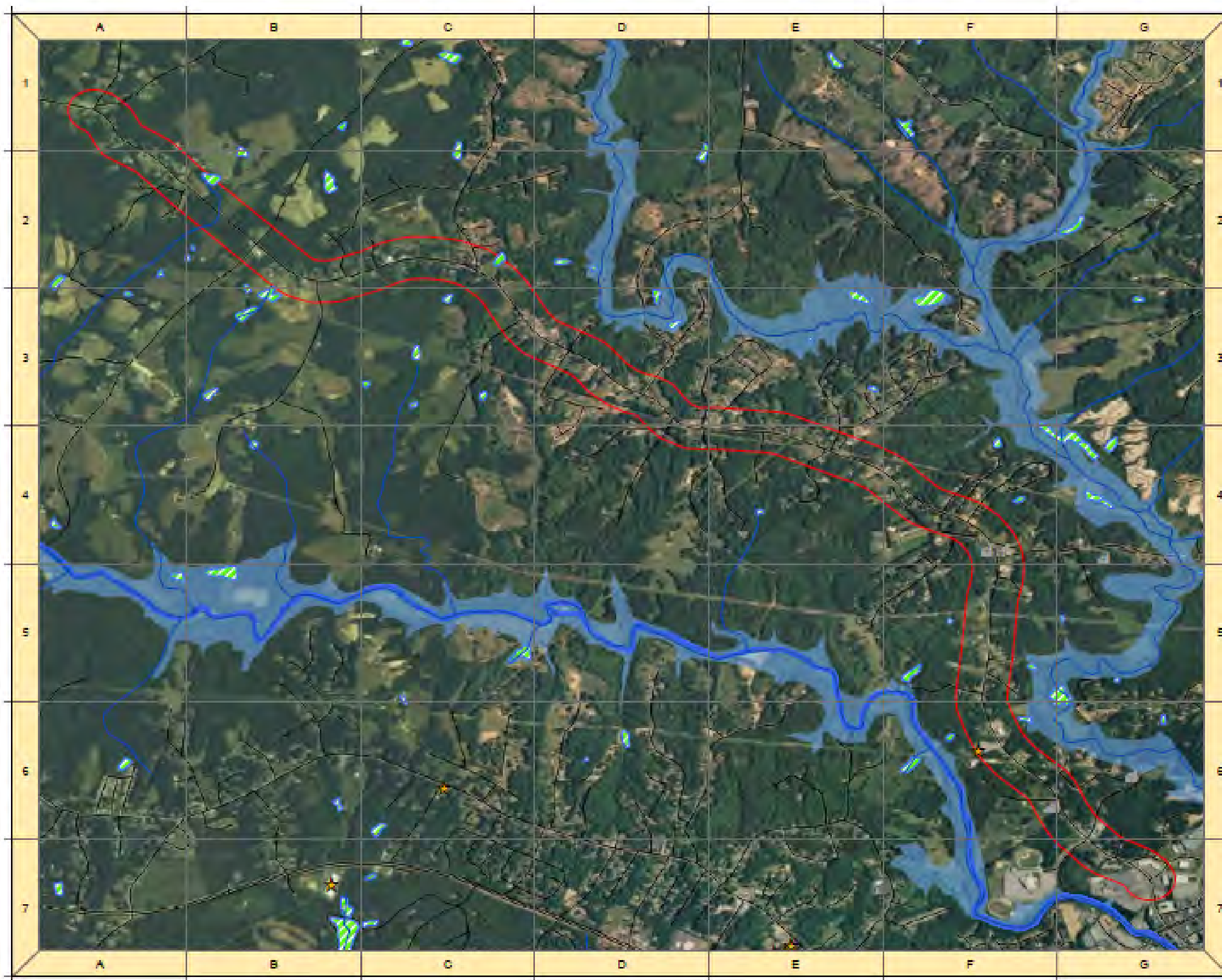
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Figure 6: Environmental Constraints

Legend

-  Mount Cross Road Improvements Study Area
-  Streams
-  Open Water
-  NWI Wetlands
-  Flood Zone A
-  Flood Zone AE
-  Schools
-  Cemetery
-  Church
-  Public Places
-  Roads

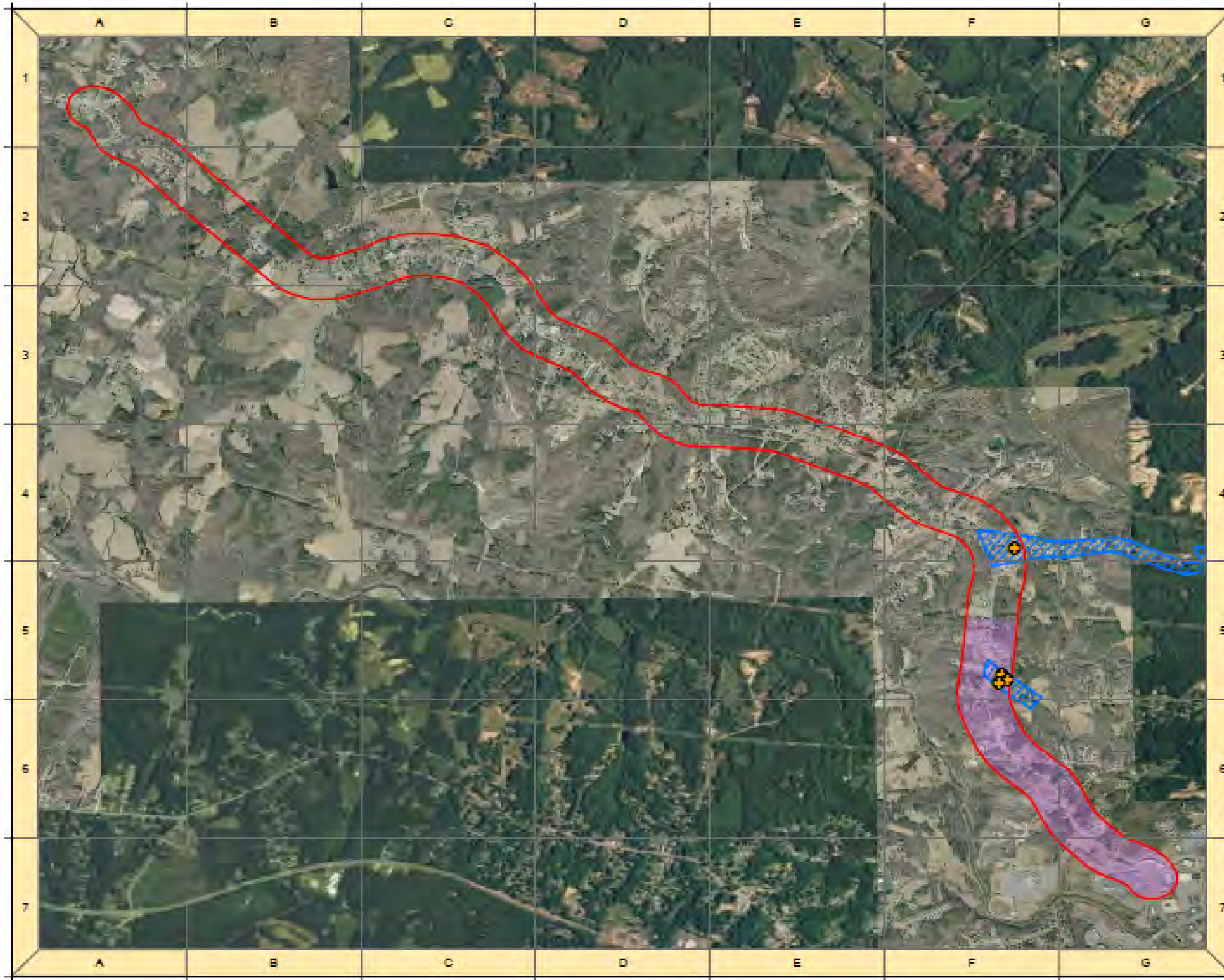
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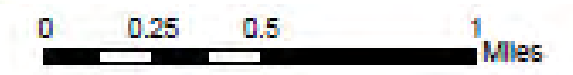
Figure 7: Cultural Resources Map



Legend

-  Mount Cross Road Improvements Study Area
-  Archaeological Sites
-  Historic Sites
-  Historic Properties
-  Disturbed/Developed Area
-  Culturally Sensitive Area
-  Previously Surveyed Area

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IV. YEAR 2035 FORECASTED CONDITIONS

IV.1 FORECAST METHODOLOGY

Forecasts of year 2035 traffic volumes were developed using the travel demand modeling software and the Year 2035 Danville-Pittsylvania Area travel demand model, which is developed and maintained by VDOT. The model was developed for the Danville-Pittsylvania MPO in association with development of the current long range transportation plan.

To use the model output as part of forecast process for this study, growth rates were computed by comparing current traffic counts with the year 2035 model forecast volumes. The growth factors computed from this comparison were then applied to the corridor and intersection peak hour traffic counts collected as part of this study. In this sense, the model was used only to develop growth factors and the volumes to which these factors were applied were based on field counts.

IV.2 YEAR 2035 NO BUILD ALTERNATIVE

The purpose of developing and evaluating the No Build Alternative is to provide a baseline against which to compare proposed improvement alternatives. The No Build Alternative is defined as future conditions if the proposed improvement(s) were not to be completed. It includes the assumption that all other improvements in the transportation plan will have been completed by 2035.

By the year 2035, volumes on Mount Cross Road are forecast to grow as follows:

Segment	% Increase
Lowes Drive – City Limits	158%
City Limits – Mill Creek Road	126%
Mill Creek Road – Moorefield Bridge Road	154%
Moorefield Bridge Road to Whitmell School Road	172%

A major factor in the high rate of forecasted volume growth is the Mega Park, a major economic development site located south of Route 58 West and west of the Danville Expressway along Berry Hill Road. As it develops, the Mega Park will become a center of employment, and Moorefield Bridge Road will serve as a route of choice for many of the employees from the north and west commuting to and from the site. The forecasted Year 2035 No Build Alternative volumes and service levels are presented in **Figure 8**.

IV.3 NO BUILD ALTERNATIVE CAPACITY ANALYSIS

Using the forecasted volumes shown in **Figure 8**, capacity analysis was conducted for the study area intersections. The results of the intersection capacity analysis are summarized in **Tables 10 and 11**.

Table 10 shows forecasted conditions for the intersection of Lowes Drive and Mount Cross Road. It operates adequately in the AM peak hour; however in the PM peak hour conditions deteriorate to LOS E for the overall intersection. Poor PM peak hour conditions are a product of heavy traffic volumes, long cycle lengths (maintaining the existing cycle length), and phasing/lane designation.

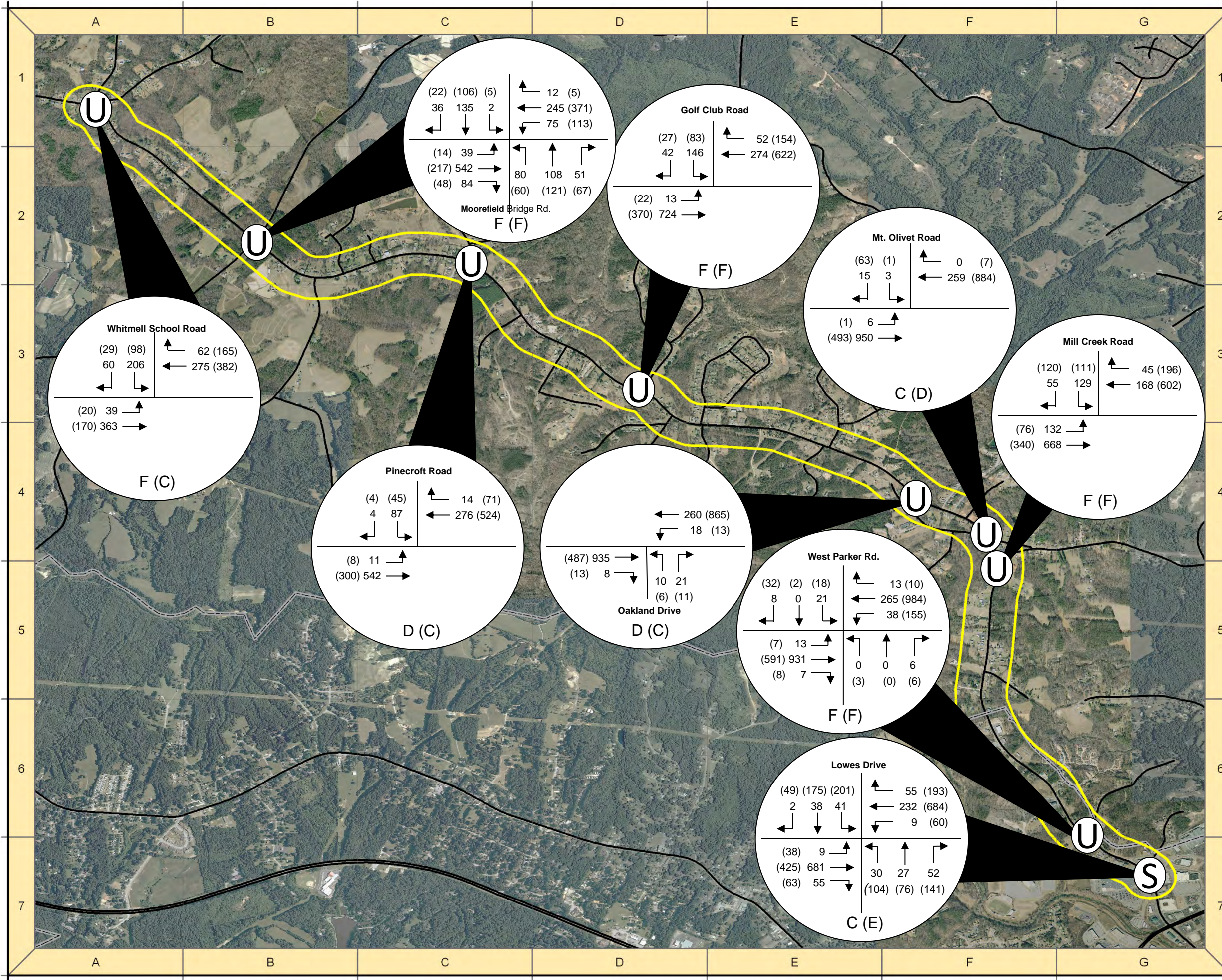
Table 10 Summary of No Build Alternative Capacity Analysis (HCM)				
Lowes Drive @ Mount Cross Road				
Movement	AM Delay	AM LOS	PM Delay	PM LOS
EB Lowes Drive – Left/Through	46.9	D	95.4	F
EB Lowes Drive - Right	42.1	D	53.2	D
WB Lowes Drive - Left/Through	45.8	D	74.5	E
WB Lowes Drive - Right	37.2	D	35.0	C
NB Mount Cross Road - Left	50.9	D	75.1	E
NB Mount Cross Rd. - Through/Right	13.1	B	50.4	D
SB Mount Cross Road - Left	54.5	D	80.4	F
SB Mount Cross Road - Through	15.9	B	36.2	D
SB Mount Cross Road - Right	12.0	B	31.4	C
Overall Intersection	21.9	C	56.6	E

As **Table 11** shows, when compared with existing conditions, service analyzed under the No Build Alternative deteriorates by several levels. Additionally, several of the intersections are forecast to operate at deficient service levels (LOS E and F). These are: Whitmell School Road, Golf Club Road, Oakland Drive, Mill Creek Road, West Parker Road, and Moorefield Bridge Road. Poor service levels are due to forecasted traffic volumes on Mount Cross Road becoming sufficiently high so that adequate gaps in the traffic stream will be less frequent, and motorists on the minor street approaches (particularly those executing left turns) will find it more difficult to complete their turning movements safely. Some of these intersections may meet traffic signal warrants in the future, some will not. The analysis of Build Alternative conditions will address the potential for future traffic signals on Mount Cross Road.

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Figure 8: 2035 No Build Alternative Traffic Volumes and Levels of Service



Legend

- Study Area
- 54 (65) – AM (PM) Peak Hour Volumes
- B (C) – AM (PM) Level of Service
- S** – Signalized Intersection
- U** – Unsignalized Int.

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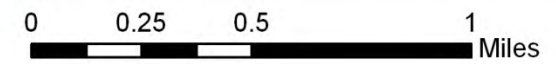


Table 11
Summary of No Build Alternative Capacity Analysis (HCM)
Unsignalized Intersection Level of Service

Intersection	AM Delay	AM LOS	PM Delay	PM LOS
Whitmell School Rd. @ Mt. Cross Rd.	155.5	F	20.4	C
Pinecroft Rd. @ Mt. Cross Rd.	34.0	D	20.1	C
Golf Club Rd. @ Mt. Cross Rd.	132.0	F	69.9	F
Oakland Dr. @ Mt. Cross Rd.	27.1	F	23.7	C
Mt. Olivet Rd. @ Mt. Cross Rd.	15.5	C	26.5	D
Mill Creek Rd. @ Mt. Cross Rd.	178.7	F	234.7	F
West Parker Rd. @ Mt. Cross Rd.	71.8	F	Error*	F
Womack Dr. @ Mt. Cross Rd.	0.0	A	0.0	A
Carter Dr. @ Mt. Cross Rd.	13.9	B	13.7	B
Kerr Ln. @ Mt. Cross Rd.	14.5	B	17.9	C
Kent Ln. @ Mt. Cross Rd.	13.9	B	16.7	C
Brush Arbor Ct. @ Mt. Cross Rd.	15.1	C	17.4	C
Carriage Hill Dr. @ Mt. Cross Rd.	15.2	C	17.6	C
Carriage Hill Cir. @ Mt. Cross Rd.	14.6	B	16.9	C
Olde Hunting Tr. @ Mt. Cross Rd.	15.8	C	17.4	C
Cedar Tr. @ Mt. Cross Rd.	12.9	B	10.1	B
Rosewood Ct. @ Mt. Cross Rd.	13.5	B	12.7	B
Jamerson Rd. @ Mt. Cross Rd.	17.1	C	18.9	C
Woodhaven Dr. @ Mt. Cross Rd.	13.5	B	13.5	B
Deerfield Ln. @ Mt. Cross Rd.	12.0	B	11.9	B
Astin Ln. @ Mt. Cross Rd.	11.2	B	10.3	B
Ottawa Ln. @ Mt. Cross Rd.	11.0	B	10.3	B
Carter Farms Ln. @ Mt. Cross Rd.	11.8	B	11.4	B
Moorefield Br. Rd. @ Mt. Cross Rd.	Error*	F	Error*	F

Note: The individual approach movement with the lowest level of service and delay is shown for each unsignalized intersection.

*Where Volume to Capacity (v/c) ratio exceeds 3.0, average delays increase to extremely large amounts. Instead, error statement is shown by Synchro to indicate that movement is oversaturated.

Table 12 summarizes the queuing analysis of the intersection of Lowes Drive and Mount Cross Road. The AM peak hour analysis showed moderate queuing with all movements less than 160 feet in length. The PM peak hour results show the development of more lengthy queues. At the 95th percentile traffic volume level, several movements exhibit queues in excess of 300 feet in length. This level of queuing will cause turn lanes to be blocked with the vehicle queues spilling back into the through lanes, diminishing the capacity and safety of the intersection. Here again long cycle lengths are a part of the problem, since longer cycle lengths tend to produce longer queue lengths.

Table 12
Summary of No Build Alternative Queuing Analysis (SimTraffic)
Lowes Drive @ Mount Cross Road
(Queue lengths in feet)

Movement	AM Average	AM 95%	PM Average	PM 95%
EB Lowes Drive - Left/Through	45	101	140	223
EB Lowes Drive - Right	18	33	33	58
WB Lowes Drive - Left/Through	68	119	246	316
WB Lowes Drive - Right	2	15	191	439
NB Mount Cross Road - Left	6	20	101	242
NB Mount Cross Rd. - Through/Right	40	85	313	437
SB Mount Cross Road - Left	11	31	27	58
SB Mount Cross Road - Through	76	156	111	188
SB Mount Cross Road - Right	8	27	28	99

Table 13
Summary of No Build Alternative Queuing Analysis (SimTraffic)
Unsignalized Intersection

Intersection	AM Average	AM 95%	PM Average	PM 95%
Whitmell School Rd. @ Mt. Cross Rd.	76	134	38	63
Pincroft Rd. @ Mount Cross Rd.	27	45	21	60
Fox Trail Rd. @ Mount Cross Rd.	82	165	49	81
Oakland Dr. @ Mount Cross Rd.	19	46	13	51
Mount Olivet Rd. @ Mount Cross Rd.	7	27	33	65
Mill Creek Rd. @ Mount Cross Rd.	63	105	114	196
West Parker Rd. @ Mount Cross Rd.	20	46	34	76
Womack Dr. @ Mount Cross Rd.	0	0	0	0
Carter Dr. @ Mount Cross Rd.	3	18	5	24
Kerr Ln. @ Mount Cross Rd.	6	26	1	9
Kent Ln. @ Mount Cross Rd.	3	18	6	24
Brush Arbor Ct. @ Mount Cross Rd.	16	43	8	30
Carriage Hill Dr. @ Mount Cross Rd.	17	40	11	45
Carriage Hill Cir. @ Mount Cross Rd.	19	46	13	37
Olde Hunting Tr. @ Mount Cross Rd.	32	48	20	50
Cedar Tr. @ Mount Cross Rd.	1	10	1	9
Rosewood Ct. @ Mount Cross Rd.	12	36	11	36
Jamerson Rd. @ Mount Cross Rd.	26	53	21	44
Woodhaven Dr. @ Mount Cross Rd.	12	34	7	28
Deerfield Ln. @ Mount Cross Rd.	11	34	12	34
Astin Ln. @ Mount Cross Rd.	9	31	9	31
Ottawa Ln. @ Mount Cross Rd.	11	34	3	16
Carter Farms Ln. @ Mount Cross Rd.	6	24	6	25
Moorefield Br. Rd. @ Mt. Cross Rd.	165	312	77	138

Table 13 presents a summary of the queuing analysis for all of the unsignalized intersections. SimTraffic microsimulation software was used to determine the queue lengths (in feet) for median traffic condition and for the 95th percentile heaviest traffic volume conditions. The longest individual movement queue length, which typically involves the left turn movement from the minor street approach, is shown. Queue lengths were generally below 100 feet in length, with the exception of the following intersections: Whitmell School Road, Mill Creek Road, and Moorefield Bridge Road. These intersections generally had the heaviest side-street volumes.

Table 14 displays the service levels for Mount Cross Road as a two-lane roadway from West Parker Road to the City/County line. In the No Build Alternative, Mount Cross Road shows consistently poor levels of service, with the peak direction approaching capacity during the PM peak hour.

Table 14
No Build Conditions Facility Service Levels
Mount Cross Road (from W. Parker Rd. to City/County Line)

Peak Hour/Direction	LOS	PTSF	V/C
AM/Northbound	C	65.9%	0.18
AM/Southbound	D	83.4%	0.70
PM/Northbound	E	91.0%	0.75
PM/Southbound	D	80.5%	0.39

IV.4 PURPOSE AND NEED

In 2007 the Virginia General Assembly approved legislation authorizing VDOT to develop and publish regulations and standards for management of access to highways maintained by VDOT. The regulations were published on July 1, 2008, and define Access Management as *"...the systematic control of the location, spacing, design, and operation of entrances, median openings, traffic signals, and interchanges for the purpose of providing vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system"* (See 24VAC30-72-10).

The regulations further state: *"...each proposed highway entrance creates a potential conflict point that impacts the safe and efficient flow of traffic on the highway; therefore, private property interests in access to the highway must be balanced with public interests of safety and mobility. Managing access to highways can reduce traffic congestion, help maintain the levels of service, enhance public safety by decreasing traffic conflict points, support economic development by promoting the efficient movement of people and goods, reduce the need for new highways and road widening by improving the performance of existing highways, preserve the public investment in new highways by maximizing their efficient operation, and better coordinate transportation and land use decisions"* (See 24VAC30-72-20).

As stated in the regulations, the goals of access management are:

1. Reduce traffic congestion;
2. Help maintain levels of service;
3. Enhance public safety;
4. Support economic development;
5. Reduce the need for new highways;
6. Preserve investment in new highways; and,
7. Coordinate transportation and land use decisions.

After applying these goals within the regulatory definition of Access Management and considering the results of the analysis of existing and forecasted conditions, the statement of purpose and need for the Mount Cross Road Improvement Study is defined as addressing the following issues:

1. The *FY 2012 Six-Year Transportation Improvement Program* provides for spot safety and access management improvements along the Mount Cross Road segment located within the City of Danville. These should be defined so that the City may pursue final design;
2. Pittsylvania County needs a guide to assist property owners and developers to understand the impacts of the application of access management regulations along a Urban Minor Arterial and a Rural Major Collector;
3. Frequencies of crashes along Mount Cross Road have the potential to increase as traffic volumes and development activity increases;
4. Service levels in the area of six intersections are forecast to deteriorate to inadequate levels unless improvements are developed and installed; and,
5. Capacity along the corridor should be preserved so that it can adequately serve traffic volumes associated with commuters to and from the Mega Park.

V. ANALYSIS OF IMPROVEMENT ALTERNATIVES

V.1 DANVILLE SEGMENT ALTERNATIVES

As recommended in the *Long Range Transportation Plan*, Mount Cross Road in the City of Danville is to be widened to either a 4-lane or 5-lane facility from Lowes Drive to the City/County line. Initially, a 4-lane section (Alternative 1) with a divided median and a 5-lane section (Alternative 2) with a center two-way left turn lane were developed and presented to the study team. The *VDOT Road Design Manual* geometric design standards were used in the development of the typical sections. Alternative 1 is shown in **Figures 9-A and 9-B**, and Alternative 2 is shown in **Figures 10-A and 10-B**.

The proposed typical section has a right-of-way width of 95 feet for both the 4-lane and 5-lane improvement alternatives. The 4-lane typical section provides for outside lanes with 12 feet of width and inside lanes (adjacent to the median) with 13 feet of width, typical curb and gutter (CG-7) drainage, 16 feet of grass median width (or landscaped median) as well as 8 feet of width for a multi-purpose trail on one side of the section and 5 feet of width for a sidewalk on the other side of the section. The 5-lane typical section provides for 4 lanes, the width of each at 12 feet, a two-way center left turn lane with 14 feet of width, curb and gutter drainage (CG-7) and a multi-purpose trail on one side with 8 feet of width and a sidewalk on the other side with 5 feet of width. The typical sections are shown on the figures depicting the respective alternatives.

The 4-lane typical section with a raised grass median will provide for more control of access. Within the proposed widened segment only three median crossovers are identified: at West Parker Road, at Womack Drive, and at the entrance to Abundant Life World Outreach Church. This configuration would change access for several homes and business that currently have full access to Mount Cross Road. The 5-lane typical section would continue to provide full access to all entrances on Mount Cross Road with the exception of the intersection with Old Mount Cross Road, where movements would be restricted to right-in/right-out access using a raised median.

An interim improvement, Alternative 3, was also developed in order to have a design that might be implemented in the short term. Alternative 3, shown in **Figures 11-A and 11-B**, has a 4-lane divided cross-section with a raised grass median from Old Mount Cross Road to West Parker Road. It is proposed within a right-of-way width of 95 feet, with outside lanes with 12 feet of width and inside lanes with 13 feet of width, and curb and gutter drainage. It also has a multi-purpose trail on one side of the road with 8 feet of width and a sidewalk on the other side with 5 feet of width. This design provides two median openings: one at the apartment complex immediately north of Old Mount Cross Road and the other at West Parker Road. To the north of West Parker Drive the cross-section only provides a paved outside shoulder with 8 feet of width on both sides of the existing pavement. The shoulder improvements can be installed within the existing right-of-way.

Finally, a hybrid alternative was developed, Alternative 4, shown in **Figures 13-A and 13-B**. It begins in the east with the same typical section as developed in Alternative 1. However, unlike Alternative 1, Alternative 4 provides for a left turn in movement from Mount Cross Road to the apartment complex just north of Old Mount Cross Road. North and west of West Parker Road the cross-section changes to the 5-lane typical section as found in Alternative 2. As a measure to control costs, the widening in Alternative 4 was not carried to the City/County line. Instead it terminates widening near Salem Road, and west of Salem Road Alternative 4 provides for paved shoulders, each with a width of 8 feet, on the existing two-lane section.

V.2 EVALUATION CRITERIA

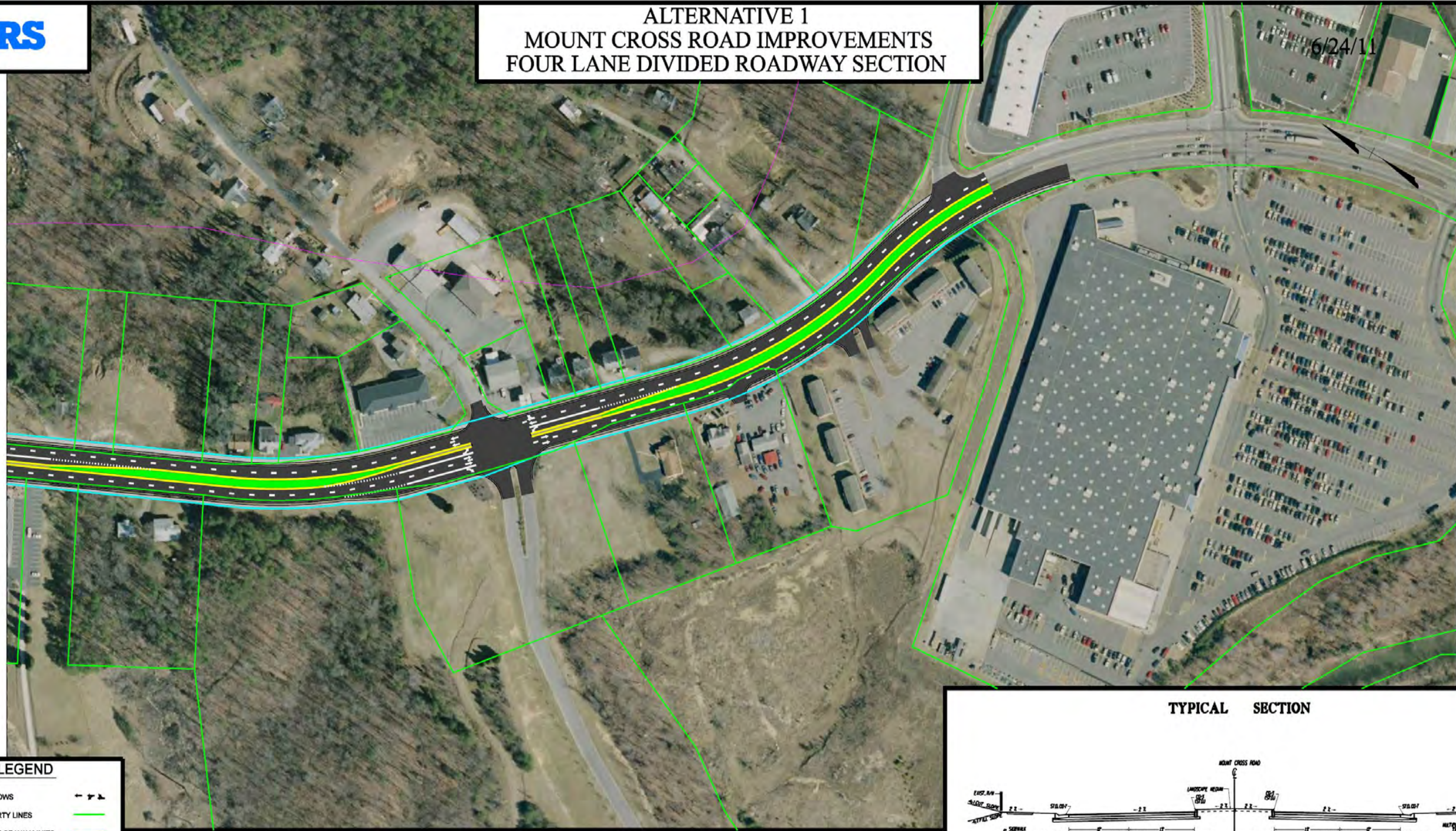
Prior to developing improvements to address deficiencies on Mount Cross Road, a set of weighted evaluation criteria were developed and adopted by the Project Management Team. The reason for developing the evaluation criteria and weighting before development of alternatives was to avoid introducing bias in the selection process by adopting criteria and weights that would favor one alternative over another. A total of eight evaluation criteria were developed, each with a weighting from 1-3 (the higher weight indicating greater importance among the criteria). A list of the evaluation criteria and the relative weights (in parenthesis) is as follows:

1. Capacity (3) – producing an acceptable (LOS C or better) level of service on roadways, and at signalized or unsignalized intersections.
2. System Performance (3) – a relative comparison of the performance of the overall system within the study area.
3. Safety (3) – by improving capacity or removing conflicts, address geometric and capacity factors in high corridor accident rate.
4. Cost (3) – costs for each alternative were estimated and compared using year 2011 dollars.
5. Right Of Way Impacts (3) – the number of acres, residences, and other structures that are affected by alternative improvements.
6. Environmental Impacts (3) – the amount of wetlands, hazardous waste sites, Section 4(f) & 6(f) properties, and historic & cultural resources that are adversely impacted by alternative improvements. Environmental justice will also be evaluated.
7. Financial Impacts (2) – the impact of funding improvement alternatives on the funding stream for all transportation improvements in the Danville area.
8. Consistency with Local Plans (2) – determining if the proposed improvements in each alternative are consistent with current local transportation and land use.



ALTERNATIVE 1
MOUNT CROSS ROAD IMPROVEMENTS
FOUR LANE DIVIDED ROADWAY SECTION

MATCHLINE SHEET 1



LEGEND

- LANE USAGE ARROWS
- EXISTING PROPERTY LINES
- PROPOSED RIGHT-OF-WAY LIMITS

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

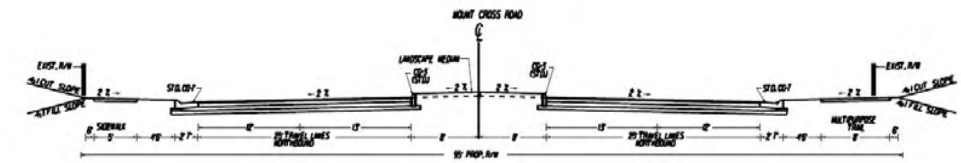
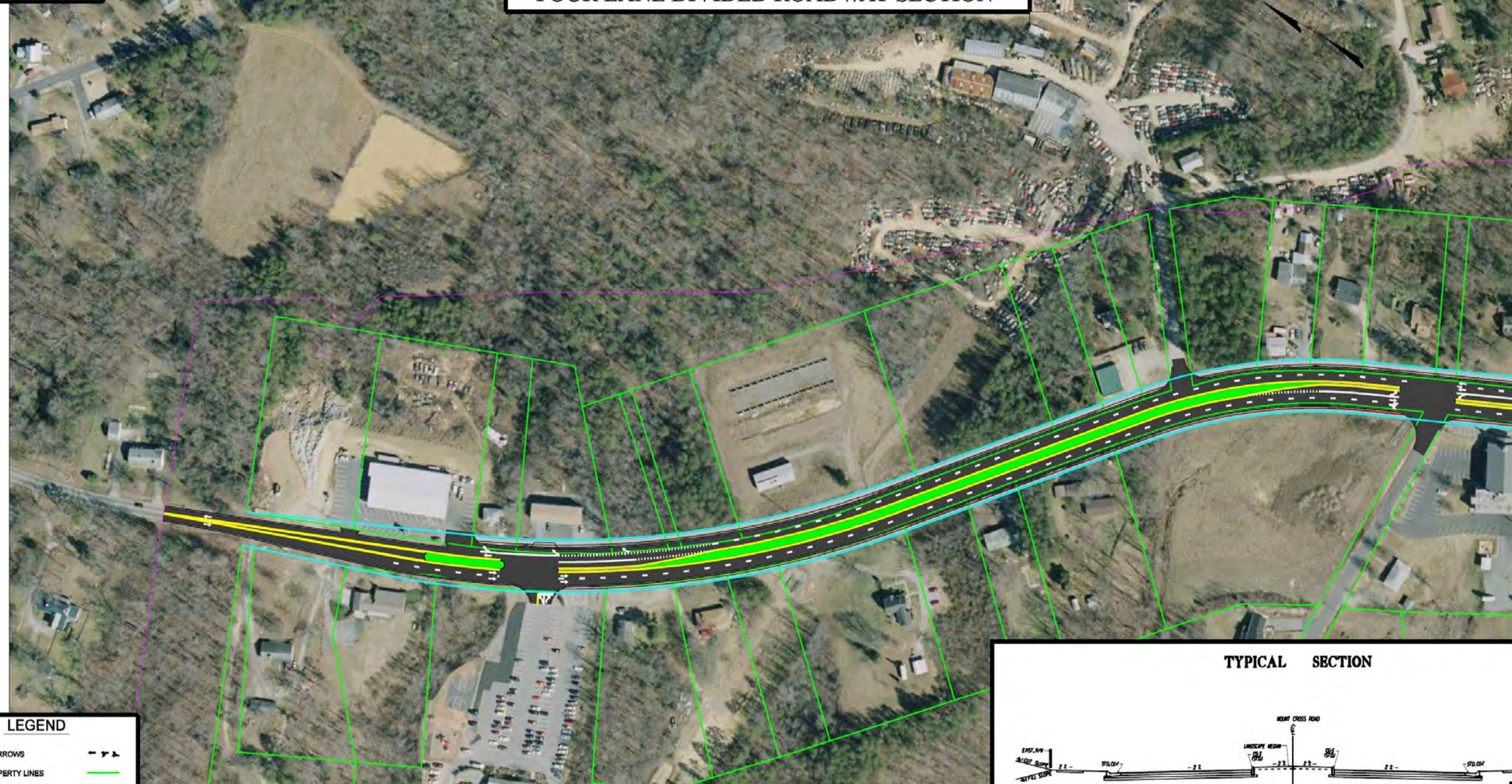


FIGURE 9-A: ALTERNATIVE 1: 4-Lane Divided Section (East Segment)



ALTERNATIVE 1
MOUNT CROSS ROAD IMPROVEMENTS
FOUR LANE DIVIDED ROADWAY SECTION

6/24/11



MATCHLINE SHEET 2

LEGEND

- LANE USAGE ARROWS
- EXISTING PROPERTY LINES
- PROPOSED RIGHT-OF-WAY LIMITS

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

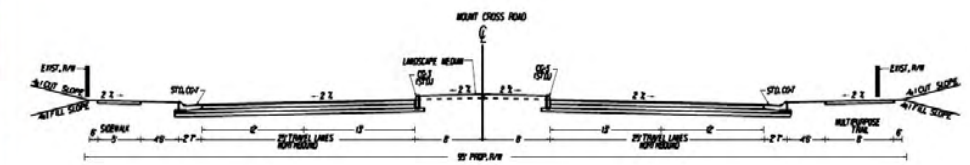


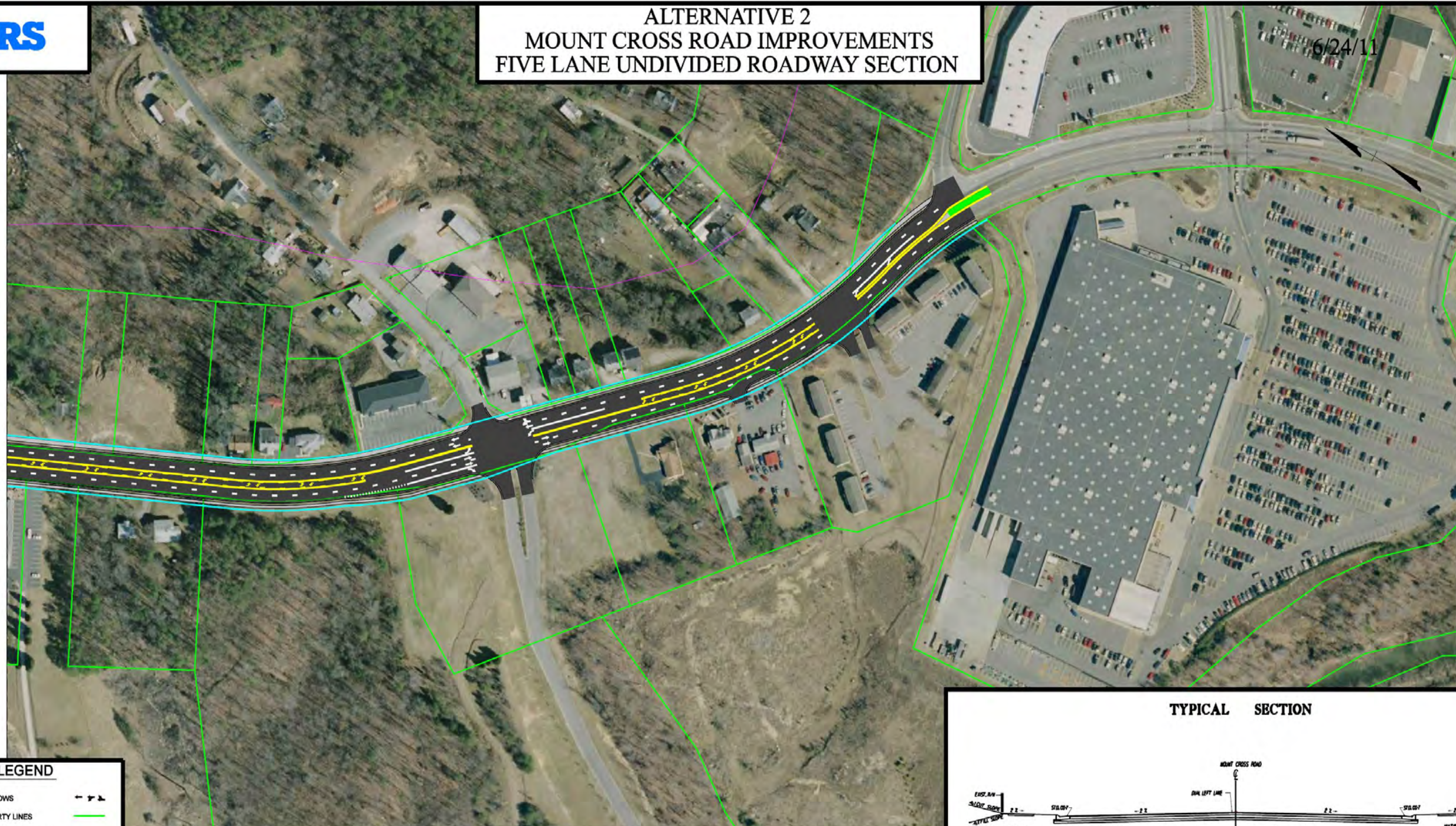
FIGURE 9-B: ALTERNATIVE 1: 4-Lane Divided Section (West Segment)



ALTERNATIVE 2
MOUNT CROSS ROAD IMPROVEMENTS
FIVE LANE UNDIVIDED ROADWAY SECTION

6/24/11

MATCHLINE SHEET 1



LEGEND

- LANE USAGE ARROWS
- EXISTING PROPERTY LINES
- PROPOSED RIGHT-OF-WAY LIMITS

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

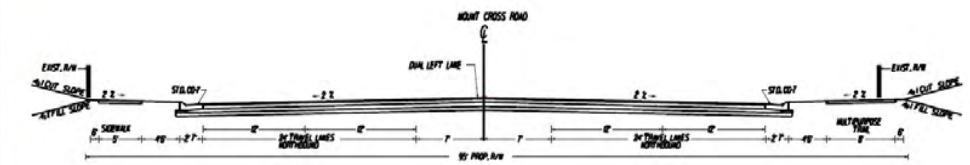
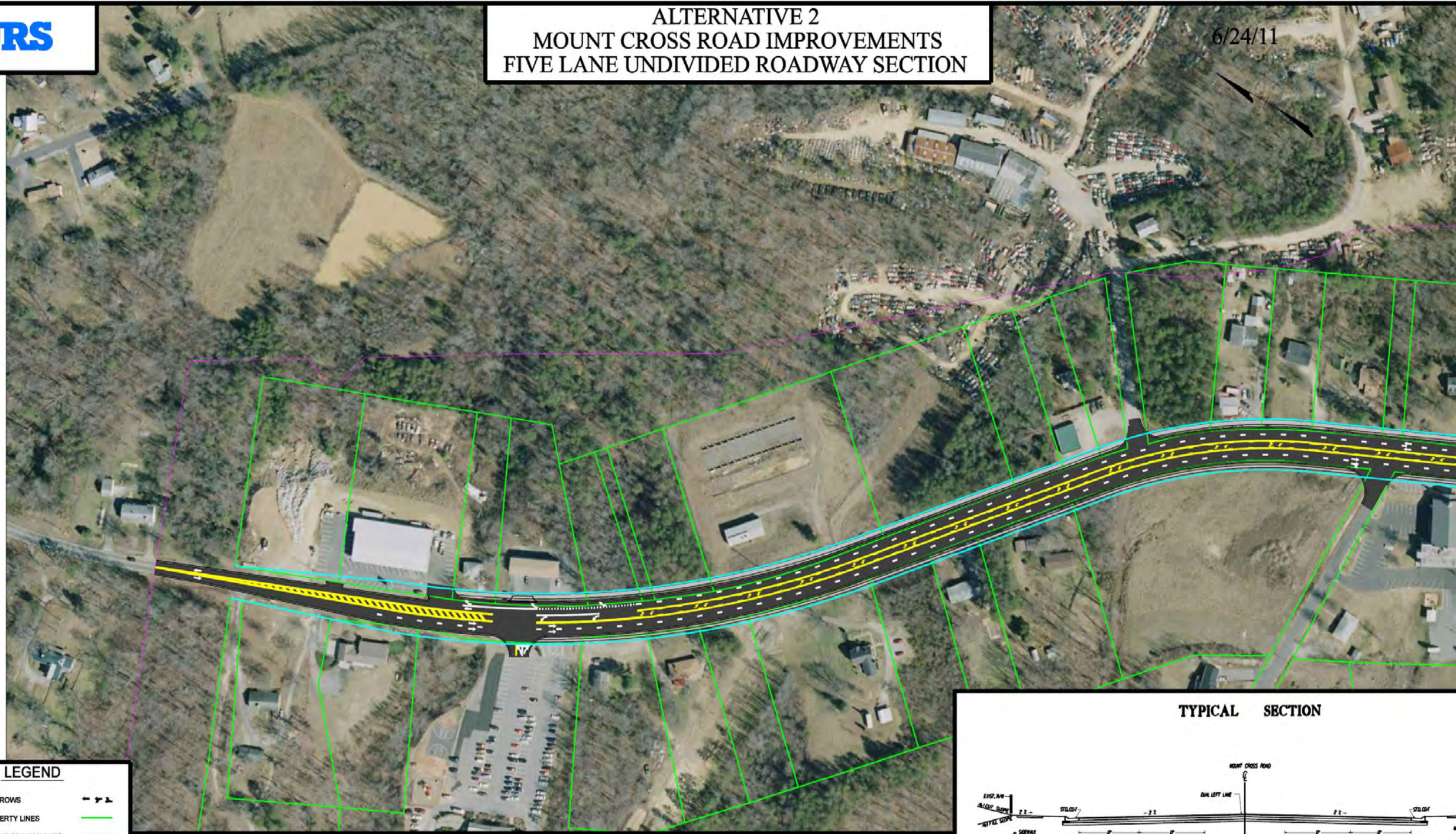


FIGURE 10-A: ALTERNATIVE 2: 5- Lane Section (East Segment)

ALTERNATIVE 2
MOUNT CROSS ROAD IMPROVEMENTS
FIVE LANE UNDIVIDED ROADWAY SECTION

6/24/11



MATCHLINE SHEET 2

LEGEND

- LANE USAGE ARROWS - - - -
- EXISTING PROPERTY LINES - - - -
- PROPOSED RIGHT-OF-WAY LIMITS - - - -

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

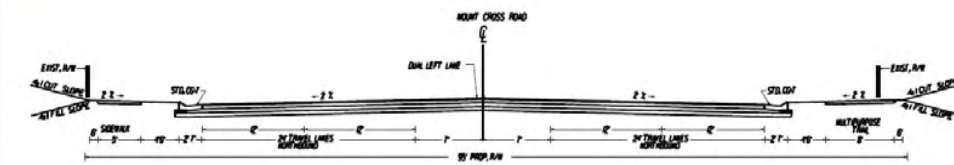
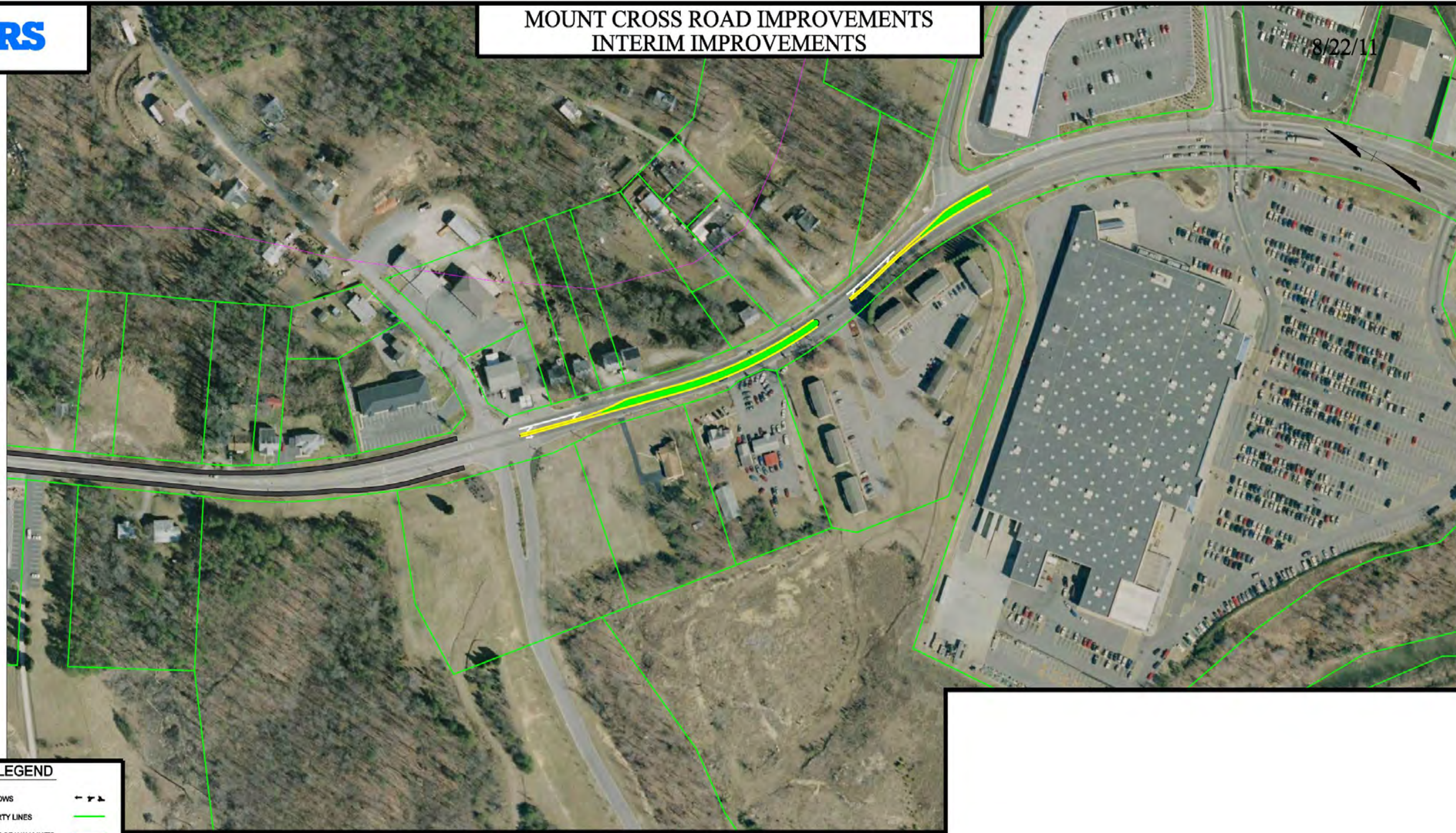


FIGURE 10-B: ALTERNATIVE 2: 5- Lane Section (West Segment)

MOUNT CROSS ROAD IMPROVEMENTS
INTERIM IMPROVEMENTS

8/22/11

MATCHLINE SHEET 1



LEGEND

- LANE USAGE ARROWS
- EXISTING PROPERTY LINES
- PROPOSED RIGHT-OF-WAY LIMITS

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

FIGURE 11-A: ALTERNATIVE 3: Interim Improvements (East Segment)



MOUNT CROSS ROAD IMPROVEMENTS INTERIM IMPROVEMENTS

8/22/11



MATCHLINE SHEET 2

LEGEND

- LANE USAGE ARROWS
- EXISTING PROPERTY LINES
- PROPOSED RIGHT-OF-WAY LIMITS

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

FIGURE 11-B: ALTERNATIVE 3: Interim Improvements (West Segment)



ALTERNATIVE 4
MOUNT CROSS ROAD IMPROVEMENTS
CORRIDOR IMPROVEMENTS

9/15/11

MATCHLINE SHEET 1



LEGEND

- LANE USAGE ARROWS ← →
- EXISTING PROPERTY LINES ———
- PROPOSED RIGHT-OF-WAY LIMITS ———



The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

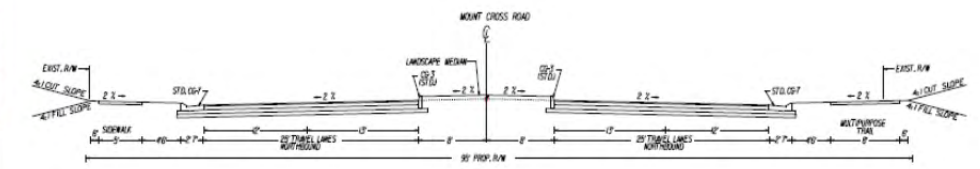


FIGURE 12-A: ALTERNATIVE 4: Corridor Improvements (East Segment)



ALTERNATIVE 4
MOUNT CROSS ROAD IMPROVEMENTS
CORRIDOR IMPROVEMENTS

9/15/11



MATCHLINE SHEET 2

LEGEND

- LANE USAGE ARROWS ← →
- EXISTING PROPERTY LINES ———
- PROPOSED RIGHT-OF-WAY LIMITS ———

SCALE
0 50 100

The roadway and right of way features shown on this map are conceptual and FOR TRANSPORTATION PLANNING PURPOSES ONLY and are not to be regarded as final locations. The actual location and detail of these improvements will be determined at the conclusion of NEPA studies and the preliminary engineering stage.

TYPICAL SECTION

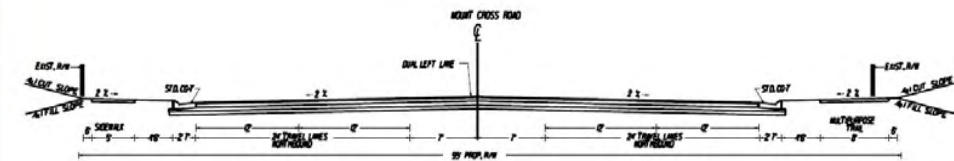


FIGURE 12-B: ALTERNATIVE 4: Corridor Improvements (West Segment)

V.3 ENVIRONMENTAL IMPACTS OF IMPROVEMENT ALTERNATIVES

Each of the segments in the four improvement alternatives were analyzed for their potential environmental impacts within study area inside the City Of Danville limits based on the inventory of resources previously summarized in Section III. Analysis was conducted on each alternative using the appropriate typical section, and the results are summarized in **Table 15**.

The results in **Table 15** show little difference in impacts for each resource. Since Alternatives 1 and 2 provide for the most extensive level of improvements (widening throughout the segment of the roadway within the city limits), the impacts are the greatest. However, this conclusion is not to imply that impacts on any of the four alternatives can be classified as either intrusive or negligible. On balance, when comparing the four improvement alternatives the extent of impacts to resources are commensurate with the extent of the land disturbance anticipated.

The issue of environmental justice was considered. Environmental justice addresses the racial and economic demography of potential impacts to residents. Its purpose is to ensure that disadvantaged minorities do not endure a disproportionate burden of the adverse impacts of roadway improvements. When comparing the racial and poverty rates in the census tracts that would be impacted by the improvement alternatives for Mount Cross Road with the rates for the City of Danville as a whole, it was found that the impacted census tracts did not exhibit rates that were higher than the overall city rates. These findings were based on year 2000 census of population and housing data.

In summary, there is little difference in the environmental impacts among the four improvement alternatives on Mount Cross Road.

V.4 PITTSYLVANIA COUNTY SEGMENT IMPROVEMENTS

Since no major improvements have been included in the *Long Range Transportation Plan*, and no funding for improvements in the corridor have been specifically programmed in the *SYIP*, the focus on improving Mount Cross Road in Pittsylvania County is on safety and access management measures. Improvements were developed based on an assessment of the following resources:

1. Existing and forecasted traffic volumes and service levels;
2. Crash records;
3. Roadway and intersection geometry; and,
4. Comments from citizens.

Improvements proposed along the Mount Cross Road corridor in Pittsylvania County are shown in **Figures 13-16**.

**TABLE 15
SUMMARY OF ENVIRONMENTAL IMPACTS
MOUNT CROSS ROAD IMPROVEMENT ALTERNATIVES
CITY OF DANVILLE**






POTENTIAL RESOURCE CONSTRAINT	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stream Crossing (#)	0	0	0	0
Stream Crossing (lf)	0	0	0	0
Flood Zone (ac)	0	0	0	0
Flood Zone (lf)	0	0	0	0
NWI Wetlands (ac)	0	0	0	0
Prime Farmland Soils (ac)	0	0	0	0
Farmlands of Statewide Importance (ac)	3.6	3.5	1.6	2.6
Hazardous Materials	3	3	1	3
Leaking Underground Storage Tank	0	0	0	0
Archaeology	0	0	0	0
Cemetery	0	0	0	0
Church	1	1	0	1
School	2	2	0	1
Nursing Home	0	0	0	0
Recreational Facility	0	0	0	0
Parcels (#) – Residential	34	34	10	22
Parcels (#) – Business	7	7	1	4
Parcels (#) – City	1	1	0	0
Parcels (#) – County	0	0	0	0
Parcels (#) – Government	1	1	0	0
Parcels (#) – Church	3	3	0	3
Parcels (#) – School	1	1	0	2
Poverty*	9.0	9.0	9.0	9.0
Minority*	15.1	15.1	15.1	15.1

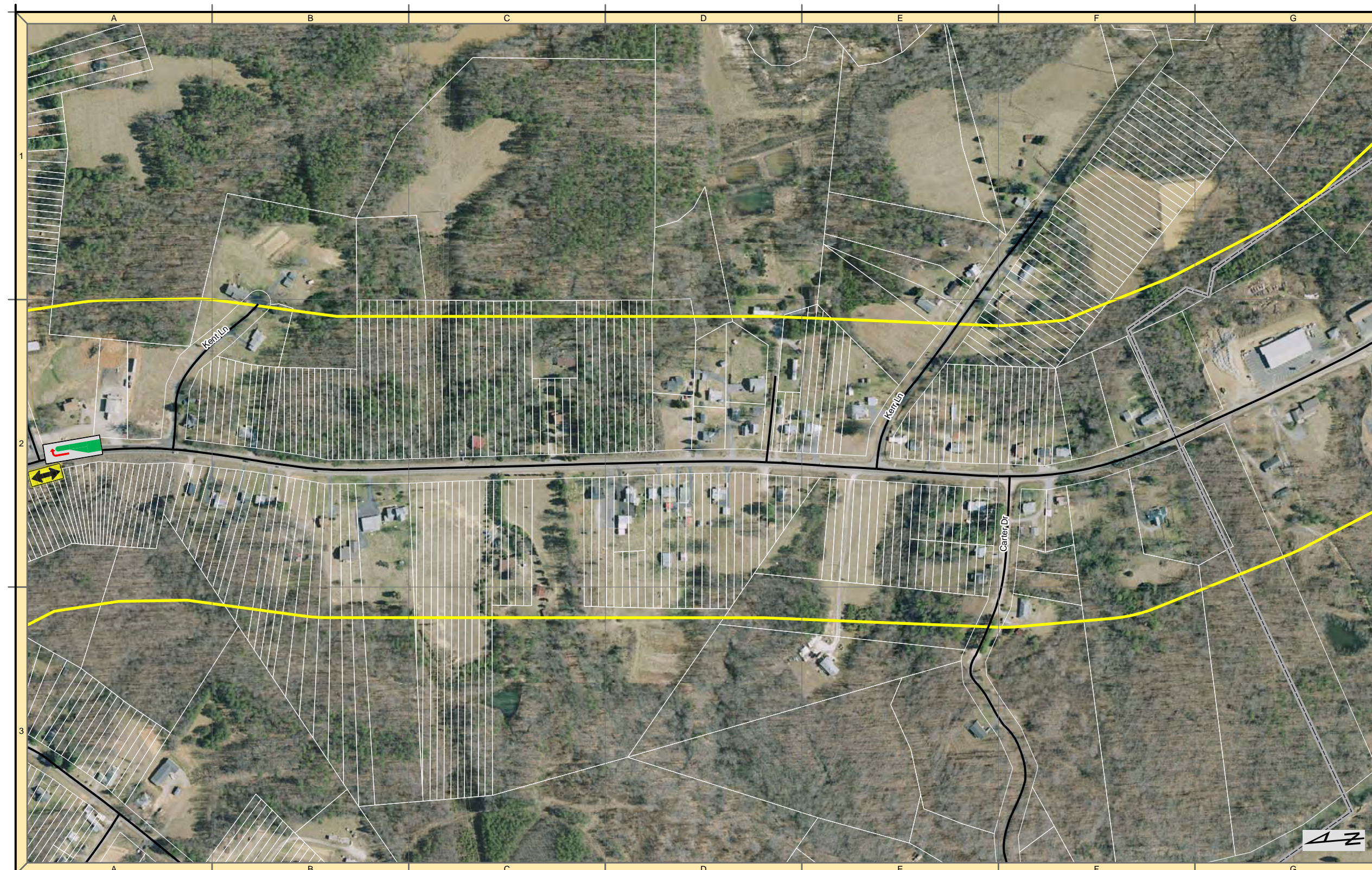
Mt. Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
Danville, Virginia

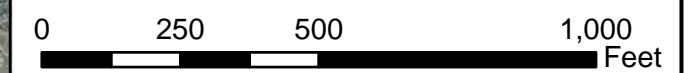
Figure 13: Safety and Access Management Improvements - Pittsylvania County

Legend

-  Parcel Boundary
-  Mount Cross Road Improvement Study Area
-  City of Danville City Limit
-  Install Right-turn Lane
-  Two-Direction Large Arrow Sign



February 2012



Sheet 1 of 4



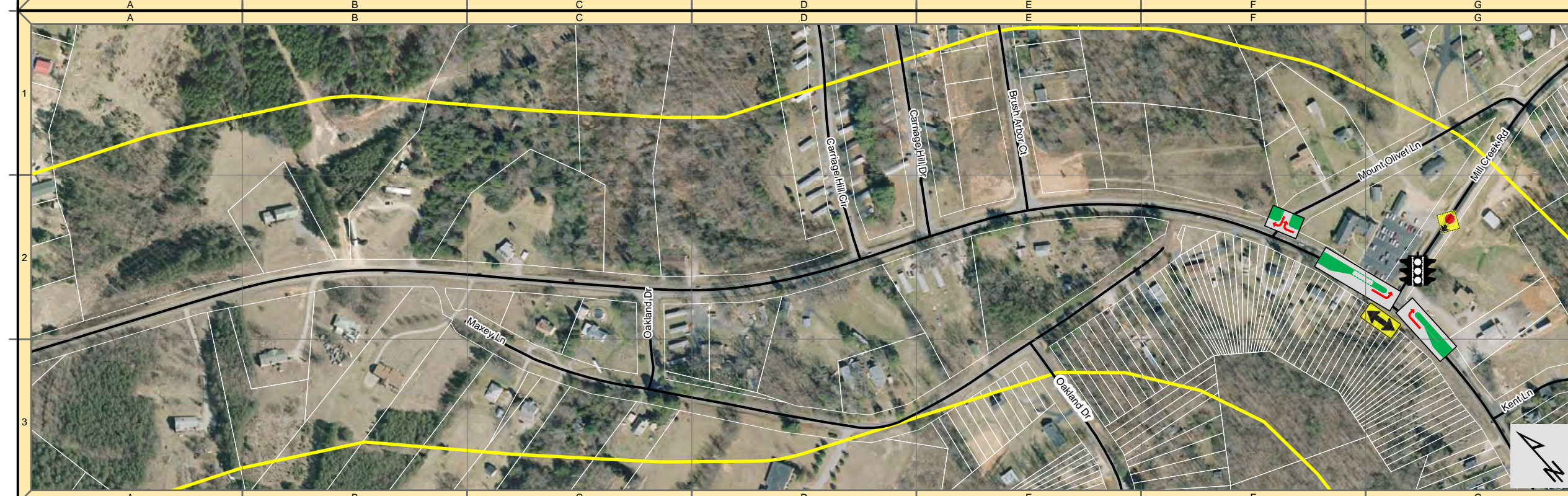
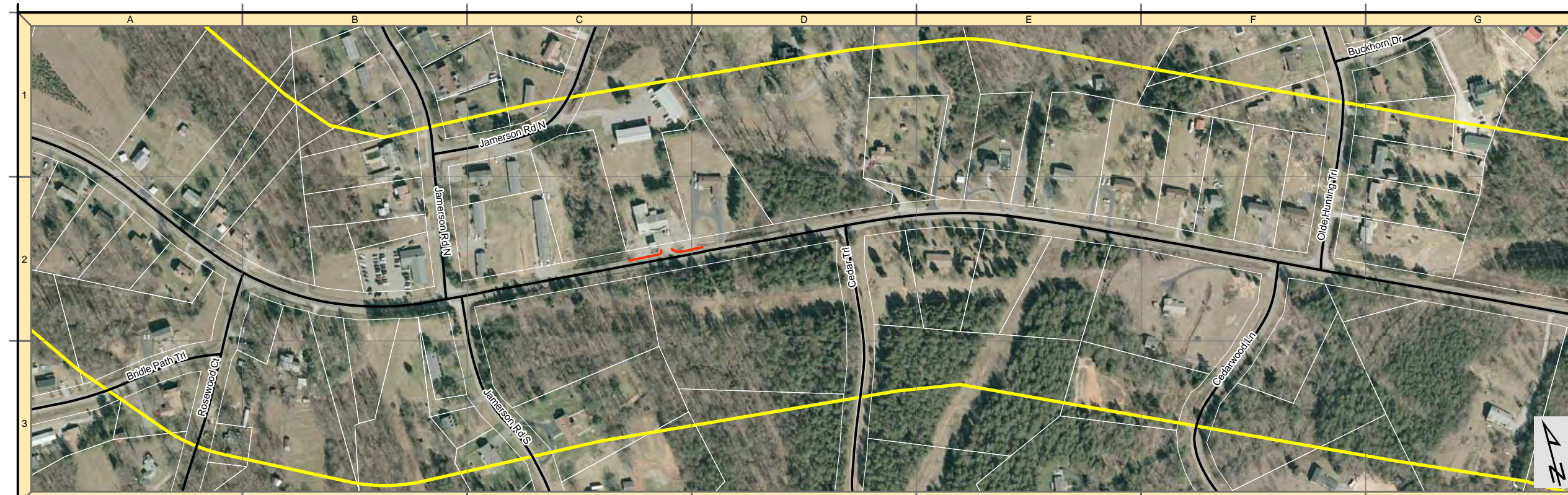
Mt. Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
Danville, Virginia

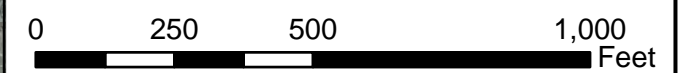
Figure 14: Safety and Access Management Improvements - Pittsylvania County

Legend

-  Parcel Boundary
-  Mount Cross Road Improvement Study Area
-  Access Modification
-  Install Right-turn Lane
-  Extend Left-turn Lane
-  Future Shared-use Right-in/Right-out Driveway (No Left Turn)
-  Traffic Signal
-  Two-Direction Large Arrow Sign
-  Stop Ahead Sign



February 2012










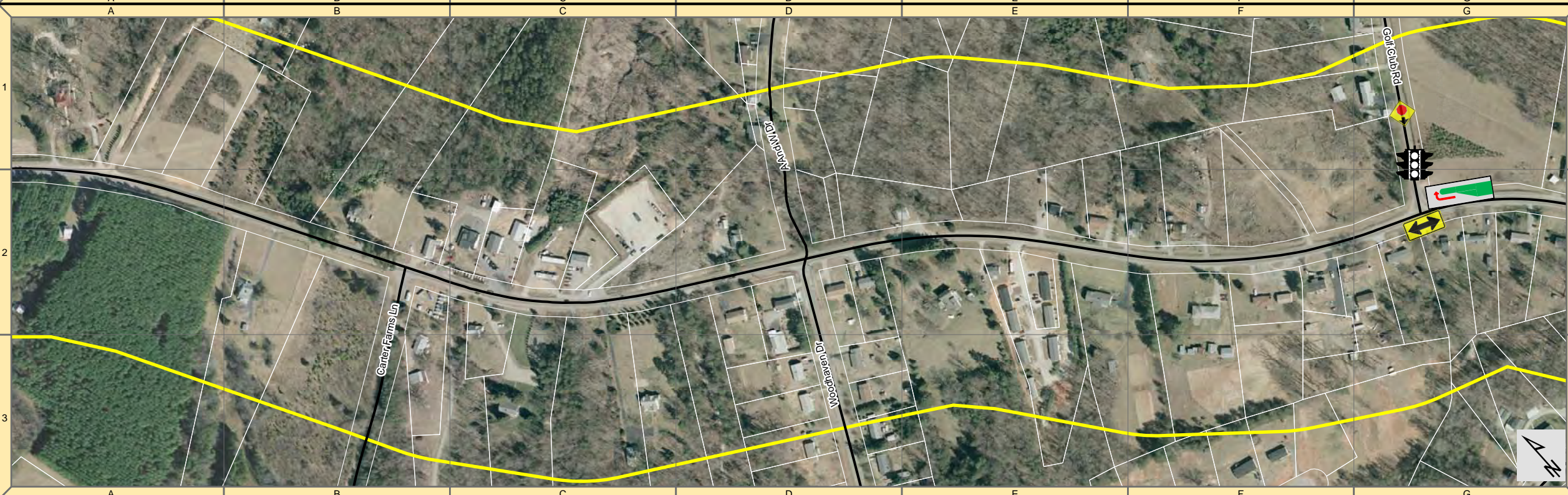
Mt. Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

Figure 15: Safety and Access Management Improvements - Pittsylvania County

Legend

-  Parcel Boundary
-  Mount Cross Road Improvement Study Area
-  Install Right-turn Lane
-  Future Shared-use Full Access Driveway
-  Traffic Signal
-  Two-Direction Large Arrow Sign
-  Stop Ahead Sign



February 2012






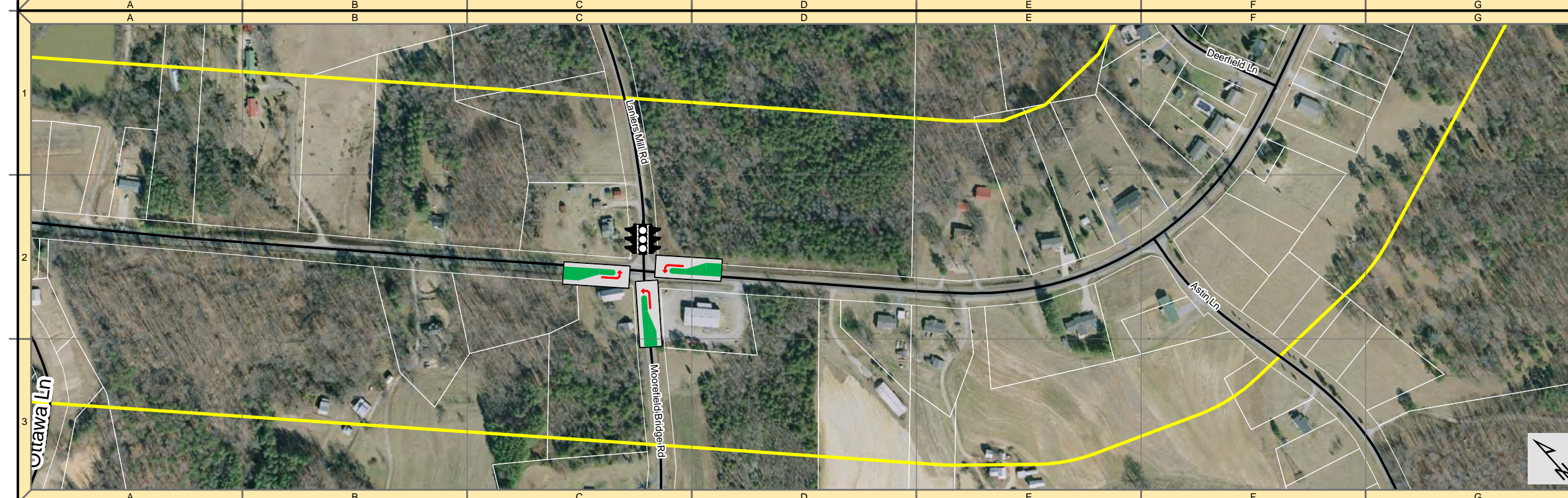
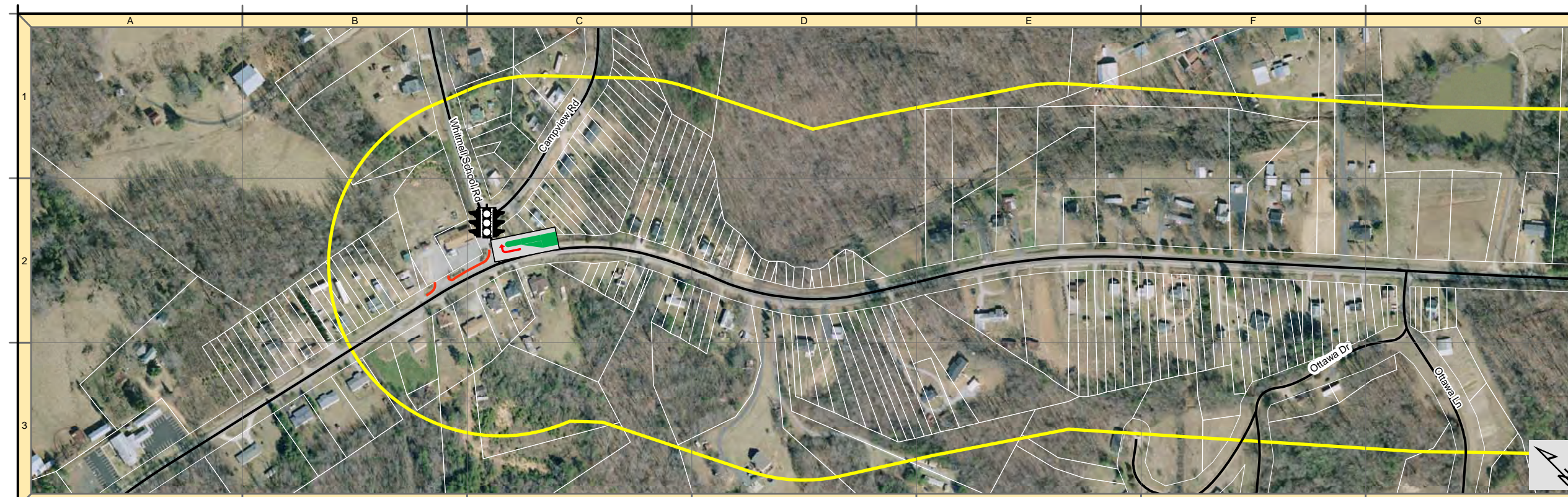
Mt. Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

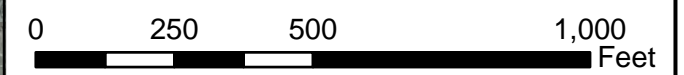
Figure 16: Safety and Access Management Improvements - Pittsylvania County

Legend

-  Parcel Boundary
-  Mount Cross Road Improvement Study Area
-  Access Modification
-  Traffic Signal
-  Install Right-turn Lane
-  Install Left-turn Lane



February 2012



V.5 COST ESTIMATES

PITTSYLVANIA COUNTY SEGMENT

Cost estimates were prepared for each of the proposed improvements related to the access management segments of the corridor (in Pittsylvania County) using VDOT Transportation & Mobility Planning Division's statewide planning level cost estimates developed from data through year 2009.

Each of the proposed new traffic signal installations will cost approximately \$170,000 (in 2011 dollars). Traffic signals were warranted (based on 2035 volumes) at the following intersections:

- Whitmell School Road
- Moorefield Bridge Road
- Golf Club Road
- Mill Creek Road

At several study area intersections turn lanes were forecast to be warranted, and each turn lane will cost approximately \$120,000 (in 2011 dollars). Based on 2035 volumes, turn lanes were forecast to be warranted at the following locations:

- Westbound right turn lane @ Whitmell School Road
- Westbound left turn lane @ Moorefield Bridge Road
- Eastbound left turn lane @ Moorefield Bridge Road
- Northbound left turn lane @ Moorefield Bridge Road
- Westbound left turn lane @ Pinecroft Road
- Westbound left turn lane @ Golf Club Road
- Westbound left turn lane @ Mill Creek Road

CITY OF DANVILLE

Cost estimating for the proposed widening of Mount Cross Road was completed using quantity estimates along with recent VDOT bid tab prices. Right-of-way costs were estimated at 25% of the construction costs and engineering and surveys were estimated at 20% of the construction costs. The widening cost estimates were estimated as follows:

- Alternatives 1 & 2 \$7,500,000
- Alternative 3 \$2,030,000
- Alternative 4 \$6,000,000

In addition to the widening improvements on Mount Cross Road, a separate right turn lane was evaluated on the westbound Mount Cross Road approach to Lowes Drive. Because the land immediately adjacent to the westbound approach slopes upward on an embankment estimated at approximately 8-10 feet in height, a retaining wall would

have to be installed in order to be able to install a right turn lane. The retaining wall is estimated to cost approximately \$120,000, and the total cost for the right turn lane (including the retaining wall) is estimated at \$190,000.

V.6 YEAR 2035 CAPACITY ANALYSIS: BUILD ALTERNATIVE

Capacity analysis of the Build Alternative was conducted for both a 4-lane and a 5-lane section for the segment of Mount Cross Road in the City. In the County, the Build Alternative consisted of turn lane improvements and the installation of traffic signals. In order to determine the need for turn lane improvements and new traffic signals the forecasted year 2035 traffic volumes were used to analyze volume warrants as documented in the *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*.² The year 2035 Build Alternative peak hour volumes and service levels are shown in **Figure 17**.

Based on the forecasted volumes the following southbound intersection approaches with Mount Cross Road meet warrants for a right turn lane:

- | | |
|-------------------------|--------------------|
| 1. Lowes Drive | 2. Mill Creek Road |
| 3. Golf Club Road | 4. Pinecroft Road |
| 5. Whitmell School Road | |

No left turn movement volumes were forecasted to meet left turn lane warrants along Mount Cross Road. However, the intersection of Moorefield Bridge Road and Mount Cross Road is forecast to meet traffic signal warrants under year 2035 volume conditions. Based on the need for a traffic signal at this intersection, left turn lanes will be required to achieve optimal signal operation on all approaches with the exception of the southbound approach.

Traffic signal warrants were also considered for the Year 2035 Build Alternative for all of the study area intersections. The 2009 MUTCD manual was used to evaluate the forecasted 2035 volumes for meeting traffic signal volume warrants. Specifically, the four-hour volume (included in the technical appendix) was the warrant of choice to evaluate the intersections. This warrant was analyzed at the 70% level because Mount Cross Road has a speed limit of 45 MPH. The four-hour volume warrant was used because the peak hour warrant is typically not used to justify a traffic signal alone. The forecasted 2035 AM and PM peak hour volumes (shown previously in **Figure 8** were used as two of the four hours that were evaluated and 85% of the AM and PM peak hours were used for the second two hours. Based on the 4-hour warrant four intersections were forecasted to warrant a traffic signal under year 2035 traffic volumes: Whitmell School Road, Moorefield Bridge Road, Golf Club Road, and Mill Creek Road.

² *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways: 2009 Edition*. U.S. Department of Transportation, Federal Highway Administration. Washington, D.C., December 2009. pp.437-439.

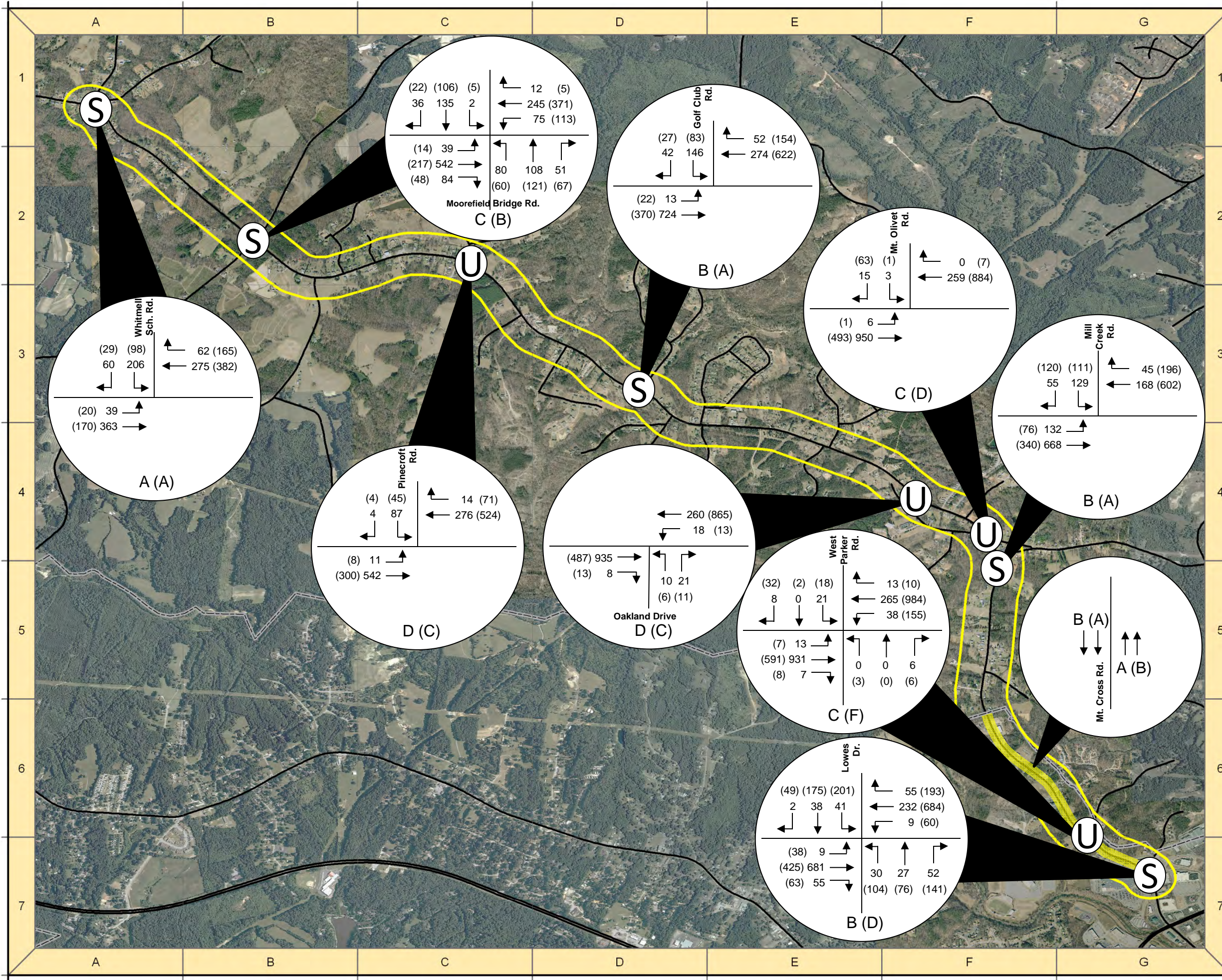
Mount Cross Road (Route 750) Improvement Study

Danville Urbanized Area Metropolitan Planning Organization
 Danville, Virginia

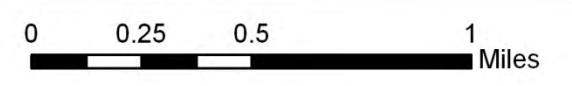
Figure 17: 2035 Build Alternative Traffic Volumes and Levels of Service

Legend

- Study Area
- 54 (65) – AM (PM) Peak Hour Volumes
- B (C) – AM (PM) Level of Service
- S** – Signalized Intersection
- U** – Unsignalized Intersection



February 2012



Analysis was conducted for the forecasted Build Alternative volumes (shown in **Figure 17**) using the proposed geometric improvements previously described. Analysis was conducted using the same procedures previously used to analyze both the existing conditions and the No Build Alternative conditions.

Table 16 displays a summary of the results of the Build Alternative capacity analysis for the intersection of Lowes Drive and Mount Cross Road. In both peak hours the overall intersection level of service is adequate with level of service B and C exhibited in the AM and PM peak hours, respectively. Most of the individual movements service levels exhibited are no lower than D. Improvement over the No Build Alternative was achieved by applying a shorter traffic signal cycle length and the rearrangement of the westbound Lowes Drive approach lane designations.

Table 16				
Summary of Build Alternative Capacity Analysis				
Lowes Drive @ Mount Cross Road				
Movement	AM Delay	AM LOS	PM Delay	PM LOS
EB Lowes Drive – Left/Through	37.3	D	53.6	D
EB Lowes Drive - Right	33.5	C	33.0	C
WB Lowes Drive - Left	38.5	D	50.5	D
WB Lowes Drive – Through/Right	35.2	D	41.7	D
NB Mount Cross Road - Left	56.1	E	44.5	D
NB Mount Cross Rd. – Through	11.4	B	28.2	C
NB Mount Cross Road - Right	10.7	B	21.2	C
SB Mount Cross Road – Left	41.3	D	52.1	D
SB Mount Cross Road - Through	13.1	B	25.1	C
SB Lowes Drive – Right	9.8	A	21.4	C
Overall Intersection	18.1	B	33.9	C

Table 17 summarizes the levels of service for the unsignalized intersections under year 2035 Build Alternative conditions. Here also, the lowest individual movement level of service is shown in the results, and generally this reflects the minor street left turn movement. With only one exception the unsignalized intersections operate with no lower than LOS D conditions, with the exception being the intersection of West Parker Road and Mount Cross Road. The low service level is a result of heavy through volumes on Mount Cross Road making it difficult for motorists on the minor street desiring to turn

left turn to complete their maneuver. This intersection does not appear to have sufficient forecasted volumes to meet traffic signal warrants.

Table 17				
Summary of Build Alternative Conditions Capacity Analysis				
Unsignalized Intersections				
Lowest Individual Movement Level of Service				
Intersection	AM Delay	AM LOS	PM Delay	PM LOS
Pinecroft Rd. @ Mt. Cross Rd.	33.3	D	19.1	C
Oakland Dr. @ Mt. Cross Rd.	27.1	D	23.7	C
Mt. Olivet Rd. @ Mt. Cross Rd.	15.5	C	31.5	D
West Parker Rd. @ Mt. Cross Rd.	15.5	C	178.4	F
Womack Dr. @ Mt. Cross Rd.	0.0	A	0.0	A
Carter Dr. @ Mt. Cross Rd.	13.9	B	13.7	B
Kerr Ln. @ Mt. Cross Rd.	14.5	B	17.9	C
Kent Ln. @ Mt. Cross Rd.	13.8	B	16.8	C
Brush Arbor Ct. @ Mt. Cross Rd.	15.1	C	17.4	C
Carriage Hill Dr. @ Mt. Cross Rd.	15.2	C	17.6	C
Carriage Hill Cir. @ Mt. Cross Rd.	14.6	B	16.9	C
Olde Hunting Tr. @ Mt. Cross Rd.	15.8	C	17.4	C
Cedar Tr. @ Mt. Cross Rd.	12.9	B	10.1	B
Rosewood Ct. @ Mt. Cross Rd.	13.3	B	12.7	B
Jamerson Rd. @ Mt. Cross Rd.	17.1	C	18.9	C
Woodhaven Dr. @ Mt. Cross Rd.	13.5	B	13.5	B
Deerfield Ln. @ Mt. Cross Rd.	12.0	B	11.9	B
Astin Ln. @ Mt. Cross Rd.	11.2	B	10.3	B
Ottawa Ln. @ Mt. Cross Rd.	11.0	B	10.3	B
Carter Farms Ln. @ Mt. Cross Rd.	11.7	B	11.4	B

Note: The individual approach movement with the lowest level of service and delay is shown for each unsignalized intersection.

**Where Volume to Capacity (v/c) ratio exceeds 3.0, average delays increase to extremely large amounts. Instead, error statement is shown by Synchro to indicate that movement is oversaturated.*

Table 18 displays a summary of the results of the Build Alternative conditions queuing analysis for the unsignalized intersections. The longest queue for a minor street approach is shown - generally the minor street approach left turn movement. Nearly all of the queuing movements are less than 100 feet in length, even under the heaviest (95th percentile) peak hour traffic conditions.

Table 18 Summary of Build Conditions Queuing Analysis (SimTraffic) Unsignalized Intersections				
Intersection	AM Average	AM 95%	PM Average	PM 95%
Pinecroft Rd. @ Mt. Cross Rd.	39	71	26	42
Oakland Dr. @ Mt. Cross Rd.	22	44	15	50
Mt. Olivet Rd. @ Mt. Cross Rd.	12	31	27	67
West Parker Rd. @ Mt. Cross Rd.	19	49	59	133
Womack Dr. @ Mt. Cross Rd.	0	0	0	0
Carter Dr. @ Mt. Cross Rd.	4	21	4	24
Kerr Ln. @ Mt. Cross Rd.	3	18	2	14
Kent Ln. @ Mt. Cross Rd.	3	18	3	17
Brush Arbor Ct. @ Mt. Cross Rd.	18	45	10	33
Carriage Hill Dr. @ Mt. Cross Rd.	16	41	11	35
Carriage Hill Cir. @ Mt. Cross Rd.	12	36	16	41
Olde Hunting Tr. @ Mt. Cross Rd.	28	46	23	48
Cedar Tr. @ Mt. Cross Rd.	2	13	0	0
Rosewood Ct. @ Mt. Cross Rd.	12	36	13	37
Jamerson Rd. @ Mt. Cross Rd.	19	46	19	45
Woodhaven Dr. @ Mt. Cross Rd.	10	33	7	26
Deerfield Ln. @ Mt. Cross Rd.	8	29	6	25
Astin Ln. @ Mt. Cross Rd.	12	35	6	25
Ottawa Ln. @ Mt. Cross Rd.	10	33	4	21
Carter Farms Ln. @ Mt. Cross Rd.	6	25	7	26

Results of the capacity analysis of the proposed signalized intersections in the Build Alternative conditions are found in **Table 19**. All four of the intersections recommended for signalization are forecast to operate with LOS C or better. Nearly all of the individual movements at these four intersections operate at LOS C or better.

**Table 19
Summary of Build Alternative Capacity Analysis (HCM)**

Whitmell School Rd. @ Mt. Cross Rd.
Moorefield Bridge Rd. @ Mt. Cross Rd.
Golf Club Rd. @ Mt. Cross Rd.
Mill Creek Rd. @ Mt. Cross Rd.

Movement	AM Delay	AM LOS	PM Delay	PM LOS
<i>Whitmell School Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Road -Through/Left	8.9	A	3.9	A
WB Mount Cross Road -Through	7.1	A	5.0	A
WB Mount Cross Road - Right	5.2	A	3.6	A
SB Whitmell School Road - Left	15.1	B	16.4	B
SB Whitmell School Road - Right	12.6	B	14.6	B
Overall Intersection	9.3	A	6.1	A
<i>Moorefield Br. Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Rd. - Left	12.0	B	13.6	B
EB Mount Cross Rd. - Through/Right	43.9	D	18.6	B
WB Mount Cross Road - Left	24.1	C	10.1	B
WB Mount Cross Rd. - Through/Right	17.0	B	16.3	B
NB Moorefield Bridge Rd. - Left	34.3	C	16.1	B
NB Moorefield Bridge - Through/Right	24.6	C	16.7	B
SB Laniers Mill - Left/Through/Right	49.5	D	24.9	C
Overall Intersection	33.6	C	17.3	B
<i>Golf Club Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Rd. -Through/Left	11.9	B	4.5	A
WB Mount Cross Rd. - Through	5.7	A	6.4	A
WB Mount Cross Road - Right	4.6	A	3.6	A
SB Golf Club Road - Left /Right	20.9	C	19.8	B
Overall Intersection	11.6	B	6.9	A
<i>Mill Creek Rd. @ Mt. Cross Rd.</i>				
SB Mill Creek Road - Left/Right	20.1	C	17.2	B
WB Mount Cross Road - Through	4.9	A	8.9	A
WB Mount Cross Road - Right	4.4	A	5.0	A
EB Mount Cross Road - Left	5.1	A	6.3	A
EB Mount Cross Road - Through	10.8	B	5.8	A
Overall Intersection	10.7	B	8.8	A

Table 20 summarizes the queuing analysis for the Build Alternative conditions at the intersection of Lowes Drive and Mount Cross Road. In the AM peak hour all but one movement exhibited queue lengths of less than 100 feet. The PM peak hour results showed many queue lengths in the range of 100-200 feet in length, with no queue exceeding 250 feet in length. The analysis results show no significant queuing issues are forecasted.

Table 20 Summary of Build Alternative Queuing Analysis (SimTraffic) Lowes Drive @ Mount Cross Road				
Movement	AM Average	AM 95%	PM Average	PM 95%
EB Lowes Drive – Left/Through	38	69	116	178
EB Lowes Drive - Right	18	38	31	58
WB Lowes Drive - Left	42	85	121	197
WB Lowes Drive – Through/Right	20	51	109	211
NB Mount Cross Road - Left	7	30	36	77
NB Mount Cross Rd. – Through	21	47	143	250
NB Mount Cross Road - Right	7	18	36	119
SB Mount Cross Road – Left	7	25	30	63
SB Mount Cross Road - Through	82	149	103	166
SB Lowes Drive – Right	16	45	36	107

The results of the queuing analysis of the four proposed signalized intersection in the Build Alternative conditions – Whitmell School Road, Moorefield Bridge Road, Golf Club Road, and Mill Creek Road are shown in **Table 21**. The vast majority of the individual movements at these four intersections exhibit vehicle queues less than 100 feet in length under average traffic volume conditions and less than 200 feet in length under 95th percentile traffic volume conditions. The heaviest queuing was evident at the intersection of Moorefield Bridge Road/Laniers Mill Road and Mount Cross Road.

Table 21 Summary of Build Alternative Queuing Analysis (SimTraffic) Whitmell School Rd. @ Mt. Cross Rd. Moorefield Bridge Rd. @ Mt. Cross Rd. Golf Club Rd. @ Mt. Cross Rd. Mill Creek Rd. @ Mt. Cross Rd.				
Movement	AM Average	AM 95%	PM Average	PM 95%
<i>Whitmell School Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Road -Through/Left	55	100	20	52
WB Mount Cross Road -Through	45	78	32	75
WB Mount Cross Road - Right	16	40	18	42
SB Whitmell School Road - Left	59	99	34	56
SB Whitmell School Road - Right	27	72	13	29
<i>Moorefield Br. Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Rd. - Left	22	90	10	35
EB Mount Cross Rd. - Through/Right	186	298	66	110
WB Mount Cross Road - Left	41	80	42	82
WB Mount Cross Rd. - Through/Right	55	110	60	114
NB Moorefield Bridge Rd. - Left	49	81	24	49
NB Moorefield Bridge - Through/Right	57	100	50	87
SB Laniers Mill - Left/Through/Right	81	126	52	86
<i>Golf Club Rd. @ Mt. Cross Rd.</i>				
EB Mount Cross Rd. -Through/Left	111	204	52	107
WB Mount Cross Rd. - Through	37	77	59	125
WB Mount Cross Road - Right	11	34	21	48
SB Golf Club Road - Left /Right	76	133	40	58
<i>Mill Creek Rd. @ Mt. Cross Rd.</i>				
SB Mill Creek Road - Left/Right	74	123	80	137
WB Mount Cross Road - Through	23	55	88	182
WB Mount Cross Road - Right	6	26	28	57
EB Mount Cross Road - Left	38	70	38	73
EB Mount Cross Road - Through	82	140	52	98

Table 22 summarizes the Build Alternative conditions (4 or 5-lane) capacity analysis for Mount Cross Road as a 4-lane roadway from West Parker Road to the City/County line. Multilane highways are evaluated based on the density of vehicles on the roadway. Density can be related to the amount of freedom of movement drivers have to change lanes and travel their desired speed. During both peak hours both directions of Mount Cross Road are forecast to operate with LOS A or B conditions. This is a significant improvement over the No Build Alternative conditions which were between LOS C and E.

Table 22 Build Alternative (4 or 5-lane) Pavement Section: Service Levels and Density		
Mount Cross Road (from West Parker Rd. to City/County Line)		
Peak Hour/Direction	LOS	Density*
AM/Northbound	A	3.1
AM/Southbound	B	12.0
PM/Northbound	B	12.9
PM/Southbound	A	6.7

**Density is measured in passenger cars per mile per lane.*

V.7 PREFERRED ALTERNATIVE

After reviewing the impacts of the four alternatives, considering concerns expressed by citizens, traffic operations and cost estimates, URS Corporation recommended to the Project Management Team that Alternative 4 be selected as the Preferred Alternative. Alternative 4 provides for widening Mount Cross Road and shoulder improvements (shown previously in **Figures 12-A and 12-B**) on the roadway segment in the City of Danville. URS Corporation further recommended that for the segment of Mount Cross Road in Pittsylvania County the improvements shown in **Figures 14-16** be selected as the Preferred Alternative.

When compared with the other alternatives, including the No Build Alternative, the Preferred Alternative was selected because of the following principal reasons:

1. It (the Preferred Alternative) provides for the greatest extent of improvements within the budget for improvements as detailed in the current VDOT *FY2012-2017 Six-Year Improvement Program*;
2. It addresses all existing and forecasted deficiencies along the corridor, with emphasis on addressing safety and access management;
3. The environmental impacts of the Preferred Alternative are not anticipated to be either severe or extensive;
4. It provides the MPO and VDOT with the option to extend the length of the widening section to the Pittsylvania County limits if additional funding becomes available;
5. It provides the option to include added improvements (such as the northbound right turn lane on the Lowes Drive approach) either concurrently with the widening or at a later date; and,
6. It is consistent with the 2035 Long-Range Transportation Plan and the Six-Year Improvement Program.

V.8 ECONOMIC AND FINANCIAL IMPACTS

Implementing the Preferred Alternative on the Mount Cross Road segments in the City of Danville will require that financing be provided to cover the estimated \$6 million cost. As previously stated, the *FY 2012 Six-Year Transportation Improvement Program (SYIP)* provides for \$2 million in programmed urban system funds. The *SYIP* also identifies that \$4 million in additional funds will be needed, but it does not identify from what source those funds could be obtained.

The *Danville-Pittsylvania Area Long-Range Transportation Plan* identifies anticipated funding resources on an annual basis beginning in Fiscal Year 2010³. The funding resources indicate that beginning in Fiscal Year 2016, construction funding for roadway improvements in the Danville-Pittsylvania urbanized area is anticipated to be approximately \$2.4 million per year. Of that total, \$75,658 is allocated for the secondary road system in Pittsylvania County, leaving approximately \$2.3 million for other improvements on the primary, secondary or urban system.

If additional funding for the Preferred Alternative improvements on Mount Cross Road in the City of Danville does not become available prior to FY 2017, the MPO in coordination with VDOT may program the added funding to complete the improvements from funding allocations beginning in FY 2018. The added funding would require approximately 87% of the anticipated FY 2018-19 construction funding allocation to the MPO. In programming FY 2018-19 funds to Mount Cross Road, the MPO would be indicating that these improvements would likely be of the highest priority within the urbanized area.

The current SYIP identifies \$893,000 in funds beyond the current SYIP FY 2017 that are needed to fully fund improvements that are either programmed or completed. However, the *SYIP* also identifies \$1,541,000 in unallocated surplus funds associated with the Robertson Bridge replacement, leaving a net available funding after FY 2017 of approximately \$648,000, which could be allocated to the Mount Cross Road improvements reducing the addition funding required to \$3,352,000 from \$4,000,000.

For the improvements to Mount Cross Road in Pittsylvania County, construction funding may be allocated from the secondary roadway fund, the MPO funds or from safety funds. Moreover, unlike the improvements in the City, the individual improvements in the County can be implemented at different times. With this flexibility, the improvements can be individually implemented when they achieve a sufficient level of priority relative to other needed improvements that the MPO in cooperation with Pittsylvania County and VDOT program the funds in the appropriate *SYIP* fiscal year.

V.9 PERMIT EVALUATION

Considering that widening of Mount Cross Road is not being considered for the segments in Pittsylvania County, the information in shown previously in **Figure 5 – Hazardous Sites Map**, **Figure 6 – Environmental Constraints** and **Figure 7 – Cultural Resources Map** do not indicate the presence of any constraints that are likely to compromise the ability of either VDOT or the County to implement recommended actions.

In contrast, along the segment in the City of Danville, four sites of potential hazardous materials will need further documentation as design activities are initiated.

Focusing on the Preferred Alternative, permits under the Section 404 of the Clean Water Act as administered by the U.S. Army Corps of Engineers (USACE) and relate to potential stream and wetland impacts are not anticipated to be required. In addition, the Virginia Department of Environmental Quality (DEQ) regulates activities within state waters and wetlands under Section 401 of the Clean Water Act (33 U.S.C. §1341), under State Water Control Law (Code of Virginia Title 62.1), and Virginia Administrative Code Regulations 9VAC25-210 et seq., 9VAC25-660 et seq., 9VAC25-670 et seq., 9VAC25-680 et seq., and 9VAC25-690 et seq. The Preferred Alternative does not appear to involve activities in state waters and wetlands, so a permit will not be required.

V.10 Public Involvement

The public involvement program conducted as part of the corridor study provided two opportunities for interested citizens to participate in the process.

First Citizens Information Meeting

The first Citizens Information Meeting was held on Monday, July 11, 2011 between 4 p.m. and 7 p.m. at Park Avenue Elementary School in Danville, Virginia. The meeting was advertised in local newspapers and notices were posted on the City's public access cable channel. In addition, notices by letter were sent to addresses along the corridor study area in the City of Danville. A total of twenty citizens signed the attendance sheet.

The materials presented at the first meeting included maps showing environmental constraints, existing peak period traffic volumes, crash locations and frequencies, and year 2035 forecasted peak period traffic volumes and service levels. A brief PowerPoint presentation was provided by URS Corporation staff, in which the project purpose and schedule were detailed.

Three written comments were submitted. No written or verbal comments expressed opposition to considering improvements along the corridor.

³ *Danville-Pittsylvania Area Long-Range Transportation Plan*. Danville-Pittsylvania MPO. August 16, 2010. p.55.

Second Citizens Information Meeting

The second Citizen Information Meeting was conducted on Monday, September 19, 2011, between 4 p.m. and 6 p.m. at Park Avenue Elementary School in Danville, Virginia. The meeting was also advertised in the newspapers. In addition, notices either by letter or by email were sent to all those who signed up as attendees at the first Citizens Information Meeting. A total of nine citizens signed the attendance sheet.

The materials presented at the second meeting included maps showing environmental constraints, existing peak period traffic volumes, crash locations and frequencies, and year 2035 forecasted peak period traffic volumes and service levels – all previously shown at the first Citizens Information Meeting. New material exhibited included:

- Map based renderings of the four improvement alternatives;
- Graphic display of the proposed typical roadway section; and,
- Table of the construction cost estimates for each Build Alternative.

Four written comments were submitted, with one requesting more detail on the impacts the proposed improvements would have on a particular site, and the remaining three comments suggesting operational improvements (signals, warning signs, for example). No written or verbal comments expressed opposition to improvements to Mount Cross Road.

A summary presentation and discussion was conducted at an informal meeting of the Danville City Council on November 15, 2011 at Danville City Hall. Finally, an additional opportunity for citizen comment was provided at the public hearing, which was held immediately prior to the meeting of the MPO Board on January 19, 2012 at the Danville Regional Airport.

VI. CONCLUSIONS & RECOMMENDATIONS*VI. 1 SUMMARY AND CONCLUSIONS*

The Danville-Pittsylvania Metropolitan Planning Organization engaged URS Corporation to conduct the Mount Cross Road (Route 750) Improvement Study. The goal of the study is to define improvements to the existing two-lane section between Lowes Drive and Whitmell School Road to the west. Mount Cross Road widening from Lowes Drive to the City/County line is a recommended improvement in the *Danville Metropolitan Area Year 2035 Long Range Transportation Plan*. Additionally, VDOT's *FY2012-2017 Six-Year Transportation Improvement Program (SYIP)* includes the project, Mount Cross Road Spot Improvements and Access Management project (UPC 100822) from Lowes Drive to the West Corporate Limits of the City of Danville.

The study has reviewed different designs for widening Mount Cross Road from Lowes Drive to the City/County line. The two basic typical-sections that were considered were a 4-lane divided typical section with a raised median and a 5-lane typical-section with a two-way center left turn lane. Both typical-sections include a sidewalk and a trail adjacent to the roadway along with curb and gutter drainage. The right-of-way footprint is 95 feet in width for both typical-sections.

Access management was also a major component of this study for the entire length of the study area. The lack of access management in the past has left Mount Cross Road with numerous closely-spaced residential driveways along the roadway. Given that the residential character of the roadway is not likely to change in the foreseeable future, modifications to the residential driveways were not proposed. The focus of the access management study instead was to identify the need for turn lanes, traffic signals, safety improvements, and access in the City of Danville.

Existing Conditions

To determine existing conditions, AM and PM peak period traffic counts were conducted at nine key intersections in the study area. Traffic volumes at 16 other minor intersections were estimated based on the number of residential units they served. Most of the intersections in the study are currently unsignalized, and two of the unsignalized intersections currently have deficient service levels – Mill Creek Road and West Parker Road. The only intersection in the study area that is currently signalized is at Lowes Drive. Using the current traffic signal timings, capacity analysis was conducted, and it was determined that this intersection operates with LOS B conditions in the AM peak hour and LOS D conditions in the PM peak hour.

Using records provided by the Danville Police Department, crash types and locations along Mount Cross Road were also analyzed for the three year period from 2007-2009. City records show 37 crashes during this period. VDOT provided records for crashes in Pittsylvania County. The most recently available three year period 2005-2007, was used

to analyze crash patterns. A total of 63 crashes were recorded during this period with 27 rear end crashes, 14 angle crashes, and 14 fixed-object off-road crashes. Out of the 100 total crashes in the study area there were 74 injuries and 1 fatality. Comparing crash rates in the corridor study area with statewide rates demonstrated that corridor crash rates were higher than the statewide average rates for roads with the same classification. Crashes were generally evenly spread out through the corridor. The poor geometrics (rolling terrain and lack of shoulder) and access characteristics (frequent residential driveways) of the road are the most influential contributors to the high crash rates.

Environmental Resources

Using the data developed from a detailed scan of a wide range of environmental resources in the study area.

The overall finding of the evaluation of environmental resource constraints is that there does not appear to be known environmental resources that either individually or in concert with other resources that would preclude implementation of the improvements in the Preferred Alternative. The design and permitting process of the individual improvements will require efforts to either avoid or minimize impacts to existing resources, but if reasonable efforts to achieve such avoidance and minimization are pursued, the need for permits can be either avoided or minimized.

Year 2035 Forecasted Conditions

The Danville area year 2035 travel demand model was used to develop peak period forecast. Specifically, growth rates were computed by comparing the baseline (year 2000) model estimates with the year 2035 model forecasts, and the growth factors were then applied to the corridor and intersection peak hour traffic counts collected as part of this study. It should be noted that the travel demand model did include employment located at the Mega Park.

Analysis of the No Build Alternative found that the volumes on Mount Cross Road are forecast to grow from 26-72% by the year 2035. With these higher volumes, capacity analysis determined that service will fall by several levels from where they are in the existing conditions. Moreover, deficient conditions are forecast to deteriorate from marginally inadequate to severely inadequate, with six unsignalized intersections exhibiting service levels of E and F – Whitmell School Road, Golf Club Road, Oakland Drive, Mill Creek Road, West Parker Road, and Moorefield Bridge Road. The signalized intersection of Lowes Drive and Mount Cross Road is forecast to operate with LOS C and E conditions, respectively for the AM and PM peak hours. Mount Cross Road from West Parker Road to the City/County line is forecast to operate with levels of service ranging from C to E.

Purpose and Need

Mount Cross Road exhibits periods of congestion, high crash frequencies, and has poor access management. VDOT states in the access management regulations, the goals of access management are:

1. Reduce traffic congestion;
2. Help maintain levels of service;
3. Enhance public safety;
4. Support economic development;
5. Reduce the need for new highways;
6. Preserve investment in new highways; and,
7. Coordinate transportation and land use decisions.

Applying these goals within the regulatory definition of Access Management and based on the analysis of existing and forecasted conditions, the purpose and need for the Mount Cross Road Improvement Study is defined as addressing the following issues:

1. In the segment Mount Cross Road located within the City of Danville, the *FY2012 Six-Year Transportation Improvement Program* provides for spot safety and access management improvements. These should be defined so that the City may pursue final design.
2. Pittsylvania County needs a guide for assisting property owners and developers with understanding the application of access management regulations along a Urban Minor Arterial and a Rural Major Collector;
3. Frequencies of crashes along Mount Cross Road have the potential to increase as traffic volumes and development pressures increase;
4. Service levels in the area of six intersections are forecast to deteriorate to inadequate levels unless improvements are developed and installed; and,
5. Capacity along the corridor should be preserved so that it can adequately serve traffic volumes associated with commuters to and from the Mega Park.

Alternatives Development and Analysis

Eight evaluation criteria were developed, each with a weighting from 1-3 (the higher weight indicating greater importance among the criteria). The evaluation criteria are:

- | | |
|-----------------------|---------------------------------|
| 1. Capacity | 5. Right Of Way Impacts |
| 2. System Performance | 6. Environmental Impacts |
| 3. Safety | 7. Financial Impacts |
| 4. Cost | 8. Consistency with Local Plans |

Cost Estimates

Using VDOT planning level cost estimating data cost estimates were developed for all of the proposed improvements. Each of the proposed new traffic signal installations will cost approximately \$170,000 (in 2011 dollars). Traffic signals will be warranted in future years at the following intersections – Whitmell School Road, Moorefield Bridge Road, Golf Club Road, and Mill Creek Road. Several turn lanes will be warranted at study area intersections, and each turn lane will cost approximately \$120,000. One exception to this would be the intersection of Lowes Drive and Mount Cross Road where a northbound right turn lane was proposed. Because the land immediately adjacent to the road is an embankment approximately 8'-10' high a retaining wall would have to be installed in order to be able to install a right turn lane. The retaining wall is estimated to cost approximately \$120,000 and the right turn lane total cost is estimated at \$190,000.

The widening cost estimates were as follows: Alternatives 1 & 2 – \$7,500,000 each, Alternative 3 - \$2,030,000, Alternative 4 - \$6,000,000.

Year 2035 Capacity Analysis

The proposed improvements related to access management (turn lanes, traffic signals, etc.) along with the proposed widening of Mount Cross Road makes significant improvement on the No Build conditions. Four of the unsignalized intersections that showed poor service levels in the No Build conditions became signalized and showed significantly better (and adequate) service levels. Signal timing improvements, changes in lane designations, and a new northbound left turn lane showed modest improvements at the Lowes Drive intersection with Mount Cross Road. Finally, the widened sections of Mount Cross Road showed dramatic increases in service levels when evaluated as a roadway facility. Alternative 4 struck a balance of safety with a raised median at the southern portion of the widening and a center two-way left turn lane north of West Parker Road which will provide for better access to Mount Cross Road from the side streets.

Environmental Impacts

The scan of environmental resources within the study area identified four sites with a potential for hazardous materials; four sites with historic resources that were found to lack sufficient historic value to add to the National Register of Historic Places, and little potential for significant archeological resources. On balance, when comparing the four improvement alternatives the extent of impacts to resources are commensurate with the extent of the land disturbance anticipated.

In summary, there is little difference in the environmental impacts among the four improvement alternatives on Mount Cross Road, and no environmental resources were identified that would jeopardize the viability of the Preferred Alternative.

Financial Impacts

The FY 2012 Six-Year Transportation Improvement Program (SYIP) provides for \$2 million in programmed urban system funds, and identifies that \$4 million in additional funds will be needed, but it does not identify from what source those funds could be obtained. If additional funding for the Preferred Alternative improvements on Mount Cross Road in the City of Danville does not become available prior to FY 2017, the MPO in coordination with VDOT may program the added funding to complete the improvements from future funding allocations.

If the MPO and VDOT allocate surplus funds from current construction projects to the Mount Cross Road improvements, additional funding required would be reduced to \$3,352,000 from \$4,000,000.

For the improvements to Mount Cross Road in Pittsylvania County, construction funding may be allocated from the secondary roadway fund, the MPO funds or from safety funds. The improvements can be individually implemented when they achieve a sufficient level of priority relative to other needed improvements that the MPO in cooperation with Pittsylvania County and VDOT program the funds in the appropriate SYIP fiscal year.

V.10 Public Involvement

The public involvement program conducted as part of the corridor study provided two opportunities for interested citizens to participate in the process. The Citizens Information Meetings were held on July 11, 2011 and September 19, 2011 at the Park Avenue Elementary School in Danville, Virginia. Twenty citizens attended the first meeting and nine attended the second meeting. Comments were received and incorporated into the study process. No written or verbal comments expressed opposition to considering improvements along the corridor.

VI. 2 RECOMMENDATIONS

Based on the findings of the analysis of existing and forecasted year 2035 conditions on the Mount Cross Road corridor from Lowes Drive in Danville to Whitmell School Road in Pittsylvania County, the following improvements are recommended:

City of Danville

1. Improve Mount Cross Road from Lowes Drive to the Pittsylvania County limits with widening and shoulder improvements included in Alternative 4 as shown in **Figures 12-A and 12-B**. Include with these improvements a separate right turn lane on the northbound Mount Cross Road approach to eastbound Lowes Drive;
2. Modify the intersection of Lowes Drive and Mount Cross Road:
 - a. Reconfigure the westbound lane configuration to provide a separate left turn lane and a combined through/right lane;
 - b. Modify the traffic signal timing and phasing to accommodate the re-configured eastbound approach and the added northbound right turn lane.

Pittsylvania County

3. Install improvements as detailed in **Figures 13-16**. Improvements should be installed based on the findings of appropriate traffic safety studies and traffic signal warrant analysis.