REPORT

# Crossroads IGA
# 8001 Smyrna Parkway
# Louisville, KY

# Traffic Impact Study

Louisville Metro Planning

March 8, 2016

*Revised May 2,2016*

CDM Smith

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# Introduction

The proposed Crossroads IGA in Louisville, KY is located on Smyrna Parkway east of Applegate Lane (west) intersection and north of Highview Fire Station Number 2. Crossroads IGA is proposing a 14,532 square foot neighborhood grocery with eight fueling positions. The building will also house a hardware store and a fast-food restaurant. **Figure 1** displays a map of the site. Access to the tract will be from two entrances on Smyrna Parkway. The purpose of this study is to examine the traffic impacts of the proposed development upon the adjacent highway system. For this study the impact area was defined to be the intersection of Applegate Lane (west) and Smyrna Parkway.

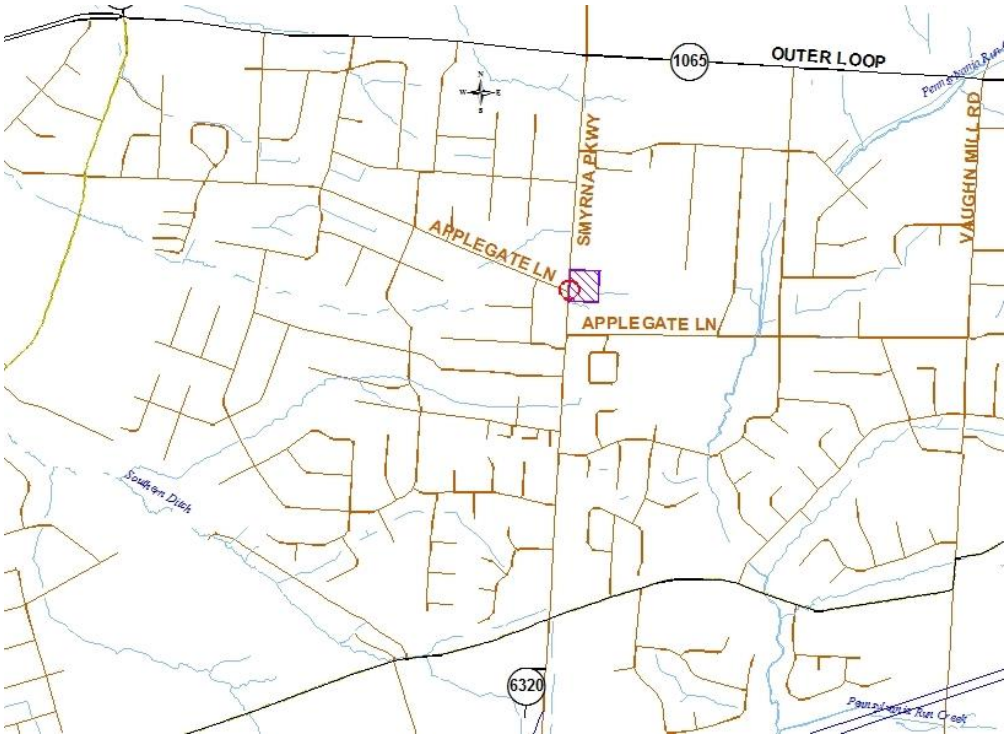



**Figure 1**
**Site Location**

# Existing Conditions

Smyrna Parkway is maintained by Metro Louisville with an estimated 2015 ADT of 12,200 vehicles per day between Outer Loop (KY 1065) and Manslick Road (KY 2845), as estimated from the Kentucky Transportation Cabinet 2014 count at station 402. The road is a three lane road with ten-foot lanes a two-way left turn lane and curb and gutter. The posted speed limit is 35 mph. There are sidewalks on the west side. The intersection with Applegate Lane is controlled with a stop sign. There are no turn lanes on Applegate Lane.

A.m. and p.m. peak hour traffic counts were obtained at the intersection on December 17, 2015 (see Appendix A). The a.m. peak hour occurred between 7:00 and 8:00 and the p.m. peak hour occurred between 5:00 and 6:00 p.m. **Figure 2** illustrates the existing peak hour traffic volumes.

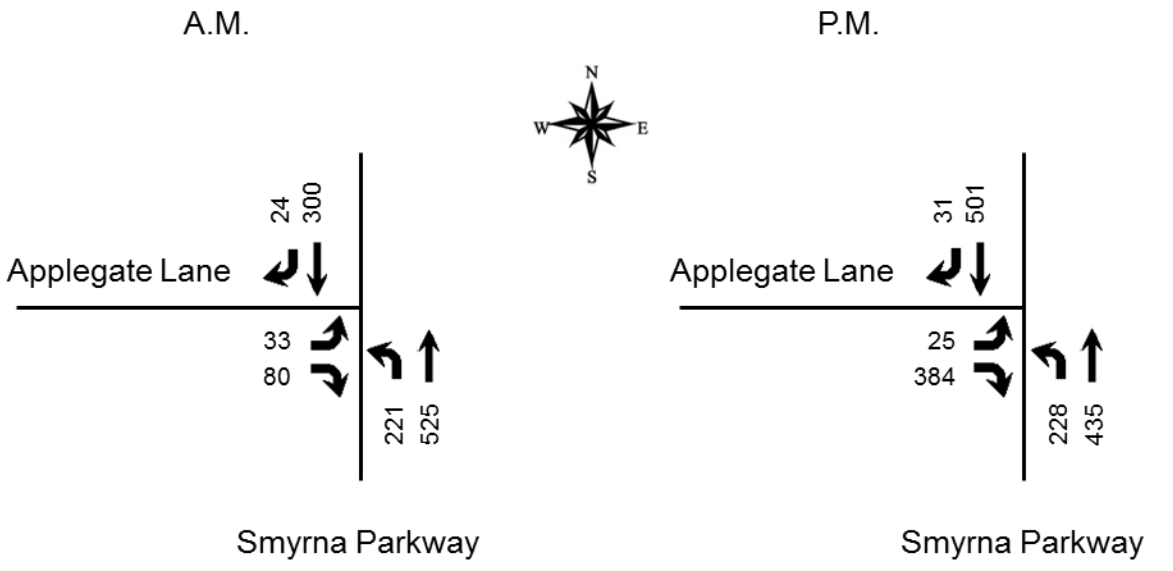



**Figure 2**
**2015 Peak Hour Counts**

## Future Conditions

The projected completion year for this development is 2017, so the analysis year for this study is 2017. To predict traffic conditions in 2017, one percent annual growth in traffic was added. This growth is based upon a review of the historical growth at KYTC count stations 401 and 402. **Figure 3** displays the 2017 No Build volumes.

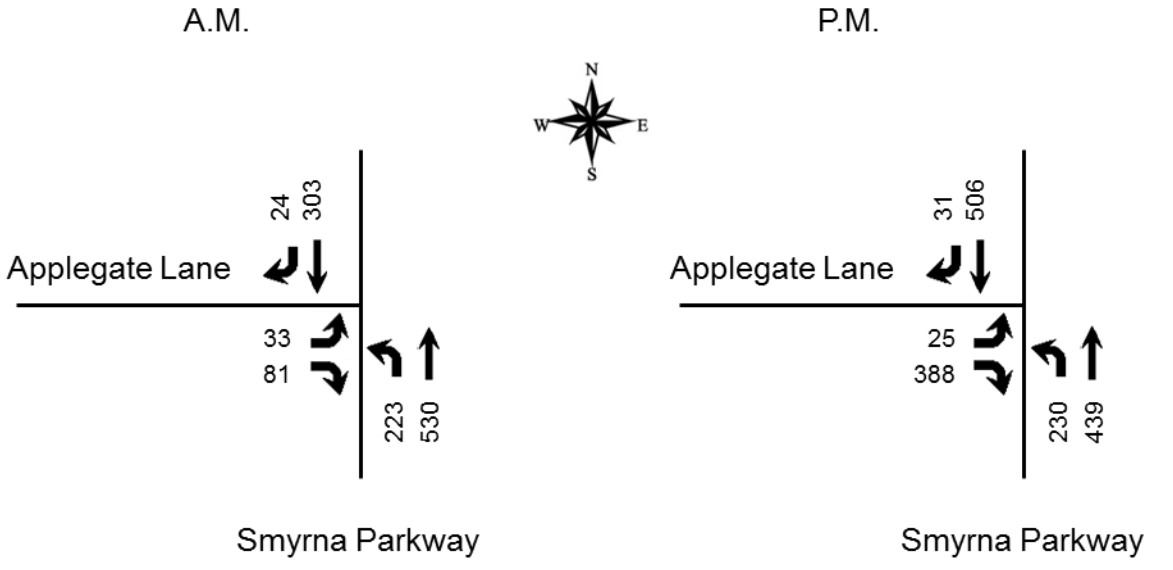



**Figure 3**
**2017 No Build Peak Hour Volumes**

# Trip Generation

The Institute of Transportation Engineers Trip Generation Manual, 9th Edition contains trip generation rates for a wide range of developments. The land uses of "Gasoline/Service Station with Convenience Market (945)", "Fast-Food with Drive-Through Window (934)" and "Hardware Store (816)" best describes this development. The trip generation results were compared with existing Crossroads IGA sites to confirm this as the best match. The trip generation results are listed in **Table 1**. The results of the trip generation analysis are that this development will generate 129 a.m. peak hour trips and 179 p.m. peak hour trips. The trips were assigned to the highway network with 70 percent to/from the south, 15 percent to/from the north and 15 percent to/from the west. This is based upon the residential density in the vicinity. **Figure 4** shows the trips generated by this development and distributed throughout the road network for the year 2017 during the peak hours. **Figure 5** displays the individual turning movements for the year 2017 for the peak hours when the development is completed.

**Table 1 – Trip Generation**

| | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|
| | Total | Enter | Exit | Total | Enter | Exit |
| Gasoline/Service Station with Conv Market (8 fueling positions) | 81 | 41 | 40 | 108 | 54 | 54 |
| Hardware Store (3,000 square feet) | 3 | 2 | 1 | 38 | 18 | 20 |
| Fast-Food with Drive-Through Window (1,000 square feet) | 45 | 23 | 22 | 33 | 17 | 16 |
| **TOTAL** | **129** | **66** | **63** | **179** | **89** | **90** |

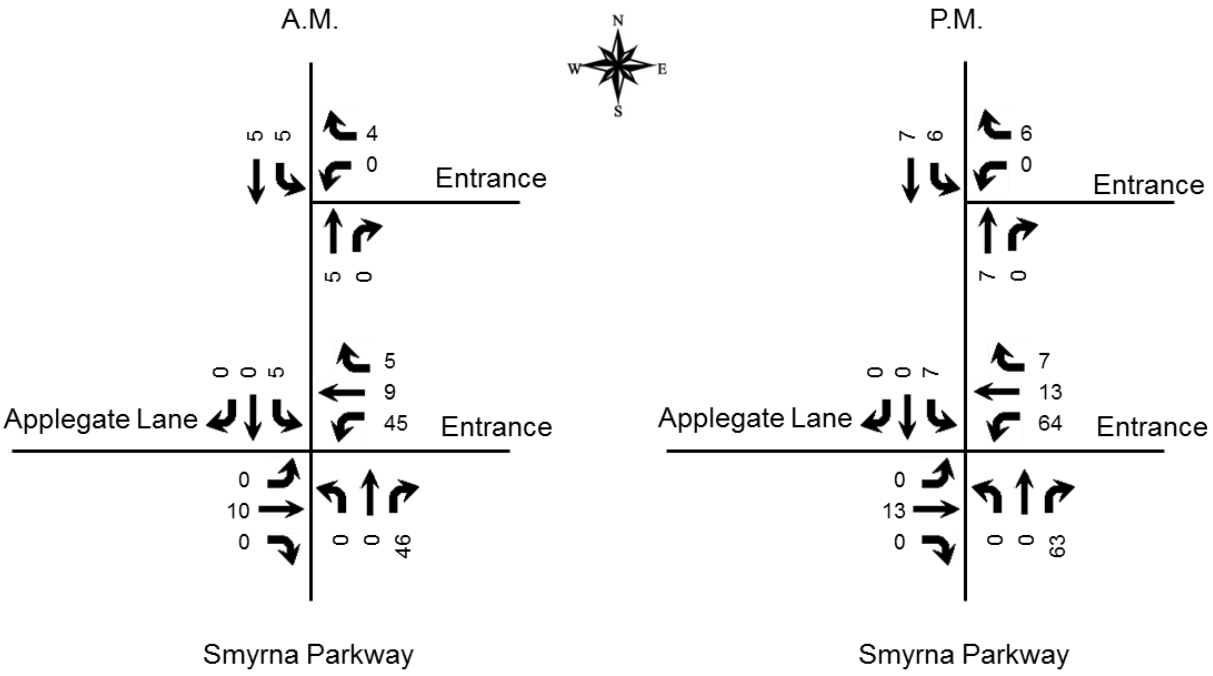



**Figure 4**
**Trip Distribution for Site**

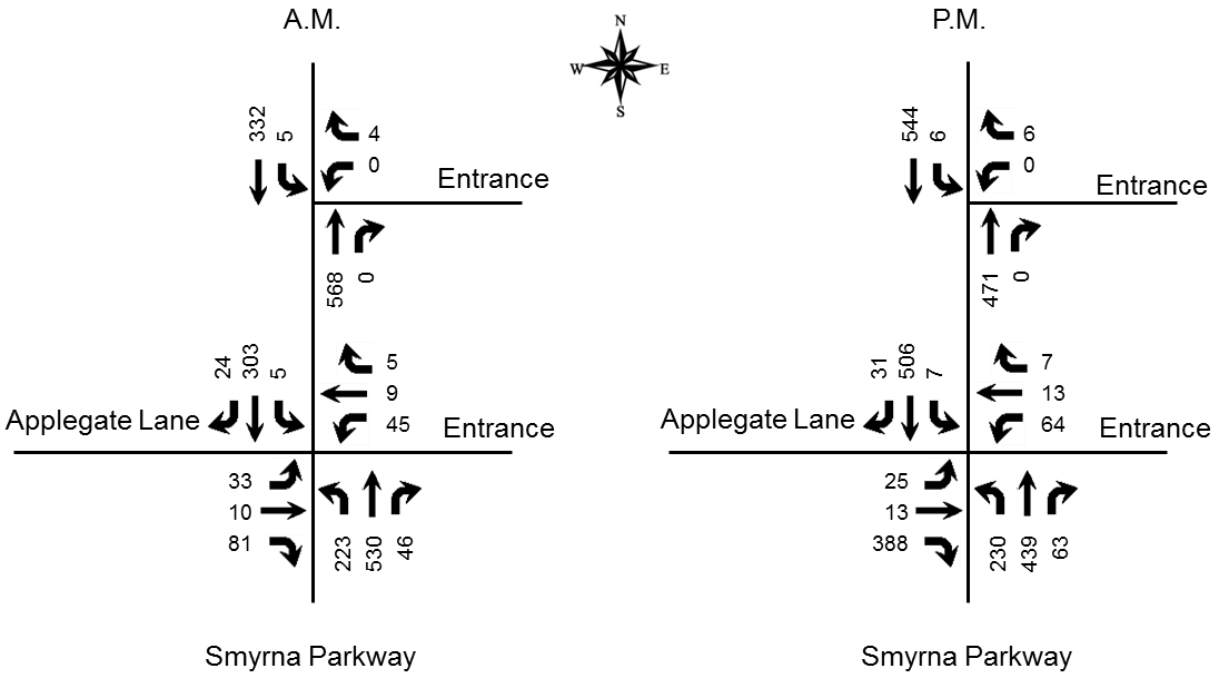



**Figure 5**
**2017 Build Peak Hour Volumes**

## Analysis

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a "Level of Service" or LOS. Level of Service is a ranking scale from A through F with each level representing a range. LOS results depend upon the type of facility that is analyzed. In this case, the LOS is based upon the average vehicle delay each movement experiences at an intersection.

To evaluate the impact of the proposed development, the vehicle delays at the intersection were determined using procedures detailed in the Highway Capacity Manual, 2010 edition. Future delay and Level of Service were determined for the intersection using HCS 2010 TWSC and Streets software (version 6.70). **Table 2** shows the results of the analysis for the three scenarios analyzed. The full printouts are included in Appendix B.

**Table 2 - Level of Service Results**

| | AM Peak Hour | | | | PM Peak Hour | | | | Traffic Signal | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 Existing | 2017 No Build | 2017 Build | 2017 Build EB R | 2015 Existing | 2017 No Build | 2017 Build | 2017 Build EB R | 2017 AM Build | 2017 PM Build |
| **Smyrna Parkway at Applegate Lane** | | | | | | | | | **C 25.4** | **C 32.8** |
| Applegate Lane Eastbound | A 9.7 | A 9.7 | F 213.9 | F 87.8 | F 50.7 | F 54.3 | F 158.6 | D 32.0 | D 37.5 | D 39.5 |
| Crossroads IGA Westbound | NA | NA | F 377.8 | F 377.8 | NA | NA | F 1537.8 | F 1537.8 | D 54.7 | E 55.9 |
| Smyrna Parkway Southbound | A 9.2 | A 9.2 | A 9.2 | A 9.2 | A 9.6 | A 9.6 | A 9.5 | A 9.5 | C 21.9 | C 25.8 |
| Smyrna Parkway Northbound | NA | NA | A 9.1 | A 9.1 | NA | NA | A 8.4 | A 8.4 | C 24.2 | C 33.7 |

*Note: Level of Service, delay in seconds*

Because the intersection currently experiences Level of Service F during the current p.m. peak hour and during both build peak hours, two options were evaluated. The first option is to construct an eastbound right turn lane and the second was the installation of a traffic signal. The addition of an eastbound right turn lane does not eliminate Level of Service F conditions in both peak hours.

The Manual on Uniform Traffic Control Device Warrants for installing a traffic signal were reviewed. A speed study was conducted on Smyrna Parkway on April 26, 2016. The 85$^{th}$ percentile speed was 46 mph. Therefore, the speed reduction has been applied to the signal warrants. Using only the volumes from the existing count, Warrant 1A is satisfied for all twelve hours. The speed study and warrant chart are included in Appendix B. The full volume on the minor street approach includes the right turn volume due to the single lane approach on Applegate Lane. Additionally, the signal meets the recommendation for installing protected left turn movement for northbound Smyrna Parkway. Installing a traffic signal will improve the overall operation of the intersection.

In order to achieve the level of service results shown in the table above, an eastbound right turn lane will also be constructed on Applegate Lane.

# Conclusions

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2017, there will be an impact to the existing highway network. Due to the delays currently experienced on Applegate Lane at Smyrna Parkway, a traffic signal with an eastbound right turn lane is recommended for the intersection. The installation of the traffic signal will improve the overall operation of the intersection.

# Appendix A

# Traffic Counts

| | |
|---|---|
| **Study Name** | **Smyrna Rd & Applegate Ln** |
| **Start Date** | **12/17/2015** |
| **Start Time** | **7:00 AM** |
| **Site Code** | |

| | Southbound Approach Southbound | | | Northbound Approach Northbound | | | Mainline | | Eastbound Approach Eastbound | | | Side street | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Right | Thru | U-Turn | Thru | Left | U-Turn | Total | Hourly Total | Right | Left | U-Turn | Total | Hourly Total |
| 7:00 AM | 3 | 55 | 0 | 140 | 31 | 0 | 229 | | 14 | 6 | 0 | 20 | |
| 7:15 AM | 4 | 67 | 0 | 179 | 58 | 0 | 308 | | 20 | 11 | 0 | 31 | |
| 7:30 AM | 12 | 110 | 0 | 141 | 85 | 0 | 348 | | 22 | 9 | 0 | 31 | |
| 7:45 AM | 5 | 68 | 0 | 65 | 47 | 0 | 185 | 1070 | 24 | 7 | 0 | 31 | 113 |
| 8:00 AM | 2 | 51 | 0 | 65 | 33 | 0 | 151 | | 21 | 5 | 0 | 26 | |
| 8:15 AM | 1 | 61 | 0 | 76 | 35 | 0 | 173 | | 21 | 7 | 0 | 28 | |
| 8:30 AM | 3 | 70 | 0 | 103 | 40 | 0 | 216 | | 31 | 2 | 0 | 33 | |
| 8:45 AM | 3 | 76 | 0 | 93 | 44 | 0 | 216 | 756 | 26 | 5 | 0 | 31 | 118 |
| 9:00 AM | 4 | 70 | 0 | 69 | 31 | 0 | 174 | | 29 | 6 | 0 | 35 | |
| 9:15 AM | 5 | 60 | 0 | 69 | 24 | 0 | 158 | | 18 | 2 | 0 | 20 | |
| 9:30 AM | 3 | 39 | 0 | 79 | 35 | 0 | 156 | | 21 | 2 | 0 | 23 | |
| 9:45 AM | 4 | 51 | 0 | 65 | 35 | 0 | 155 | 643 | 26 | 3 | 0 | 29 | 107 |
| 10:00 AM | 3 | 61 | 0 | 73 | 37 | 0 | 174 | | 15 | 3 | 0 | 18 | |
| 10:15 AM | 0 | 50 | 0 | 66 | 39 | 0 | 155 | | 29 | 1 | 0 | 30 | |
| 10:30 AM | 6 | 46 | 0 | 63 | 23 | 0 | 138 | | 23 | 4 | 0 | 27 | |
| 10:45 AM | 3 | 51 | 0 | 53 | 37 | 0 | 144 | 611 | 30 | 3 | 0 | 33 | 108 |
| 11:00 AM | 2 | 44 | 0 | 64 | 35 | 0 | 145 | | 23 | 7 | 0 | 30 | |
| 11:15 AM | 4 | 60 | 0 | 77 | 43 | 0 | 184 | | 21 | 6 | 0 | 27 | |
| 11:30 AM | 2 | 67 | 0 | 84 | 45 | 0 | 198 | | 27 | 5 | 0 | 32 | |
| 11:45 AM | 2 | 73 | 0 | 74 | 35 | 0 | 184 | 711 | 38 | 9 | 0 | 47 | 136 |
| 12:00 PM | 7 | 55 | 0 | 80 | 33 | 0 | 175 | | 31 | 7 | 0 | 38 | |
| 12:15 PM | 4 | 57 | 0 | 72 | 35 | 0 | 168 | | 33 | 3 | 0 | 36 | |
| 12:30 PM | 6 | 65 | 0 | 80 | 34 | 0 | 185 | | 27 | 6 | 0 | 33 | |
| 12:45 PM | 6 | 77 | 0 | 90 | 40 | 0 | 213 | 741 | 40 | 5 | 0 | 45 | 152 |
| 1:00 PM | 0 | 77 | 0 | 97 | 35 | 0 | 209 | | 55 | 9 | 0 | 64 | |
| 1:15 PM | 5 | 89 | 0 | 73 | 48 | 0 | 215 | | 50 | 2 | 0 | 52 | |
| 1:30 PM | 5 | 81 | 0 | 91 | 45 | 0 | 222 | | 57 | 3 | 0 | 60 | |
| 1:45 PM | 5 | 87 | 0 | 102 | 45 | 0 | 239 | 885 | 60 | 2 | 0 | 62 | 238 |
| 2:00 PM | 5 | 58 | 0 | 109 | 41 | 0 | 213 | | 60 | 7 | 0 | 67 | |
| 2:15 PM | 6 | 94 | 0 | 129 | 55 | 0 | 284 | | 57 | 9 | 0 | 66 | |
| 2:30 PM | 10 | 112 | 0 | 106 | 62 | 0 | 290 | | 70 | 6 | 0 | 76 | |
| 2:45 PM | 7 | 126 | 0 | 112 | 32 | 0 | 277 | 1064 | 99 | 6 | 0 | 105 | 314 |
| 3:00 PM | 6 | 113 | 0 | 82 | 40 | 0 | 241 | | 94 | 5 | 0 | 99 | |
| 3:15 PM | 4 | 90 | 0 | 116 | 44 | 0 | 254 | | 68 | 10 | 0 | 78 | |
| 3:30 PM | 6 | 120 | 0 | 86 | 45 | 0 | 257 | | 68 | 6 | 0 | 74 | |
| 3:45 PM | 6 | 105 | 0 | 96 | 51 | 0 | 258 | 1010 | 75 | 4 | 0 | 79 | 330 |
| 4:00 PM | 2 | 148 | 0 | 115 | 54 | 0 | 319 | | 82 | 8 | 0 | 90 | |
| 4:15 PM | 5 | 116 | 0 | 106 | 46 | 0 | 273 | | 80 | 5 | 0 | 85 | |
| 4:30 PM | 10 | 136 | 0 | 107 | 52 | 0 | 305 | | 87 | 5 | 0 | 92 | |
| 4:45 PM | 6 | 124 | 0 | 97 | 64 | 0 | 291 | 1188 | 90 | 7 | 0 | 97 | 364 |
| 5:00 PM | 7 | 135 | 0 | 100 | 57 | 0 | 299 | | 80 | 7 | 0 | 87 | |
| 5:15 PM | 6 | 127 | 0 | 100 | 57 | 0 | 290 | | 103 | 6 | 0 | 109 | |
| 5:30 PM | 9 | 114 | 0 | 122 | 47 | 0 | 292 | | 111 | 7 | 0 | 118 | |
| 5:45 PM | 9 | 125 | 0 | 113 | 67 | 0 | 314 | 1195 | 90 | 5 | 1 | 96 | 410 |
| 6:00 PM | 4 | 116 | 0 | 106 | 56 | 0 | 282 | | 96 | 4 | 0 | 100 | |
| 6:15 PM | 10 | 98 | 0 | 115 | 40 | 0 | 263 | | 66 | 6 | 0 | 72 | |
| 6:30 PM | 2 | 104 | 0 | 94 | 53 | 0 | 253 | | 75 | 11 | 0 | 86 | |
| 6:45 PM | 5 | 87 | 0 | 110 | 52 | 0 | 254 | 1052 | 71 | 4 | 0 | 75 | 333 |

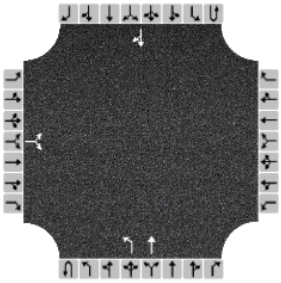
# Appendix B

# HCS Reports

# HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkw at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2015 | North/South Street | Smyrna Pkwy |
| Time Analyzed | AM Peak | Peak Hour Factor | 0.78 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Crossroads IGA | | |

## Lanes



Major Street: North-South

## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| Configuration | | | LR | | | | | | | L | T | | | | | TR |
| Volume (veh/h) | | 33 | | 80 | | | | | | 221 | 525 | | | | 300 | 24 |
| Percent Heavy Vehicles | | 6 | | 1 | | | | | | 3 | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Left Only | | | | | | | | | | | | | | | |
| Median Storage | 1 | | | | | | | | | | | | | | | |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 145 | | | | | | | 283 | | | | | | |
| Capacity | | | 918 | | | | | | | 1136 | | | | | | |
| v/c Ratio | | | 0.16 | | | | | | | 0.25 | | | | | | |
| 95% Queue Length | | | 0.6 | | | | | | | 1.0 | | | | | | |
| Control Delay (s/veh) | | | 9.7 | | | | | | | 9.2 | | | | | | |
| Level of Service (LOS) | | | A | | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 9.7 | | | | | | | | 2.7 | | | | | | | |
| Approach LOS | A | | | | | | | | A | | | | | | | |



HCS 2010™ TWSC Version 6.70
Applegate AM 15.xtw

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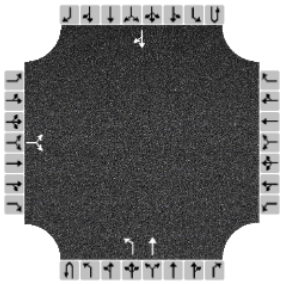
## HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkw at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Pkwy |
| Time Analyzed | AM Peak No Build | Peak Hour Factor | 0.78 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Crossroads IGA | | |

### Lanes




### Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| Configuration | | | LR | | | | | | | L | T | | | | | TR |
| Volume (veh/h) | | 33 | | 81 | | | | | | 223 | 530 | | | | 303 | 24 |
| Percent Heavy Vehicles | | 6 | | 1 | | | | | | 3 | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Left Only | | | | | | | | | | | | | | | |
| Median Storage | 1 | | | | | | | | | | | | | | | |

### Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 146 | | | | | | | 286 | | | | | | |
| Capacity | | | 911 | | | | | | | 1134 | | | | | | |
| v/c Ratio | | | 0.16 | | | | | | | 0.25 | | | | | | |
| 95% Queue Length | | | 0.6 | | | | | | | 1.0 | | | | | | |
| Control Delay (s/veh) | | | 9.7 | | | | | | | 9.2 | | | | | | |
| Level of Service (LOS) | | | A | | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 9.7 | | | | | | | | 2.7 | | | | | | | |
| Approach LOS | A | | | | | | | | A | | | | | | | |



HCS 2010™ TWSC Version 6.70
Applegate AM 17 NB.xtw

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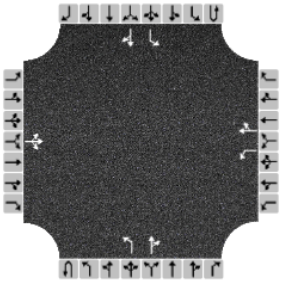
# HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkwy at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Parkway |
| Time Analyzed | AM Peak Build | Peak Hour Factor | 0.78 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Smyrna Pkway Crossroads IGA | | |

## Lanes



Major Street: North-South

## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 1 | 0 | | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| Configuration | | | LTR | | | L | | TR | | L | | TR | | L | | TR |
| Volume (veh/h) | | 33 | 10 | 81 | | 45 | 9 | 5 | | 223 | 530 | 46 | | 5 | 303 | 24 |
| Percent Heavy Vehicles | | 6 | 0 | 1 | | 0 | 0 | 0 | | 1 | | | | 0 | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 159 | | | 58 | | 18 | | 286 | | | | 6 | | |
| Capacity | | | 131 | | | 39 | | 95 | | 1145 | | | | 877 | | |
| v/c Ratio | | | 1.22 | | | 1.49 | | 0.19 | | 0.25 | | | | 0.01 | | |
| 95% Queue Length | | | 9.7 | | | 6.0 | | 0.7 | | 1.0 | | | | 0.0 | | |
| Control Delay (s/veh) | | | 213.9 | | | 479.0 | | 51.6 | | 9.2 | | | | 9.1 | | |
| Level of Service (LOS) | | | F | | | F | | F | | A | | | | A | | |
| Approach Delay (s/veh) | 213.9 | | | | 377.8 | | | | 2.6 | | | | 0.1 | | | |
| Approach LOS | F | | | | F | | | | A | | | | A | | | |



HCS 2010™ TWSC Version 6.70
Applegate AM 17B.xtw

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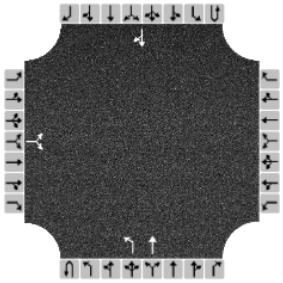
## HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkw at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2015 | North/South Street | Smyrna Pkwy |
| Time Analyzed | PM Peak | Peak Hour Factor | 0.98 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Crossroads IGA | | |

### Lanes




### Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| Configuration | | | LR | | | | | | | L | T | | | | | TR |
| Volume (veh/h) | | 25 | | 384 | | | | | | 228 | 435 | | | | 501 | 31 |
| Percent Heavy Vehicles | | 6 | | 1 | | | | | | 3 | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Left Only | | | | | | | | | | | | | | | |
| Median Storage | 1 | | | | | | | | | | | | | | | |

### Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 418 | | | | | | | 233 | | | | | | |
| Capacity | | | 464 | | | | | | | 1020 | | | | | | |
| v/c Ratio | | | 0.90 | | | | | | | 0.23 | | | | | | |
| 95% Queue Length | | | 10.0 | | | | | | | 0.9 | | | | | | |
| Control Delay (s/veh) | | | 50.7 | | | | | | | 9.6 | | | | | | |
| Level of Service (LOS) | | | F | | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 50.7 | | | | | | | | 3.3 | | | | | | | |
| Approach LOS | F | | | | | | | | A | | | | | | | |



HCS 2010™ TWSC Version 6.70
Applegate PM 15.xtw

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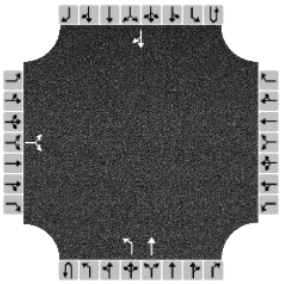
# HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkw at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Pkwy |
| Time Analyzed | PM Peak No Build | Peak Hour Factor | 0.98 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Crossroads IGA | | |

## Lanes



Major Street: North-South

## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| Configuration | | | LR | | | | | | | L | T | | | | | TR |
| Volume (veh/h) | | 25 | | 388 | | | | | | 230 | 439 | | | | 506 | 31 |
| Percent Heavy Vehicles | | 6 | | 1 | | | | | | 3 | | | | | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Left Only | | | | | | | | | | | | | | | |
| Median Storage | 1 | | | | | | | | | | | | | | | |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 422 | | | | | | | 235 | | | | | | |
| Capacity | | | 459 | | | | | | | 1015 | | | | | | |
| v/c Ratio | | | 0.92 | | | | | | | 0.23 | | | | | | |
| 95% Queue Length | | | 10.5 | | | | | | | 0.9 | | | | | | |
| Control Delay (s/veh) | | | 54.3 | | | | | | | 9.6 | | | | | | |
| Level of Service (LOS) | | | F | | | | | | | A | | | | | | |
| Approach Delay (s/veh) | 54.3 | | | | | | | | 3.3 | | | | | | | |
| Approach LOS | F | | | | | | | | A | | | | | | | |



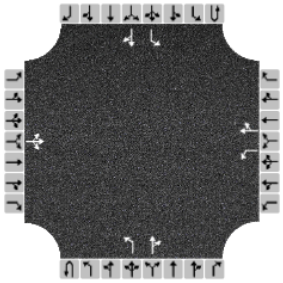
HCS 2010™ TWSC Version 6.70
Applegate PM 17 NB.xtw

Generated: 2/17/2016 4:19:24 PM

## HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkwy at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Parkway |
| Time Analyzed | PM Peak Build | Peak Hour Factor | 0.98 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Smyrna Pkway Crossroads IGA | | |

### Lanes




### Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 1 | 0 | | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| Configuration | | | LTR | | | L | | TR | | L | | TR | | L | | TR |
| Volume (veh/h) | | 25 | 13 | 388 | | 64 | 13 | 7 | | 230 | 439 | 63 | | 7 | 506 | 31 |
| Percent Heavy Vehicles | | 6 | 0 | 1 | | 0 | 0 | 0 | | 1 | | | | 0 | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | |

### Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | | 435 | | | 65 | | 20 | | 235 | | | | 7 | | |
| Capacity | | | 353 | | | 15 | | 132 | | 1026 | | | | 1064 | | |
| v/c Ratio | | | 1.23 | | | 4.31 | | 0.15 | | 0.23 | | | | 0.01 | | |
| 95% Queue Length | | | 18.9 | | | 9.0 | | 0.5 | | 0.9 | | | | 0.0 | | |
| Control Delay (s/veh) | | | 158.6 | | | 1999.6 | | 37.2 | | 9.5 | | | | 8.4 | | |
| Level of Service (LOS) | | | F | | | F | | E | | A | | | | A | | |
| Approach Delay (s/veh) | 158.6 | | | | 1537.8 | | | | 3.0 | | | | 0.1 | | | |
| Approach LOS | F | | | | F | | | | A | | | | A | | | |



HCS 2010™ TWSC Version 6.70
Applegate PM 17B.xtw

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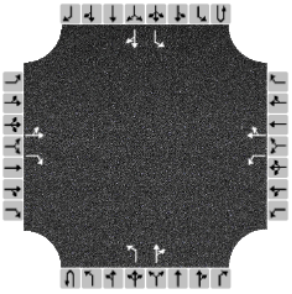
# HCS 2010 Two-Way Stop Control Summary Report

## General Information

| | | | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkwy at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Parkway |
| Time Analyzed | AM Peak Build EB right | Peak Hour Factor | 0.78 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Smyrna Pkway Crossroads IGA | | |

## Lanes



Major Street: North-South

## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 1 | 1 | | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| Configuration | | LT | | R | | L | | TR | | L | | TR | | L | | TR |
| Volume (veh/h) | | 33 | 10 | 81 | | 45 | 9 | 5 | | 223 | 530 | 46 | | 5 | 303 | 24 |
| Percent Heavy Vehicles | | 6 | 0 | 1 | | 0 | 0 | 0 | | 1 | | | | 0 | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | 55 | | 104 | | 58 | | 18 | | 286 | | | | 6 | | |
| Capacity | | 52 | | 649 | | 39 | | 95 | | 1145 | | | | 877 | | |
| v/c Ratio | | 1.06 | | 0.16 | | 1.49 | | 0.19 | | 0.25 | | | | 0.01 | | |
| 95% Queue Length | | 4.7 | | 0.6 | | 6.0 | | 0.7 | | 1.0 | | | | 0.0 | | |
| Control Delay (s/veh) | | 269.0 | | 11.6 | | 479.0 | | 51.6 | | 9.2 | | | | 9.1 | | |
| Level of Service (LOS) | | F | | B | | F | | F | | A | | | | A | | |
| Approach Delay (s/veh) | 87.8 | | | | 377.8 | | | | 2.6 | | | | 0.1 | | | |
| Approach LOS | F | | | | F | | | | A | | | | A | | | |



HCS 2010™ TWSC Version 6.70
Applegate AM 17B eb right.xtw

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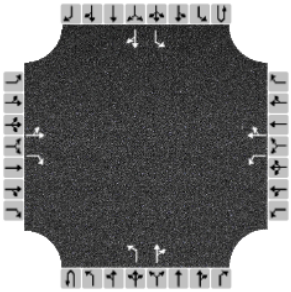
# HCS 2010 Two-Way Stop Control Summary Report

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | DBZ | Intersection | Smyrna Pkwy at Applegate |
| Agency/Co. | CDM Smith | Jurisdiction | |
| Date Performed | 2/17/2016 | East/West Street | Applegate Lane |
| Analysis Year | 2017 | North/South Street | Smyrna Parkway |
| Time Analyzed | PM Peak Build eb right | Peak Hour Factor | 0.98 |
| Intersection Orientation | North-South | Analysis Time Period (hrs) | 0.25 |
| Project Description | Smyrna Pkway Crossroads IGA | | |

## Lanes



Major Street: North-South

## Vehicle Volumes and Adjustments

| Approach | Eastbound | | | | Westbound | | | | Northbound | | | | Southbound | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | U | L | T | R | U | L | T | R | U | L | T | R | U | L | T | R |
| Priority | | 10 | 11 | 12 | | 7 | 8 | 9 | 1U | 1 | 2 | 3 | 4U | 4 | 5 | 6 |
| Number of Lanes | | 0 | 1 | 1 | | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| Configuration | | LT | | R | | L | | TR | | L | | TR | | L | | TR |
| Volume (veh/h) | | 25 | 13 | 388 | | 64 | 13 | 7 | | 230 | 439 | 63 | | 7 | 506 | 31 |
| Percent Heavy Vehicles | | 6 | 0 | 1 | | 0 | 0 | 0 | | 1 | | | | 0 | | |
| Proportion Time Blocked | | | | | | | | | | | | | | | | |
| Right Turn Channelized | No | | | | No | | | | No | | | | No | | | |
| Median Type | Undivided | | | | | | | | | | | | | | | |
| Median Storage | | | | | | | | | | | | | | | | |

## Delay, Queue Length, and Level of Service

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (veh/h) | | 39 | | 396 | | 65 | | 20 | | 235 | | | | 7 | | |
| Capacity | | 76 | | 549 | | 15 | | 132 | | 1026 | | | | 1064 | | |
| v/c Ratio | | 0.51 | | 0.72 | | 4.31 | | 0.15 | | 0.23 | | | | 0.01 | | |
| 95% Queue Length | | 2.1 | | 5.9 | | 9.0 | | 0.5 | | 0.9 | | | | 0.0 | | |
| Control Delay (s/veh) | | 93.5 | | 26.7 | | 1999.6 | | 37.2 | | 9.5 | | | | 8.4 | | |
| Level of Service (LOS) | | F | | D | | F | | E | | A | | | | A | | |
| Approach Delay (s/veh) | 32.0 | | | | 1537.8 | | | | 3.0 | | | | 0.1 | | | |
| Approach LOS | D | | | | F | | | | A | | | | A | | | |



HCS 2010™ TWSC Version 6.70
Applegate PM 17B eb right.xtw

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TRAFFIC SIGNAL WARRANT ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| COUNTY | Jefferson | | DATE | December 17, 2015 | DAY OF WEEK | Thurs |
| CITY | Louisville | MILEPOST | | NO. OF CORRECTIBLE CRASHES IN 12 MONTH PERIOD | NA |
| MAJOR STREET NAME | Smyrna Parkway | | | NO. OF MAJOR STREET APPROACH LANES | 1 |
| MINOR STREET NAME | Applegate Lane (west) | | | NO. OF MINOR STREET APPROACH LANES | 1 |
| POSTED SPEED LIMIT MAJOR SREET | 45 MPH | POPULATION < 10,000 | [ ] YES [X] NO | REDUCED WARRANTS BASED UPON | [X] SPEED [ ] POPULATION |
| POSTED SPEED LIMIT MINOR SREET | 35 MPH | | | | |

| TIME | MAJOR STREET TWO WAY VOLUME | MINOR STREET HIGHEST VOLUME APPROACH<br>Are Side Street Rights Included?<br>Yes ☑ No ☐ | Warrant 1 Condition A<br>Minimum Vehicular Volume | | Warrant 1 Condition B<br>Interruption of Continuous Traffic | | Warrant 7 - CRASH EXPERIENCE<br>(Warrant 1 Condition A or B 80% Satisfied) AND<br>(5 or More Correctible Crashes in 12 Month Period)<br>Warrant 1 Condition A - 80% | | Warrant 1 Condition B - 80% | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MAJOR | MINOR | MAJOR | MINOR | MAJOR | MINOR | MAJOR | MINOR |
| | | | 500 (1)<br>600 (2) | 150 (1)<br>200 (2) | 750 (1)<br>900 (2) | 75 (1)<br>100 (2) | 400 (1)<br>480 (2) | 120 (1)<br>160 (2) | 600 (1)<br>720 (2) | 60 (1)<br>80 (2) |
| | | | REDUCED WARRANTS | | | | REDUCED WARRANTS (56% Reduction) | | | |
| | | | 350 (1)<br>420 (2) | 105 (1)<br>140 (2) | 525 (1)<br>630 (2) | 53 (1)<br>70 (2) | 280 (1)<br>336 (2) | 84 (1)<br>112 (2) | 420 (1)<br>504 (2) | 42 (1)<br>56 (2) |
| | | | (1) = ONE LANE APPROACH | | | | (2) = TWO LANE APPROACH | | | |
| 7-8 am | 1,070 | 113 | X | X | X | X | X | X | X | X |
| 8-9 am | 756 | 118 | X | X | X | X | X | X | X | X |
| 9-10 am | 643 | 107 | X | X | X | X | X | X | X | X |
| 10-11 am | 611 | 108 | X | X | X | X | X | X | X | X |
| 11-12 am | 711 | 136 | X | X | X | X | X | X | X | X |
| 12-1 pm | 741 | 152 | X | X | X | X | X | X | X | X |
| 1-2 pm | 885 | 238 | X | X | X | X | X | X | X | X |
| 2-3 pm | 1,064 | 314 | X | X | X | X | X | X | X | X |
| 3-4 pm | 1,010 | 330 | X | X | X | X | X | X | X | X |
| 4-5 pm | 1,188 | 364 | X | X | X | X | X | X | X | X |
| 5-6 pm | 1,195 | 410 | X | X | X | X | X | X | X | X |
| 6-7 pm | 1,052 | 343 | X | X | X | X | X | X | X | X |
| NUMBER OF HOURS | | | 12 | | 12 | | 12 | | 12 | |
| COMPLIANCE | | | YES | | YES | | YES | | | |

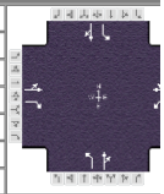
Volumes are the existing count. Speed reduction due to speed study on the next page.

| | | | | | |
|---|---|---|---|---|---|
| Date: | 4/26/2016 | | Start Time: | 3:10 | |
| Name: | DBZ JW | | End Time: | 3:40 | |
| Location: | Smyrna Pkwy | | Weather: | 81° Cloudy | |
| Speed Limit: | 35 mph | | | | |

| | | Car | | Bus | | Truck | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Seconds | mph for 176 | Record | Number | Record | Number | Record | Number | TOTAL | Cummulative | Cummulative % |
| 4.0 | 29.9 | | | | | | 1 | 1 | 1 | 1% |
| 3.9 | 30.7 | | | | | | | 0 | 1 | 1% |
| 3.8 | 31.5 | | | | | | | 0 | 1 | 1% |
| 3.7 | 32.4 | | | | | | | 0 | 1 | 1% |
| 3.6 | 33.3 | | | | | | | 0 | 1 | 1% |
| 3.5 | 34.2 | | | | | | | 0 | 1 | 1% |
| 3.4 | 35.2 | | 1 | | | | | 1 | 2 | 2% |
| 3.3 | 36.3 | | 1 | | | | | 1 | 3 | 3% |
| 3.2 | 37.4 | | 5 | | | | | 5 | 8 | 8% |
| 3.1 | 38.6 | | 8 | | 1 | | | 9 | 17 | 17% |
| 3.0 | 39.9 | | 10 | | | | 1 | 11 | 28 | 28% |
| 2.9 | 41.3 | | 12 | | | | 1 | 13 | 41 | 41% |
| 2.8 | 42.8 | | 10 | | 1 | | | 11 | 52 | 52% |
| 2.7 | 44.3 | | 20 | | 1 | | | 21 | 73 | 73% |
| 2.6 | 46.0 | | 7 | | | | | 7 | 80 | 80% |
| 2.5 | 47.9 | | 7 | | | | | 7 | 87 | 87% |
| 2.4 | 49.9 | | 12 | | | | | 12 | 99 | 99% |
| 2.2 | 54.4 | | 1 | | | | | 1 | 100 | 100% |
| 2.0 | 59.9 | | | | | | | | 100 | 100% |
| | TOTAL | | 94 | | 3 | | 3 | 100 | | |

## HCS 2010 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | CDM Smith | | | Duration, h | 0.25 |
| Analyst | DBZ | Analysis Date | Feb 17, 2016 | Area Type | Other |
| Jurisdiction | | Time Period | AM Peak | PHF | 0.78 |
| Urban Street | Smyrna Pkwy | Analysis Year | 2017 Build | Analysis Period | 1> 7:00 |
| Intersection | Applegate Lane | File Name | AM rt.xus | | |
| Project Description | Crossroads IGA | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 33 | 10 | 81 | 45 | 9 | 5 | 223 | 530 | 46 | 5 | 303 | 2 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 4 | | 8 | 5 | 2 | 1 | 6 |
| Case Number | | 11.0 | | 10.0 | 1.1 | 4.0 | 1.1 | 4.0 |
| Phase Duration, s | | 26.0 | | 14.0 | 18.1 | 72.8 | 7.2 | 61.9 |
| Change Period, ( $Y+R_c$ ), s | | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

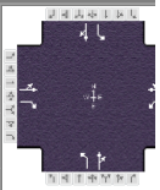
| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Adjusted Flow Rate ( *v* ), veh/h | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Queue Service Time ( $g_s$ ), s | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Green Ratio ( *g/C* ) | | 0.17 | 0.27 | 0.07 | 0.07 | | 0.58 | 0.56 | | 0.48 | 0.47 | |
| Capacity ( *c* ), veh/h | | 296 | 430 | 117 | 116 | | 529 | 1013 | | 245 | 849 | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.186 | 0.241 | 0.493 | 0.155 | | 0.541 | 0.729 | | 0.026 | 0.494 | |
| Available Capacity ( $c_a$ ), veh/h | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 1.4 | 2.8 | 1.7 | 0.5 | | 0.0 | 13.0 | | 0.0 | 5.6 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.18 | 0.06 | 0.44 | 0.13 | | 0.48 | 0.81 | | 0.02 | 0.43 | |
| Uniform Delay ( $d_1$ ), s/veh | | 43.0 | 34.4 | 54.0 | 52.8 | | 15.1 | 19.8 | | 19.7 | 22.2 | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.1 | 0.1 | 1.2 | 0.2 | | 0.3 | 4.6 | | 0.0 | 2.1 | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | | 43.1 | 44.9 | 55.2 | 53.0 | | 0.0 | 17.9 | | 0.0 | 12.4 | |
| Level of Service (LOS) | | | | | | | | | | | | |
| Approach Delay, s/veh / LOS | 37.5 | D | | 54.7 | D | | 21.9 | C | | 24.2 | C | |
| Intersection Delay, s/veh / LOS | 25.4 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.3 | B | 2.3 | B | 2.2 | B | 2.2 | B |
| Bicycle LOS Score / LOS | 0.7 | A | 0.6 | A | 2.2 | B | 1.2 | A |

 HCS 2010™ Streets Version 6.70 Generated: 5/2/2016 2:53:38 PM

## HCS 2010 Signalized Intersection Results Summary

| General Information | | | | Intersection Information | |
|---|---|---|---|---|---|
| Agency | CDM Smith | | | Duration, h | 0.25 |
| Analyst | DBZ | Analysis Date | Mar 17, 2016 | Area Type | Other |
| Jurisdiction | | Time Period | PM Peak | PHF | 0.98 |
| Urban Street | Smyrna Pkwy | Analysis Year | 2017 Build | Analysis Period | 1> 5:00 |
| Intersection | Applegate Lane | File Name | PM w rt lane pleft.xus | | |
| Project Description | Crossroads IGA | | | | |



| Demand Information | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Demand ( *v* ), veh/h | 25 | 13 | 388 | 64 | 13 | 7 | 230 | 439 | 63 | 7 | 506 | 3 |

| Signal Information | | | |
|---|---|---|---|
| Cycle, s | 120.0 | Reference Phase | 2 |
| Offset, s | 0 | Reference Point | End |
| Uncoordinated | No | Simult. Gap E/W | On |
| Force Mode | Fixed | Simult. Gap N/S | On |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Green | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Yellow | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Red | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

| Timer Results | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Assigned Phase | | 4 | | 8 | 5 | 2 | 1 | 6 |
| Case Number | | 11.0 | | 10.0 | 1.1 | 4.0 | 1.1 | 4.0 |
| Phase Duration, s | | 32.6 | | 13.5 | 17.0 | 61.8 | 12.0 | 56.8 |
| Change Period, ( $Y+R_c$ ), s | | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Max Allow Headway ( *MAH* ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Queue Clearance Time ( $g_s$ ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Green Extension Time ( $g_e$ ), s | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Phase Call Probability | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Out Probability | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| Movement Group Results | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approach Movement | L | T | R | L | T | R | L | T | R | L | T | R |
| Assigned Movement | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Adjusted Flow Rate ( *v* ), veh/h | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Adjusted Saturation Flow Rate ( *s* ), veh/h/ln | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Queue Service Time ( $g_s$ ), s | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Cycle Queue Clearance Time ( $g_c$ ), s | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Green Ratio ( *g/C* ) | | 0.22 | 0.31 | 0.06 | 0.06 | | 0.52 | 0.47 | | 0.47 | 0.42 | |
| Capacity ( *c* ), veh/h | | 396 | 505 | 110 | 109 | | 370 | 839 | | 355 | 773 | |
| Volume-to-Capacity Ratio ( *X* ) | | 0.098 | 0.724 | 0.592 | 0.187 | | 0.634 | 0.610 | | 0.020 | 0.709 | |
| Available Capacity ( $c_a$ ), veh/h | | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Back of Queue ( *Q* ), veh/ln ( 50 th percentile) | | 0.9 | 9.8 | 2.0 | 0.6 | | 3.6 | 11.3 | | 0.1 | 13.8 | |
| Queue Storage Ratio ( *RQ* ) ( 50 th percentile) | | 0.12 | 0.24 | 0.50 | 0.15 | | 0.46 | 0.58 | | 0.01 | 0.71 | |
| Uniform Delay ( $d_1$ ), s/veh | | 37.1 | 36.6 | 54.7 | 53.3 | | 21.1 | 24.0 | | 18.8 | 28.5 | |
| Incremental Delay ( $d_2$ ), s/veh | | 0.0 | 3.2 | 1.9 | 0.3 | | 1.4 | 3.3 | | 0.0 | 5.4 | |
| Initial Queue Delay ( $d_3$ ), s/veh | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Control Delay ( *d* ), s/veh | | 37.2 | 39.8 | 56.6 | 53.6 | | 22.6 | 27.3 | | 18.8 | 33.9 | |
| Level of Service (LOS) | | D | D | E | D | | C | C | | B | C | |
| Approach Delay, s/veh / LOS | 39.5 | D | | 55.9 | E | | 25.8 | C | | 33.7 | C | |
| Intersection Delay, s/veh / LOS | 32.8 | | | | | | C | | | | | |

| Multimodal Results | EB | | WB | | NB | | SB | |
|---|---|---|---|---|---|---|---|---|
| Pedestrian LOS Score / LOS | 2.3 | B | 2.3 | B | 2.3 | B | 2.3 | B |
| Bicycle LOS Score / LOS | 1.2 | A | 0.6 | A | 1.7 | A | 1.4 | A |

 HCS 2010™ Streets Version 6.70 Generated: 5/2/2016 2:48:01 PM