DRAFT REPORT

ROUTE 29 North CORRIDOR IMPROVEMENT STUDY
Route 605 TO PRINCE WILLIAM COUNTY LINE
PHASE II

Prepared for

Fauquier County

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Introduction

This report covers Phase 2 of the Route 29 Corridor Study between Route 605 and Route 215. In Phase 1 which was conducted for the Piedmont Environmental Council and Fauquier County, initial access management recommendations including proposed roundabouts and directional left turns were proposed and evaluated at various Route 29 intersections. For Phase 2, additional corridor improvements were evaluated and the study boundaries were expanded from Route 605 to the Prince William County line. The proposed improvements are designed to be sensitive to the character of Fauquier County and meet the needs of the New Baltimore business community while handling existing and projected traffic volumes in a safe and efficient manner.

Overall Concepts and Design Principles

The following are the overall concepts and design principles used in the Route 29 Corridor Study.

1. Corridor Issues

The Route 29 Corridor between Route 605 and the Prince William County line is primarily a 4-lane divided highway that serves local, regional, and statewide traffic. The most recent traffic counts (2008) in the study corridor show approximately 45,000 average daily trips however it experienced traffic declines in recent years. About 4% of the traffic is truck traffic. The corridor has many competing interests and issues including relieving congestion, improving safety, preserving the agricultural land use and viewsheds and maintaining its historic integrity.

With the southern portion of the corridor located within one of the County's Service District, the corridor is facing continuing pressure from local traffic as well as an increase in regional through traffic. Increased traffic will create more demand for traffic signalization which in turn will lower the overall capacity of the road. The construction of driveways connected directly to Route 29 will also increase the congestion and raise the collision rate. For every commercial driveway per mile the free flow speed drops a ¼ mile per hour. Signalization closer than ½ mile will reduce the capacity as well. Under ideal conditions signals should not be closer than two miles apart.

In order to preserve capacity, improve safety, provide for commercial access, and preserve the historic nature of the corridor, access management techniques such as signal spacing, closing of unnecessary median openings, spacing of driveways, reverse frontage roads, and innovative continuous flow intersection designs will be considered for the corridor. Speed reductions will also be considered for the corridor to improve the safety and allow greater landscaping within the right-of-way. The purpose of the proposed improvements is to maintain a four-lane divided highway and preserve the corridor's historic character while maintaining good access and improved safety.

2. *Overall Roadway Concept*

The roadway sections north of Route 605 and south of the Prince William County line are recommended to be designed as a rural parkway with limited median openings, traffic signals, and driveways that meet VDOT's access management criteria. The concept of a rural roadway would be consistent with the Prince William County goals for the Buckland area. In the New Baltimore area, the roadway should transition into an area where the drivers are aware of a sense of community and the concept that they are in a section of the corridor with more land use activity and where lower speeds are appropriate.

3. *Contex*t *Sensitive Solutions and Prudent and Feasible Alternatives*

Context sensitive solutions (CSS) is an approach to develop and redesign transportation facilities that fit into their physical and human environment and preserve the scenic, aesthetic, and historic community and natural environment, while maintaining safety and mobility. CSS considers the total context within which a transportation improvement project will exist. For the Route 29 corridor, it has been rated as the most threatened stretch of the Journey Through Hallowed Ground Corridor. Therefore the proposed designs and improvements will propose context sensitive solutions that protect and consider viewsheds, battlefield areas, and appropriate landscaping.

An extremely sensitive area in the corridor is the Buckland Races Battlefield located in the northern portion of the corridor and into Prince William County. Throughout the process of developing transportation improvements for the Battlefield area , one of the chief considerations was to avoid, minimize, or mitigate the adverse impacts to the historic battlefield environment. In order to avoid and minimize the impact to the Battlefield, a Continuous Green T Intersection is proposed at the intersection located within it.

4. *Reduction in Corridor Speeds*

A reduction in the speed from 60 mph to 45 mph in the corridor extending to Vint Hill Road would have several benefits. With lower speeds many of the design standards would change. For example, the required clear zone distances would be reduced and additional landscaping would be possible. The lower speeds would require shorter sight and stopping distances thus reducing the potential for rear-end collisions which is especially problematic at the Vint Hill Road intersection.

Several proposed improvements such as roundabouts would lower the overall speed. Additionally, lower speeds would allow for mountable curbs in the median areas that would encourage traffic calming.

5. Adjustment of Future Traffic Forecasts

The future traffic forecasts are critical when determining the type and effectiveness of Route 29 corridor improvements. A review of current forecasts (as presented in the VDOT Route 29 Corridor Study) indicated that Route 29 forecasts could grow to 75,000 – 80,000 average daily trips (ADT) by 2030. The current volume is approximately 43,000 to 45,000 ADT depending on the section of Route 29 that is being evaluated. However, recent VDOT counts have shown no growth in traffic volumes which is most likely reflective of the recent downturn in economic activity and increase in gas prices.

The previously completed New Baltimore Traffic Impact Analysis, prepared in 2007, developed traffic forecasts at full build out. However, full build-out may not occur until at least 2050 or later at the current and past rates of growth and development. For this evaluation, the traffic forecast has been adjusted to reflect 2030 traffic. The 2030 traffic is based on a straight-line extrapolation between current traffic and full build out traffic.

Summary

In summary as part of the identification and development of Route 29 transportation improvement concepts, certain principles and objectives were considered. These principles included:

a. Maintain or improve upon the existing levels of service and minimize future increases in travel delay.
b. Improve safety and reduce the crash rate.
c. Maintain the corridor as a four-lane rural parkway.
d. Incorporate innovative at-grade intersections rather than grade separation interchanges.
e. Design transition areas and corridor improvements that promote urban nodes for areas such as New Baltimore.
f. Lower the travel speeds to 45 miles per hour through innovative design features and where appropriate in the commercial node to 35 miles per hour.

Potential Types of Improvements

Various types of intersection and roadway improvements were considered for implementation on Route 29. These improvements include but are not limited to:

1. Rural Double-Lane Roundabouts:

The modern roundabout has characteristics that improve the capacity and safety versus the typical signalized or un-signalized intersection. These characteristics include yield

control on all entries; priority to circulating vehicles; all vehicles circulating counter-clockwise; speed reductions to no greater than 30 miles per hour; entry flares; splitter islands; and accommodation of large vehicles.

Roundabouts in accordance with the Federal Highway Administration Roundabout Guide provide higher capacity and safer operations than comparable signalized intersections and two-way stops. The degree of improved capacity and safety depends upon the traffic characteristics using the facility.

Typical rural double-lane roundabouts have inscribed diameters of 150 feet or larger. With an inscribed diameter of 150 feet or greater most large trucks can be accommodated. The typical design vehicle for a rural double lane roundabout is a WB-67 (a truck with a wheelbase of 67 feet). In addition truck aprons may be included in the design so that even the largest trucks will be able to negotiate the roundabouts.

There are over 2,000 roundabouts that have been constructed in the US and 40 in Virginia including 3 on Route 50 in Loudon County. A typical large rural two-lane roundabout is shown in Appendix A in Figure A. The roundabout in Figure A is located in Michigan and currently handles 47,000 vehicles per day at a Level of Service A.

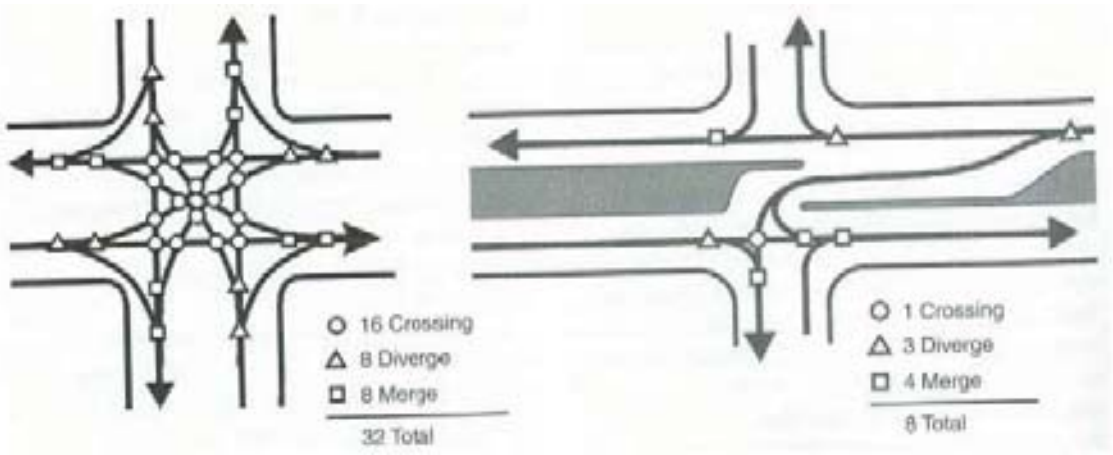
VDOT recognizes that Roundabouts are frequently able to address safety and operation objectives better than other types of intersections in both urban and rural environments and on high-speed and low-speed highways. Therefore it is a VDOT policy that Roundabouts be considered when a project includes reconstructing or constructing new intersection(s) signalized or unsignalized. The Engineer shall provide an analysis of each intersection to determine if a Roundabout is a feasible alternative based on site constraints, including right-of-way, environmental factors and other design constraints.

VDOT's policy states that when the analysis shows that a Roundabout is a feasible alternative, it should be considered the Department's preferred alternative due to the proven substantial safety and operational benefits.

2. Directional Left Turns

Directional left turns provide one of the most effective ways for improving both safety and capacity in a corridor. A directional median opening or restriction limits median openings to specific turns. The physical design actively discourages or prevents all other movements at the intersection. Figure 1 shows the design and typical reduction at a four-way intersection versus a directional median opening.

Figure 1 – Conflicting Movements of a 4-Legged Intersection Versus a Directional Median Opening



3. Median U-Turn Intersection

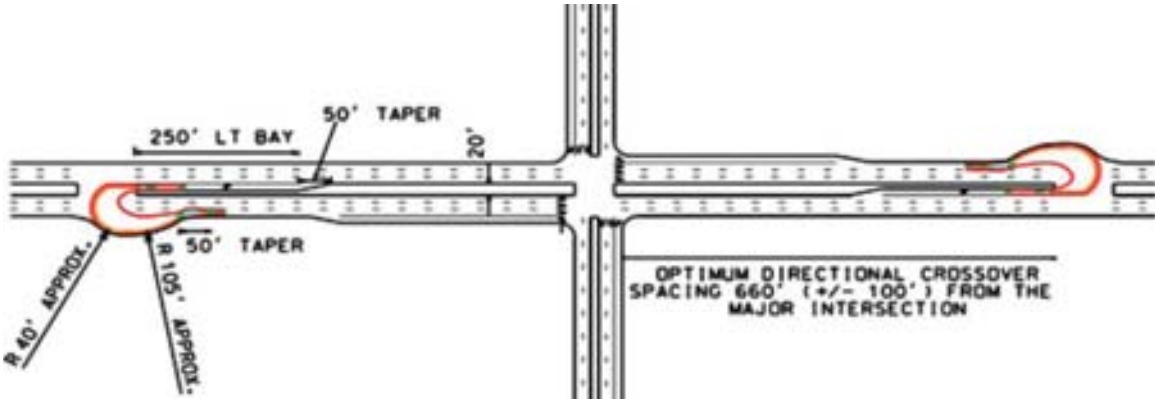
Median U-Turn (MUT) Intersections are designed to eliminate left turns at intersections by requiring left turning vehicles to go through the intersection and make a left turn by making a u-turn at a median opening downstream from the intersection and then turning right at the cross street. For vehicles on the minor street, they turn right onto the main street and then make a u-turn at a downstream median and proceed through the main intersection.

With MUT intersections eliminating the need for left turns, the signalized intersections operate as two-phases. A two-phase operation allows more time to be allocated for through movements and may increase throughput capacity from 20 to 50% and the reduction in delay will reduce system-wide travel time. Conflicts are reduced from 32 points for a typical intersection to 16. Fewer conflict points will result in a safer operation.

The most appropriate location for MUT intersections are medium to high speed four-lane divided highways that are transitioning from rural to suburban settings with similar characteristics of Route 29. Applicable conditions would include intersections where the minor to main street traffic ratio are equal to or less than 0.25 as is the case in the Route 29 study area.

Most large u-turning trucks can be accommodated where medians are 40 feet or wider. If larger trucks need to be accommodated loons-Figure 2 (paved widened shoulder areas) could be constructed at the appropriate crossover areas to accommodate these vehicles in order to negotiate the u-turns.

Figure 2: Loon movements



Typical designs for MUT left-turn movements from the major and minor streets are shown in Figure 3 and Figure 4. MUT intersections are used widely in Michigan as well as other states. An example of a MUT intersections applied to a Michigan corridor is shown in Figure 5.

Figure 3: MUT left-turn movements from the major street

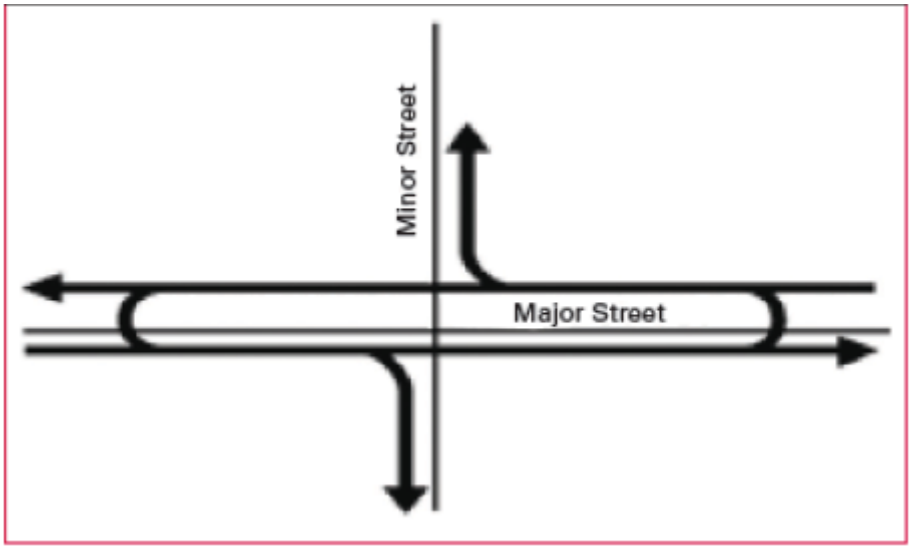


Figure 4: MUT left turns from the minor street

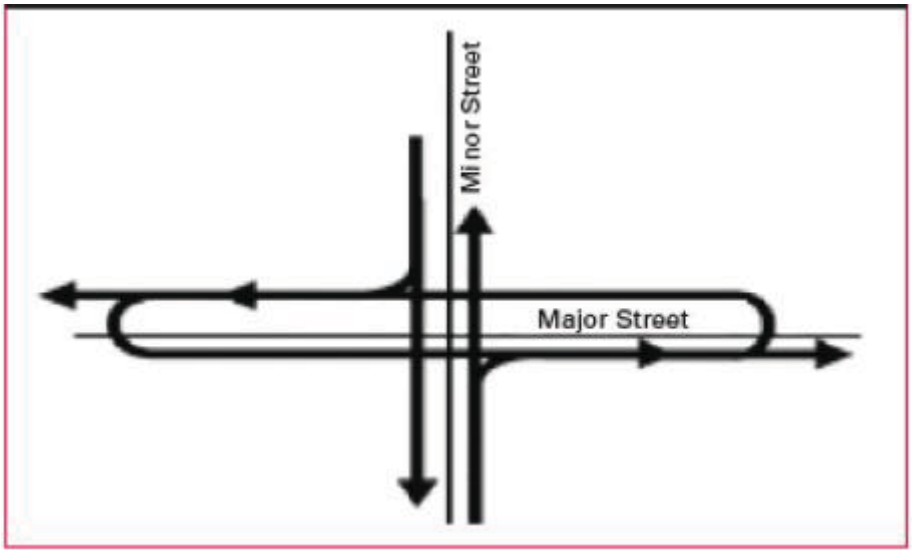


Figure 5: MUT Michigan Corridor Example

4. Restricted Crossing U-Turn (RCUT) Intersection

The RCUT is also known as the superstreet intersection. In an RCUT intersection left turns and through movements are physically restricted from the side streets to the main road. Instead the side street left turns and through movements are required to make a u-turn at a median opening on the mainline approximately 400 to 1,000 ft. from the intersection. However, left turns from the main road to the minor streets are allowed.

RCUT intersections have been built in Michigan, North Carolina and Maryland. An example of a typical RCUT built in Emmitsburg, Maryland is shown in Figure 6. Where medians are less than 40 feet, loons may be built to accommodate large trucks. Overall, the safety record for RCUT intersections has shown substantial reductions in crash rates. In North Carolina on US Route 23/74 the fatality/injury crash rate has been reduced by 51 percent. Similar reductions have been experienced in Maryland. The design reduces the number of conflict points from 32 for a conventional intersection to 18.

Possible locations in the Route 29 corridor include the intersections with Broad Run Church Road, and Suffield Lane/Baldwin Road.

Figure 6-US Route15 RCUT Intersection in Emmitsburg, Maryland

5. Quadrant Roadway Intersection

A quadrant roadway (QR) intersection functions by rerouting all four left-turns at a four-legged intersection onto a road that connects the two intersecting roads. Figure 7 shows an example of a QR with the connecting roadway located in the southwest quadrant and the corresponding routing of the left turns. Figure 8 shows the typical signal location. The key principle is that no left turns are allowed at the four-legged intersection and a simple two-phase signal system may be used. Through simulation analysis, it is estimated that a QR intersection will increase throughput capacity by 5 to 15 percent and reduce travel time by 5 to 20 percent compared to the existing intersections on Route 29. The QR intersection also reduces the number of conflicts from 32 to 28 which may create safer operations. Potential applications on Route 29 are at the intersections of Route 29/Broad Run Church Road/Route 600 and the proposed intersection of Cross Creek Road and Route 29.

Figure 7 – Typical Movement in a QR intersection.

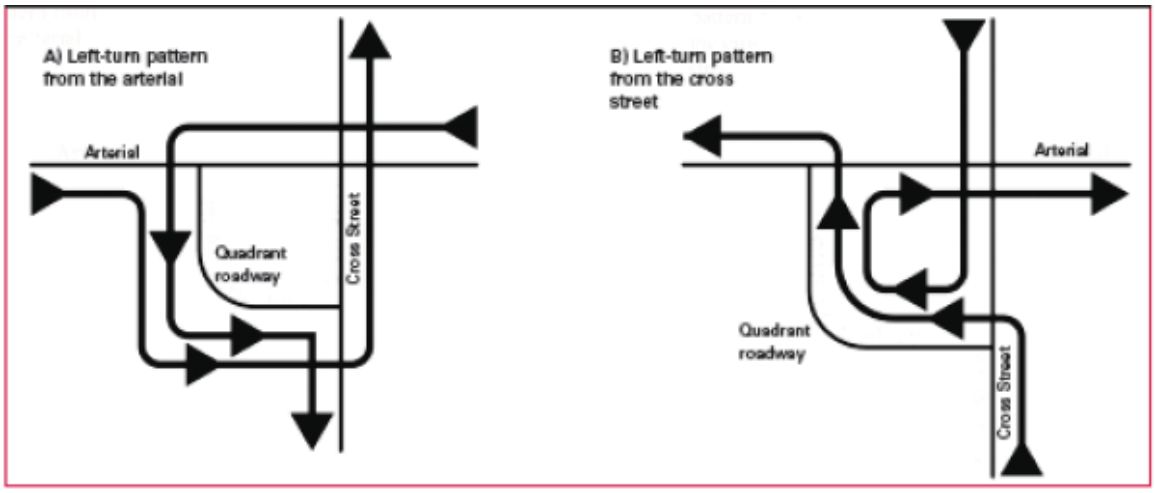
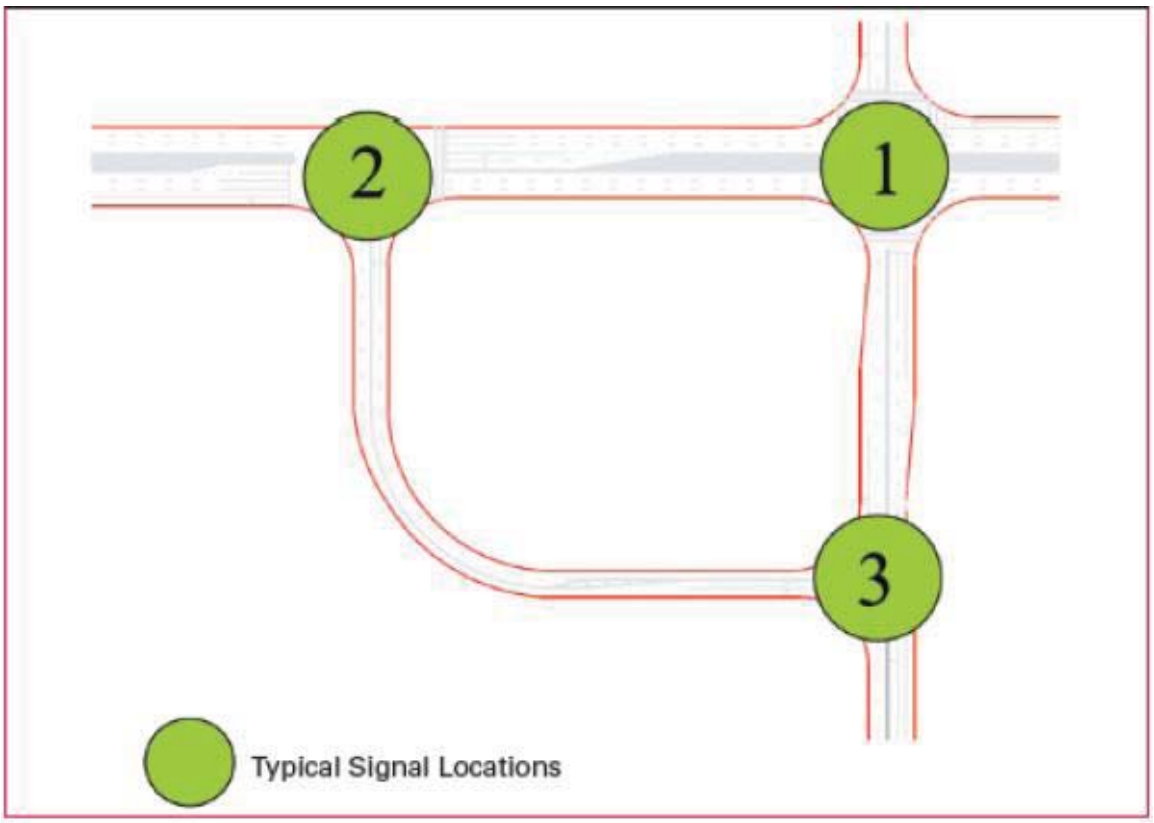


Figure 8 – Typical QR Intersection Signal Locations



6. Continuous Green T Intersection

The Continuous Green T Intersection allows the main line through traffic of a T intersection to pass through the signalized intersections without stopping (the top side of a T) while eliminating the conflict with vehicles turning left onto the main line. With a Continuous Green T Intersection design the main through movement on the main line approach to the intersection has a continuous steady green arrow traffic signal and left turning vehicles enter into an acceleration lane that merges with the main line of traffic. In Appendix B, Figure B shows a detailed design for a Continuous Green T Intersection used by the Colorado DOT.

The most appropriate locations for the Continuous Green T Intersection have moderate-to-low left turn lanes volumes from the cross-street, and high arterial through volumes similar to that at the Vint Hill Road/Route 215 intersection.

7. Roadway Realignments, Relocations, and New Service Roads

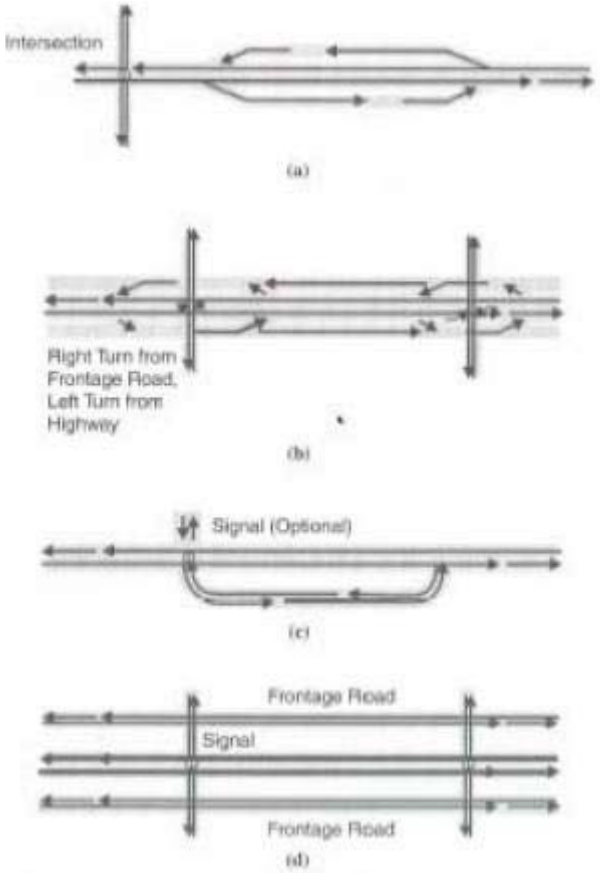
Service roads may be public or private roads that provide access to land parcels adjacent to the arterial and typically serve nonresidential developments. Existing roads may also be realigned to provide improved access or better alignment to form a four-way

intersection. In this study, realignments are considered for Telephone Road, Old Alexandria Road and Route 600 where it intersects with Route 29.

8. Frontage Roads

A frontage road is a type of service road for property access that generally parallels an arterial roadway or freeway between the right-of-way of the major roadway and the front building setback. In Figure 9, four examples of a frontage road design are shown.

Figure 9: Typical Frontage Road Designs



Frontage roads classification: (*a*) one-way between intersections, (*b*) one-way continuous, (*c*) two-way between intersections, and (*d*) two-way continuous.

As applied in the New Baltimore area the frontage road would provide service to the small highway oriented commercial developments along Route 29. However, the frontage road will reduce either the existing open space and area for landscaping or the parking between the commercial developments and the roadway. The frontage road will also tend to contribute to strip development rather than encourage compact land use patterns.

9. Access Management Techniques

Access Management is the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway. It also involves roadway design applications, such as median treatments and auxiliary lanes, and the appropriate spacing of traffic signals.

Techniques such as combining driveways and constructing inter-parcel connections improve both safety and reduce delay. Each commercial driveway per mile in a corridor reduces the corridor's free flow speed by ¼ mile per hour. Studies have also shown that the fewer the number of access points, the lower the crash rate on an arterial.

VDOT in recognizing the benefits of access management and the consolidation of driveways has developed access management regulations and minimum distances between driveways. The consolidation of driveways on Route 29 will be recommended in the report.

10. Signal Timing Improvements

Signal timing improvements are a cost effective method for increasing intersection capacity. Depending upon the existing timing, geometrics, and traffic volumes, capacity improvements could range from 10 to 30%.

For existing signalized intersections on Route 29 the minor street movements of most intersections are operating on a split timing basis. Split timing means that for a east/west minor street movement, the westbound movements are given green time and the eastbound movements are restricted with a red phase. Once the westbound movements have completed their phase, the movements are reversed with the westbound movements restricted and the eastbound movements given a green phase. Typically split phasing is used at locations where there are poor sight distances, safety concerns, or there are shared lanes (lane that allows both through movements and left turns) in the minor street approach.

With the addition of exclusive lanes on minor street roads at signalized intersections on Route 29, the elimination of split timing would be possible and the use of more efficient timing plans would increase the overall capacity and efficiency of the signalized intersections. The intersection of Route 29 and Route 605 (Dumfries Road) with the addition of exclusive left turn lanes on Dumfries Road is a potential site for eliminating split phasing. See additional discussion in Section H.

11. Turning Lanes and Widening Minor Road Approaches at Intersections

Turning lanes add both capacity and significantly improve safety. The basic principle would be to widen nodes (minor street intersection approaches) but maintain narrow roads. The mainline (Route 29) would remain a 4-lane facility with auxiliary lanes but the approaches on the minor street would be expanded. The additional capacity on the minor street approach would allow more green time to be given to Route 29 and improve its capacity without expanding the number of Route 29 lanes. This approach would be combined with the signal time improvements and would be effective at the intersection of Route 29 and Route 605.

Proposed Transportation Improvements to Route 29

A. Intersection of Route 29 and Route 215 (Vint Hill Road)

The Route 29/Vint Hill Road intersection is an at grade signalized intersection. It has two southbound and two northbound through lanes. The southbound direction has a left turn lane. Vint Hill Road has one lane eastbound and one westbound left turn lane and a free right turn lane from Vint Hill Road to northbound Route 29. Currently left turns heading northbound on Route 29 are restricted from turning into a commercial driveway on the west side of the intersection. The northbound approach of the intersection has poor sight distance due to the grade and queues that form during the peak periods of traffic. A significant number of rear end collisions have occurred at this approach, necessitating the placement of rumble strips and cautionary signage.

The Route 29/Vint Hill Road intersection is located in the Buckland Races historic battlefield area. The current roadway grades remain unchanged over the years, making visualization of the battlefield movement realistic. Due to its location in an historic area, proposed efforts to improve the intersection should take into consideration the potential impact on the viewshed and minimize the footprint of the improved intersection.

Rather than proposing a grade-separated intersection, which would have a significant adverse impact on the historic context, more context sensitive solutions such as a signalized directional left turn with median u-turns or a continuous green T configuration or restricting all left turns by extending the median on Route 29 at the intersection are recommended for consideration.

Under Phase 1 of this study, a conceptual design of a signalized directional left turn from Southbound Route 29 to Eastbound Vint Hill Road with no left turns allowed from Vint Hill Road to Southbound Route 29 was developed and analyzed.

Option 1 – a signalized directional left with median u-turns is shown in Figure C as part of Appendix C:

The signalized directional left with median u-turns allows for a continuous flow southbound on Route 29 without interruption. The elimination of left turns allows more green time for the northbound movement with an improved level of service and reduced delay. Based on a Highway Capacity Manual HCS analysis, the northbound movement will operate at a level of service (LOS) A in the PM peak and LOS B in AM peak in 2030. The intersection is currently operating at a level of service B in the AM and PM.

The major concern expressed by the community concerning Option 1 is the ability of trucks to negotiate a u-turn at the median crossings. If trucks could not make the u-turns they may change their routes. However, with the Route 29 median, two through lanes, a - shoulder, and the construction of loons (loons are paved extensions of the shoulder) sufficient width can be provided for trucks to negotiate the u-turns.

Option 2 - the Continuous Green T Intersection (CGT):

Option 2 was developed for the Route 29 /Vint Hill Intersection due to the concern expressed about the ability of trucks to negotiate u-turns in Option1. With a CGT, u-turns at median crossings are eliminated. A conceptual drawing of a CGT for the Route 29/Vint Hill Road Intersection is shown in Appendix C, Figure D1. For Option 2, the level of service would be D in the AM peak period and C in the PM peak period in 2030. The capacity on Route 29 would be maximized since the southbound traffic would be a continuous flow.

Option 3 – extending the Route 29 median and converting Vint Hill Road to a right-in/right-out (RI-RO) at the Route 29 intersection:

Option 3 was developed for the Route 29/Vint Hill Intersection in order to minimize the proposed transportation improvement impacts on the Buckland Races historic area, eliminate the safety hazard created by northbound Route 29 vehicles queuing at the intersection and improving the level of service.

By converting the Vint Hill Road's approach to a right-in/right-out, Route 29 would be a continuous flow in the northbound and southbound directions. The northbound queues would be eliminated and as well as the hazard created by queues due to poor sight distances. The Route 29 capacity would significantly increase to 3200-3400 passenger cars per hour for each direction.

The conversion of Vint Hill Road to a RI-RO would change the existing traffic patterns in the area. Existing and future traffic could be diverted to the Rilely Road Intersection as well as other local roads. To determine the extent of the change in the traffic patterns a traffic origin-destination study should be conducted as part of the analysis of Option 3.

A conceptual drawing of Option 3 is shown in Appendix C, Figure D2.

B. Intersection of Route 29 and Riley Road

In Phase 1 a two-lane roundabout, with three approach legs and an inscribed diameter of 180 feet, was proposed for the Intersection of Route 29 and Riley Road. The proposed design is shown in Appendix D, Figure E. As discussed in the Phase 1, report there is sufficient right-of-way to construct the roundabout and the future estimated levels of service are acceptable based on our previous study. See Appendix D1 for Level of Service.

The Riley Road intersection represents the start of the commercial node associated with the New Baltimore Service District on the east side of Route 29. A roundabout in the location would help to define the entry into the distinctly different section of the corridor. The proposed roundabout at Route 29/Riley Road would be part of series of potential roundabout sites on Route 29. However, due to the available right-of-way and low density development at the intersection, the Route29/Riley Road should be constructed first to demonstrate the viability and benefits of roundabouts for Route 29.

C. Intersections of Route 29 and Cross Creek and Broad Run Church Road /Route 600

In Phase 1 of the study, roundabouts were proposed for both Route 29 and Cross Creek, Route 29 and Broad Run Church Road intersection. Conceptual drawings were completed and are in Appendix E. A level of service analysis was completed and is in the report, "Operational Analysis for Proposed Route 29 Roundabouts Fauquier County" and in Appendix D2.

In this study a series of alternatives other than roundabouts were developed for the Broad Run Church Road intersection and a realignment of Route 600. The alternatives were presented at several one-on-one meetings with members of the business community and potential improvements including access management strategies were discussed. The proposed alternative improvements are:

Alternatives 1A and 1B: Intersection of Route 29 and Realigned Route 600

Alternative 1A: Route 600 west of Route 29 is realigned to enter Route 29 directly across from the proposed Cross Creek road. The existing southbound Route 600 entrance to Route 29 is closed off and a T intersection is formed with Broad Run Church Road. The formation of a T intersection would improve both the northbound and the southbound capacity of Route 29 at Broad Church Run. Alternative 1A is shown in Appendix E- Figure F.

Alternative 1B: With the realignment of Route 600, a four-legged intersection would be created at Route 29 and the proposed Cross Creek Road. Alternative 1B is a quadrant intersection that eliminates all left turn movements at Route 29/Cross Creek by redirecting left turn movements on to Broad Run Church Road. The quadrant intersection would increase through movement capacity on Route 29 both at Broad Run Church and Cross Creek by 5-15%. The configuration and permitted movements are shown in Appendix E, Figure G.

Alternatives 1C and 1D: Intersection of Route 29 and Broad Run Church Road/Route 600 at Existing Location: Various other configurations were developed that included right-in and right-out for Broad Run Church Road/Route 600 on to Route 29. The configurations are shown in Appendix E- Figures H and I.

D. *Frontage Road and Driveway Consolidation Between Riley Road and Broad Run Church Road*

For the commercial areas between Riley Road and Broad Run Church Road several frontage and reverse frontage road alternatives are proposed. The various alternatives are shown in Appendix F-Figures J1, J2, K1 , K2 , K3 and L1, L2, L3,L4,L5,L6.

Alternative 1, as shown in Appendix F -Figures J1 and J2 is a reverse frontage road. Although the frontage road would provide excellent access it would be located in a flood plain and require extensive structural construction.

Alternative 2, as shown in Appendix F - Figures K1, K2, and K3 is a continuous frontage road. The frontage road would have a 1.5 foot pan and gutter, 4 foot separation median, and a 14 foot lane. A greater median width would be desirable but would intrude on the parking areas. Access to the commercial areas would be provided via the frontage road but would require u-turns for Route 29 southbound vehicles. This alternative would have significant impacts on the visual quality of the roadway as well as provide complicated movement into and out of the commercial properties.

Alternative 3, as shown in Appendix F - Figures L1, L2, L3, L4 and L5 is a combination of short frontage roads and interparcel access. The combination of short frontage roads and interparcel access provides more direct access than Alternative 2.

Alternative 4, as shown in Appendix F – Figures L6, L7, L8, L9 and L10 is a series of driveway consolidations with improved interparcel access. Such consolidation and interparcel access is a desirable approach to improve the efficiency of the roadway and provide for a safer environment.

E. Commercial Area South of Route 29 between Broad Run Church Road and Gray's Mill Road

The driveways in the commercial area on the south side of Route 29 between Broad Run Church Road and Gray's Mill Road are undefined and form large open access points.

Poorly defined driveways create unexpected movements and affect safety. VDOT in recognizing poorly defined driveways create safety hazards has created driveway spacing standards that should be implemented at this location and in the corridor. The Virginia's spacing standards are identified in Table 2-2 Appendix F of Virginia's Access Management Regulations. The specific spacing requirements for the Route 29 Corridor are as follows:

For a Rural Principal Arterial Centerline to Centerline Spacing in Feet:

Speed	**Unsignalized Intersections/ Crossovers And Full Access Entrances**	**Right In/Right Out & Partial Entrances**
35 to 45 MPH	1320 Feet	440 Feet
$\geq$ 50 MPH	1760 Feet	585 Feet

In Appendix G there are two different options shown. The options are Figure M-Reverse Frontage and, Figure N-Driveway Consolidation.

F. Comprehensive Road Plan for Route 29 in the area of Telephone Road, Old Alexandria Pike, and the entrance to the Pepsi Plant

Route 29 in the area of Telephone Road, Old Alexandria Pike and the entrance to the Pepsi Plant has three median crossovers in close proximity. The consolidation of the median openings would reduce the number of conflict points. A proposed alternative is the relocation of Old Alexandria Pike opposite Telephone Road with a relocation of the access to the Pepsi Plant. A diagram of the relocation of Old Alexandria Pike is shown in Appendix H- Figure O.

A second proposed alternative is to create a new access roadway that provide access to the Pepsi Plant running parallel to Route 29 and entering Route 29 opposite the existing site of Old Alexandria Pike. The existing median openings at Telephone Road and the access to the Pepsi Plant would be closed. The new parallel road depending upon its alignment could serve in the future as a reverse frontage road. A conceptual diagram of the proposed alternative is shown in Appendix H- Figure P. A traffic signal at this location is not currently warranted based on peak period counts taken at the site and should be avoided if possible in the future.

G. Intersection of Route 29 and Suffield Lane/Baldwin Street

The intersection of Route 29 and Suffield Lane/ Baldwin is an unsignalized four-legged intersection. In order to maintain a continuous flow and preserve the concept of a parkway for Route 29, the proliferation of signals should be avoided.

The construction of directional left turns in the median in combination with median u-turns (restricted crossing u-turn intersection) would allow continuity of flow and maintain access to and from Suffield Lane and Baldwin Street. The proposed configuration is shown in Appendix I- Figure Q. The median u-turns would be located at existing crossovers and the crossovers would be designed with deceleration lanes.

The proposed intersection treatment would also improve the safety of the intersection. The elimination of exiting left turn movements from the minor streets and replacing them with a well design u-turn at the upstream and downstream median crossovers would increase the safety by 27%. A recent University of South Florida research project evaluated the safety of exiting left turns versus u-turns and found that the u-turns resulted in 27% less crashes.

H. Intersection of Route 29 and Route 605 Dumfries Road

The intersection of Route 29 and Route 605 Dumfries Road is currently operating at a Level of Service F during the AM and the PM Peak. With the growth of traffic in the future, the intersection will operate at a LOS F with even longer delays if the intersection is not improved. Currently the intersection is operating with split timing on system and increases lost time which results in a lower capacity for the intersection. A grade separated intersection had previously been considered for this intersection. An alternative approach was evaluated to eliminate the need for an improvement that would have a significant impact.

For the Route 29 and Route 605 Dumfries intersection the recommendation is to add an additional lane to each of the minor street approaches. The additional lanes would eliminate the shared left and through lanes and create exclusive through and left turn lanes. The additional lanes will allow the split phasing to be eliminated and a more effective timing plan to be used at the intersection. These improvements would result in a LOS C for the intersection for 2011.

The proposed improved intersection design is shown in Appendix J-Figure R. The signal timing was optimized and the new design was analyzed using the Highway Capacity Manual HCS software. With the improvements, the intersection will operate at a LOS C in the AM peak and LOS D in the PM peak in 2030.

For the analysis, the 2030 traffic growth for the intersection was estimated by a linear interpolation between the existing traffic to the estimated build out traffic for the year 2050.

I. *Proposed Median Closings*

The closing of medians generally improves the safety and capacity of a corridor. Median closures reduce the number of conflict points and provide a more continuous flow that

will not disrupt traffic. A typical multi-lane highway will have a capacity of 2200 passenger cars per hour per lane. Currently the Route 29 Corridor is experiencing 1200 to 1300 vehicles per lane with a possible future growth to 1600 to 1800 vehicles per hour. Closing medians will preserve the existing capacity. However, closing medians will have to be done in coordination with the various proposed innovative intersection designs to preserve an acceptable level of access to the adjacent lane use in the Route 29 Corridor.

For rural principal arterial crossovers, the VDOT Access Management Spacing Standards are 1320 feet for speeds of 35 to 45 mph and 1760 feet for speeds of $\geq$50 mph.

Listed below is an evaluation and initial recommendations for various median openings and their potential closing. It should be noted that these recommendations are dependent upon the implementation of the various proposed intersection and access management improvements including the implementation of roundabouts. Also the proposed recommendations build upon VDOT's prior recommendations for the corridor. The mile marker locations are shown on Appendix K.

Median Opening Mile 21.2 – Recommend improving with deceleration lanes to allow the u-turn from Vint Hill Road.

Median Opening Mile 21.0 – Recommend closing the median because it is too close to Vint Hill Road for the left movement to weave across the through lanes.

Median Opening Mile 20.5 – The median opening should be considered for closing in the future.

Median Opening Mile 20.2 – VDOT recommended posting it with no u-turn signs because of sight distance limitations and we concur.

Median Opening Mile 19.8 – VDOT recommended closing when Riley Road is signalized in the future. We also recommend closing the median in conjunction with improvements to Riley Road including the possible construction of a roundabout.

Median Opening Mile 19.5 – VDOT recommended closing the median in the future. We recommend closing the median opening because of the close distance to the improvements at Riley Road.

Median Opening at Mile 19.4 – VDOT recommended installing left turn lanes and clear vegetation in the median. We concur, however, the removal of vegetation should be limited to that necessary to achieve adequate sight distance, as vegetation in the median is an integral part of the County's goal to retain a rural parkway environment.

Median Opening at Mile 19.2 – Commerce Court – VDOT proposed to lengthen the northbound and southbound left turn lanes. However, depending upon the proposed improvements and construction of the Cross Creek intersection and improvements at the median opening Mile 19.4 the median may be considered for closing. However, this will

depend upon the future design for Route 29 from Riley Road to Broad Run Church Road. Alternatives should be explored for providing additional connection of this road to the interior of the service district.

Median Opening Mile 19.1 – VDOT recommended closing this opening in the future. We propose to close it due to the proximity of the proposed Cross Creek intersection or roundabout.

Median Opening Mile 19.0 – VDOT recommended leaving it open. We propose to close it because it's just north of the proposed Cross Creek intersection or roundabout. If the median is closed then it would be in conjunction with providing access via interparcel connections and access from Cross Creek.

Median Opening Mile 18.9 – VDOT recommended closing in the future. We propose to close it because of the proximity to the future Cross Creek intersection.

Median Opening Mile 18.8 – VDOT proposed increasing the length of the southbound left turn lane on Route 29. We are proposing to close the median opening and permit u-turns at Broad Run Church to the south and at the proposed Cross Creek intersection to the north.

References:

1. Transportation Research Board Access Management Manual
2. National Cooperative Highway Research Report 420
3. Federal Highway Administration Roundabout Guide

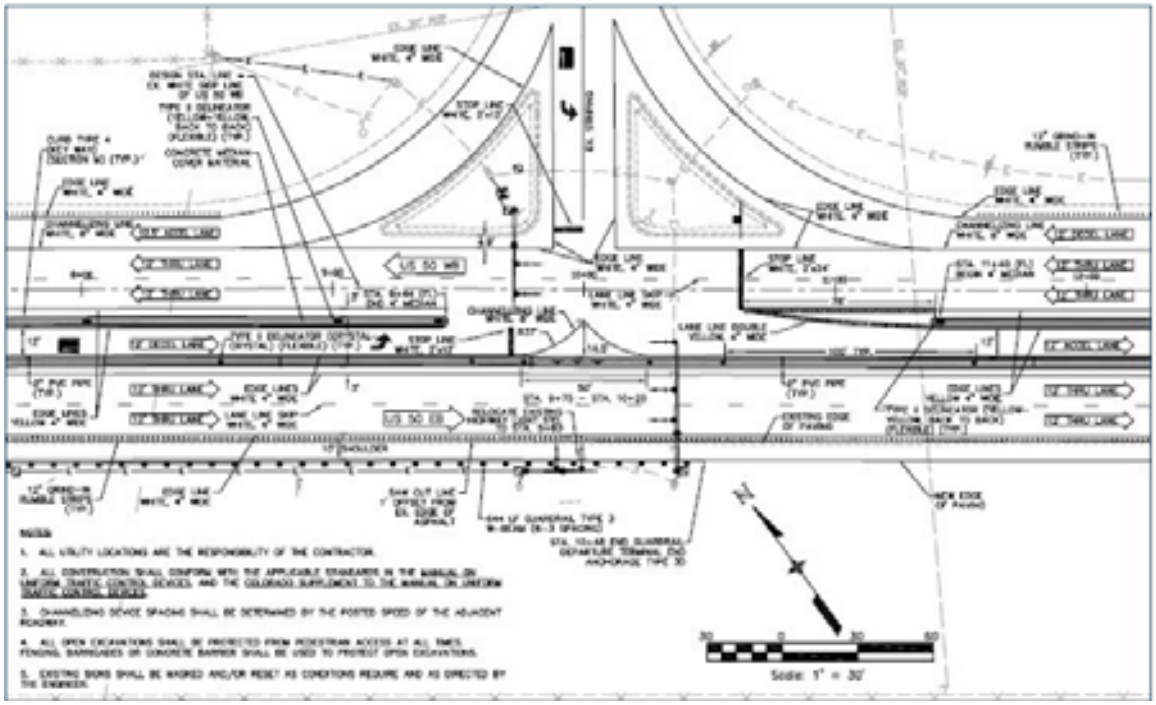
Appendices

Appendix A

Figure A: Typical Two-Lane Rural Roundabout (Michigan Rural Roundabout)

Appendix B

Figure B Continuous Green T Intersection Sample Design



Appendix C

Route 29 / Route 215/ Vint Hill Intersection Options

Figure C – Option 1: Signalized Directional Left Turn with U-Turns

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
× 400.05	SPOT ELEVATION	× 400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT-OF-WAY	
	CURB	
	EDGE OF PAVEMENT	
0 0	GUIDERAIL	T T
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
D	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

PROJECT:

IMPROVEMENTS TO RT. 29

NEW BALTIMORE
FAUQUIER COUNTY, VIRGINIA

CLIENT:

DANE ISMART

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ORLANDO, FL 32819

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TITLE:

HIGHWAY OCCUPANCY PERMIT
PAVEMENT MARKING & SIGNING PLAN

DESIGN: S.M. HARNEY	PLAN DATE: 03/24/10	DWG. NO.: PMS-10H
DRAWN: J.D. GILMORE	SCALE: AS NOTED	
SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 22 OF 25

50 0 50 100
SCALE IN FEET

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Appendix C

Route 29 / Route 215/ Vint Hill Intersection Options

Figure D1 - Option 2: Continuous Green T Intersection

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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FAQUIER COUNTY, VIRGINIA

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MODIFICATION PLAN FOR
INTERSECTION OF
VINT HILL ROAD (ROUTE 215) AND
LEE HIGHWAY (ROUTE 29)

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...\Vint Hill Modifications2 Appendix C Fig D Option 2.dgn 6/22/2011 4:56:55 PM

Appendix C

Route 29 / Route 215/ Vint Hill Intersection Options

Figure D2 - Option 3: Right In/ Right Out

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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...\Vint Hill Modifications2 Appendix C Fig D Option 3.dgn 6/22/2011 4:59:32 PM

Appendix D

Figure E: Route 29 / Riley Road Roundabout

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
× 400.05	SPOT ELEVATION	× 400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT-OF-WAY	
	CURB	
	EDGE OF PAVEMENT	
0 0	GUIDERAIL	T T
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
D	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

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SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 5 OF 25

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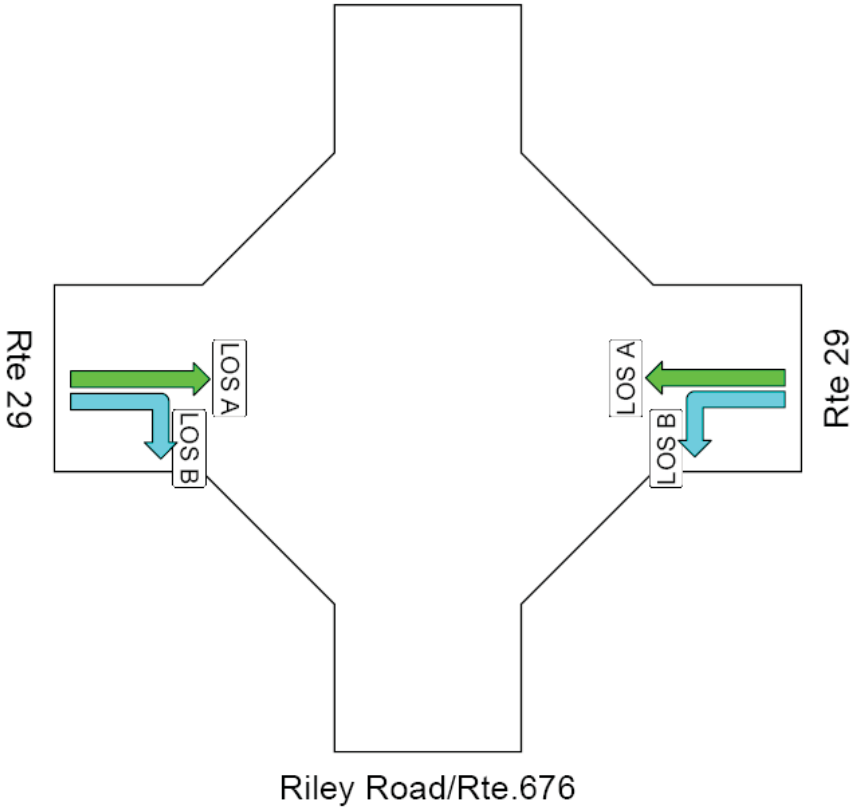
Appendix D1

Roundabout Analysis-Existing AM

Level of Service Method: Delay (HCM)

Rte 29 and Riley Rd Existing _AM
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

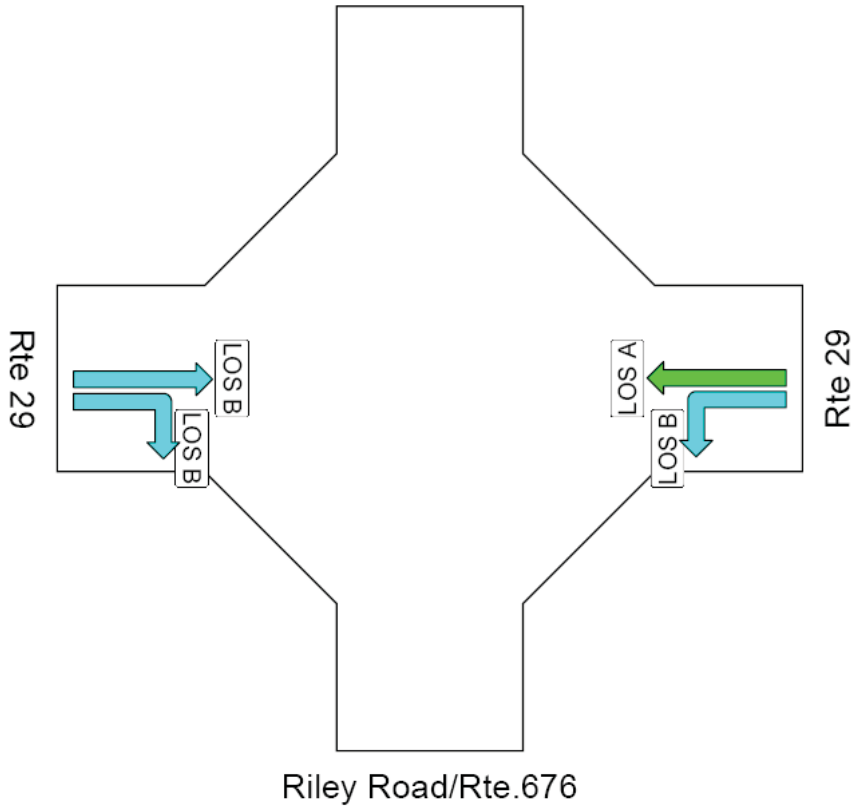
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D1

Roundabout Analysis-Existing PM

Level of Service Method: Delay (HCM)

Rte 29 and Riley Rd Existing_PM
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

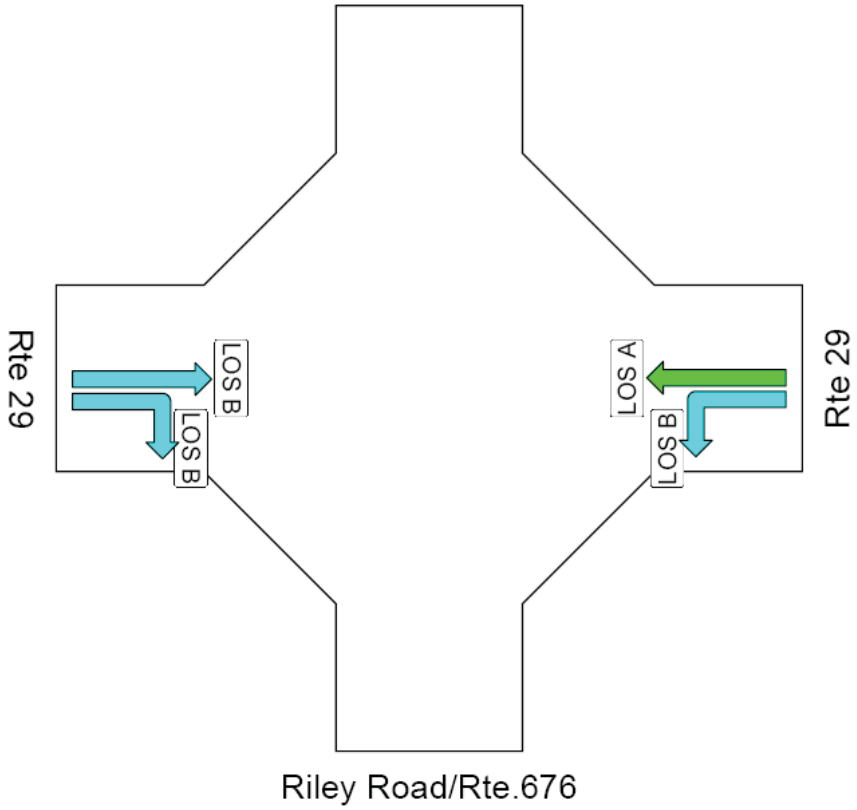
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D1

Roundabout Analysis-2030 AM

Level of Service Method: Delay (HCM)

Rte 29 and Riley Rd_2030 AM_mitigation
Roundabout



Colour code based on Level of Service

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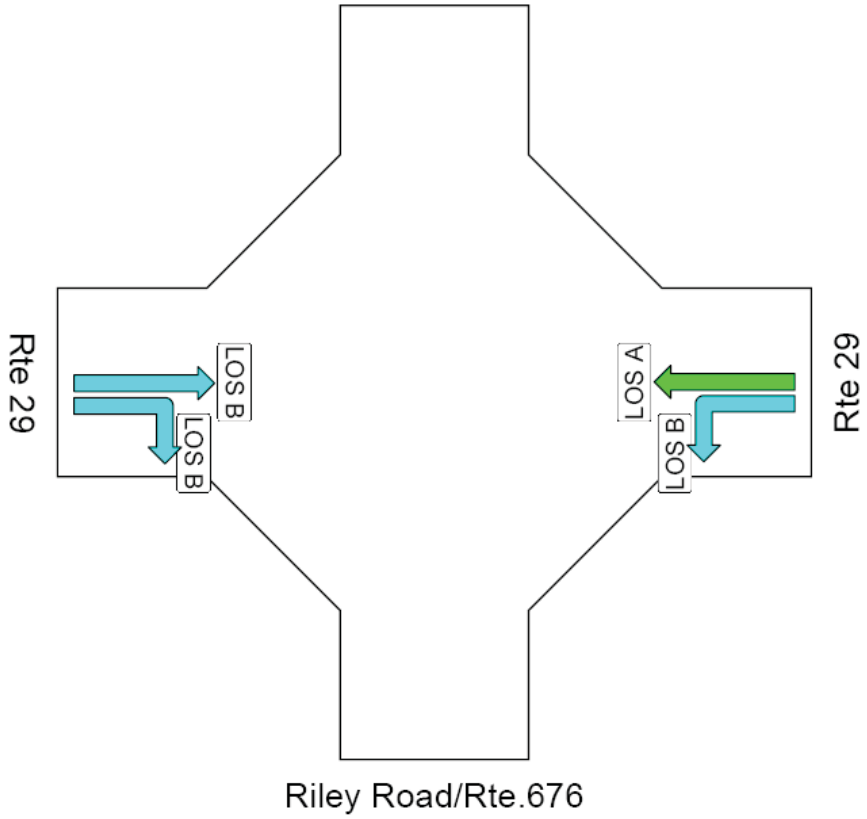
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D1

Roundabout Analysis-2030 PM

Level of Service Method: Delay (HCM)

Rte 29 and Riley Rd_2030 PM_mitigation
Roundabout



Colour code based on Level of Service

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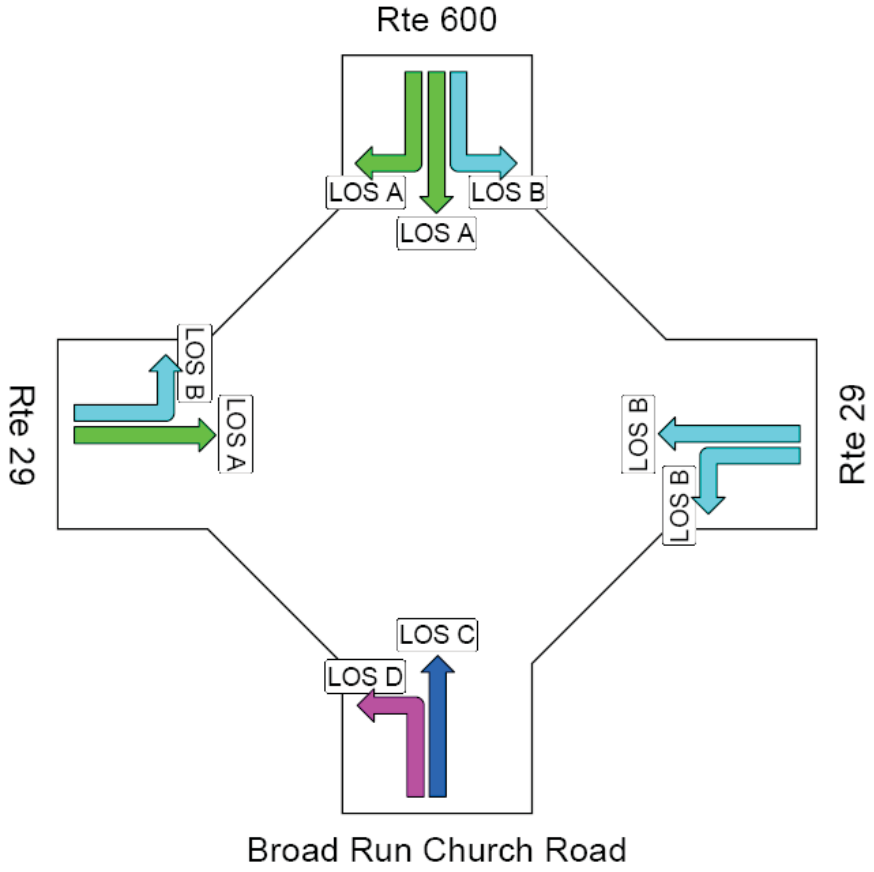
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D2

Roundabout Analysis-Existing AM

Level of Service Method: Delay (HCM)

Rte 29 and Broad Run Church Road Existing_AM
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

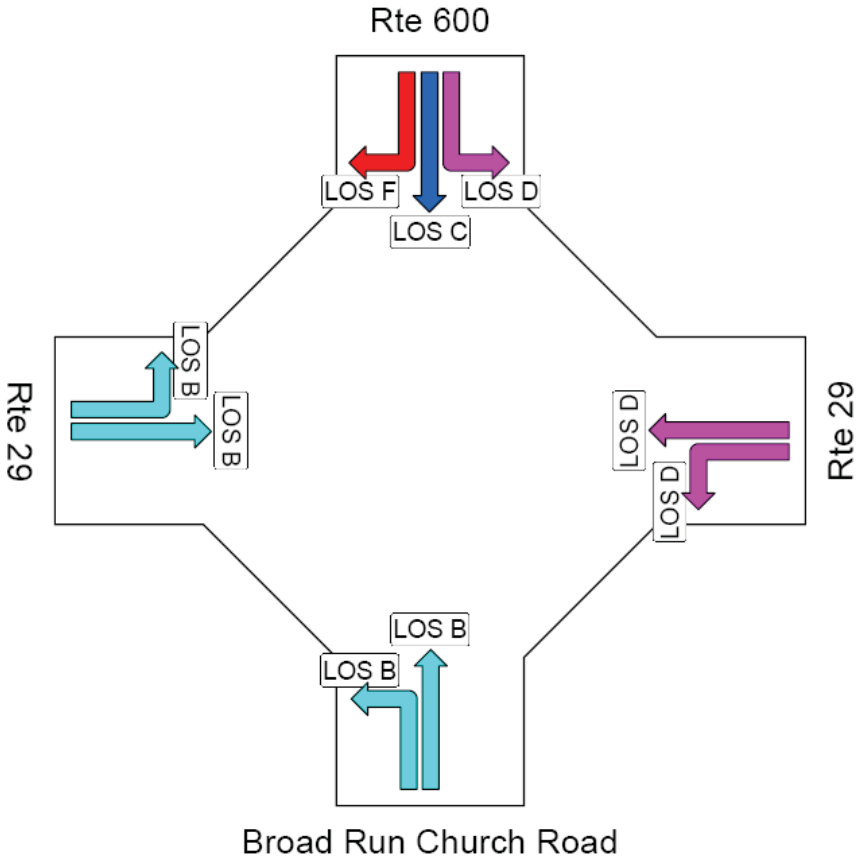
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D2

Roundabout Analysis-Existing PM

Level of Service Method: Delay (HCM)

Rte 29 and Broad Run Church Road Existing_PM
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

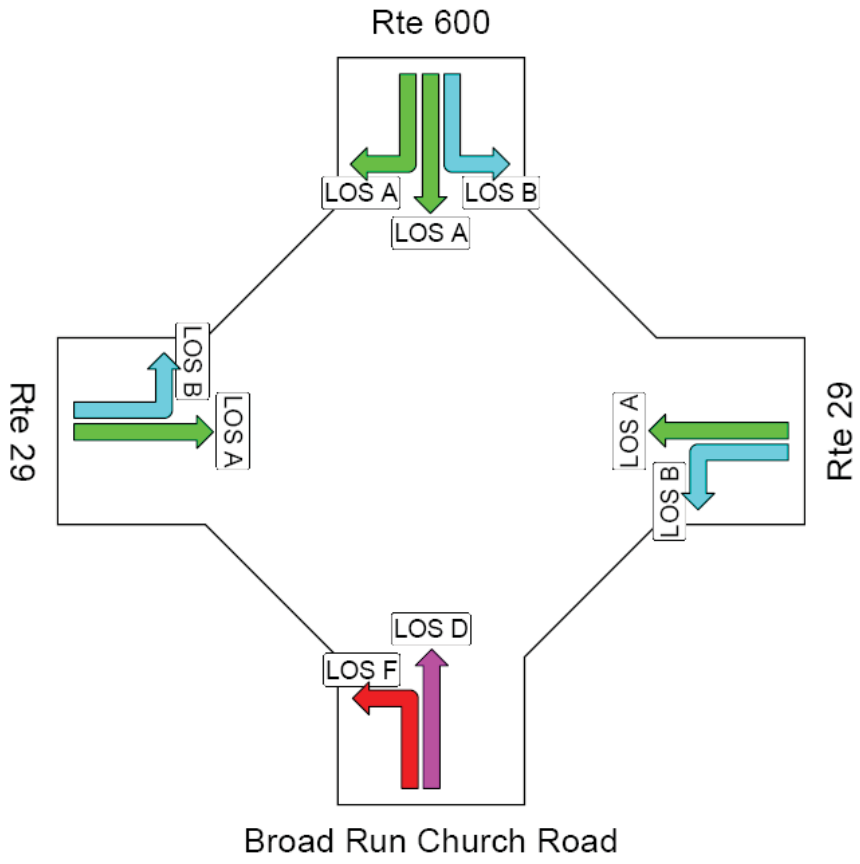
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D2

Roundabout Analysis-2030 AM

Level of Service Method: Delay (HCM)

Rte 29 and Broad Run Church Road_2030 AM_mitigation
Roundabout



Colour code based on Level of Service

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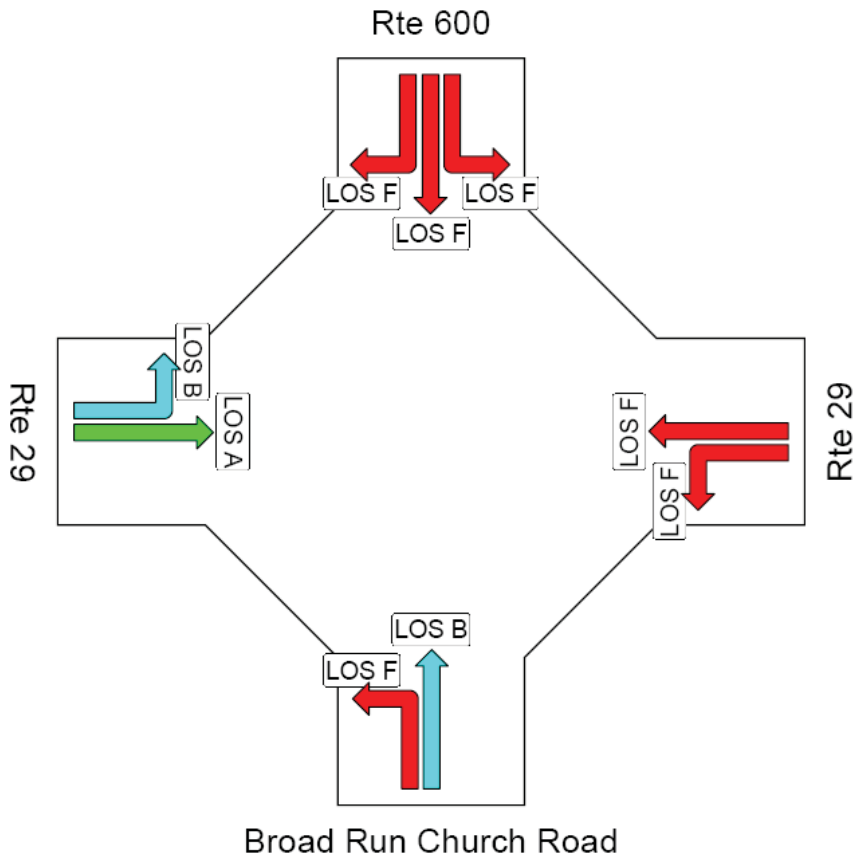
Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix D2

Roundabout Analysis-2030 PM

Level of Service Method: Delay (HCM)

Rte 29 and Broad Run Church Road_2030 PM_mitigation
Roundabout



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Continuous

Roundabout Level of Service Method used in this display: Same as Signalised Intersections

Appendix E

Intersections of Route 29 and Cross Creek and Broad Run Church Road/Route 600

Figure F- Alternative 1A – Realigned Route 600 Opposite Cross Creek

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

...\Broad run Church Road Option 1A.dgn 11/11/2010 2:27:48 PM

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MODIFICATION PLAN FOR
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LEE HWY

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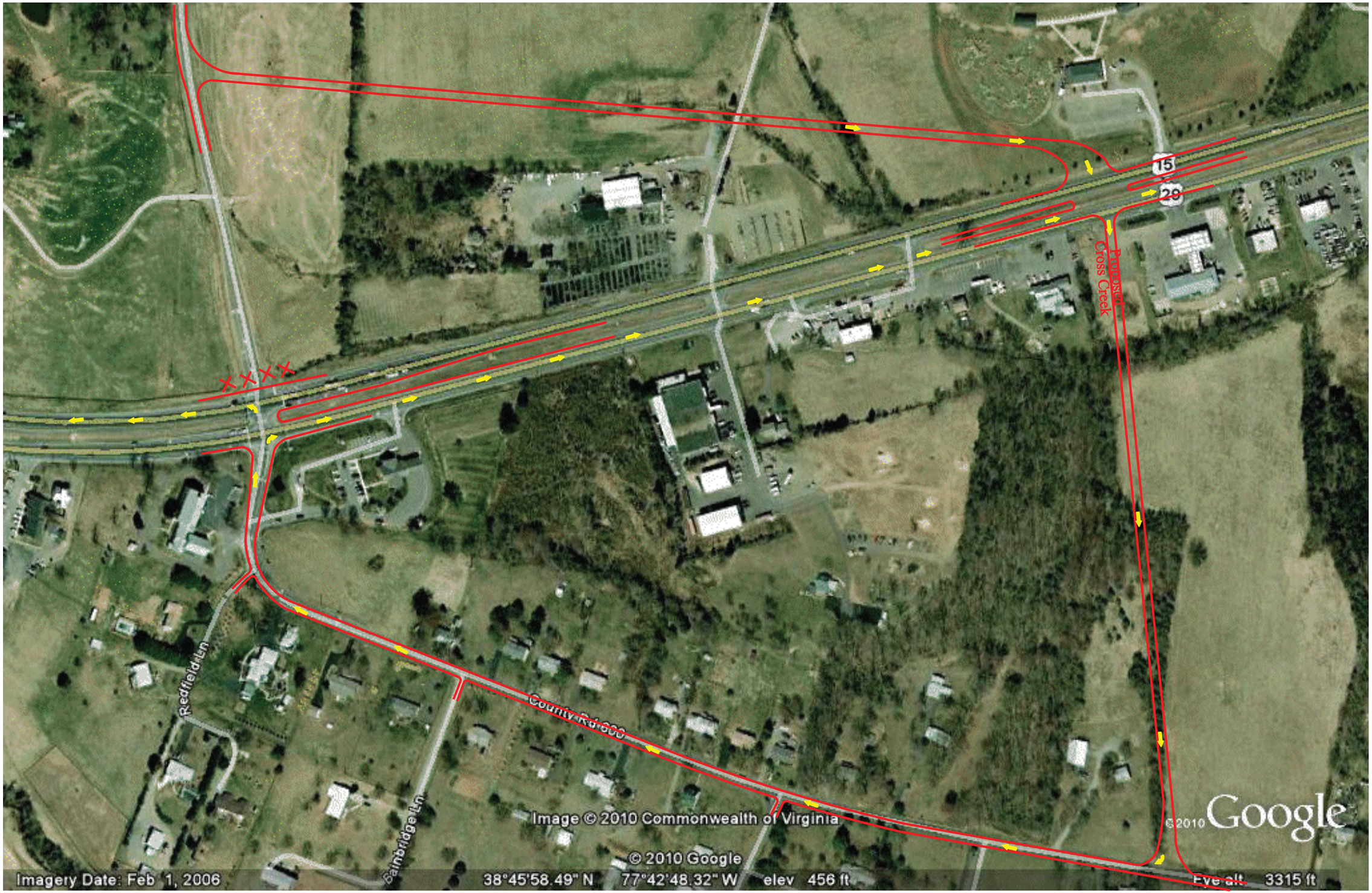
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix E

Intersections of Route 29 and Cross Creek and Broad Run Church Road/Route 600

Figure G– Alternative 1B – Quadrant Intersection-Left turn path from Route 600



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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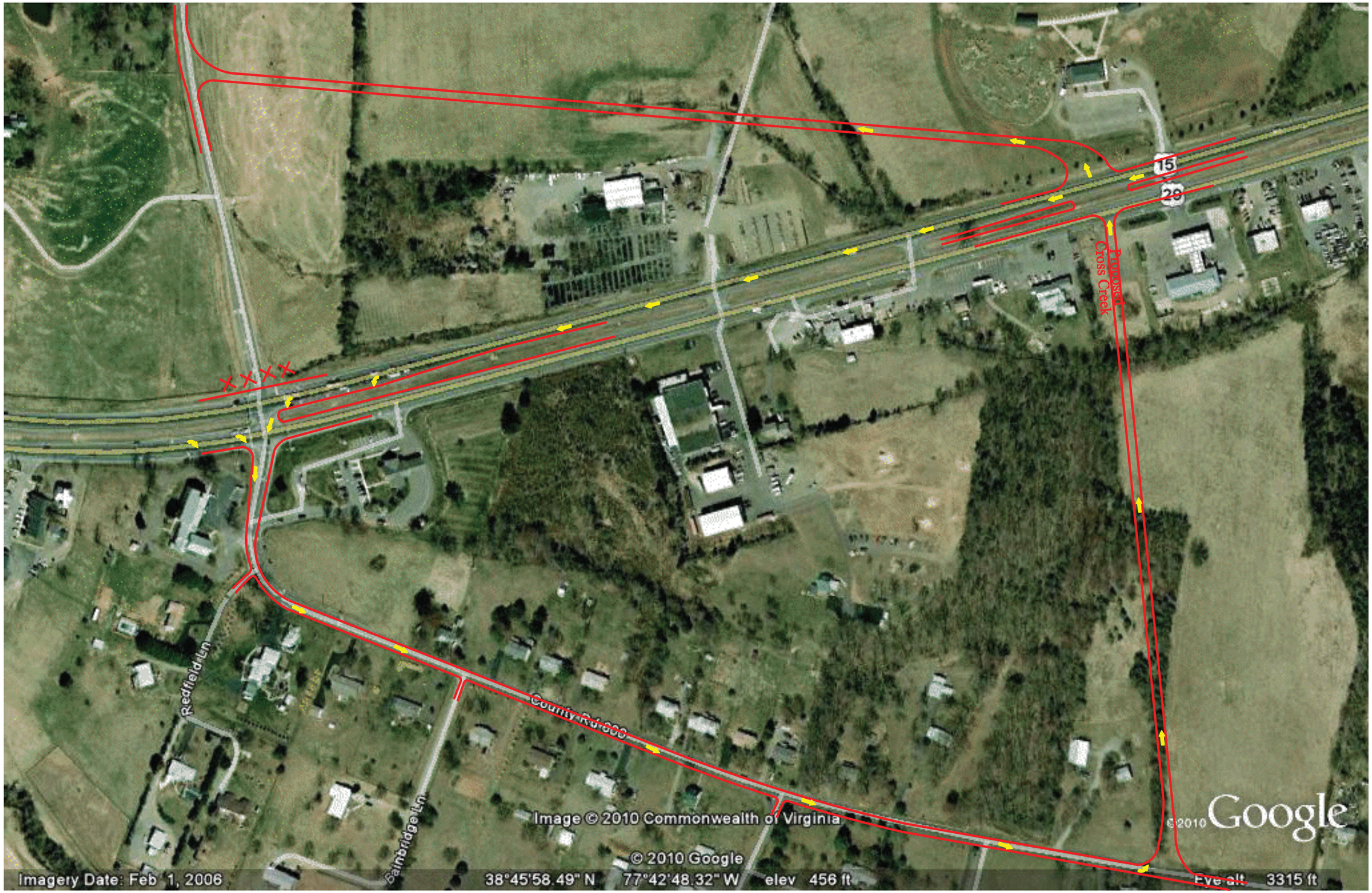
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Broad run Church Road Option 2A QR.dgn 12/10/2010 5:19:15 PM

Appendix E

Intersections of Route 29 and Cross Creek and Broad Run Church Road/Route 600

Figure G– Alternative 2B – Quadrant Intersection-Left turn path from Route 29



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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LEE HWY

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CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Broad run Church Road Option 1A QR.dgn 12/10/2010 5:18:07 PM

Appendix E

Intersections of Route 29 and Broad Run Church Road/Route 600

Figure H– Alternative 1C

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FRONTAGE ROAD
REDESIGN SECTION 1

FIGURE I

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SHEET 1 OF 1	FILE NO.

Appendix E

Intersections of Route 29 and Broad Run Church Road/Route 600

Figure I– Alternative 1D

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FRONTAGE ROAD
REDESIGN SECTION 1

FIGURE II

MCV
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DESIGN BKM	DRAWN BKM
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SHEET 1 OF 1	FILE NO.

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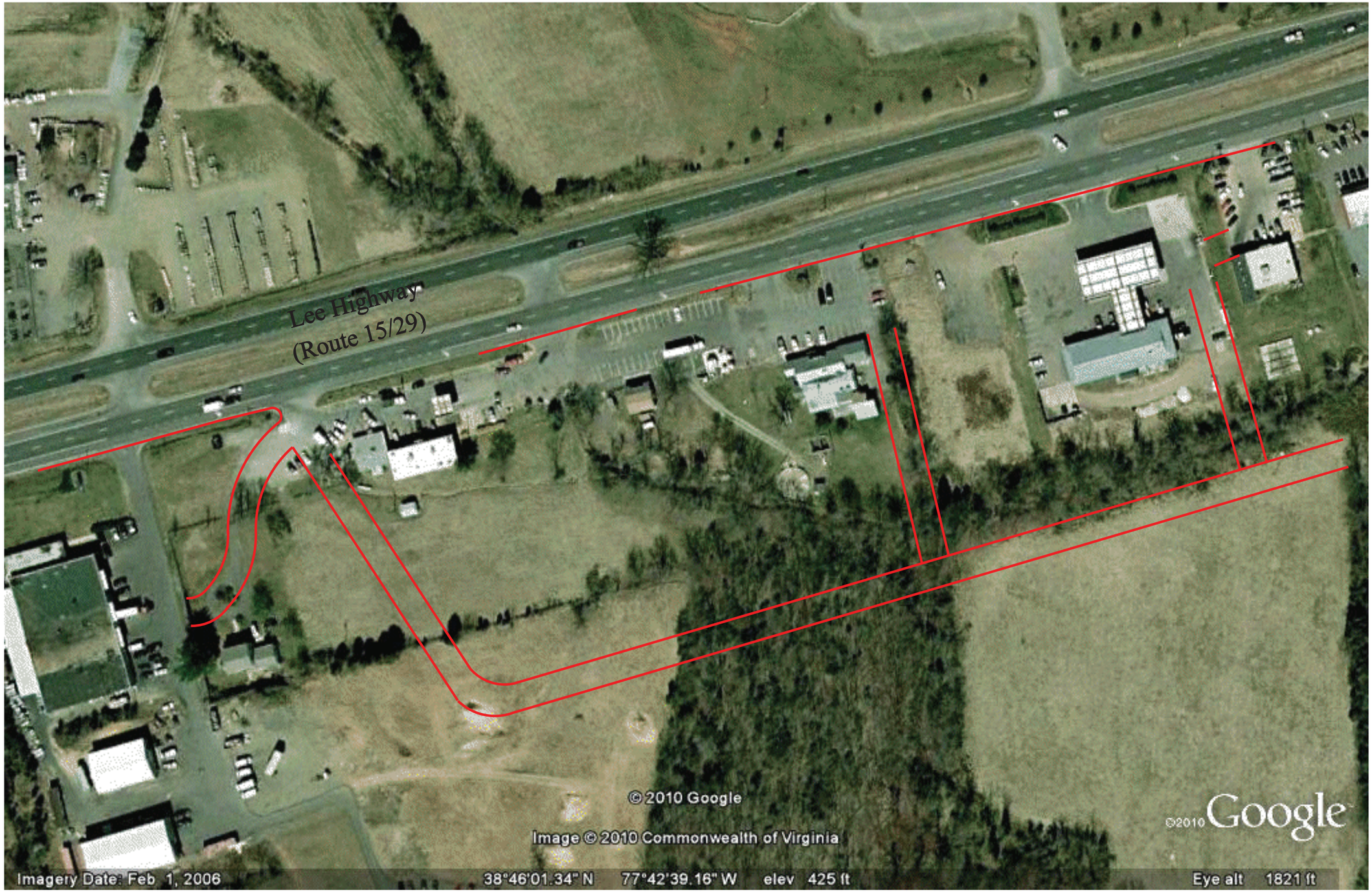
Appendix F

Figure J1– Reverse Frontage Road



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FRONTAGE ROAD
REDESIGN SECTION 3
OPTION A

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DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure J2– Reverse Frontage Road

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FRONTAGE ROAD
REDESIGN SECTION 4
OPTION A

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SURVEY	DATE SEPTEMBER 2010
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CHKD.	SCALE 1" = 25'
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Appendix F

Figure K1– Frontage Road

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
× 400.05	SPOT ELEVATION	× 400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT–OF–WAY	
	CURB	
	EDGE OF PAVEMENT	
0 0	GUIDERAIL	
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
D	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

PROJECT:

INTERSECTIONS OF RTS. 29 & 215

NEW BALTIMORE
FAUQUIER COUNTY, VIRGINIA

CLIENT:

DANE ISMART

5409 RUSTIC PINE COURT
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TITLE:

HIGHWAY OCCUPANCY PERMIT PAVEMENT MARKING & SIGNING PLAN

DESIGN: S.M. HARNEY	PLAN DATE: 03/24/10	DWG. NO.: PMS-6B
DRAWN: J.D. GILMORE	SCALE: AS NOTED	
SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 7 OF 9

50 0 50 100
SCALE IN FEET

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Appendix F

Figure K2– Frontage Road

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
× 400.05	SPOT ELEVATION	× 400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT-OF-WAY	
	CURB	
	EDGE OF PAVEMENT	
0 0	GUIDERAIL	T T
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
D	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

PROJECT:

INTERSECTIONS OF RTS. 29 & 215

NEW BALTIMORE
FAUQUIER COUNTY, VIRGINIA

CLIENT:

DANE ISMART

5409 RUSTIC PINE COURT
ORLANDO, FL 32819

PREPARER:

Benchmark
CIVIL ENGINEERING SERVICES, INC.
1727 JONATHAN STREET
ALLENTOWN, PA 18104
610.776.6700 610.776.1190 FAX
www.bencivil.com info@bencivil.com
• CIVIL ENGINEERING • TRAFFIC ENGINEERING • SURVEYING

TITLE:

HIGHWAY OCCUPANCY PERMIT PAVEMENT MARKING & SIGNING PLAN

DESIGN: S.M. HARNEY	PLAN DATE: 03/24/10	DWG. NO.: PMS-6C
DRAWN: J.D. GILMORE	SCALE: AS NOTED	
SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 8 OF 9

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Appendix F

Figure K3– Frontage Road

50 0 50 100
SCALE IN FEET

N

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
400.05	SPOT ELEVATION	400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT–OF–WAY	
	CURB	
	EDGE OF PAVEMENT	
	GUIDERAIL	
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

PROJECT:

INTERSECTIONS OF RTS. 29 & 215

NEW BALTIMORE
FAUQUIER COUNTY, VIRGINIA

CLIENT:

DANE ISMART

5409 RUSTIC PINE COURT
ORLANDO, FL 32819

PREPARER:

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TITLE:

HIGHWAY OCCUPANCY PERMIT PAVEMENT MARKING & SIGNING PLAN

DESIGN: S.M. HARNEY	PLAN DATE: 03/24/10	DWG. NO.: PMS-6D
DRAWN: J.D. GILMORE	SCALE: AS NOTED	
SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 9 OF 9

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Appendix F

Figure L1– Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10. 2010 COMMENTS.	3/2010	AHN	JLM		

REVISION APPROVED BY

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L1: INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Appendix F-Interparcel connection Sheet L1.dgn 6/23/2011 10:36:37 AM

Appendix F

Figure L2– Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

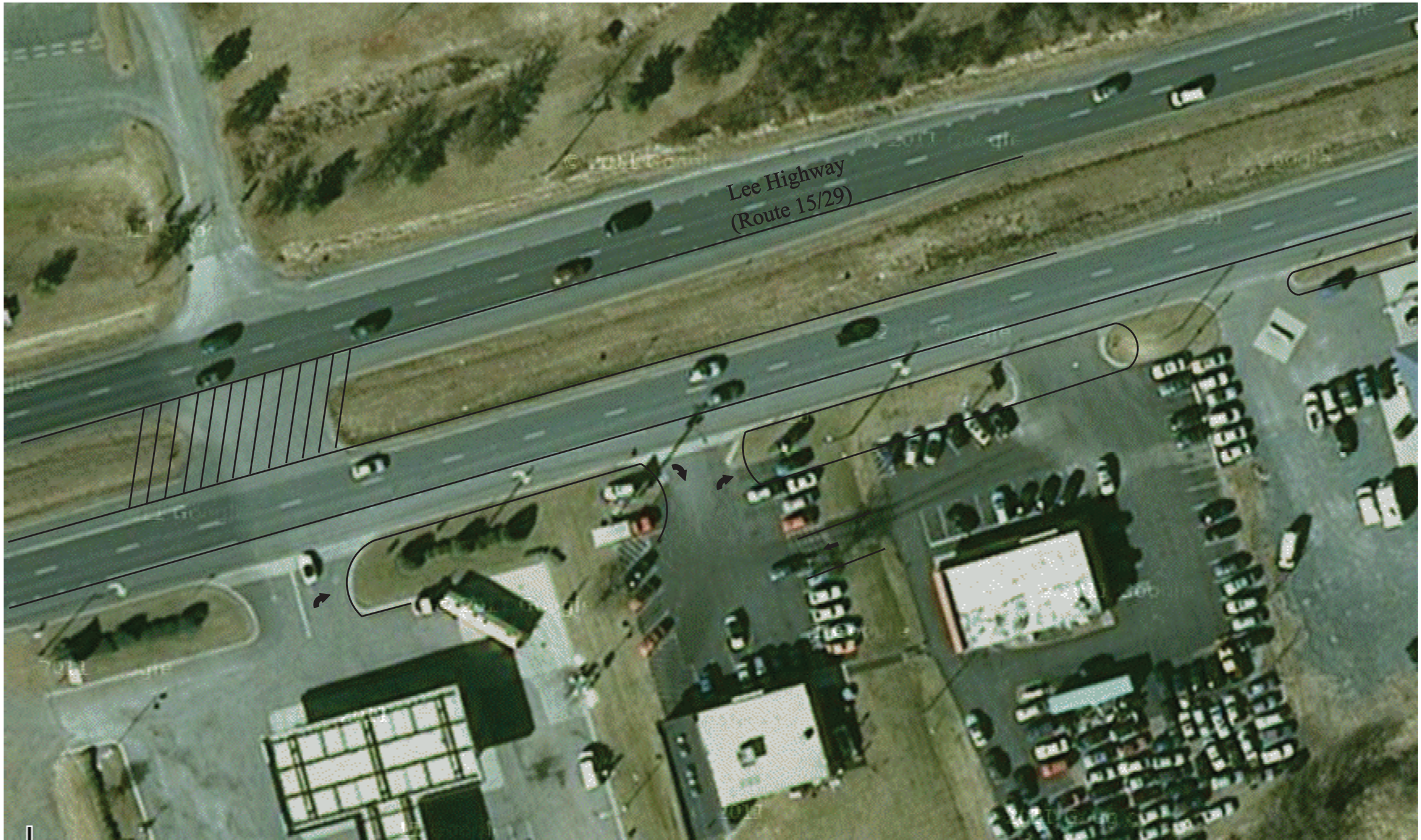
FIGURE L2:INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L3– Inter-parcel Connections



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

REVISION APPROVED BY

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L3:INTER-PARCEL
CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L4– Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L4:INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L5– Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10. 2010 COMMENTS.	3/2010	AHN	JLM		

REVISION APPROVED BY

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L5:INTER-PARCEL CONNECTIONS

MCV

4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865

Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L6– Consolidation and Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10. 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L6: INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L7– Consolidation and Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L7:INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L8– Consolidation and Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L8:INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L9– Consolidation and Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L9:INTER-PARCEL CONNECTIONS

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix F

Figure L10– Consolidation and Inter-parcel Connections

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE L10:INTER-PARCEL CONNECTIONS

MCV
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Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix G

Figure M– Reverse Frontage

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FRONTAGE ROAD
REDESIGN-SECTION 1
OPTION A

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Frontage road section 1 Option A.dgn 11/11/2010 3:10:26 PM

Appendix G

Figure N– Driveway Consolidation

EXISTING	TYPE	PROPOSED
400	CONTOUR MAJOR	400
401	CONTOUR MINOR	401
× 400.05	SPOT ELEVATION	× 400.05
TEXT	DECIDUOUS TREE	TEXT
TEXT	EVERGREEN TREE	TEXT
	BRUSH / WOODED AREA	
	PROPERTY LINE	
	LEGAL RIGHT–OF–WAY	
	CURB	
	EDGE OF PAVEMENT	
	GUIDERAIL	
	UTILITY POLE	
OHU OHU	OVERHEAD UTILITIES	OHU OHU
	LIGHT POLE / FLOOD LIGHT	
	SIGN	A
	EASEMENT LINE	
	PAVEMENT RECONSTRUCTION	
	SAWCUT	
	PAVEMENT MILL / OVERLAY	
X X	FENCE	X X
G	GAS LINE	G
W	WATER LINE / VALVE	W
	FIRE HYDRANT	
D	STORM SEWER MH/INLET/LINE	D
S SAN	SANITARY SEWER MH/LINE	S SAN
	TO BE REMOVED	TBR
	WATER EDGE	

NO	REVISION	BY	DATE

N

50 0 50 100
SCALE IN FEET

PROJECT:

INTERSECTIONS OF RTS. 29 & 215

NEW BALTIMORE
FAUQUIER COUNTY, VIRGINIA

CLIENT:

DANE ISMART

5409 RUSTIC PINE COURT
ORLANDO, FL 32819

PREPARER:

Benchmark
CIVIL ENGINEERING SERVICES, INC.
1727 JONATHAN STREET
ALLENTOWN, PA 18104
610.776.6700 610.776.1190 FAX
www.bencivil.com info@bencivil.com
• CIVIL ENGINEERING • TRAFFIC ENGINEERING • SURVEYING

TITLE:

HIGHWAY OCCUPANCY PERMIT
PAVEMENT MARKING & SIGNING PLAN

DESIGN: S.M. HARNEY	PLAN DATE: 03/24/10	DWG. NO.: PMS-7
DRAWN: J.D. GILMORE	SCALE: AS NOTED	
SURVEY DATE: –	DWG. FILE: 543001	SHT. NO.: 10 OF 10

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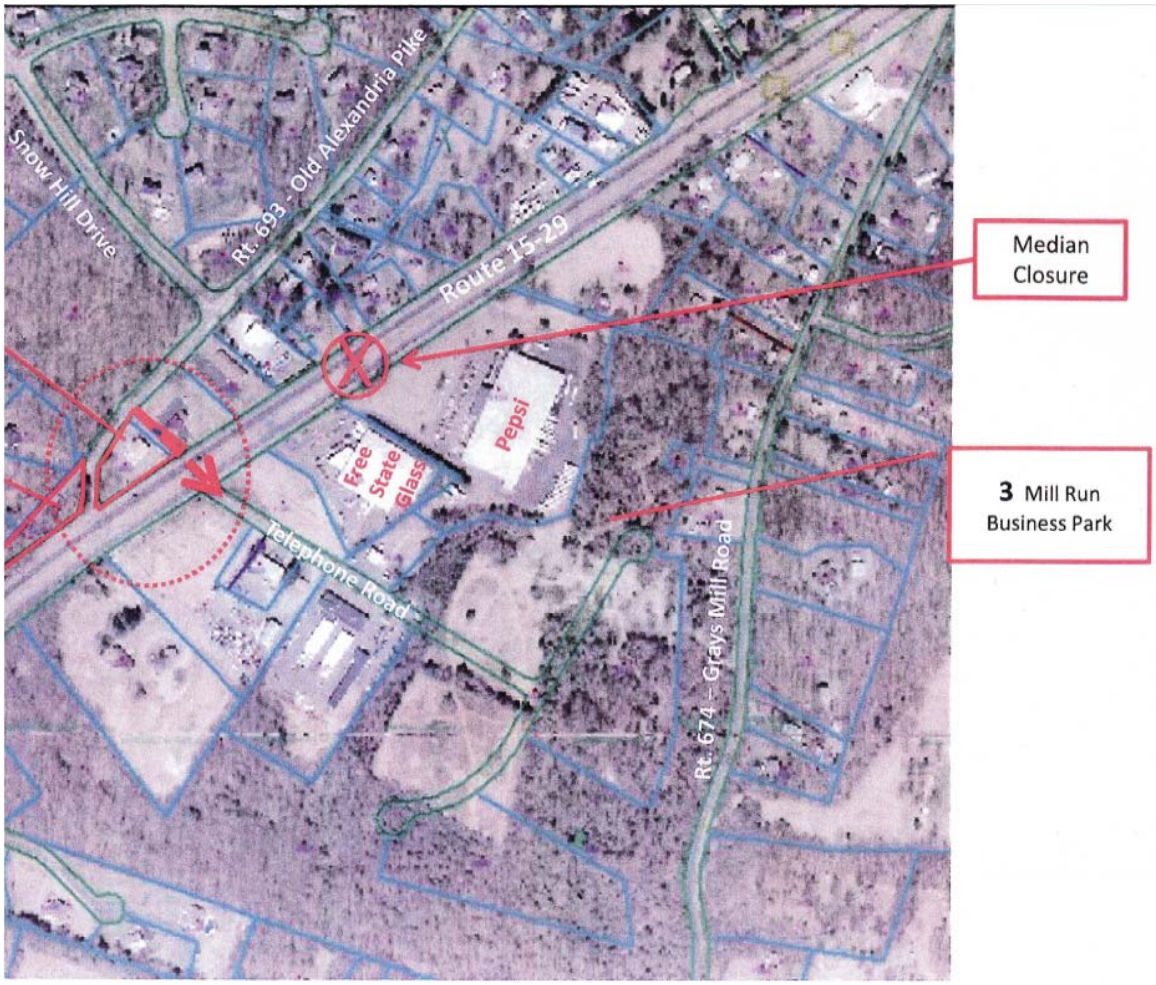
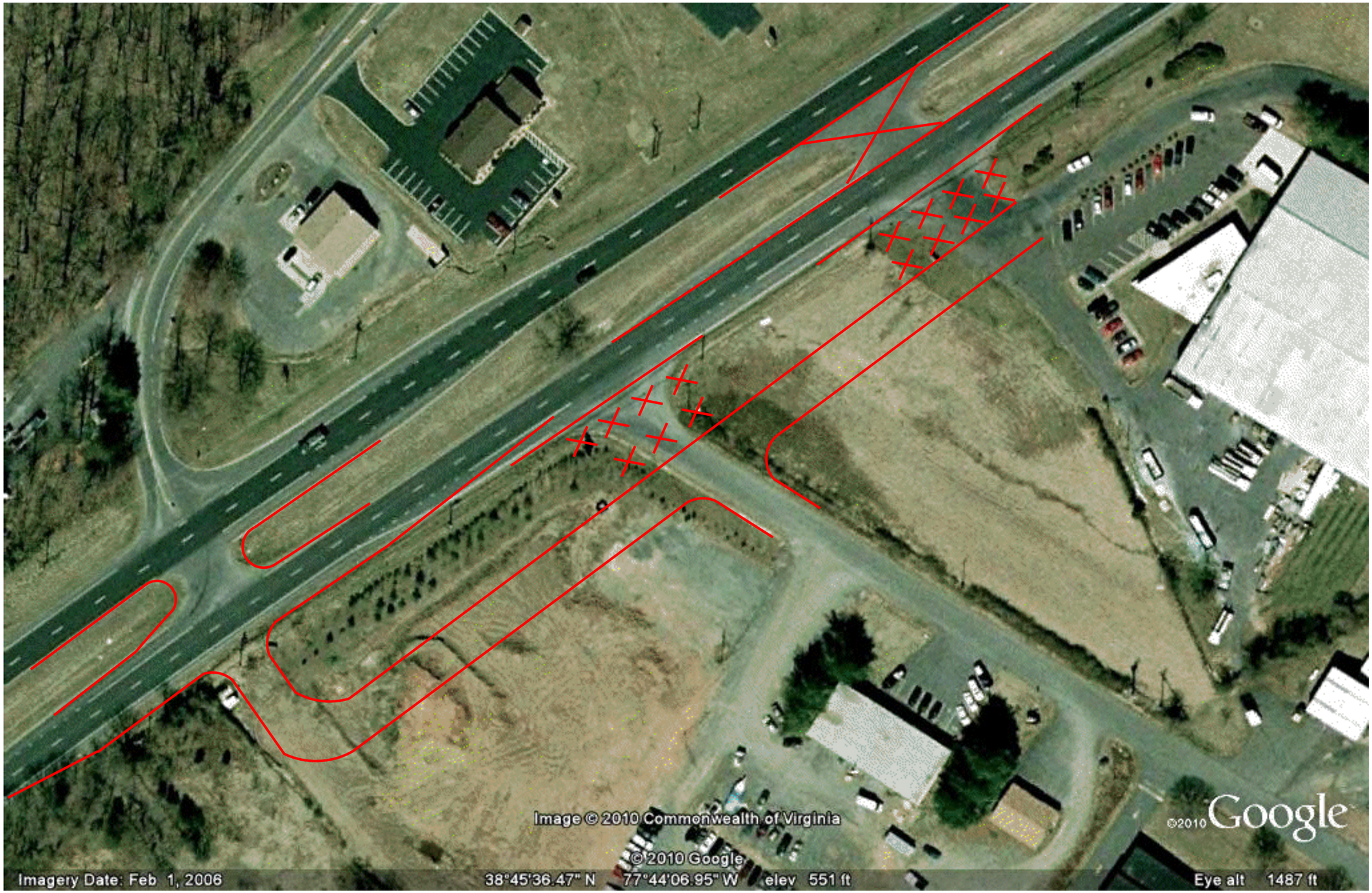
Appendix H

Figure O – Relocation of Old Alexandria Pike



Appendix H

Figure P – Construction of a New Access Road at the Intersection of Route 29 and Telephone Road



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

MODIFICATION PLAN FOR
INTERSECTION OF
TELEPHONE ROAD AND
ROUTE 29

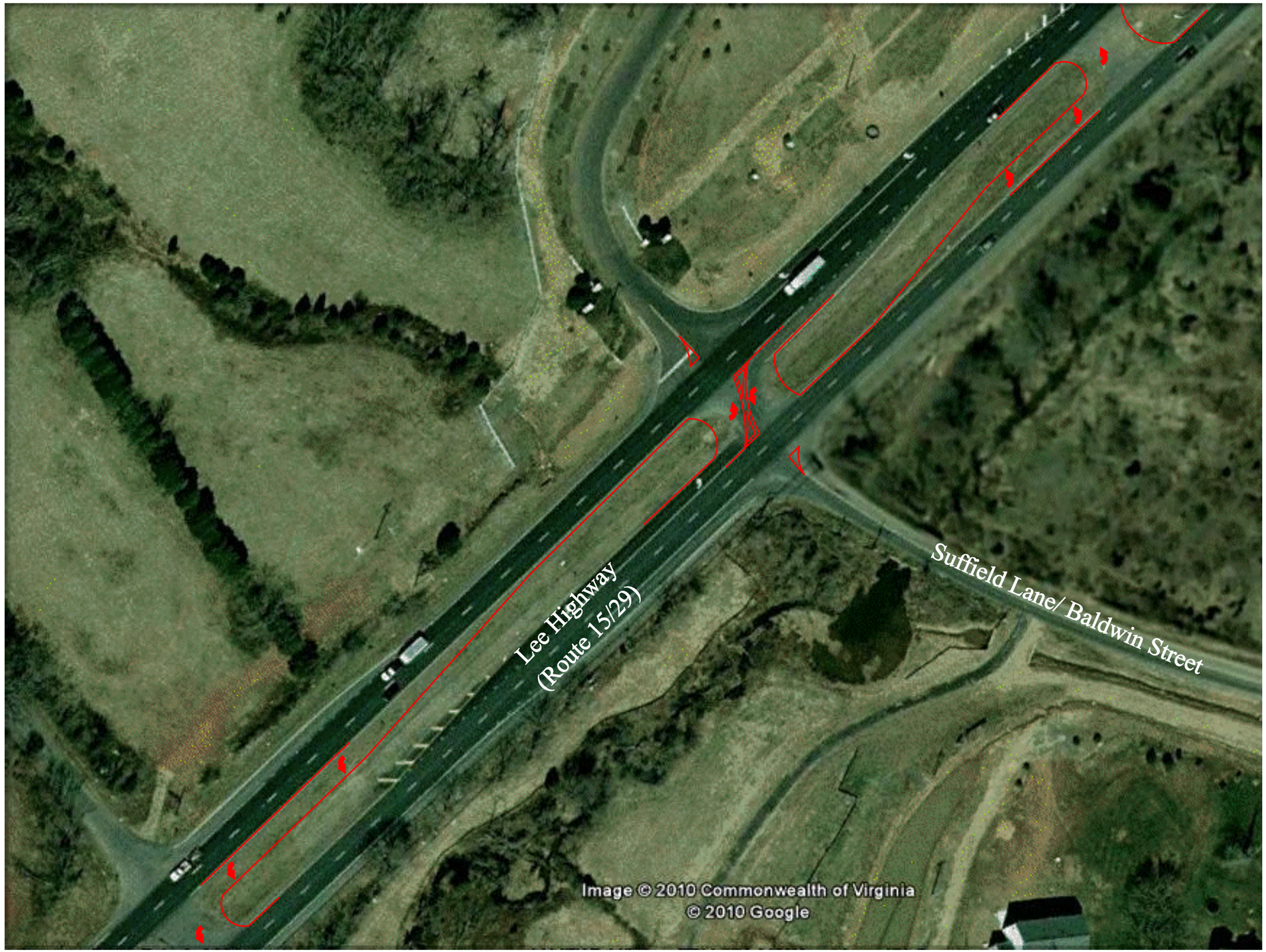
MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Telephone Road Modifications 2.dgn 11/11/2010 2:34:11 PM

Appendix I

Figure Q - Intersection of Route 29 and Suffield Lane/Baldwin Street



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

REVISION APPROVED BY

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

MODIFICATION PLAN FOR
INTERSECTION OF
BALDWIN STREET AND
SUFFIELD DRIVE

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Baldwin Modifications.dgn 6/23/2011 12:21:44 PM

Appendix J

Figure R – Concept of Proposed Intersection at Route 29 and Dumfries Rd.

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

MODIFICATION PLAN FOR
INTERSECTION OF
ROUTE 605 AND
LEE HWY (RTE.29)

M C V
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Dumfries Road.dgn 6/23/2011 12:13:24 PM

Appendix K

Figure K1 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K1: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
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F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K2 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K2: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K3 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K3: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
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SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K4 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K4: MILE MARKER 4

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
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SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Appendix K-Mile Marker 4.dgn 6/23/2011 11:01:24 AM

Appendix K

Figure K5 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K5: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Appendix K-Mile Marker 5.dgn 6/23/2011 11:02:18 AM

Appendix K

Figure K6 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K6: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
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SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K7 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

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FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K7: MILE MARKER

MCV
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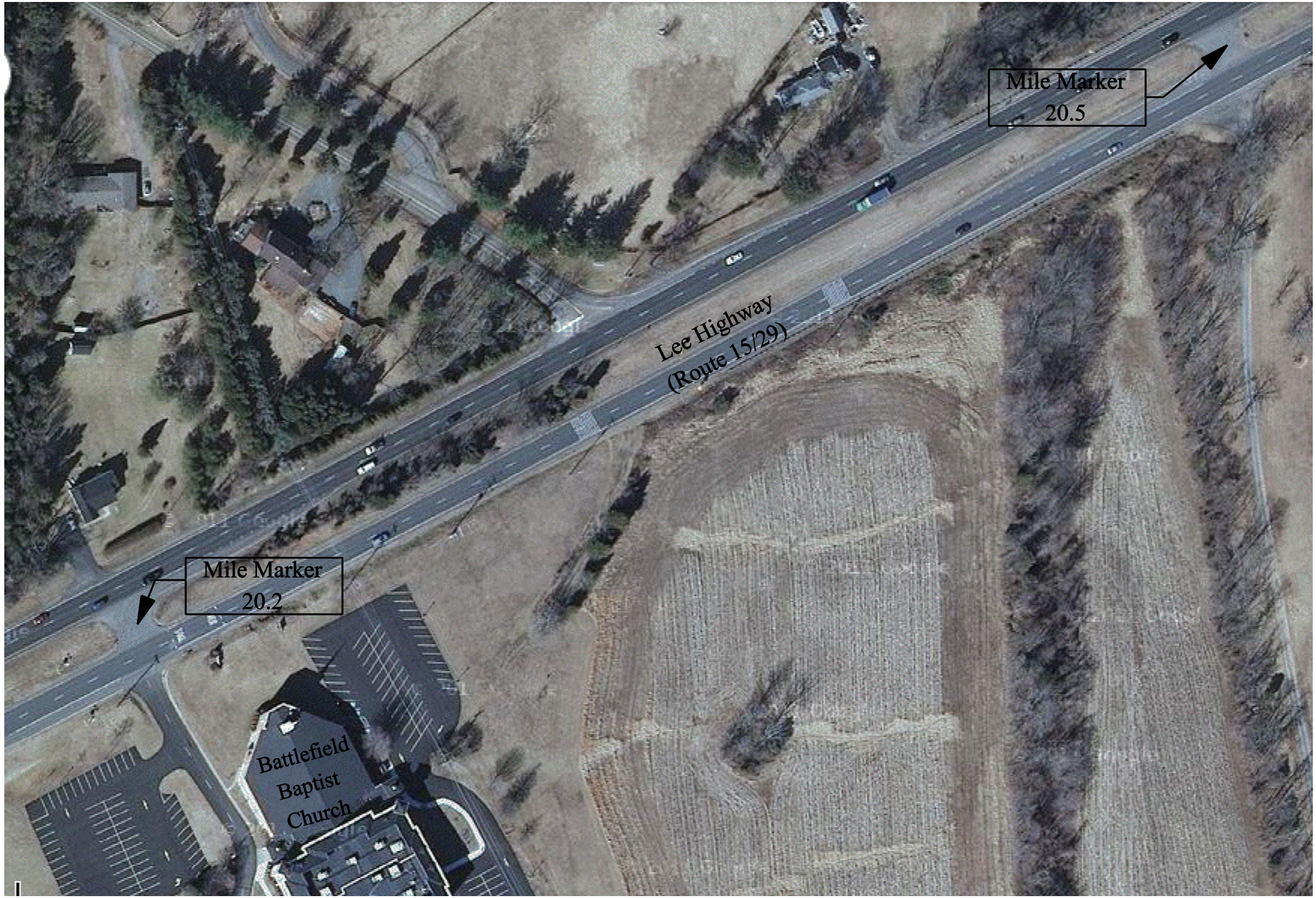
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

...\Appendix K-Mile Marker 7.dgn 6/23/2011 11:04:21 AM

Appendix K

Figure K8 – Mile Marker



NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K8: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
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F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K9 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

REVISION APPROVED BY

PROFESSIONAL SEAL:

PROJECT:

RTE 29 ACCESS MANAGEMENT
FAQUIER COUNTY, VIRGINIA

TITLE:

FIGURE K9: MILE MARKER

MCV
4605-C Pinecrest Office Park Dr.
Alexandria, VA 22312-1442
T 703.914.4850
F 703.914.4865
Planning. Engineering. Information Technology

SURVEY	DATE SEPTEMBER 2010
DESIGN BKM	DRAWN BKM
CHKD.	SCALE 1" = 25'
SHEET 1 OF 1	FILE NO.

Appendix K

Figure K10 – Mile Marker

NO.	DESCRIPTION	DATE	RVSD BY	REV BY	APPROVED	DATE
1.	VDOT MARCH 10, 2010 COMMENTS.	3/2010	AHN	JLM		

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