



**WELLS + ASSOCIATES**

## MEMORANDUM

**To:** George R. Phillips, AICP  
Loudoun County Office of Transportation Services

**CC:** Roy Barnett  
Jeff Nein  
Jeff Gilliland

**From:** Michael J. Workosky, PTP, TOPS  
James W. Watson, PTP  
Wells + Associates, Inc.

**Date:** January 8, 2010

**Subject:** Ryan Road Property Special Exception (SPEX)  
Traffic Impact Analysis;  
Loudoun County, Virginia

### Introduction

This memorandum presents a traffic impact analysis for the Ryan Road Property. The property is located on the north side of Ryan Road (VA Route 772) and east of Belmont Ridge Road (VA Route 659) in the Brambleton area of Loudoun County, Virginia, as shown on Figure 1. The property is defined on the Loudoun County Tax Map with Pin Number 158-27-9331.

The property consists of 7.7389 acres and is zoned R-1 that would allow for up to seven (7) single-family homes. A two-acre portion of the property is proposed to obtain a Special Exception to allow for a child care center of up to 208 students. The remaining five-acre portion would be developed under the current R-1 zoning at a later date along with the adjacent approximately 12-acre parcel.

This traffic study serves as an update to the previously submitted Ryan Road Property rezoning traffic impact study, dated April 1, 2009. The April 2009 report proposed a larger property (19.68-acres) to be rezoned to increase the residential density from 21 units to 49 units. Comments were provided by both the Loudoun County Office of Transportation Services (OTS) and Virginia Department of Transportation (VDOT). Responses to these comments are contained in Appendix A and incorporated into this report. Confirmation of the scope for the updated traffic report and original traffic study scope are also included in Appendix A.

Consistent with the previously submitted traffic study, a buildout year of 2015 was assumed for purposes of this analysis.

An existing median break is provided on Ryan Road at Legacy Park Drive opposite the proposed site access. This median break is assumed to remain and serve the proposed development under buildout conditions. A copy of the concept development plan is shown on Figure 2.

This study was prepared for 2015 conditions with the buildout and occupancy of the property, in accordance with the Loudoun County Facilities Standards Manual (FSM) and is based on a traffic scoping agreement with Loudoun County Office of Transportation Services (OTS). As specified in the agreement, a buildout plus 10-year condition was not required.

Tasks undertaken in this updated study included the following:

1. Review of updated Special Exception development plans prepared for the Ryan Road Property.
2. Responses to OTS comments.
3. Confirmation of the traffic study scope with the Special Exception Application. A copy of the traffic study scoping agreement is contained in Appendix A.
4. Collection of existing traffic counts at the key intersections surrounding the site.
5. Preparation of background traffic forecasts 2015 to include existing traffic, traffic generated by other approved developments including the existing project development potential, and ambient growth. Background development calculations were updated based on comments provided by OTS staff.
6. Calculation and comparison of the number of peak hour trips that would be generated by the Ryan Road Property under the current zoning and with the proposed special exception based on standard Institute of Transportation Engineers (ITE) rates and equations.
7. A forecast of future traffic conditions with the proposed special exception for 2015.
8. Determination of total future levels of service at key intersections based on the future traffic forecasts, proposed traffic controls, and proposed intersection geometrics.

Sources of data for this analysis included previous traffic studies conducted by Wells + Associates, the Institute of Transportation Engineers (ITE), the Virginia Department of Transportation (VDOT), Loudoun County, Virginia, J2 Engineers, Cooley Godward Kronish, and Van Metre Homes.

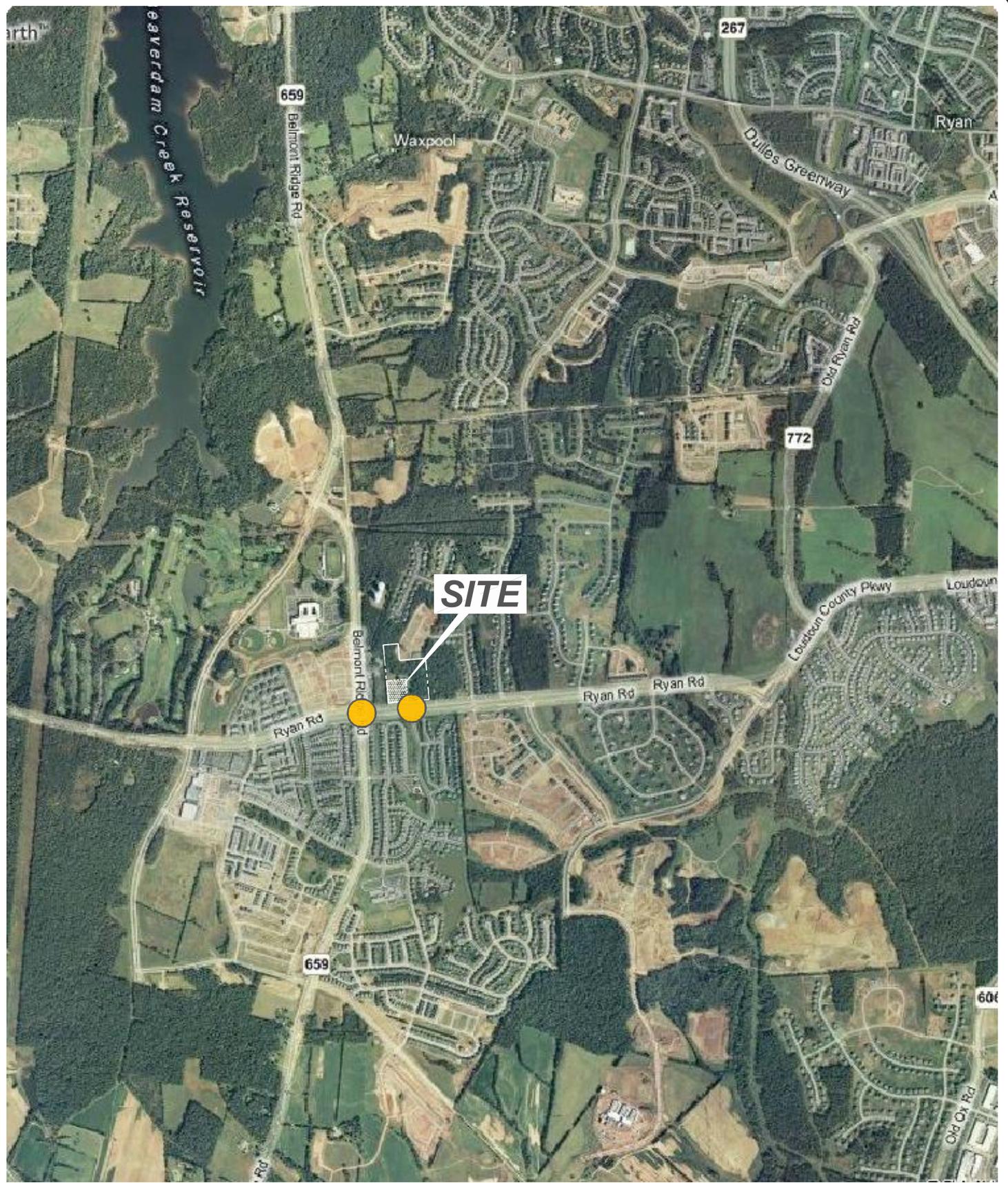


Figure 1  
Site Location Map

● Study Intersection



North

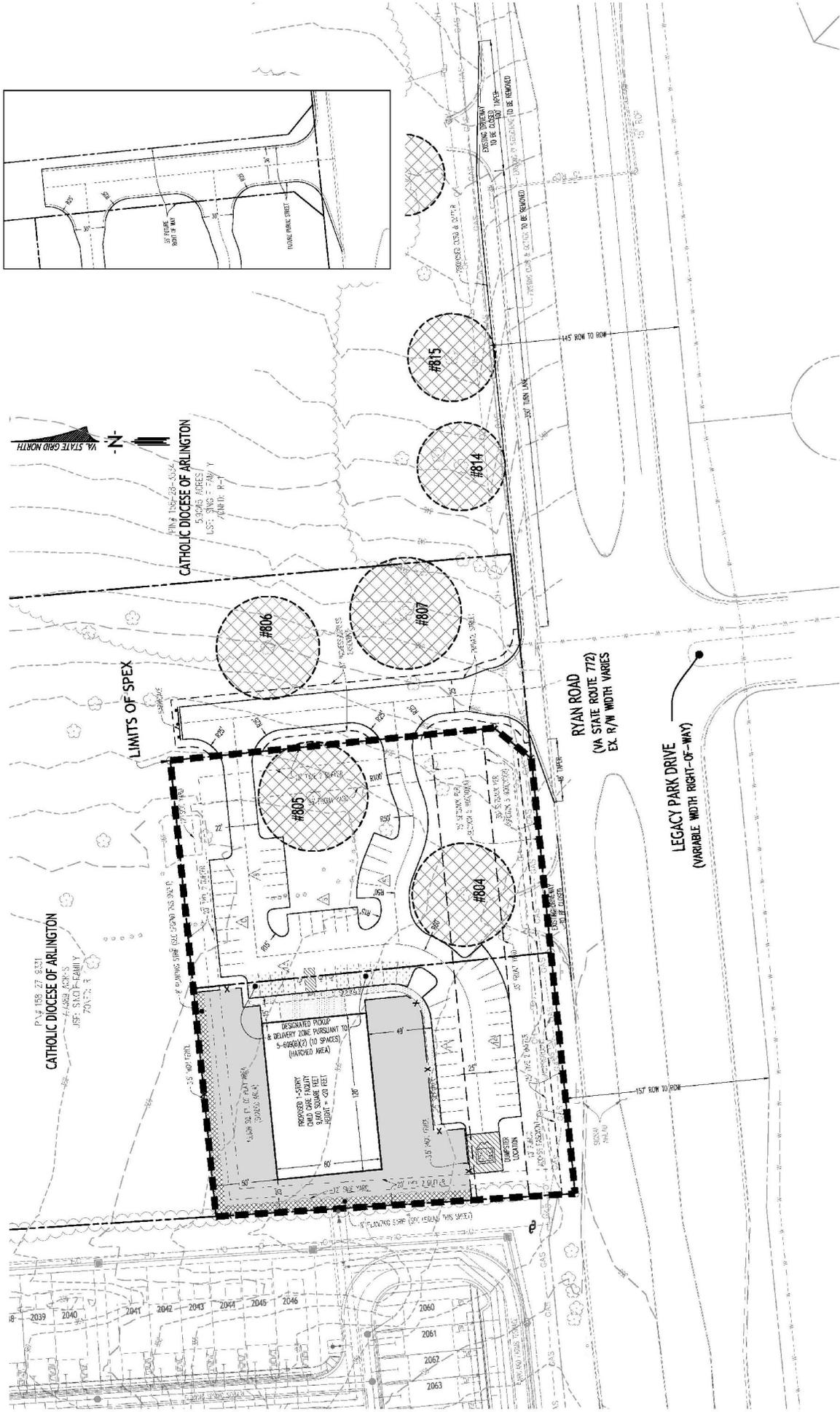


Figure 2  
Site Development Plan  
(Provided by J2 Engineers)



## **Compliance with VDOT Chapter 527 Guidelines**

Wells + Associates have prepared a Chapter 527 Compliance package associated with the development of the Ryan Road Property site, as required by 24 VAC 30-155. Implementation of the new regulations has been phased statewide over 18 months (July 01, 2007 to January 01, 2009). Implementation in the Northern Virginia District of VDOT began on July 01, 2007. As of January 1, 2008, site plans for commercial sites generating less than 250 peak hour trips are exempt from Chapter 527 Guidelines. The proposed special exception is estimated to generate less than the 250 peak hour trip threshold for commercial uses and would be exempt from 527 Guidelines. The Compliance Package is located in Appendix B.

## **BACKGROUND INFORMATION**

### **Study Area and Road Network**

Based on the traffic scoping agreement, the following intersections were included as part of this special exception traffic study:

1. Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772).
2. Site Entrance/Legacy Park Drive/Site Entrances/Ryan Road (VA 772).

A copy of the 10 percent rule analysis is shown in Appendix C.

### **Existing and Planned Road Network**

Belmont Ridge Road (VA Route 659) is a four-lane, divided roadway with a posted speed limit of 45 mph in the site vicinity. A traffic signal and multiple turn lanes exist at the Ryan Road (VA Route 772) intersection. This roadway is specified in the Countywide Transportation Plan (CTP) as a Major Collector designed as a 40 mph design speed and classified downward from a major collector to a minor collector when North Star Boulevard (Route 659 Relocated) is constructed.

Ryan Road (VA Route 772) is a four-lane divided, major collector with a posted speed limit of 45 mph in the vicinity of the site. Separate left and right turn lanes are provided at the Legacy Park Drive intersection. Ryan Road is specified in the CTP as a an ultimate six-lane roadway with a 50-mile-per-hour design speed, 120-foot right-of-way, left and right turn lanes at all intersections, and 900-foot desirable median break spacing.

The majority of these roadways were assumed to remain in their current configuration for purposes of this traffic study in 2015. Only the extension of Loudoun County Parkway from it's currently terminus to Ox Road (VA Route 606) was assumed under future conditions since its construction would be consummate with other planned development. Although other roadway connections are ultimately

planned, that include North Star Boulevard (Route 659 Relocated) and Route 621 Relocated, these facilities were not assumed in the future analyses to provide a conservative condition since there are no immediate plans for their construction.

Existing and planned intersection lane use and traffic control at key intersections in the site vicinity are shown on Figure 3.

### **Existing Traffic Counts**

Wells + Associates conducted peak hour traffic counts at the previously mentioned intersections on Wednesday, March 17, 2009. The results are shown on Figure 3 and contained in Appendix D. Note that the through movements on Ryan Road at Legacy Park Drive were reasonably balance with the counts collected at the Ryan Road/Belmont Ridge Road intersection.

### **Hazardous Locations**

Based on a field evaluation, Ryan Road has a crest vertical curve in the vicinity of the proposed site entrance opposite Legacy Park Drive. It appears that adequate sight distance exists and the recently constructed roadway does not present any apparent safety hazards.

### **Site Access**

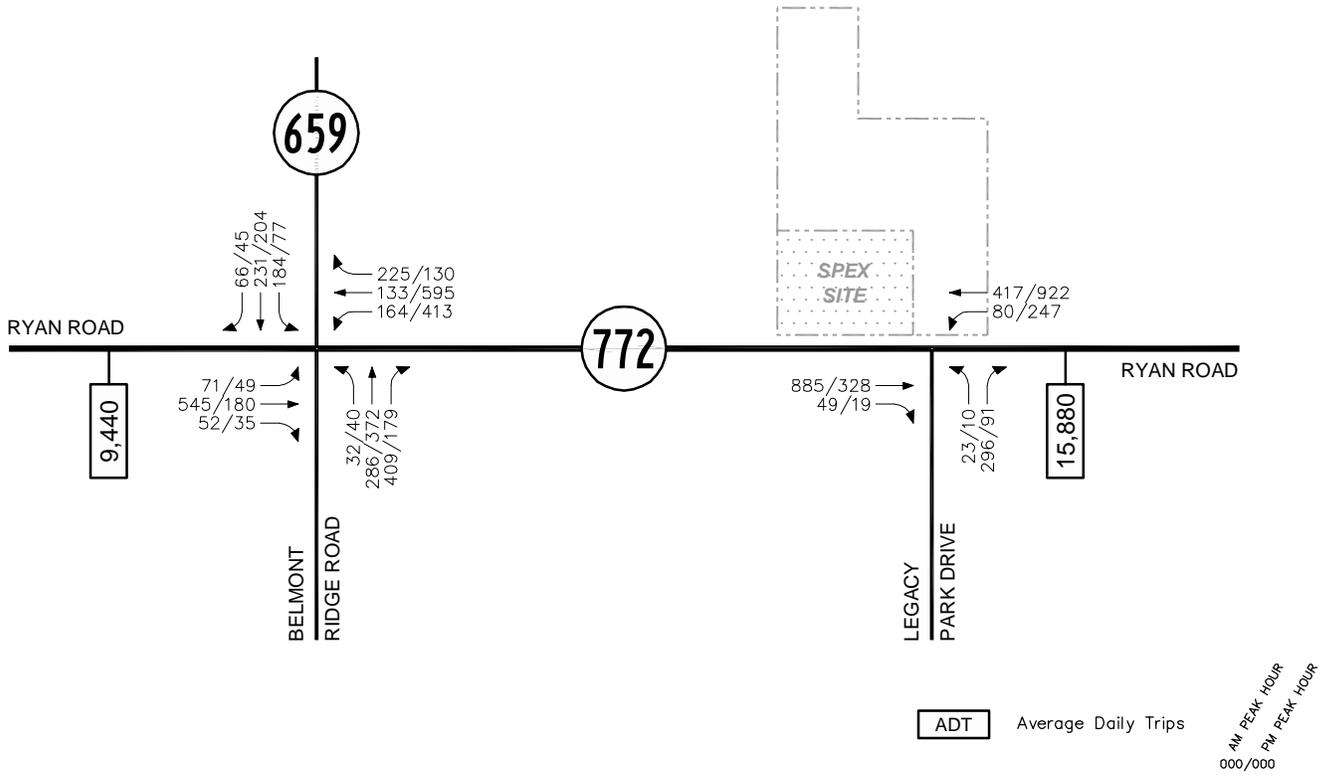
A full-movement median break currently exists on Ryan Road opposite the proposed site driveway at Legacy Park Drive. It is located approximately 850 feet east of the signalized Belmont Ridge Road/Ryan Road intersection. The existing median on Ryan Road is approximately 50-feet wide and provides separate eastbound and westbound left turn lanes with approximately 350 feet of storage. A separate eastbound right turn lane into Legacy Park Drive is also constructed.

The proposed site driveway would be served by the existing eastbound left turn lane with a new westbound right turn lane constructed in accordance with the CTP. An existing driveway located approximately 400 feet east of the proposed site driveway will be closed. As noted by OTS staff, the available sight distance will be verified by J2 Engineers for adequacy with the presence of the crest vertical curve mentioned previously.

The road section for the site driveway with the public street option would ultimately provide 36 feet of pavement that allows for a single inbound lane and two outbound lanes. The anticipated access scheme is shown on Figure 3.

A 10-foot wide public access easement is proposed to be provided along the Ryan Road frontage.

# Existing Peak Hour Traffic Counts



# Existing Lane Use and Traffic Control

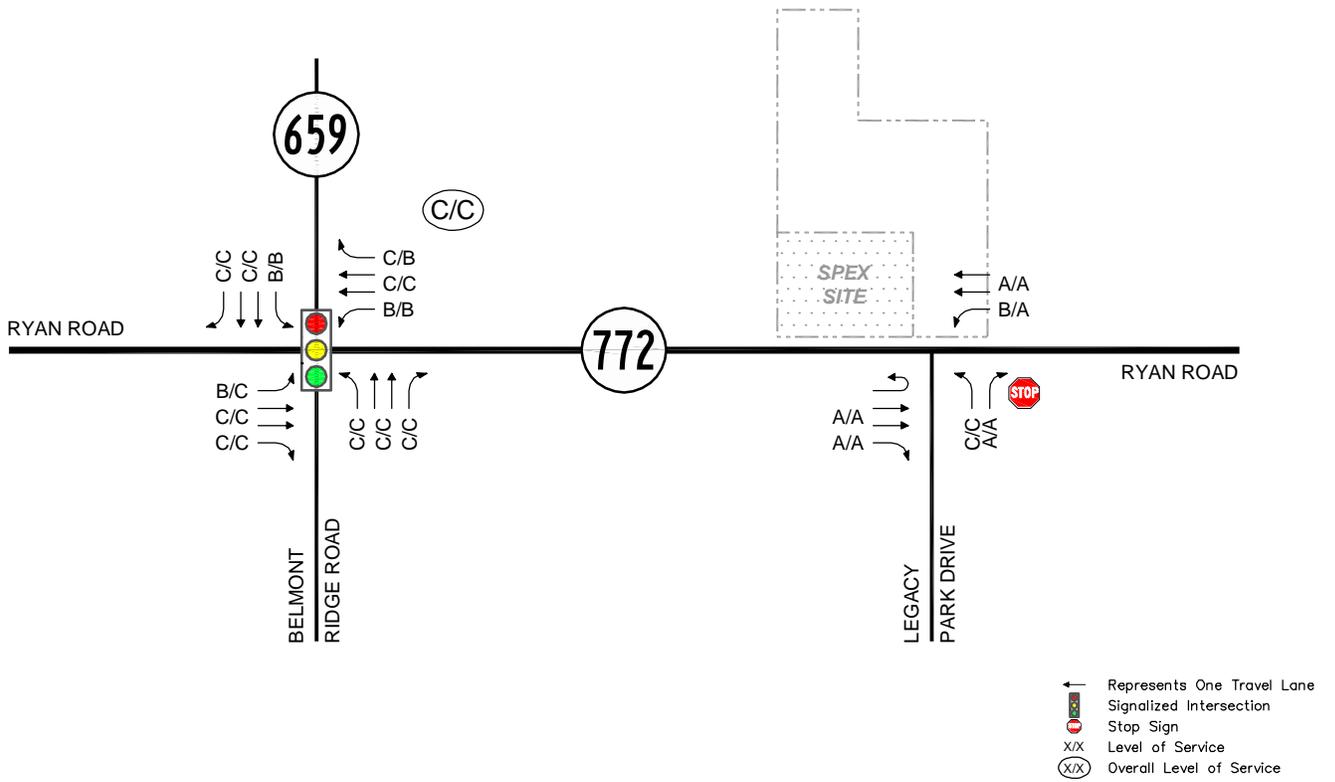


Figure 3  
 Existing Peak Hour Traffic Counts, and  
 Lane Use and Traffic Control



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## Existing Levels of Service

Existing peak hour levels of service were estimated at the existing intersections in the study area based on the existing lane usage and traffic control and existing traffic volumes shown on Figure 3, and the Highway Capacity Manual methodology (Synchro version 7). The results are presented in Appendix E and summarized in Table I, and indicate that all of the approaches at the Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) intersection currently operate at acceptable levels of service during both the AM and PM peak hours under signal control. In addition, all of the individual turning movements at the Legacy Park Drive/Ryan Road (VA Route 772) intersection operate at acceptable levels of service under stop sign control during both peak periods.

## Other Approved Developments

**Overview.** This traffic study includes traffic generated by 11 other approved development projects in the region, including the currently approved development program for the site. The following projects were considered in this traffic study:

1. Loudoun Parkway Center.
2. Loudoun Valley Estates.
3. Dulles Parkway Center - South.
4. Moorefield Station.
5. Park at Bella Terra.
6. Graham Flynn.
7. Belmont Trace.
8. Brambleton.
9. Loudoun Valley Estates II.
10. Brambleton Additions.
11. Ryan Road Property (existing zoning).

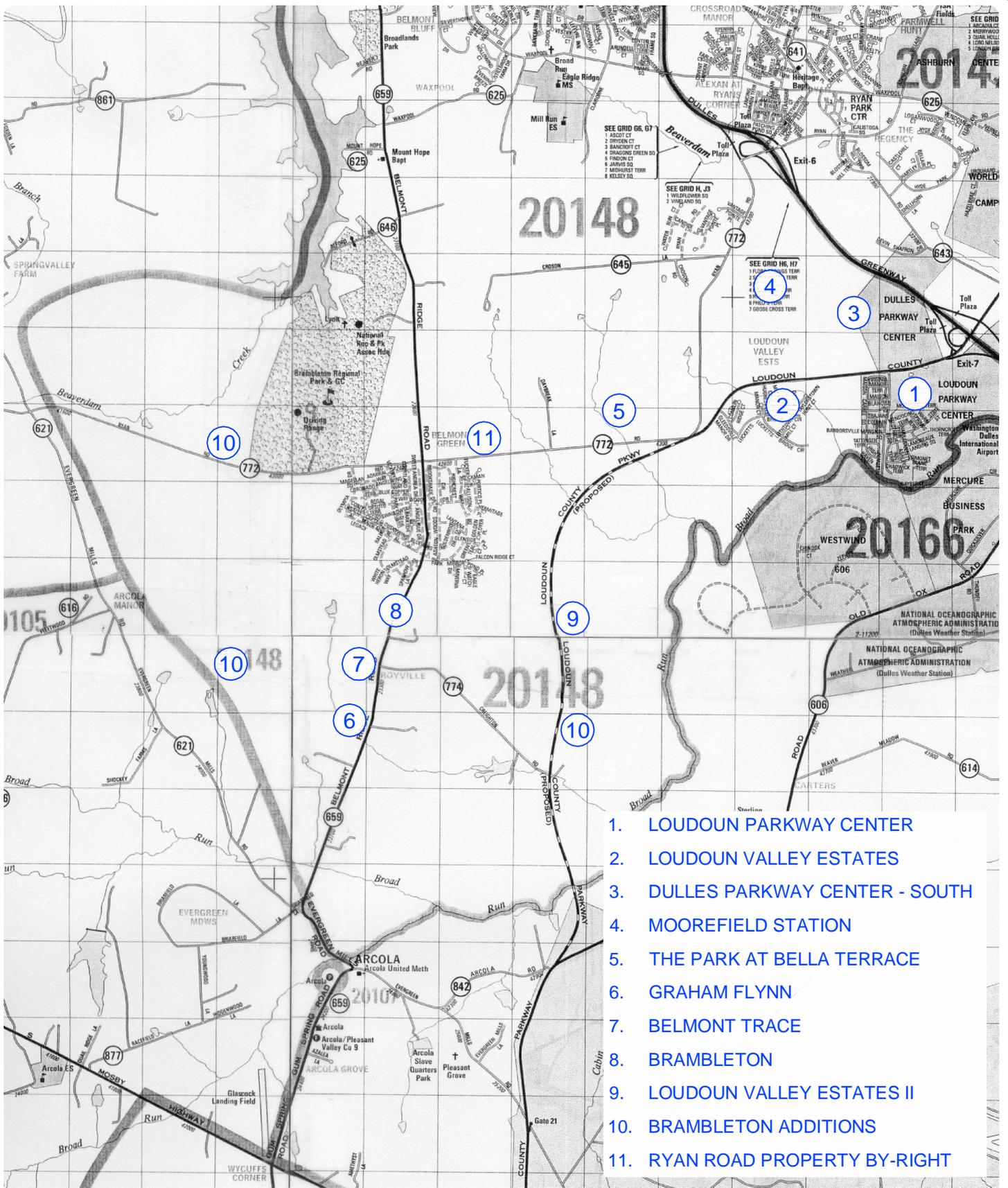
The level of development within each of the other approved projects listed above was updated based on comments provided by OTS on the April 2009 rezoning traffic study. The location of these other developments is shown on Figure 4.

Table I  
 Ryan Road Property  
 Intersection Level of Service

Intersection	Intersection Control	Critical Movement	2015					
			Existing 2008		Background		Total Future	
			AM	PM	AM	PM	AM	PM
1. Belmont Ridge Road (Route 659)/ Ryan Road (Route 772)	Signalized	EBL	B (19.2)	B (18.2)	B (17.7)	C (21.4)	B (18.0)	C (21.6)
		EBT	C (30.4)	C (25.2)	C (30.2)	C (28.9)	C (30.8)	C (29.1)
		EBR	C (24.6)	C (23.8)	C (22.9)	C (26.4)	C (23.1)	C (26.5)
		WBL	B (17.0)	B (17.3)	B (17.2)	B (18.9)	B (17.6)	B (19.6)
		WBT	C (22.6)	C (22.5)	C (22.6)	C (28.7)	C (22.7)	C (29.2)
		WBR	C (22.9)	B (18.6)	C (22.3)	C (22.0)	C (22.4)	C (22.0)
		NBL	C (23.0)	C (20.2)	C (24.9)	C (22.6)	C (25.5)	C (23.0)
		NBT	C (30.1)	C (27.8)	C (34.5)	C (33.3)	D (35.2)	C (33.8)
		NBR	C (31.3)	C (25.1)	C (32.2)	C (28.5)	C (33.4)	C (28.9)
		SBL	B (16.9)	B (17.4)	C (20.1)	B (18.8)	C (21.0)	B (19.1)
		SBT	C (22.5)	C (23.8)	C (26.6)	C (26.5)	C (27.1)	C (26.8)
		SBR	<u>C (21.2)</u>	<u>C (22.4)</u>	<u>C (24.5)</u>	<u>C (24.2)</u>	<u>C (25.0)</u>	<u>C (24.5)</u>
		<b>Overall</b>	<b>C (25.9)</b>	<b>C (22.4)</b>	<b>C (27.0)</b>	<b>C (26.9)</b>	<b>C (27.6)</b>	<b>C (27.3)</b>
		2. Ryan Road (Route 772)/ Legacy Park Drive/Future Site Driveway	Unsignalized	WBL	B [11.6]	A [9.4]	N/A	N/A
NBL	C [17.6]			C [15.3]				
EBL					A [8.9]	B [12.0]	A [9.2]	B [12.5]
WBL					B [11.9]	A [9.8]	B [11.9]	A [10.0]
NBLT					B [13.8]	B [12.4]	B [14.5]	C [15.3]
NBR				N/A	A [0.0]	A [0.0]	A [0.0]	A [0.0]
SBLTR					C [19.8]	F [52.3]	N/A	N/A
SBLT					N/A	N/A	E [36.1]	E [35.2]
SBR					N/A	N/A	A [0.0]	A [0.0]

Notes:

- Numbers in parentheses () represent delay at signalized intersections in seconds per vehicle.
- Numbers in square brackets [] represent delay at unsignalized intersections in seconds per vehicle.
- Synchro files and timings provided by VDOT and remain constant through all analysis scenarios.



1. LOUDOUN PARKWAY CENTER
2. LOUDOUN VALLEY ESTATES
3. DULLES PARKWAY CENTER - SOUTH
4. MOOREFIELD STATION
5. THE PARK AT BELLA TERRACE
6. GRAHAM FLYNN
7. BELMONT TRACE
8. BRAMBLETON
9. LOUDOUN VALLEY ESTATES II
10. BRAMBLETON ADDITIONS
11. RYAN ROAD PROPERTY BY-RIGHT

Figure 4  
Other Development Location Map



## **Background Development Trip Assignments**

The traffic anticipated to be generated by the other developments including the approved development program for the Ryan Road Property and adjacent parcel (21 SFDU) were assigned to the study network according to distributions from previous studies, existing travel patterns and traffic counts, and local knowledge.

Trip assignments generated by all other approved developments for 2015 are shown on Figure 5. Confirmation of the updated background development assumptions, trip generation estimates, and isolated traffic assignments for background developments are contained in Appendix F.

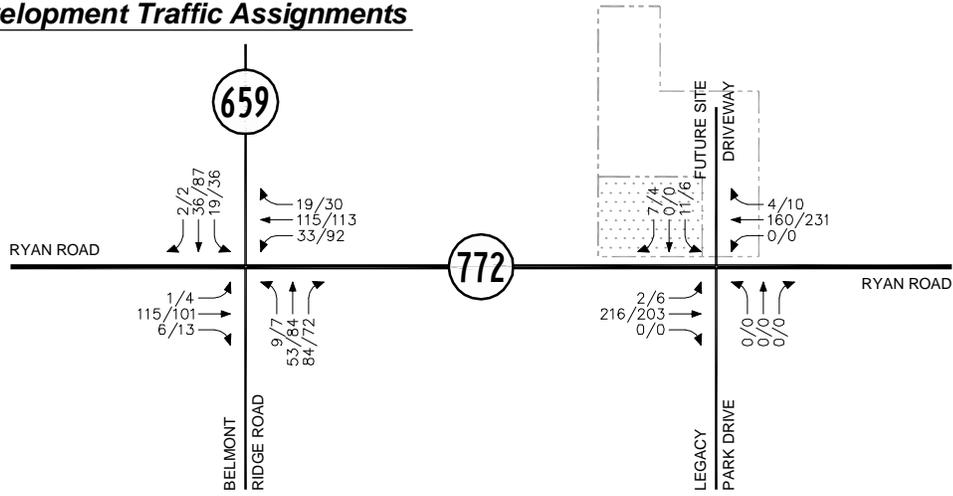
## **Adjustments to Existing Traffic**

The existing traffic counts were adjusted to reflect the construction of Loudoun County Parkway from its current terminus to Ox Road (VA Route 606). As part of this improvement, one-half of the westbound left turns and northbound right turns were assumed to utilize Loudoun County Parkway rather than Belmont Ridge Road. These adjustments are shown on Figure 5.

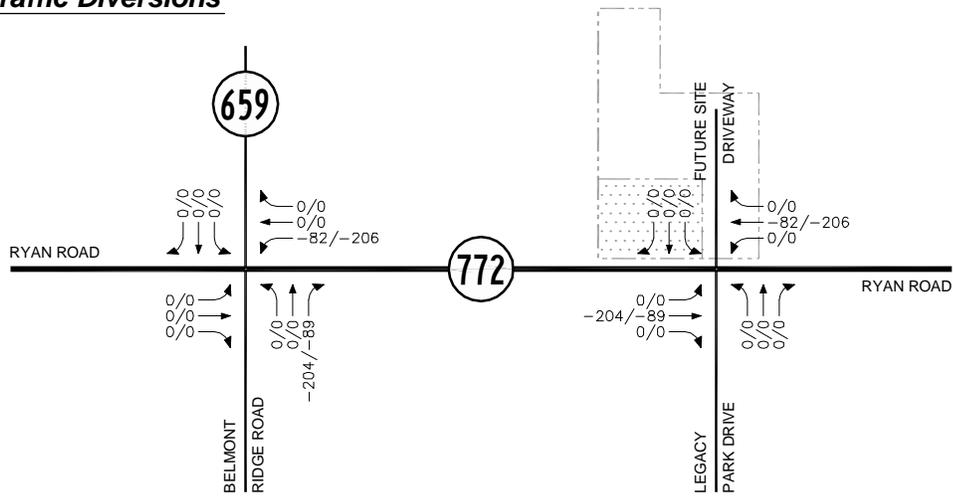
## **Growth Rate**

Consistent with the aforementioned study, a regional growth rate of 1.0 percent per year, compounded annually, was applied to all turning movements at the Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) intersection and on the through traffic movements on Ryan Road at the Legacy Park Drive intersection. The annually compounded growth is depicted on Figure 5.

**2015 Other Development Traffic Assignments**



**2015 Existing Traffic Diversions**



**2015 Regional Growth (1% Compounded Annually)**

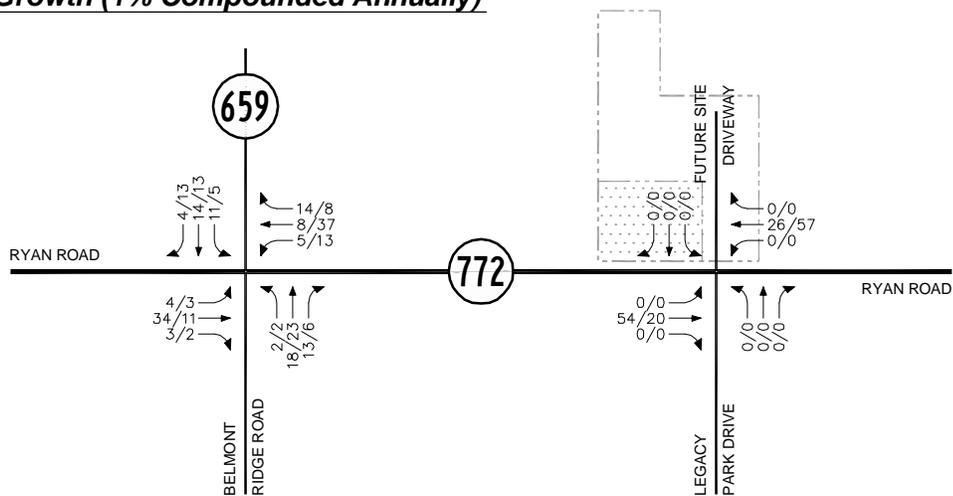


Figure 5  
Other Development Traffic Assignments, Regional Growth  
and Existing Traffic Diversions

AM PEAK HOUR  
PM PEAK HOUR  
000/000



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## **Year 2015 Background Traffic Forecasts**

Background traffic forecasts for 2015 were developed based on the existing traffic counts, applied growth rate, and traffic generated by other approved developments including the current zoning of the Ryan Road Property. These forecasts assume the site and adjacent property to be developed with 21 single-family homes as allowed under the current R-1 zoning. The results are summarized on Figure 6.

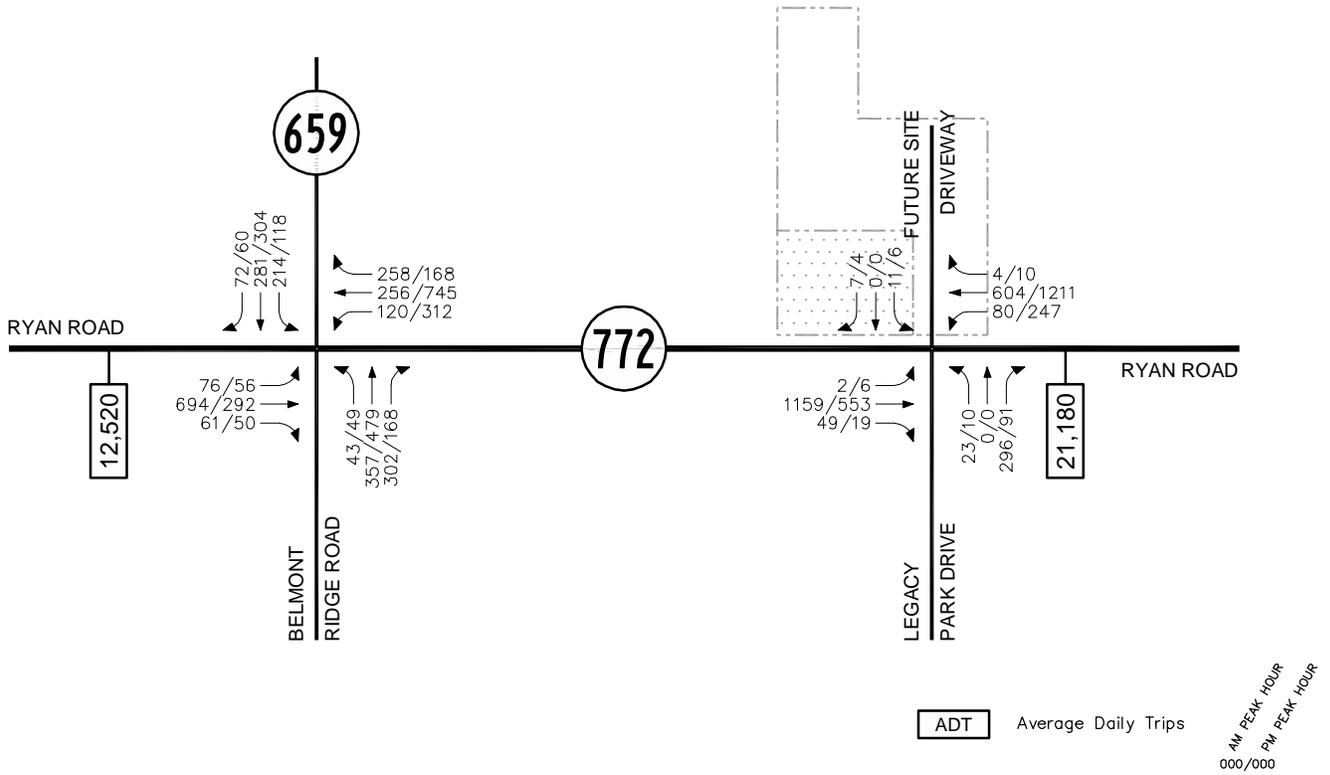
## **Year 2015 Background Levels of Service**

Peak hour levels of service under background 2015 conditions were estimated at the study intersections based on the existing and future lane usage and traffic control shown on Figure 3, the traffic volumes shown on Figure 6, and the Highway Capacity Manual methodology (Synchro version 7). The results are presented in Appendix G and indicate the following:

1. The Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) intersection would continue to operate at overall acceptable levels of service, at LOS “C” during the AM peak hour and at LOS “C” during the PM peak hour.
2. All of the turning movements at the Site Driveway/Legacy Park Drive/Ryan Road intersection would operate at acceptable levels of service during both the AM and PM peak hours under stop sign control with the exception of the southbound approach. This movement would theoretically operate beyond capacity during the PM peak hour, but would likely utilize gaps in through traffic created by the traffic signal at Belmont Ridge Road (VA Route 659) and the wide median to travel east on Ryan Road, minimizing delays. Note that the analysis assumed site development under the current zoning would provide single lanes for the southbound Site Driveway approach and would require a separate westbound right turn lane on Ryan Road. The single southbound lane contributes to the increased delay for this movement.
3. Since the southbound approach of the Site Driveway on Ryan Road is forecasted to operate beyond capacity during the PM peak hour, warrants for signalization were reviewed. The results indicate that traffic signal warrants would not be met at this location based on the volume and its proximity to the signalized Belmont Ridge Road/Ryan Road intersection 850 feet to the west.

These levels of service are depicted graphically on Figure 6.

# Background Future Traffic Forecasts



# Background Future Levels of Service

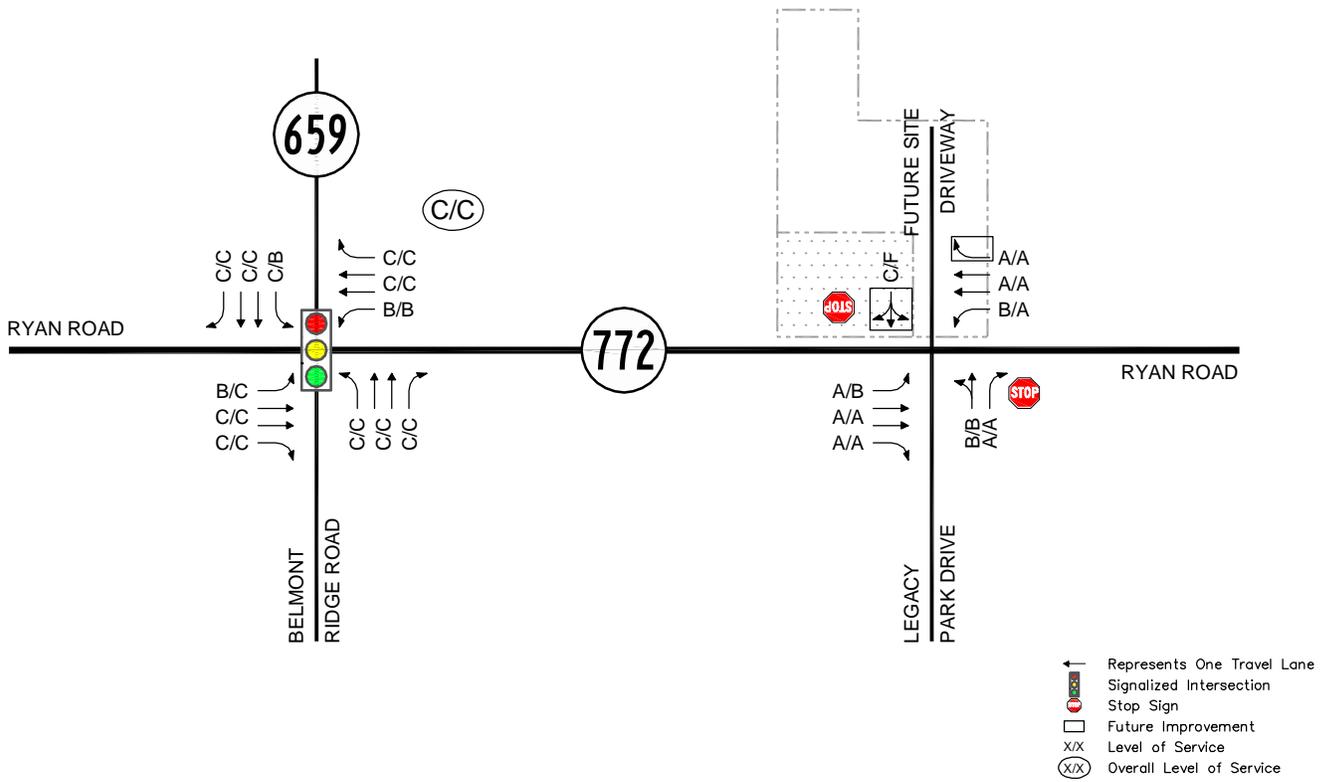


Figure 6  
Background Future Peak Hour Traffic Forecasts and Levels of Service



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## **Site Trip Generation**

The number of trips generated by both the existing zoning and proposed development programs for the Ryan Road Property was calculated using the Institute of Transportation Engineers Trip Generation, 8<sup>th</sup> Edition trip rates and equations, and is summarized on Table 2.

The existing zoning (R-1) would allow for the development of two (2) single-family homes, and would generate 2 AM peak hour trips (1 in and 1 out), 2 PM peak hour trips (1 in and 1 out) and 20 average daily (24-hour) trips. The proposed Ryan Road Property Special Exception program (208-student child care center) would generate 157 AM peak hour trips (83 in and 74 out), 143 PM peak hour trips (67 in and 76 out), and 941 average daily (24-hour) trips. Thus, the proposed special exception would generate 155 *more* AM peak hour trips, 141 *more* PM peak hour trips, and 921 *more* daily trips the current zoning.

## **Site Generated Traffic Assignments**

The net new vehicle trips discussed above were applied to the road network based on forecasted traffic volumes and reflect home to work travel patterns for patrons of the child care center. Separate distributions were prepared for both the AM and PM peak hours for accuracy. The results are shown on Figure 7 with the site generated traffic assignments.

Table 2  
 Ryan Road Property  
 Site Trip Generation Summary (1)

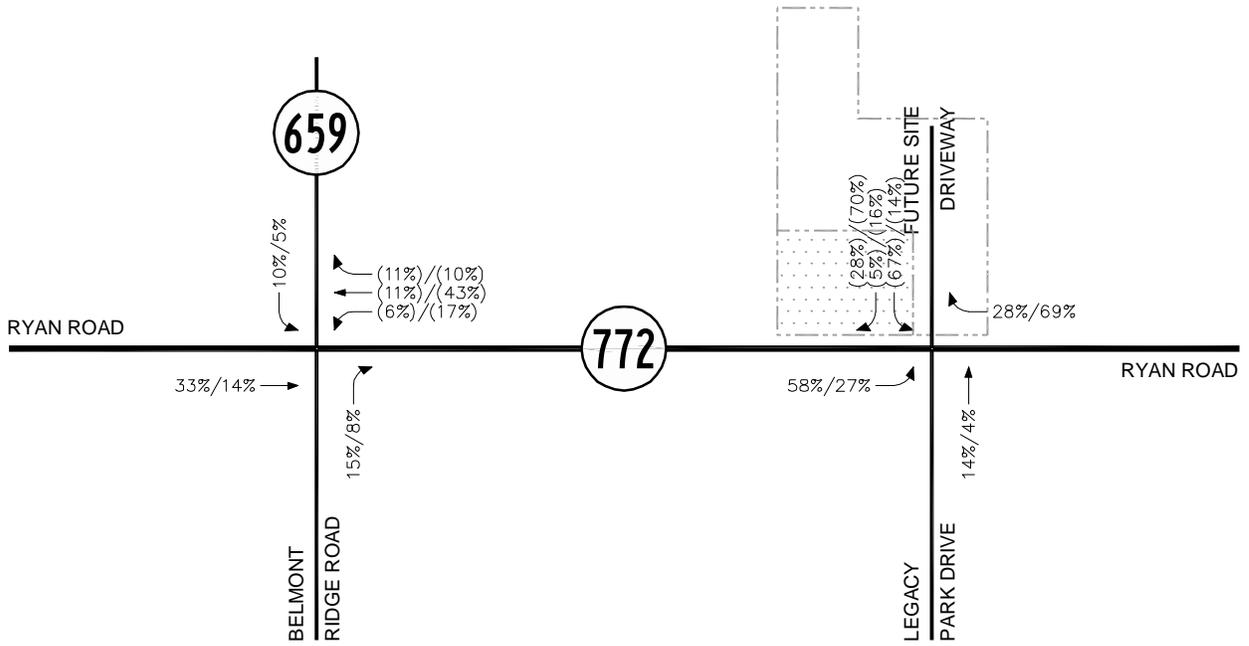
Development/Use	Land Use Code	Amount	Units	AM Peak Hour (2)			PM Peak Hour			Weekday ADT (3)
				In	Out	Total	In	Out	Total	
<b>Existing Zoning</b>										
Residential - Single-Family Detached	210	2	DU	1	1	2	1	1	2	20
<b>Proposed Special Exception</b>										
Child Day Care Center	565	208	Students	83	74	157	67	76	143	941
<b>Difference (Net New Trips)</b>				<b>82</b>	<b>73</b>	<b>155</b>	<b>66</b>	<b>75</b>	<b>141</b>	<b>921</b>

Notes: (1) Trips based on the rates and equations published in the Trip Generation Manual, 8th Edition, by the Institute of Transportation Engineers (ITE).

(2) Based on average rate due to small size.

(3) ADT based on 10 daily trips per residential unit.

# Directional Distributions



# Site-Generated Traffic Assignments (Net New Trips)

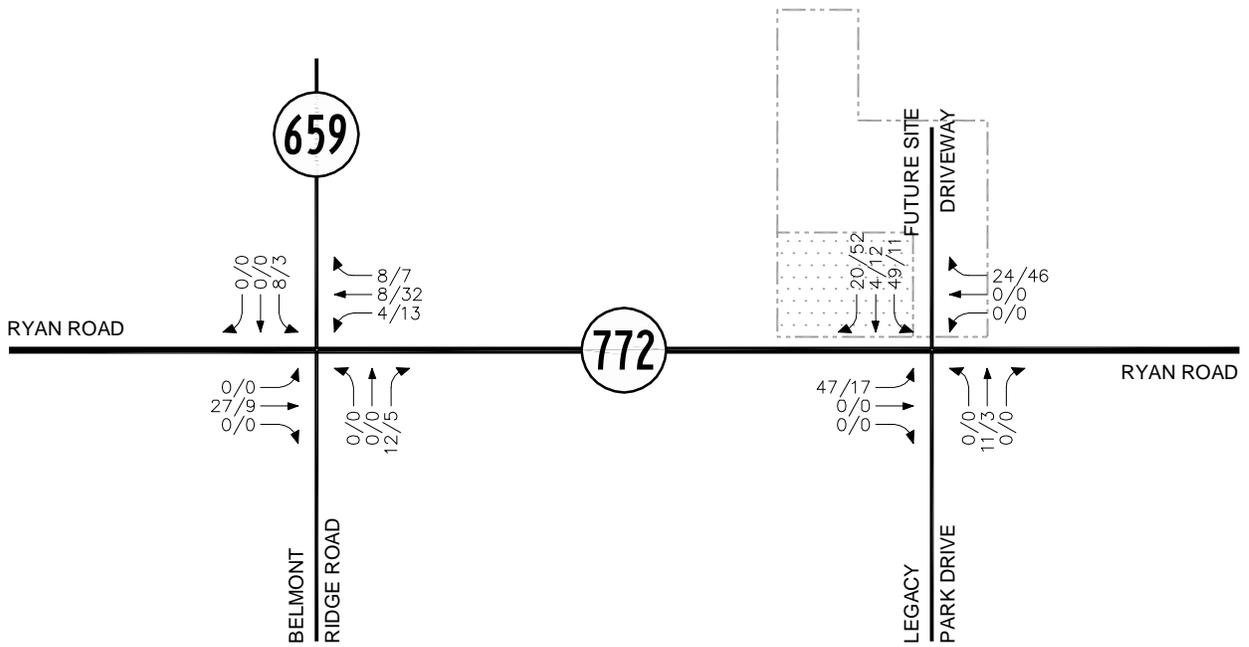


Figure 7  
Site-Generated Traffic Assignments and  
Directional Distributions

00% IN  
(00%) OUT

AM PEAK HOUR  
PM PEAK HOUR  
000/000



## **Year 2015 Total Future Traffic Forecasts**

Total future traffic forecasts for 2015 were prepared based on the existing traffic counts, applied growth rate, adjustments to existing traffic, background development and the net new trips generated by the proposed special exception program. These forecasts include the traffic generated by the 21 residential units that could be built on the adjacent property under the current zoning. (Note that only 19 units could be built due to the displacement caused by the Child Care Center, but no adjustments were made since these would have minimal impact on the overall road network.) The resultant traffic forecasts are shown on Figure 8.

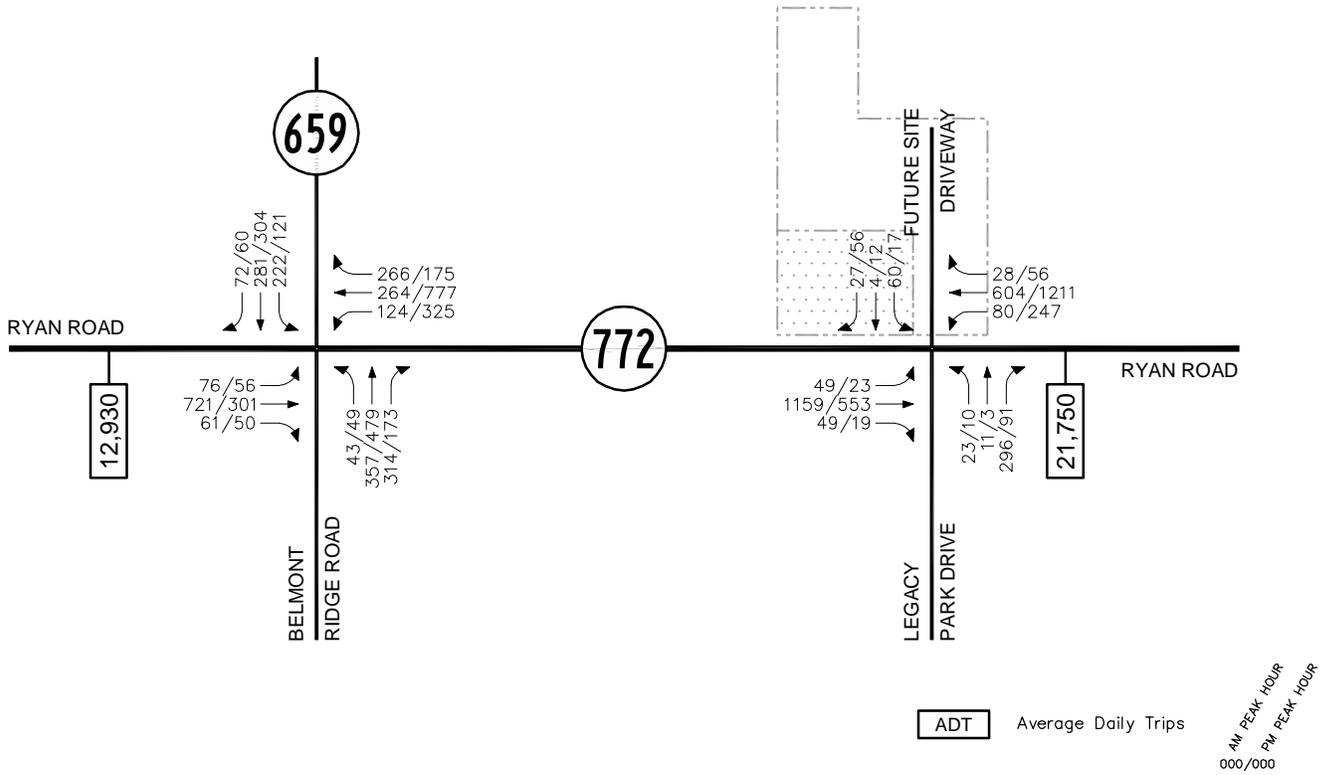
## **Year 2015 Total Future Levels of Service**

Capacity analyses were prepared for total future conditions with the proposed rezoning of the Ryan Road Property based on the lane use shown on Figure 3, the traffic forecasts shown on Figure 8 and the Synchro (version 7) capacity analysis procedures. The results are summarized in Table I and include a comparison of the existing versus proposed zoning. Capacity analysis worksheets are contained in Appendix H and depicted graphically on Figure 8, and indicate the following:

1. The Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) intersection would continue to operate at overall acceptable levels of service, at LOS "C" during the AM peak hour and at LOS "C" during the PM peak hour, with the proposed special exception. The site development would have only a minimal increase in delay at this intersection when compared to the density allowed by the currently approved zoning.
2. All of the turning movements at the Site Driveway/Legacy Park Drive/Ryan Road intersection would operate at acceptable levels of service during both the AM and PM peak hours under stop sign control with the exception of the southbound approach that is forecasted to operate at LOS "E" during both the AM and PM peak periods. The delay for this approach exceeds the threshold for LOS "D" by approximately one (1) second.
3. A review of the traffic signal warrants for the Site Driveway/Legacy Park Drive/Ryan Road intersection indicates that warrants for signalization would not be met at this location. Further, the southbound approach is planned to provide a separate right turn lane that would better facilitate these movements. The southbound turning movements would utilize gaps in through traffic created by the traffic signal at Belmont Ridge Road and the wide median, reducing delay for these maneuvers.

The results of the total future analyses indicate that the additional traffic generated by the proposed special exception would have only a minor impact to the road network and intersection delays, and not require any additional road improvements beyond a separate westbound right turn lane on Ryan Road (VA Route 772) in accordance with the Countywide Transportation Plan. The existing eastbound left turn lane on Ryan Road (approximately 350 feet of storage) would adequately serve the site.

# Total Future Traffic Forecasts



# Total Future Levels of Service

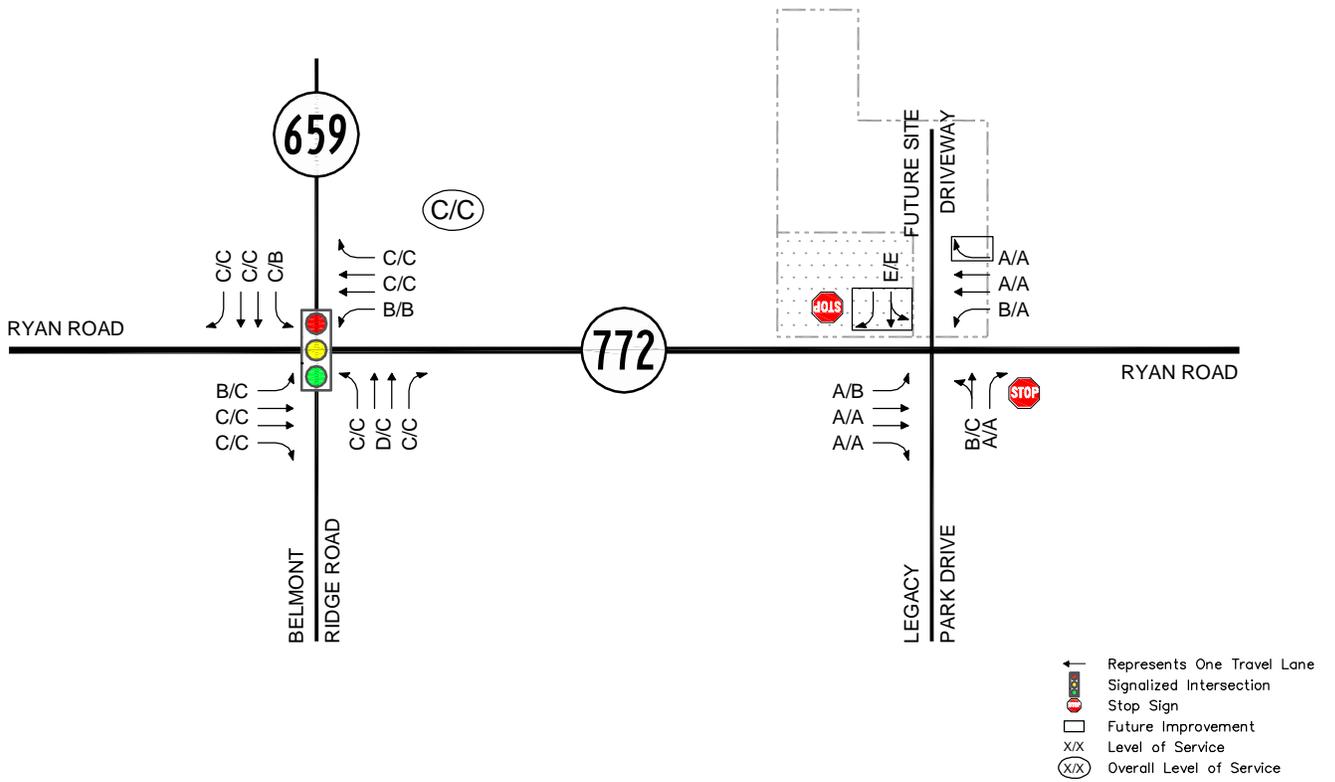


Figure 8  
 Total Future Peak Hour Traffic Forecasts and  
 Levels of Service



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## Conclusions

The conclusions of this traffic impact analysis are as follows:

1. All of the approaches and turning movements at the Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) intersection and the Legacy Park Drive/Ryan Road intersection currently operate at acceptable levels of service during both the AM and PM peak hours
2. The existing zoning (R-1) for the Ryan Road Property allows for the development of two (2) single-family homes that would generate 2 AM peak hour trips, 2 PM peak hour trips, and 20 average daily (24-hour) trips. The proposed Ryan Road Property Special Exception program (208-student child care center) would generate 157 AM peak hour trips (83 in and 74 out), 143 PM peak hour trips (67 in and 76 out), and 941 average daily (24-hour) trips. Thus, the proposed special exception would generate 155 *more* AM peak hour trips, 141 *more* PM peak hour trips, and 921 *more* daily trips the current zoning.
3. The Belmont Ridge Road (VA Route 659)/Ryan Road (VA Route 772) signalized intersection currently operates at overall acceptable levels of service during both the AM and PM peak hours, and is expected to continue to do so in 2015 with or without the proposed special exception, without further improvements.
4. All of the movements at the Belmont Ridge Road (VA Route 659) and Legacy Park Drive/Site Entrance on Ryan Road are anticipated to operate at acceptable levels of service with the special exception, with the exception of the southbound approach of the Site Driveway. This approach would theoretically operate beyond capacity during the AM and/or PM peak hours under both background and future conditions. Warrants for signalization would not be met under either condition at this location. In addition, gaps in through traffic created by the traffic signal at Belmont Ridge Road, the wide median on Ryan Road, and separate lanes for southbound traffic exiting the Site Driveway are expected to facilitate these movements and minimize delay for motorists.
5. The results of the total future analyses indicate that the additional traffic generated by the proposed special exception would have minimal impact to the road network and intersection delays, and not require any additional road improvements beyond a separate westbound right turn lane on Ryan Road (VA Route 772) in accordance with the Countywide Transportation Plan. The existing eastbound left turn lane on Ryan Road (approximately 350 feet of storage) would adequately serve the site.

Questions regarding this document should be directed to Wells + Associates.

Appendix A

Loudoun County OTS Scoping Agreement



## Michael J. Workosky

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**From:** phillips, george [George.Phillips@loudoun.gov]  
**Sent:** Tuesday, December 08, 2009 6:15 PM  
**To:** Michael J. Workosky  
**Cc:** Michael J. Buelow; Mosurak, Lou; Beacher, Andrew  
**Subject:** RE:

Mike- 12/8/09

It looks good and am O.K. with it overall. However, for the background traffic, please check the 2008 Loudoun County Growth Summary and compare it to what was assumed before. I'm curious how they compare with the background developments assumed with the Brambleton Additions and other background developments. I want to make sure that the background traffic is not overestimated, especially given the current economy. Let's talk once you check it out.

Thanks, George

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**From:** Michael J. Workosky [mailto:Mjworkosky@mjwells.com]  
**Sent:** Tuesday, December 08, 2009 2:34 PM  
**To:** phillips, george  
**Cc:** Michael J. Buelow  
**Subject:**

George,

This email requests an updated traffic scope for the Ryan Road Property. Wells + Associates previously submitted a traffic study for the ZMAP application, dated April 1, 2009 to rezone the 19.68-acre site from R-1, allowing one residential unit per 40,000 S.F., or 21 single-family homes to R-3 Cluster to allow the development of 49 single-family homes. This application was withdrawn. Two units currently exist on the property. A copy of the previously submitted traffic study and the previous scoping agreement is attached for your reference.

A pre-application conference was held on November 19, 2009. A new SPEX application will be filed to allow for an approximately 2 acre day care site (200-children) within the overall development. The daycare would be primarily a pick-up/drop-off facility with the majority of its trips occurring during the peak hour of adjacent street traffic. (Note that the day care center would generate fewer than 250 new peak hour trips and would therefore be exempt from 527 requirements.) The balance of the site would remain R-1 and be developed by-right with 19 single-family homes. Thus, the updated traffic study would include both the by-right condition with 2 single-family residential units versus the proposed 200-child day care. The project is still planned to be constructed in a single phase by 2015 as considered in the previously submitted study. The background developments and growth rate used in the previous study will be applied to this updated report.

We propose to retain the scope included in the April 1, 2009 traffic study. We would use the previously collected traffic counts (March 1009) for the Belmont Ridge Road (Route 659)/Ryan Road (Route 772) and Ryan Road (Route 772)/Legacy Park Drive intersections. Similar to the previous plan, the proposed site entrance would be full access and be aligned opposite Legacy Park Drive. The site-generated traffic assignments will reflect the travel patterns for day-care patrons traveling to and from work. The study will address the need to provide left and right-turn lanes into the site and review peak hour signal warrants at the Ryan Road/Legacy Park Drive/Site Entrance intersection.

Please respond to this email to confirm that this revised scope is adequate. Feel free to call or email me or Mike Buelow with any questions. Thanks.

Mike.

Michael J. Workosky, PTP, TOPS  
Principal Associate

**Wells + Associates, Inc.**

1420 Spring Hill Road

Suite 600

McLean, Virginia 22102

Ph: 703/917-6620

Fax: 703/917-0739

Cell: 703/898-6712

Email: [mjworkosky@mjwells.com](mailto:mjworkosky@mjwells.com)

Application Name: Van Metre CDA Property  
Application Type: Residential  
Attendees: George Phillips

Date: 3/16/09  
Mike Wankosky/Wells

Include Compliance Package to UDOT/521

- (1) **Study Area:** Roadways internal or adjacent to the development site shall be included in the traffic study. The study area should be defined at the scoping meeting and as a guideline should include other external roads to the extent that the project's generated traffic is anticipated to exceed 10 percent of the road's current/existing traffic volumes (at the time of application).

Comments: Ryan Road / Belmont Ridge Road area  
(North-south alignment)

- (2) **Traffic Count Locations:** Traffic counts are required on the adjacent roads, the adjacent intersections beyond the project's frontage on adjacent roads in the study area. The AM/PM peak period traffic counts shall not be more than twelve (12) months old at the time of the application submission. Twenty-four (24) hour weekday traffic counts are also required for roadway segments.

Comments: Will provide  
Site estimates on Ryan Road / Legacy Park Drive  
Rate 659 / Ryan Road intersection

- (3) **Trip Generation:** As a general guide to vehicle trip generation, the latest edition of the Institute of Transportation Engineer's (I.T.E.). Trip Generation Report shall be used. These rates may be supplemented by additional information provided by the County. If the applicant chooses to use different rates, they shall be documented and agreed to at the scoping meeting prior to their use in the traffic analyses. Primary trip reductions associated with passby trips and methodologies for trip reductions associated with passby trips shall be discussed and agreed upon at the scoping meeting.

Comments: Will provide. Use ITE Rates (8th Edition)  
Single Family Detached.  
Provide comparison with the existing zoning.  
Check warrants for westbound night turn lane

- (4) **Traffic Volume Projections:** The traffic study shall include an agreed upon build out year and provide existing and projected traffic volumes, with and without the subject project, for Average Daily Traffic (ADT), as well as AM and PM peak hours. The peak hour of the project/individual land use(s) (as given in the ITE Trip Generation Report) should be added to the corresponding AM/PM existing peak hour of the adjacent roadway traffic volumes (to show the worst case scenario), if the peak hour of the project/individual land use(s) for the generator is greater than the peak hour of the adjacent roadway (per ITE Trip Generation Report). The existing peak hour of traffic on the roads adjacent to the subject project site shall be identified. These traffic volumes shall be provided at roadway intersections and commercial or private accessways/entrances.

Comments: Will provide 2015 Buildout Year  
Assume 4 lanes on Ryan Road and Belmont Ridge Road

- (5) **LOS Analysis:** Level of Service (LOS) calculations for existing and projected conditions, with and without the subject project, for highway segments, intersection legs, and entrances shall be provided. Calculations shall be in accordance with the Highway Capacity Manual (HCM) and/or the Highway Capacity Software (HCS), or as may be agreed at the scoping meeting. Traffic volumes and LOS information shall be provided for each phase of development, to include conditions at date of project completion. ~~Projections shall also be made for date of completion plus ten (10) years or to an agreed upon forecast year.~~

Comments: Will provide Due to other large studies in the area, no buildout plus 10 needed

- (6) **Minimum Roadway/Intersection LOS Standards:** Recommendations for phased improvements to the road network links in order to maintain an acceptable LOS (minimum LOS "D") shall be provided. For each phase up to and including buildout, a minimum approach and overall LOS "D" at intersections shall apply.

Comments: Will provide

- (7) **Background Traffic Assumptions:** Assumptions which determine projected background traffic, including through traffic growth rate to be applied on roadway links, shall be confirmed at the scoping meeting. The sources for determining future traffic projections will include one or more of the following:
- The Loudoun County Growth Summary or similar documents from Loudoun County.
  - The Loudoun County transportation model which incorporates COG's Cooperative Forecasts for Loudoun County.
  - Approved developments in the vicinity of the proposed development.

Specific other approved development names and respective development square footage or residential units in the study shall be provided.

Comments: See Comment #4. 2015 Buildout Year. Existing Road Network  
Review Brambleton Additions TIA (Wells) September 14, 2006  
for background assumptions for 2012. Update to 2015 / take into  
account the current economy. Check Loudoun County Growth  
Summary. Use/Apply

- (8) **Traffic/Trip Distribution:** Directional trip distribution information shall be provided for project entrances and collector and arterial intersections within the study area for the phases and categories (e.g., residential, office, retail, industrial and institutional) of development.

Comments: Will provide. Majority to the east on Ryan Road  
Locality based on existing counts and Brambleton Additions study.

- (9) **LOS Calculations Assumptions:** Traffic counts and LOS worksheets and projected traffic volume LOS analyses, using agreed upon analysis techniques, including existing AM/PM peak hour signal timing, shall be included as a part of the traffic study.

Comments: Will provide. Synchro 7. Include report text and  
Synchro Run on Disc.  
Include Compliance (S27 Compliance) Package as well.

- (10) **Mode Choice:** Modal split information shall be provided for the phases of the analysis, with sources of information identified (e.g., COG model).

Comments: N.A.

- (11) **Safety Locations:** Road safety hazards, as identified by the ISTEA set-aside funding criteria and/or as identified by the County at the scoping meeting, within the study area shall be analyzed for all roadway links and intersections in the traffic study.

Comments: Willys made in the report. (Either way)

- (12) **Traffic Mitigation Measures:** If trip reduction factors are used in the study, measures necessary to implement the reduction must be specified, with supporting documentation.

Comments: N.A.

- (13) **Bicycle & Pedestrian Accommodations:** When bicycle and pedestrian accommodations are used to reduce anticipated traffic volumes, a description of the physical and functional characteristics of the proposed bicycle and pedestrian accommodations shall be provided. If such separate bicycle accommodations (e.g., striped lanes or multi-purpose trails) are anticipated, they shall also be identified. A description of the functional characteristics shall be provided to identify the transportation options that these accommodations provide (e.g., pedestrian access to retail center, safe bicycle route to elementary school, inter-parcel connections to adjacent neighborhoods, access to W&OD trail, etc.)

Comments: N.A.

Staff Signature: Steve R. Phillips 3/16/07  
Traffic Consultant Signature: [Signature] 3/16/09

Appendix B

VDOT Chapter 527 Compliance Package





**WELLS + ASSOCIATES**

January 8, 2010

Alex Faghri  
Virginia Department of Transportation  
14685 Avion Parkway  
Chantilly, Virginia 20151-1104

Re: Ryan Road Property Rezoning  
Compliance Package  
Loudoun County, Virginia

Dear Mr. Faghri,

Wells + Associates are pleased to submit a VDOT Chapter 527 Compliance package. This package provides VDOT with information associated with the proposed special exception for the Ryan Road Property located in Loudoun County, Virginia. The property is located on north side of Ryan Road (VA Route 772), just east of Belmont Ridge Road (VA Route 659) in the Brambleton area of Loudoun County, Virginia. The property is defined on the Loudoun County Tax Map with Pin Number 158-27-9331.

The property consists of 7.7389 acres and is zoned R-1 that would allow for up to seven (7) single-family homes. A two-acre portion of the property is proposed to obtain a Special Exception to allow for a child care center of up to 208 students. This portion could be developed with two (2) single-family homes, under by-right conditions. The remaining five-acre portion would be developed under the current R-1 zoning at a later date along with the adjacent approximately 12-acre parcel. The project is planned to be constructed in a single phase by 2015.

The proposed site plan is attached with this letter. The following items are contained in this submission package:

- Chapter 527 Compliance Letter
- Site location map and associated study intersections
- Proposed Site Plan
- Loudoun County Office of Transportation Services Scoping Meeting Notes
- Proposed Site Trip Generation

If you have any questions or comments, feel free to contact me or Jim Watson at 703-917-6620 or at [mjworkosky@mjwells.com](mailto:mjworkosky@mjwells.com).

Sincerely,

Michael J. Workosky  
Principal Associate

Cc: Roy Barnett  
Jeff Nein  
Jeff Gilliland

O:\Projects\4501-5000\4510 CDA Van Metre\Documents\Correspondence\Compliance\Compliance Cover Letter.doc



January 8, 2010

Alex Faghri  
Virginia Department of Transportation  
14685 Avion Parkway  
Chantilly, Virginia 20151-1104

Re: Ryan Road Property Rezoning  
Compliance Letter  
VDOT Chapter 527 Regulations – Determination of Compliance

Dear Mr. Faghri,

As requested, Wells + Associates have completed a trip generation assessment associated with the proposed special exception for the Ryan Road Property, as required by 24 VAC 30-155. Implementation of these new regulations has been phased statewide over 18 months (July 01, 2007 to January 01, 2009). Implementation in the Northern Virginia District of VDOT began on July 01, 2007. As of January 1, 2008, site plans for commercial sites generating less than 250 peak hour trips are exempt.

For purposes of determining compliance with the new regulations, trip generation calculations must meet the following trip criteria<sup>1</sup>:

- Shall be based upon the rates or equations published in the Institute of Transportation Engineers Trip Generation (described in the Reference Documents chapter, page 73).
- Shall *not be reduced* through internal capture rates, pass by rates, or any other reduction methods. The opportunity to properly use these reduction rates will be provided in the traffic impact analysis itself and effect the negotiation of any proffered improvements.
- For *redevelopment sites only* (refer to the Definitions chapter 7), when an existing use is to be development as a different or denser use, trips currently generated by existing development that will be removed may be deducted from the total trips that are generated by the proposed land use.

<sup>1</sup>VDOT, Traffic Impact Analysis Regulations Administrative Guidelines – 24 VAC 30-155, 24 May 2007.

The property is located on north side of Ryan Road (VA Route 772), just east of Belmont Ridge Road (VA Route 659) in the Brambleton area of Loudoun County, Virginia. The property is defined on the Loudoun County Tax Map with Pin Number 158-27-9331.

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for a child care center of up to 208 students. This portion could be developed with two (2) single-family homes, under by-right conditions. The remaining five-acre portion would be developed under the current R-1 zoning at a later date along with the adjacent approximately 12-acre parcel.

As shown in Table I, the by-right development of the property with two residential units would generate approximately 2 AM peak hour of the adjacent street and peak hour of the generator trips, 2 PM peak hour of the adjacent street and peak hour of the generator trips, and 20 daily (24-hour) trips. The proposed 208 student child care center would generate 157 AM peak hour of the adjacent street trips, 143 PM peak hour of the adjacent street trips, 132 AM peak hour of the generator trips, 135 PM peak hour of the generator trips, and 941 daily (24-hour) trips. The net additional trips generated by the site would be 155 AM peak hour of the adjacent street trips, 141 PM peak hour of the adjacent street trips, 130 AM peak hour of the generator trips, 133 PM peak hour of the generator trips, and 921 daily (24-hour) trips. The trips generated for this development were calculated using ITE Trip Generation Handbook, 8<sup>th</sup> Edition rates. As shown above, this commercial development is estimated to generate less than the 250 peak hour trip threshold and would be exempt from Chapter 527 Guidelines.

Please review this information and review this information and provide a response via email or letter confirming this projects compliance with the Chapter 527 Guidelines.

If you have any questions or comments, feel free to contact me or Jim Watson at 703-917-6620 or at [mjworkosky@mjwells.com](mailto:mjworkosky@mjwells.com).

Sincerely,



Michael J. Workosky  
Principal Associate

Cc: Roy Barnett  
Jeff Nein  
Jeff Gilliland

C:\PROJECTS\4501-5000\4510 CDA VAN METRE\GRAPHICS\4510 - RPT GRAPHICS - JAN 2010.DWG

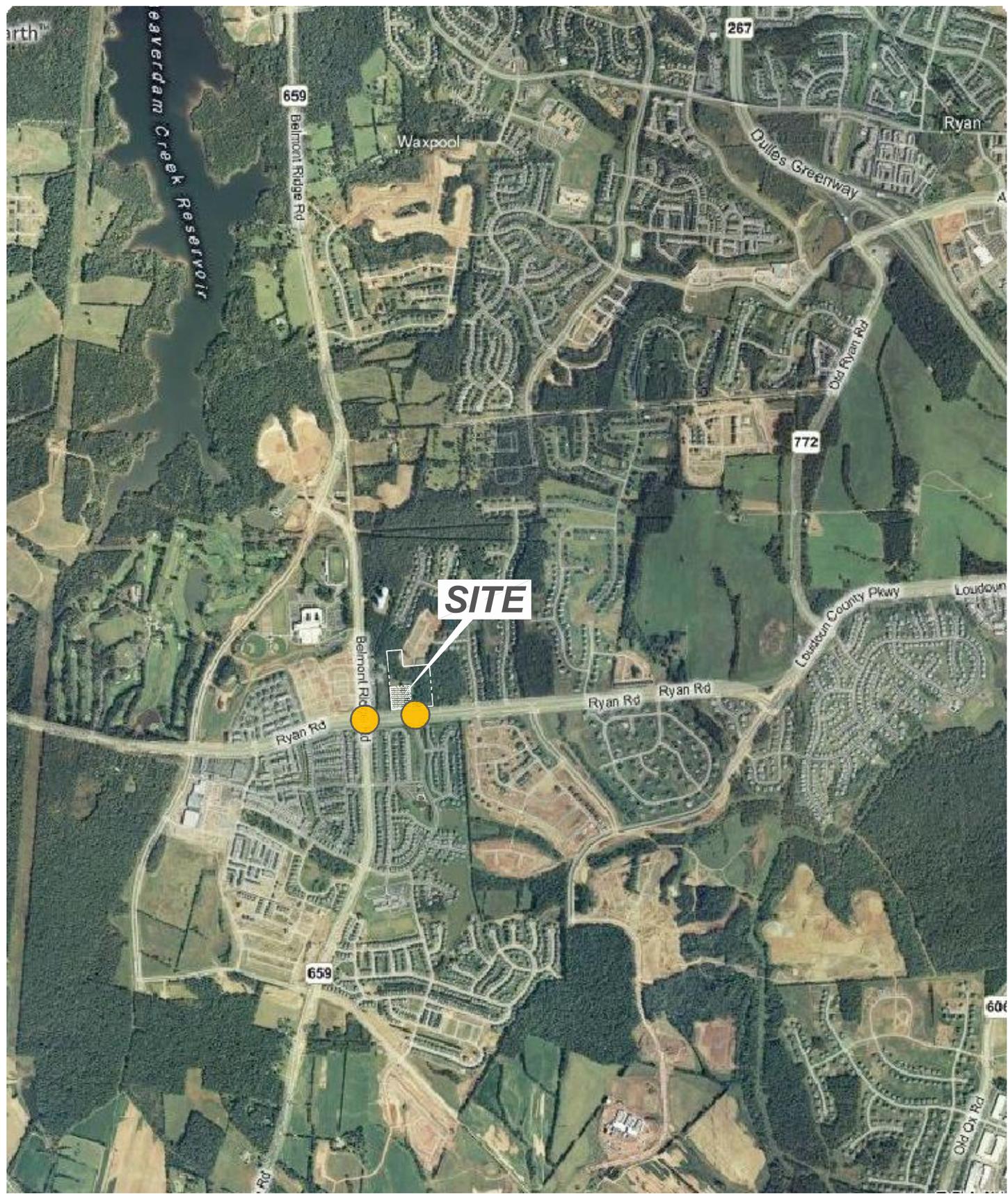


Figure 1  
Site Location Map

● Study Intersection



North

B

Ryan Road Property – SPEX  
Loudoun County, Virginia





## Michael J. Workosky

---

**From:** phillips, george [George.Phillips@loudoun.gov]  
**Sent:** Tuesday, December 08, 2009 6:15 PM  
**To:** Michael J. Workosky  
**Cc:** Michael J. Buelow; Mosurak, Lou; Beacher, Andrew  
**Subject:** RE:

Mike- 12/8/09

It looks good and am O.K. with it overall. However, for the background traffic, please check the 2008 Loudoun County Growth Summary and compare it to what was assumed before. I'm curious how they compare with the background developments assumed with the Brambleton Additions and other background developments. I want to make sure that the background traffic is not overestimated, especially given the current economy. Let's talk once you check it out.

Thanks, George

---

**From:** Michael J. Workosky [mailto:Mjworkosky@mjwells.com]  
**Sent:** Tuesday, December 08, 2009 2:34 PM  
**To:** phillips, george  
**Cc:** Michael J. Buelow  
**Subject:**

George,

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Please respond to this email to confirm that this revised scope is adequate. Feel free to call or email me or Mike Buelow with any questions. Thanks.

Mike.

Michael J. Workosky, PTP, TOPS  
Principal Associate

B  
6

**Wells + Associates, Inc.**

1420 Spring Hill Road

Suite 600

McLean, Virginia 22102

Ph: 703/917-6620

Fax: 703/917-0739

Cell: 703/898-6712

Email: [mjworkosky@mjwells.com](mailto:mjworkosky@mjwells.com)

Application Name: Van Metre CDA Property  
Application Type: Residential  
Attendees: George Phillips

Date: 3/16/09  
Mike Wankosky/Wells

Include Compliance Package to UDOT/521

- (1) **Study Area:** Roadways internal or adjacent to the development site shall be included in the traffic study. The study area should be defined at the scoping meeting and as a guideline should include other external roads to the extent that the project's generated traffic is anticipated to exceed 10 percent of the road's current/existing traffic volumes (at the time of application).

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(North-south alignment)

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Rate 659 / Ryan Road intersection

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Comments: Will provide. Use ITE Rates (8th Edition)  
Single Family Detached.  
Provide comparison with the existing zoning.  
Check warrants for westbound night turn lane

- (4) **Traffic Volume Projections:** The traffic study shall include an agreed upon build out year and provide existing and projected traffic volumes, with and without the subject project, for Average Daily Traffic (ADT), as well as AM and PM peak hours. The peak hour of the project/individual land use(s) (as given in the ITE Trip Generation Report) should be added to the corresponding AM/PM existing peak hour of the adjacent roadway traffic volumes (to show the worst case scenario), if the peak hour of the project/individual land use(s) for the generator is greater than the peak hour of the adjacent roadway (per ITE Trip Generation Report). The existing peak hour of traffic on the roads adjacent to the subject project site shall be identified. These traffic volumes shall be provided at roadway intersections and commercial or private accessways/entrances.

Comments: Will provide 2015 Buildout Year  
Assume 4 lanes on Ryan Road and Belmont Ridge Road

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area, no buildout plus 10 needed

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Specific other approved development names and respective development square footage or residential units in the study shall be provided.

Comments: See Comment #4. 2015 Buildout Year. Existing Road Network  
Review Brambleton Additions TIA (Wells) September 14, 2006  
for background assumptions for 2012. Update to 2015 / take into  
account the current economy. Check Loudoun County Growth  
Summary. Use/Apply

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Locality based on existing counts and Brambleton Additions study.

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Comments: Will provide. Synchro 7. Include report text and  
Synchro Run on Disc.  
Include Compliance (S27 Compliance) Package as well.

- (10) **Mode Choice:** Modal split information shall be provided for the phases of the analysis, with sources of information identified (e.g., COG model).

Comments: N.A.

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Comments: Will provide in the report. (Either way)

- (12) **Traffic Mitigation Measures:** If trip reduction factors are used in the study, measures necessary to implement the reduction must be specified, with supporting documentation.

Comments: N.A.

- (13) **Bicycle & Pedestrian Accommodations:** When bicycle and pedestrian accommodations are used to reduce anticipated traffic volumes, a description of the physical and functional characteristics of the proposed bicycle and pedestrian accommodations shall be provided. If such separate bicycle accommodations (e.g., striped lanes or multi-purpose trails) are anticipated, they shall also be identified. A description of the functional characteristics shall be provided to identify the transportation options that these accommodations provide (e.g., pedestrian access to retail center, safe bicycle route to elementary school, inter-parcel connections to adjacent neighborhoods, access to W&OD trail, etc.)

Comments: N.A.

Staff Signature: Steve R. Phillips 3/16/07  
Traffic Consultant Signature: [Signature] 3/16/09

Table I  
Ryan Road Property - SPEX  
Site Trip Generation Analysis(1)

Land Use	ITE Land Use Code	Size	Units	AM Peak Hour of Adjacent Street			PM Peak Hour of Adjacent Street			AM Peak Hour of Generator			PM Peak Hour of Generator			Weekday ADT (2)
				In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
<b>By-Right Development Program</b> Single Family Detached	210	2	D.U.	1	1	2	1	1	2	1	1	2	1	1	2	20
<b>Proposed Special Exception</b> Child Day Care Center	565	208	Students	83	74	157	67	76	143	70	62	132	63	72	135	941
<b>Difference</b>				<b>82</b>	<b>73</b>	<b>155</b>	<b>66</b>	<b>75</b>	<b>141</b>	<b>69</b>	<b>61</b>	<b>130</b>	<b>62</b>	<b>71</b>	<b>133</b>	<b>921</b>

Notes:

(1) Traffic estimates based on Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition.

(2) ADT assumes 10 daily trips per residential unit.

## Appendix C

### 10 Percent Rule



Table C-1  
 Ryan Road Property  
 10% Rule

Intersection		AM	PM
<b>Belmont Ridge Road/Ryan Road</b>	Existing	2398	2319
	Site	67	69
	%	3%	3%
<b>Ryan Road/Legacy Park Drive/Site Driveway</b>	Existing	1750	1617
	Site	155	141
	%	9%	9%



Appendix D  
Existing Traffic Counts





# Wells + Associates, Inc.

McLean, Virginia

## Existing Traffic Count

PROJECT: Van Metre CDA		DATE: 3/17/2009		SOUTHBOUND ROAD:	
W & A JOB NO.: 4510		DAY: Wednesday		NORTHBOUND ROAD: Legacy Park Drive	
INTERSECTION: Ryan Rd. & Legacy Park Dr.		WEATHER: clear		WESTBOUND ROAD: Ryan Road	
LOCATION: Loudoun County, VA		COUNTED BY: Majda		EASTBOUND ROAD: Ryan Road	
		INPUTED BY: agan			

Time Period	Turning Movements																		Total	PHF	Time Period
	Southbound				Westbound Ryan Road				Northbound Legacy Park Drive				Eastbound Ryan Road				North & South	East & West			
	1 Right	2 Thru	3 Left	Total	4 Right	5 Thru	6 Left	Total	7 Right	8 Thru	9 Left	Total	10 Right	11 Thru	12 Left	Total					
<b>AM</b>																					
6:00-6:15	0	0	0	0	0	12	4	16	11	0	1	12	0	38	0	38	12	54	66		6:00-6:15
6:15-6:30	0	0	0	0	0	21	1	22	26	0	1	27	0	100	0	100	27	122	149		6:15-6:30
6:30-6:45	0	0	0	0	0	36	4	40	34	0	0	34	0	163	0	163	34	203	237		6:30-6:45
6:45-7:00	0	0	0	0	0	55	4	59	38	0	0	38	0	166	0	166	38	225	263		6:45-7:00
7:00-7:15	0	0	0	0	0	54	12	66	41	0	0	41	1	207	0	208	41	274	315		7:00-7:15
7:15-7:30	0	0	0	0	0	57	31	88	36	0	2	38	4	261	0	265	38	353	391		7:15-7:30
7:30-7:45	0	0	0	0	0	70	37	107	76	0	2	78	2	319	0	321	78	428	506		7:30-7:45
7:45-8:00	0	0	0	0	0	92	17	109	85	0	7	92	5	330	0	335	92	444	536		7:45-8:00
8:00-8:15	0	0	0	0	0	92	11	103	74	0	1	75	1	304	0	305	75	408	483		8:00-8:15
8:15-8:30	0	0	0	0	0	121	15	136	60	0	1	61	0	300	1	301	61	437	498		8:15-8:30
8:30-8:45	0	0	0	0	0	142	14	156	50	0	5	55	1	249	0	250	55	406	461		8:30-8:45
8:45-9:00	0	0	0	0	0	131	11	142	35	0	6	41	3	270	0	273	41	415	456		8:45-9:00
<b>3 Hour Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>883</b>	<b>161</b>	<b>1,044</b>	<b>566</b>	<b>0</b>	<b>26</b>	<b>592</b>	<b>17</b>	<b>2,707</b>	<b>1</b>	<b>2,725</b>	<b>592</b>	<b>3,769</b>	<b>4,361</b>		
<b>1 Hour Totals</b>																					
6:00-7:00	0	0	0	0	0	124	13	137	109	0	2	111	0	467	0	467	111	604	715	0.68	6:00-7:00
6:15-7:15	0	0	0	0	0	166	21	187	139	0	1	140	1	636	0	637	140	824	964	0.77	6:15-7:15
6:30-7:30	0	0	0	0	0	202	51	253	149	0	2	151	5	797	0	802	151	1,055	1,206	0.77	6:30-7:30
6:45-7:45	0	0	0	0	0	236	84	320	191	0	4	195	7	953	0	960	195	1,280	1,475	0.73	6:45-7:45
7:00-8:00	0	0	0	0	0	273	97	370	238	0	11	249	12	1,117	0	1,129	249	1,499	1,748	0.82	7:00-8:00
7:15-8:15	0	0	0	0	0	311	96	407	271	0	12	283	12	1,214	0	1,226	283	1,633	1,916	0.89	7:15-8:15
7:30-8:30	0	0	0	0	0	375	80	455	295	0	11	306	8	1,253	1	1,262	306	1,717	2,023	0.94	7:30-8:30
7:45-8:45	0	0	0	0	0	447	57	504	269	0	14	283	7	1,183	1	1,191	283	1,695	1,978	0.92	7:45-8:45
8:00-9:00	0	0	0	0	0	486	51	537	219	0	13	232	5	1,123	1	1,129	232	1,666	1,898	0.95	8:00-9:00
<b>AM Peak 7:30-8:30</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>375</b>	<b>80</b>	<b>455</b>	<b>295</b>	<b>0</b>	<b>11</b>	<b>306</b>	<b>8</b>	<b>1,253</b>	<b>1</b>	<b>1,262</b>	<b>306</b>	<b>1,717</b>	<b>2,023</b>	<b>0.94</b>	<b>AM Peak 7:30-8:30</b>
<b>PM</b>																					
4:00-4:15	0	0	0	0	0	169	31	200	34	0	2	36	4	152	0	156	36	356	392		4:00-4:15
4:15-4:30	0	0	0	0	0	192	24	216	30	0	2	32	2	102	0	104	32	320	352		4:15-4:30
4:30-4:45	0	0	0	0	0	221	36	257	19	0	1	20	4	84	1	89	20	346	366		4:30-4:45
4:45-5:00	0	0	0	0	0	203	40	243	24	0	0	24	4	99	1	104	24	347	371		4:45-5:00
5:00-5:15	0	0	0	0	0	237	58	295	24	0	2	26	3	88	0	91	26	386	412		5:00-5:15
5:15-5:30	0	0	0	0	0	296	56	352	13	0	0	13	3	98	0	101	13	453	466		5:15-5:30
5:30-5:45	0	0	0	0	0	307	55	362	17	0	5	22	8	118	0	126	22	488	510		5:30-5:45
5:45-6:00	0	0	0	0	0	273	66	339	25	0	1	26	2	90	0	92	26	431	457		5:45-6:00
6:00-6:15	0	0	0	0	0	230	70	300	24	0	2	26	5	121	0	126	26	426	452		6:00-6:15
6:15-6:30	0	0	0	0	0	260	56	316	25	0	2	27	4	122	0	126	27	442	469		6:15-6:30
6:30-6:45	0	0	0	0	0	217	44	261	32	0	2	34	6	111	0	117	34	378	412		6:30-6:45
6:45-7:00	0	0	0	0	0	191	33	224	29	0	4	33	4	111	2	117	33	341	374		6:45-7:00
<b>3 Hour Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2,796</b>	<b>569</b>	<b>3,365</b>	<b>296</b>	<b>0</b>	<b>23</b>	<b>319</b>	<b>49</b>	<b>1,296</b>	<b>4</b>	<b>1,349</b>	<b>319</b>	<b>4,714</b>	<b>5,033</b>		
<b>1 Hour Totals</b>																					
4:00-5:00	0	0	0	0	0	785	131	916	107	0	5	112	14	437	2	453	112	1,369	1,481	0.94	4:00-5:00
4:15-5:15	0	0	0	0	0	853	158	1,011	97	0	5	102	13	373	2	388	102	1,399	1,501	0.91	4:15-5:15
4:30-5:30	0	0	0	0	0	957	190	1,147	80	0	3	83	14	369	2	385	83	1,532	1,615	0.87	4:30-5:30
4:45-5:45	0	0	0	0	0	1,043	209	1,252	78	0	7	85	18	403	1	422	85	1,674	1,759	0.86	4:45-5:45
5:00-6:00	0	0	0	0	0	1,113	235	1,348	79	0	8	87	16	394	0	410	87	1,758	1,845	0.90	5:00-6:00
5:15-6:15	0	0	0	0	0	1,106	247	1,353	79	0	8	87	18	427	0	445	87	1,798	1,885	0.92	5:15-6:15
5:30-6:30	0	0	0	0	0	1,070	247	1,317	91	0	10	101	19	451	0	470	101	1,787	1,888	0.93	5:30-6:30
5:45-6:45	0	0	0	0	0	980	236	1,216	106	0	7	113	17	444	0	461	113	1,677	1,790	0.95	5:45-6:45
6:00-7:00	0	0	0	0	0	898	203	1,101	110	0	10	120	19	465	2	486	120	1,587	1,707	0.91	6:00-7:00
<b>PM Peak 5:30-6:30</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,070</b>	<b>247</b>	<b>1,317</b>	<b>91</b>	<b>0</b>	<b>10</b>	<b>101</b>	<b>19</b>	<b>451</b>	<b>0</b>	<b>470</b>	<b>101</b>	<b>1,787</b>	<b>1,888</b>	<b>0.93</b>	<b>PM Peak 5:30-6:30</b>

## Appendix E

### Existing Peak Hour Capacity Analysis



HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Existing 2009 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	545	52	164	133	225	32	286	409	184	231	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.66	1.00	1.00	0.22	1.00	1.00	0.59	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1228	3539	1583	411	3539	1583	1107	3539	1583	754	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	78	599	57	180	146	247	35	314	449	202	254	73
RTOR Reduction (vph)	0	0	41	0	0	168	0	0	280	0	0	49
Lane Group Flow (vph)	78	599	16	180	146	79	35	314	169	202	254	24
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	29.2	22.7	22.7	37.0	26.6	26.6	22.8	18.9	18.9	38.7	27.8	27.8
Effective Green, g (s)	35.2	26.2	26.2	43.0	30.1	30.1	28.8	22.4	22.4	41.7	31.3	31.3
Actuated g/C Ratio	0.38	0.28	0.28	0.46	0.32	0.32	0.31	0.24	0.24	0.44	0.33	0.33
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	516	989	442	383	1136	508	389	845	378	506	1181	528
v/s Ratio Prot	0.02	c0.17		c0.07	0.04		0.01	0.09		c0.07	0.07	
v/s Ratio Perm	0.04		0.01	0.15		0.05	0.02		c0.11	0.11		0.02
v/c Ratio	0.15	0.61	0.04	0.47	0.13	0.16	0.09	0.37	0.45	0.40	0.22	0.05
Uniform Delay, d1	19.1	29.3	24.6	16.7	22.6	22.8	23.0	29.8	30.4	16.7	22.4	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	1.1	0.0	0.3	0.1	0.1	0.0	0.3	0.8	0.2	0.1	0.0
Delay (s)	19.2	30.4	24.6	17.0	22.6	22.9	23.0	30.1	31.3	16.9	22.5	21.2
Level of Service	B	C	C	B	C	C	C	C	C	B	C	C
Approach Delay (s)		28.7			21.0			30.4			20.2	
Approach LOS		C			C			C			C	

**Intersection Summary**

HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	93.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 2: Ryan Road (Rte 772) & Legacy Park Drive

Ryan Road Property  
 Existing 2009 AM



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↑↑	↗	↖	↑↑	↖	↗
Volume (veh/h)	0	1089	49	80	499	23	296
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	1159	52	85	531	24	315
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							14
Median type		None			None		
Median storage (veh)							
Upstream signal (ft)		897					
pX, platoon unblocked	0.00			0.87		0.87	0.87
vC, conflicting volume	0			1211		1594	579
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			952		1391	230
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			86		76	53
cM capacity (veh/h)	0			627		101	675

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1
Volume Total	579	579	52	0	85	265	265	339
Volume Left	0	0	0	0	85	0	0	24
Volume Right	0	0	52	0	0	0	0	315
cSH	1700	1700	1700	1700	627	1700	1700	728
Volume to Capacity	0.34	0.34	0.03	0.00	0.14	0.16	0.16	0.47
Queue Length 95th (ft)	0	0	0	0	12	0	0	62
Control Delay (s)	0.0	0.0	0.0	0.0	11.6	0.0	0.0	17.6
Lane LOS					B			C
Approach Delay (s)	0.0				1.6			17.6
Approach LOS								C

Intersection Summary			
Average Delay		3.2	
Intersection Capacity Utilization	55.1%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Existing 2009 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	180	35	413	595	130	40	372	179	77	204	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.39	1.00	1.00	0.52	1.00	1.00	0.61	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	719	3539	1583	978	3539	1583	1140	3539	1583	640	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	54	198	38	454	654	143	44	409	197	85	224	49
RTOR Reduction (vph)	0	0	29	0	0	93	0	0	150	0	0	36
Lane Group Flow (vph)	54	198	10	454	654	50	44	409	47	85	224	13
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	23.6	17.5	17.5	38.7	25.6	25.6	20.6	16.7	16.7	26.0	19.4	19.4
Effective Green, g (s)	29.6	21.0	21.0	41.7	29.1	29.1	26.6	20.2	20.2	32.0	22.9	22.9
Actuated g/C Ratio	0.35	0.25	0.25	0.50	0.35	0.35	0.32	0.24	0.24	0.38	0.27	0.27
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	367	885	396	648	1226	548	413	851	381	373	965	432
v/s Ratio Prot	0.02	0.06		c0.14	0.18		0.01	c0.12		c0.03	0.06	
v/s Ratio Perm	0.04		0.01	c0.20		0.03	0.03		0.03	0.06		0.01
v/c Ratio	0.15	0.22	0.02	0.70	0.53	0.09	0.11	0.48	0.12	0.23	0.23	0.03
Uniform Delay, d1	18.2	25.0	23.8	14.5	22.0	18.5	20.1	27.4	25.0	17.3	23.7	22.4
Progression Factor	1.00	1.00	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	0.1	0.0	2.8	0.4	0.1	0.0	0.4	0.1	0.1	0.1	0.0
Delay (s)	18.2	25.2	23.8	17.3	22.5	18.6	20.2	27.8	25.1	17.4	23.8	22.4
Level of Service	B	C	C	B	C	B	C	C	C	B	C	C
Approach Delay (s)		23.7			20.1			26.5			22.1	
Approach LOS		C			C			C			C	

Intersection Summary

HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
2: Ryan Road (Rte 772) & Legacy Park Drive

Ryan Road Property  
Existing 2009 PM



Movement	EBU	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰	↑↑	↗	↰	↑↑	↗	↗
Volume (veh/h)	0	417	19	247	1128	10	91
Sign Control		Free			Free	Stop	
Grade		0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	448	20	266	1213	11	98
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							14
Median type		None			None		
Median storage (veh)							
Upstream signal (ft)		896					
pX, platoon unblocked	0.00						
vC, conflicting volume	0			469		1586	224
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	0			469		1586	224
tC, single (s)	0.0			4.1		6.8	6.9
tC, 2 stage (s)							
tF (s)	0.0			2.2		3.5	3.3
p0 queue free %	0			76		86	87
cM capacity (veh/h)	0			1089		75	779

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1
Volume Total	224	224	20	0	266	606	606	109
Volume Left	0	0	0	0	266	0	0	11
Volume Right	0	0	20	0	0	0	0	98
cSH	1700	1700	1700	1700	1089	1700	1700	755
Volume to Capacity	0.13	0.13	0.01	0.00	0.24	0.36	0.36	0.14
Queue Length 95th (ft)	0	0	0	0	24	0	0	13
Control Delay (s)	0.0	0.0	0.0	0.0	9.4	0.0	0.0	15.3
Lane LOS					A			C
Approach Delay (s)	0.0				1.7			15.3
Approach LOS								C

Intersection Summary			
Average Delay		2.0	
Intersection Capacity Utilization	47.8%		ICU Level of Service A
Analysis Period (min)	15		

## Appendix F

### Background Development Trip Generation And Traffic Assignments



## Michael J. Workosky

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**From:** phillips, george [George.Phillips@loudoun.gov]  
**Sent:** Wednesday, January 06, 2010 9:37 AM  
**To:** Michael J. Workosky  
**Cc:** Mosurak, Lou; Beacher, Andrew  
**Subject:** RE: Ryan Road SPEX - Background Development

Mike- 1/6/09

Thanks for the information. I compared the original trip gen table with the updated table and agree that the updated table is more realistic (much lower) given the near term economic outlook in terms of development. Your updated table is based on the Loudoun County publications (2008 Growth Summary and the 2009 Fiscal Impact Committee Guidelines) which are the best projections we have at this point. This is acceptable. Go ahead and include this background development in the Ryan Road TIA.

Let me know if you have any other questions.

Thanks, George

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**From:** Michael J. Workosky [mailto:Mjworkosky@mjwells.com]  
**Sent:** Tuesday, January 05, 2010 1:54 PM  
**To:** phillips, george  
**Subject:** RE: Ryan Road SPEX - Background Development

George,

Please see both the original and updated table for background development. I have adjusted the background development totals based on both the 2008 Annual Update and the 2009 Fiscal Impact Guidelines.

If this is acceptable, please respond to this email so that I may finish up the analysis. Thanks for your attention to this and call me with any questions.

Mike.

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**From:** phillips, george [mailto:George.Phillips@loudoun.gov]  
**Sent:** Tuesday, December 08, 2009 6:15 PM  
**To:** Michael J. Workosky  
**Cc:** Michael J. Buelow; Mosurak, Lou; Beacher, Andrew  
**Subject:** RE:

Mike- 12/8/09

It looks good and am O.K. with it overall. However, for the background traffic, please check the 2008 Loudoun County Growth Summary and compare it to what was assumed before. I'm curious how they compare with the background developments assumed with the Brambleton Additions and other background developments. I want to make sure that the background traffic is not overestimated, especially given the current economy. Let's talk once you check it out.

Thanks, George

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**From:** Michael J. Workosky [mailto:Mjworkosky@mjwells.com]  
**Sent:** Tuesday, December 08, 2009 2:34 PM  
**To:** phillips, george  
**Cc:** Michael J. Buelow  
**Subject:**

George,

This email requests an updated traffic scope for the Ryan Road Property. Wells + Associates previously submitted a traffic study for the ZMAP application, dated April 1, 2009 to rezone the 19.68-acre site from R-1, allowing one residential unit per 40,000 S.F., or 21 single-family homes to R-3 Cluster to allow the development of 49 single-family homes. This application was withdrawn. Two units currently exist on the property. A copy of the previously submitted traffic study and the previous scoping agreement is attached for your reference.

A pre-application conference was held on November 19, 2009. A new SPEX application will be filed to allow for an approximately 2 acre day care site (200-children) within the overall development. The daycare would be primarily a pick-up/drop-off facility with the majority of its trips occurring during the peak hour of adjacent street traffic. (Note that the day care center would generate fewer than 250 new peak hour trips and would therefore be exempt from 527 requirements.) The balance of the site would remain R-1 and be developed by-right with 19 single-family homes. Thus, the updated traffic study would include both the by-right condition with 2 single-family residential units versus the proposed 200-child day care. The project is still planned to be constructed in a single phase by 2015 as considered in the previously submitted study. The background developments and growth rate used in the previous study will be applied to this updated report.

We propose to retain the scope included in the April 1, 2009 traffic study. We would use the previously collected traffic counts (March 1009) for the Belmont Ridge Road (Route 659)/Ryan Road (Route 772) and Ryan Road (Route 772)/Legacy Park Drive intersections. Similar to the previous plan, the proposed site entrance would be full access and be aligned opposite Legacy Park Drive. The site-generated traffic assignments will reflect the travel patterns for day-care patrons traveling to and from work. The study will address the need to provide left and right-turn lanes into the site and review peak hour signal warrants at the Ryan Road/Legacy Park Drive/Site Entrance intersection.

Please respond to this email to confirm that this revised scope is adequate. Feel free to call or email me or Mike Buelow with any questions. Thanks.

Mike.

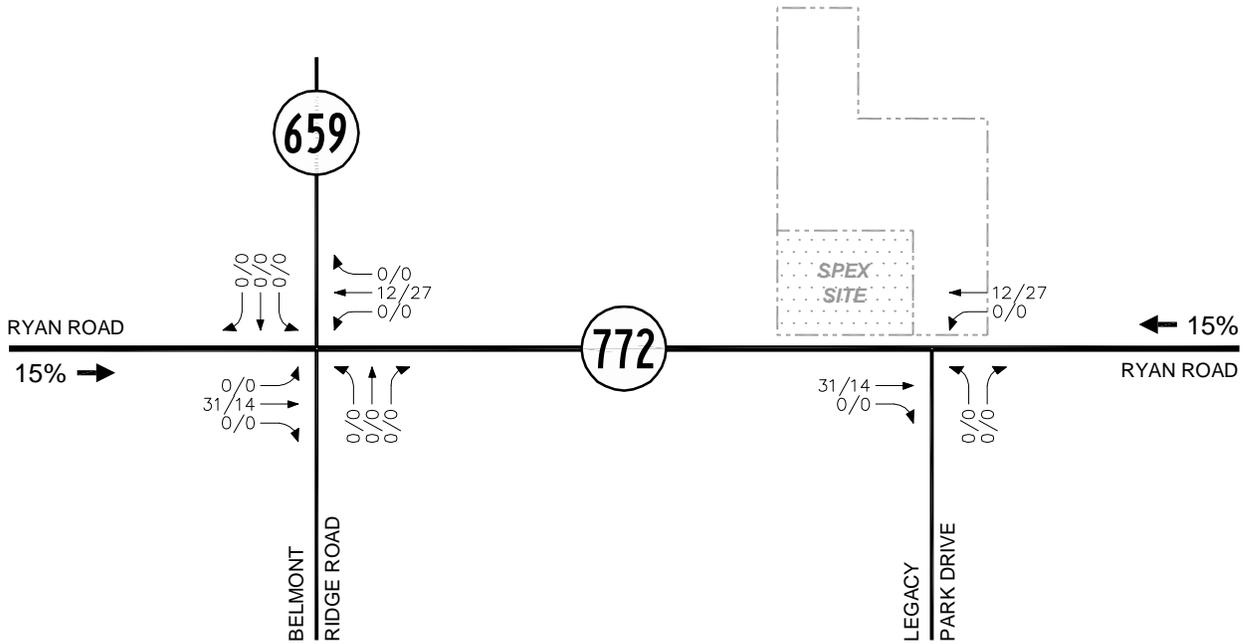
Michael J. Workosky, PTP, TOPS  
Principal Associate  
**Wells + Associates, Inc.**  
1420 Spring Hill Road  
Suite 600  
McLean, Virginia 22102  
Ph: 703/917-6620  
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Cell: 703/898-6712  
Email: [mjworkosky@mjwells.com](mailto:mjworkosky@mjwells.com)

Table F-1  
 Ryan Road Property  
 Other Development Trip Generation - 2015 (1)(2)(3)

Land Use	ITE Code	Amount	Units	AM Peak Hour			PM Peak Hour			Average Daily Traffic
				In	Out	Total	In	Out	Total	
<b>I. Loudoun Parkway Center</b>										
Single Family	210	92 DU		19	55	74	62	37	99	963
General Flex-Ind.	710/110	200,000 SF		189	26	215	30	142	172	1,967
Subtotal for Loudoun Parkway Center				208	81	289	92	179	271	2,930
<b>2. Loudoun Valley Estates</b>										
Single Family	210	200 DU		37	112	149	126	74	200	1,967
Townhouse	230	53 DU		5	26	31	24	12	36	374
Subtotal Loudoun Valley Estates				42	138	180	150	86	236	2,341
<b>3. Dulles Parkway Center - South</b>										
Office/Gas Station	(2)	270,000 SF		420	80	499	106	389	495	3,875
<b>4. Moorefield Station</b>										
Townhouse	230	200 DU		15	75	90	71	35	106	1,157
Multi-Family	220	500 DU		50	199	249	190	103	293	3,155
Office	710	100,000 SF		164	22	186	32	159	191	1,327
Subtotal for Moorefield Station				229	296	525	294	297	590	5,639
<b>5. Park at Belle Terra</b>										
Single-Family Detached	210	50 DU		11	33	44	36	21	57	550
<b>6. Graham Flynn</b>										
Townhouse	230	149 DU		12	59	71	56	28	83	901
<b>7. Belmont Trace</b>										
Single-Family Detached	210	97 DU		19	58	77	66	38	104	1,011
<b>8. Brambleton</b>										
Single Family	210	288 DU		53	158	211	175	103	278	2,752
Townhouse	230	312 DU		22	106	128	102	50	153	1,688
Golf Course	430	18 Holes		32	8	40	22	28	49	643
Industrial	130	100,000 SF		84	19	103	25	94	119	1,244
Subtotal for Brambleton				190	292	482	324	275	599	6,327
<b>9. Loudoun Valley Estates II</b>										
Single-Family Detached	210	207 DU		39	115	154	130	76	206	2,031
Townhouse	230	168 DU		13	65	78	62	30	92	998
Subtotal for Loudoun Valley Estates II		375 DU		52	180	232	192	106	298	3,029
<b>10. Brambleton Additions(2)</b>										
Brambleton Corner (incl. rec. center)		Residential/Rec. Center		18	32	50	28	26	54	643
Brandt Property		SFDU/Restaurant/Gas Station		170	192	362	173	152	324	4,013
Brambleton Active Adult		600 DU/50k retail		72	58	131	188	208	396	5,558
Subtotal for Brambleton Additions		-		260	282	542	389	386	775	10,213
<b>11. Ryan Road Property By-Right</b>										
Residential - Single-Family Detached	210	21 DU		6	18	24	16	10	26	247
<b>Total Approved Development Trips</b>				<b>1,450</b>	<b>1,516</b>	<b>2,966</b>	<b>1,720</b>	<b>1,814</b>	<b>3,533</b>	<b>37,064</b>

Notes: (1) Trip Generation, 7th Edition, published by the Institute of Transportation Engineers.  
 (2) Based on Wells & Associates Brambleton Additions TIA dated, Sept. 14, 2006.  
 (3) Totals adjusted based on "2009 Fiscal Impact Committee Guidelines" and "2008 Annual Growth Summary", published by Loudoun County.

# 2015 Loudoun Parkway Center Trip Assignment



# 2015 Loudoun Valley Estates Trip Assignments

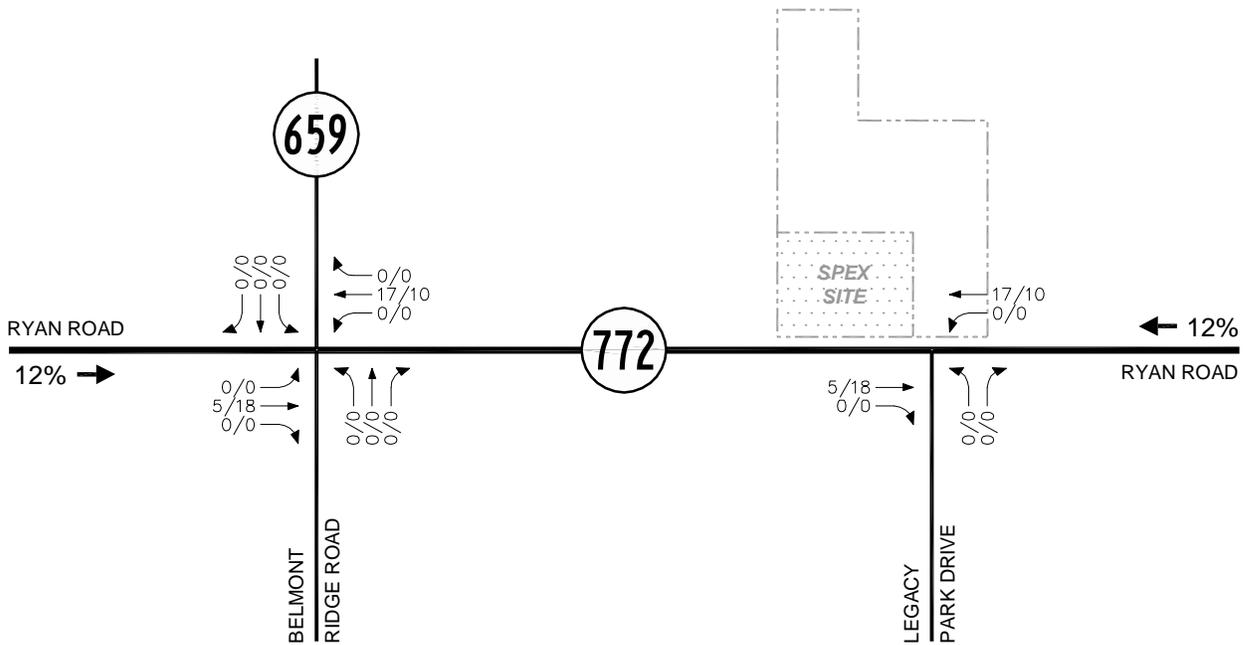


Figure F-1  
Other Development Traffic Assignments

AM PEAK HOUR  
PM PEAK HOUR  
000/000  
North

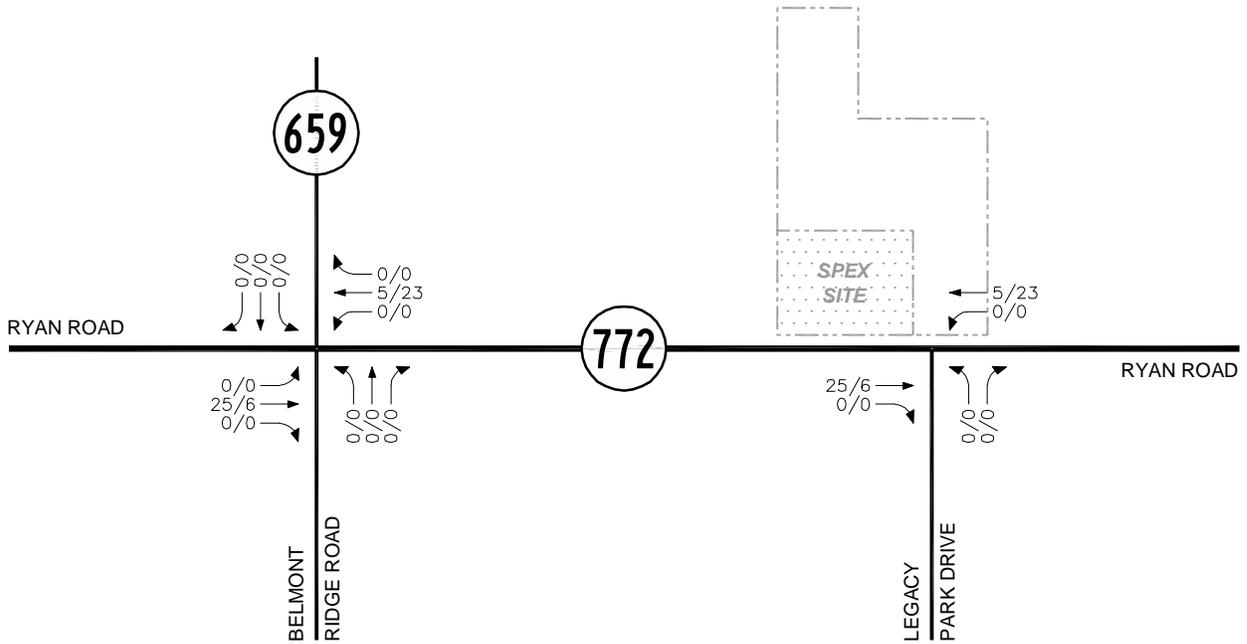
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Ryan Road Property - SPEX  
Loudoun County, Virginia

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JCP

# 2015 Dulles Parkway Center South Trip Assignments



# 2015 Moorefield Station Trip Assignments

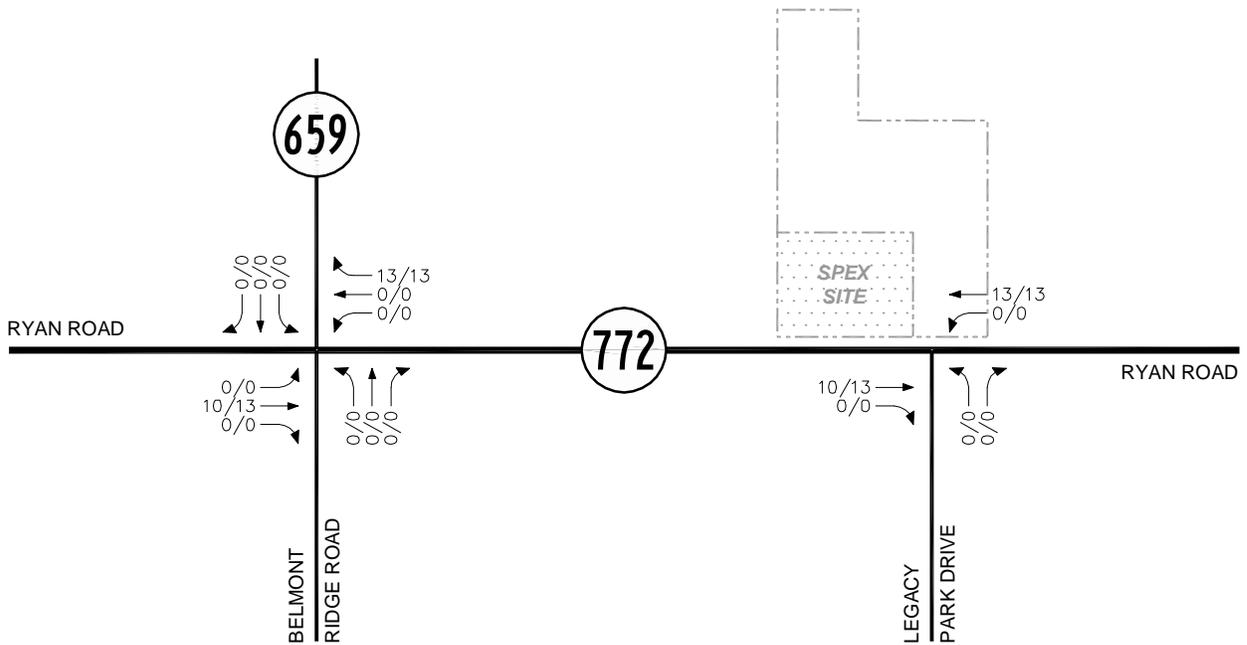
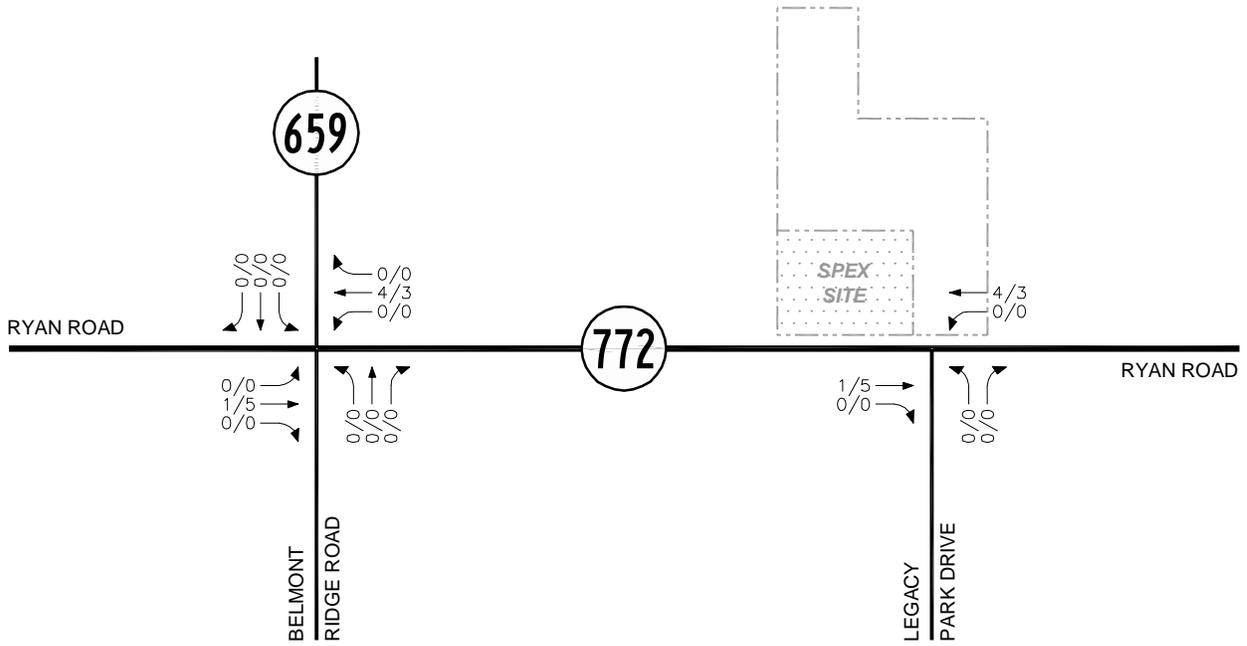


Figure F-2  
Other Development Traffic Assignments

AM PEAK HOUR  
PM PEAK HOUR  
000/000

North

# 2015 Park at Bella Terra Trip Assignments



# 2015 Graham Flynn Trip Assignments

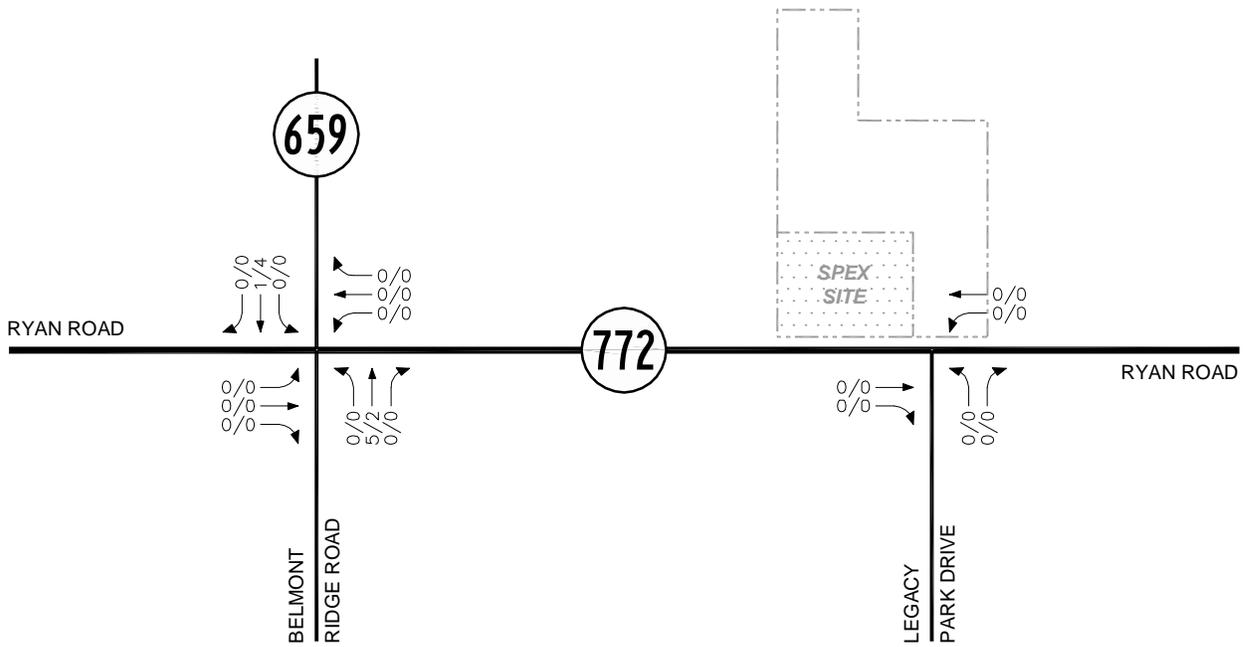


Figure F-3  
Other Development Traffic Assignments

AM PEAK HOUR  
PM PEAK HOUR  
000/000

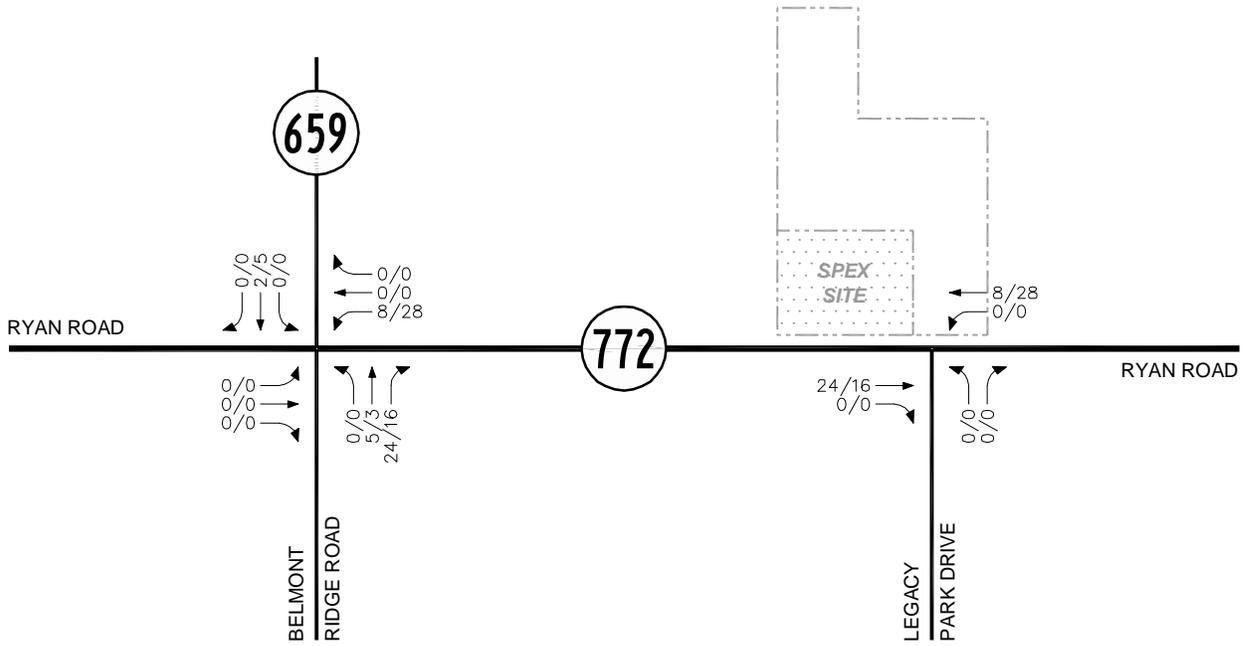


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Ryan Road Property - SPEX  
Loudoun County, Virginia



# 2015 Belmont Trace Trip Assignments



# 2015 Brambleton Trip Assignments

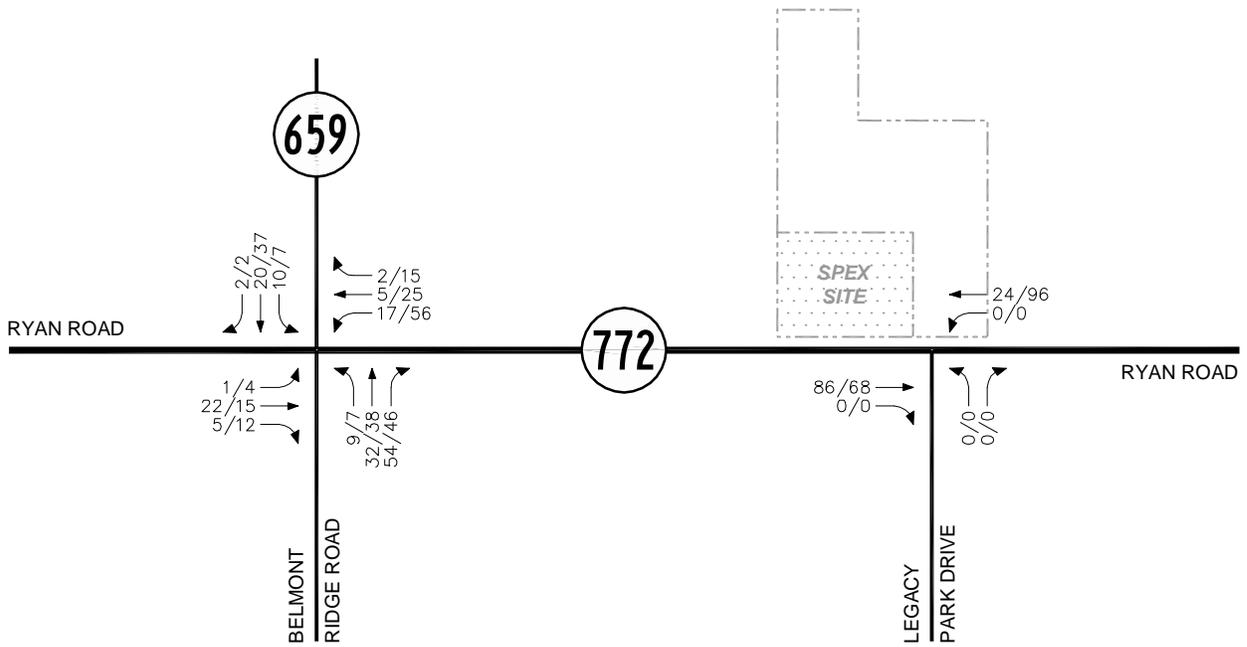
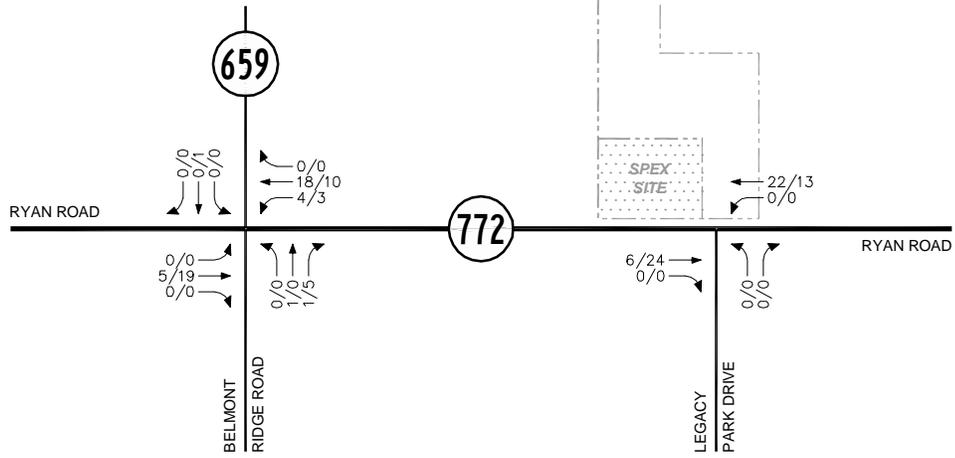


Figure F-4  
Other Development Traffic Assignments

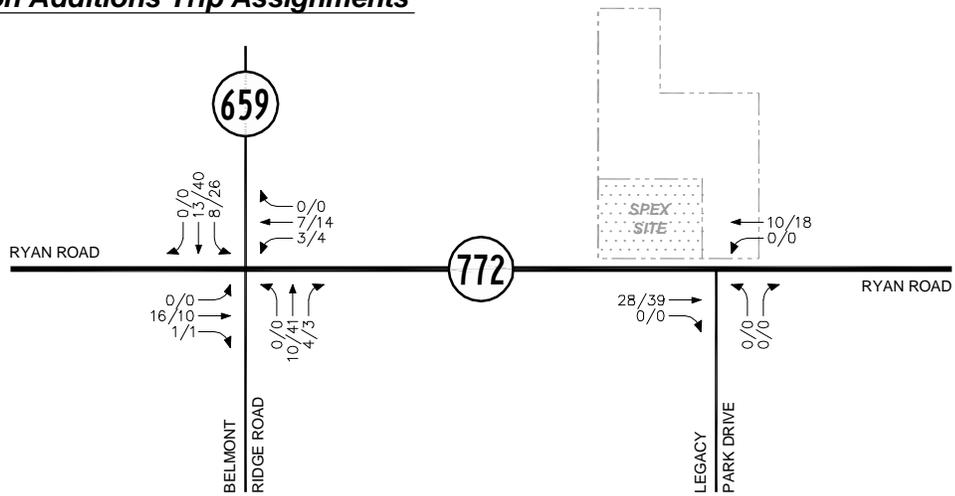
AM PEAK HOUR  
PM PEAK HOUR  
000/000



**2015 Loudoun Valley Estates II Trip Assignments**



**2015 Brambleton Additions Trip Assignments**



**2015 Ryan Road Property By-Right Trip Assignments**

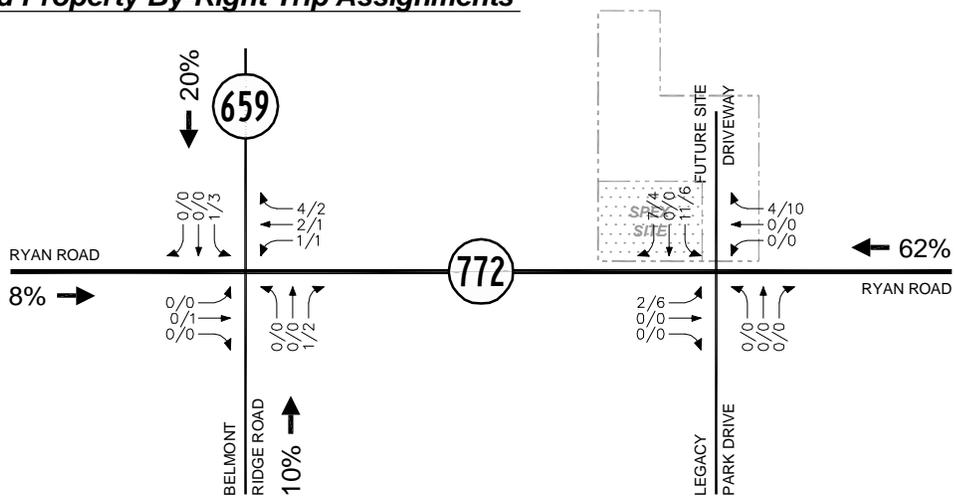


Figure F-5  
Other Development Traffic Assignments

AM PEAK HOUR  
PM PEAK HOUR  
000/000



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JCP

**F**

Ryan Road Property - SPEX  
Loudoun County, Virginia



## Appendix G

### 2015 Background Future Capacity Analysis



HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Background 2015 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	694	61	120	256	258	43	357	302	214	281	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.58	1.00	1.00	0.17	1.00	1.00	0.56	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	1079	3539	1583	324	3539	1583	1050	3539	1583	584	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	84	763	67	132	281	284	47	392	332	235	309	79
RTOR Reduction (vph)	0	0	45	0	0	184	0	0	250	0	0	55
Lane Group Flow (vph)	84	763	22	132	281	100	47	392	82	235	309	24
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	35.3	28.7	28.7	40.7	31.4	31.4	23.8	18.2	18.2	39.0	26.4	26.4
Effective Green, g (s)	41.3	32.2	32.2	46.7	34.9	34.9	29.8	21.7	21.7	42.0	29.9	29.9
Actuated g/C Ratio	0.42	0.33	0.33	0.47	0.35	0.35	0.30	0.22	0.22	0.42	0.30	0.30
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	517	1151	515	332	1248	558	379	776	347	449	1069	478
v/s Ratio Prot	0.02	c0.22		c0.05	0.08		0.01	0.11		c0.09	0.09	
v/s Ratio Perm	0.05		0.01	0.14		0.06	0.03		0.05	c0.13		0.02
v/c Ratio	0.16	0.66	0.04	0.40	0.23	0.18	0.12	0.51	0.24	0.52	0.29	0.05
Uniform Delay, d1	17.7	28.7	22.9	16.9	22.5	22.2	24.8	33.9	31.8	19.6	26.4	24.5
Progression Factor	1.00	1.00	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	1.4	0.0	0.3	0.1	0.2	0.1	0.5	0.4	0.5	0.2	0.0
Delay (s)	17.7	30.2	22.9	17.2	22.6	22.3	24.9	34.5	32.2	20.1	26.6	24.5
Level of Service	B	C	C	B	C	C	C	C	C	C	C	C
Approach Delay (s)		28.5			21.5			32.9			23.9	
Approach LOS		C			C			C			C	

Intersection Summary

HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	99.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 2: Ryan Road (Rte 772) & Future Site Driveway

Ryan Road Property  
 Background 2015 AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Volume (veh/h)	2	1159	49	80	604	4	23	0	296	11	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.94	0.94	0.94	0.94	1.00	0.94	1.00	0.94	1.00	1.00	1.00
Hourly flow rate (vph)	2	1233	52	85	643	4	24	0	315	11	0	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									14			
Median type		Raised			Raised							
Median storage (veh)		2			2							
Upstream signal (ft)		897										
pX, platoon unblocked				0.83			0.83	0.83	0.83	0.83	0.83	
vC, conflicting volume	647			1285			1735	2054	616	1591	2102	321
vC1, stage 1 conf vol							1237	1237		813	813	
vC2, stage 2 conf vol							498	817		778	1289	
vCu, unblocked vol	647			922			1468	1853	112	1292	1912	321
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			86			89	100	59	94	100	99
cM capacity (veh/h)	935			608			225	223	759	188	172	674
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1		
Volume Total	2	616	616	52	85	321	321	4	339	18		
Volume Left	2	0	0	0	85	0	0	0	24	11		
Volume Right	0	0	0	52	0	0	0	4	315	7		
cSH	935	1700	1700	1700	608	1700	1700	1700	818	261		
Volume to Capacity	0.00	0.36	0.36	0.03	0.14	0.19	0.19	0.00	0.41	0.07		
Queue Length 95th (ft)	0	0	0	0	12	0	0	0	51	6		
Control Delay (s)	8.9	0.0	0.0	0.0	11.9	0.0	0.0	0.0	13.8	19.8		
Lane LOS	A				B				B	C		
Approach Delay (s)	0.0				1.4				13.8	19.8		
Approach LOS									B	C		
Intersection Summary												
Average Delay				2.6								
Intersection Capacity Utilization			63.7%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Background 2015 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘	↑↑	↗	↘	↑↑	↗
Volume (vph)	56	292	50	312	745	168	49	479	168	118	304	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.23	1.00	1.00	0.42	1.00	1.00	0.55	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	426	3539	1583	788	3539	1583	1025	3539	1583	456	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	62	321	55	343	819	185	54	526	185	130	334	66
RTOR Reduction (vph)	0	0	40	0	0	120	0	0	138	0	0	46
Lane Group Flow (vph)	62	321	15	343	819	65	54	526	47	130	334	20
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	30.4	24.0	24.0	44.8	31.4	31.4	27.6	22.0	22.0	38.0	27.2	27.2
Effective Green, g (s)	36.4	27.5	27.5	47.8	34.9	34.9	33.6	25.5	25.5	42.8	30.7	30.7
Actuated g/C Ratio	0.37	0.28	0.28	0.48	0.35	0.35	0.34	0.26	0.26	0.43	0.31	0.31
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	283	977	437	544	1240	555	410	906	405	378	1091	488
v/s Ratio Prot	0.02	0.09		c0.11	c0.23		0.01	c0.15		c0.05	0.09	
v/s Ratio Perm	0.06		0.01	0.20		0.04	0.03		0.03	0.10		0.01
v/c Ratio	0.22	0.33	0.03	0.63	0.66	0.12	0.13	0.58	0.12	0.34	0.31	0.04
Uniform Delay, d1	21.2	28.7	26.3	17.1	27.3	21.9	22.6	32.4	28.4	18.6	26.3	24.1
Progression Factor	1.00	1.00	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	0.2	0.0	1.8	1.3	0.1	0.1	1.0	0.1	0.2	0.2	0.0
Delay (s)	21.4	28.9	26.4	18.9	28.7	22.0	22.6	33.3	28.5	18.8	26.5	24.2
Level of Service	C	C	C	B	C	C	C	C	C	B	C	C
Approach Delay (s)		27.5			25.3			31.4			24.3	
Approach LOS		C			C			C			C	

Intersection Summary

HCM Average Control Delay	26.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	99.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Ryan Road (Rte 772) & Future Site Driveway

Ryan Road Property  
Background 2015 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↘	↘	↑↑	↘	↘		↘		↕	
Volume (veh/h)	6	553	19	247	1211	10	10	0	91	6	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.93	0.93	0.93	0.93	1.00	0.93	1.00	0.93	1.00	1.00	1.00
Hourly flow rate (vph)	6	595	20	266	1302	10	11	0	98	6	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									14			
Median type		Raised			Raised							
Median storage (veh)		2			2							
Upstream signal (ft)		896										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	0.95
vC, conflicting volume	1312			615			1793	2450	297	2192	2460	651
vC1, stage 1 conf vol							607	607		1833	1833	
vC2, stage 2 conf vol							1186	1843		358	627	
vCu, unblocked vol	1312			490			1730	2421	156	2149	2432	651
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			74			92	100	88	89	100	99
cM capacity (veh/h)	523			1016			134	83	819	56	85	411

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1
Volume Total	6	297	297	20	266	651	651	10	109	10
Volume Left	6	0	0	0	266	0	0	0	11	6
Volume Right	0	0	0	20	0	0	0	10	98	4
cSH	523	1700	1700	1700	1016	1700	1700	1700	909	86
Volume to Capacity	0.01	0.17	0.17	0.01	0.26	0.38	0.38	0.01	0.12	0.12
Queue Length 95th (ft)	1	0	0	0	26	0	0	0	10	9
Control Delay (s)	12.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	12.4	52.3
Lane LOS	B				A				B	F
Approach Delay (s)	0.1				1.6				12.4	52.3
Approach LOS									B	F

### Intersection Summary

Average Delay	2.0
Intersection Capacity Utilization	52.7%
ICU Level of Service	A
Analysis Period (min)	15

Table G1  
 Ryan Road (Route 772)/Legacy Park Drive/Future Site Driveway  
 Ryan Road Property  
 2015 Background  
 Warrants IA, IB, IC

	Ryan Road (Route 772)		Legacy Park Drive/Future Site Driveway		Warrant Satisfied
	Projected ADT	Min. Required EADT*	Projected ADT	Min. Required EADT *	
Warrant IA - Minimum Vehicular Volume	20,170	9,600	100	2,400	No
Warrant IB - Interruption of Continuous Traffic	20,170	14,400	100	1,200	No
Warrant IC - Combination 80%	20,170	7,680	100	1,920	No
	20,170	11,520	100	960	No

Source: Institute of Traffic Engineers, Manual of Traffic Signal Design, 2<sup>nd</sup> Edition (Numbers revised by VDOT/NOVA policy)  
 Notes: \* Minimum Required EADT is based on number of approach lanes.



## Appendix H

### 2015 Total Future Levels of Service



HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Total Future 2015 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗↗	↘	↘	↗↗	↘	↘	↗↗	↘	↘	↗↗	↘
Volume (vph)	76	721	61	124	264	266	43	357	314	222	281	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.57	1.00	1.00	0.16	1.00	1.00	0.56	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	1070	3539	1583	301	3539	1583	1050	3539	1583	584	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	84	792	67	136	290	292	47	392	345	244	309	79
RTOR Reduction (vph)	0	0	45	0	0	187	0	0	244	0	0	55
Lane Group Flow (vph)	84	792	22	136	290	105	47	392	101	244	309	24
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	36.4	29.9	29.9	42.4	32.9	32.9	24.4	18.7	18.7	39.8	27.1	27.1
Effective Green, g (s)	42.4	33.4	33.4	48.4	36.4	36.4	30.4	22.2	22.2	42.8	30.6	30.6
Actuated g/C Ratio	0.42	0.33	0.33	0.48	0.36	0.36	0.30	0.22	0.22	0.42	0.30	0.30
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	514	1168	522	325	1273	569	377	776	347	447	1070	479
v/s Ratio Prot	0.02	c0.22		c0.05	0.08		0.01	0.11		c0.09	0.09	
v/s Ratio Perm	0.05		0.01	0.15		0.07	0.03		0.06	c0.14		0.02
v/c Ratio	0.16	0.68	0.04	0.42	0.23	0.18	0.12	0.51	0.29	0.55	0.29	0.05
Uniform Delay, d1	17.9	29.3	23.0	17.3	22.6	22.2	25.4	34.7	32.9	20.2	27.0	25.0
Progression Factor	1.00	1.00	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	1.6	0.0	0.3	0.1	0.2	0.1	0.5	0.5	0.7	0.2	0.0
Delay (s)	18.0	30.8	23.1	17.6	22.7	22.4	25.5	35.2	33.4	21.0	27.1	25.0
Level of Service	B	C	C	B	C	C	C	D	C	C	C	C
Approach Delay (s)		29.1			21.6			33.8			24.5	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM Average Control Delay	27.6	HCM Level of Service C
HCM Volume to Capacity ratio	0.60	
Actuated Cycle Length (s)	101.2	Sum of lost time (s) 16.0
Intersection Capacity Utilization	62.3%	ICU Level of Service B
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis  
 2: Ryan Road (Rte 772) & Future Site Driveway

Ryan Road Property  
 Total Future 2015 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↑↑	↖	↗	↑↑	↖		↖	↖		↖	↖
Volume (veh/h)	49	1159	49	80	604	28	23	11	296	60	4	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.94	0.94	0.94	0.94	1.00	0.94	1.00	0.94	1.00	1.00	1.00
Hourly flow rate (vph)	49	1233	52	85	643	28	24	11	315	60	4	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									14			14
Median type		Raised			Raised							
Median storage (veh)		2			2							
Upstream signal (ft)		897										
pX, platoon unblocked				0.82			0.82	0.82	0.82	0.82	0.82	
vC, conflicting volume	671			1285			1824	2172	616	1690	2196	321
vC1, stage 1 conf vol							1331	1331		813	813	
vC2, stage 2 conf vol							493	841		877	1383	
vCu, unblocked vol	671			913			1569	1992	99	1406	2021	321
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			86			87	94	59	59	97	96
cM capacity (veh/h)	916			610			185	186	770	148	140	674

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1
Volume Total	49	616	616	52	85	321	321	28	350	91
Volume Left	49	0	0	0	85	0	0	0	24	60
Volume Right	0	0	0	52	0	0	0	28	315	27
cSH	916	1700	1700	1700	610	1700	1700	1700	857	210
Volume to Capacity	0.05	0.36	0.36	0.03	0.14	0.19	0.19	0.02	0.41	0.43
Queue Length 95th (ft)	4	0	0	0	12	0	0	0	50	51
Control Delay (s)	9.2	0.0	0.0	0.0	11.9	0.0	0.0	0.0	14.5	36.1
Lane LOS	A				B				B	E
Approach Delay (s)	0.3				1.3				14.5	36.1
Approach LOS									B	E

Intersection Summary

Average Delay	3.9
Intersection Capacity Utilization	63.9%
ICU Level of Service	B
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis  
 1: Ryan Road (Rte 772) & Belmont Ridge Road

Ryan Road Property  
 Total Future 2015 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	301	50	325	777	175	49	479	173	121	304	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.21	1.00	1.00	0.42	1.00	1.00	0.55	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	393	3539	1583	775	3539	1583	1025	3539	1583	454	3539	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	62	331	55	357	854	192	54	526	190	133	334	66
RTOR Reduction (vph)	0	0	40	0	0	124	0	0	142	0	0	46
Lane Group Flow (vph)	62	331	15	357	854	68	54	526	48	133	334	20
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8		8	6		6	2		2
Actuated Green, G (s)	31.0	24.6	24.6	45.6	32.2	32.2	27.8	22.2	22.2	38.4	27.5	27.5
Effective Green, g (s)	37.0	28.1	28.1	48.6	35.7	35.7	33.8	25.7	25.7	43.1	31.0	31.0
Actuated g/C Ratio	0.37	0.28	0.28	0.48	0.35	0.35	0.34	0.26	0.26	0.43	0.31	0.31
Clearance Time (s)	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5	7.0	7.5	7.5
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)	273	988	442	542	1255	561	408	903	404	376	1089	487
v/s Ratio Prot	0.02	0.09		c0.11	c0.24		0.01	c0.15		c0.05	0.09	
v/s Ratio Perm	0.06		0.01	0.21		0.04	0.03		0.03	0.10		0.01
v/c Ratio	0.23	0.34	0.03	0.66	0.68	0.12	0.13	0.58	0.12	0.35	0.31	0.04
Uniform Delay, d1	21.4	28.9	26.4	17.3	27.6	21.9	22.9	32.8	28.8	18.9	26.6	24.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	0.0	2.2	1.5	0.1	0.1	1.0	0.1	0.2	0.2	0.0
Delay (s)	21.6	29.1	26.5	19.6	29.2	22.0	23.0	33.8	28.9	19.1	26.8	24.5
Level of Service	C	C	C	B	C	C	C	C	C	B	C	C
Approach Delay (s)		27.7			25.8			31.8			24.6	
Approach LOS		C			C			C			C	

**Intersection Summary**

HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 2: Ryan Road (Rte 772) & Future Site Driveway

Ryan Road Property  
 Total Future 2015 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗		↘	↗		↘	↗
Volume (veh/h)	23	583	19	247	1211	56	10	3	91	17	2	56
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.93	0.93	0.93	0.93	1.00	0.93	1.00	0.93	1.00	1.00	1.00
Hourly flow rate (vph)	23	627	20	266	1302	56	11	3	98	17	2	56
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									14			14
Median type		Raised			Raised							
Median storage (veh)		2			2							
Upstream signal (ft)		896										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	0.95
vC, conflicting volume	1358			647			1856	2562	313	2243	2527	651
vC1, stage 1 conf vol							673	673		1833	1833	
vC2, stage 2 conf vol							1183	1889		410	693	
vCu, unblocked vol	1358			516			1792	2538	163	2201	2500	651
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			73			89	95	88	69	98	86
cM capacity (veh/h)	502			991			97	61	808	55	82	411

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	SB 1
Volume Total	23	313	313	20	266	651	651	56	112	75
Volume Left	23	0	0	0	266	0	0	0	11	17
Volume Right	0	0	0	20	0	0	0	56	98	56
cSH	502	1700	1700	1700	991	1700	1700	1700	726	230
Volume to Capacity	0.05	0.18	0.18	0.01	0.27	0.38	0.38	0.03	0.15	0.33
Queue Length 95th (ft)	4	0	0	0	27	0	0	0	14	34
Control Delay (s)	12.5	0.0	0.0	0.0	10.0	0.0	0.0	0.0	15.3	35.2
Lane LOS	B				A				C	E
Approach Delay (s)	0.4				1.6				15.3	35.2
Approach LOS									C	E

Intersection Summary

Average Delay	2.9
Intersection Capacity Utilization	54.5%
ICU Level of Service	A
Analysis Period (min)	15

Table HI  
 Ryan Road (Route 772)/Legacy Park Drive/Future Site Driveway  
 Ryan Road Property  
 2015 Total Future  
 Warrants IA, IB, IC

	Ryan Road (Route 772)		Legacy Park Drive/Future Site Driveway		Warrant Satisfied
	Projected ADT	Min. Required EADT*	Projected ADT	Min. Required EADT *	
Warrant IA - Minimum Vehicular Volume	20,340	9,600	290	3,200	No
Warrant IB - Interruption of Continuous Traffic	20,340	14,400	290	1,600	No
Warrant IC - Combination 80%	20,340	7,680	290	2,560	No
	20,340	11,520	290	1,280	No

Source: Institute of Traffic Engineers, Manual of Traffic Signal Design, 2<sup>nd</sup> Edition (Numbers revised by VDOT/NOVA policy)

Notes: \* Minimum Required EADT is based on number of approach lanes.