Braddock Road/Pleasant Valley Road Alternatives Analysis

Fairfax County, Virginia

June 2013

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Braddock Road/Pleasant Valley Road Alternatives Analysis

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EXECUTIVE SUMMARY

This report evaluates improvements to the intersection of Braddock Road and Pleasant Valley Road in Fairfax County, Virginia. Analyses were performed for existing conditions, future design year no-build conditions (year 2020), and six alternative improvement configurations (year 2020). Following an initial screening, two alternatives were carried forward and refined to further assess the viability and benefit of each alternative. A single-lane roundabout was identified as the preferred alternative after evaluating comparisons of intersection controls, traffic operations, safety, impacts to right-of-way, physical/built environment, and a qualitative review of alternatives across several key criteria.

The following findings have been determined through the project team's (Kittelson & Associates, Inc. and Timmons Group) field evaluations and analysis of existing and future operational and safety performance of the Braddock Road/Pleasant Valley Road intersection, including collaboration and meetings with VDOT and key stakeholders.

> *Note: Throughout this report, Braddock Road is referred to as an east/west-oriented roadway, and Pleasant Valley Road is referred to as a north/south-oriented roadway.*

EXISTING CONDITIONS

- Excessive queuing was observed on the critical approaches of the intersection during both peak periods.
  - During the weekday a.m. peak hour, the eastbound queue was observed to exceed 80 vehicles (approximately 4,750 feet or 0.9 miles).
  - During the weekday p.m. peak hour, the westbound queue was observed to exceed 80 vehicles (approximately 4,750 feet or 0.9 miles).
- The intersection currently operates over capacity and at Level of Service (LOS) F during the weekday a.m. and p.m. peak hours under all-way stop control.
- A preliminary traffic signal warrant analysis indicates that Manual on Uniform Traffic Control Devices (MUTCD) Warrants #1-3 are met under existing conditions.
- During the three-year period between 2008 and 2010 there were a total of 14 reported crashes at the intersection. Descriptive statistics developed from crash data and police reports revealed the following notable trends:
  - Four angle crashes occurred when vehicles traveling westbound on Braddock Road ran a stop sign and collided with vehicles traveling northbound on Pleasant Valley Road
  - Ten crashes (83 percent) were property damage only (PDO) crashes
  - Two crashes (17 percent) were injury crashes
  - Six angle crashes and four rear end crashes were reported (the remaining two crashes consisted of a head on crash and a fixed object crash)

  - Half of the crashes occurred outside of the weekday p.m. peak hour during the afternoon hours
  - Half of the crashes occurred on Thursday and Friday
  - Five crashes (42 percent) occurred on the weekend

- The following environmental constraints have been identified at the Braddock Road/Pleasant Valley Road intersection:
  - Three of the four quadrants (northwest, northeast, and southeast) are designated as Section 4f lands and owned by the Fairfax County Park Authority.
  - Probable wetland areas near the intersection have been identified on previous base-mapping provided by the Virginia Department of Transportation (VDOT), though to date a formal jurisdictional delineation has not be performed. Field observations revealed areas of standing water in several locations and that overall the area is very flat, complicating drainage.
  - There are several above ground utility poles in close proximity to the study intersection, several of which carry multiple circuits.
  - A majority of the right-of-way is prescriptive, meaning that VDOT does not have fee right-of-way in the northwest, northeast, and southwest quadrants of the intersection. In the southeast quadrant, there is some fee right-of-way along both roads that was obtained by the County and/or VDOT through a previous land use action.
  - The Department of Conservation and Recreation has identified rare plant and natural heritage resources in the northeast quadrant of the intersection.
  - Cox Farms is currently zoned as agricultural land and recognized as an agricultural resource.

FUTURE NO-BUILD CONDITIONS

- A future design year of 2020 was identified for this analysis. Future year volume projections assumed a two percent annual growth rate.
- The intersection is forecast to continue to operate over capacity and at LOS F during the weekday a.m. and p.m. peak hours under all-way stop control.
- Vehicle queues and delay will worsen as demand grows at the intersection.

INITIAL ALTERNATIVES SCREENING

- Six alternatives at the Braddock Road/Pleasant Valley Drive intersection were initially identified.
  - Full-movement Traffic Signal with Auxiliary Turn Lanes
  - Traffic Signal with Auxiliary Turn Lanes (restricted N/S left-turns)
  - Traffic Signal with Auxiliary Turn Lanes (restricted E/W left-turns)
  - Traffic Signal without Auxiliary Turn Lanes
  - Single-lane Roundabout

  - Mini-roundabout
- All alternatives were evaluated based on their operational performance in the design year (2020). Other qualitative criteria considered include potential environmental/right-of-way/utility impacts, driver expectation, and safety performance.
- Following an initial screening evaluation, the following two alternatives (shown in **bold)** were carried forward for further detailed analysis; those listed in *italics* were eliminated from further consideration.
  - **Full-movement Traffic Signal with Auxiliary Turn Lanes**
  - *Traffic Signal with Auxiliary Turn Lanes (restricted N/S left-turns)*
  - *Traffic Signal with Auxiliary Turn Lanes (restricted E/W left-turns)*
  - *Traffic Signal without Auxiliary Turn Lanes*
  - **Single-lane Roundabout**
  - *Mini-roundabout*

ALTERNATIVES ANALYSIS

Several design iterations of both the full-movement traffic signal and single-lane roundabout were developed and considered before converging on an optimal design that struck an appropriate balance between operations, safety, cost, and minimizing impacts to right-of-way and the physical/natural/built environment.

Full-Movement Traffic Signal with Auxiliary Turn Lanes

Design Parameters

- The storage lengths for left- and right-turn lanes were determined based on the 95th percentile queue lengths reported from the Synchro 7 traffic analysis software
- Northbound and eastbound right-turn lanes are warranted as per the VDOT *Road Design Manual*.
- A cycle length of 90 seconds was selected for both the weekday a.m. and p.m. peak hours.
- Left-turn signal phasing was assumed as follows based on forecast left-turn volumes and operational performance of the intersection:
  - Protected/permissive left-turn phasing
  - Northbound right-turn overlap phase
- With one exception, design year peak hour factors (PHF) were changed to 0.95 unless the existing PHF was greater than 0.95, in which case the PHF was held constant.
  - The weekday a.m. peak hour westbound PHF was changed from 0.75 (existing) to 0.80 (design year) to retain the pronounced peaking characteristic of this one approach.

Operational Performance

- The full-movement traffic signal is forecast to operate at LOS C and a volume-to-capacity (v/c) ratio of 0.72 and 0.71 during the weekday a.m. and p.m. peak hours, respectively.

Single-Lane Roundabout

Design Parameters

- A 100-foot inscribed circle diameter (ICD) was selected to achieve an optimal balance between operational performance and minimizing the overall intersection footprint.
- A WB-40 was selected as the design vehicle.
- A raised central island with landscaping was selected to increase conspicuity and improve deflection and speed control.
- A northbound right-turn bypass lane was included to provide acceptable design year traffic operations.
- The center of the roundabout is located south and west of the existing centerline intersection.

Operational Performance

- A 100-foot ICD single-lane roundabout is forecast to operate at LOS D and a v/c ratio of 0.96 and 0.91 during the weekday a.m. and p.m. peak hours, respectively.

Evaluation Criteria

A wide range of quantitative and qualitative criteria were considered in the evaluation of the two alternatives carried forward for further analysis and refinement, including:

- Design year traffic operations
  - LOS
  - Volume-to-capacity
  - Queuing
  - Off-peak performance
  - Demand absorption
- Safety performance
- Design and construction
  - Right-of-way impacts
  - Environmental impacts
  - Utilities
  - Drainage
  - Maintenance/operation costs
  - Design vehicle
  - Access management
  - Maintenance of traffic/constructability
  - Ability for future expansion
  - Preliminary cost estimate

Community Meeting

A community meeting at the Sully District Governmental Center was held on March 18, 2013, to present the two advanced alternatives to the public. Public comments were collected and reviewed by the project team and VDOT, and have been incorporated into the alternatives to the extent feasible.

PREFERRED ALTERNATIVE

Both alternatives were shown to be feasible and represent a marked improvement as compared to future no-build conditions. Comparing the two alternatives across the selected evaluation criteria suggests that the **single-lane roundabout** is preferable to a traffic signal across a majority of criteria.

- Traffic Operations: The single-lane roundabout with a yield-controlled northbound right-turn bypass lane is forecast to operate at LOS D or better under design year conditions, meeting VDOT's desired operational performance. Drivers will experience little or no delay during off-peak hours. While the traffic signal is forecast to operate at LOS C during peak periods, drivers will experience more delay with a traffic signal in place during off-peak periods. Impacts to other evaluation criteria (discussed below) reduce the overall viability of a traffic signal. The roundabout has more flexibility to absorb/respond to small increases in demand for certain movements (or quicker growth) relative to the traffic signal.
- Safety Performance: Roundabouts generally reduce the frequency and severity of crashes and reduce the number of conflict points at the intersection by 75 percent compared to a traditional four-legged intersection, whereas a traffic signal tends to increase the frequency and severity of crashes, particularly rear-end and angle crashes.
- Design and Construction: Overall, the single-lane roundabout has fewer and less severe impacts to right-of-way and the physical/natural/built environment as compared to a traffic signal.
- Cost: The design and construction of a single-lane roundabout ($3M) is estimated to cost roughly $1M less than the traffic signal ($4M). A single-lane roundabout is also likely to have slightly lower life-cycle costs as compared to the traffic signal.

Consideration was given to the anticipated schedule of a construction project and what delivery format was most advantageous to minimizing the time between selection, design, and construction/implementation. Both Design-Build and Design-Bid-Build delivery methods were considered.

- The Design-Build approach provides a shorter timeframe for implementation and reduced impacts to the traveling public and surrounding community as compared to a Design-Bid-Build approach.

Based on this alternatives analysis, the project team and VDOT recommend the single-lane roundabout alternative be carried forward to design and implementation through a Design-Build delivery method.

Section 2

Introduction

INTRODUCTION

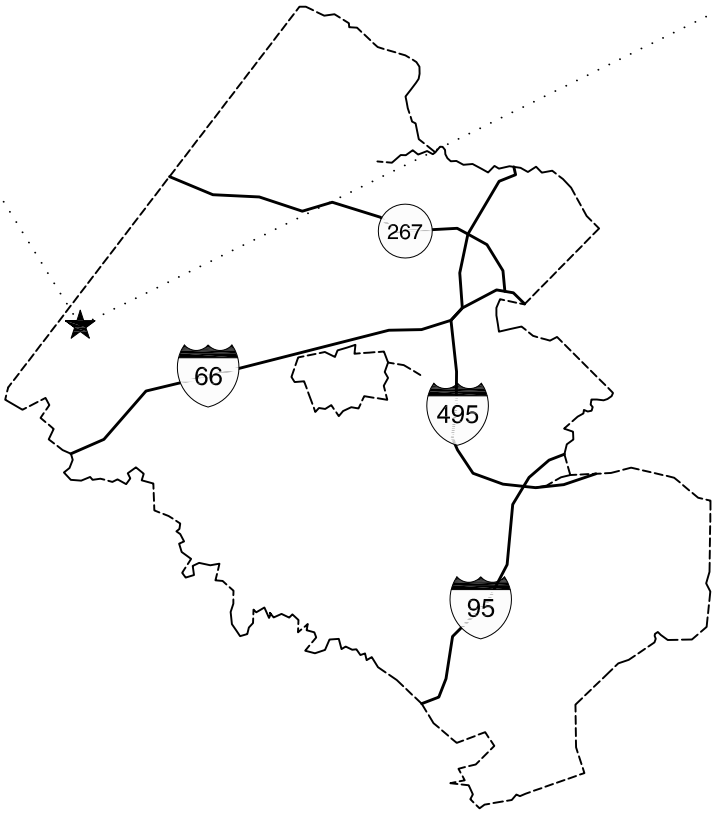
This report evaluates improvements to the intersection of Braddock Road and Pleasant Valley Road in Fairfax County, Virginia. At the request of VDOT, Kittelson & Associates, Inc. (KAI) and Timmons Group performed analyses for existing conditions, future design year no-build conditions (year 2020), and six alternative improvement configurations (year 2020). Following an initial screening of the alternatives, two alternatives were carried forward and refined to further assess the viability and benefit of each alternative. Based on the evaluation, the project team and VDOT recommend the single-lane roundabout alternative be carried forward to design and implementation.

Details regarding data collection, analyses, preliminary estimates of probable cost, evaluation of potential treatments, and a qualitative evaluation of alternatives across several key criteria and findings are contained in the remainder of this report.

PROJECT LOCATION

The Braddock Road/Pleasant Valley Road intersection is located in western Fairfax County, Virginia, approximately two miles west of the Braddock Road/SR 28 intersection just north of Interstate 66. **Figure 1** illustrates the site vicinity map and the Braddock Road/Pleasant Valley Road intersection.

(NO SCALE)



LEGEND

● - STUDY INTERSECTION

SITE VICINITY MAP
BRADDOCK ROAD AND PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 1

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING

H:\profile\11764 - Central Region VDOT On-Call\Task Orders\Task 14 (12-057) - Braddock Rd & Pleasant Valley\dwgs\figs\Report Figur11764.14_SiteVicinityMap.dwg Jun 21, 2013 - 7:44am - ctiesler Layout Tab: Fig_01

Section 3

Methodology

METHODOLOGY

The following key objectives were identified to guide the project team and VDOT in the selection of potential alternatives for the Braddock Road/Pleasant Valley Road intersection:

- Improve intersection operations and safety
- Minimize right-of-way, environmental, and utility impacts

The methodological approach and key assumptions are provided below. A more detailed discussion of each step is included in subsequent sections of this report.

- Weekday a.m. and p.m. peak hour intersection turning movement counts were collected by VDOT in September 2012 to create an existing baseline condition.
- As per direction from VDOT, a two percent annual growth rate was applied (compounded annually) to develop year 2020 design year volumes.
- The most recent three years of available crash data was reviewed and evaluated.
- Traffic operations for existing and future year 2020 no-build conditions were evaluated in Synchro 7 and the following measures of effectiveness (MOEs) were summarized:
    - Volume-to-Capacity Ratio
    - Queuing
    - Delay
    - LOS
- An initial traffic operations screening of six intersection control modification alternatives at the Braddock Road/Pleasant Valley Road intersection was performed using Synchro 7 (and SIDRA for the roundabout alternatives), including:
    - Full-movement Traffic Signal
    - Traffic Signal (restricted N/S left-turns)
    - Traffic Signal (restricted E/W left-turns)
    - Temporary Traffic Signal
    - Single-lane Roundabout
    - Mini-roundabout
- The six identified alternatives were qualitatively evaluated based on the following criteria:
    - Traffic operations
    - Safety
    - Environmental impacts
    - Utility impacts
    - Planning level cost
    - Right-of-way
- Two alternatives were carried forward for further evaluation:
    - Full-movement Traffic Signal (Synchro 7)
    - Single-lane Roundabout (SIDRA)

- The no-build and two alternatives were both quantitatively and qualitatively evaluated using the identified MOEs and previously mentioned evaluation criteria.
- A preferred alternative (single-lane roundabout) was selected based on the results of the evaluation.

Details regarding each alternative and analyses are contained in the subsequent sections of this report.

Section 4

Existing Conditions

EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and current operational and geometric characteristics of the roadways within the study area. These conditions will be compared with future conditions later in this report.

KAI and Timmons Group staff visited the study area on two different occasions in December 2012 to collect information regarding site conditions, adjacent land uses, existing utilities, transportation facilities in the study area, and existing traffic operations during the weekday a.m. and p.m. peak periods.

EXISTING LAND USE & DEMOGRAPHICS

The Braddock Road/Pleasant Valley Road intersection and surrounding area is best characterized as rural. The northwest, northeast, and southeast quadrants of the intersection owned by the Fairfax County Park Authority are currently vacant and include wetland and 4f property designations, as well as environmentally sensitive areas/species. With the exception of the southeast quadrant, all remaining right-of-way along both roads is prescriptive. Cox Farms is located in the southwest quadrant of the intersection.

EXISTING ROADWAY NETWORK

Braddock Road and Pleasant Valley Road are currently classified by VDOT as *Urban Minor Arterials*. Both roads are currently two-lane undivided roadways with posted speed limits of 35 miles per hour (mph). Pleasant Valley Road currently restricts truck traffic to local deliveries only. Fairfax County classifies both facilities as *Minor Arterials (Type B).* The current transportation plan indicates that both roads are ultimately envisioned as four-lane arterials, though there are no known plans or funding for such improvements. The approaches of the intersection are shared left-through-right lanes. Existing transportation facilities were inventoried for the study area. **Table 1** summarizes these facilities.

> *Note: Throughout this report, Braddock Road is referred to as an east/west-oriented roadway, and Pleasant Valley Road is referred to as a north/south-oriented roadway.*

Table 1 Existing Transportation Facilities

Roadway	Functional Classification[1]	Number of Lanes	Posted Speed (mph)	Paved Width (ft)	Median?	Sidewalks?	Bicycle Lanes?	On-Street Parking?
Braddock Road	Urban Minor Arterial (B)	2	35	22-24	No	No	No	No
Pleasant Valley Road	Urban Minor Arterial (B)	2	35	22-24	No	No	No	No

[1] VDOT Functional Classification

ALTERNATIVE TRAVEL MODES

There is an existing multi-use path that currently begins in the southeast quadrant of the intersection and extends south along Pleasant Valley Road to residential development near Route 29. No pedestrian or bicycle activity was observed during field visits during peak periods, though local residents are known to actively use the multi-use path. No transit service is currently provided within the study area.

No transit service currently serves this intersection or the immediate surrounding area.

EXISTING DATA

Details regarding the data collected for this study are provided below.

Turning Movement Counts

Twelve-hour weekday a.m. and p.m. peak hour intersection turning movement counts were conducted by VDOT on September 25, 2012. A delay study was also conducted for each approach between 7:15–9:15 a.m. and 4:00–6:00 p.m. on September 25, 2012. Year 2011 annual average daily traffic (AADT) volume estimates by section of route for the Fairfax Maintenance Area was provided by the VDOT Traffic Engineering Division. The traffic data were analyzed to determine system peak hours, peak hour factors, average daily traffic (ADT), and heavy vehicle percentages. The data show the weekday morning and evening peak hours occur between 7:15–8:15 a.m. and 5:00–6:00 p.m., respectively. The compound annual growth rate (CAGR) volume growth from 2012–2020 is two percent (17.2 percent total). **Appendix A** contains the raw traffic data and data worksheets.

Field Observations

Current directional peak hour volume patterns place a disproportionate amount of demand on certain approaches depending on the time of day, which result in long delays and extensive queuing on certain approaches. The current geometrics and limited paved widths/corner radii of the intersecting roadways provide limited opportunities for turning vehicles to “sneak” past stopped through vehicles at the stop bars, further restricting the overall capacity of the intersection. Field observations revealed several notable traffic patterns and operations:

Weekday AM Peak Hour

- The critical eastbound approach queue was observed to regularly exceed 80 vehicles. The maximum queue was estimated at 100 vehicles, extending nearly a mile west from the stop bar.
- Other approach queues fluctuated, but were not observed to exceed ten vehicles and were regularly less than five vehicles in length.
- Several (15–20) school buses were observed to make either westbound left turns or northbound right turn movements.
    - Vehicles at the stop bar occasionally impeded the ability of the school bus to turn due to the constrained geometry and limited paved width at the intersection. Buses

incurred delay until the car that was blocking the turn maneuver cleared the intersection

Weekday PM Peak Hour

- The critical westbound weekday p.m. peak hour queue was observed to exceed 80 vehicles at its peak, nearly extending back to Old Lee Road which is over 0.8 miles away.
- Other approach queues fluctuated, but were not observed to exceed 15–20 vehicles.
  - The southbound and northbound queues occasionally grew to approximately 20 vehicles, but during the observation period decreased to two or three vehicles.
  - The eastbound queue occasionally grew to about ten vehicles, but quickly dissipated each time.
  - The 18th vehicle in the northbound queue was observed to take 2 minutes, 25 seconds to reach the intersection.

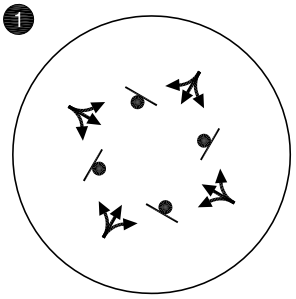
EXISTING OPERATIONS ANALYSIS

Existing conditions traffic operations were evaluated using the *Highway Capacity Manual* (HCM) 2000 reports produced by Synchro 7 traffic analysis software. All LOS analyses described in this report were performed in accordance with the procedures stated in the HCM 2010. **Figure 2** illustrates the existing lane configurations and traffic control devices at the study intersection.

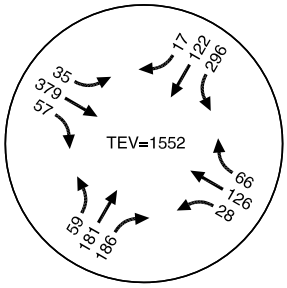
Existing Traffic Volume Adjustments

Existing traffic volumes were adjusted based on field observations and delay study findings provided by VDOT. It is apparent from observations and data that demand on critical approaches during the weekday a.m. (eastbound) and p.m. (westbound) is not fully served within the peak one-hour period. An additional 25 vehicles were added to turning movement volumes on the noted approaches and distributed proportionally based on the turning patterns of the approach to estimate total peak-hour demand on the critical approach. This number of vehicles was selected based on field observations and reflects a reasonable approximation of unserved demand within a given peak one-hour time period. Figure 2 also shows these adjusted traffic volumes used to analyze weekday a.m. and p.m. peak hour traffic operations.

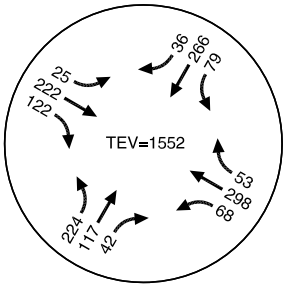
LANE CONFIGURATION



WEEKDAY AM PEAK HOUR



WEEKDAY PM PEAK HOUR



LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

TEV= TOTAL ENTERING VEHICLES
NOTE: VOLUMES ADJUSTED TO REFELCT UNSERVED PEAK HOUR DEMAND

EXISTING LANE CONFIGURATION, TRAFFIC CONTROL, AND EXISTING WEEKDAY AM & PM PEAK HOUR VOLUMES FAIRFAX COUNTY, VIRGINIA

FIGURE 2

Operational Analysis

Table 2 shows the results of the traffic operations analysis for the study intersections under weekday a.m. and p.m. peak hour existing traffic conditions.

Table 2 Year 2012 Existing Conditions Traffic Operations

Intersection Approach	Weekday AM Peak Hour		Weekday PM Peak Hour	
	v/c	LOS	v/c	LOS
Northbound	**1.08**	**F**	**1.05**	**F**
Eastbound	**1.24**	**F**	**1.05**	**F**
Westbound	0.77	**E**	**1.14**	**F**
Southbound	**1.13**	**F**	**1.05**	**F**

As shown in Table 2, all movements currently operate at LOS F and are over capacity during both time periods except for the westbound movement, which operates at LOS E and has a v/c ratio of 0.77 during the weekday a.m. peak hour. **Appendix B** contains the existing conditions LOS worksheets.

Crash Data

Descriptive statistics were developed from the most recent three years of available crash data (2008 to 2010) and police reports were provided by VDOT. Crashes are random events whose occurrence is influenced foremost by human behavior and secondarily by driver's responding to roadway conditions, other motorists, pedestrians, and bicyclists. As a result, engineering cannot prevent or eliminate crashes altogether; combining engineering with enforcement, education, and emergency response services has the greatest potential to reduce crashes. This report focuses on engineering solutions; therefore, crash trends were identified to obtain a sense of the number and nature of crashes that have occurred. **Appendix C** contains the crash data reports.

Crash data and available police reports were provided by VDOT. Of the 14 reported crashes, 12 were intersection related and are discussed in more detail in the following section. The two excluded crashes are listed below:

- An angle crash located 1,300 feet west of the study intersection at a driveway access to Cox Farms.
- A head on crash located 3,800 feet west of the study intersection at a private driveway.

When available, police crash reports often contain additional geographic detail to help plot reported crashes on a crash diagram. Police reports were not available for half of the crash data provided by VDOT; these crashes were placed on the crash diagram with the information in Microsoft Excel spreadsheet format provided by VDOT. **Figure 3** displays the location, severity, and type of crashes that occurred at the Braddock Road/Pleasant Valley Road intersection for the three-year period. The numbered crashes correspond to the listed data provided in Appendix C.

BRADDOCK ROAD AND PLEASANT VALLEY ROAD
CRASH DIAGRAM
FAIRFAX COUNTY, VIRGINIA

FIGURE 3

A review of the crash diagram reveals the following trends:

- Four angle crashes occurred when vehicles traveling westbound on Braddock Road ran a stop sign and collided with vehicles traveling northbound on Pleasant Valley Road.
- Two angle crashes occurred when vehicles traveling straight through the intersection collided with vehicles making a left-turn movement.
- Two rear-end, property damage only crashes occurred leading up to the intersection: one in the eastbound direction 100 feet west of the study intersection and one in the northbound direction (distance from the intersection unknown).

Crash History

During the three-year period between 2008 and 2010 there were 12 intersection related crashes at the Braddock Road/Pleasant Valley Road intersection, resulting in a combined average of four reported crashes per year. Crashes were analyzed by type, severity, time of day, and day of week. Additional information regarding weather and light conditions at the time of the crash was available for half of the reported crashes.

Table 3 shows the number of crashes per year and the distribution by severity. There were no fatalities during the three-year study period. Of the 12 reported crashes, the majority of reported crashes (ten) were PDO. The remaining two reported crashes were injury crashes.

Table 3 Crash Summary by Severity

Year	Injury Crash	PDO Crash	Fatality	Total
2008	0	1	0	1
2009	0	5	0	5
2010	2	4	0	6
Total	**2**	**10**	**0**	**12**

Table 4 shows the number of crashes per year and the distribution by type. Angle crashes were the most common reported crash type during the study period, comprising half of the reported crashes. Rear-end crashes were the second most common type, comprising a third of the reported crashes in the study area for the three-year period.

Table 4 Crash Summary by Type

Year	Angle	Rear End	Head On	Fixed Object	Total
2008	0	1	0	0	1
2009	3	1	1	0	5
2010	3	2	0	1	6
Total	**6**	**4**	**1**	**1**	**12**

Figure 4 illustrates the number of crashes by time of day. Half of the reported crashes occurred during the afternoon hours (between 2:00 p.m. and 7:00 p.m.). A quarter of the crashes occurred during morning hours, though none were reported during the morning peak period. A quarter of the crashes occurred at night, between 9:00 p.m. and 1:00 a.m.

Figure 4 Crashes by Time of Day

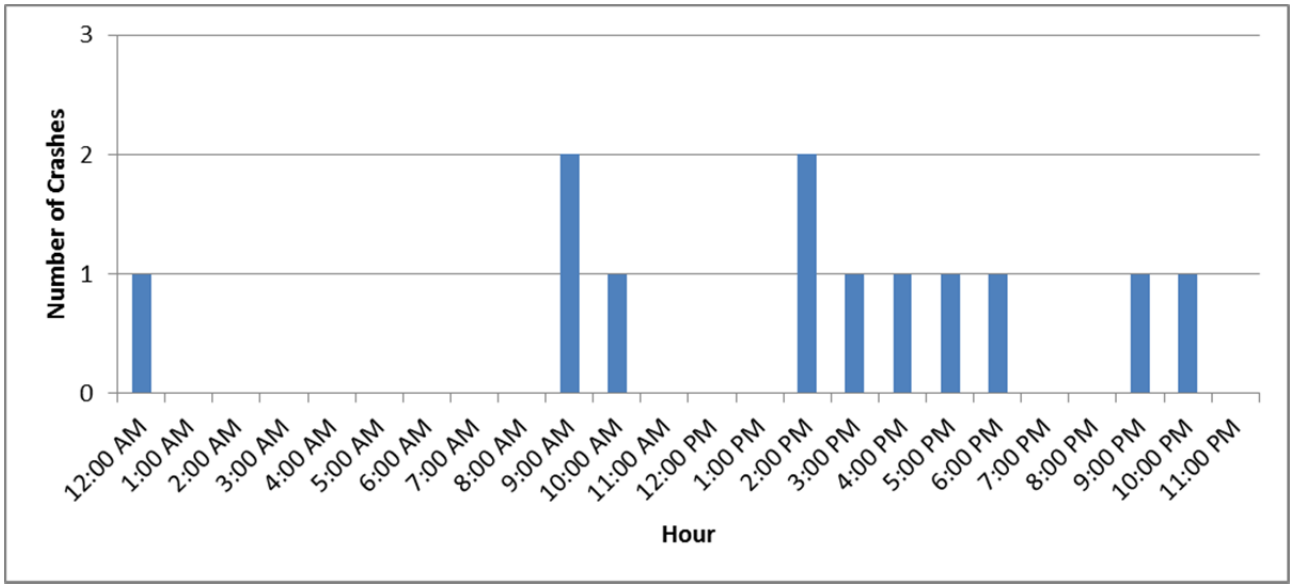
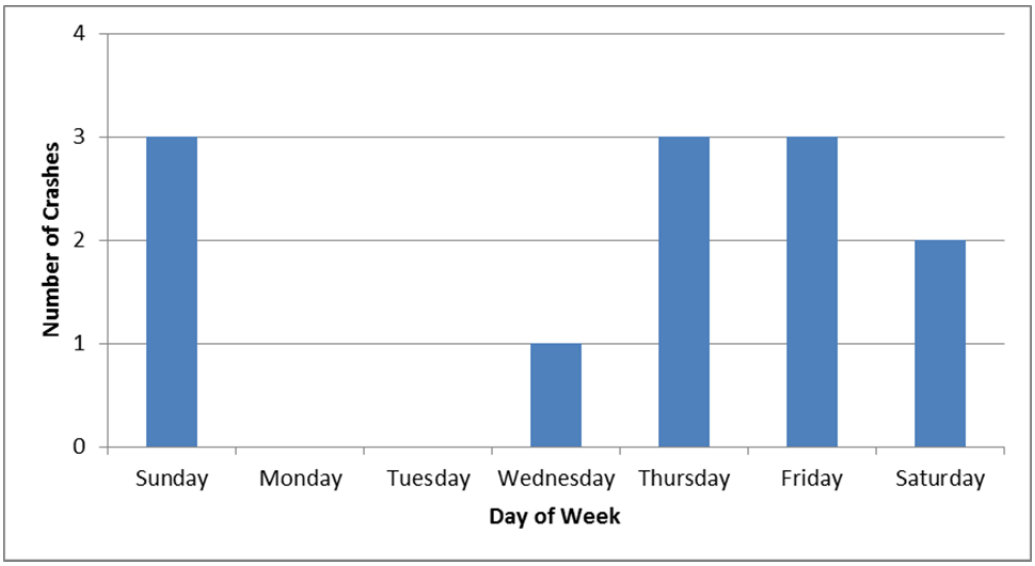


Figure 5 shows the crashes by day of week. Six of the reported crashes (50 percent) occurred on Thursday and Friday. Five of the reported crashes (42 percent) occurred during the weekend and the remaining crash occurred on a Wednesday.

Figure 5 Crashes by Day of Week



Most reported crashes occur outside the weekday a.m. and p.m. peak hours, when traffic volumes are lower. The observation that a small proportion of reported crashes occurred during the peak periods may be due to drivers expecting vehicles on the remaining approaches given high congestion levels and thus a heightened awareness of conflicting movements.

Weather and light conditions were provided for six of the 12 crashes at the Braddock Road/Pleasant Valley Road intersection. All six crashes occurred during clear/cloudy weather conditions. Four of those crashes occurred during daylight while the remaining two crashes occurred during darkness.

Crash History Summary

A summary of the 12 reported crashes at the Braddock Road/Pleasant Valley Road intersection consists of the following notable points:

- Four angle crashes occurred when vehicles traveling westbound on Braddock Road ran a stop sign and collided with vehicles traveling northbound on Pleasant Valley Road.
- Ten crashes (83 percent) were PDO crashes.
- Two crashes (17 percent) were injury crashes.
- Six angle crashes and four rear end crashes were reported (the remaining two crashes consisted of a head on crash and a fixed object crash).
- Half of the crashes occurred outside of the p.m. peak hour during the afternoon hours.
- Half of the crashes occurred on Thursday and Friday.
- Five crashes (42 percent) occurred on the weekend.

Traffic Signal Warrant Analysis

Preliminary traffic signal warrants were evaluated for the Braddock Road/Pleasant Valley Road intersection under existing traffic conditions. The 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) Minimum Volume Warrant, the Interruption of Continuous Flow Warrant, Four-Hour Warrant, Peak Hour Warrant, and Crash Experience (Warrant 1 – Conditions A and B, Warrant 2, Warrant 3) were evaluated. Estimates of fourth and eighth highest hour volumes were developed from the 12-hour traffic count data supplied by VDOT.

Table 5 summarizes the analysis results data shown for Warrants 1, 2 and 3 for the respective eighth highest, fourth highest, and peak-hour volumes, in accordance with the methodology shown in the MUTCD. The signal warrant analysis worksheets are provided in **Appendix D**.

Table 5 Existing Conditions Preliminary Traffic Signal Warrant Analysis – Braddock Road/Pleasant Valley Road

SIGNAL WARRANT	NUMBER OF LANES		REQUIRED VOLUMES		ACTUAL VOLUMES		WARRANT MET?
	Major Street	Minor Street	Major Volumes Both Approaches	Minor Volume High Approaches	Major Volumes Both Appr. [1]	Minor Volume High Appr. [1]	
WARRANT 1 – Condition A Minimum Vehicular Volume	1	1	500[2]	150[2]	520[3]	253[3]	**Yes**
WARRANT 1 – Condition B Interruption of Continuous Traffic	1	1	750[2]	75[2]	520[3]	253[3]	No
WARRANT 2 Four-Hour Vehicular Volume	1	1	686[4]	190[4]	686[5]	333[5]	**Yes**
WARRANT 3 Peak Hour Volume	1	1	788[6]	290[6]	788[7]	383[7]	**Yes**

[1] Appr. = Approach

[2] Corresponding values from Table 4C-1 of the 2009 MUTCD

[3] Computed as 66% of weekday p.m. peak hour volume

[4] Corresponding values from Figure 4C-1 of the 2009 MUTCD

[5] Computed as 87% of weekday p.m. peak hour volume

[6] Corresponding values from Figure 4C-3 of the 2009 MUTCD

[7] Weekday p.m. peak hour volume

The results of the preliminary signal warrant analysis show that existing Braddock Road/Pleasant Valley Road intersection volumes meet the requirements of MUTCD Warrants 1, 2, and 3 under existing conditions.

EXISTING ENVIRONMENTAL CONSTRAINTS

There are environmental constraints surrounding the study area. Each of these environmental constraints was qualitatively assessed for each of the alternatives analyzed for this project. The purpose of recording these constraints is to provide additional information that may influence the analysis and geometric design of the alternatives. Details regarding the existing environmental constraints at the Braddock Road/Pleasant Valley Road intersection were developed by the project team and VDOT and are described below. To the extent possible, existing survey data provided by VDOT was used to identify limits of constraints, but no additional survey was performed for this evaluation. Constraints and their extent may be altered from their preliminary designations below once a full survey of existing conditions can be conducted.

4f Lands

Projects adjacent to and/or through Section 4f lands require the consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development in accordance the U.S. Department of Transportation Act of 1966 when federal funds may be used for a project. Three of the four quadrants (northwest, northeast, and southeast) at the Braddock Road/Pleasant Valley Road intersection are owned by the Fairfax County Park Authority (FCPA). As such, attention must be paid to the impacts of proposed improvements such as those considered in this analysis.

Preliminary discussions between the project team, VDOT, and FCPA reveal that FCPA is currently considering development in the northwest quadrant of the intersection. As part of an on-going master planning effort, FCPA is examining options for providing active recreational areas along with parking in this quadrant.

Wetlands/Drainage

Probable wetland areas have been identified on previous base-mapping provided by VDOT, though to date a formal jurisdictional delineation has not be performed nor confirmed. Field observations by Timmons Group (TG) revealed areas of standing water in several locations and that overall the area is very flat, complicating drainage for this area. Potential intersection improvements will need to address drainage and any additional impervious surface through the design of a selected alternative. Key highlights from TG field notes and information provided by VDOT includes the following:

- Wetlands in the northwest quadrant are considered by VDOT and the Department of Conservation and Recreation to be less significant than those located in the northeast quadrant.
- Water flows to the intersection from the north, east and west legs and continues to the south towards the tributary at the south end of Cox Farms.
- The northeast and northwest quadrants of the intersection (almost all undeveloped) flow through two small culverts to the south side of the intersection.

- The two culverts were observed in the field to be significantly filled with soil such that the capacity of the culverts is limited.
- The soil in the area is non-marine clay, high shrink-swell according to a review of the geology in the area. There is Elbert silt loam under the intersection and Kelly silt loam down to the stream.
- This area of Fairfax County is contained in a Water Supply Protection overlay district where development is limited.
- The tributary at the south end of Cox Farms appeared to be in good shape with stable banks.
- There are no Resource Protection Areas in the area.
- Considered alternatives should try to direct the majority of the stormwater to the eastern side of Pleasant Valley Road at the intersection and carry it south.
- Due to flat gradients, concrete ditches may be preferable to improve flow.

Alternatives considered attempt to minimize impacts to these areas to the extent possible.

Utilities

There are several above ground utility poles in close proximity to the study intersection. Utility poles are located along the south side of Braddock Road, the west side of Pleasant Valley Road to the north, and the east side of Pleasant Valley Road to the south. The poles along Braddock Road and along Pleasant Valley Road north of the intersection carry several circuits, and moving one or more of these poles would present a significant expense and a "domino" effect, because the relocation of one pole often triggers the need to adjust adjacent pole locations. The pole line extending south of Braddock Road along Pleasant Valley Road appears to be a single phase line which is less of a concern compared to the multi-phase lines discussed above. The poles appear to carry both power and telecommunication lines. There are no known underground utilities per the VDOT supplied base mapping. Alternatives considered attempt to minimize impacts to these poles to the extent possible.

Figure 6 and **Figure 7** show the layout and magnitude of utility poles in the immediate vicinity of the intersection.

Figure 6 Southbound View of Utility Poles

Figure 7 Northbound View of Utility Poles

Right-of-Way

A majority of the right-of-way at the Braddock Road/Pleasant Valley Road intersection is prescriptive, meaning that VDOT does not have fee right-of-way in the northwest, northeast, and southwest quadrants of the intersection. In the southeast quadrant, there is some fee right-of-way along both roads that was obtained by the County and/or VDOT through a previous land use action. Alternatives that were considered as part of this analysis attempt to take advantage of this available right-of-way to the greatest extent possible, but some additional right-of-way will likely be required regardless of the selected alternative.

Natural Resources

The state Department of Conservation and Resources (DCR) identified potential impacts to the Northern Piedmont Upland Depression Swamp (northeast quadrant of the intersection) during previous efforts by VDOT to evaluate improvements at the Braddock Road/Pleasant Valley Road intersection. This area contains rare plant and natural heritage resources. Flat-stemmed spikerush (*Eleocharis compressa*) found in this area is one of the largest and most outstanding examples of this globally rare plant type, which is endemic to the northern Virginia Piedmont and Montgomery County, Maryland, area. Alternatives considered attempt to minimize impacts to these natural resources to the extent possible.

Agricultural Land

Cox Farms is located in the southwest quadrant of the Braddock Road/Pleasant Valley Road intersection, which is currently zoned as agricultural land and recognized as an agricultural resource. Alternatives considered attempt to minimize impacts to agricultural resources to the extent possible.

Section 5

Future No-Build Conditions

FUTURE NO-BUILD CONDITIONS

Future no-build conditions serve as a baseline against which to compare alternative improvements. The results from the future no-build analysis demonstrate that the existing Braddock Road/Pleasant Valley Road intersection can neither provide the necessary access nor satisfactory LOS to accommodate the peak period design year traffic demands. A design year of 2020 was identified by VDOT for this analysis.

2020 DESIGN YEAR TRAFFIC VOLUMES

Staff at the VDOT Northern Region Transportation Planning Section analyzed traffic volumes for both of these roadways using the National Capital Region Transportation Planning Board's (NCRTPB) travel demand model from the 2012 Constrained Long Range Plan (CLRP) for the base simulation year of 2013 and forecast simulation year of 2020. The Cooperative Forecast land activity of Round 8.1 for Prince William and Loudoun Counties and Traffic Analysis Zones (TAZ) near the study intersection (2010 to 2020) was also examined. The recent 2012 turning movement counts were compared and analyzed in conjunction with counts from 2003, which were used to develop a previous February 2006 memorandum regarding traffic and turning movement forecasts in the project area.

The VDOT findings show that the NCRTPB model shows a growth rate of less than one percent for both of the subject roadways between 2013 and 2020. However, land use growth (from the year 2010 to 2020) in the vicinity of the site and traffic turning movement growth for the Braddock Road/Pleasant Valley Road intersection (from the year 2003 to 2012) show a growth rate value in the range of 2.5 to 3.0 percent per year. Therefore, VDOT identified an annual growth rate of two percent per year, compounded, to develop 2020 volumes using the year 2012 as the baseline. While this value might be higher than traffic growth rates based on the regional travel demand model, it is more consistent with traffic trends and land use assumptions for this site.

There is potential for induced demand to occur at the Braddock Road/Pleasant Valley Road intersection. More people will use the route if the intersection operates more efficiently as a result of improved operational performance from modifications. To account for this increase, a range of volumes can be developed to add a percent of traffic to this intersection to represent the additional traffic. Currently, there is construction on US 50 (a parallel route to Braddock Road) and, as a result, there are more people traveling on Braddock Road than usual. Thus, any induced demand effects may be counterbalanced by a shift of traffic from Braddock Road to US 50 when the US 50 construction and road widening is complete in 2015.

2020 NO-BUILD TRAFFIC OPERATIONS

Without improvements, traffic operations at the Braddock Road/Pleasant Valley Road intersection will worsen compared to existing conditions under year 2020 no-build conditions. **Table 6** shows the results of the traffic operations analysis for the study intersections under weekday a.m. and p.m. peak hour future no-build traffic conditions.

The v/c ratio for the 2020 no-build scenario exceeds 1.0 for all movements during the weekday a.m. and p.m. peak hours except:

- The westbound approach operates at LOS E and a v/c ratio of 0.84 during the weekday a.m. peak hour.

Table 6 Year 2020 No-Build Traffic Operations

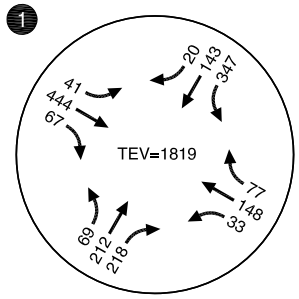
	Weekday AM Peak Hour		Weekday PM Peak Hour	
Intersection Approach	v/c	LOS	v/c	LOS
Northbound	**1.29**	**F**	**1.22**	**F**
Eastbound	**1.47**	**F**	**1.19**	**F**
Westbound	0.84	E	**1.34**	**F**
Southbound	**1.36**	**F**	**1.24**	**F**

Figure 8 illustrates the design year 2020 weekday a.m. and p.m. peak hour volumes and operational results. Overall, the intersection continues to operate at LOS F for both the weekday a.m. and p.m. peak hours and unserved demand within a given one-hour peak period increases.

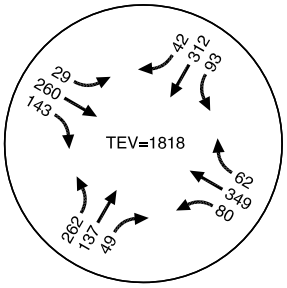
Appendix E contains the year 2020 design year no-build conditions operational worksheets.

(NO SCALE)

WEEKDAY AM PEAK HOUR



WEEKDAY PM PEAK HOUR



TEV= TOTAL ENTERING VEHICLES
NOTE: VOLUMES ADJUSTED TO REFELCT UNSERVED PEAK HOUR DEMAND

DESIGN YEAR 2020 TRAFFIC VOLUMES
WEEKDAY AM & PM PEAK HOUR
FAIRFAX COUNTY, VIRGINIA

FIGURE 8

Section 6

Alternative Screening

ALTERNATIVE SCREENING

Six alternatives were identified for initial screening in response to operational issues described in the previous sections. The identified alternatives were selected based on discussions between VDOT staff and the project team. This section presents each of the alternatives in detail, and describes screening criteria and a preliminary qualitative evaluation process that was conducted to narrow the number of alternatives for further evaluation and refinement.

The primary criterion used to evaluate the alternatives was traffic operational performance. Other criteria that were evaluated were: potential environmental/right-of-way/utility impacts, driver expectation, and safety performance.

Four traffic signal alternatives were evaluated:

- Full-movement Traffic Signal with Auxiliary Turn Lanes
- Traffic Signal with Auxiliary Turn Lanes – Restricted Northbound and Southbound Left Turns
- Traffic Signal with Auxiliary Turn Lanes – Restricted Eastbound and Westbound Left Turns
- Traffic Signal with No Auxiliary Turn Lanes

Two roundabout alternatives were evaluated:

- Single-lane Roundabout
- Mini-roundabout

Each of these alternatives is discussed in further detail below.

FULL-MOVEMENT TRAFFIC SIGNAL WITH AUXILIARY TURN LANES

This alternative would construct a traffic signal at the Braddock Road/Pleasant Valley Road intersection and widen approaches to accommodate warranted left- and right-turn lanes and to provide adequate queue storage and capacity at the intersection in the design year of 2020. **Figure 9** illustrates a concept sketch of this alternative and the assumed lane configuration.

FULL-MOVEMENT TRAFFIC SIGNAL WITH AUXILIARY TURN LANES ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 9

Traffic signal operational parameters and design features of this alternative were developed to accommodate forecast year 2020 weekday a.m. and p.m. 95th percentile queues as reported in Synchro 7 and produce an operational performance of LOS D or better for the intersection. These parameters/features are summarized below.

- Storage lengths of left- and right-turn lanes were determined by Synchro 7 estimated 95th percentile queue lengths.
- Right-turn lanes are warranted for the following movements per the VDOT *Road Design Manual:*
    - Northbound right-turn lane
    - Eastbound right-turn lane
- A cycle length of 90 seconds was selected for both the weekday a.m. and p.m. peak hours based on Synchro optimization parameters.
- Left-turn signal phasing was assumed as follows based on forecast left-turn volumes and operational performance of the intersection:
    - Protected/permissive phasing
    - Northbound right-turn overlap phase

Operational Performance

The full-movement traffic signal alternative is forecast to operate at LOS C and a v/c ratio of 0.72 and 0.71 during the weekday a.m. and p.m. peak hours, respectively. **Table 7** summarizes the Synchro 7 reported 95th percentile queues for the full-movement traffic signal alternative.

Table 7 Full-Movement Traffic Signal – 95th Percentile Queue Lengths

		95th Percentile Queuing Distances (ft)	
Movement	Proposed Storage (ft)	Weekday AM Peak Hour	Weekday PM Peak Hour
EBL	150	50	25
EBT	-	350	200
EBR	150	75	125
WBL	150	25	50
WBT	-	175	325
NBL	250	50	#150
NBT	-	200	100
NBR	175	175	50
SBL	300	#250	75
SBT	-	125	300

*Queue lengths rounded up to nearest 25, if <5 above nearest 25 then rounded down.
- Queue may be longer than reported in Synchro

Appendix F contains the full-movement traffic signal operational analysis worksheets.

Other Considerations

This alternative will require right-of-way acquisition to accommodate roadway widening for identified turn lanes and queue storages. Roadway widening has the potential to adversely impact surrounding utilities, natural/agricultural resources, park land (4f designation), and environmental conditions. In general, the installation of a traffic signal presents an increased potential for rear-end and angle crashes at the intersection relative to the current all-way stop control condition.

Based on the initial screening, this alternative is recommended for further consideration to evaluate the extent of potential impacts and possible refinements to the initial sketch design that may further reduce overall impacts.

TRAFFIC SIGNAL WITH AUXILIARY TURN LANES – RESTRICTED NORTHBOUND & SOUTHBOUND LEFT-TURNS

This alternative would install a traffic signal at the Braddock Road/Pleasant Valley Road intersection but restrict left-turn movements on the north and south approaches to further minimize impacts to surrounding properties and utilities. **Figure 10** illustrates a concept sketch of this alternative and the assumed lane configuration.

On approaches with restricted left-turns, 90 percent of left-turn volumes were assumed to reroute in advance of the intersection. The remaining 10 percent of vehicles were reassigned as through movements to remain conservative.

Traffic signal operational parameters and design features of this alternative were developed to achieve LOS D or better operations in the design year (year 2020) and to accommodate 95th percentile queues. Specific aspects of the design were determined as follows:

- Storage lengths for left- and right-turn lanes were determined using the 95th percentile queue length estimates produced from Synchro 7.
- Right-turn lane warrants were evaluated per the VDOT *Road Design Manual*. The following right-turn lanes are warranted*:*
    - Northbound right-turn lane
    - Eastbound right-turn lane
- A cycle length of 90 seconds was selected for both the weekday a.m. and p.m. peak hours.
- Left-turn signal phasing for the eastbound and westbound approaches was assumed to be permissive.

Operational Performance

The traffic signal with restricted northbound and southbound left-turn movements operates at LOS A and LOS B during the weekday a.m. and p.m. peak hours with v/c ratios of 0.55 and 0.62, respectively. **Table 8** shows the 95th percentile queues for this alternative.

TRAFFIC SIGNAL WITH AUXILIARY TURN LANES (NB & SB LEFT-TURNS RESTRICTED) ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 10

Table 8 Traffic Signal – Restricted N/S Left Turns – 95th Percentile Queues

		95th Percentile Queuing Distances (ft)	
Movement	Proposed Storage (ft)	Weekday AM Peak Hour	Weekday PM Peak Hour
EBT	-	200	125
EBR	100	25	75
WBT	-	100	250
NBT	-	125	100
NBR	150	125	50
SBT	-	100	225

*Queue lengths rounded up to nearest 25, if <5 above nearest 25 then rounded down.

Appendix G contains the traffic signal (restricted N/S left turns) operational analysis worksheets.

Other Considerations

While traffic operations are improved relative to the full-movement traffic signal alternative (and assuming 100 percent compliance with the turn movement restrictions), the localized operational improvement does not take into consideration several implications of restricting northbound and southbound left-turns to the traveling public. These impacts (and anticipated outcomes) are noted below.

- Drivers are not likely to comply (or be pleased with) with left-turn restrictions particularly given the lack of a viable alternate route.
- Prohibiting northbound and southbound left-turn movements does not significantly reduce the required amount of right-of-way, costs, or potential natural resource/environmental impacts relative to the full-movement traffic signal alternative.
- Safety performance is potentially degraded further (as compared to full-movement traffic signal alternative) due to the lack of alternative routes and increased potential for illegal turns at the intersection and increased exposure due to additional out-of-direction travel on the network for those who do comply with the turn restrictions.
- Advanced warning signs/routing information would be necessary to warn drivers about turn restrictions well in advance of the intersection itself. The physical distance between these signs and the intersection itself would likely reduce their effectiveness.

This alternative will require right-of-way acquisition to accommodate roadway widening for identified turn lanes and queue storages. Roadway widening has the potential to adversely impact surrounding utilities, natural/agricultural resources, park land (4f designation), and environmental conditions. In general, the installation of a traffic signal presents an increased potential for rear-end and angle crashes at the intersection relative to the current all-way stop control condition.

Based on this initial screening, this alternative is not recommended for further consideration.

TRAFFIC SIGNAL WITH AUXILIARY TURN LANES – RESTRICTED EASTBOUND & WESTBOUND LEFT-TURNS

This alternative would install a traffic signal at the Braddock Road/Pleasant Valley Road intersection but restrict left-turn movements on the east and west approaches to minimize impacts to surrounding properties and utilities. **Figure 11** illustrates a concept sketch of this alternative and the assumed lane configuration.

On approaches with restricted left-turns, 90 percent of left-turn volumes were assumed to reroute in advance of the intersection. The remaining 10 percent of vehicles were reassigned as through movements to remain conservative.

Traffic signal operational parameters and design features of this alternative were developed in the same manner as described previously to accommodate forecast year 2020 weekday a.m. and p.m. 95th percentile queues as reported in Synchro 7 and produce an operational performance of LOS D or better for the intersection.

Operational Performance

The traffic signal with restricted eastbound and westbound left turns operates at LOS C during the weekday a.m. and p.m. peak hours with v/c ratios of 0.73 and 0.76, respectively. **Table 9** shows the 95th percentile queues for the traffic signal with restricted eastbound and westbound left turns.

Table 9 Traffic Signal – Restricted E/W Left Turns – 95th Percentile Queues

		95th Percentile Queuing Distances (ft)	
Movement	**Proposed Storage (ft)**	**Weekday AM Peak Hour**	**Weekday PM Peak Hour**
EBT	-	350	150
EBR	100	75	75
WBT	-	175	#250
NBL	250	100	#200
NBT	-	200	75
NBR	150	#200	50
SBL	250	#300	75
SBT	-	125	#250

*Queue lengths rounded up to nearest 25, if <5 above nearest 25 the rounded down.

Based on the operational results, this alternative does not provide a significant operational improvement as compared to the full-movement traffic signal alternative. **Appendix H** contains the traffic signal (restricted E/W left-turns) operational analysis worksheets.

TRAFFIC SIGNAL WITH AUXILIARY TURN LANES (EB & WB LEFT-TURNS RESTRICTED) ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 11

Other Considerations

As with the other turn-restricted signal alternative, the intersection operational analysis results do not take into consideration several implications of restricting eastbound and westbound left-turn movements to the traveling public. These impacts (and anticipated outcomes) are noted below.

- Drivers are not likely to comply (or be pleased with) with left-turn restrictions particularly given the lack of a viable alternate route.
- Prohibiting northbound and southbound left-turn movements does not significantly reduce the required amount of right-of-way, costs, or potential natural resource/environmental impacts relative to the full-movement traffic signal alternative.
- Safety performance is potentially degraded further (as compared to full-movement traffic signal alternative) due to the lack of alternative routes and increased potential for illegal turns at the intersection and increased exposure due to additional out-of-direction travel on the network for those who do comply with the turn restrictions.
- Advanced warning signs/routing information would be necessary to warn drivers about turn restrictions well in advance of the intersection itself. The physical distance between these signs and the intersection itself would likely reduce their effectiveness.

This alternative will require right-of-way acquisition to accommodate roadway widening for identified turn lanes and queue storage lengths. Roadway widening has the potential to adversely impact surrounding utilities, natural/agricultural resources, park land (4f designation), and environmental conditions. In general, the installation of a traffic signal presents an increased potential for rear-end and angle crashes at the intersection relative to the current all-way stop control condition.

Based on this initial screening, this alternative is not recommended for further consideration.

TRAFFIC SIGNAL WITHOUT AUXILIARY TURN LANES

This alternative would implement a traffic signal at the Braddock Road/Pleasant Valley Road intersection with no auxiliary turn lanes or modifications to the current intersection geometry. Two different design options were considered: a single pole/mast arm configuration and a two-pole span wire configuration. **Figure 12** illustrates sketch designs of these concepts.

The following parameters and design features were determined from the necessary analyses listed below to accommodate weekday a.m. and p.m. 95th percentile queues as reported in Synchro 7 and provide desired LOS:

- A cycle length of 90 seconds was selected for both the weekday a.m. and p.m. peak hours.
- Permissive left-turn signal phasing on all approaches.

In this alternative, the lane configuration does not change. Therefore, additional turn lanes and storage length are not added.

Table 10 summarizes the traffic signal without auxiliary turn lanes operations for both existing and design year 2020 volumes.

Table 10 Traffic Signal without Auxiliary Turn Lanes – Traffic Operations

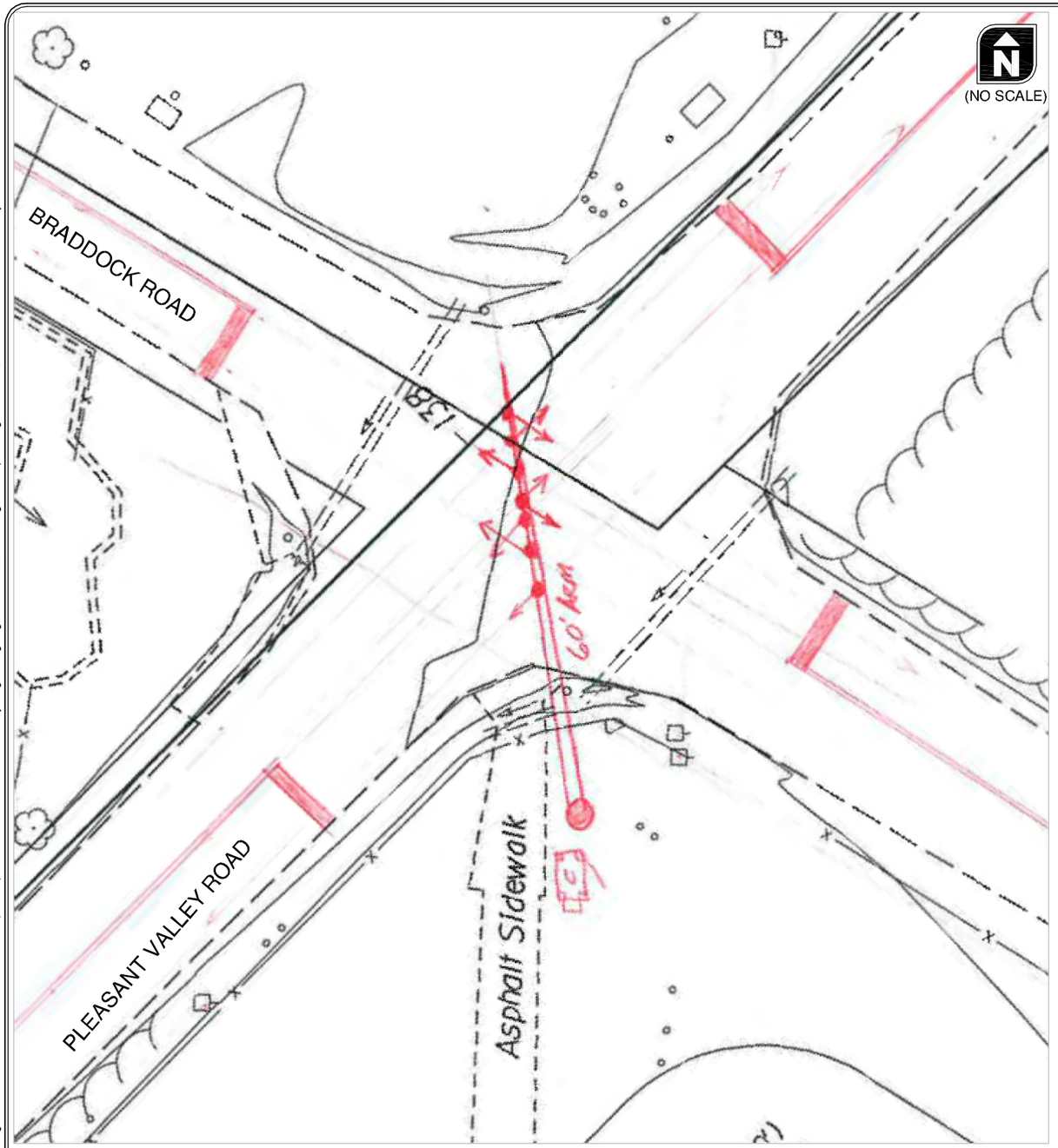
Metric	Temporary Traffic Signal (2012)		Temporary Traffic Signal (2020)	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Intersection LOS	C	B	**E**	C
Volume-to-capacity ratio (v/c)	0.84	0.73	**1.05**	0.89

Table 11 displays the 95th percentile queues for the traffic signal without auxiliary turn lanes alternative.

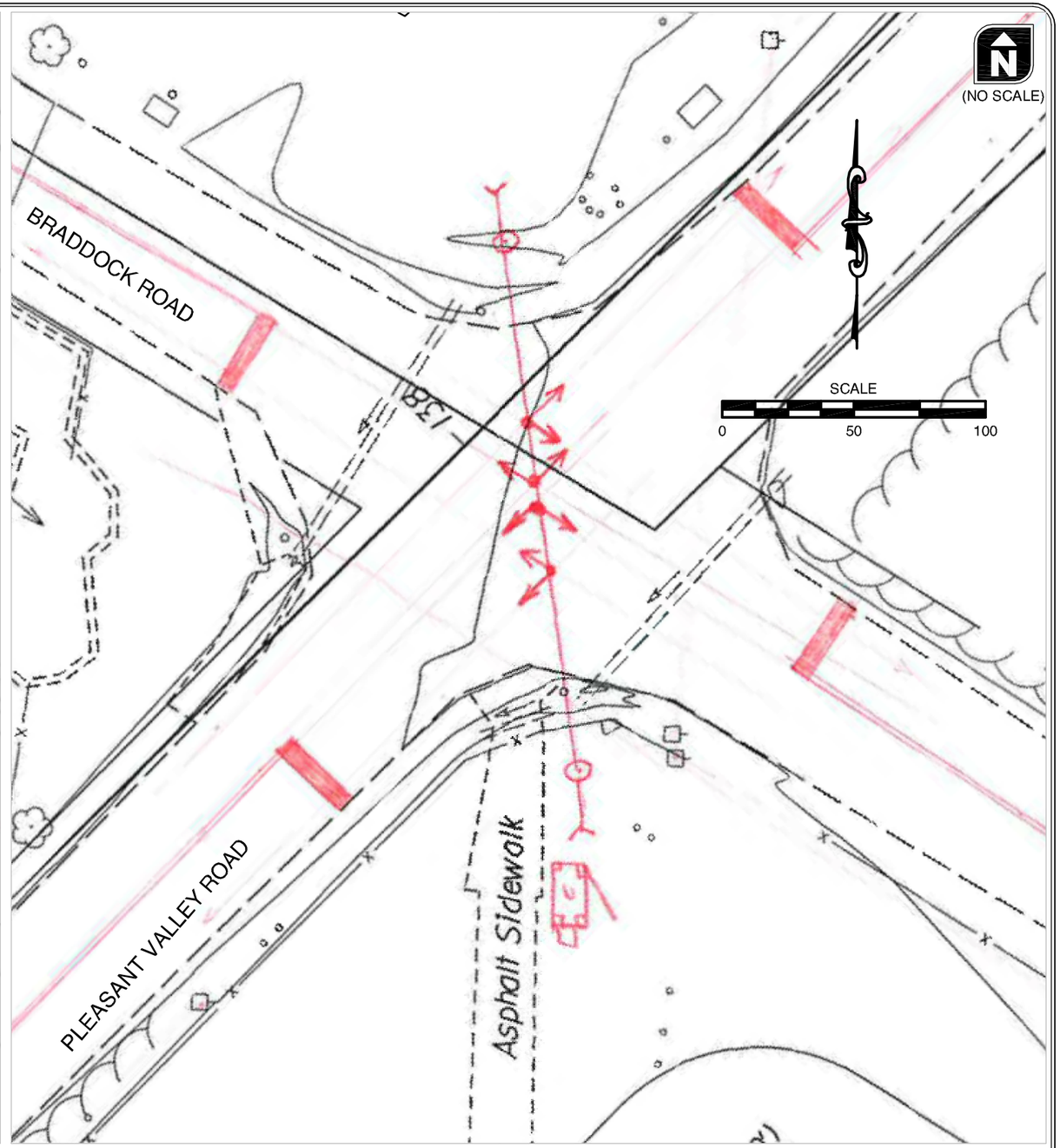
Table 11 Traffic Signal without Auxiliary Turn Lanes – 95th Percentile Queues

95th Percentile Queuing Distances (ft)	Temporary Traffic Signal (2012)		Temporary Traffic Signal (2020)	
Movement	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Eastbound	#425	275	#575	325
Westbound	175	325	#425	#450
Northbound	250	275	300	#450
Southbound	#400	225	#525	275

*Queue lengths rounded up to nearest 25, if <5 above nearest 25 the rounded down.



POLE/MAST ARM CONFIGURATION



SPAN WIRE CONFIGURATION

TRAFFIC SIGNAL WITHOUT AUXILIARY TURN LANES ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 12

As shown in Tables 10 and 11, a traffic signal without auxiliary turn lanes could operate acceptably in the near term, but will provide only marginally better operations compared to the existing all-way stop controlled condition. To achieve desirable traffic operations in the design year, part-time restrictions of left-turn movements would likely be necessary. This alternative is not a viable long-term solution for the intersection as it is forecast to operate over capacity in the design year and does not meet the design objective of LOS D or better.

Appendix I contains the temporary traffic signal operational analysis worksheets.

Other Considerations

Even without geometric improvements/roadway widening, the installation of a traffic signal is likely to increase the frequency and severity of crashes compared to the current all-way stop control configuration. The existing geometry (limited width of roadway and small corner radii) makes turning movements difficult, especially for larger vehicles such as school buses. The pole/mast arm design concept would use existing right-of-way in the southeast quadrant, while the span wire configuration would require acquisition of right-of-way in the northwest quadrant of the intersection.

Based on this initial screening, this alternative is not recommended for further consideration.

SINGLE-LANE ROUNDABOUT

This alternative assumes a single-lane roundabout (ICD of 120 feet) with a non-traversable landscaped central island. **Figure 13** illustrates a concept sketch of this alternative with a yield-controlled northbound right-turn bypass lane.

Table 12 displays the traffic operations of the 120 foot ICD single-lane roundabout with and without a right-turn bypass lane.

The SIDRA Standard model is sensitive to geometric design parameters such as ICD, but only the 2010 HCM model is based on empirical data collected at roundabout sites in the United States. Therefore, the HCM 2010 model was selected to evaluate operational performance of the single-lane roundabout.

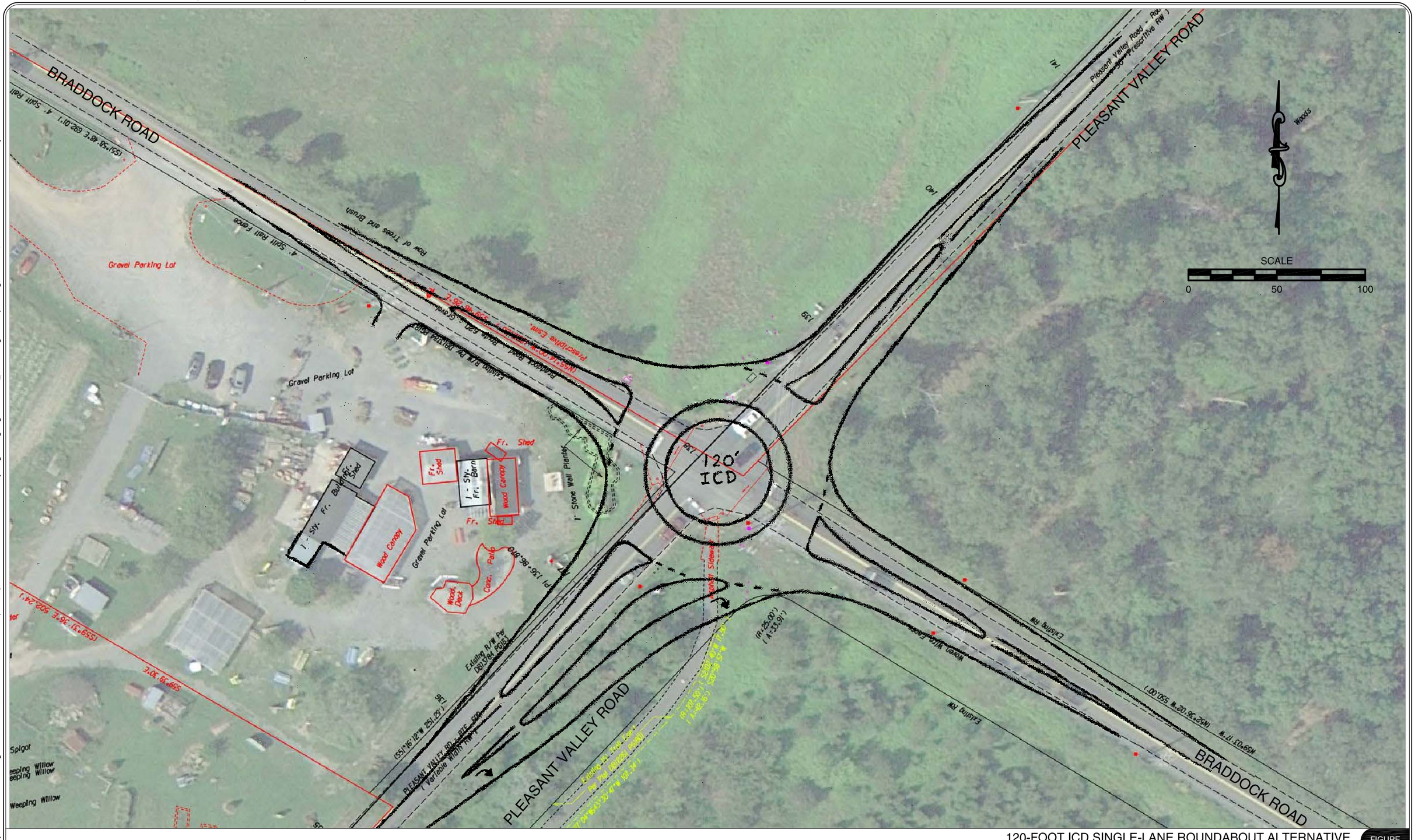
The HCM 2010 model predicts that the critical approaches of a single-lane roundabout would operate at a v/c ratio of 0.82 or better under existing 2012 traffic conditions, but by year 2017 would operate over capacity during the weekday a.m. peak hour unless a right-turn bypass were constructed. With a northbound right-turn bypass lane, a single-lane roundabout is forecast to operate at LOS C and v/c ratio of 0.89 or better under year 2020 conditions.

Table 12 Roundabout (ICD 120') with and without Right-Turn Bypass – Traffic Operations

Scenario	Total Entering Volume	Critical Approach	Critical V/C Ratio (no NBRT Bypass)	Critical V/C Ratio (with NBRT Bypass)
HCM 2010 Model – Single-Lane Roundabout				
2012 Weekday AM	1,552	NB/EB[1]	0.82	0.70
2012 Weekday PM	1,552	SB	0.65	0.65
2020 Weekday AM	1,818	NB/EB[1]	**1.10**	0.89
2020 Weekday PM	1,818	SB	0.85	0.85

V/C – Volume-to-capacity ratio
NB – Northbound; SB – Southbound; EB – Eastbound
[1] Critical approach is NB when no right-turn bypass lane is present and EB with a right-turn bypass lane

Appendix J contains the single-lane roundabout operational analysis worksheets.



120-FOOT ICD SINGLE-LANE ROUNDABOUT ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 13

Other Considerations

Roundabouts improve safety by reducing the frequency and severity of crashes and slowing traffic. Additionally, a raised central island improves visibility of the intersection as compared to a traffic signal or mini-roundabout. Yield control reduces the number of vehicles needing to come to a complete stop, particularly during off-peak hours when traffic volumes are lower. The single-lane roundabout alternative also presents unique access management benefits relative to the traffic signal alternative because there is U-turn potential. This may be advantageous during times when the Cox Farms Fall Festival is occurring. A WB-40 design vehicle was selected following discussions amongst the project team and VDOT and in recognition of the current truck restrictions on Pleasant Valley Road. The single-lane roundabout alternative requires less overall property acquisition than the traffic signal alternatives with auxiliary turn lanes because there is widening only near the intersection, though impacts at the intersection itself may be slightly greater.

Based on this initial screening, this alternative is recommended for further consideration to evaluate the extent of potential impacts and possible refinements to the initial sketch design that may further reduce overall impacts.

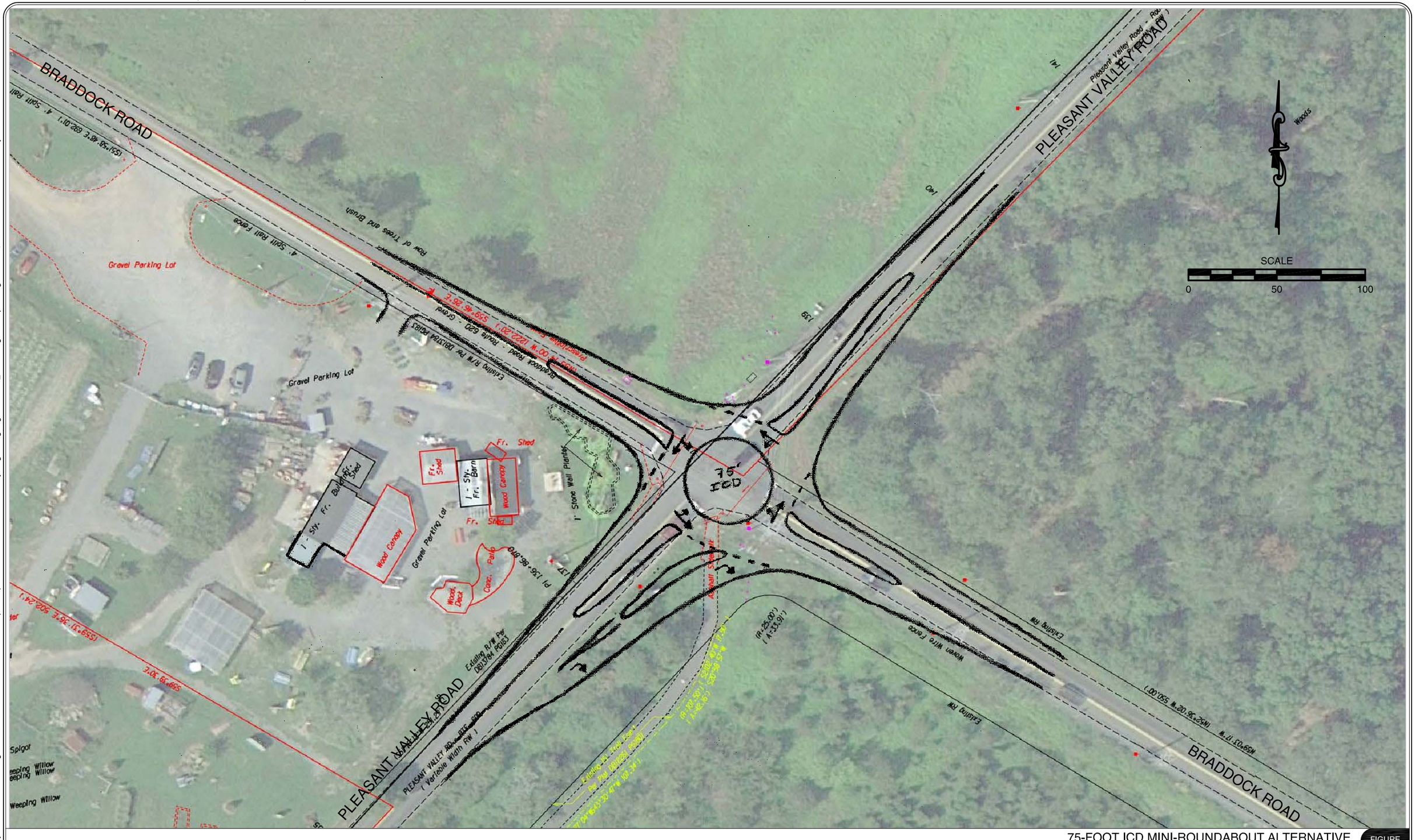
MINI-ROUNDABOUT

This alternative assumes a mini-roundabout (ICD of 75 feet, fully traversable central island). **Figure 14** illustrates a concept sketch of this alternative and the assumed lane configuration.

Definition

Mini-roundabouts are small roundabouts (ICDs ranging approximately 45–90 feet) with a fully traversable central island. They are most commonly used in low-speed urban environments with average operating speeds of 30 mph or less. Many of the same principles are used in the design of mini-roundabouts as in full-sized roundabouts. Key considerations include vehicle channelization, design vehicle paths, and intersection visibility. A mini-roundabout is often considered as an alternative to a larger single-lane roundabout due to a desire to minimize impacts outside of the existing intersection footprint. Mini-roundabouts should generally be made as large as possible to achieve desired geometric deflection and accommodate large vehicles, but should generally not exceed a 90-foot ICD. Above 90 feet, the ICD is typically large enough to accommodate the design vehicle navigating around a raised central island. A raised central island provides physical channelization to control vehicle speeds and is more conspicuous to drivers approaching the roundabout.

A fully traversable central island is typically domed or raised with a mountable curb and flat top, but in some cases painted islands or islands flush with the roadway surface may be used. In any case, it is essential that the central island be clear and conspicuous to drivers. As with larger roundabouts, splitter islands are generally used at mini-roundabouts to align vehicle paths and encourage deflection and proper circulation.



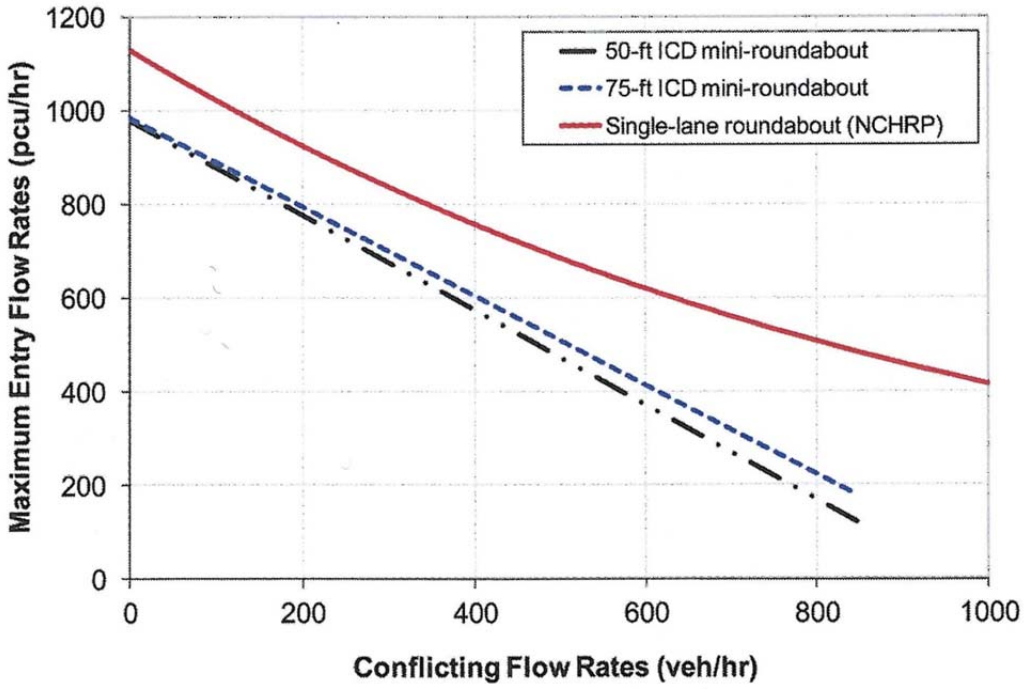
75-FOOT ICD MINI-ROUNDABOUT ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 14

FHWA Capacity Models

The Federal Highway Administration (FHWA) recently developed capacity models for mini-roundabouts that were published in the Institute of Transportation Engineers (ITE) Journal[1]. Data of driver behaviors and travel characteristics at mini-roundabouts were observed at the Stevensville, Maryland mini-roundabout site, a microscopic traffic simulation model was developed and calibrated to simulate for multiple traffic flow scenarios, and a multi-linear regression model was developed to fit the simulated data and estimate mini-roundabout capacities for both 50-foot and 75-foot ICDs. **Figure 15** below illustrates the simulated capacity of both 50-foot and 75-foot mini-roundabouts compared to a standard single-lane roundabout as reported in NCHRP Report 572 based on entering and circulating volume.

Figure 15 Comparison of FHWA Mini-Roundabout Capacity Models to Single-Lane Roundabout NCHRP 572 Capacity Equation



As shown in **Figure 15**, the FHWA mini-roundabout models predict a 13–40 percent lower capacity than a traditional single-lane roundabout.

[1] Institute of Transportation Engineers Journal. *Mini roundabouts for the United States and Traffic Capacity Models.* November 2012.

Operational Results

Different capacity models were initially considered to evaluate the mini-roundabout configurations at the Braddock Road/Pleasant Valley Road intersection:

- FHWA 50-foot and 75-foot ICD Mini-roundabout models
- SIDRA Standard

As noted previously, the SIDRA Standard model is sensitive to geometric design parameters such as ICD; however, the FHWA models are based on empirical data collected at mini-roundabout sites in the United States. Therefore, the FHWA models were selected to evaluate operational performance.

Several scenarios were evaluated using the FHWA 75-foot ICD capacity model with recent turning movement counts at the Braddock Road/Pleasant Valley Road intersection. The 75-foot ICD capacity model was selected as the more appropriate of the two FHWA models given the desired geometrics for the Braddock Road/Pleasant Valley Road intersection. These scenarios are:

- 2012 Existing Traffic Volumes – Weekday a.m. and p.m. Peak Hours
- 2020 Forecast Traffic Volumes – Weekday a.m. and p.m. Peak Hours

A northbound right-turn bypass lane was also modeled given the high turning movement demand for this movement (218 vehicles per hour during 2020 weekday a.m. peak hour conditions). The FHWA capacity model does not directly consider the effect of right-turn bypasses on capacity; as such, the benefit was approximated from the HCM 2010 model for roundabouts. **Table 13** summarizes the operational results.

Table 13 Braddock Road/Pleasant Valley Road Capacity Model Comparison

Scenario	Total Entering Volume	Critical Approach	Critical V/C Ratio (no NBRT Bypass)	Critical V/C Ratio (with NBRT Bypass)
FHWA Mini-Roundabout Model – 75-foot ICD				
2012 Weekday AM	1,552	NB/WB[1]	**1.21**	0.88
2012 Weekday PM	1,552	EB	0.86	0.86
2020 Weekday AM	1,819	NB	**2.11**	**1.64**
2020 Weekday PM	1,818	EB	**1.23**	**1.23**

V/C – Volume-to-capacity ratio
NB – Northbound; SB – Southbound; EB – Eastbound
[1] Critical approach is NB when no right-turn bypass lane is present and WB with a right-turn bypass lane

The FHWA model indicates that a mini-roundabout would operate over capacity under existing 2012 traffic volumes unless a northbound right-turn bypass was provided. With a bypass lane, a sensitivity analysis (assuming a compound annual growth rate of two percent) shows a 75-foot ICD mini-roundabout would reach capacity by the year 2016 under both weekday a.m. and p.m. peak hour conditions. A northbound right-turn bypass lane affects only weekday a.m. peak hour operations because the northbound approach is critical only during that time period.

Based on this analysis (and assumed provision of a northbound right-turn bypass lane), a mini-roundabout would initially operate below capacity (v/c of 0.88 or better) under existing 2012 traffic conditions and offer slightly less overall capacity (six percent) compared to a single-lane roundabout. As traffic volumes grow, the mini-roundabout would reach capacity by year 2016 and would operate over capacity (v/c of 1.64) by year 2020. For this location, a mini-roundabout is estimated to provide 46 percent less capacity than a single-lane roundabout. ***Appendix K*** *contains the FHWA 75-foot ICD capacity model operational worksheets.*

Other Considerations

Keeping the center of the roundabout near the center of the current intersection and reducing the need to shift approach alignments will minimize impacts in the constrained environment of the intersection and help keep the overall size of the roundabout itself smaller.

Our assessment of a mini-roundabout intersection control at the Braddock Road/Pleasant Valley Road intersection resulted in the following findings:

- The rural context and 35 mph posted approach speeds of the Braddock Road/Pleasant Valley Road intersection suggests the need for a raised central island that includes landscaping to ensure the roundabout is conspicuous to drivers.
- As the ICD decreases, deflection and speed control are reduced, adversely affecting safety and operational performance.
- Keeping the center of the roundabout near the center of the current intersection and reducing the need to shift approach alignments will minimize impacts in the constrained environment of the intersection and help keep the overall size of the roundabout itself smaller. This must be balanced against the desire/need to avoid existing physical obstructions, utilities, or environmental/right-of-way impacts.
- A mini-roundabout would be more difficult (and costly) to modify/expand under traffic compared to a single-lane roundabout.
- Benefits of a mini-roundabout include reduced cost of initial construction, fewer impacts to utilities, and smaller environmental and 4f impacts relative to a single-lane roundabout.

Based on this initial screening, this alternative is not recommended for further consideration.

Section 7

Alternatives Analysis

ALTERNATIVES ANALYSIS

Two of the six alternatives were carried forward for further refinement based on the results of the initial screening. This section presents results of a more detailed evaluation and analysis of the full-movement traffic signal and single-lane roundabout alternatives. As noted previously, the Braddock Road/Pleasant Valley Road intersection has several constraints:

- Parkland (4f property designations) in the northeast, northwest, and southeast quadrants
- Wetland areas
- Large multi-circuit utility poles
- Limited right of way availability
- Rare plant and natural heritage resources
- Agricultural land (Cox Farms) in southwest quadrant

Given these constraints, minimizing the physical footprint is a key consideration in determining the appropriate intersection control. At the same time, maximizing the functional life of the improvement is another key consideration. Thinking ahead to how the selected intersection control might be revised, expanded, or replaced when it reaches the end of its functional life is yet another factor considered.

Several design iterations of both the full-movement traffic signal and single-lane roundabout were developed and considered before converging on an optimal design that struck an appropriate balance between operations, safety, and minimizing impacts to right-of-way and the physical/natural/built environment.

REFINED DESIGN OPTIONS

All conceptual design alternatives in this report have been developed with the best information available at the time to approximate impacts and costs; however, a full evaluation of impacts to right-of-way, drainage, environment, utilities, topography, property access, plant and natural heritage resources, and other factors will require detailed survey information not available at the time this report was produced.

Several sketch design concepts were developed for each of these two alternatives to try to balance impacts to the surrounding properties while maintaining acceptable traffic operations and safety performance.

Full-Movement Traffic Signal with Auxiliary Turn Lanes

Certain design parameters such as turn lane requirements and storage lengths were determined through the initial operational analysis and were considered fixed to provide desired operational results for the alternative. With these parameters already determined, the only design features with potential flexibility were the alignments of Braddock Road and Pleasant Valley Road. The most constrained quadrants of the intersection in terms of built and natural environment are the northeast quadrant (wetland, right-of-way, 4f land, rare plant and natural heritage resources) and the southwest quadrant

(Cox Farms, right-of-way, agricultural land). After weighing several possible roadway and intersection alignments and their impacts, the only reasonable realignment design option was to shift Braddock Road to the north in an attempt to avoid impacting the multi-circuit utility poles in areas where the roadway would be widened to accommodate the identified turn lanes and minimize impacts to Cox Farms.

Shifting Braddock Road to the north in the vicinity of the intersection does minimize impacts to utility poles and Cox Farms. This shift would also be advantageous from a constructability standpoint because it would be easier to maintain traffic through the construction area while the realigned portion of Braddock Road was constructed. However, the offset Braddock Road alignment is not without consequence. A comprehensive assessment of the benefits and trade-offs between the existing and offset alignments noted the following regarding the offset alignment:

- Increases impacts to 4f property in the northeast and northwest quadrants.
- Increases impacts to wetland areas in the northeast and northwest quadrants. This is particularly notable in the northeast quadrant, which has “higher value” forested wetland areas.
- Reduces, but does not totally eliminate impacts to large multi-circuit utility poles.
- Increases right-of-way impacts.
- Increases impacts to rare plant and natural heritage resources in the northeast quadrant.
- Reduces impacts to Cox Farms.

Following discussions amongst the project team, VDOT, and representatives from FCPA, it was determined that the potential benefits of realigning Braddock Road to the north are outweighed by the residual impacts across a wider range of identified constraints. Therefore, the full-movement traffic signal alternative using the existing roadway alignments was ultimately selected for comparison against a single-lane roundabout alternative. **Figure 16** illustrates the conceptual design sketch of this alternative.

FULL-MOVEMENT TRAFFIC SIGNAL WITH AUXILIARY TURN LANES ALTERNATIVE - EXISTING ALIGNMENT
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 16

Single-Lane Roundabout

Geometric roundabout design requires balancing competing design objectives. Roundabouts operate most safely when their geometry forces traffic to enter and circulate at slow speeds. Poor roundabout geometry that fails to control speeds, accommodate the design vehicle, or provide adequate channelization and deflection has been found to negatively impact roundabout safety by affecting driver behavior through the roundabout. Thus, designing a roundabout is a process of determining the optimal balance between safety provisions, operational performance, and accommodation of the design vehicle.

Basic geometric design parameters directly affect operations and safety at roundabouts, regardless the size. In general:

- As the circle gets smaller, the distance between entries/exits gets smaller. This has the effect of reducing capacity.
- The size of the circle and the design vehicle will dictate whether the central island can be raised/landscaped or needs to be fully traversable.
    - A raised island that supports landscaping is more conspicuous to drivers.
    - A larger ICD enhances speed control through increased deflection.
- The desire/need to avoid existing physical obstructions or utilities will affect approach alignments, and shifting the center of the roundabout from the center of the intersection increases the ICD and reduces the potential to achieve appropriate speed control and deflection on all approaches.

As shown previously, different ICDs produce different capacity results, with a 75-foot ICD mini-roundabout reaching capacity well before a 120-foot ICD single-lane roundabout and providing 46 percent less capacity than a single-lane roundabout by the year 2020. Given the rural context of the Braddock Road/Pleasant Valley Road intersection, a raised central island is an important design feature to ensure the roundabout is conspicuous to drivers. In addition, a larger ICD will enhance speed control and deflection.

The following design parameters for a single-lane roundabout were selected based on the roundabout design principles noted above and the operational results from the initial alternative screening:

- A 100-foot ICD was selected to achieve an optimal balance between operational performance and minimizing the overall intersection footprint.
- A WB-40 was selected as the design vehicle following discussions amongst the project team and VDOT and in recognition of the current truck restrictions on Pleasant Valley Road.
- A raised central island with landscaping was selected to increase conspicuity and improve deflection and speed control.
- A northbound right-turn bypass lane should be included to provide acceptable design year traffic operations.
- The roundabout should remain centered near the existing centerline intersection of Braddock Road and Pleasant Valley Road. The desire/need to avoid existing physical

obstructions or utilities will affect approach alignments. Shifting the center of the roundabout from the center of the intersection increases the difficulty of keeping the ICD small to achieve appropriate speed control and deflection on all approaches and increases impacts to surrounding properties.

Several design concepts based on these parameters were developed in an attempt to minimize impacts and optimize results. After several iterations, an optimal design was identified that balanced competing objectives. **Figure 17** illustrates the refined conceptual design sketch of a single-lane roundabout.

As shown in Figure 17, the center of the roundabout has been shifted slightly southwest of the existing centerline intersection of Braddock Road and Pleasant Valley Road.

Operational Analysis

As noted previously, the smaller the ICD of a roundabout gets the shorter the distance between entries/exits. This has the effect of reducing capacity. The SIDRA Standard model was used to analyze traffic operations of the proposed design as this model is sensitive to geometric changes to geometric parameters such as ICD. It should be noted that the HCM 2010 and SIDRA Standard models produce almost identical operational results when an ICD of 120 feet is assumed.

Table 14 summarizes the forecast design year 2020 traffic operations of the refined conceptual design.

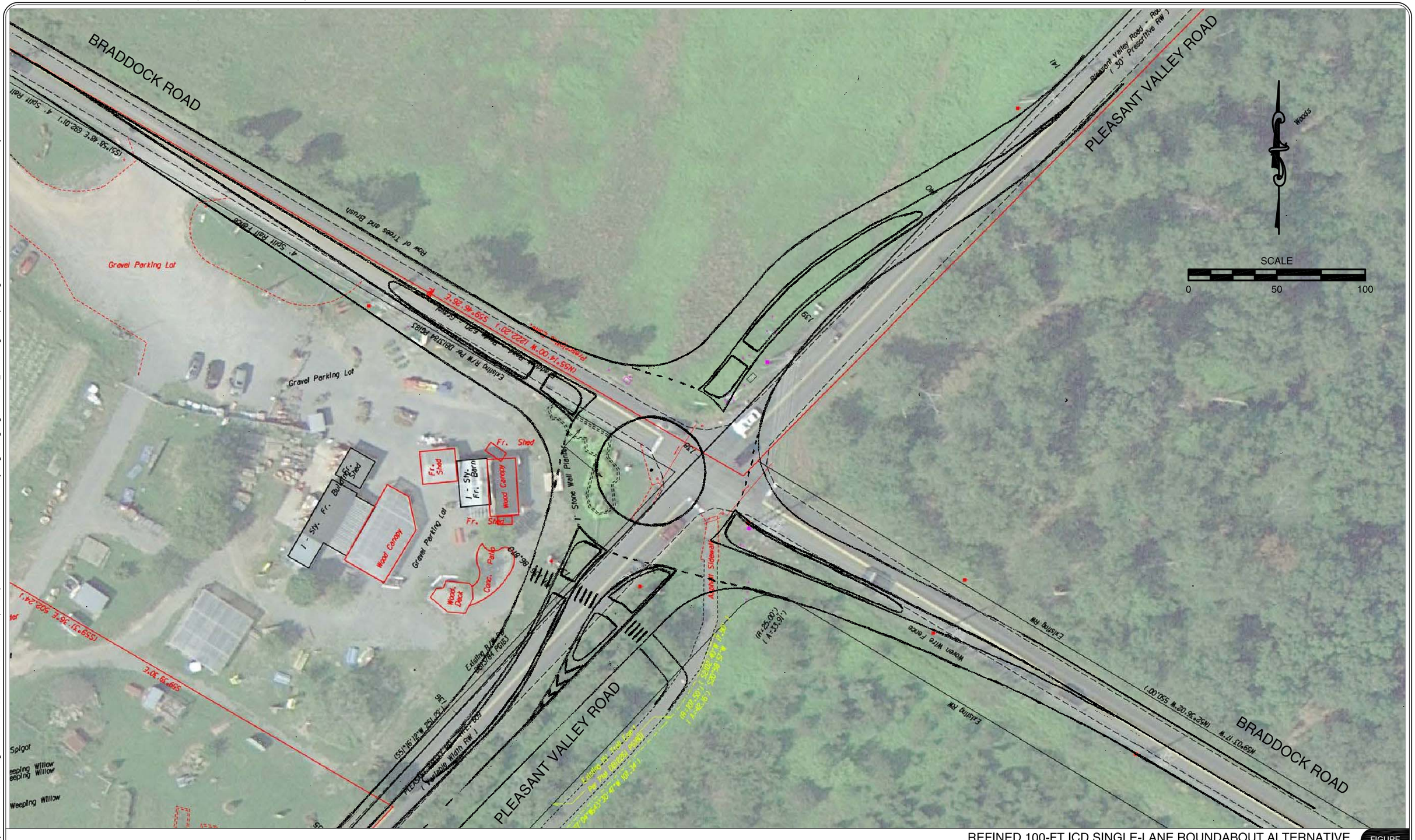
Table 14 Design Year 2020 Traffic Operations – 100-foot ICD Single-Lane Roundabout

	West Leg (Eastbound) Braddock Road	East Leg (Westbound) Braddock Road	South Leg (Northbound) Pleasant Valley Road	North Leg (Southbound) Pleasant Valley Road
Weekday AM Peak Hour				
V/C ratio	0.96	0.43	0.54	0.63
Approach Delay, (seconds)	39.0	9.8	16.0	14.2
Approach LOS	D	A	B	B
95th Percentile Queue (feet)[1]	500	75	125	150
Weekday PM Peak Hour				
V/C ratio	0.73	0.73	0.46	0.91
Approach Delay, (seconds)	17.9	16.8	11.8	39.4
Approach LOS	B	B	B	D
95th Percentile Queue (feet)[1]	200	200	75	375

[1] Queue lengths rounded up to the nearest 25 feet (rounded down to the nearest 25 feet if less than 5 above closest 25) and assume 25 feet per vehicle.

As shown in Table 13, the weekday a.m. peak hour critical approach is eastbound, which is forecast to operate at LOS D and a v/c ratio of 0.96. During the weekday p.m. peak hour, the critical approach is southbound and is forecast to operate at LOS D and a v/c ratio of 0.91.

Appendix L contains the SIDRA Standard operational analysis worksheets.



REFINED 100-FT ICD SINGLE-LANE ROUNDABOUT ALTERNATIVE
BRADDOCK ROAD/PLEASANT VALLEY ROAD
FAIRFAX COUNTY, VIRGINIA

FIGURE 17

EVALUATION MATRIX

A wide range of quantitative and qualitative criteria were considered in the evaluation of the two alternatives carried forward for further analysis and refinement, including:

- Design year traffic operations
  - LOS
  - Volume-to-capacity
  - Queuing
  - Off-Peak Performance
  - Demand absorption
- Safety performance
- Design and construction
  - Right-of-way impacts
  - Environmental impacts
  - Utilities
  - Drainage
  - Maintenance/operation costs
  - Design vehicle
  - Access management
  - Maintenance of traffic/constructability
  - Ability for future expansion
  - Preliminary cost estimate

Table 15 summarizes the comparison of the full-movement traffic signal and single-lane roundabout alternatives.

Table 15 Comparison of Advanced Alternatives

Criteria	Performance Measure Description	Advanced Alternatives	
		Full-Movement Traffic Signal	100' ICD Single-Lane Roundabout (Refined)
Traffic Operations	Intersection Level of Service	AM: LOS C[1] PM: LOS C[1]	AM: LOS D[2] PM: LOS D[2]
	Volume-to-Capacity Ratio	AM: v/c = 0.72[1] PM: v/c = 0.71[1]	AM: v/c = 0.96[2] PM: v/c = 0.91[2]
	Queuing	Forecast 95th percentile queues accommodated by designed turn storage lanes	Forecast 95th percentile queues on critical approaches managed appropriately
	Off-Peak Performance	Some delay on all approaches	Little or no delay
	Demand Absorption	Small increases in demand for certain movements (or quicker growth) could trigger wholesale re-design or widening of intersection to provide longer/dual turn lanes – less flexibility	Small increases in demand for certain movements (or quicker growth) more readily absorbed by a single-lane roundabout with less potential for wholesale re-design or widening – more flexibility
Safety	Anticipated Safety Performance of Traffic Control	Increased potential for rear-end and angle crashes	Reduced crashes relative to a traffic signal (frequency and severity)
Design & Construction	Right-of-Way Impacts	Requires more property acquisition for widening to accommodate turn lanes	Requires less property acquisition, widening only near intersection itself
	Environmental Impacts	Wetlands - 0.95 acres of impacts to wetlands in the NE quadrant viewed as higher quality wetlands; 0.65 acres of impacts to the wetlands in the SE quadrant. Park Authority land – three of the four quadrants of the intersection will have impacts to the 4f property designations.	Wetlands - 0.2 acres of impacts to wetlands in the NE quadrant viewed as higher quality wetlands; 0.15 acres of impacts to the wetlands in the SE quadrant; and 0.1 acres of impacts to wetlands in the NW quadrant of the intersection. Park Authority land – three of the four quadrants of the intersection will have impacts to the 4f property designations.
	Utility Impacts/Relocation Costs	Several multi-circuit utility poles are impacted with this alternative. There is no ability to retain and protect any existing poles within the areas identified to be widened by the project because a traffic signal does not provide median areas.	Several multi-circuit utility poles are impacted with this alternative. It may be possible to locate one or more existing poles within the raised central island and/or splitter islands of the roundabout.
	Drainage Requirements	Drainage can be collected and directed to the eastern side of the southern leg (Pleasant Valley) of the intersection to take advantage of the existing right of way that is available. The storm water will be separated between off-site and on-site. The off-site water which is flowing largely from the two undeveloped parcels on the northern side of the intersection will flow through the intersection with no treatment and conveyed to the tributary south of the project. The on-site water collected from the work areas that occurs within the two corridors will be collected and pre-treated via bio-retention or small water quality package facilities used in conjunction with the local storm sewer system and then combined with the off-site water and conveyed to the south. The water will then be conveyed from the east side of PV to the west side through new culverts.	Drainage can be collected and directed to the eastern side of the southern leg (Pleasant Valley) of the intersection to take advantage of the existing right of way that is available. The storm water will be separated between off-site and on-site. The off-site water which is flowing largely from the two undeveloped parcels on the northern side of the intersection will flow through the intersection with no treatment and conveyed to the tributary south of the project. The on-site water collected from the work areas that occurs within the two corridors will be collected and pre-treated via bio-retention or small water quality package facilities used in conjunction with the local storm sewer system and then combined with the off-site water and conveyed to the south. The water will then be conveyed from the east side of PV to the west side through new culverts.
	Maintenance/ Operations Costs	Signal power, illumination, signal hardware/detection maintenance, signing, striping	Illumination, signing, striping, maintenance of center island landscaping
	Design Vehicle	Accommodates designated design vehicle	Accommodates designated design vehicle
	Access Management	Potential for eastbound queues to block Cox Farm entrance during peak periods	RBT provides better access management relative to traffic signal alternative (U-turn potential)
	Maintenance of Traffic	Moderate. Offset approach allows a portion of the new intersection to be constructed without significant impacts to current traffic operations.	Moderate. Offset approach allows a portion of the new intersection to be constructed without significant impacts to current traffic operations.
	Ability to Widen/Expand for Future Capacity	Moderately difficult - less expensive operational fixes can be attempted (signal timing). Need for additional dual left-turn lanes and/or through lanes would require significant widening.	Moderately difficult - additional right-turn bypass lane only impacts one quadrant. Multilane approaches would require more significant widening.
	Preliminary Cost Estimate[3]	$4 Million	$3 Million

[1] Overall intersection LOS and V/C ratio reported for traffic signal alternative
[2] Critical approach LOS and V/C ratio reported for single-lane roundabout alternative
[3] Preliminary cost estimates developed by VDOT

COMMUNITY MEETING

A community meeting at the Sully District Governmental Center was held on March 18, 2013, to present the two advanced alternatives to the public. Public comments were collected and reviewed by the project team and VDOT, and have been incorporated into the alternatives to the extent feasible.

PREFERRED ALTERNATIVE

Following several discussions amongst the project team and VDOT and careful consideration of the identified criteria, the refined single-lane roundabout alternative was selected as the preferred alternative to be carried forward to an RFP design level. This roundabout concept provides an optimum balance between competing criteria with the following outcomes:

- Acceptable design year 2020 operational performance
  - Weekday AM
    - Overall intersection: LOS C; Delay = 21.3 sec
    - Critical eastbound approach: LOS D; Delay = 39.0 sec; v/c = 0.96
  - Weekday PM
    - Overall intersection: LOS C; Delay = 21.5 sec
    - Critical southbound approach: LOS D; Delay = 39.4 sec; v/c = 0.91
- Better safety performance than traffic signal
- Reduced "footprint"
- Lesser right-of-way, environmental, and utility impacts
- Better off-peak performance
- Lower life-cycle (maintenance/operations) costs
- Lower design/construction cost

Delivery Method

VDOT developed preliminary estimates of design/construction schedules for Design-Build and Design-Bid-Build delivery methods. The project team and VDOT considered these two estimates to evaluate which delivery format was most advantageous to minimizing the time between selection, design, and construction/implementation.

Table 16 shows a comparison of a Design-Build and Design-Bid-Build delivery.

Table 16 Design-Build and Design-Bid-Build Construction Schedule Comparison

Delivery Method	Design-Build		Design-Bid-Build	
	DESIGN-BUILD OPTION		DESIGN-BID-BUILD OPTION	
	RFP Advertisement:	Dec 2013	Advertisement Date:	Late 2015/Early 2016
	Construction Begin:	early 2015	Construction Begins:	Summer 2016
	Construction Completed:	early 2016	Construction Completed:	Summer/Fall 2017

The Design-Build approach provides a shorter timeframe for implementation and reduced impacts to the traveling public and surrounding community. Following discussions between the project team and VDOT, it was determined that a Design-Build approach would be preferable.

Based on this alternatives analysis, the refined single-lane roundabout alternative is recommended for implementation through a Design-Build delivery method.

Section 8

Findings & Summary

FINDINGS & SUMMARY

This report evaluates improvements to the intersection of Braddock Road and Pleasant Valley Road in Fairfax County, Virginia. Analyses were performed for existing conditions, future design year no-build conditions (year 2020), and six alternative improvement configurations (year 2020). Following an initial screening, two alternatives were carried forward and refined to further assess the viability and benefit of each alternative. A single-lane roundabout was identified as the preferred alternative after evaluating comparisons of intersection controls, traffic operations, safety, impacts to right-of-way, physical/built environment, and a qualitative review of alternatives across several key criteria.

The following findings have been determined through the project team's (Kittelson & Associates, Inc. and Timmons Group) field evaluations and analysis of existing and future operational and safety performance of the Braddock Road/Pleasant Valley Road intersection, including collaboration and meetings with VDOT and key stakeholders.

> *Note: Throughout this report, Braddock Road is referred to as an east/west-oriented roadway, and Pleasant Valley Road is referred to as a north/south-oriented roadway.*

EXISTING CONDITIONS

- Excessive queuing was observed on the critical approaches of the intersection during both peak periods.
  - During the weekday a.m. peak hour, the eastbound queue was observed to exceed 80 vehicles (approximately 4,750 feet or 0.9 miles).
  - During the weekday p.m. peak hour, the westbound queue was observed to exceed 80 vehicles (approximately 4,750 feet or 0.9 miles).
- The intersection currently operates over capacity and at Level of Service (LOS) F during the weekday a.m. and p.m. peak hours under all-way stop control.
- A preliminary traffic signal warrant analysis indicates that Manual on Uniform Traffic Control Devices (MUTCD) Warrants #1-3 are met under existing conditions.
- During the three-year period between 2008 and 2010 there were a total of 14 reported crashes at the intersection. Descriptive statistics developed from crash data and police reports revealed the following notable trends:
  - Four angle crashes occurred when vehicles traveling westbound on Braddock Road ran a stop sign and collided with vehicles traveling northbound on Pleasant Valley Road
  - Ten crashes (83 percent) were property damage only (PDO) crashes
  - Two crashes (17 percent) were injury crashes
  - Six angle crashes and four rear end crashes were reported (the remaining two crashes consisted of a head on crash and a fixed object crash)
  - Half of the crashes occurred outside of the weekday p.m. peak hour during the afternoon hours
  - Half of the crashes occurred on Thursday and Friday

  - Five crashes (42 percent) occurred on the weekend

- The following environmental constraints have been identified at the Braddock Road/Pleasant Valley Road intersection:
  - Three of the four quadrants (northwest, northeast, and southeast) are designated as Section 4f lands and owned by the Fairfax County Park Authority.
  - Probable wetland areas near the intersection have been identified on previous base-mapping provided by the Virginia Department of Transportation (VDOT), though to date a formal jurisdictional delineation has not be performed. Field observations revealed areas of standing water in several locations and that overall the area is very flat, complicating drainage.
  - There are several above ground utility poles in close proximity to the study intersection, several of which carry multiple circuits.
  - A majority of the right-of-way is prescriptive, meaning that VDOT does not have fee right-of-way in the northwest, northeast, and southwest quadrants of the intersection. In the southeast quadrant, there is some fee right-of-way along both roads that was obtained by the County and/or VDOT through a previous land use action.
  - The Department of Conservation and Recreation has identified rare plant and natural heritage resources in the northeast quadrant of the intersection.
  - Cox Farms is currently zoned as agricultural land and recognized as an agricultural resource.

FUTURE NO-BUILD CONDITIONS

- A future design year of 2020 was identified for this analysis. Future year volume projections assumed a two percent annual growth rate.
- The intersection is forecast to continue to operate over capacity and at LOS F during the weekday a.m. and p.m. peak hours under all-way stop control.
- Vehicle queues and delay will worsen as demand grows at the intersection.

INITIAL ALTERNATIVES SCREENING

- Six alternatives at the Braddock Road/Pleasant Valley Drive intersection were initially identified.
  - Full-movement Traffic Signal with Auxiliary Turn Lanes
  - Traffic Signal with Auxiliary Turn Lanes (restricted N/S left-turns)
  - Traffic Signal with Auxiliary Turn Lanes (restricted E/W left-turns)
  - Traffic Signal without Auxiliary Turn Lanes
  - Single-lane Roundabout
  - Mini-roundabout
- All alternatives were evaluated based on their operational performance in the design year (2020). Other qualitative criteria considered include potential environmental/right-of-way/utility impacts, driver expectation, and safety performance.

- Following an initial screening evaluation, the following two alternatives (shown in **bold)** were carried forward for further detailed analysis; those listed in *italics* were eliminated from further consideration.
    - **Full-movement Traffic Signal with Auxiliary Turn Lanes**
    - *Traffic Signal with Auxiliary Turn Lanes (restricted N/S left-turns)*
    - *Traffic Signal with Auxiliary Turn Lanes (restricted E/W left-turns)*
    - *Traffic Signal without Auxiliary Turn Lanes*
    - **Single-lane Roundabout**
    - *Mini-roundabout*

ALTERNATIVES ANALYSIS

Several design iterations of both the full-movement traffic signal and single-lane roundabout were developed and considered before converging on an optimal design that struck an appropriate balance between operations, safety, cost, and minimizing impacts to right-of-way and the physical/natural/built environment.

Full-Movement Traffic Signal with Auxiliary Turn Lanes

Design Parameters

- The storage lengths for left- and right-turn lanes were determined based on the 95th percentile queue lengths reported from the Synchro 7 traffic analysis software
- Northbound and eastbound right-turn lanes are warranted as per the VDOT *Road Design Manual*.
- A cycle length of 90 seconds was selected for both the weekday a.m. and p.m. peak hours.
- Left-turn signal phasing was assumed as follows based on forecast left-turn volumes and operational performance of the intersection:
    - Protected/permissive left-turn phasing
    - Northbound right-turn overlap phase
- With one exception, design year peak hour factors (PHF) were changed to 0.95 unless the existing PHF was greater than 0.95, in which case the PHF was held constant.
    - The weekday a.m. peak hour westbound PHF was changed from 0.75 (existing) to 0.80 (design year) to retain the pronounced peaking characteristic of this one approach.

Operational Performance

- The full-movement traffic signal is forecast to operate at LOS C and a volume-to-capacity (v/c) ratio of 0.72 and 0.71 during the weekday a.m. and p.m. peak hours, respectively.

Single-Lane Roundabout

Design Parameters

- A 100-foot inscribed circle diameter (ICD) was selected to achieve an optimal balance between operational performance and minimizing the overall intersection footprint.
- A WB-40 was selected as the design vehicle.
- A raised central island with landscaping was selected to increase conspicuity and improve deflection and speed control.
- A northbound right-turn bypass lane was included to provide acceptable design year traffic operations.
- The center of the roundabout is located south and west of the existing centerline intersection.

Operational Performance

- A 100-foot ICD single-lane roundabout is forecast to operate at LOS D and a v/c ratio of 0.96 and 0.91 during the weekday a.m. and p.m. peak hours, respectively.

Evaluation Criteria

A wide range of quantitative and qualitative criteria were considered in the evaluation of the two alternatives carried forward for further analysis and refinement, including:

- Design year traffic operations
  - LOS
  - Volume-to-capacity
  - Queuing
  - Off-peak performance
  - Demand absorption
- Safety performance
- Design and construction
  - Right-of-way impacts
  - Environmental impacts
  - Utilities
  - Drainage
  - Maintenance/operation costs
  - Design vehicle
  - Access management
  - Maintenance of traffic/constructability
  - Ability for future expansion
  - Preliminary cost estimate

Community Meeting

A community meeting at the Sully District Governmental Center was held on March 18, 2013, to present the two advanced alternatives to the public. Public comments were collected and reviewed by the project team and VDOT, and have been incorporated into the alternatives to the extent feasible.

PREFERRED ALTERNATIVE

Both alternatives were shown to be feasible and represent a marked improvement as compared to future no-build conditions. Comparing the two alternatives across the selected evaluation criteria suggests that the **single-lane roundabout** is preferable to a traffic signal across a majority of criteria.

- Traffic Operations: The single-lane roundabout with a yield-controlled northbound right-turn bypass lane is forecast to operate at LOS D or better under design year conditions, meeting VDOT's desired operational performance. Drivers will experience little or no delay during off-peak hours. While the traffic signal is forecast to operate at LOS C during peak periods, drivers will experience more delay with a traffic signal in place during off-peak periods. Impacts to other evaluation criteria (discussed below) reduce the overall viability of a traffic signal. The roundabout has more flexibility to absorb/respond to small increases in demand for certain movements (or quicker growth) relative to the traffic signal.
- Safety Performance: Roundabouts generally reduce the frequency and severity of crashes and reduce the number of conflict points at the intersection by 75 percent compared to a traditional four-legged intersection, whereas a traffic signal tends to increase the frequency and severity of crashes, particularly rear-end and angle crashes.
- Design and Construction: Overall, the single-lane roundabout has fewer and less severe impacts to right-of-way and the physical/natural/built environment as compared to a traffic signal.
- Cost: The design and construction of a single-lane roundabout ($3M) is estimated to cost roughly $1M less than the traffic signal ($4M). A single-lane roundabout is also likely to have slightly lower life-cycle costs as compared to the traffic signal.

Consideration was given to the anticipated schedule of a construction project and what delivery format was most advantageous to minimizing the time between selection, design, and construction/implementation. Both Design-Build and Design-Bid-Build delivery methods were considered.

- The Design-Build approach provides a shorter timeframe for implementation and reduced impacts to the traveling public and surrounding community as compared to a Design-Bid-Build approach.

Based on this alternatives analysis, the project team and VDOT recommend the single-lane roundabout alternative be carried forward to design and implementation through a Design-Build delivery method.

Appendix A
Traffic Count Data

Study Name 10089-119-Braddock/Pleasant Valley
Start Date 9/25/2012
Start Time 6:00AM

	Pleasant Valley Drive Southbound			Braddock Road Westbound			Pleasant Valley Drive Northbound			Braddock Road Eastbound		
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
6:00 AM	1	4	2	4	17	0	13	38	7	14	59	8
6:15 AM	0	5	8	7	17	2	15	52	7	17	83	12
6:30 AM	2	10	9	12	22	2	22	49	14	17	112	17
6:45 AM	2	17	31	15	36	3	55	52	13	16	94	19
7:00 AM	3	25	41	9	29	7	33	55	20	21	102	13
7:15 AM	7	38	57	14	30	14	38	38	20	14	87	7
7:30 AM	4	38	70	18	21	7	45	50	14	10	98	11
7:45 AM	4	28	78	25	45	3	56	42	13	15	82	11
8:00 AM	2	18	91	9	30	4	47	51	12	15	92	4
8:15 AM	2	26	74	16	24	4	40	50	17	10	90	8
8:30 AM	3	31	70	13	25	5	39	60	8	15	87	5
8:45 AM	2	38	69	23	27	5	35	57	14	13	88	9
9:00 AM	1	34	62	19	29	13	37	48	10	10	81	8
9:15 AM	2	33	76	18	28	3	19	35	13	21	86	8
9:30 AM	1	15	28	10	28	3	21	30	8	25	113	14
9:45 AM	6	12	22	17	31	5	22	39	12	22	91	19
10:00 AM	5	13	8	3	22	3	9	18	9	16	56	11
10:15 AM	8	10	7	8	14	5	12	24	17	11	58	8
10:30 AM	5	11	9	8	23	4	6	26	11	12	53	6
10:45 AM	5	19	12	8	20	9	6	21	8	14	35	6
11:00 AM	1	11	6	10	22	9	14	11	11	11	48	10
11:15 AM	5	13	10	11	33	6	9	17	11	12	39	7
11:30 AM	7	19	9	8	37	5	5	22	18	6	36	12
11:45 AM	2	15	11	7	38	6	10	26	13	10	51	6
12:00 PM	7	19	14	18	51	8	2	12	12	11	46	2
12:15 PM	6	20	12	14	45	6	8	28	7	5	31	6
12:30 PM	5	24	15	20	45	9	5	15	14	10	34	10
12:45 PM	3	19	15	9	46	8	7	26	16	9	37	5
1:00 PM	10	19	16	18	43	7	8	16	16	7	45	8
1:15 PM	6	13	11	13	50	7	10	17	26	11	43	5
1:30 PM	5	25	12	14	47	8	4	23	24	14	35	9
1:45 PM	8	22	10	13	55	15	6	16		9	28	5
2:00 PM	9	15	7	20	53	18	11	25	16	14	33	8
2:15 PM	8	41	10	13	40	46	8	12	22	13	38	5
2:30 PM	6	35	14	16	57	15	12	24	23	13	30	9
2:45 PM	7	34	13	14	51	21	8	33	32	22	32	6
3:00 PM	7	35	13	11	60	22	6	20	25	17	31	8
3:15 PM	6	47	7	20	58	18	9	10	25	28	49	6
3:30 PM	6	42	15	16	72	18	4	24	32	18	29	10
3:45 PM	15	44	15	12	85	31	5	27	37	26	53	5
4:00 PM	9	58	11	17	73	16	8	28	34	20	48	4
4:15 PM	6	56	6	12	49	8	11	24	34	18	36	9
4:30 PM	10	65	16	12	77	5	13	28	52	23	45	12
4:45 PM	12	71	18	13	65	20	11	29	46	37	51	5
5:00 PM	13	62	22	16	66	18	7	29	59	27	55	5
5:15 PM	7	76	14	11	74	13	12	30	54	23	59	5
5:30 PM	8	68	23	11	77	14	13	33	52	37	56	7
5:45 PM	8	60	20	12	63	19	10	25	59	35	52	8
6:00 PM	6	60	20	11	70	15	8	26	59	32	54	8

Appendix B
Existing Conditions
Operational Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	35	379	57	28	126	66	59	181	186	296	122	17
Peak Hour Factor	0.94	0.94	0.94	0.75	0.75	0.75	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	37	403	61	37	168	88	61	189	194	305	126	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	501	293	444	448
Volume Left (vph)	37	37	61	305
Volume Right (vph)	61	88	194	18
Hadj (s)	-0.04	-0.14	-0.22	0.13
Departure Headway (s)	8.9	9.4	8.8	9.1
Degree Utilization, x	1.24	0.77	1.08	1.13
Capacity (veh/h)	409	376	419	409
Control Delay (s)	155.8	37.6	97.0	116.5
Approach Delay (s)	155.8	37.6	97.0	116.5
Approach LOS	F	E	F	F

Intersection Summary			
Delay	109.3		
HCM Level of Service	F		
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	25	222	122	68	298	53	224	117	42	79	266	36
Peak Hour Factor	0.92	0.92	0.92	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Hourly flow rate (vph)	27	241	133	70	307	55	229	119	43	82	277	38

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	401	432	391	397
Volume Left (vph)	27	70	229	82
Volume Right (vph)	133	55	43	38
Hadj (s)	-0.17	-0.03	0.07	0.00
Departure Headway (s)	9.4	9.5	9.6	9.6
Degree Utilization, x	1.05	1.14	1.05	1.05
Capacity (veh/h)	388	381	378	381
Control Delay (s)	90.3	122.3	91.0	93.3
Approach Delay (s)	90.3	122.3	91.0	93.3
Approach LOS	F	F	F	F

Intersection Summary			
Delay	99.8		
HCM Level of Service	F		
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

Appendix C
Crash Data

Document Number	ROUTE	CRASHDATE	Type_of_Collision	VehOneDir	VehOneManeuver	VehTwoDir	VehTwoManeuver	VehOneType	VehTwoType	NODE	INTERSECTIONROUTE	NODEOFFSET	INJURYCOUNT	FATALCOUNT	ROUTEMILEPOST	CRASHHOUR	DAMAGEAMOUNT	SEVERITY	SEVERITYDESCRIPTION
80910259	00620	3/14/2008	RearEnd	E	Going Straight Ahead	E	Stopped in Traffic Lane	Passenger Car	Truck - pick-up/passenger truck (SUV through 2003)	866007	00609	0.691	0	0	0.691	900	4000	4	No visible injury but complaint of pain or momentary unconsciousness
91880625	00620	1/15/2009	HeadOn		Going Straight Ahead		Making Left Turn	Truck - sport utility vehicle	Truck - pick-up/passenger truck (SUV through 2003)	263121	00609	0	0	0	0.71	1558	4000	4	No visible injury but complaint of pain or momentary unconsciousness
93230330	00620	8/13/2009	Angle		Going Straight Ahead		Going Straight Ahead	Van	Passenger Car	263121		0	0	0	0.71	14		4	No visible injury but complaint of pain or momentary unconsciousness
100040252	00609	11/21/2009	Angle		Going Straight Ahead		Making Left Turn	Passenger Car	Truck - sport utility vehicle				0	0	3.899	18		4	No visible injury but complaint of pain or momentary unconsciousness
100100350	00620	11/27/2009	Angle		Going Straight Ahead		Going Straight Ahead	Passenger Car	Passenger Car	263121		0	0	0	0.71	16		4	No visible injury but complaint of pain or momentary unconsciousness
100970653	00609	1/14/2010	RearEnd		Going Straight Ahead		Stopped in Traffic Lane	Truck - sport utility vehicle	Truck - sport utility vehicle				0	0	3.899	17		4	No visible injury but complaint of pain or momentary unconsciousness
102030029	00620	6/16/2010	Angle		Going Straight Ahead		Going Straight Ahead	Passenger Car	Truck - sport utility vehicle	263121		0.002	0	0	0.712	21		4	No visible injury but complaint of pain or momentary unconsciousness
102210190	00620	7/18/2010	Angle		Going Straight Ahead		Going Straight Ahead	Passenger Car	Van	263121		0	0	0	0.71	0		4	No visible injury but complaint of pain or momentary unconsciousness
102230742	00620	7/24/2010	Motorcyclist		Ran Off Road - Right			Motorcycle		263121		0.005	1	0	0.715	9		3	Other visible injury, as bruises, abrasions, swelling, lumping, etc.
103560257	00620	10/24/2010	Angle		Going Straight Ahead		Making Left Turn	Passenger Car	Truck - pick-up/passenger truck (SUV through 2003)	263121		0	0	0	0.71	22		4	No visible injury but complaint of pain or momentary unconsciousness

Revised Report

Commonwealth of Virginia • Department of Motor Vehicles

Police Crash Report

FR300P (Rev 7/07)

GPS Lat. GPS Long.

CRASH

Crash Date: 08 13 2009
Day of Week: THURS
MILITARY Time (24 hr clock): 1424
County of Crash: Fairfax
Official DMV Use: 093230330

City of / Town of:

Landmarks at Scene: Cox Farm

Location of Crash (route/street): BRADDOCK RD. / RT. 620

Railroad Crossing ID no. (if within 150 ft.):

Local Case Number: 092250018 79

At Intersection With or ______ Miles Feet N S E W of

Location of Crash (route/street): PLEASANT VALLEY RD. / RT 609

Mile Marker Number:

Number of Vehicles: 2

VEHICLE

DRIVER

Driver Fled Scene:

Driver's Name (Last, First, Middle): MONTANO, MAGDA Jimena
Gender: ●

Address (Street and Number): 8532 Bauer DR

City: Springfield
State: Va
ZIP: 22152

Birth Date: 09 10 1969
Drivers License Number: 11001-3650031
State:
DL: ●
CDL: ●

Safety Equip. Used:
Air Bag:
Ejected:
Date of Death:
Injury Type: 6
EMS Transport: ●

Summons Issued As Result of Crash: 1
Offenses Charged to Driver: Disregard Stop Sign (46.2-821) 82.1-6

VEHICLE

Vehicle Owner's Name (Last, First, Middle): Stock Cole Charles
Same as Driver:

Address (Street and Number): 8532 Bauer DR

City: Springfield
State: VA
ZIP: 22152

Vehicle Year: 05
Vehicle Make: Honda
Vehicle Model: Odyssey
Disabled:
CMV:
Towed: ●

Vehicle Plate Number: XPB9650
State: VA
Approximate Repair Cost: $4000

VIN: 5FNRL38835B082826

Oversize / Cargo Spill / Override / Underride

Name of Insurance Company (not agent): StateFarm

Speed Before Crash: 25
Speed Limit: 35
Maximum Safe Speed: 35
ALL Passengers Age Count: Under 8 / 8-17 / 18-21 / Over 21

VEHICLE

DRIVER

Driver Fled Scene:

Driver's Name (Last, First, Middle): Blanton, Earl, Alexander
Gender: ●

Address (Street and Number): 10328 Sager Ave #408

City: Fairfax
State: Va
ZIP: 22030

Birth Date: 02 13 1944
Drivers License Number: T24-69-0338
State: VA
DL: ●
CDL: ●

Safety Equip. Used: 3
Air Bag: 2
Ejected: 1
Date of Death:
Injury Type: 6
EMS Transport: ●

Summons Issued As Result of Crash: 2
Offenses Charged to Driver:

VEHICLE

Vehicle Owner's Name (Last, First, Middle):
Same as Driver: ●

Address (Street and Number):

City:
State:
ZIP:

Vehicle Year: 05
Vehicle Make: Merc.
Vehicle Model: E320
Disabled:
CMV:
Towed: ●

Vehicle Plate Number: XVY5614
State: VA
Approximate Repair Cost: $2000

VIN: WDBUF65J85A639201

Oversize / Cargo Spill / Override / Underride

Name of Insurance Company (not agent): USAA

Speed Before Crash: 5
Speed Limit: 35
Maximum Safe Speed: 35
ALL Passengers Age Count: Under 8: 3 / 8-17 / 18-21 / Over 21

PASSENGER *(only if injured or killed)*

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

PASSENGER *(only if injured or killed)*

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

Name of Injured (Last, First, Middle) | EMS Transport | Date of Death

Position In/On Vehicle | Safety Equip Used | Airbag | Ejected | Injury Type | Birthdate | Gender

Codes

8
1 2 3
8 4 5 6 8
7
8

POSITION IN/ON VEHICLE
1. Driver
2-6. Passengers
7. Cargo Area
8. Riding/Hanging On Outside
9-98. All Other Passengers

SAFETY EQUIPMENT USED
1. Lap Belt Only
2. Shoulder Belt Only
3. Lap and Shoulder Belt
4. Child Restraint
5. Helmet
6. Other
7. Booster Seat
8. No Restraint Used
9. Not Applicable

AIRBAG
1. Deployed – Front
2. Not Deployed
3. Unavailable/Not Applicable
4. Keyed Off
5. Unknown
6. Deployed – Side
7. Deployed – Other (Knee, Air Belt, etc.)
8. Deployed – Combination

EJECTED FROM VEHICLE
1. Not Ejected
2. Partially Ejected
3. Totally Ejected

SUMMONS ISSUED AS A RESULT OF CRASH
1. Yes
2. No
3. Pending

INJURY TYPE
1. Dead Before Report Made
2. Visible Signs of Injury, as Bleeding Wound or Distorted Member or Had to be Carried From Scene.
3. Other Visible Injury, as Bruises, Abrasions, Swelling, Limping, etc.
4. No Visible Injury, But Complaint of Pain, or Momentary Unconsciousness.
6. No Injury (driver only)

Investigating Officer: ENRIGHT, M
Badge/Code Number: 2849
Agency/Department Name and Code: FFX Co PD 029
Reviewing Officer: [signature]
Report File Date: 8/17/09

Officer Initials ME Badge # 2849

Commonwealth of Virginia • Department of Motor Vehicles

Police Crash Report

FR300P (Rev 7/07)

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Revised Report

CRASH

Crash Date: 08 13 2009 | MILITARY Time (24 hr clock): 1424 | County of Crash: FAIRFAX | City of / Town of: | Local Case Number: 0922500879

DRIVER INFORMATION

VEHICLE INFORMATION

Driver's Action P1

Veh 1 | Veh 2

1. No Improper Action ●
2. Exceeded Speed Limit
3. Exceeded Safe Speed But Not Speed Limit
4. Overtaking On Hill
5. Overtaking On Curve
6. Overtaking at Intersection
7. Improper Passing of School Bus
8. Cutting In
9. Other Improper Passing
10. Wrong Side of Road – Not Overtaking
11. Did Not Have Right-of-Way
12. Following Too Close
13. Fail to Signal or Improper Signal
14. Improper Turn – Wide Right Turn
15. Improper Turn – Cut Corner on Left Turn
16. Improper Turn From Wrong Lane
17. Other Improper Turn
18. Improper Backing
19. Improper Start From Parked Position
20. Disregarded Officer or Flagger
21. Disregarded Traffic Signal
22. Disregarded Stop or Yield Sign ●
23. Driver Distraction
24. Fail to Stop at Through Highway – No Sign
25. Drive Through Work Zone
26. Fail to Set Out Flares or Flags
27. Fail to Dim Headlights
28. Driving Without Lights
29. Improper Parking Location
30. Avoiding Pedestrian
31. Avoiding Other Vehicle
32. Avoiding Animal
33. Crowded Off Highway
34. Hit and Run
35. Car Ran Away – No Driver
36. Blinded by Headlights
37. Other
38. Avoiding Object in Roadway
39. Eluding Police
40. Fail to Maintain Proper Control
41. Improper Passing
42. Improper or Unsafe Lane Change
43. Over Correction

Condition of Driver Contributing to the Crash P2

Veh 1 | Veh 2

1. No Defects ● ●
2. Eyesight Defective
3. Hearing Defective
4. Other Body Defects
5. Illness
6. Fatigued
7. Apparently Asleep
8. Other
9. Unknown

Driver Vision Obscured P3

Veh 1 | Veh 2

1. Not Obscured ● ●
2. Rain, Snow, etc. on Windshield
3. Windshield Otherwise Obscured
4. Vision Obscured by Load on Vehicle
5. Trees, Crops, etc.
6. Building
7. Embankment
8. Sign or Signboard
9. Hillcrest
10. Parked Vehicle(s)
11. Moving Vehicle(s)
12. Sun or Headlight Glare
13. Other
14. Blind Spot
15. Smoke/Dust
16. Stopped Vehicle(s)

Type of Driver Distractions P4

1. Looking at Roadside Incident ●
2. Driver Fatigue
3. Looking at Scenery
4. Passenger(s)
5. Radio/CD, etc. ●
6. Cell Phone
7. Eyes Not on Road
8. Daydreaming
9. Eating/Drinking
10. Adjusting Vehicle Controls
11. Other
12. Navigation Device

Drinking P5

Veh 1 | Veh 2

1. Had Not Been Drinking ● ●
2. Drinking – Obviously Drunk
3. Drinking – Ability Impaired
4. Drinking – Ability Not Impaired
5. Drinking – Not Known Whether Impaired
6. Unknown

Method of Alcohol Determination (by police) P6

1. Blood
2. Breath
3. Refused
4. No Test ● ●

Drug Use P7

1. Yes
2. No ● ●
3. Unknown

Vehicle Maneuver V1

Veh 1 | Veh 2

1. Going Straight Ahead ● ●
2. Making Right Turn
3. Making Left Turn
4. Making U-Turn
5. Slowing or Stopping
6. Merging Into Traffic Lane
7. Starting From Parked Position
8. Stopped in Traffic Lane
9. Ran Off Road – Right
10. Ran Off Road – Left
11. Parked
12. Backing
13. Passing
14. Changing Lanes
15. Other
16. Entering Street From Parking Lot

Skidding Tire/Mark V2

1. Before Application of Brakes
2. After Application of Brakes
3. Before and After Application of Brakes
4. No Visible Skid Mark/Tire Mark ● ●

Vehicle Body Type V3

1. Passenger car ●
2. Truck – Pick-up/Passenger Truck
3. Van ●
4. Truck – Single Unit Truck (2-Axles)
7. Motor Home, Recreational Vehicle
8. Special Vehicle – Oversized Vehicle/Earthmover/Road Equipment
9. Bicycle
10. Moped
11. Motorcycle
12. Emergency Vehicle (Regardless of Vehicle Type)
13. Bus – School Bus
14. Bus – City Transit Bus/Privately Owned Church Bus
15. Bus – Commercial Bus
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.
18. Special Vehicle – Farm Machinery
19. Special Vehicle – ATV
21. Special Vehicle – Low-Speed Vehicle
22. Truck – Sport Utility Vehicle (SUV)
23. Truck – Single Unit Truck (3 Axles or More)
25. Truck – Truck Tractor (Bobtail-No Trailer)

Vehicle Damage V4

Veh 1 | Veh 2

1. Unknown
2. No damage
3. Overturned
4. Motor
5. Undercarriage
6. Totaled
7. Fire
8. Other ● ●

Vehicle Condition V5

Veh 1 | Veh 2

1. No Defects ● ●
2. Lights Defective
3. Brakes Defective
4. Steering Defective
5. Puncture/Blowout
6. Worn or Slick Tires
7. Motor Trouble
8. Chains In Use
9. Other
10. Vehicle Altered
11. Mirrors Defective
12. Power Train Defective
13. Suspension Defective
14. Windows/Windshield Defective
15. Wipers Defective
16. Wheels Defective
17. Exhaust System

Special Function Motor Vehicle V6

Veh 1 | Veh 2

1. No Special Function ● ●
2. Taxi
3. School Bus (Public or Private)
4. Transit Bus
5. Intercity Bus
6. Charter Bus
7. Other Bus
8. Military
9. Police
10. Ambulance
11. Fire Truck
12. Tow Truck
13. Maintenance
14. Unknown

EMV in service V7

Veh 1 | Veh 2

1. Yes ● ●
2. No

Truck Cover V8

Veh 1 | Veh 2

1. Yes ● ●
2. No

Revised Report

CRASH

Crash Date	MILITARY Time (24 hr clock)	County of Crash	City of Town of	Local Case Number
08 13 2009	1424	FAIRFAX		092250001879

CRASH INFORMATION

Location of First Harmful Event In Relation to Roadway — C1

- (●) 1. On Roadway
- 2. Shoulder
- 3. Median
- 4. Roadside
- 5. Gore
- 6. Separator
- 7. In Parking Lane or Zone
- 8. Off Roadway, Location Unknown
- 9. Outside Right-of-Way

Weather Condition — C2

- (●) 1. No Adverse Condition (Clear/Cloudy)
- 3. Fog
- 4. Mist
- 5. Rain
- 6. Snow
- 7. Sleet/Hail
- 8. Smoke/Dust
- 9. Other
- 10. Blowing Sand, Soil, Dirt, or Snow
- 11. Severe Crosswinds

Light Conditions — C3

- 1. Dawn
- (●) 2. Daylight
- 3. Dusk
- 4. Darkness –Road Lighted
- 5. Darkness –Road Not Lighted
- 6. Darkness –Unknown Road Lighting
- 7. Unknown

Traffic Control Mechanical Device — C4

- 1. Yes – Working
- 2. Yes – Working and Obscured
- 3. Yes – Not Working
- 4. Yes – Not Working and Obscured
- 5. Yes – Missing
- (●) 6. No Traffic Control Device Present

Traffic Control Type — C5

- 1. No Traffic Control
- 2. Officer or Flagger
- 3. Traffic Signal
- (●) 4. Stop Sign
- 5. Slow or Warning Sign
- 6. Traffic Lanes Marked
- 7. No Passing Lines
- 8. Yield Sign
- 9. One Way Road or Street
- 10. Railroad Crossing With Markings and Signs
- 11. Railroad Crossing With Signals
- 12. Railroad Crossing With Gate and Signals
- 13. Other
- 14. Pedestrian Crosswalk
- 15. Reduced Speed – School Zone
- 16. Reduced Speed – Work Zone
- 17. Highway Safety Corridor

Roadway Alignment — C6

- (●) 1. Straight – Level
- 2. Curve – Level
- 3. Grade – Straight
- 4. Grade – Curve
- 5. Hillcrest – Straight
- 6. Hillcrest – Curve
- 7. Dip – Straight
- 8. Dip – Curve
- 9. Other
- 10. On/Off Ramp

Roadway Surface Condition — C7

- (●) 1. Dry
- 2. Wet
- 3. Snowy
- 4. Icy
- 5. Muddy
- 6. Oil/Other Fluids
- 7. Other
- 8. Natural Debris
- 9. Water (Standing, Moving)
- 10. Slush
- 11. Sand, Dirt, Gravel

Roadway Surface Type — C8

- 1. Concrete
- (●) 2. Blacktop, Asphalt, Bituminous
- 3. Brick or Block
- 4. Slag, Gravel, Stone
- 5. Dirt
- 6. Other

Roadway Description — C9

- (●) 1. Two-Way, Not Divided
- 2. Two-Way, Divided, Unprotected Median
- 3. Two-Way, Divided, Positive Median Barrier
- 4. One-Way, Not Divided
- 5. Unknown

Roadway Defects — C10

- (●) 1. No Defects
- 2. Holes, Ruts, Bumps
- 3. Soft or Low Shoulder
- 4. Under Repair
- 5. Loose Material
- 6. Restricted Width
- 7. Slick Pavement
- 8. Roadway Obstructed
- 9. Other
- 10. Edge Pavement Drop Off

Relation to Roadway — C11

Interchange Area:

- (●) 1. Main-Line Roadway
- 2. Acceleration/Deceleration Lanes
- 3. Gore Area (Between Ramp and Highway Edgelines)
- 4. Collector/Distributor Road
- 5. On Entrance/Exit Ramp
- 6. Intersection at end of Ramp
- 7. Other location not listed above within an interchange area (median, shoulder and roadside)

Intersection Area:

- 8. Non-Intersection
- (●) 9. Within Intersection
- 10. Intersection-Related - Within 150'
- 11. Intersection-Related - Outside 150'

Other Location:

- 12. Crossover Related
- 13. Driveway, Alley-Access - Related
- 14. Railway Grade Crossing
- 15. Other Crossing (Crossings for Bikes, School, etc.)

Intersection Type — C12

- 1. Not at Intersection
- (●) 2. Two Approaches
- 3. Three Approaches
- (●) 4. Four Approaches
- 5. Five-Point, or more
- 6. Roundabout

Work Zone Related — C13

- 1. Yes
- (●) 2. No

Work Zone Workers Present — C14

- 1. With Law Enforcement
- 2. With No Law Enforcement
- 3. No Workers Present

Work Zone Location — C15

- 1. Advance Warning Area
- 2. Transition Area
- 3. Activity Area
- 4. Termination Area

Work Zone Type — C16

- 1. Lane Closure
- 2. Lane Shift/Crossover
- 3. Work on Shoulder or Median
- 4. Intermittent or Moving Work
- 5. Other

School Zone — C17

- 1. Yes
- 2. Yes - With School Activity
- (●) 3. No

Type of Collision — C18

- 1. Rear End
- (●) 2. Angle
- 3. Head On
- 4. Sideswipe – Same Direction
- 5. Sideswipe – Opposite Direction
- 6. Fixed Object in Road
- 7. Train
- 8. Non-Collision
- 9. Fixed Object – Off Road
- 10. Deer
- 11. Other Animal
- 12. Pedestrian
- 13. Bicyclist
- 14. Motorcyclist
- 15. Backed Into
- 16. Other

Officer Initials ME Badge # 2849

Commonwealth of Virginia • Department of Motor Vehicles

Police Crash Report

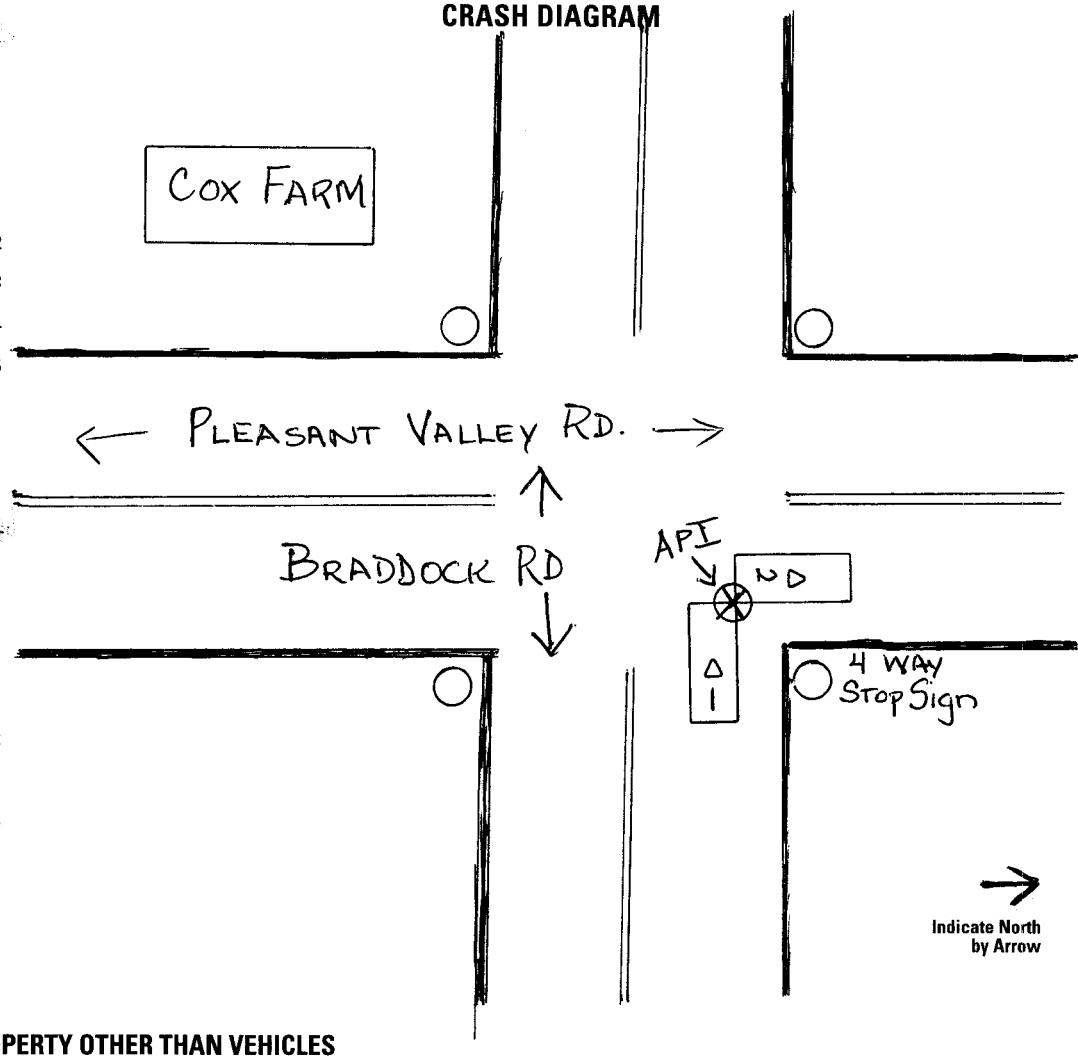
FR300P (Rev 7/07)

Revised Report

CRASH

Crash Date	MILITARY Time (24 hr clock)	County of Crash	City of / Town of	Local Case Number
08/13/2009	1424	FAIRFAX		092250018 79

CRASH DIAGRAM



DAMAGE TO PROPERTY OTHER THAN VEHICLES

Approx. Repair Cost	Object Struck (Tree, Fence, etc.)	Property Owners Name (Last, First, Middle)	Address (Street and Number)	VDOT Property

CRASH DESCRIPTION 218 901.03

Veh. # 2 was heading NORTH ON Pleasant Valley Rd.. After stopping at the 4 way Stop Sign Veh. 2 proceeded through the intersection. Veh. # 1 was westbound on Braddock Rd. and was looking at her GPS unit and didn't see the Stop Sign and Struck Veh. #2.

CRASH EVENTS

Vehicle #	First Event	Second Event	Third Event	Fourth Event	Most Harmful Event
1	20				20
2	20				20

First Harmful Event of Entire Crash that Results in First Injury or Damage: 20

COLLISION WITH FIXED OBJECT
1. Bank Or Ledge
2. Trees
3. Utility Pole
4. Fence Or Post
5. Guard Rail
6. Parked Vehicle
7. Tunnel, Bridge, Underpass, Culvert, etc.
8. Sign, Traffic Signal
9. Impact Cushioning Device
10. Other
11. Jersey Wall
12. Building/Structure
13. Curb
14. Ditch
15. Other Fixed Object
16. Other Traffic Barrier
17. Traffic Sign Support
18. Mailbox

COLLISION WITH PERSON, MOTOR VEHICLE OR NON-FIXED OBJECT
19. Pedestrian
20. Motor Vehicle In Transport
21. Train
22. Bicycle
23. Animal
24. Work Zone Maintenance Equipment
25. Other Movable Object
26. Unknown Movable Object
27. Other

NON-COLLISION
28. Ran Off Road
29. Jack Knife
30. Overturn (Rollover)
31. Downhill Runaway
32. Cargo Loss or Shift
33. Explosion or Fire
34. Separation of Units
35. Cross Median
36. Cross Centerline
37. Equipment Failure (Tire, etc)
38. Immersion
39. Fell/Jumped From Vehicle
40. Thrown or Falling Object
41. Non-Collision Unknown
42. Other Non-Collision

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Police Crash Report

FR300P (Rev 7/07)

Page 1 of 4

Revised Report

GPS Lat. GPS Long.

CRASH

Crash Date: 10 04 2009 | Day of Week: SUN | MILITARY Time (24 hr clock): 1430 | County of Crash: FAIRFAX | Official DMV Use

City of Town of:

Landmarks at Scene: 15613 BROADDOCK RD | 093480053

Location of Crash (route/street): BROADDOCK RD (RT 620)

Railroad Crossing ID no. (if within 150 ft.):

Local Case Number: 092770000120

At Intersection With or .01 Miles Feet N S E W of: Location of Crash (route/street): PURSAR VALLEY RD (RT 609)

Mile Marker Number:

Number of Vehicles: 2

VEHICLE # 1

DRIVER

Driver's Name (Last, First, Middle): COSSIO DALENZ, ARMANDO

Driver Fled Scene: | Gender: ●

Address (Street and Number): 9591 NEITANY DR

City: MANASSAS | State: VA | ZIP: 20110

Birth Date: 10 22 RR | Drivers License Number: AG96607 21 | State: VA | DL: ● | CDL: ●

Safety Equip. Used: 3 | Air Bag: 2 | Ejected: 1 | Date of Death: | Injury Type: 6 | EMS Transport: ●

Summons Issued As Result of Crash: 2 | Offenses Charged to Driver:

VEHICLE

Vehicle Owner's Name (Last, First, Middle): | Same as Driver: ●

Address (Street and Number):

City: | State: | ZIP:

Vehicle Year: 2004 | Vehicle Make: CHEV | Vehicle Model: EXPRESS | Disabled: | CMV: | Towed:

Vehicle Plate Number: 5934AS | State: VA | Approximate Repair Cost: 3500

VIN: 1GCHG35U041119436 | Oversize: | Cargo Spill:

Name of Insurance Company (not agent): NATIONWIDE | Override: | Underride:

Speed Before Crash: 15 | Speed Limit: 35 | Maximum Safe Speed: 35 | ALL Passengers Age Count: Under 8: | 8-17: | 18-21: | Over 21:

PASSENGER *(only if injured or killed)*

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

VEHICLE # 2

DRIVER

Driver's Name (Last, First, Middle): BECKHAM, ANN, C

Driver Fled Scene: | Gender: ●

Address (Street and Number): 25908 FLINTBRIDGE DR

City: SOUTH RIDE | State: VA | ZIP: 20152

Birth Date: 04 13 A49 | Drivers License Number: T66043659 | State: VA | DL: ● | CDL: ●

Safety Equip. Used: 3 | Air Bag: 2 | Ejected: 1 | Date of Death: | Injury Type: 6 | EMS Transport: ●

Summons Issued As Result of Crash: 2 | Offenses Charged to Driver:

VEHICLE

Vehicle Owner's Name (Last, First, Middle): | Same as Driver: ●

Address (Street and Number):

City: | State: | ZIP:

Vehicle Year: 2009 | Vehicle Make: TOYO | Vehicle Model: RAV4 | Disabled: | CMV: | Towed:

Vehicle Plate Number: YSZ765Z | State: VA | Approximate Repair Cost: 3500

VIN: JTMBF33V49D016532 | Oversize: | Cargo Spill:

Name of Insurance Company (not agent): USAA | Override: | Underride:

Speed Before Crash: 0 | Speed Limit: 35 | Maximum Safe Speed: 35 | ALL Passengers Age Count: Under 8: | 8-17: | 18-21: | Over 21:

PASSENGER *(only if injured or killed)*

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

Name of Injured (Last, First, Middle): | EMS Transport: | Date of Death:

Position In/On Vehicle: | Safety Equip Used: | Airbag: | Ejected: | Injury Type: | Birthdate: | Gender:

Codes

8 / 1 2 3 / 8 4 5 6 8 / 7 / 8

POSITION IN/ON VEHICLE
1. Driver
2-6. Passengers
7. Cargo Area
8. Riding/Hanging On Outside
9-98. All Other Passengers

SAFETY EQUIPMENT USED
1. Lap Belt Only
2. Shoulder Belt Only
3. Lap and Shoulder Belt
4. Child Restraint
5. Helmet
6. Other
7. Booster Seat
8. No Restraint Used
9. Not Applicable

AIRBAG
1. Deployed – Front
2. Not Deployed
3. Unavailable/Not Applicable
4. Keyed Off
5. Unknown
6. Deployed – Side
7. Deployed – Other (Knee, Air Belt, etc.)
8. Deployed – Combination

EJECTED FROM VEHICLE
1. Not Ejected
2. Partially Ejected
3. Totally Ejected

SUMMONS ISSUED AS A RESULT OF CRASH
1. Yes
2. No
3. Pending

INJURY TYPE
1. Dead Before Report Made
2. Visible Signs of Injury, as Bleeding Wound or Distorted Member or Had to be Carried From Scene.
3. Other Visible Injury, as Bruises, Abrasions, Swelling, Limping, etc.
4. No Visible Injury, But Complaint of Pain, or Momentary Unconsciousness.
6. No Injury (driver only)

Investigating Officer	Badge/Code Number	Agency/Department Name and Code	Reviewing Officer	Report File Date
C.D. PADDY	3230	FAIRFAX COUNTY PD 09		10/5/09

Officer Initials DP Badge # 3230

Commonwealth of Virginia • Department of Motor Vehicles

Police Crash Report

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FR300P (Rev 7/07)

Revised Report

CRASH

Crash Date: 10 04 2009 | MILITARY Time (24 hr clock): 1430 | County of Crash: FAIRFAX | City of Town of: | Local Case Number: 092770000120

DRIVER INFORMATION

Veh 1 | Veh 2

Driver's Action P1

- 1. No Improper Action
- 2. Exceeded Speed Limit
- 3. Exceeded Safe Speed But Not Speed Limit
- 4. Overtaking On Hill
- 5. Overtaking On Curve
- 6. Overtaking at Intersection
- 7. Improper Passing of School Bus
- 8. Cutting In
- 9. Other Improper Passing
- 10. Wrong Side of Road – Not Overtaking
- 11. Did Not Have Right-of-Way
- 12. Following Too Close
- 13. Fail to Signal or Improper Signal
- 14. Improper Turn – Wide Right Turn
- 15. Improper Turn – Cut Corner on Left Turn
- 16. Improper Turn From Wrong Lane
- 17. Other Improper Turn
- 18. *Improper Backing*
- 19. Improper Start From Parked Position
- 20. Disregarded Officer or Flagger
- 21. Disregarded Traffic Signal
- 22. Disregarded Stop or Yield Sign
- 23. Driver Distraction
- 24. Fail to Stop at Through Highway – No Sign
- 25. Drive Through Work Zone
- 26. Fail to Set Out Flares or Flags
- 27. Fail to Dim Headlights
- 28. Driving Without Lights
- 29. Improper Parking Location
- 30. Avoiding Pedestrian
- 31. Avoiding Other Vehicle
- 32. Avoiding Animal
- 33. *Crowded Off Highway*
- 34. Hit and Run
- 35. Car Ran Away – No Driver
- 36. Blinded by Headlights
- 37. Other
- 38. Avoiding Object in Roadway
- 39. Eluding Police
- 40. Fail to Maintain Proper Control
- 41. Improper Passing
- 42. Improper or Unsafe Lane Change
- 43. Over Correction

Condition of Driver Contributing to the Crash P2

- 1. No Defects
- 2. Eyesight Defective
- 3. Hearing Defective
- 4. Other Body Defects
- 5. Illness
- 6. Fatigued
- 7. Apparently Asleep
- 8. Other
- 9. Unknown

Veh 1 | Veh 2

Driver Vision Obscured P3

- 1. Not Obscured
- 2. Rain, Snow, etc. on Windshield
- 3. Windshield Otherwise Obscured
- 4. Vision Obscured by Load on Vehicle
- 5. Trees, Crops, etc.
- 6. Building
- 7. Embankment
- 8. Sign or Signboard
- 9. Hillcrest
- 10. Parked Vehicle(s)
- 11. Moving Vehicle(s)
- 12. Sun or Headlight Glare
- 13. Other
- 14. Blind Spot
- 15. Smoke/Dust
- 16. Stopped Vehicle(s)

Type of Driver Distractions P4

- 1. Looking at Roadside Incident
- 2. Driver Fatigue
- 3. Looking at Scenery
- 4. Passenger(s)
- 5. Radio/CD, etc.
- 6. Cell Phone
- 7. Eyes Not on Road
- 8. Daydreaming
- 9. Eating/Drinking
- 10. Adjusting Vehicle Controls
- 11. Other
- 12. Navigation Device

Drinking P5

- 1. *Had Not Been Drinking*
- 2. Drinking – Obviously Drunk
- 3. Drinking – Ability Impaired
- 4. Drinking – Ability Not Impaired
- 5. Drinking – Not Known Whether Impaired
- 6. Unknown

Method of Alcohol Determination (by police) P6

- 1. Blood
- 2. Breath
- 3. Refused
- 4. No Test

Drug Use P7

- 1. Yes
- 2. No
- 3. Unknown

VEHICLE INFORMATION

Veh 1 | Veh 2

Vehicle Maneuver V1

- 1. Going Straight Ahead
- 2. Making Right Turn
- 3. Making Left Turn
- 4. Making U-Turn
- 5. Slowing or Stopping
- 6. Merging Into Traffic Lane
- 7. Starting From Parked Position
- 8. Stopped in Traffic Lane
- 9. Ran Off Road – Right
- 10. Ran Off Road – Left
- 11. Parked
- 12. Backing
- 13. Passing
- 14. Changing Lanes
- 15. Other
- 16. Entering Street From Parking Lot

Skidding Tire/Mark V2

- 1. Before Application of Brakes
- 2. After Application of Brakes
- 3. Before and After Application of Brakes
- 4. No Visible Skid Mark/Tire Mark

Vehicle Body Type V3

- 1. Passenger car
- 2. Truck – Pick-up/Passenger Truck
- 3. Van
- 4. Truck – Single Unit Truck (2-Axles)
- 7. Motor Home, Recreational Vehicle
- 8. Special Vehicle – Oversized Vehicle/Earthmover/Road Equipment
- 9. Bicycle
- 10. Moped
- 11. Motorcycle
- 12. Emergency Vehicle (Regardless of Vehicle Type)
- 13. Bus – School Bus
- 14. Bus – City Transit Bus/Privately Owned Church Bus
- 15. Bus – Commercial Bus
- 16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.
- 18. Special Vehicle – Farm Machinery
- 19. Special Vehicle – ATV
- 21. Special Vehicle – Low-Speed Vehicle
- 22. Truck – Sport Utility Vehicle (SUV)
- 23. Truck – Single Unit Truck (3 Axles or More)
- 25. Truck – Truck Tractor (Bobtail-No Trailer)

Veh 1 | Veh 2

Vehicle Damage V4

- 1. Unknown
- 2. No damage
- 3. Overturned
- 4. Motor
- 5. Undercarriage
- 6. Totaled
- 7. Fire
- 8. Other

Vehicle Condition V5

- 1. No Defects
- 2. Lights Defective
- 3. Brakes Defective
- 4. Steering Defective
- 5. Puncture/Blowout
- 6. Worn or Slick Tires
- 7. Motor Trouble
- 8. Chains In Use
- 9. Other
- 10. Vehicle Altered
- 11. Mirrors Defective
- 12. Power Train Defective
- 13. Suspension Defective
- 14. Windows/Windshield Defective
- 15. Wipers Defective
- 16. Wheels Defective
- 17. Exhaust System

Special Function Motor Vehicle V6

- 1. No Special Function
- 2. Taxi
- 3. School Bus (Public or Private)
- 4. Transit Bus
- 5. *Intercity Bus*
- 6. Charter Bus
- 7. Other Bus
- 8. Military
- 9. Police
- 10. Ambulance
- 11. Fire Truck
- 12. Tow Truck
- 13. Maintenance
- 14. Unknown

EMV in service V7

- 1. Yes
- 2. No

Truck Cover V8

- 1. Yes
- 2. No

Revised Report

CRASH

Crash Date: 10 4 2019 | MILITARY Time (24 hr clock): 1430 | County of Crash: FAIRFAX | City of / Town of: | Local Case Number: 09277 000 120

CRASH INFORMATION

Location of First Harmful Event In Relation to Roadway — C1

- (●) 1. On Roadway
- 2. Shoulder
- 3. Median
- 4. Roadside
- 5. Gore
- 6. Separator
- 7. In Parking Lane or Zone
- 8. Off Roadway, Location Unknown
- 9. Outside Right-of-Way

Weather Condition — C2

- (●) 1. No Adverse Condition (Clear/Cloudy)
- 3. Fog
- 4. Mist
- 5. Rain
- 6. Snow
- 7. Sleet/Hail
- 8. Smoke/Dust
- 9. Other
- 10. Blowing Sand, Soil, Dirt, or Snow
- 11. Severe Crosswinds

Light Conditions — C3

- 1. Dawn
- (●) 2. Daylight
- 3. Dusk
- 4. Darkness –Road Lighted
- 5. Darkness –Road Not Lighted
- 6. Darkness –Unknown Road Lighting
- 7. Unknown

Traffic Control Mechanical Device — C4

- 1. Yes – Working
- 2. Yes – Working and Obscured
- 3. Yes – Not Working
- 4. Yes – Not Working and Obscured
- 5. Yes – Missing
- (●) 6. No Traffic Control Device Present

Traffic Control Type — C5

- 1. No Traffic Control
- 2. Officer or Flagger
- 3. Traffic Signal
- 4. Stop Sign
- 5. Slow or Warning Sign
- (●) 6. Traffic Lanes Marked
- 7. No Passing Lines
- 8. Yield Sign
- 9. One Way Road or Street
- 10. Railroad Crossing With Markings and Signs
- 11. Railroad Crossing With Signals
- 12. Railroad Crossing With Gate and Signals
- 13. Other
- 14. Pedestrian Crosswalk
- 15. Reduced Speed – School Zone
- 16. Reduced Speed – Work Zone
- 17. Highway Safety Corridor

Roadway Alignment — C6

- (●) 1. Straight – Level
- 2. Curve – Level
- 3. Grade – Straight
- 4. Grade – Curve
- 5. Hillcrest – Straight
- 6. Hillcrest – Curve
- 7. Dip – Straight
- 8. Dip – Curve
- 9. Other
- 10. On/Off Ramp

Roadway Surface Condition — C7

- (●) 1. Dry
- 2. Wet
- 3. Snowy
- 4. Icy
- 5. Muddy
- 6. Oil/Other Fluids
- 7. Other
- 8. Natural Debris
- 9. Water (Standing, Moving)
- 10. Slush
- 11. Sand, Dirt, Gravel

Roadway Surface Type — C8

- 1. Concrete
- (●) 2. Blacktop, Asphalt, Bituminous
- 3. Brick or Block
- 4. Slag, Gravel, Stone
- 5. Dirt
- 6. Other

Roadway Description — C9

- (●) 1. Two-Way, Not Divided
- 2. Two-Way, Divided, Unprotected Median
- 3. Two-Way, Divided, Positive Median Barrier
- 4. One-Way, Not Divided
- 5. Unknown

Roadway Defects — C10

- (●) 1. No Defects
- 2. Holes, Ruts, Bumps
- 3. Soft or Low Shoulder
- 4. Under Repair
- 5. Loose Material
- 6. Restricted Width
- 7. Slick Pavement
- 8. Roadway Obstructed
- 9. Other
- 10. Edge Pavement Drop Off

Relation to Roadway — C11

Interchange Area:

- 1. Main-Line Roadway
- 2. Acceleration/Deceleration Lanes
- 3. Gore Area (Between Ramp and Highway Edgelines)
- 4. Collector/Distributor Road
- 5. On Entrance/Exit Ramp
- 6. Intersection at end of Ramp
- 7. Other location not listed above within an interchange area (median, shoulder and roadside)

Intersection Area:

- (●) 8. Non-Intersection
- 9. Within Intersection
- 10. Intersection-Related - Within 150'
- 11. Intersection-Related - Outside 150'

Other Location:

- 12. Crossover Related
- 13. Driveway, Alley-Access - Related
- 14. Railway Grade Crossing
- 15. Other Crossing (Crossings for Bikes, School, etc.)

Intersection Type — C12

- (●) 1. Not at Intersection
- 2. Two Approaches
- 3. Three Approaches
- 4. Four Approaches
- 5. Five-Point, or more
- 6. Roundabout

Work Zone Related — C13

- 1. Yes
- (●) 2. No

Work Zone Workers Present — C14

- 1. With Law Enforcement
- 2. With No Law Enforcement
- 3. No Workers Present

Work Zone Location — C15

- 1. Advance Warning Area
- 2. Transition Area
- 3. Activity Area
- 4. Termination Area

Work Zone Type — C16

- 1. Lane Closure
- 2. Lane Shift/Crossover
- 3. Work on Shoulder or Median
- 4. Intermittent or Moving Work
- 5. Other

School Zone — C17

- 1. Yes
- 2. Yes - With School Activity
- (●) 3. No

Type of Collision — C18

- (●) 1. Rear End
- 2. Angle
- 3. Head On
- 4. Sideswipe – Same Direction
- 5. Sideswipe – Opposite Direction
- 6. Fixed Object in Road
- 7. Train
- 8. Non-Collision
- 9. Fixed Object – Off Road
- 10. Deer
- 11. Other Animal
- 12. Pedestrian
- 13. Bicyclist
- 14. Motorcyclist
- 15. Backed Into
- 16. Other

Officer Initials GDP Badge # 3230

Commonwealth of Virginia • Department of Motor Vehicles

Police Crash Report

0 7 0 7 D

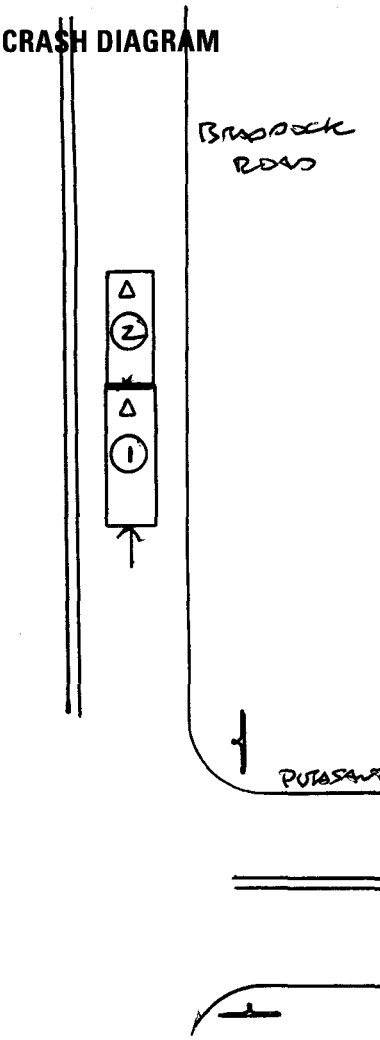
FR300P (Rev 7/07)

Revised Report

CRASH

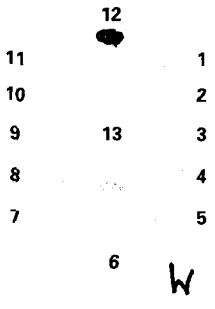
Crash Date 10 04 2009 | MILITARY Time (24 hr clock) 1430 | County of Crash FAUQUIER | City of Town of | Local Case Number 092770000120

CRASH DIAGRAM



VEHICLE # 1

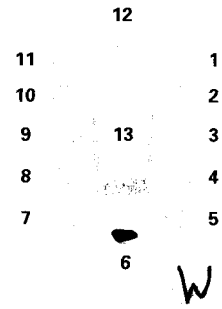
Fill In Impact Area(s). Initial Impact. 12



Veh Dir of Travel–N/S/E/W W

VEHICLE # 2

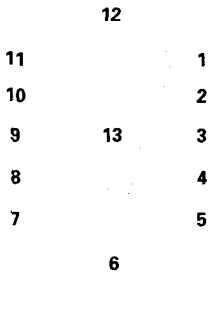
Fill In Impact Area(s). Initial Impact. 6



Veh Dir of Travel–N/S/E/W W

VEHICLE #

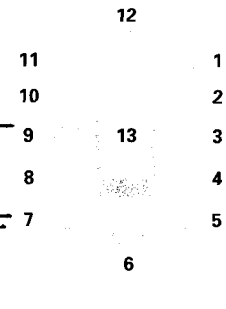
Fill In Impact Area(s). Initial Impact.



Veh Dir of Travel–N/S/E/W

VEHICLE #

Fill In Impact Area(s). Initial Impact.



Indicate North by Arrow

Veh Dir of Travel–N/S/E/W

DAMAGE TO PROPERTY OTHER THAN VEHICLES

Approx. Repair Cost	Object Struck (Tree, Fence, etc.)	Property Owners Name (Last, First, Middle)	Address (Street and Number)	VDOT Property

CRASH DESCRIPTION 2:01 / 911.01

VEHICLE #1 AND #2 WERE WESTBOUND ON BROADRUN ROAD WEST OF PLEASANT VALLEY ROAD. VEHICLE #2 HAD TO STOP QUICKLY FOR A VEHICLE THAT WAS TURNING LEFT WHEN VEHICLE #1 APPROACHED FROM THE REAR AND COULD NOT STOP IN TIME AND STRUCK VEHICLE #2

CRASH EVENTS

Vehicle #	First Event	Second Event	Third Event	Fourth Event	Most Harmful Event
1	20				20
2	20				20

Vehicle #	First Event	Second Event	Third Event	Fourth Event	Most Harmful Event

First Harmful Event of Entire Crash that Results in First Injury or Damage: 20

COLLISION WITH FIXED OBJECT
1. Bank Or Ledge
2. Trees
3. Utility Pole
4. Fence Or Post
5. Guard Rail
6. Parked Vehicle
7. Tunnel, Bridge, Underpass, Culvert, etc.
8. Sign, Traffic Signal
10. Other
11. Jersey Wall
12. Building/Structure
13. Curb
14. Ditch
15. Other Fixed Object
16. Other Traffic Barrier
17. Traffic Sign Support
18. Mailbox

COLLISION WITH PERSON, MOTOR VEHICLE OR NON-FIXED OBJECT
19. Pedestrian
20. Motor Vehicle In Transport
21. Train
22. Bicycle
23. Animal
24. Work Zone Maintenance Equipment
25. Other Movable Object
26. *Unknown Movable Object*
27. Other

NON-COLLISION
28. Ran Off Road
29. Jack Knife
30. Overturn (Rollover)
31. Downhill Runaway
32. *Cargo Loss or Shift*
33. Explosion or Fire
34. Separation of Units
35. Cross Median
36. Cross Centerline
37. Equipment Failure (Tire, etc)
38. Immersion
39. Fell/Jumped From Vehicle
40. Thrown or Falling Object
41. Non-Collision Unknown
42. Other Non-Collision

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Police Crash Report

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Revised Report ☐

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GPS Lat. GPS Long.

CRASH

Crash Date: 11 27 2009 | Day of Week: FRI | MILITARY Time (24 hr clock): 1630 | County of Crash: FAIRFAX COUNTY. | Official DMV Use: 100100350

☐ City of ☐ Town of — City or Town Name | Landmarks at Scene

Location of Crash (route/street): RT 620 / BRADDOCK RD | Railroad Crossing ID no. (if within 150 ft.) | Local Case Number: 200933 10165

● At Intersection With or ☐ Miles ☐ Feet ○ N ○ S ○ E ○ W of Location of Crash (route/street): RT 609 / PLEASANT VALLEY | Mile Marker Number | Number of Vehicles: 2

VEHICLE # 1

DRIVER

Driver Fled Scene ☐

Driver's Name (Last, First, Middle): GOMEZ JARAMILLO, FERMIN | Gender: ● M ○ F

Address (Street and Number): 6065 BELLVIEW DR #101

City: FALLS CHURCH | State: VA | ZIP: 22041

Birth Date: 06/18/1971 | Drivers License Number: NOT LICENSED | State | DL ○ | CDL ○

Safety Equip. Used: 3 | Air Bag: 2 | Ejected: 1 | Date of Death | Injury Type: 6 | EMS Transport ● Y ○ N

Summons Issued As Result of Crash: 1 | Offenses Charged to Driver: 46.2-300 / 46.2-707 / 46.2-821

VEHICLE

Vehicle Owner's Name (Last, First, Middle) | Same as Driver ☐

Address (Street and Number): 7001 ESSEX AVENUE

City: SPRINGFIELD | State: VA | ZIP: 22150

Vehicle Year: 1990 | Vehicle Make: PTYM | Vehicle Model: ACCTAIN | Disabled ☐ | CMV ☐ | Towed ☐

Vehicle Plate Number: KJA 3564 | State: VA | Approximate Repair Cost: 500.00

VIN: 1P3XA4637LF833283 | ☐ Oversize ☐ Cargo Spill

Name of Insurance Company (not agent): N/A | ☐ Override ☐ Underride

Speed Before Crash: 5 | Speed Limit: 35 | Maximum Safe Speed: 35 | ALL Passengers Age Count: Under 8 | 8-17 | 18-21 | Over 21

PASSENGER (only if injured or killed)

Name of Injured (Last, First, Middle)	EMS Transport	Date of Death	Position In/On Vehicle	Safety Equip Used	Airbag	Ejected	Injury Type	Birthdate	Gender
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F

VEHICLE # 2

DRIVER

Driver Fled Scene ☐

Driver's Name (Last, First, Middle): PASQUARIELLO JR. RICHARD | Gender: ● M ○ F

Address (Street and Number): 9504 WOODBROOKE CT

City: MANASSAS | State: VA | ZIP: 20110

Birth Date: 10/01/1984 | Drivers License Number: T62-78-1655 | State: VA | DL ● Y ○ N | CDL ○ Y ○ N

Safety Equip. Used: 3 | Air Bag: 2 | Ejected: 1 | Date of Death | Injury Type: 6 | EMS Transport ○ Y ● N

Summons Issued As Result of Crash: 2 | Offenses Charged to Driver

VEHICLE

Vehicle Owner's Name (Last, First, Middle) | Same as Driver ●

Address (Street and Number)

City | State | ZIP

Vehicle Year: 1998 | Vehicle Make: SATR | Vehicle Model: L1 | Disabled ☐ | CMV ☐ | Towed ☐

Vehicle Plate Number: PAG214 | State: VA | Approximate Repair Cost: 1,000

VIN: 168ZH1275WZ294325 | ☐ Oversize ☐ Cargo Spill

Name of Insurance Company (not agent): ALLSTATE | ☐ Override ☐ Underride

Speed Before Crash: 5 | Speed Limit: 35 | Maximum Safe Speed: 35 | ALL Passengers Age Count: Under 8 | 8-17 | 18-21 | Over 21

PASSENGER (only if injured or killed)

Name of Injured (Last, First, Middle)	EMS Transport	Date of Death	Position In/On Vehicle	Safety Equip Used	Airbag	Ejected	Injury Type	Birthdate	Gender
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F
	○ Y ○ N	MM DD YY						MM DD YYYY	○ M ○ F

Codes

8 / 1 2 3 / 8 4 5 6 8 / 7 / 8

POSITION IN/ON VEHICLE
1. Driver
2-6. Passengers
7. Cargo Area
8. Riding/Hanging On Outside
9-98. All Other Passengers

SAFETY EQUIPMENT USED
1. Lap Belt Only
2. Shoulder Belt Only
3. Lap and Shoulder Belt
4. Child Restraint
5. Helmet
6. Other
7. Booster Seat
8. No Restraint Used
9. Not Applicable

AIRBAG
1. Deployed – Front
2. Not Deployed
3. Unavailable/Not Applicable
4. Keyed Off
5. Unknown
6. Deployed – Side
7. Deployed – Other (Knee, Air Belt, etc.)
8. Deployed – Combination

EJECTED FROM VEHICLE
1. Not Ejected
2. Partially Ejected
3. Totally Ejected

SUMMONS ISSUED AS A RESULT OF CRASH
1. Yes
2. No
3. Pending

INJURY TYPE
1. Dead Before Report Made
2. Visible Signs of Injury, as Bleeding Wound or Distorted Member or Had to be Carried From Scene.
3. Other Visible Injury, as Bruises, Abrasions, Swelling, Limping, etc.
4. No Visible Injury, But Complaint of Pain, or Momentary Unconsciousness.
6. No Injury (driver only)

Investigating Officer	Badge/Code Number	Agency/Department Name and Code	Reviewing Officer	Report File Date
E.L. GARCIA	3650	FCPD (029)		

Officer Initials JG Badge # 365

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Police Crash Report

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Revised Report

CRASH

Crash Date: 11/27/2009 | MILITARY Time (24 hr clock): 1630 | County of Crash: FAIRFAX | City of / Town of: | Local Case Number: 200933 10165

DRIVER INFORMATION

Veh: 1 2

Driver's Action P1

- [x] 1. No Improper Action
- [ ] 2. Exceeded Speed Limit
- [ ] 3. Exceeded Safe Speed But Not Speed Limit
- [ ] 4. Overtaking On Hill
- [ ] 5. Overtaking On Curve
- [ ] 6. Overtaking at Intersection
- [ ] 7. Improper Passing of School Bus
- [ ] 8. Cutting In
- [ ] 9. Other Improper Passing
- [ ] 10. Wrong Side of Road – Not Overtaking
- [ ] 11. Did Not Have Right-of-Way
- [ ] 12. Following Too Close
- [ ] 13. Fail to Signal or Improper Signal
- [ ] 14. Improper Turn – Wide Right Turn
- [ ] 15. Improper Turn – Cut Corner on Left Turn
- [ ] 16. Improper Turn From Wrong Lane
- [ ] 17. Other Improper Turn
- [ ] 18. Improper Backing
- [ ] 19. Improper Start From Parked Position
- [ ] 20. Disregarded Officer or Flagger
- [ ] 21. Disregarded Traffic Signal
- [x] 22. Disregarded Stop or Yield Sign
- [ ] 23. Driver Distraction
- [ ] 24. Fail to Stop at Through Highway – No Sign
- [ ] 25. Drive Through Work Zone
- [ ] 26. Fail to Set Out Flares or Flags
- [ ] 27. Fail to Dim Headlights
- [ ] 28. Driving Without Lights
- [ ] 29. Improper Parking Location
- [ ] 30. Avoiding Pedestrian
- [ ] 31. Avoiding Other Vehicle
- [ ] 32. Avoiding Animal
- [ ] 33. Crowded Off Highway
- [ ] 34. Hit and Run
- [ ] 35. Car Ran Away – No Driver
- [ ] 36. Blinded by Headlights
- [ ] 37. Other
- [ ] 38. Avoiding Object in Roadway
- [ ] 39. Eluding Police
- [ ] 40. Fail to Maintain Proper Control
- [ ] 41. Improper Passing
- [ ] 42. Improper or Unsafe Lane Change
- [ ] 43. Over Correction

Condition of Driver Contributing to the Crash P2

- [x] 1. No Defects
- [ ] 2. Eyesight Defective
- [ ] 3. Hearing Defective
- [ ] 4. Other Body Defects
- [ ] 5. Illness
- [ ] 6. Fatigued
- [ ] 7. Apparently Asleep
- [ ] 8. Other
- [ ] 9. Unknown

Veh: 1 2

Driver Vision Obscured P3

- [x] 1. Not Obscured
- [ ] 2. Rain, Snow, etc. on Windshield
- [ ] 3. Windshield Otherwise Obscured
- [ ] 4. Vision Obscured by Load on Vehicle
- [ ] 5. Trees, Crops, etc.
- [ ] 6. Building
- [ ] 7. Embankment
- [ ] 8. Sign or Signboard
- [ ] 9. Hillcrest
- [ ] 10. Parked Vehicle(s)
- [ ] 11. Moving Vehicle(s)
- [ ] 12. Sun or Headlight Glare
- [ ] 13. Other
- [ ] 14. Blind Spot
- [ ] 15. Smoke/Dust
- [ ] 16. Stopped Vehicle(s)

Type of Driver Distractions P4

- [x] 1. Looking at Roadside Incident
- [ ] 2. Driver Fatigue
- [ ] 3. Looking at Scenery
- [ ] 4. Passenger(s)
- [ ] 5. Radio/CD, etc.
- [ ] 6. Cell Phone
- [ ] 7. Eyes Not on Road
- [ ] 8. Daydreaming
- [ ] 9. Eating/Drinking
- [ ] 10. Adjusting Vehicle Controls
- [ ] 11. Other
- [ ] 12. Navigation Device

Drinking P5

- [x] 1. Had Not Been Drinking
- [ ] 2. Drinking – Obviously Drunk
- [ ] 3. Drinking – Ability Impaired
- [ ] 4. Drinking – Ability Not Impaired
- [ ] 5. Drinking – Not Known Whether Impaired
- [ ] 6. Unknown

Method of Alcohol Determination (by police) P6

- [ ] 1. Blood
- [ ] 2. Breath
- [ ] 3. Refused
- [x] 4. No Test

Drug Use P7

- [ ] 1. Yes
- [x] 2. No
- [ ] 3. Unknown

VEHICLE INFORMATION

Veh: 1 2

Vehicle Maneuver V1

- [x] 1. Going Straight Ahead
- [ ] 2. Making Right Turn
- [ ] 3. Making Left Turn
- [ ] 4. Making U-Turn
- [ ] 5. Slowing or Stopping
- [ ] 6. Merging Into Traffic Lane
- [ ] 7. Starting From Parked Position
- [ ] 8. Stopped in Traffic Lane
- [ ] 9. Ran Off Road – Right
- [ ] 10. Ran Off Road – Left
- [ ] 11. Parked
- [ ] 12. Backing
- [ ] 13. Passing
- [ ] 14. Changing Lanes
- [ ] 15. Other
- [ ] 16. Entering Street From Parking Lot

Skidding Tire/Mark V2

- [ ] 1. Before Application of Brakes
- [ ] 2. After Application of Brakes
- [ ] 3. Before and After Application of Brakes
- [x] 4. No Visible Skid Mark/Tire Mark

Vehicle Body Type V3

- [x] 1. Passenger car
- [ ] 2. Truck – Pick-up/Passenger Truck
- [ ] 3. Van
- [ ] 4. Truck – Single Unit Truck (2-Axles)
- [ ] 7. Motor Home, Recreational Vehicle
- [ ] 8. Special Vehicle – Oversized Vehicle/Earthmover/Road Equipment
- [ ] 9. Bicycle
- [ ] 10. Moped
- [ ] 11. Motorcycle
- [ ] 12. Emergency Vehicle (Regardless of Vehicle Type)
- [ ] 13. Bus – School Bus
- [ ] 14. Bus – City Transit Bus/Privately Owned Church Bus
- [ ] 15. Bus – Commercial Bus
- [ ] 16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.
- [ ] 18. Special Vehicle – Farm Machinery
- [ ] 19. Special Vehicle – ATV
- [ ] 21. Special Vehicle – Low-Speed Vehicle
- [ ] 22. Truck – Sport Utility Vehicle (SUV)
- [ ] 23. Truck – Single Unit Truck (3 Axles or More)
- [ ] 25. Truck – Truck Tractor (Bobtail-No Trailer)

Veh: 1 2

Vehicle Damage V4

- [ ] 1. Unknown
- [ ] 2. No damage
- [ ] 3. Overturned
- [ ] 4. Motor
- [ ] 5. Undercarriage
- [ ] 6. Totaled
- [ ] 7. Fire
- [x] 8. Other

Vehicle Condition V5

- [x] 1. No Defects
- [ ] 2. Lights Defective
- [ ] 3. Brakes Defective
- [ ] 4. Steering Defective
- [ ] 5. Puncture/Blowout
- [ ] 6. Worn or Slick Tires
- [ ] 7. Motor Trouble
- [ ] 8. Chains In Use
- [ ] 9. Other
- [ ] 10. Vehicle Altered
- [ ] 11. Mirrors Defective
- [ ] 12. Power Train Defective
- [ ] 13. Suspension Defective
- [ ] 14. Windows/Windshield Defective
- [ ] 15. Wipers Defective
- [ ] 16. Wheels Defective
- [ ] 17. Exhaust System

Special Function (Motor Vehicle) V6

- [x] 1. No Special Function
- [ ] 2. Taxi
- [ ] 3. School Bus (Public or Private)
- [ ] 4. Transit Bus
- [ ] 5. Intercity Bus
- [ ] 6. Charter Bus
- [ ] 7. Other Bus
- [ ] 8. Military
- [ ] 9. Police
- [ ] 10. Ambulance
- [ ] 11. Fire Truck
- [ ] 12. Tow Truck
- [ ] 13. Maintenance
- [ ] 14. Unknown

EMV in service V7

- [ ] 1. Yes
- [ ] 2. No

Truck Cover V8

- [ ] 1. Yes
- [ ] 2. No

Police Crash Report

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CRASH

Crash Date: 11/27/2009 | MILITARY Time (24 hr clock): 1630 | County of Crash: FAIRFAX | City of / Town of: | Local Case Number: 200933010165

CRASH INFORMATION

Location of First Harmful Event in Relation to Roadway — C1

- 1. On Roadway
- 2. Shoulder
- 3. Median
- 4. Roadside
- 5. Gore
- 6. Separator
- 7. In Parking Lane or Zone
- 8. Off Roadway, Location Unknown
- 9. Outside Right-of-Way

Weather Condition — C2

- 1. No Adverse Condition (Clear/Cloudy)
- 3. Fog
- 4. Mist
- 5. Rain
- 6. Snow
- 7. Sleet/Hail
- 8. Smoke/Dust
- 9. Other
- 10. Blowing Sand, Soil, Dirt, or Snow
- 11. Severe Crosswinds

Light Conditions — C3

- 1. Dawn
- 2. Daylight
- 3. Dusk
- 4. Darkness –Road Lighted
- 5. Darkness –Road Not Lighted
- 6. Darkness –Unknown Road Lighting
- 7. Unknown

Traffic Control Device — C4

- 1. Yes – Working
- 2. Yes – Working and Obscured
- 3. Yes – Not Working
- 4. Yes – Not Working and Obscured
- 5. Yes – Missing
- 6. No Traffic Control Device Present

Traffic Control Type — C5

- 1. No Traffic Control
- 2. Officer or Flagger
- 3. Traffic Signal
- 4. Stop Sign
- 5. Slow or Warning Sign
- 6. Traffic Lanes Marked
- 7. No Passing Lines
- 8. Yield Sign
- 9. One Way Road or Street
- 10. Railroad Crossing With Markings and Signs
- 11. Railroad Crossing With Signals
- 12. Railroad Crossing With Gate and Signals
- 13. Other
- 14. Pedestrian Crosswalk
- 15. Reduced Speed – School Zone
- 16. Reduced Speed – Work Zone
- 17. Highway Safety Corridor

Roadway Alignment — C6

- 1. Straight – Level
- 2. Curve – Level
- 3. Grade – Straight
- 4. Grade – Curve
- 5. Hillcrest – Straight
- 6. Hillcrest – Curve
- 7. Dip – Straight
- 8. Dip – Curve
- 9. Other
- 10. On/Off Ramp

Roadway Surface Condition — C7

- 1. Dry
- 2. Wet
- 3. Snowy
- 4. Icy
- 5. Muddy
- 6. Oil/Other Fluids
- 7. Other
- 8. Natural Debris
- 9. Water (Standing, Moving)
- 10. Slush
- 11. Sand, Dirt, Gravel

Roadway Surface Type — C8

- 1. Concrete
- 2. Blacktop, Asphalt, Bituminous
- 3. Brick or Block
- 4. Slag, Gravel, Stone
- 5. Dirt
- 6. Other

Roadway Description — C9

- 1. Two-Way, Not Divided
- 2. Two-Way, Divided, Unprotected Median
- 3. Two-Way, Divided, Positive Median Barrier
- 4. One-Way, Not Divided
- 5. Unknown

Roadway Defects — C10

- 1. No Defects
- 2. Holes, Ruts, Bumps
- 3. Soft or Low Shoulder
- 4. Under Repair
- 5. Loose Material
- 6. Restricted Width
- 7. Slick Pavement
- 8. Roadway Obstructed
- 9. Other
- 10. Edge Pavement Drop Off

Relation to Roadway — C11

Interchange Area:

- 1. Main-Line Roadway
- 2. Acceleration/Deceleration Lanes
- 3. Gore Area (Between Ramp and Highway Edgelines)
- 4. Collector/Distributor Road
- 5. On Entrance/Exit Ramp
- 6. Intersection at end of Ramp
- 7. Other location not listed above within an interchange area (median, shoulder and roadside)

Intersection Area:

- 8. Non-Intersection
- 9. Within Intersection
- 10. Intersection-Related - Within 150'
- 11. Intersection-Related - Outside 150'

Other Location:

- 12. Crossover Related
- 13. Driveway, Alley-Access - Related
- 14. Railway Grade Crossing
- 15. Other Crossing (Crossings for Bikes, School, etc.)

Intersection Type — C12

- 1. Not at Intersection
- 2. Two Approaches
- 3. Three Approaches
- 4. Four Approaches
- 5. Five-Point, or more
- 6. Roundabout

Work Zone — C13

- 1. Yes
- 2. No

Work Zone Workers Present — C14

- 1. With Law Enforcement
- 2. With No Law Enforcement
- 3. No Workers Present

Work Zone Location — C15

- 1. Advance Warning Area
- 2. Transition Area
- 3. Activity Area
- 4. Termination Area

Work Zone Type — C16

- 1. Lane Closure
- 2. Lane Shift/Crossover
- 3. Work on Shoulder or Median
- 4. Intermittent or Moving Work
- 5. Other

School Zone — C17

- 1. Yes
- 2. Yes - With School Activity
- 3. No

Type of Collision — C18

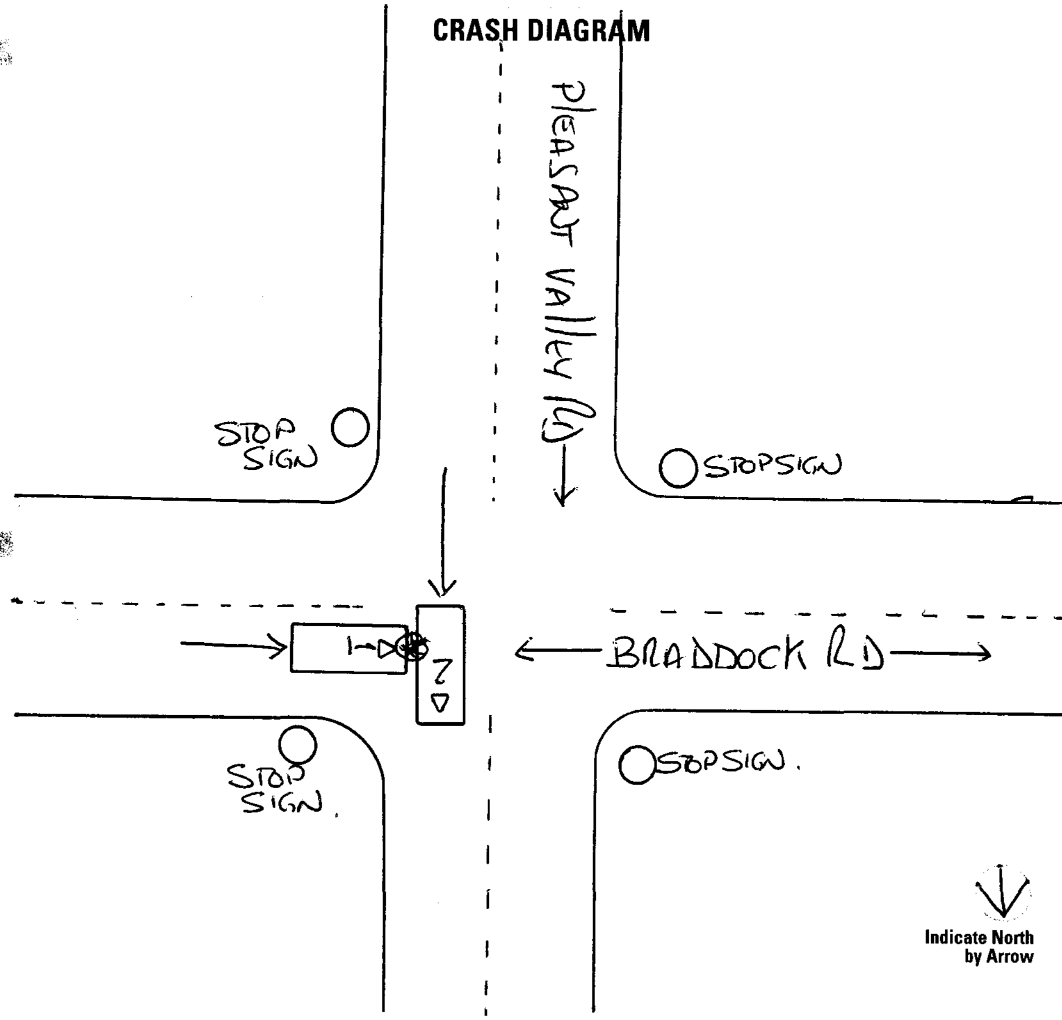
- 1. Rear End
- 2. Angle
- 3. Head On
- 4. Sideswipe – Same Direction
- 5. Sideswipe – Opposite Direction
- 6. Fixed Object in Road
- 7. Train
- 8. Non-Collision
- 9. Fixed Object – Off Road
- 10. Deer
- 11. Other Animal
- 12. Pedestrian
- 13. Bicyclist
- 14. Motorcyclist
- 15. Backed Into
- 16. Other

Revised Report

CRASH

Crash Date	MILITARY Time (24 hr clock)	County of Crash	City of / Town of	Local Case Number
11 27 2009	1630	FAIRFAX		200933 10165

CRASH DIAGRAM



VEHICLE # 1
Fill In Impact Area(s). Initial Impact. 12
12, 11, 1, 10, 2, 9, 13, 3, 8, 4, 7, 5, 6
Veh Dir of Travel–N/S/E/W: W

[redacted] 2
Fill In Impact Area(s). Initial Impact. 4
12, 11, 1, 10, 2, 9, 13, 3, 8, 4, 7, 5, 6
Veh Dir of Travel–N/S/E/W: N

VEHICLE #
Fill In Impact Area(s). Initial Impact.
12, 11, 1, 10, 2, 9, 13, 3, 8, 4, 7, 5, 6
Veh Dir of Travel–N/S/E/W

[redacted]
Fill In Impact Area(s). Initial Impact.
12, 11, 1, 10, 2, 9, 13, 3, 8, 4, 7, 5, 6
Veh Dir of Travel–N/S/E/W

DAMAGE TO PROPERTY OTHER THAN VEHICLES

Approx. Repair Cost	Object Struck (Tree, Fence, etc.)	Property Owners Name (Last, First, Middle)	Address (Street and Number)	VDOT Property

CRASH DESCRIPTION

200933 10165 / 90102 / 218

VEH #2 WAS CROSSING BRADDOCK RD. AFTER STOPPED AND THE INTERSECTION, WHEN. VEH #1 DISREGARD THE STOP SIGN STRICKING VEH #2 ON THE RIGHT REAR FENDER.

CRASH EVENTS

[redacted]					
1	20				

Vehicle #	First Event	Second Event	Third Event	Fourth Event	Most Harmful Event
2	20				

[redacted]					

Vehicle #	First Event	Second Event	Third Event	Fourth Event	Most Harmful Event

First Harmful Event of Entire Crash that Results in First Injury or Damage. 20

COLLISION WITH FIXED OBJECT
1. Bank Or Ledge
2. Trees
3. Utility Pole
4. Fence Or Post
5. Guard Rail
6. Parked Vehicle
7. Tunnel, Bridge, Underpass, Culvert, etc.
8. Sign, Traffic Signal
9. Impact Cushioning Device
10. Other
11. Jersey Wall
12. Building/Structure
13. Curb
14. Ditch
15. Other Fixed Object
16. Other Traffic Barrier
17. Traffic Sign Support
18. Mailbox

COLLISION WITH PERSON, MOTOR VEHICLE OR NON-FIXED OBJECT
19. Pedestrian
20. Motor Vehicle In Transport
21. Train
22. Bicycle
23. Animal
24. Work Zone Maintenance Equipment
25. Other Movable Object
26. Unknown Movable Object
27. Other

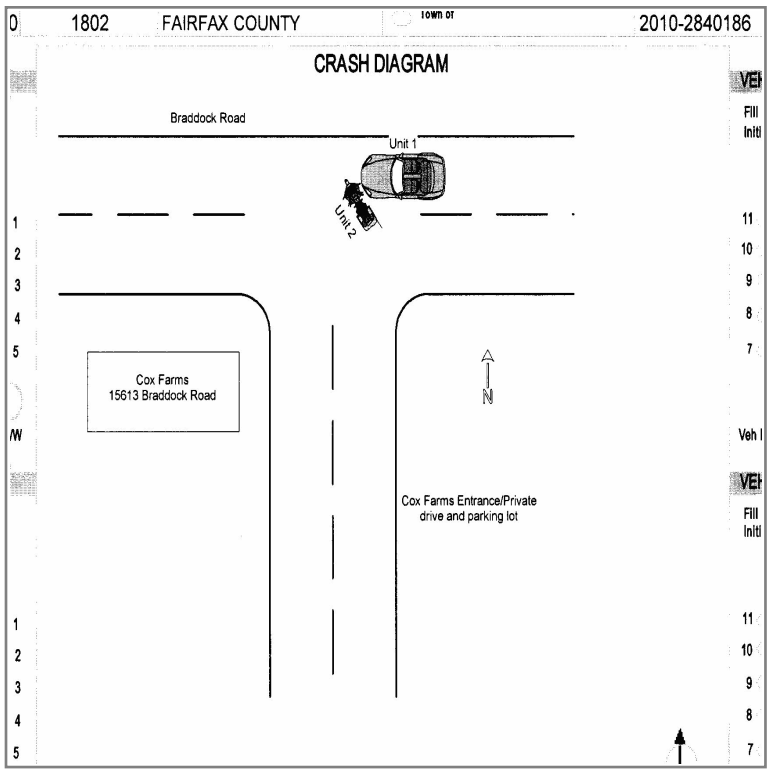
NON-COLLISION
28. Ran Off Road
29. Jack Knife
30. Overturn (Rollover)
31. Downhill Runaway
32. Cargo Loss or Shift
33. Explosion or Fire
34. Separation of Units
35. Cross Median
36. Cross Centerline
37. Equipment Failure (Tire, etc)
38. Immersion
39. Fell/Jumped From Vehicle
40. Thrown or Falling Object
41. Non-Collision Unknown
42. Other Non-Collision

Crash Report

Document Number	103430741			Jurisdiction	Fairfax County	GPS Lat.	GPS Long.
Revised Report	0			County of Crash	Fairfax County	38.883540	-77.489440
Crash Date	Monday	10/11/2010	1802	Landmarks at Scene	15613 BRADDOCK RD		
City / Town of				Railroad Crossing ID			
Location of Crash	15613 BRADDOCK RD						

Mile Marker Number	Number of Vehicles
0.00	2

Crash Image



Fatalities Non-Pedestrian	0
Fatalities Pedestrian	0
Injuries Non-Pedestrian	1
Injuries Pedestrian	0

Crash Information

Location of First Harmful Event	1. On Roadway	Roadway Defects	1. No Defects
Weather Condition	1. No Adverse Condition (Clear/Cloudy)	Relation to Roadway	1. Main-Line Roadway
Light Condition	2. Daylight	Intersection Type	1. Not at Intersection
Traffic Control Mechanical Device	1. Yes - Working	Work Zone Related	2. No
Traffic Control Type	6. Traffic Lanes Marked	Work Zone Workers Present	Not Provided
Roadway Alignment	1. Straight - Level	Work Zone Location	Not Provided
Roadway Surface Condition	1. Dry	Work Zone Type	Not Provided
Roadway Surface Type	2. Blacktop, Asphalt, Bituminous	School Zone	3. No
Roadway Description	1. Two-Way, Not Divided	Type of Collision	2. Angle

Crash Description

CRASH DESCRIPTIONVeh #1 was attempting to make a left turn out of Cox Farms located on Braddock Road.Veh #2 was traveling WB on Braddock Road. Veh #1 pulled out of the parking lot (view was

Crash Report

Driver Information 07/01/1968 Age 42

Driver's Action	11. Did Not Have Right-of-Way
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	11. Moving Vehicle(s)
Type of Driver Distractions	Not Applicable
Drinking	Not Applicable
Method of Alcohol Determination	Not Applicable
Drug Use	Not Applicable
Driver's License	
Commercial Driver's License	No
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	2. Not Deployed
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	6. No Injury (driver only)
EMS Transport	NotProvided
Summons Issued	2. No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count < 8	8-17	18-21	> 21
3	35	35	3	0	0	0

Vehicle Information 1

Vehicle Maneuver	3. Making Left Turn
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	1. Passenger car
Vehicle Damage	8. Other
Vehicle Condition	1. No Defects
Spec. Function Motor Vehicle	1. No Special Function
EMV in service	Not Applicable
Truck Cover	Not Applicable
Vehicle Disabled	No
Commercial Motor Vehicle	No
Towed	No
Oversized	No
Cargo Spill	No
Override	No
Underride	No
Initial Impact Area	3. Right side - middle
Direction of Travel	North
Crash Events: 1.	20. Motor Vehicle In Transport
2.	Not Provided
3.	Not Provided
4.	Not Provided
Most Harmful	20. Motor Vehicle In Transport

Weight over 10,000 lbs	Seats 9 or more	Hazardous Materials Placard
No	No	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 11/17/1954 Age 55

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	Not Applicable

Vehicle Information 2

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	2. After Application of Brakes
Vehicle Body Type	11. Motorcycle

Crash Report

Method of Alcohol Determination	Not Applicable	Vehicle Damage	4. Motor
Drug Use	Not Applicable	Vehicle Condition	1. No Defects
Driver's License		Spec. Function Motor Vehicle	1. No Special Function
Commercial Driver's License	No	EMV in service	Not Applicable
Safety Equipment Used	5. Helmet	Truck Cover	Not Applicable
Air Bag	3. Unavailable/Not Applicable	Vehicle Disabled	No
Ejected from Vehicle	1. Not Ejected	Commercial Motor Vehicle	No
Date of Death		Towed	Yes
Injury Type	3. Minor/Possible Injury	Oversized	No
		Override	No
EMS Transport	Yes	Initial Impact Area	12. Front
Summons Issued	2. No	Direction of Travel	West
		Crash Events: 1.	20. Motor Vehicle In Transport
		2.	Not Provided
		3.	Not Provided
		4.	Not Provided
		Most Harmful	20. Motor Vehicle In Transport

Cargo Spill	No
Underride	No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
15	35	35	0	0	0	1

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

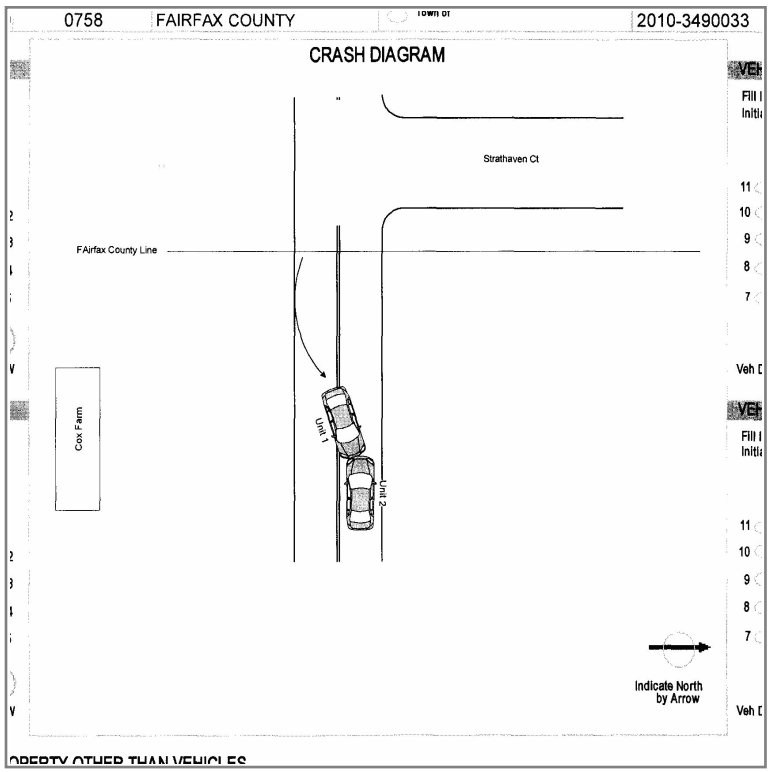
Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Crash Report

						GPS Lat.	GPS Long.
Document Number	110420483		Jurisdiction	Fairfax County		38.883760	-77.489910
Revised Report	0		County of Crash	Fairfax County			
Crash Date	Wednesday	12/15/2010 758	Landmarks at Scene	COX FARM			
City / Town of			Railroad Crossing ID				
Location of Crash	15613 braddock rd No - At Intersection With or 5.00 Miles Not Provided of starthaven ct				Mile Marker Number 0.00	Number of Vehicles 2	

Crash Image



Fatalities Non-Pedestrian	0
Fatalities Pedestrian	0
Injuries Non-Pedestrian	2
Injuries Pedestrian	0

Crash Information

Location of First Harmful Event	4. Roadside	Roadway Defects	1. No Defects
Weather Condition	1. No Adverse Condition (Clear/Cloudy)	Relation to Roadway	1. Main-Line Roadway
Light Condition	2. Daylight	Intersection Type	1. Not at Intersection
Traffic Control Mechanical Device	1. Yes - Working	Work Zone Related	2. No
Traffic Control Type	6. Traffic Lanes Marked	Work Zone Workers Present	Not Provided
Roadway Alignment	1. Straight - Level	Work Zone Location	Not Provided
Roadway Surface Condition	1. Dry	Work Zone Type	Not Provided
Roadway Surface Type	2. Blacktop, Asphalt, Bituminous	School Zone	3. No
Roadway Description	1. Two-Way, Not Divided	Type of Collision	3. Head On

Crash Description

Crash Report

Driver Information 04/07/1974 Age 36

Driver's Action	40. Fail to Maintain Proper Control
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	Not Applicable
Method of Alcohol Determination	Not Applicable
Drug Use	Not Applicable
Driver's License	
Commercial Driver's License	No
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	1. Deployed - Front
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	4. No Apparent Injury
EMS Transport	Yes
Summons Issued	1. Yes

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count < 8	8-17	18-21	> 21
30	35	35	0	0	0	0

Vehicle Information 1

Vehicle Maneuver	8. Stopped in Traffic Lane
Skidding Tire / Mark	2. After Application of Brakes
Vehicle Body Type	1. Passenger car
Vehicle Damage	8. Other
Vehicle Condition	1. No Defects
Spec. Function Motor Vehicle	1. No Special Function
EMV in service	Not Applicable
Truck Cover	Not Applicable
Vehicle Disabled	Yes
Commercial Motor Vehicle	No
Towed	Yes
Oversized	No
Cargo Spill	No
Override	No
Underride	No
Initial Impact Area	12. Front
Direction of Travel	West
Crash Events: 1.	20. Motor Vehicle In Transport
2.	Not Provided
3.	Not Provided
4.	Not Provided
Most Harmful	20. Motor Vehicle In Transport

Weight over 10,000 lbs	Seats 9 or more	Hazardous Materials Placard
No	No	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 09/20/1982 Age 28

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	Not Applicable

Vehicle Information 2

Vehicle Maneuver	8. Stopped in Traffic Lane
Skidding Tire / Mark	Not Applicable
Vehicle Body Type	1. Passenger car

Crash Report

Method of Alcohol Determination	Not Applicable	Vehicle Damage	8. Other
Drug Use	Not Applicable	Vehicle Condition	1. No Defects
Driver's License		Spec. Function Motor Vehicle	1. No Special Function
Commercial Driver's License	No	EMV in service	Not Applicable
Safety Equipment Used	3. Lap and Shoulder Belt	Truck Cover	Not Applicable
Air Bag	1. Deployed - Front	Vehicle Disabled	Yes
Ejected from Vehicle	1. Not Ejected	Commercial Motor Vehicle	No
Date of Death		Towed	Yes
Injury Type	4. No Apparent Injury	Oversized	No
		Override	No
EMS Transport	Yes	Initial Impact Area	12. Front
Summons Issued	1. Yes	Direction of Travel	East
		Crash Events: 1.	20. Motor Vehicle In Transport
		2.	Not Provided
		3.	Not Provided
		4.	Not Provided
		Most Harmful	20. Motor Vehicle In Transport

Cargo Spill: No
Underride: No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
0	35	35	0	0	0	0

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

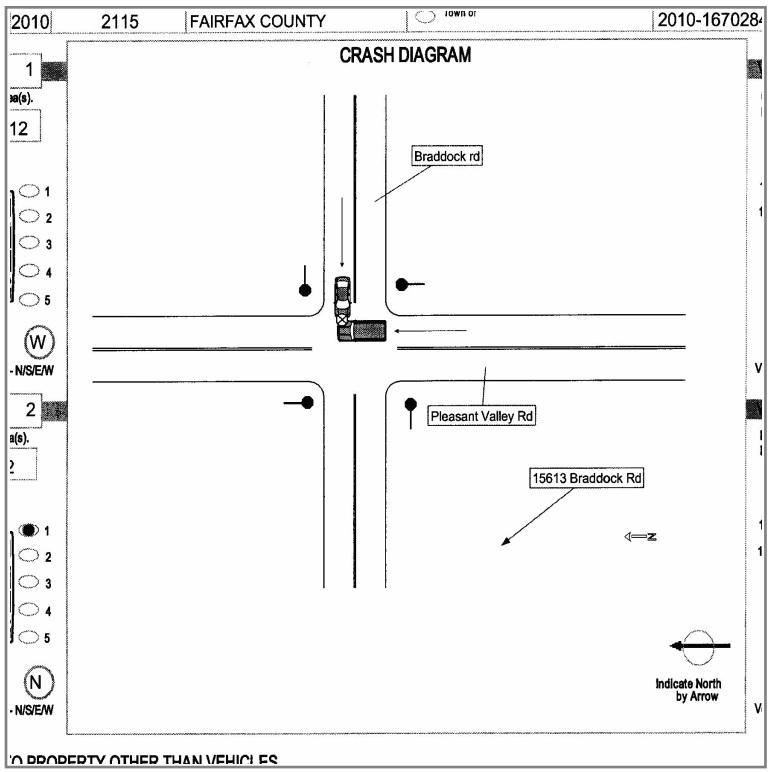
Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Crash Report

						GPS Lat.	GPS Long.
Document Number	102030029		Jurisdiction	Fairfax County		38.881672	-77.485544
Revised Report	0		County of Crash	Fairfax			
Crash Date	Wednesday	06/16/2010 2115	Landmarks at Scene	15613 BRADDOCK ROAD			
City / Town of			Railroad Crossing ID				
Location of Crash	BRADDOCK ROAD Yes - At Intersection With or 0.00 Feet South of PLEASANT VALLEY ROAD				Mile Marker Number 0.00	Number of Vehicles 2	

Crash Image



Fatalities Non-Pedestrian	0
Fatalities Pedestrian	0
Injuries Non-Pedestrian	0
Injuries Pedestrian	0

Crash Information

Location of First Harmful Event	1. On Roadway	Roadway Defects	1. No Defects
Weather Condition	1. No Adverse Condition (Clear/Cloudy)	Relation to Roadway	9. Within Intersection
Light Condition	5. Darkness - Road Not Lighted	Intersection Type	4. Four Approaches
Traffic Control Mechanical Device	6. No Traffic Control Device Present	Work Zone Related	2. No
Traffic Control Type	4. Stop Sign	Work Zone Workers Present	Not Provided
Roadway Alignment	1. Straight - Level	Work Zone Location	Not Provided
Roadway Surface Condition	1. Dry	Work Zone Type	Not Provided
Roadway Surface Type	2. Blacktop, Asphalt, Bituminous	School Zone	3. No
Roadway Description	1. Two-Way, Not Divided	Type of Collision	2. Angle

Crash Description

CRASHEVENTS

Crash Report

Driver Information 02/27/1990 Age 20

Driver's Action	21. Disregarded Traffic Signal
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	5. Trees, Crops, etc.
Type of Driver Distractions	12. Navigation Device
Drinking	1. Had Not Been Drinking
Method of Alcohol Determination	Not Applicable
Drug Use	2. No
Driver's License	
Commercial Driver's License	NotProvided
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	2. Not Deployed
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	6. No Injury (driver only)
EMS Transport	No
Summons Issued	1. Yes

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count < 8	8-17	18-21	> 21
30	35	35	0	1	0	0

Vehicle Information 1

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	1. Passenger car
Vehicle Damage	8. Other
Vehicle Condition	1. No Defects
Spec. Function Motor Vehicle	1. No Special Function
EMV in service	Not Applicable
Truck Cover	Not Applicable
Vehicle Disabled	No
Commercial Motor Vehicle	No
Towed	No
Oversized	No
Override	No
Initial Impact Area	12. Front
Direction of Travel	West
Crash Events: 1.	20. Motor Vehicle In Transport
2.	Not Provided
3.	Not Provided
4.	Not Provided
Most Harmful	20. Motor Vehicle In Transport

Cargo Spill No

Underride No

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 08/23/1959 Age 50

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	1. Had Not Been Drinking

Vehicle Information 2

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	22. Truck - Sport Utility Vehicle (SUV)

Crash Report

Method of Alcohol Determination	Not Applicable	Vehicle Damage	8. Other
Drug Use	Not Applicable	Vehicle Condition	1. No Defects
Driver's License		Spec. Function Motor Vehicle	1. No Special Function
Commercial Driver's License	NotProvided	EMV in service	Not Applicable
Safety Equipment Used	3. Lap and Shoulder Belt	Truck Cover	Not Applicable
Air Bag	2. Not Deployed	Vehicle Disabled	No
Ejected from Vehicle	1. Not Ejected	Commercial Motor Vehicle	No
Date of Death		Towed	Yes
Injury Type	6. No Injury (driver only)	Oversized	No
		Override	No
EMS Transport	No	Initial Impact Area	2. Right side - front
Summons Issued	2. No	Direction of Travel	North
		Crash Events: 1.	20. Motor Vehicle In Transport
		2.	Not Provided
		3.	Not Provided
		4.	Not Provided
		Most Harmful	20. Motor Vehicle In Transport

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
10	35	35	0	0	0	0

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

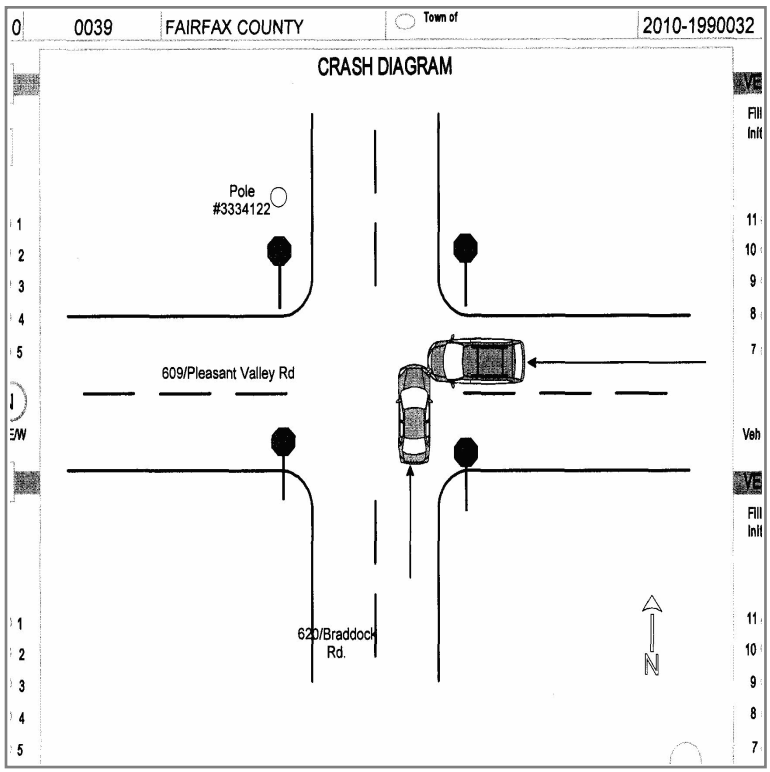
Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Crash Report

Document Number	102210190			Jurisdiction	Fairfax County	GPS Lat.	GPS Long.
Revised Report	0			County of Crash	Fairfax	38.881680	-77.485560
Crash Date	Sunday	07/18/2010	39	Landmarks at Scene	POLE 3334122		
City / Town of				Railroad Crossing ID			
Location of Crash	BRADDOCK RD Yes - At Intersection With or 0.00 Feet Not Provided of PLEASANT VALLEY RD					Mile Marker Number 0.00	Number of Vehicles 2

Crash Image



Fatalities Non-Pedestrian	0
Fatalities Pedestrian	0
Injuries Non-Pedestrian	0
Injuries Pedestrian	0

Crash Information

Location of First Harmful Event	1. On Roadway	Roadway Defects	1. No Defects
Weather Condition	1. No Adverse Condition (Clear/Cloudy)	Relation to Roadway	1. Main-Line Roadway
Light Condition	5. Darkness - Road Not Lighted	Intersection Type	4. Four Approaches
Traffic Control Mechanical Device	1. Yes - Working	Work Zone Related	2. No
Traffic Control Type	4. Stop Sign	Work Zone Workers Present	Not Provided
Roadway Alignment	1. Straight - Level	Work Zone Location	Not Provided
Roadway Surface Condition	1. Dry	Work Zone Type	Not Provided
Roadway Surface Type	2. Blacktop, Asphalt, Bituminous	School Zone	3. No
Roadway Description	1. Two-Way, Not Divided	Type of Collision	2. Angle

Crash Description

CRASH DESCRIPTION - .. - .- - .. - .- ..

Crash Report

Driver Information 03/25/1992 Age 18

Driver's Action	22. Disregarded Stop or Yield Sign
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	7. Eyes Not on Road
Drinking	1. Had Not Been Drinking
Method of Alcohol Determination	Not Applicable
Drug Use	Not Applicable
Driver's License	
Commercial Driver's License	NotProvided
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	2. Not Deployed
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	6. No Injury (driver only)
EMS Transport	No
Summons Issued	2. No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count < 8	8-17	18-21	> 21
50	35	35	0	0	2	0

Vehicle Information 1

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	1. Passenger car
Vehicle Damage	8. Other
Vehicle Condition	1. No Defects
Spec. Function Motor Vehicle	1. No Special Function
EMV in service	Not Applicable
Truck Cover	Not Applicable
Vehicle Disabled	No
Commercial Motor Vehicle	No
Towed	No
Oversized	No
Cargo Spill	No
Override	No
Underride	No
Initial Impact Area	1. Right side - front corner
Direction of Travel	North
Crash Events: 1.	10. Other
2.	Not Provided
3.	Not Provided
4.	Not Provided
Most Harmful	10. Other

Weight over 10,000 lbs	Seats 9 or more	Hazardous Materials Placard
No	No	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 05/11/1966 Age 44

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	1. Had Not Been Drinking

Vehicle Information 2

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	3. Van

Crash Report

Method of Alcohol Determination	Not Applicable	Vehicle Damage	8. Other
Drug Use	Not Applicable	Vehicle Condition	1. No Defects
Driver's License		Spec. Function Motor Vehicle	1. No Special Function
Commercial Driver's License	NotProvided	EMV in service	Not Applicable
Safety Equipment Used	3. Lap and Shoulder Belt	Truck Cover	Not Applicable
Air Bag	2. Not Deployed	Vehicle Disabled	No
Ejected from Vehicle	1. Not Ejected	Commercial Motor Vehicle	No
Date of Death		Towed	No
Injury Type	6. No Injury (driver only)	Oversized	No
		Cargo Spill	No
		Override	No
		Underride	No
EMS Transport	No	Initial Impact Area	11. Left side - front corner
Summons Issued	2. No	Direction of Travel	West
		Crash Events: 1.	10. Other
		2.	Not Provided
		3.	Not Provided
		4.	Not Provided
		Most Harmful	10. Other

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
10	35	35	1	1	0	2

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

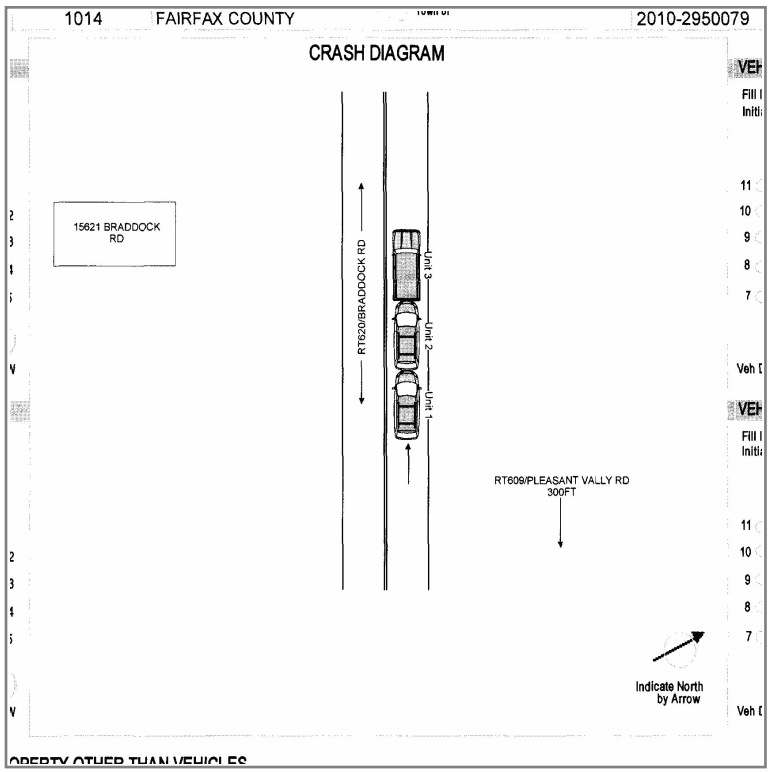
Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Crash Report

						GPS Lat.	GPS Long.
Document Number	103560052		Jurisdiction	Fairfax County		38.882100	-77.486450
Revised Report	0		County of Crash	Fairfax County			
Crash Date	Friday	10/22/2010 1014	Landmarks at Scene	15613 braddock rd			
City / Town of			Railroad Crossing ID				
Location of Crash	15613 braddock rd No - At Intersection With or 300.00 Feet West of RT 609 PLEASANT VALLEY				Mile Marker Number 0.00	Number of Vehicles 3	

Crash Image



Fatalities Non-Pedestrian	0
Fatalities Pedestrian	0
Injuries Non-Pedestrian	1
Injuries Pedestrian	0

Crash Information

Location of First Harmful Event	1. On Roadway	Roadway Defects	1. No Defects
Weather Condition	1. No Adverse Condition (Clear/Cloudy)	Relation to Roadway	1. Main-Line Roadway
Light Condition	2. Daylight	Intersection Type	1. Not at Intersection
Traffic Control Mechanical Device	6. No Traffic Control Device Present	Work Zone Related	2. No
Traffic Control Type	1. No Traffic Control	Work Zone Workers Present	Not Provided
Roadway Alignment	1. Straight - Level	Work Zone Location	Not Provided
Roadway Surface Condition	1. Dry	Work Zone Type	Not Provided
Roadway Surface Type	2. Blacktop, Asphalt, Bituminous	School Zone	3. No
Roadway Description	1. Two-Way, Not Divided	Type of Collision	1. Rear End

Crash Description

Crash Report

Driver Information 10/25/1965 Age 44

Driver's Action	23. Driver Distraction
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	2. Rain, Snow, etc. on Windshield
Type of Driver Distractions	7. Eyes Not on Road
Drinking	1. Had Not Been Drinking
Method of Alcohol Determination	4. No Test
Drug Use	2. No
Driver's License	
Commercial Driver's License	NotProvided
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	2. Not Deployed
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	6. No Injury (driver only)
EMS Transport	No
Summons Issued	1. Yes

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count < 8	8-17	18-21	> 21
15	25	25	0	0	0	0

Vehicle Information 1

Vehicle Maneuver	1. Going Straight Ahead
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	3. Van
Vehicle Damage	8. Other
Vehicle Condition	1. No Defects
Spec. Function Motor Vehicle	Not Applicable
EMV in service	Not Applicable
Truck Cover	Not Applicable
Vehicle Disabled	No
Commercial Motor Vehicle	No
Towed	No
Oversized	No
Cargo Spill	No
Override	No
Underride	No
Initial Impact Area	12. Front
Direction of Travel	West
Crash Events: 1.	20. Motor Vehicle In Transport
2.	Not Provided
3.	Not Provided
4.	Not Provided
Most Harmful	20. Motor Vehicle In Transport

Weight over 10,000 lbs	Seats 9 or more	Hazardous Materials Placard
No	No	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 11/12/1967 Age 42

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	1. Had Not Been Drinking

Vehicle Information 2

Vehicle Maneuver	5. Slowing or Stopping
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark
Vehicle Body Type	3. Van

Crash Report

Method of Alcohol Determination	4. No Test	Vehicle Damage	8. Other
Drug Use	2. No	Vehicle Condition	1. No Defects
Driver's License		Spec. Function Motor Vehicle	Not Applicable
Commercial Driver's License	NotProvided	EMV in service	Not Applicable
Safety Equipment Used	3. Lap and Shoulder Belt	Truck Cover	Not Applicable
Air Bag	2. Not Deployed	Vehicle Disabled	Yes
Ejected from Vehicle	1. Not Ejected	Commercial Motor Vehicle	No
Date of Death		Towed	Yes
Injury Type	4. No Apparent Injury	Oversized	No
		Override	No
EMS Transport	No	Initial Impact Area	6. Rear
Summons Issued	2. No	Direction of Travel	West

Cargo Spill: No

Underride: No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
5	25	25	0	0	0	0

Crash Events: 1.	20. Motor Vehicle In Transport
2.	20. Motor Vehicle In Transport
3.	Not Provided
4.	Not Provided
Most Harmful	20. Motor Vehicle In Transport

Weight over 10,000 lbs	No	Seats 9 or more	No	Hazardous Materials Placard	No

Commercial Motor Vehicle Section

Vehicle Configuration	Not Provided		
Cargo Body Type	Not Provided	License Class	
GVWR/GCWR	Not Provided	Commercial Endorsement	

Hazardous Material

Hazardous Material Placard	NotProvided	HM Class	
HM 4-Digit		HM Cargo Present	NotProvided
HM Placard Name		HM Cargo Released	NotProvided

Carrier Identification

Commericial Motor Carrier Name	
US DOT# / State	
Commercial / Non-Commercial	

Passenger Information

EMS Transport		Safety Equip Used	
Date of Death		Airbag Deployment Type	
Position In / On Vehicle		Ejected from Vehicle Type	
		Injury Type	

Driver Information 04/12/1966 Age 44

Driver's Action	1. No Improper Action
Condition of Driver Contributing to	1. No Defects
Driver Vision Obscured	1. Not Obscured
Type of Driver Distractions	Not Applicable
Drinking	1. Had Not Been Drinking
Method of Alcohol Determination	4. No Test
Drug Use	2. No
Driver's License	
Commercial Driver's License	NotProvided
Safety Equipment Used	3. Lap and Shoulder Belt
Air Bag	2. Not Deployed
Ejected from Vehicle	1. Not Ejected
Date of Death	
Injury Type	6. No Injury (driver only)

Vehicle Information 3

Vehicle Maneuver	8. Stopped in Traffic Lane		
Skidding Tire / Mark	4. No Visible Skid Mark/Tire Mark		
Vehicle Body Type	1. Passenger car		
Vehicle Damage	8. Other		
Vehicle Condition	1. No Defects		
Spec. Function Motor Vehicle	Not Applicable		
EMV in service	Not Applicable		
Truck Cover	Not Applicable		
Vehicle Disabled	No		
Commercial Motor Vehicle	No		
Towed	No		
Oversized	No	Cargo Spill	No

Crash Report

EMS Transport No
Summons Issued 2. No

Speed Before Crash	Speed Limit	Maximum Safe Speed	ALL Passengers Age Count			
			< 8	8-17	18-21	> 21
0	25	25	1	0	0	0

Override No Underride No
Initial Impact Area 6. Rear
Direction of Travel West
Crash Events: 1. 20. Motor Vehicle In Transport
2. Not Provided
3. Not Provided
4. Not Provided
Most Harmful 20. Motor Vehicle In Transport

Weight over 10,000 lbs No
Seats 9 or more No
Hazardous Materials Placard No

Commercial Motor Vehicle Section

Vehicle Configuration Not Provided
Cargo Body Type Not Provided
GVWR/GCWR Not Provided
License Class
Commercial Endorsement

Hazardous Material

Hazardous Material Placard NotProvided
HM 4-Digit
HM Placard Name
HM Class
HM Cargo Present NotProvided
HM Cargo Released NotProvided

Carrier Identification

Commericial Motor Carrier Name
US DOT# / State
Commercial / Non-Commercial

Passenger Information

EMS Transport
Date of Death
Position In / On Vehicle
Safety Equip Used
Airbag Deployment Type
Ejected from Vehicle Type
Injury Type

Appendix D
MUTCD Traffic Signal Warrant Analysis Worksheets

Study Name 10089-119-Braddock/Pleasant Valley
Start Date 9/25/2012
Start Time 6:00AM

	Pleasant Valley Drive Southbound			Braddock Road Westbound			Pleasant Valley Drive Northbound			Braddock Road Eastbound					
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Sum Hourly Totals	Eight highest hours	Percent Reduction of Traffic
6:00 AM	1	4	2	4	17	0	13	38	7	14	59	8			
6:15 AM	0	5	8	7	17	2	15	52	7	17	83	12			
6:30 AM	2	10	9	12	22	2	22	49	14	17	112	17			
6:45 AM	2	17	31	15	36	3	55	52	13	16	94	19	1033	7	68%
7:00 AM	3	25	41	9	29	7	33	55	20	21	102	13	1224		
7:15 AM	7	38	57	14	30	14	38	38	20	14	87	7	1363		
7:30 AM	4	38	70	18	21	7	45	50	14	10	98	11	1461		
7:45 AM	4	28	78	25	45	3	56	42	13	15	82	11	1510	2	99%
8:00 AM	2	18	91	9	30	4	47	51	12	15	92	4	1527		
8:15 AM	2	26	74	16	24	4	40	50	17	10	90	8	1524		
8:30 AM	3	31	70	13	25	5	39	60	8	15	87	5	1499		
8:45 AM	2	38	69	23	27	5	35	57	14	13	88	9	1477	3	97%
9:00 AM	1	34	62	19	29	13	37	48	10	10	81	8	1454		
9:15 AM	2	33	76	18	28	3	19	35	13	21	86	8	1435		
9:30 AM	1	15	28	10	28	3	21	30	8	25	113	14	1370		
9:45 AM	6	12	22	17	31	5	22	39	12	22	91	19	1288	5	84%
10:00 AM	5	13	8	3	22	3	9	18	9	16	56	11	1109		
10:15 AM	8	10	7	8	14	5	12	24	17	11	58	8	949		
10:30 AM	5	11	9	8	23	4	6	26	11	12	53	6	827		
10:45 AM	5	19	12	8	20	9	6	21	8	14	35	6	692		
11:00 AM	1	11	6	10	22	9	14	11	11	11	48	10	683		
11:15 AM	5	13	10	11	33	6	9	17	11	12	39	7	674		
11:30 AM	7	19	9	8	37	5	5	22	18	6	36	12	684		
11:45 AM	2	15	11	7	38	6	10	26	13	10	51	6	716		
12:00 PM	7	19	14	18	51	8	2	12	12	11	46	2	754		
12:15 PM	6	20	12	14	45	6	8	28	7	5	31	6	769		
12:30 PM	5	24	15	20	45	9	5	15	14	10	34	10	791		
12:45 PM	3	19	15	9	46	8	7	26	16	9	37	5	796		
1:00 PM	10	19	16	18	43	7	8	16	16	7	45	8	807		
1:15 PM	6	13	11	13	50	7	10	17	26	11	43	5	831		
1:30 PM	5	25	12	14	47	8	4	23	24	14	35	9	845		
1:45 PM	8	22	10	13	55	15	6	16		9	28	5	832		
2:00 PM	9	15	7	20	53	18	11	25	16	14	33	8	848		
2:15 PM	8	41	10	13	40	46	8	12	22	13	38	5	892		
2:30 PM	6	35	14	16	57	15	12	24	23	13	30	9	926		
2:45 PM	7	34	13	14	51	21	8	33	32	22	32	6	1012	8	66%
3:00 PM	7	35	13	11	60	22	6	20	25	17	31	8	1038		
3:15 PM	6	47	7	20	58	18	9	10	25	28	49	6	1065		
3:30 PM	6	42	15	16	72	18	4	24	32	18	29	10	1097		
3:45 PM	15	44	15	12	85	31	5	27	37	26	53	5	1179	6	77%
4:00 PM	9	58	11	17	73	16	8	28	34	20	48	4	1250		
4:15 PM	6	56	6	12	49	8	11	24	34	18	36	9	1236		
4:30 PM	10	65	16	12	77	5	13	28	52	23	45	12	1308		
4:45 PM	12	71	18	13	65	20	11	29	46	37	51	5	1331	4	87%
5:00 PM	13	62	22	16	66	18	7	29	59	27	55	5	1384		
5:15 PM	7	76	14	11	74	13	12	30	54	23	59	5	1493		
5:30 PM	8	68	23	11	77	14	13	33	52	37	56	7	1534		
5:45 PM	8	60	20	12	63	19	10	25	59	35	52	8	1527	1	100%
6:00 PM	6	60	20	11	70	15	8	26	59	32	54	8	1517		

KITTELSON & ASSOCIATES, INC.
1850 Centennial Park Drive Suite 130
Reston, VA 20191
(703) 885-8970

Project #: 11764.14
Project Name: Braddock Road Alternatives Analysis
Analyst: ACJ
Date: 5/23/2013
File: H:\projfile\11764 - Central Region VDOT On-Call\Task Orders\Task 14 (12-057) - Braddock Rd & Pleasant
Intersection: Braddock Road/Pleasant Valley Drive
Scenario: Existing Conditions PM

Warrant Summary

Warrant	Name	Analyzed?	Met?
#1	Eight-Hour Vehicular Volume	Yes	Yes
#2	Four-Hour Vehicular volume	Yes	Yes
#3	Peak Hour	Yes	Yes
#4	Pedestrian Volume	No	-
#5	School Crossing	No	-
#6	Coordinated Signal System	No	-
#7	Crash Experience	No	-
#8	Roadway Network	No	-

Raw Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	EB	WB	NB	SB
5:00 PM	6:00 PM	369	419	383	381
2nd	Highest Hour	365	415	379	377
3rd	Highest Hour	358	406	372	370
4th	Highest Hour	321	365	333	331
5th	Highest Hour	310	352	322	320
6th	Highest Hour	284	323	295	293
7th	Highest Hour	251	285	260	259
8th	Highest Hour	244	277	253	251
9th	Highest Hour	0	0	0	0
10th	Highest Hour	0	0	0	0
11th	Highest Hour	0	0	0	0
12th	Highest Hour	0	0	0	0
13th	Highest Hour	0	0	0	0
14th	Highest Hour	0	0	0	0
15th	Highest Hour	0	0	0	0
16th	Highest Hour	0	0	0	0
17th	Highest Hour	0	0	0	0
18th	Highest Hour	0	0	0	0
19th	Highest Hour	0	0	0	0
20th	Highest Hour	0	0	0	0
21st	Highest Hour	0	0	0	0
22nd	Highest Hour	0	0	0	0
23rd	Highest Hour	0	0	0	0
24th	Highest Hour	0	0	0	0

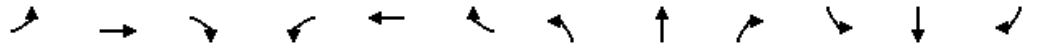
Input Parameters

Volume Adjustment Factor =	1.0
North-South Approach =	Minor
East-West Approach =	Major
Major Street Thru Lanes =	1
Minor Street Thru Lanes =	1
Speed > 40 mph?	No
Population < 10,000?	No
Warrant Factor	100%
Peak Hour or Daily Count?	Peak Hour
Major Street: 4th-Highest Hour / Peak Hour	87%
Major Street: 8th-Highest Hour / Peak Hour	66%
Minor Street: 4th-Highest Hour / Peak Hour	87%
Minor Street: 8th-Highest Hour / Peak Hour	66%

Analysis Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	EB	WB	NB	SB
5:00 PM	6:00 PM	369	419	383	381
2nd	Highest Hour	365	415	379	377
3rd	Highest Hour	358	406	372	370
4th	Highest Hour	321	365	333	331
5th	Highest Hour	310	352	322	320
6th	Highest Hour	284	323	295	293
7th	Highest Hour	251	285	260	259
8th	Highest Hour	244	277	253	251
9th	Highest Hour	0	0	0	0
10th	Highest Hour	0	0	0	0
11th	Highest Hour	0	0	0	0
12th	Highest Hour	0	0	0	0
13th	Highest Hour	0	0	0	0
14th	Highest Hour	0	0	0	0
15th	Highest Hour	0	0	0	0
16th	Highest Hour	0	0	0	0
17th	Highest Hour	0	0	0	0
18th	Highest Hour	0	0	0	0
19th	Highest Hour	0	0	0	0
20th	Highest Hour	0	0	0	0
21st	Highest Hour	0	0	0	0
22nd	Highest Hour	0	0	0	0
23rd	Highest Hour	0	0	0	0
24th	Highest Hour	0	0	0	0

Appendix E
Year 2020 No-Build
Operational Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	41	444	67	33	148	77	69	212	218	347	143	20
Peak Hour Factor	0.95	0.95	0.95	0.80	0.80	0.80	0.96	0.96	0.96	0.97	0.97	0.97
Hourly flow rate (vph)	43	467	71	41	185	96	72	221	227	358	147	21

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	581	323	520	526
Volume Left (vph)	43	41	72	358
Volume Right (vph)	71	96	227	21
Hadj (s)	-0.04	-0.14	-0.22	0.13
Departure Headway (s)	9.1	9.4	8.9	9.3
Degree Utilization, x	1.47	0.84	1.29	1.36
Capacity (veh/h)	406	378	410	396
Control Delay (s)	250.3	46.8	175.3	203.0
Approach Delay (s)	250.3	46.8	175.3	203.0
Approach LOS	F	E	F	F

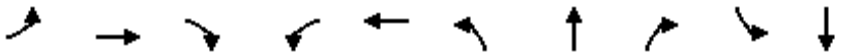
Intersection Summary			
Delay	183.8		
HCM Level of Service	F		
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	260	143	80	349	62	262	137	49	93	312	42
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Hourly flow rate (vph)	31	274	151	82	360	64	267	140	50	97	325	44

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	455	506	457	466
Volume Left (vph)	31	82	267	97
Volume Right (vph)	151	64	50	44
Hadj (s)	-0.17	-0.03	0.07	0.00
Departure Headway (s)	9.4	9.5	9.6	9.6
Degree Utilization, x	1.19	1.34	1.22	1.24
Capacity (veh/h)	388	385	379	382
Control Delay (s)	136.9	197.2	151.3	156.4
Approach Delay (s)	136.9	197.2	151.3	156.4
Approach LOS	F	F	F	F

Intersection Summary			
Delay	161.4		
HCM Level of Service	F		
Intersection Capacity Utilization	106.5%	ICU Level of Service	G
Analysis Period (min)	15		

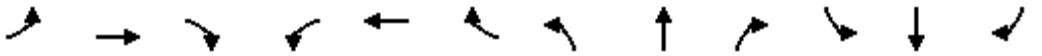
Appendix F
Full-Movement Traffic Signal with Aux Lanes Alternative Operational Worksheets



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	31	274	151	82	424	267	140	50	97	369
v/c Ratio	0.13	0.54	0.35	0.24	0.70	0.59	0.19	0.06	0.21	0.74
Control Delay	16.0	27.7	25.0	16.9	29.2	18.4	17.5	11.3	13.3	34.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	27.7	25.0	16.9	29.2	18.4	17.5	11.3	13.3	34.6
Queue Length 50th (ft)	9	106	55	23	148	58	37	9	19	137
Queue Length 95th (ft)	26	191	112	54	307	#151	95	34	57	284
Internal Link Dist (ft)		638			799		699			650
Turn Bay Length (ft)	150		150	150		250		175	300	
Base Capacity (vph)	245	870	739	338	878	466	953	857	471	743
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.31	0.20	0.24	0.48	0.57	0.15	0.06	0.21	0.50

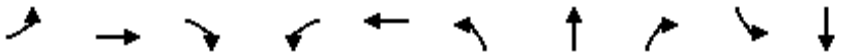
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	260	143	80	349	62	262	137	49	93	312	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	1881	1599	1787	1839		1728	1818	1546	1728	1786	
Flt Permitted	0.29	1.00	1.00	0.39	1.00		0.25	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	543	1881	1599	732	1839		447	1818	1546	1214	1786	
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Adj. Flow (vph)	31	274	151	82	360	64	267	140	50	97	325	44
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	31	274	151	82	424	0	267	140	50	97	369	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	pm+pt		Perm	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	1	6		5	2		7	4	5	3	8	
Permitted Phases	6		6	2			4		4	8		
Actuated Green, G (s)	21.7	20.4	20.4	26.5	22.8		36.6	28.9	32.6	24.3	20.6	
Effective Green, g (s)	21.7	20.4	20.4	26.5	22.8		36.6	28.9	32.6	24.3	20.6	
Actuated g/C Ratio	0.30	0.28	0.28	0.36	0.31		0.50	0.40	0.45	0.33	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	184	528	449	321	577		436	723	778	432	506	
v/s Ratio Prot	0.00	0.15		c0.01	c0.23		c0.10	0.08	0.00	0.01	c0.21	
v/s Ratio Perm	0.05		0.09	0.08			0.21		0.03	0.06		
v/c Ratio	0.17	0.52	0.34	0.26	0.73		0.61	0.19	0.06	0.22	0.73	
Uniform Delay, d1	18.8	22.0	20.8	15.8	22.3		12.3	14.3	11.4	17.1	23.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.9	0.4	0.4	4.8		2.5	0.1	0.0	0.3	5.2	
Delay (s)	19.2	22.9	21.2	16.3	27.1		14.9	14.4	11.4	17.3	28.7	
Level of Service	B	C	C	B	C		B	B	B	B	C	
Approach Delay (s)		22.1			25.3			14.3			26.4	
Approach LOS		C			C			B			C	

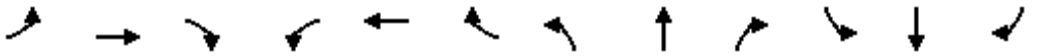
Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	72.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	43	467	71	41	281	72	221	227	358	168
v/c Ratio	0.10	0.79	0.14	0.15	0.40	0.22	0.67	0.46	0.73	0.27
Control Delay	13.4	34.5	20.0	13.9	20.5	17.3	42.1	26.7	26.1	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	34.5	20.0	13.9	20.5	17.3	42.1	26.7	26.1	21.6
Queue Length 50th (ft)	12	208	25	11	107	20	103	91	118	60
Queue Length 95th (ft)	30	330	56	26	156	49	193	177	#232	121
Internal Link Dist (ft)		638			799		699			650
Turn Bay Length (ft)	150		150	150		250		175	300	
Base Capacity (vph)	434	853	725	275	858	332	425	491	542	736
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.55	0.10	0.15	0.33	0.22	0.52	0.46	0.66	0.23

Intersection Summary

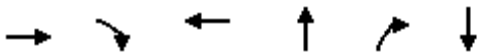
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	444	67	33	148	77	69	212	218	347	143	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1787	1881	1599	1787	1785		1728	1818	1546	1728	1784	
Flt Permitted	0.57	1.00	1.00	0.19	1.00		0.65	1.00	1.00	0.33	1.00	
Satd. Flow (perm)	1065	1881	1599	360	1785		1184	1818	1546	597	1784	
Peak-hour factor, PHF	0.95	0.95	0.95	0.80	0.80	0.80	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	43	467	71	41	185	96	72	221	227	358	147	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	43	467	71	41	281	0	72	221	227	358	168	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	pm+pt		Perm	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	1	6		5	2		7	4	5	3	8	
Permitted Phases	6		6	2			4		4	8		
Actuated Green, G (s)	27.9	25.8	25.8	35.9	29.8		18.6	14.8	20.9	34.1	26.3	
Effective Green, g (s)	27.9	25.8	25.8	35.9	29.8		18.6	14.8	20.9	34.1	26.3	
Actuated g/C Ratio	0.36	0.33	0.33	0.46	0.38		0.24	0.19	0.27	0.44	0.34	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	400	622	529	277	682		309	345	494	483	602	
v/s Ratio Prot	0.00	c0.25		0.01	c0.16		0.01	0.12	c0.04	c0.15	0.09	
v/s Ratio Perm	0.04		0.04	0.06			0.04		0.11	c0.18		
v/c Ratio	0.11	0.75	0.13	0.15	0.41		0.23	0.64	0.46	0.74	0.28	
Uniform Delay, d1	16.5	23.2	18.3	13.9	17.7		23.6	29.1	23.8	16.3	18.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	5.1	0.1	0.2	0.4		0.4	4.0	0.7	6.0	0.3	
Delay (s)	16.6	28.3	18.4	14.1	18.1		24.0	33.2	24.5	22.4	19.2	
Level of Service	B	C	B	B	B		C	C	C	C	B	
Approach Delay (s)		26.2			17.6			28.1			21.3	
Approach LOS		C			B			C			C	

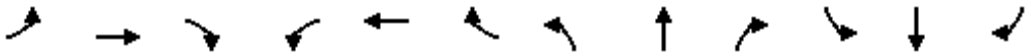
Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix G
Restricted N/S Left-Turn Traffic Signal with Aux Lanes Alternative Operational Worksheets



Lane Group	EBT	EBR	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	510	71	322	228	227	205
v/c Ratio	0.62	0.10	0.42	0.40	0.47	0.36
Control Delay	11.9	6.7	9.3	14.1	15.7	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	6.7	9.3	14.1	15.7	13.8
Queue Length 50th (ft)	65	7	37	35	35	31
Queue Length 95th (ft)	186	28	93	108	113	98
Internal Link Dist (ft)	638		799	699		650
Turn Bay Length (ft)		100			150	
Base Capacity (vph)	1756	1564	1607	1461	1243	1441
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.05	0.20	0.16	0.18	0.14

Intersection Summary

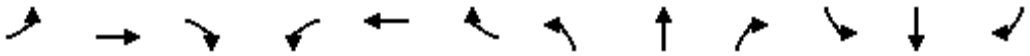


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	444	67	33	148	77	0	219	218	0	178	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00	1.00		1.00	
Frt		1.00	0.85		0.96			1.00	0.85		0.99	
Flt Protected		1.00	1.00		0.99			1.00	1.00		1.00	
Satd. Flow (prot)		1873	1599		1794			1818	1546		1793	
Flt Permitted		0.95	1.00		0.91			1.00	1.00		1.00	
Satd. Flow (perm)		1795	1599		1644			1818	1546		1793	
Peak-hour factor, PHF	0.95	0.95	0.95	0.80	0.80	0.80	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	43	467	71	41	185	96	0	228	227	0	184	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	510	71	0	322	0	0	228	227	0	205	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm		Perm	Perm					Perm			
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2					4			
Actuated Green, G (s)		17.9	17.9		17.9			12.2	12.2		12.2	
Effective Green, g (s)		17.9	17.9		17.9			12.2	12.2		12.2	
Actuated g/C Ratio		0.47	0.47		0.47			0.32	0.32		0.32	
Clearance Time (s)		4.0	4.0		4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		843	751		772			582	495		574	
v/s Ratio Prot								0.13			0.11	
v/s Ratio Perm		c0.28	0.04		0.20				c0.15			
v/c Ratio		0.60	0.09		0.42			0.39	0.46		0.36	
Uniform Delay, d1		7.5	5.6		6.7			10.1	10.3		9.9	
Progression Factor		1.00	1.00		1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.2	0.1		0.4			0.4	0.7		0.4	
Delay (s)		8.7	5.7		7.0			10.5	11.0		10.3	
Level of Service		A	A		A			B	B		B	
Approach Delay (s)		8.3			7.0			10.7			10.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	38.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	305	151	506	166	50	378
v/c Ratio	0.38	0.21	0.66	0.26	0.09	0.61
Control Delay	10.2	8.9	15.0	13.8	12.9	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	8.9	15.0	13.8	12.9	18.6
Queue Length 50th (ft)	44	20	85	27	8	72
Queue Length 95th (ft)	125	64	239	93	36	214
Internal Link Dist (ft)	638		799	699		650
Turn Bay Length (ft)		100			150	
Base Capacity (vph)	1618	1474	1538	1378	1171	1356
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.10	0.33	0.12	0.04	0.28

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	260	143	80	349	62	0	163	49	0	321	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00	1.00		1.00	
Frt		1.00	0.85		0.98			1.00	0.85		0.98	
Flt Protected		0.99	1.00		0.99			1.00	1.00		1.00	
Satd. Flow (prot)		1872	1599		1834			1818	1546		1790	
Flt Permitted		0.93	1.00		0.90			1.00	1.00		1.00	
Satd. Flow (perm)		1756	1599		1669			1818	1546		1790	
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Adj. Flow (vph)	31	274	151	82	360	64	0	166	50	0	334	44
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	305	151	0	506	0	0	166	50	0	378	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm		Perm	Perm					Perm			
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2					4			
Actuated Green, G (s)		21.3	21.3		21.3			16.2	16.2		16.2	
Effective Green, g (s)		21.3	21.3		21.3			16.2	16.2		16.2	
Actuated g/C Ratio		0.47	0.47		0.47			0.36	0.36		0.36	
Clearance Time (s)		4.0	4.0		4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		822	749		781			647	550		637	
v/s Ratio Prot								0.09			c0.21	
v/s Ratio Perm		0.17	0.09		c0.30				0.03			
v/c Ratio		0.37	0.20		0.65			0.26	0.09		0.59	
Uniform Delay, d1		7.8	7.1		9.2			10.4	9.7		12.0	
Progression Factor		1.00	1.00		1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3	0.1		1.9			0.2	0.1		1.5	
Delay (s)		8.1	7.2		11.1			10.6	9.8		13.5	
Level of Service		A	A		B			B	A		B	
Approach Delay (s)		7.8			11.1			10.4			13.5	
Approach LOS		A			B			B			B	

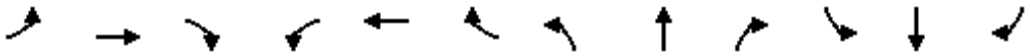
Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	45.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H
Restricted E/W Left-Turn Traffic Signal with Aux Lanes Alternative Operational Worksheets

Lane Group	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	472	71	285	72	221	227	358	168
v/c Ratio	0.77	0.14	0.48	0.37	0.56	0.68	0.75	0.22
Control Delay	32.1	19.6	23.8	41.1	34.1	40.1	36.5	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	19.6	23.8	41.1	34.1	40.1	36.5	17.0
Queue Length 50th (ft)	191	23	103	31	91	96	149	51
Queue Length 95th (ft)	340	57	168	82	185	#200	#284	105
Internal Link Dist (ft)	638		799		699			650
Turn Bay Length (ft)		100		250		150	250	
Base Capacity (vph)	900	765	859	232	543	462	671	986
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.09	0.33	0.31	0.41	0.49	0.53	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



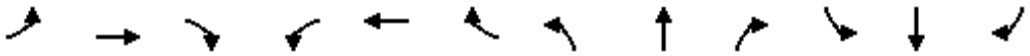
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	448	67	0	151	77	69	212	218	347	143	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00	1.00		1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1881	1599		1796		1728	1818	1546	1728	1784	
Flt Permitted		1.00	1.00		1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1881	1599		1796		1728	1818	1546	1728	1784	
Peak-hour factor, PHF	0.95	0.95	0.95	0.80	0.80	0.80	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	0	472	71	0	189	96	72	221	227	358	147	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	472	71	0	285	0	72	221	227	358	168	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type			Perm				Prot		Perm	Prot		
Protected Phases		6			2		7	4		3	8	
Permitted Phases			6						4			
Actuated Green, G (s)		23.5	23.5		23.5		6.2	16.7	16.7	19.9	30.4	
Effective Green, g (s)		23.5	23.5		23.5		6.2	16.7	16.7	19.9	30.4	
Actuated g/C Ratio		0.33	0.33		0.33		0.09	0.23	0.23	0.28	0.42	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		613	521		585		149	421	358	477	752	
v/s Ratio Prot		c0.25			0.16		0.04	0.12		c0.21	0.09	
v/s Ratio Perm			0.04						c0.15			
v/c Ratio		0.77	0.14		0.49		0.48	0.52	0.63	0.75	0.22	
Uniform Delay, d1		21.9	17.1		19.5		31.4	24.2	24.9	23.8	13.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		5.8	0.1		0.6		2.5	1.2	3.6	6.5	0.2	
Delay (s)		27.7	17.3		20.1		33.9	25.4	28.6	30.4	13.5	
Level of Service		C	B		C		C	C	C	C	B	
Approach Delay (s)		26.3			20.1			28.0			25.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	72.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	277	151	432	267	140	50	97	369
v/c Ratio	0.48	0.31	0.77	0.75	0.21	0.09	0.39	0.78
Control Delay	19.1	17.0	28.1	37.5	15.7	14.8	28.1	33.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	17.0	28.1	37.5	15.7	14.8	28.1	33.9
Queue Length 50th (ft)	77	39	133	89	35	12	32	119
Queue Length 95th (ft)	136	79	#232	#199	75	33	71	#245
Internal Link Dist (ft)	638		799		699			650
Turn Bay Length (ft)		100		250		150	250	
Base Capacity (vph)	700	595	686	386	681	580	289	532
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.25	0.63	0.69	0.21	0.09	0.34	0.69

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	263	143	0	357	62	262	137	49	93	312	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00	1.00		1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1881	1599		1844		1728	1818	1546	1728	1786	
Flt Permitted		1.00	1.00		1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1881	1599		1844		1728	1818	1546	1728	1786	
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Adj. Flow (vph)	0	277	151	0	368	64	267	140	50	97	325	44
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	277	151	0	432	0	267	140	50	97	369	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type			Perm				Prot		Perm	Prot		
Protected Phases		6			2		7	4		3	8	
Permitted Phases			6						4			
Actuated Green, G (s)		16.7	16.7		16.7		11.4	20.5	20.5	6.4	15.5	
Effective Green, g (s)		16.7	16.7		16.7		11.4	20.5	20.5	6.4	15.5	
Actuated g/C Ratio		0.30	0.30		0.30		0.21	0.37	0.37	0.12	0.28	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		565	480		554		354	670	570	199	498	
v/s Ratio Prot		0.15			c0.23		c0.15	0.08		0.06	c0.21	
v/s Ratio Perm			0.09						0.03			
v/c Ratio		0.49	0.31		0.78		0.75	0.21	0.09	0.49	0.74	
Uniform Delay, d1		16.0	15.0		17.8		20.8	12.0	11.4	23.1	18.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.4		6.9		8.8	0.2	0.1	1.9	5.9	
Delay (s)		16.6	15.4		24.6		29.6	12.2	11.5	24.9	24.1	
Level of Service		B	B		C		C	B	B	C	C	
Approach Delay (s)		16.2			24.6			22.3			24.3	
Approach LOS		B			C			C			C	

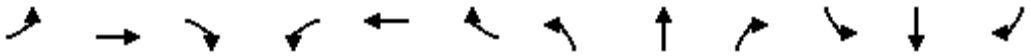
Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix I
Traffic Signal without Aux Lanes Alternative Operational Worksheets

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	501	293	444	449
v/c Ratio	0.82	0.53	0.53	0.87
Control Delay	36.4	25.4	14.5	35.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.4	25.4	14.5	35.9
Queue Length 50th (ft)	242	124	139	188
Queue Length 95th (ft)	#412	163	231	#402
Internal Link Dist (ft)	638	799	699	650
Turn Bay Length (ft)				
Base Capacity (vph)	816	741	1067	663
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.61	0.40	0.42	0.68

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	379	57	28	126	66	59	181	186	296	122	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.96			0.94			0.99	
Flt Protected		1.00			0.99			0.99			0.97	
Satd. Flow (prot)		1843			1794			1700			1749	
Flt Permitted		0.96			0.89			0.90			0.53	
Satd. Flow (perm)		1775			1614			1536			955	
Peak-hour factor, PHF	0.94	0.94	0.94	0.75	0.75	0.75	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	37	403	61	37	168	88	61	189	194	305	126	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	501	0	0	293	0	0	444	0	0	449	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		25.9			25.9			40.5			40.5	
Effective Green, g (s)		25.9			25.9			40.5			40.5	
Actuated g/C Ratio		0.35			0.35			0.54			0.54	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		618			562			836			520	
v/s Ratio Prot												
v/s Ratio Perm		c0.28			0.18			0.29			c0.47	
v/c Ratio		0.81			0.52			0.53			0.86	
Uniform Delay, d1		22.0			19.3			10.9			14.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		7.9			0.9			0.7			13.9	
Delay (s)		30.0			20.2			11.5			28.4	
Level of Service		C			C			B			C	
Approach Delay (s)		30.0			20.2			11.5			28.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	74.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	401	432	391	397
v/c Ratio	0.63	0.71	0.77	0.54
Control Delay	22.5	25.6	25.3	14.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	22.5	25.6	25.3	14.9
Queue Length 50th (ft)	110	123	102	89
Queue Length 95th (ft)	273	308	278	216
Internal Link Dist (ft)	638	799	699	650
Turn Bay Length (ft)				
Base Capacity (vph)	1111	1059	844	1217
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.41	0.46	0.33

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	222	122	68	298	53	224	117	42	79	266	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			0.99			0.99	
Flt Protected		1.00			0.99			0.97			0.99	
Satd. Flow (prot)		1791			1834			1741			1777	
Flt Permitted		0.96			0.89			0.60			0.86	
Satd. Flow (perm)		1722			1640			1070			1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Adj. Flow (vph)	27	241	133	70	307	55	229	119	43	82	277	38
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	401	0	0	432	0	0	391	0	0	397	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		22.4			22.4			28.9			28.9	
Effective Green, g (s)		22.4			22.4			28.9			28.9	
Actuated g/C Ratio		0.38			0.38			0.49			0.49	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		650			619			521			751	
v/s Ratio Prot												
v/s Ratio Perm		0.23			c0.26			c0.37			0.26	
v/c Ratio		0.62			0.70			0.75			0.53	
Uniform Delay, d1		15.0			15.6			12.3			10.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.7			3.4			6.0			0.7	
Delay (s)		16.7			19.0			18.3			11.2	
Level of Service		B			B			B			B	
Approach Delay (s)		16.7			19.0			18.3			11.2	
Approach LOS		B			B			B			B	

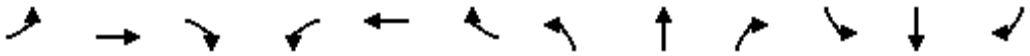
Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	59.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	587	555	518	526
v/c Ratio	1.04	0.99	0.61	1.06
Control Delay	78.8	66.3	16.8	78.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	78.8	66.3	16.8	78.4
Queue Length 50th (ft)	~363	310	182	~331
Queue Length 95th (ft)	#564	#429	286	#526
Internal Link Dist (ft)	638	799	699	650
Turn Bay Length (ft)				
Base Capacity (vph)	566	562	848	498
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.04	0.99	0.61	1.06

Intersection Summary

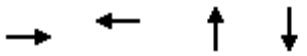
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	444	67	33	349	62	69	212	216	347	143	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			0.98			0.94			0.99	
Flt Protected		1.00			1.00			0.99			0.97	
Satd. Flow (prot)		1844			1839			1700			1749	
Flt Permitted		0.89			0.88			0.87			0.49	
Satd. Flow (perm)		1643			1632			1497			878	
Peak-hour factor, PHF	0.94	0.94	0.94	0.80	0.80	0.80	0.96	0.96	0.96	0.97	0.97	0.97
Adj. Flow (vph)	44	472	71	41	436	78	72	221	225	358	147	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	587	0	0	555	0	0	518	0	0	526	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		566			562			848			498	
v/s Ratio Prot												
v/s Ratio Perm		c0.36			0.34			0.35			c0.60	
v/c Ratio		1.04			0.99			0.61			1.06	
Uniform Delay, d1		29.5			29.3			12.9			19.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		47.8			34.4			1.3			56.0	
Delay (s)		77.3			63.7			14.2			75.5	
Level of Service		E			E			B			E	
Approach Delay (s)		77.3			63.7			14.2			75.5	
Approach LOS		E			E			B			E	

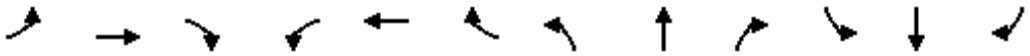
Intersection Summary			
HCM Average Control Delay	58.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	456	506	457	466
v/c Ratio	0.69	0.87	0.90	0.60
Control Delay	28.1	41.3	43.9	18.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.1	41.3	43.9	18.7
Queue Length 50th (ft)	207	253	224	176
Queue Length 95th (ft)	316	#433	#430	279
Internal Link Dist (ft)	638	799	699	650
Turn Bay Length (ft)				
Base Capacity (vph)	794	703	581	893
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.72	0.79	0.52

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	260	143	80	349	62	262	137	49	93	312	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.96			0.98			0.99			0.99	
Flt Protected		1.00			0.99			0.97			0.99	
Satd. Flow (prot)		1791			1834			1741			1777	
Flt Permitted		0.95			0.82			0.55			0.84	
Satd. Flow (perm)		1714			1517			982			1510	
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.96	0.96
Adj. Flow (vph)	31	274	151	82	360	64	267	140	50	97	325	44
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	456	0	0	506	0	0	457	0	0	466	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		30.9			30.9			41.5			41.5	
Effective Green, g (s)		30.9			30.9			41.5			41.5	
Actuated g/C Ratio		0.38			0.38			0.52			0.52	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		659			583			507			779	
v/s Ratio Prot												
v/s Ratio Perm		0.27			c0.33			c0.47			0.31	
v/c Ratio		0.69			0.87			0.90			0.60	
Uniform Delay, d1		20.8			22.9			17.6			13.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.1			12.9			19.1			1.2	
Delay (s)		23.9			35.8			36.7			14.9	
Level of Service		C			D			D			B	
Approach Delay (s)		23.9			35.8			36.7			14.9	
Approach LOS		C			D			D			B	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	106.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Appendix J
Single-Lane Roundabout Alternative Operational Worksheets

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
120' ICD - 2012 Existing AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley Rd (NB)											
1	L	61	1.0	0.824	34.8	LOS D	7.0	49.6	0.89	1.23	28.2
2	T	189	1.0	0.824	34.8	LOS D	7.0	49.6	0.89	1.18	28.8
3	R	194	1.0	0.824	34.8	LOS D	7.0	49.6	0.89	1.19	28.6
Approach		444	1.0	0.824	34.8	LOS D	7.0	49.6	0.89	1.19	28.6
East: Braddock Road (WB)											
4	L	37	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.89	40.8
5	T	168	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.60	44.5
6	R	88	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.66	43.9
Approach		293	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.66	43.8
North: Pleasant Valley Rd (SB)											
7	L	305	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.84	38.6
8	T	126	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.65	41.5
9	R	18	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.69	41.0
Approach		448	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.78	39.4
West: Braddock Road (EB)											
10	L	37	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.10	34.5
11	T	399	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	0.98	36.2
12	R	60	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.01	35.9
Approach		496	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.00	36.0
All Vehicles		1681	1.0	0.824	19.4	LOS C	7.0	49.6	0.70	0.93	35.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: New Site - 1

Braddock Road and Pleasant Valley
120' ICD - 2012 Existing PM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley (NB)											
1	L	229	1.0	0.487	11.1	LOS B	2.7	18.8	0.59	0.90	38.7
2	T	119	1.0	0.487	11.1	LOS B	2.7	18.8	0.59	0.72	41.5
3	R	43	1.0	0.487	11.1	LOS B	2.7	18.8	0.59	0.76	41.1
Approach		391	1.0	0.487	11.1	LOS B	2.7	18.8	0.59	0.83	39.7
East: Braddock Road (WB)											
4	L	70	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	1.01	37.9
5	T	307	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.81	40.5
6	R	55	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.85	40.1
Approach		432	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.85	39.9
North: Pleasant Valley (SB)											
7	L	82	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	1.09	34.6
8	T	280	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.96	36.3
9	R	38	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.99	36.0
Approach		400	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.99	35.8
West: Braddock Road (EB)											
10	L	26	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	1.02	38.0
11	T	234	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.83	40.5
12	R	128	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.87	40.2
Approach		388	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.86	40.2
All Vehicles		1611	1.0	0.649	14.1	LOS B	4.2	29.7	0.67	0.88	38.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
120' ICD - 2012 Existing AM w/ NBRT Bypass
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley Rd (NB)											
1	L	61	1.0	0.464	14.7	LOS B	2.2	15.2	0.70	1.03	36.9
2	T	189	1.0	0.464	14.7	LOS B	2.2	15.2	0.70	0.86	39.2
3	R	194	1.0	0.347	11.6	LOS B	1.4	9.9	0.64	0.82	41.3
Approach		444	1.0	0.464	13.3	LOS B	2.2	15.2	0.67	0.87	39.7
East: Braddock Road (WB)											
4	L	37	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.89	40.8
5	T	168	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.60	44.5
6	R	88	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.66	43.9
Approach		293	1.0	0.346	8.2	LOS A	1.5	10.9	0.48	0.66	43.8
North: Pleasant Valley Rd (SB)											
7	L	305	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.84	38.6
8	T	126	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.65	41.5
9	R	18	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.69	41.0
Approach		448	1.0	0.518	11.1	LOS B	3.0	21.4	0.56	0.78	39.4
West: Braddock Road (EB)											
10	L	37	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.10	34.5
11	T	399	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	0.98	36.2
12	R	60	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.01	35.9
Approach		496	1.0	0.701	19.6	LOS C	5.5	38.7	0.80	1.00	36.0
All Vehicles		1681	1.0	0.701	13.7	LOS B	5.5	38.7	0.65	0.85	39.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: New Site - 1

Braddock Road and Pleasant Valley
120' ICD - 2012 Existing PM w/ NBRT Bypass
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley (NB)											
1	L	229	1.0	0.434	10.0	LOS B	2.1	15.0	0.56	0.87	39.3
2	T	119	1.0	0.434	10.0	LOS B	2.1	15.0	0.56	0.68	42.4
3	R	43	1.0	0.052	4.9	LOS A	0.2	1.3	0.39	0.55	47.3
Approach		391	1.0	0.434	9.5	LOS A	2.1	15.0	0.54	0.78	40.9
East: Braddock Road (WB)											
4	L	70	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	1.01	37.9
5	T	307	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.81	40.5
6	R	55	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.85	40.1
Approach		432	1.0	0.556	13.0	LOS B	3.4	24.3	0.65	0.85	39.9
North: Pleasant Valley (SB)											
7	L	82	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	1.09	34.6
8	T	280	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.96	36.3
9	R	38	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.99	36.0
Approach		400	1.0	0.649	19.2	LOS C	4.2	29.7	0.77	0.99	35.8
West: Braddock Road (EB)											
10	L	26	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	1.02	38.0
11	T	234	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.83	40.5
12	R	128	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.87	40.2
Approach		388	1.0	0.530	13.0	LOS B	3.1	21.5	0.66	0.86	40.2
All Vehicles		1611	1.0	0.649	13.7	LOS B	4.2	29.7	0.66	0.87	39.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
120' ICD - 2020 AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley Rd (NB)											
1	L	72	1.0	1.096	99.1	LOS F	25.9	183.0	1.00	2.25	16.0
2	T	221	1.0	1.096	99.1	LOS F	25.9	183.0	1.00	2.25	15.6
3	R	227	1.0	1.096	99.1	LOS F	25.9	183.0	1.00	2.25	15.5
Approach		520	1.0	1.096	99.1	LOS F	25.9	183.0	1.00	2.25	15.6
East: Braddock Road (WB)											
4	L	41	1.0	0.389	9.0	LOS A	1.8	12.7	0.51	0.90	40.3
5	T	185	1.0	0.389	9.0	LOS A	1.8	12.7	0.51	0.64	43.7
6	R	96	1.0	0.389	9.0	LOS A	1.8	12.7	0.51	0.69	43.2
Approach		323	1.0	0.389	9.0	LOS A	1.8	12.7	0.51	0.69	43.1
North: Pleasant Valley Rd (SB)											
7	L	358	1.0	0.623	14.2	LOS B	4.6	32.4	0.67	0.91	36.8
8	T	147	1.0	0.623	14.2	LOS B	4.6	32.4	0.67	0.76	39.1
9	R	21	1.0	0.623	14.2	LOS B	4.6	32.4	0.67	0.80	38.8
Approach		526	1.0	0.623	14.2	LOS B	4.6	32.4	0.67	0.86	37.5
West: Braddock Road (EB)											
10	L	43	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.32	27.3
11	T	467	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.8
12	R	71	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.6
Approach		581	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.7
All Vehicles		1949	1.0	1.096	43.1	LOS E	25.9	183.0	0.83	1.34	25.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: New Site - 1

Braddock Road and Pleasant Valley
120' ICD - 2020 PM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley (NB)											
1	L	267	1.0	0.604	14.8	LOS B	4.1	28.6	0.70	1.00	36.5
2	T	140	1.0	0.604	14.8	LOS B	4.1	28.6	0.70	0.86	38.7
3	R	50	1.0	0.604	14.8	LOS B	4.1	28.6	0.70	0.89	38.4
Approach		457	1.0	0.604	14.8	LOS B	4.1	28.6	0.70	0.95	37.3
East: Braddock Road (WB)											
4	L	82	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	1.08	34.8
5	T	360	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.97	36.5
6	R	64	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.99	36.3
Approach		506	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.99	36.2
North: Pleasant Valley (SB)											
7	L	97	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.26	27.7
8	T	328	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.21	28.2
9	R	44	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.22	28.1
Approach		470	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.22	28.1
West: Braddock Road (EB)											
10	L	31	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	1.09	34.9
11	T	274	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.96	36.7
12	R	151	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.99	36.4
Approach		455	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.98	36.4
All Vehicles		1888	1.0	0.845	22.2	LOS C	7.8	55.2	0.79	1.03	34.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
120' ICD - 2020 AM w/ NBRT Bypass
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley Rd (NB)											
1	L	72	1.0	0.617	22.2	LOS C	3.3	23.3	0.78	1.09	33.2
2	T	221	1.0	0.617	22.2	LOS C	3.3	23.3	0.78	0.97	34.6
3	R	227	1.0	0.479	16.8	LOS C	2.2	15.2	0.73	0.93	37.2
Approach		520	1.0	0.617	19.8	LOS C	3.3	23.3	0.76	0.97	35.4
East: Braddock Road (WB)											
4	L	41	1.0	0.399	9.4	LOS A	1.8	13.0	0.53	0.92	40.1
5	T	185	1.0	0.399	9.4	LOS A	1.8	13.0	0.53	0.66	43.4
6	R	96	1.0	0.399	9.4	LOS A	1.8	13.0	0.53	0.71	42.9
Approach		323	1.0	0.399	9.4	LOS A	1.8	13.0	0.53	0.71	42.8
North: Pleasant Valley Rd (SB)											
7	L	358	1.0	0.627	14.4	LOS B	4.6	32.8	0.67	0.92	36.7
8	T	147	1.0	0.627	14.4	LOS B	4.6	32.8	0.67	0.78	39.0
9	R	21	1.0	0.627	14.4	LOS B	4.6	32.8	0.67	0.81	38.6
Approach		526	1.0	0.627	14.4	LOS B	4.6	32.8	0.67	0.87	37.3
West: Braddock Road (EB)											
10	L	43	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.32	27.3
11	T	467	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.8
12	R	71	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.6
Approach		581	1.0	0.888	38.0	LOS E	11.0	77.5	0.99	1.31	27.7
All Vehicles		1949	1.0	0.888	22.0	LOS C	11.0	77.5	0.77	1.00	34.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
120' ICD - 2020 PM w/ NBRT Bypass
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley (NB)											
1	L	267	1.0	0.538	12.9	LOS B	3.2	22.5	0.65	0.97	37.6
2	T	140	1.0	0.538	12.9	LOS B	3.2	22.5	0.65	0.81	40.1
3	R	50	1.0	0.066	5.4	LOS A	0.2	1.6	0.44	0.63	46.1
Approach		457	1.0	0.538	12.0	LOS B	3.2	22.5	0.63	0.88	39.1
East: Braddock Road (WB)											
4	L	82	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	1.08	34.8
5	T	360	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.97	36.5
6	R	64	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.99	36.3
Approach		506	1.0	0.694	18.8	LOS C	5.5	38.7	0.79	0.99	36.2
North: Pleasant Valley (SB)											
7	L	97	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.26	27.7
8	T	328	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.21	28.2
9	R	44	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.22	28.1
Approach		470	1.0	0.845	36.5	LOS E	7.8	55.2	0.91	1.22	28.1
West: Braddock Road (EB)											
10	L	31	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	1.09	34.9
11	T	274	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.96	36.7
12	R	151	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.99	36.4
Approach		455	1.0	0.669	18.7	LOS C	4.8	33.7	0.78	0.98	36.4
All Vehicles		1888	1.0	0.845	21.5	LOS C	7.8	55.2	0.78	1.02	34.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Appendix K
Mini-Roundabout Alternative
Operational Worksheets

Raw Count	Unserved Demand
	25
33	2
359	20
54	3

Existing 2012 VOLUMES - AM Peak Hour — Assumed Growth: 1.02

- additional demand not served in peak - added to turn movement counts for EB approach

	Cars	433	1%	1%	1%	282	
	Bicycles	0				SB	City:
	Trucks		17	122	296		State:
202	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	220
1%		35	7:15 - 8:15 a.m.			66	1%
1%		379	1552	3	0.95	126	1%
1%		57	2012	9	25	28	1%
471	270		Braddock Road			WB	861
			59	181	186		
		NB				180	0
		207	1%	1%	1%	426	0
		Notes					0

% LT	27%

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	703	708	283	352	426	1.50	**1.21**	0.74
EB	209	210	793	821	220	0.28	0.27	0.27
SB	220	221	782	811	435	0.56	0.54	0.54
WB	512	515	481	533	471	0.98	0.88	**0.88**

2013 Volumes

1.02

	Cars	444	1%	1%	1%	287	
	Bicycles	0				SB	City:
	Trucks		17	124	302		State:
206	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	224
1%		36	7:15 - 8:15 a.m.			67	1%
1%		387	1583	3	0.95	129	1%
1%		58	2012	9	25	29	1%
480	270		Braddock Road			WB	878
			60	185	190		
		NB				180	0
		211	1%	1%	1%	435	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	717	722	269	338	435	1.62	**1.28**	0.82
EB	213	215	789	817	224	0.28	0.27	0.27
SB	224	226	778	807	444	0.57	0.55	0.55
WB	522	526	470	524	480	1.02	0.92	**0.92**

2014 Volumes

1.0404

	Cars	453	1%	1%	1%	292	
	Bicycles	0				SB	City:
	Trucks		18	127	308		State:
210	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	229
1%		36	7:15 - 8:15 a.m.			69	1%
1%		394	1615	3	0.95	131	1%
1%		59	2012	9	25	29	1%
490	270		Braddock Road			WB	896
			61	188	194		
		NB				180	0
		215	1%	1%	1%	443	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	732	737	254	325	443	1.75	**1.37**	0.90
EB	217	219	785	813	229	0.29	0.28	0.28
SB	229	230	773	803	453	0.59	0.56	0.56
WB	533	536	459	514	490	1.07	0.95	**0.95**

2015 Volumes

1.061208

	Cars	462	1%	1%	1%	299	
	Bicycles	0				SB	City:
	Trucks		18	129	314		State:
214	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	233
1%		37	7:15 - 8:15 a.m.			70	1%
1%		402	1647	3	0.95	134	1%
1%		61	2012	9	25	30	1%
500	270		Braddock Road			WB	914
			63	192	197		
		NB				180	0
		220	1%	1%	1%	452	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	746	751	239	311	452	1.89	**1.46**	0.99
EB	222	223	780	809	233	0.30	0.29	0.29
SB	233	235	768	798	462	0.60	0.58	0.58
WB	543	547	448	504	500	1.11	0.99	**0.99**

2016 Volumes

1.082432

	Cars	471	1%	1%	1%	305	
	Bicycles	0				SB	City:
	Trucks		18	132	320		State:
219	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	238
1%		38	7:15 - 8:15 a.m.			71	1%
1%		410	1680	3	0.95	136	1%
1%		62	2012	9	25	30	1%
510	270		Braddock Road			WB	932
			64	196	201		
		NB				180	0
		224	1%	1%	1%	461	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	761	766	223	297	461	2.06	**1.56**	**1.09**
EB	226	228	775	805	238	0.31	0.30	0.30
SB	238	240	763	794	471	0.62	0.59	0.59
WB	554	558	437	493	510	1.17	1.03	1.03

2017 Volumes

1.104081

	Cars	480	1%	1%	1%	311	
	Bicycles	0				SB	City:
	Trucks		19	135	327		State:
223	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	243
1%		38	7:15 - 8:15 a.m.			73	1%
1%		419	1714	3	0.95	139	1%
1%		63	2012	9	25	31	1%
520	270		Braddock Road			WB	951
			65	200	205		
		NB				180	0
		229	1%	1%	1%	470	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	776	782	208	282	470	2.26	**1.67**	**1.20**
EB	231	232	771	801	243	0.32	0.30	0.30
SB	243	244	758	789	480	0.63	0.61	0.61
WB	565	569	426	483	520	1.22	1.08	1.08

2018 Volumes

1.126162

	Cars	490	1%	1%	1%	317	
	Bicycles	0				SB	City:
	Trucks		19	137	333		State:
227	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	248
1%		39	7:15 - 8:15 a.m.			74	1%
1%		427	1748	3	0.95	142	1%
1%		64	2012	9	25	32	1%
530	270		Braddock Road			WB	970
			66	204	209		
		NB				180	0
		233	1%	1%	1%	480	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	792	797	192	267	480	2.50	**1.79**	**1.33**
EB	235	237	766	796	248	0.32	0.31	0.31
SB	248	249	753	785	490	0.65	0.62	0.62
WB	576	580	414	472	530	1.28	1.12	1.12

2019 Volumes

1.148686

	Cars	500	1%	1%	1%	324	
	Bicycles	0				SB	City:
	Trucks		20	140	340		State:
232	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	253
1%		40	7:15 - 8:15 a.m.			76	1%
1%		435	1783	3	0.95	145	1%
1%		66	2012	9	25	32	1%
541	270		Braddock Road			WB	989
			68	208	214		
		NB				180	0
		238	1%	1%	1%	480	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	808	813	175	252	489	2.79	**1.94**	**1.47**
EB	240	242	761	792	253	0.33	0.32	0.32
SB	253	254	748	780	500	0.67	0.64	0.64
WB	588	592	402	461	541	1.35	1.17	1.17

2020 Volumes

1.171659

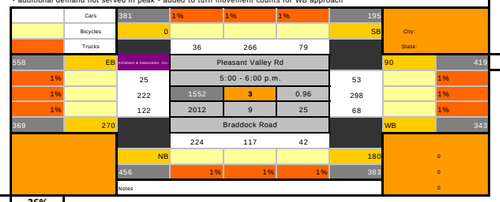
	Cars	510	1%	1%	1%	330	
	Bicycles	0				SB	City:
	Trucks		20	143	347		State:
237	EB	Kimley-Horn & Associates, Inc.	Pleasant Valley Rd			90	259
1%		41	7:15 - 8:15 a.m.			77	1%
1%		444	1818	3	0.95	148	1%
1%		67	2012	9	25	33	1%
552	270		Braddock Road			WB	1009
			69	212	218		
		NB				180	0
		243	1%	1%	1%	499	0
		Notes					0

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	824	830	159	237	499	3.15	**2.11**	**1.64**
EB	245	247	756	787	258	0.34	0.33	0.33
SB	258	259	743	775	510	0.69	0.66	0.66
WB	600	604	390	450	552	1.42	1.23	1.23

Existing 2012 VOLUMES - AM Peak Hour

Assumed Growth | **1.02**

- additional demand not served in peak - added to turn movement counts for WB approach



Unserved Demand

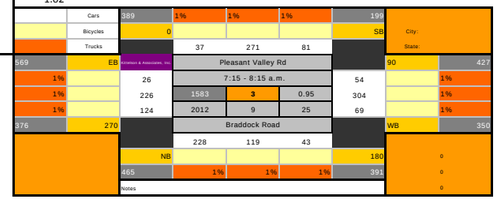
Raw Count

% LT	26%

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	369	372	628	669	383	0.61	0.57	0.51
EB	558	562	433	490	419	0.97	**0.86**	**0.86**
SB	547	551	445	500	381	0.86	0.76	0.76
WB	221	223	781	810	369	0.47	0.46	0.46

2013 Volumes

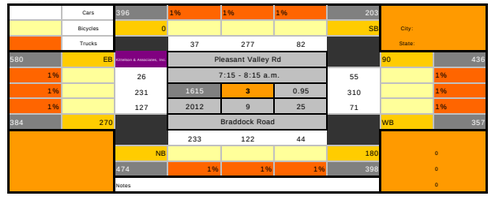
1.02



Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	376	379	620	662	391	0.63	0.59	0.52
EB	569	573	421	479	427	1.01	**0.89**	**0.89**
SB	558	562	433	490	389	0.90	0.79	0.79
WB	225	227	776	806	376	0.48	0.47	0.47

2014 Volumes

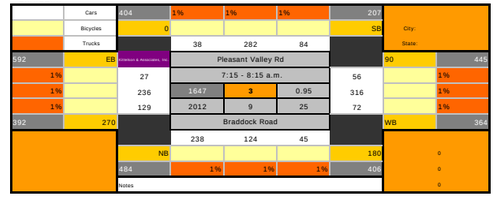
1.0404



Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	384	387	613	655	398	0.65	0.61	0.54
EB	581	585	410	468	436	1.06	**0.93**	**0.93**
SB	569	573	422	479	396	0.94	0.83	0.83
WB	230	232	772	801	384	0.50	0.48	0.48

2015 Volumes

1.061208



Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	392	394	605	648	406	0.67	0.63	0.56
EB	592	596	398	457	445	1.12	**0.97**	**0.97**
SB	580	584	410	468	404	0.99	0.86	0.86
WB	235	236	767	797	392	0.51	0.49	0.49

2016 Volumes

1.082432

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	399	402	597	640	415	0.69	0.65	0.58
EB	604	608	386	446	454	1.18	**1.02**	**1.02**
SB	592	596	398	457	412	1.04	0.90	0.90
WB	239	241	762	793	399	0.52	0.50	0.50

2017 Volumes

1.104081

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	407	410	588	633	423	0.72	0.67	0.60
EB	616	620	373	434	463	1.24	**1.07**	**1.07**
SB	604	608	386	446	421	1.09	0.94	0.94
WB	244	246	757	788	407	0.54	0.52	0.52

2018 Volumes

1.126162

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	416	419	580	625	431	0.74	0.69	0.62
EB	628	633	360	423	472	1.31	**1.12**	**1.12**
SB	616	620	373	435	429	1.15	0.99	0.99
WB	249	251	752	783	416	0.55	0.53	0.53

2019 Volumes

1.148686

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	424	427	571	617	440	0.77	0.71	0.65
EB	641	646	347	411	481	1.39	**1.17**	**1.17**
SB	628	632	361	423	438	1.21	**1.03**	**1.03**
WB	254	256	747	779	424	0.57	0.54	0.54

2020 Volumes

1.171659

Approach	V_c	V_c (PCE)	C_{50}	C_{75}	Volume	v/c C_{50}	v/c C_{75}	v/c C_{75} w/ RT bypass
NB	432	435	563	609	449	0.80	0.74	0.67
EB	654	658	334	398	491	1.47	**1.23**	**1.23**
SB	641	645	348	411	446	1.28	**1.09**	**1.09**
WB	259	261	742	774	432	0.58	0.56	0.56

Appendix L
Refined 100-foot ICD Single-Lane Roundabout Alternative Operational Worksheets

MOVEMENT SUMMARY

Site: Braddock Rd/Pleasant Valley Rd

Braddock Road and Pleasant Valley
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley Rd (NB)											
1	L	72	1.0	0.542	22.3	LOS C	4.8	33.8	0.95	1.09	38.7
2	T	221	1.0	0.542	16.8	LOS B	4.8	33.8	0.95	1.07	40.7
3	R	227	1.0	0.395	13.2	LOS B	2.8	20.0	0.88	0.94	44.0
Approach		520	1.0	0.542	16.0	LOS B	4.8	33.8	0.92	1.02	41.8
East: Braddock Road (WB)											
4	L	41	1.0	0.426	14.3	LOS B	2.9	20.5	0.69	0.86	44.4
5	T	185	1.0	0.426	8.8	LOS A	2.9	20.5	0.69	0.73	47.1
6	R	96	1.0	0.426	9.8	LOS A	2.9	20.5	0.69	0.76	47.2
Approach		323	1.0	0.426	9.8	LOS A	2.9	20.5	0.69	0.75	46.8
North: Pleasant Valley Rd (SB)											
7	L	358	1.0	0.628	15.9	LOS B	6.0	42.7	0.77	0.87	42.7
8	T	147	1.0	0.628	10.4	LOS B	6.0	42.7	0.77	0.79	45.7
9	R	21	1.0	0.628	11.4	LOS B	6.0	42.7	0.77	0.82	45.4
Approach		526	1.0	0.628	14.2	LOS B	6.0	42.7	0.77	0.85	43.5
West: Braddock Road (EB)											
10	L	43	1.0	0.958	44.0	LOS D	21.1	149.1	1.00	1.56	28.4
11	T	467	1.0	0.958	38.5	LOS D	21.1	149.1	1.00	1.56	29.1
12	R	71	1.0	0.958	39.5	LOS D	21.1	149.1	1.00	1.56	29.0
Approach		581	1.0	0.958	39.0	LOS D	21.1	149.1	1.00	1.56	29.0
All Vehicles		1949	1.0	0.958	21.3	LOS C	21.1	149.1	0.87	1.09	37.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: New Site - 1

Braddock Road and Pleasant Valley
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pleasant Valley (NB)											
1	L	267	1.0	0.462	14.1	LOS B	3.4	23.8	0.73	0.83	44.2
2	T	140	1.0	0.462	8.6	LOS A	3.4	23.8	0.73	0.73	46.4
3	R	50	1.0	0.055	8.0	LOS A	0.3	2.1	0.53	0.60	48.1
Approach		457	1.0	0.462	11.8	LOS B	3.4	23.8	0.71	0.78	45.2
East: Braddock Road (WB)											
4	L	82	1.0	0.733	21.3	LOS C	8.7	61.4	0.93	1.10	39.4
5	T	360	1.0	0.733	15.8	LOS B	8.7	61.4	0.93	1.07	41.5
6	R	64	1.0	0.733	16.7	LOS B	8.7	61.4	0.93	1.08	41.4
Approach		506	1.0	0.733	16.8	LOS B	8.7	61.4	0.93	1.07	41.1
North: Pleasant Valley (SB)											
7	L	97	1.0	0.914	43.6	LOS D	15.9	112.0	1.00	1.48	28.4
8	T	328	1.0	0.914	38.2	LOS D	15.9	112.0	1.00	1.48	29.1
9	R	44	1.0	0.914	39.1	LOS D	15.9	112.0	1.00	1.48	29.0
Approach		470	1.0	0.914	39.4	LOS D	15.9	112.0	1.00	1.48	29.0
West: Braddock Road (EB)											
10	L	31	1.0	0.731	22.6	LOS C	8.4	59.3	0.96	1.14	38.5
11	T	274	1.0	0.731	17.2	LOS B	8.4	59.3	0.96	1.13	40.5
12	R	151	1.0	0.731	18.1	LOS B	8.4	59.3	0.96	1.13	40.3
Approach		455	1.0	0.731	17.9	LOS B	8.4	59.3	0.96	1.13	40.3
All Vehicles		1888	1.0	0.914	21.5	LOS C	15.9	112.0	0.90	1.12	37.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.