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Transportation Group, LLC
Traffic Engineering and Planning

Traffic Impact Study

Colletta Park Residential Development
Highway 96E and S. Carothers Road
Franklin, TN

Prepared October 2017
For Land Solutions Company

FTG, LLC
P.O. Box 682736
Franklin, TN 37068
(615) 771-8022 phone
Gillian@FTGtraffic.com

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PREPARED FOR:
Land Solutions, LLC
2925 Berry Hill Rd
Nashville, TN 37204

PREPARED BY:
Ms. Gillian L. Fischbach, P.E., PTOE
Fischbach Transportation Group (FTG, LLC)
P.O. Box 682736
Franklin, TN 37068
Phone: (615) 771-8022
FTG Project Number: 10647

Table of Contents

1. INTRODUCTION

This traffic study has been prepared in order to identify the traffic impacts of a single-family residential development that is proposed to be constructed between Highway 96E and S. Carothers Road in Franklin, Tennessee.

For the purposes of this study, existing and background traffic volumes were established, and capacity analyses were conducted for these conditions. Also, trip generation calculations were performed, and the trips which are expected to be generated by the proposed project were distributed to the roadway system and added to the background traffic volumes. The roadways and intersections which provide access to the site were then re-evaluated to determine the traffic impacts of the proposed project. Access needs for the project were evaluated, and the necessary roadway and/or traffic control improvements were identified. This report presents the results of these analyses and the subsequent recommendations.

2. PROJECT DESCRIPTION

The location of the proposed project is shown in Figure 1. As shown, the project site is located between Highway 96E and S. Carothers Road in Franklin, Tennessee. The current project site plan is shown in Figure 2. As shown, project site includes 199 single-family homes. Access for the proposed project will be provided at one location on S. Carothers Road. Also, emergency-only access will be provided by at Stanford Drive.

In large part, economic and market considerations will dictate the pace and timing with which the proposed project is actually completed. For the purposes of this study, it was assumed that the proposed project will be completed by Year 2020.

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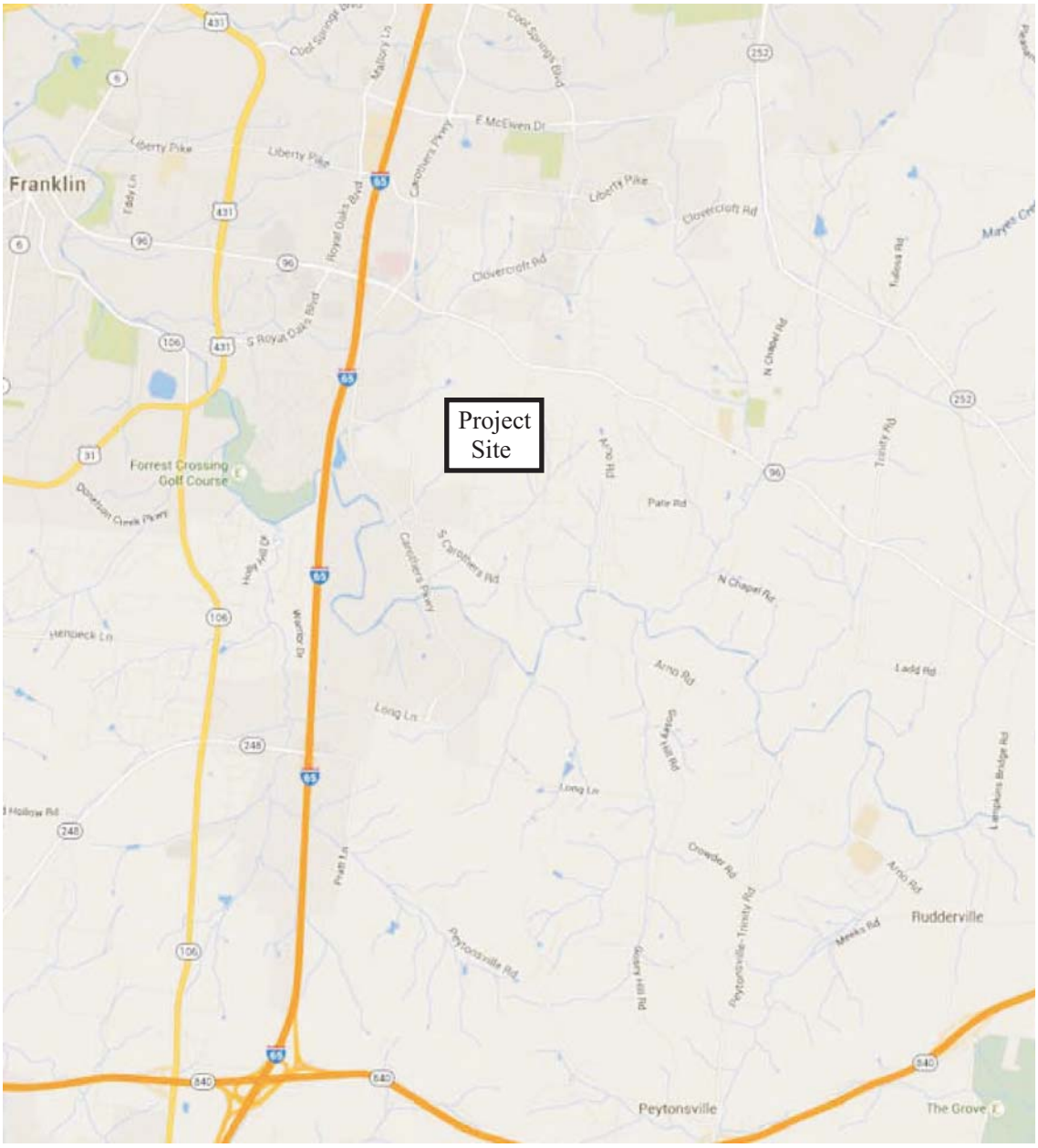

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Figure 1.
Location of the Project Site


MURFREESBORO ROAD - MAJOR ARTERIAL
RIDGEWAY DRIVE - LOCAL
RIDGEWAY DRIVE - LOCAL
CROSS CREEK DRIVE - LOCAL
BEACON HILL CT - LOCAL
HOLLOW COURT - LOCAL
EXISTING BEACON HILL DRIVE
EXISTING STANFORD DRIVE
PROPOSED STANFORD DRIVE - 50' ROW
VANTAGE WAY - LOCAL
CROSS CREEK DRIVE - LOCAL
LOCAL ROAD A - LOCAL - 50' ROW
PROPOSED STANFORD DRIVE - 50' ROW
WARREN ROAD - LOCAL
WARREN ROAD - LOCAL
WARREN COURT - LOCAL
CROSS CREEK DRIVE - LOCAL
BILTMORE COURT - LOCAL - 50' ROW
LOCAL ROAD A - LOCAL - 50' ROW
LOCAL ROAD A - LOCAL - 50' ROW
LOCAL ROAD B - LOCAL - 50' ROW
LOCAL ROAD B - LOCAL - 50' ROW
LOCAL ROAD C - LOCAL - 50' ROW
LOCAL ROAD H - LOCAL - 50' ROW
LOCAL ROAD E - LOCAL - 50' ROW
LOCAL ROAD F - LOCAL - 50' ROW
LOCAL ROAD H - LOCAL - 50' ROW
LOCAL ROAD A - LOCAL - 50' ROW
LOCAL ROAD G - LOCAL - 50' ROW
LOCAL ROAD I - LOCAL - 50' ROW
LOCAL ROAD H - LOCAL - 50' ROW
LOCAL ROAD J - LOCAL - 50' ROW
LOCAL ROAD J - LOCAL - 50' ROW
SOUTH CAROTHERS ROAD - MAJOR ARTERIAL - 50' ROW
WARREN ROAD - LOCAL
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199

3. EXISTING CONDITIONS

3.1 PEAK HOUR TRAFFIC VOLUMES

In order to provide data for the traffic impact analysis, peak hour traffic volumes were counted at the following locations:

1. Highway 96E and Carothers Parkway
2. Highway 96E and Clovercroft Road
3. Highway 96E and Cross Creek Drive
4. Highway 96E and Ridgeway Drive / Chester Stevens Road
5. Highway 96E and Arno Road
6. Carothers Parkway and S. Carothers Road
7. S. Carothers Road in the vicinity of the project site.

This data was collected during the morning and afternoon peak hours on typical weekdays in May 2017 when schools were in session. The raw traffic volumes are included in Appendix A. The existing laneage at the intersections within the study area is shown in Figure 3, and the existing peak hour traffic volumes are shown in Figure 4.

Using the existing peak hour traffic volumes shown in Figure 4, capacity analyses were conducted for the intersections counted. Specifically, in order to identify current peak hour levels of operation within the study area, the capacity calculations were performed according to the methods outlined in the Highway Capacity Manual 2010 (HCM2010). These analyses result in the determination of a Level of Service (LOS), which is a measure of evaluation is used to describe how well an intersection or roadway operates. LOS A represents free flow traffic operations, and LOS F suggests that the traffic demand exceeds the available capacity. In an urbanized area, LOS D is typically considered to be the minimum acceptable LOS. Table 1 presents the descriptions of LOS for signalized intersections, and Table 2 presents the descriptions of LOS for unsignalized intersections.

The results of the capacity analyses for the existing peak hour traffic volumes are shown in Table 3, and Appendix B includes the capacity analyses worksheets. These analyses indicate that signalized intersections within the study area currently operate at LOS C or better during both peak hours.

At the unsignalized intersections with Cross Creek Drive and Ridgeway Drive / Chester Stevens Road, most of the critical turning movements operate at acceptable LOS during both peak hours. Because of the significant traffic volumes on Highway 96E, the turning movements from the side streets operate at poor LOS during one or both peak hours, although the northbound and southbound vehicle queues are relatively short.

At the unsignalized intersection of Carothers Parkway and S. Carothers Road, all of the critical turning movements operate at acceptable LOS during both peak hours.

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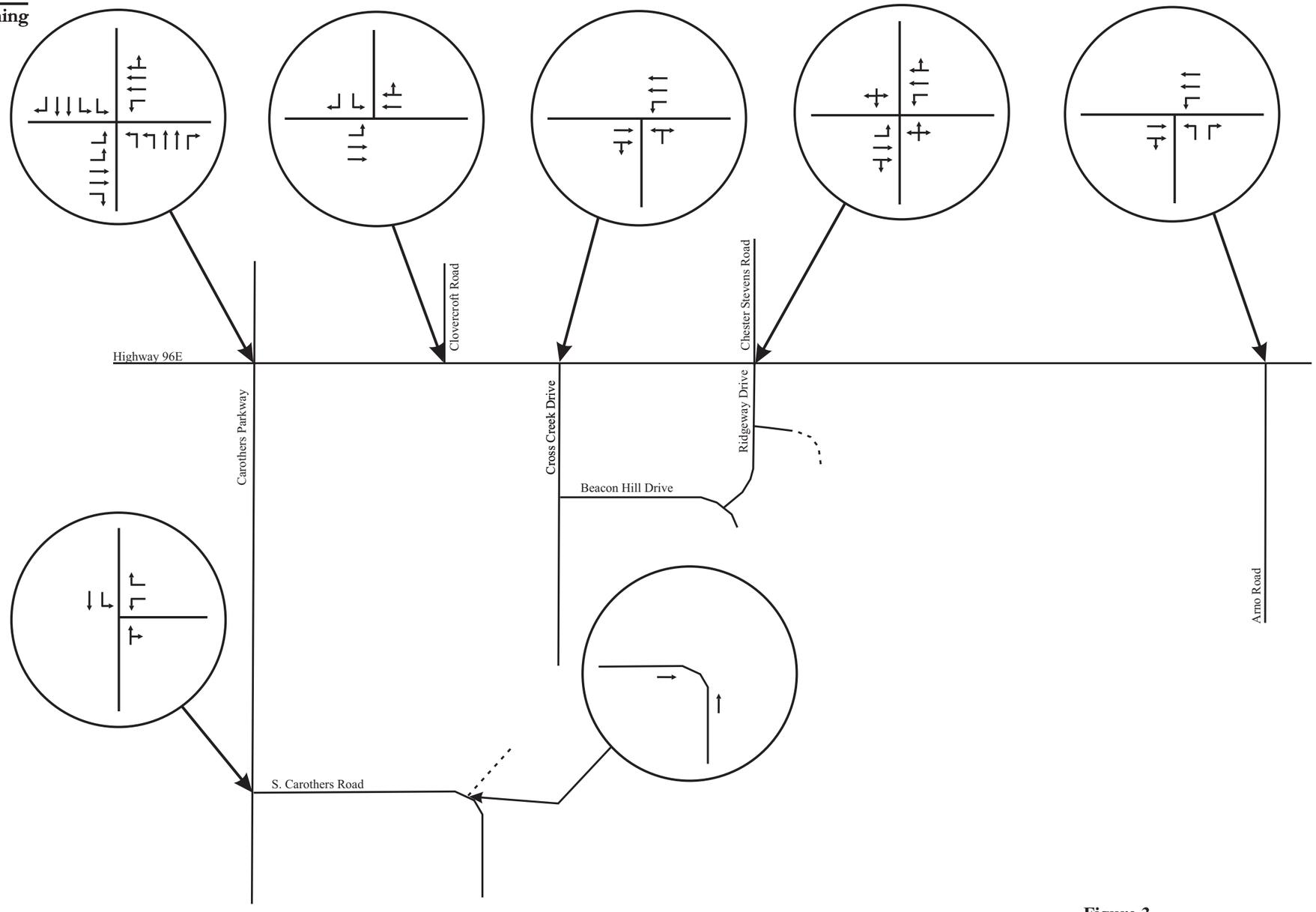

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Figure 3.
Existing Laneage within the Study Area

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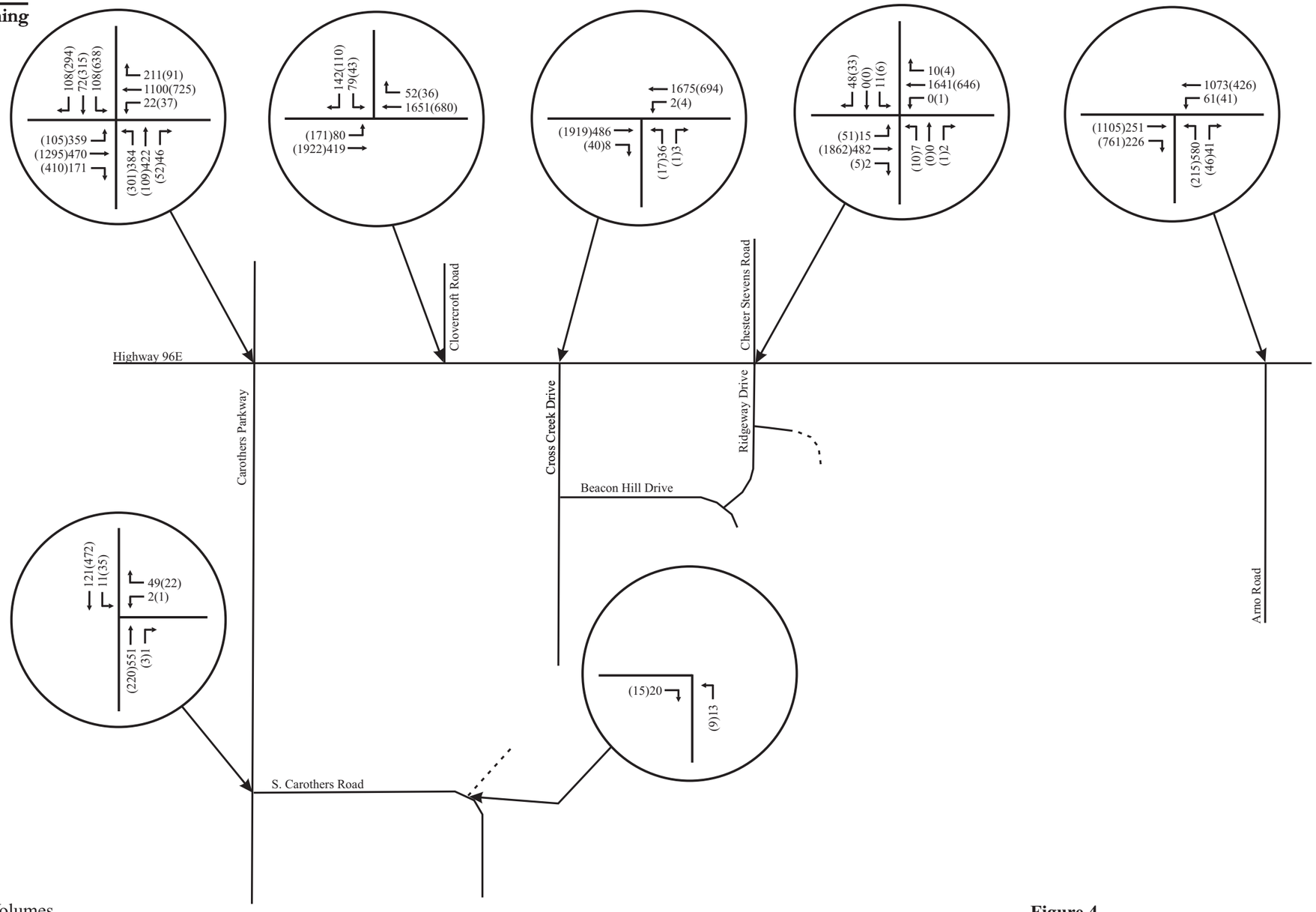

No Scale

N

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 4.
Existing Peak Hour Traffic Volumes (June 2017)

TABLE 1. DESCRIPTIONS OF LOS FOR SIGNALIZED INTERSECTIONS

Level of Service	Description	Average Control Delay per Vehicle (sec)
A	Operations with very low control delay. Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10
B	Operations with stable flows. This generally occurs with good progression, short cycle lengths, or both. More vehicles stop than for LOS A, causing higher levels of average delay.	> 10 and ≤ 20
C	Operations with stable flow. Occurs with fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	> 20 and ≤ 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop.	> 35 and ≤ 55
E	Unstable flow. In many cases, this is considered to be the limit for acceptable delay. These high delays generally indicate poor progression, long cycle lengths, and high v/c ratios.	> 55 and ≤ 80
F	Unacceptable delay. This condition often occurs with oversaturation or with high v/c ratios. Poor progression and long cycle lengths may also cause such delay levels.	> 80

Source: Highway Capacity Manual 2010 (HCM2010)

TABLE 2. DESCRIPTIONS OF LOS FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Description	Average Control Delay (sec/veh)
A	Minimal delay	≤ 10
B	Brief delay	> 10 and ≤ 15
C	Average delay	> 15 and ≤ 25
D	Significant delay	> 25 and ≤ 35
E	Long delay	> 35 and ≤ 50
F	Extreme delay	> 50

Source: Highway Capacity Manual 2010 (HCM 2010)

TABLE 3. EXISTING PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		LEVEL OF SERVICE	95TH %-ILE QUEUE	LEVEL OF SERVICE	95TH %-ILE QUEUE
Highway 96E and Carothers Parkway (signalized)	Eastbound Left Turns	LOS F	150 feet	LOS B	23 feet
	Eastbound Thrus	LOS A	73 feet	LOS C	317 feet
	Eastbound Right Turns	LOS A	25 feet	LOS A	64 feet
	Westbound Left Turns	LOS A	9 feet	LOS B	18 feet
	Westbound Thru/Right Turns	LOS A	187 feet	LOS A	67 feet
	Northbound Left Turns	LOS B	77 feet	LOS B	64 feet
	Northbound Thrus	LOS B	79 feet	LOS B	24 feet
	Northbound Right Turns	LOS A	16 feet	LOS A	22 feet
	Southbound Left Turns	LOS B	25 feet	LOS C	165 feet
	Southbound Thrus	LOS B	17 feet	LOS B	59 feet
	Southbound Right Turns	LOS A	43 feet	LOS B	100 feet
	Overall Intersection	**LOS C**		**LOS B**	
Highway 96E and Clovercroft Road (signalized)	Eastbound Left Turns	LOS F	156 feet	LOS A	34 feet
	Eastbound Thrus	LOS A	78 feet	LOS A	351 feet
	Westbound Thrus/Right Turns	LOS B	390 feet	LOS A	41 feet
	Southbound Left Turn Lane	LOS D	92 feet	LOS D	64 feet
	Southbound Right Turn Lane	LOS C	129 feet	LOS B	52 feet
	Overall Intersection	**LOS B**		**LOS A**	

Highway 96E and Cross Creek Drive (unsignalized)	Westbound Left Turn Lane	LOS A	0 veh	LOS C	0 veh
	Northbound Left / Right Turn Lane	LOS D	1 veh	LOS F	1 veh
Highway 96E and Ridgeway Drive / Chester Stevens Drive (unsignalized)	Eastbound Left Turn Lane	LOS C	1 veh	LOS A	1 veh
	Westbound Left Turn Lane	LOS A	0 veh	LOS C	0 veh
	Northbound Lane	LOS C	1 veh	LOS F	1 veh
	Southbound Lane	LOS E	2 veh	LOS B	1 veh
Highway 96E and Arno Road (signalized)	Eastbound Thrus / Right Turns	LOS A	95 feet	LOS A	263 feet
	Westbound Left Turns	LOS B	57 feet	LOS D	83 veh
	Westbound Thrus	LOS C	420 feet	LOS A	65 veh
	Northbound Left Turns	LOS C	441 feet	LOS D	217 veh
	Northbound Right Turns	LOS A	18 feet	LOS B	30 veh
	Overall Intersection	**LOS C**		**LOS B**	
Carothers Parkway and S. Carothers Road (unsignalized)	Southbound Left Turns	LOS A	0 veh	LOS A	1 veh
	Westbound Left Turns	LOS B	0 veh	LOS C	0 veh
	Westbound Right Turns	LOS B	1 veh	LOS A	1 veh

3.2 TRAFFIC SIGNAL WARRANT ANALYSES

For the purposes of this study, traffic signal warrant analyses were conducted for the intersection of Carothers Parkway and S. Carothers Road. For these analyses, hourly turning movement counts were collected at this intersection in May 2017 when schools were in session. The raw traffic volumes are included in Appendix A, and the hourly traffic volumes are shown in Table 4.

The Federal Highway Administration has published the Manual on Uniform Traffic Control Devices (MUTCD 2010), which includes traffic signal warrants that help traffic engineering professionals to identify when a traffic signal installation is justified at a particular location. The warrants include minimum conditions that are compared to existing or projected traffic conditions, and typically, traffic signals should not be installed unless at least one of the MUTCD warrants, as described in Appendix C, is met.

The Manual on Uniform Traffic Control Devices (MUTCD 2010) stipulates that the signal warrant thresholds may be reduced by 30% "…if the posted or statutory speed limit or the 85th percentile speed on the major street exceeds 40 mph…" Since a 40 mph speed limit is currently posted on Carothers Parkway, full traffic signal warrant thresholds were considered appropriate for the intersection of Carothers Parkway and S. Carothers Road.

The hourly traffic volumes at the intersections were compared to the signal warrant thresholds, and the results of these analyses are included in Table 4. These results indicate that the existing traffic volumes do not satisfy any of the volume-related traffic signal warrants for the intersection of Carothers Parkway and S. Carothers Road.

TABLE 4. TRAFFIC SIGNAL WARRANT ANALYSIS
INTERSECTION OF CAROTHERS PARKWAY AND S. CAROTHERS ROAD

HOUR	TOTAL VEHICLES BOTH DIRECTIONS OF CAROTHERS PARKWAY	WESTBOUND VEHICLES ON S. CAROTHERS ROAD	SATISFY FULL WARRANTS?		
			Warrant 1 Condition A	Warrant 1 Condition B	Warrant 2
6:00 - 7:00 AM	340	31	---	---	---
7:00 - 8:00 AM	655	48	---	---	---
8:00 - 9:00 AM	546	50	---	---	---
9:00 - 10:00 AM	368	21	---	---	---
10:00 - 11:00 AM	343	19	---	---	---
11:00 - 12:00 N	421	28	---	---	---
12:00 - 1:00 PM	460	31	---	---	---
1:00 - 2:00 PM	463	34	---	---	---
2:00 - 3:00 PM	426	28	---	---	---
3:00 - 4:00 PM	480	25	---	---	---
4:00 - 5:00 PM	576	16	---	---	---
5:00 - 6:00 PM	730	23	---	---	---
6:00 - 7:00 PM	559	29	---	---	---

4. PROJECTION OF BACKGROUND TRAFFIC VOLUMES

In order to account for the traffic growth which will occur within the study area because of typical growth, as well as other approved developments, Year 2020 background traffic volumes were established for the intersections within the study area.

Specifically, in order to account for typical growth within the study area, consideration was given to the historical traffic volumes near the project site. The Tennessee Department of Transportation (TDOT) conducts an annual count program throughout the state. This count program includes the annual collection of average daily traffic (ADT) counts at numerous fixed locations. As shown in Table 5, the daily traffic volumes within the study area have increased steadily since 2007. Based on this information, for the purposes of this study, the existing traffic volumes at the following intersections were increased by 10% to represent initial Year 2020 background traffic volumes, as shown in Figure 5A:

1. Highway 96E and Carothers Parkway
2. Highway 96E and Clovercroft Road
3. Highway 96E and Cross Creek Drive
4. Highway 96E and Ridgeway Drive / Chester Stevens Road
5. Highway 96E and Arno Road

TABLE 5. HISTORICAL TRAFFIC VOLUMES IN THE STUDY AREA

Year	Station 40 Highway 96E ADT	Annual Growth	
2009	19,501		
2010	22,312	14.41%	Overall Growth
2011	23,459	5.14%	
2012	23,343	-0.49%	
2013	23,968	2.68%	
2014	25,865	7.91%	
2015	27,728	7.20%	7.03%
Year	**Station 41 Clovercroft Rd ADT**	**Annual Growth**	
2009	2,554		
2010	2,891	13.19%	Overall Growth
2011	3,092	6.95%	
2012	3,155	2.04%	
2013	3,151	-0.13%	
2014	3,345	6.16%	
2015	3,529	5.50%	6.36%

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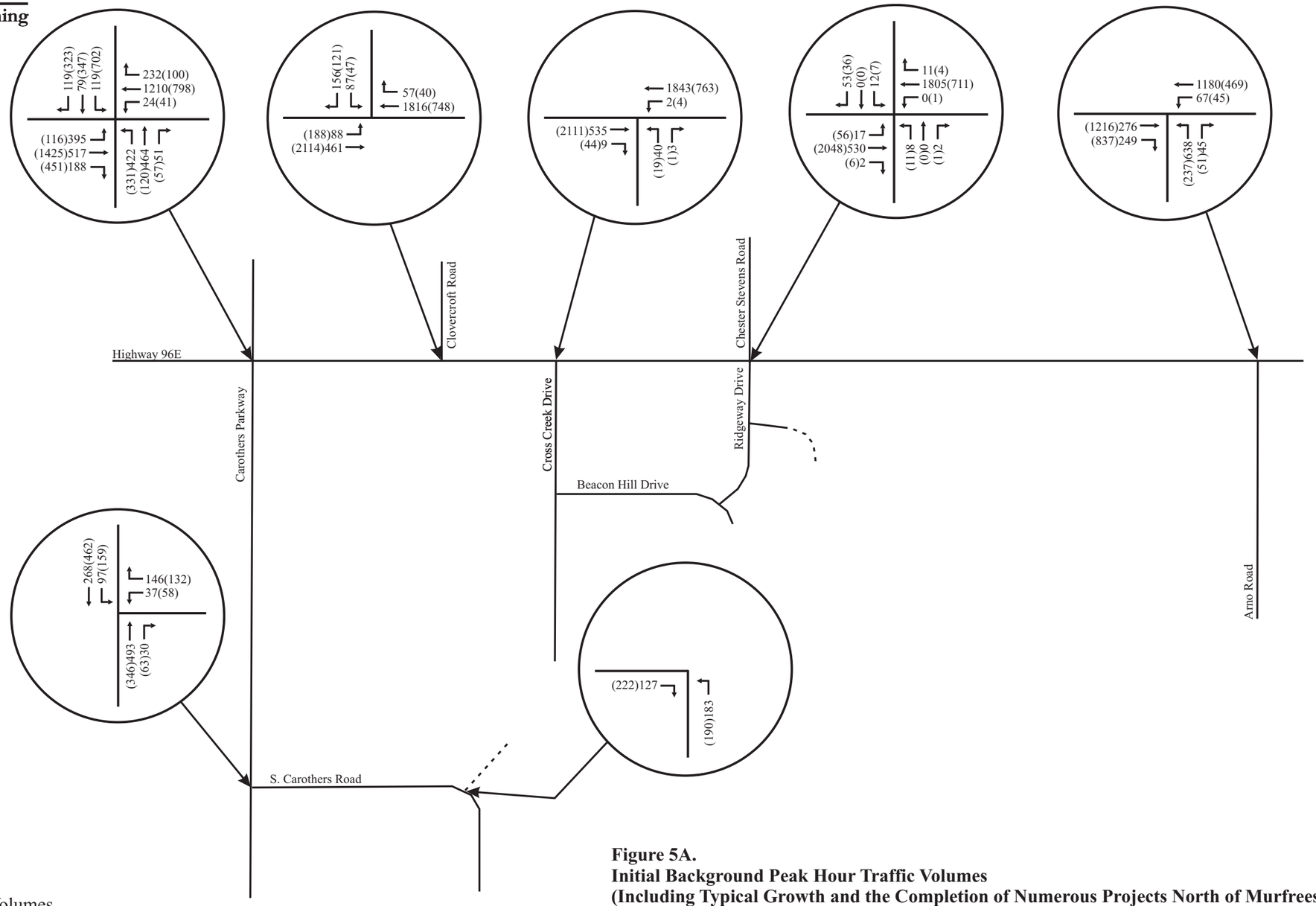

No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 5A.
Initial Background Peak Hour Traffic Volumes
(Including Typical Growth and the Completion of Numerous Projects North of Murfreesboro Road, as well as Nichols Bend/Lockwood Glen and Simmon's Ridge, south of Murfreesboro Road)

Also, it is important to note that background traffic volumes for the intersection of Carothers Parkway and S. Carothers Road were identified from the Traffic Impact Study that was prepared for the Simmons Ridge project in July 2012 by Fischbach Transportation Group (FTG, LLC). These traffic volumes are shown in Figure 5A.

In addition, it is important to note that the following other projects are under construction within the study area:

1. Echelon Residential Development, located on the east side of Carothers Parkway, south of S. Carothers Road

2. Water's Edge Residential Development, located on the west side of Carothers Parkway, south of S. Carothers Road

3. October Woods Residential Development, located on the south side of Highway 96E and the west side of Ridgeway Drive

4. Silver Grace Assisted Living Facility, which is located on the north side of Highway 96E, east of Chester Stevens Road.

Figures 5B, 5C, 5D, and 5E include the peak hour traffic volumes that are expected to be generated by these other residential projects. Information about these other projects is included in Appendix D.

The peak hour traffic volumes shown in Figures 5B, 5C, 5D, and 5E were added to the traffic volumes shown in Figure 5A in order to establish the final background traffic volumes shown in Figure 5F. Using the final background peak hour traffic volumes, capacity analyses were conducted for the intersections within the study area. For these analyses, it was assumed that all existing laneage and traffic control will be maintained and no improvements will be provided.

The results of the capacity analyses for the background peak hour traffic volumes are shown in Table 6, and Appendix B includes the capacity analyses worksheets. These analyses indicate that signalized intersections within the study area will continue to operate at LOS C or better during both peak hours.

At the unsignalized intersections with Cross Creek Drive and Ridgeway Drive / Chester Stevens Road, most of the critical turning movements will continue to operate at acceptable LOS during both peak hours. Because of the significant traffic volumes on Highway 96E, the turning movements from the side streets will continue to operate at poor LOS during one or both peak hours, although the northbound and southbound vehicle queues will remain relatively short.

At the unsignalized intersection of Carothers Parkway and S. Carothers Road, most of the critical turning movements will operate at acceptable LOS during both peak hours. Although the westbound left turns are expected to operate at poor LOS, the vehicle queues will be low during both peak hours.

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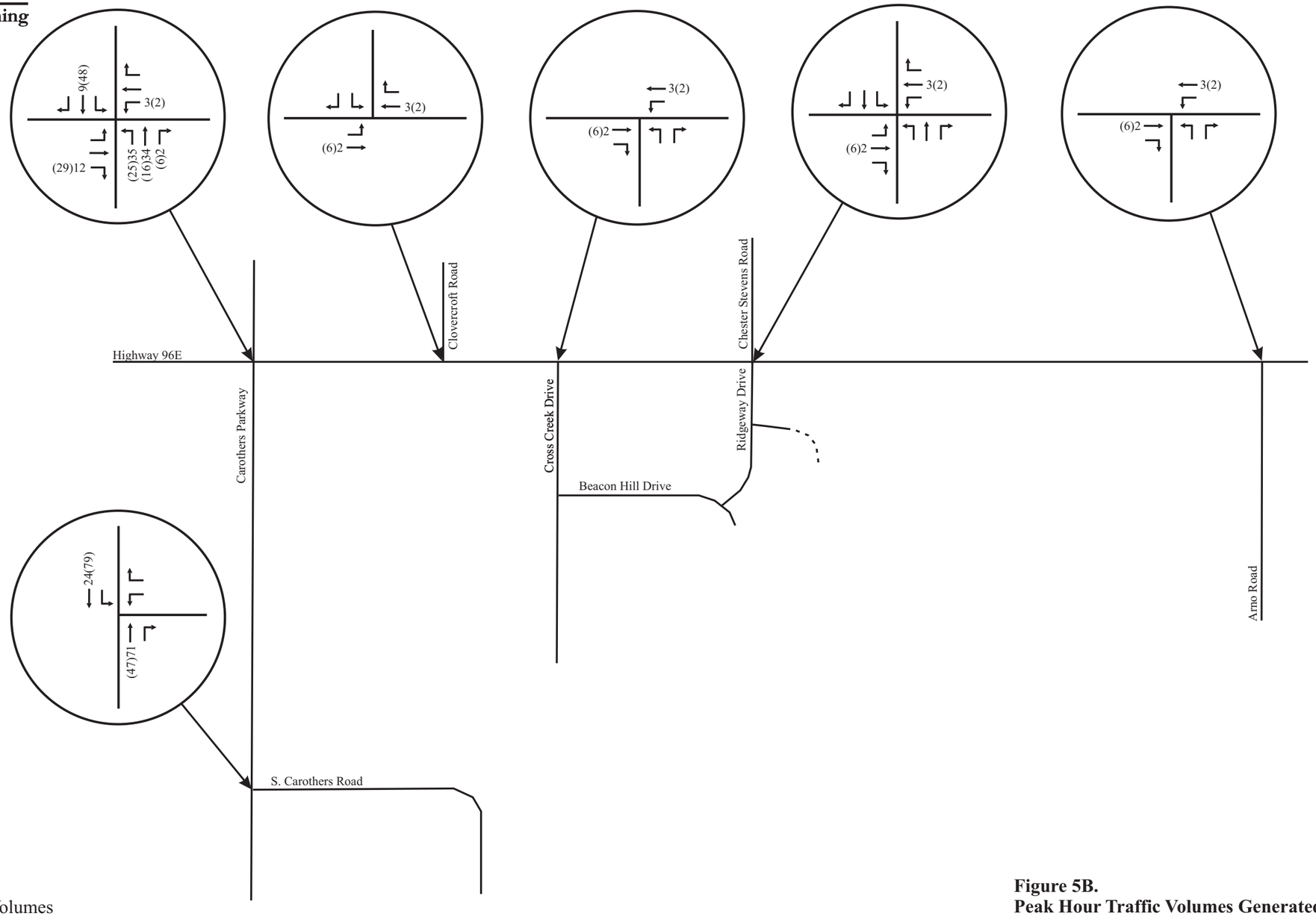

No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 5B.
Peak Hour Traffic Volumes Generated by the Echelon Residential Development

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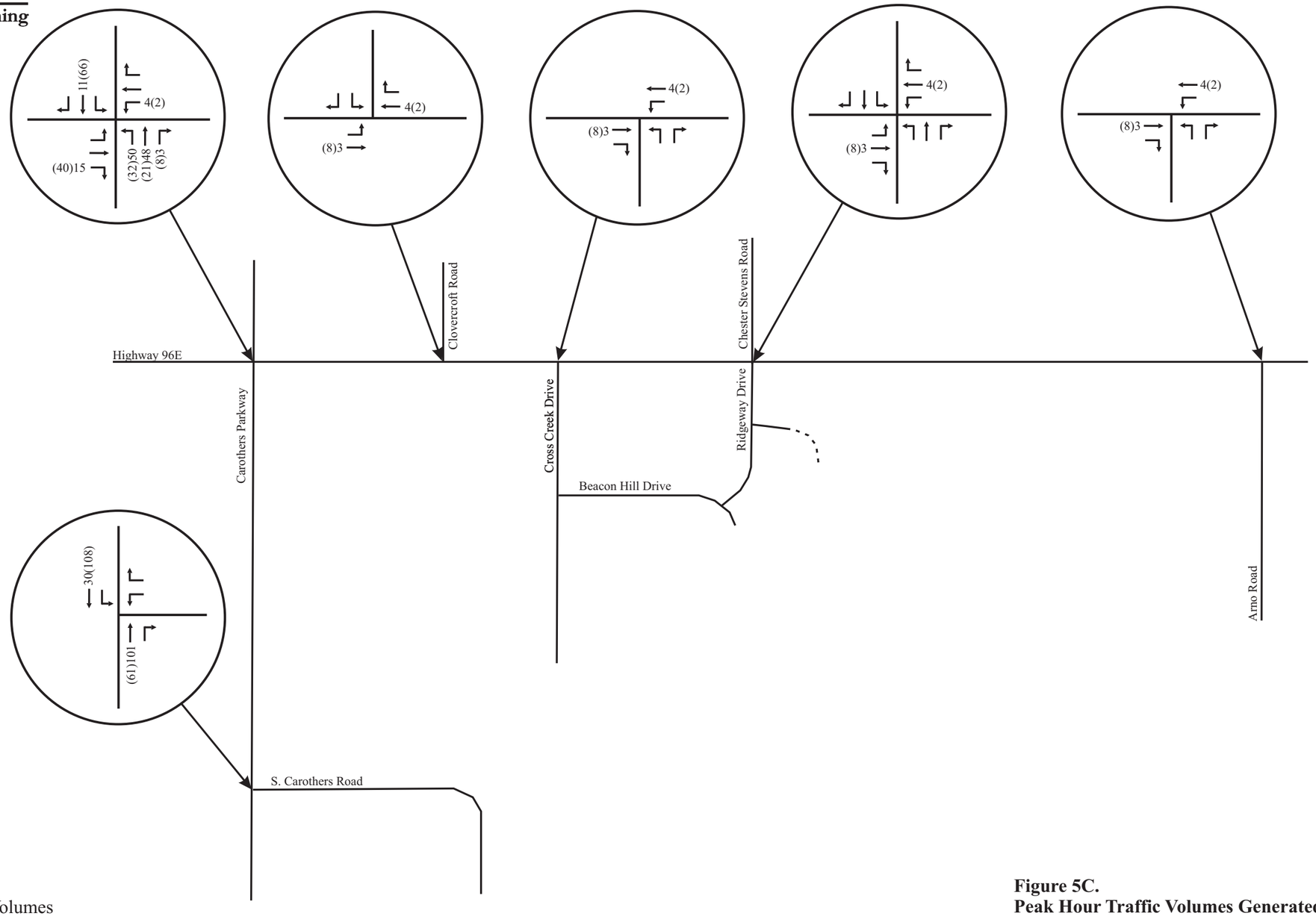

Figure 5C.
Peak Hour Traffic Volumes Generated by the Water's Edge Residential Development

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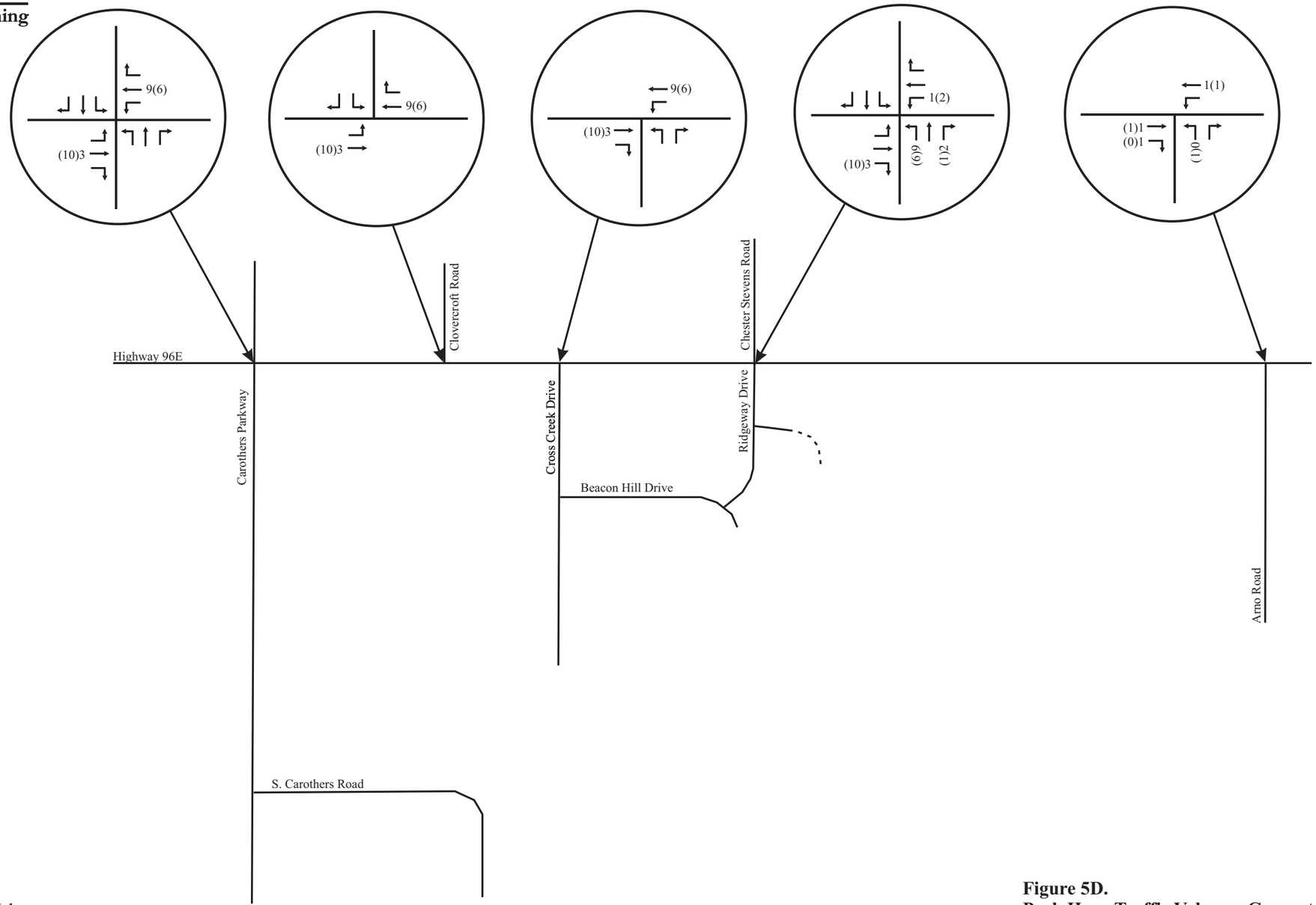

No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 5D.
Peak Hour Traffic Volumes Generated by the October Woods Residential Development

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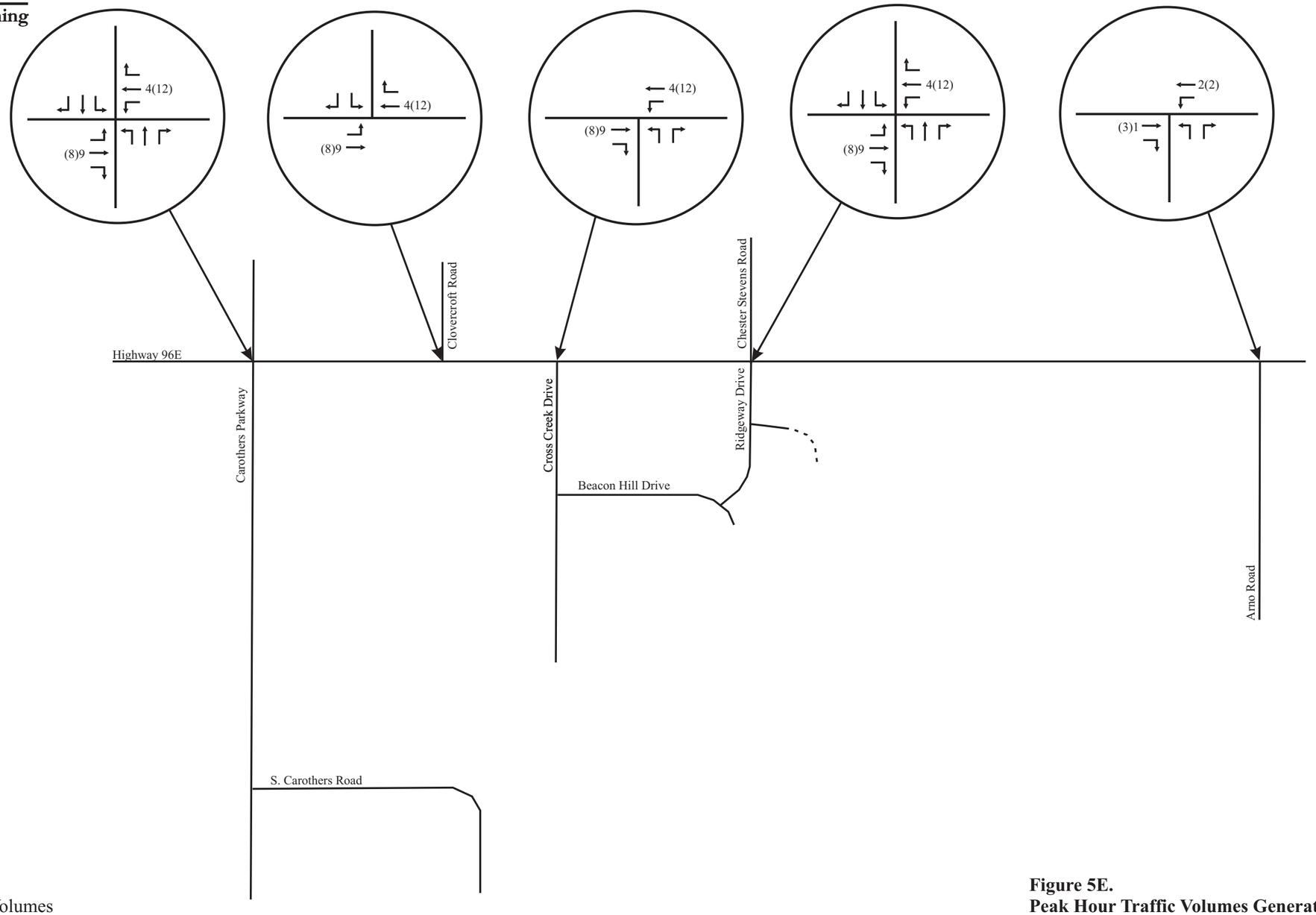

No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 5E.
Peak Hour Traffic Volumes Generated by the Silver Grace Assisted Living Development

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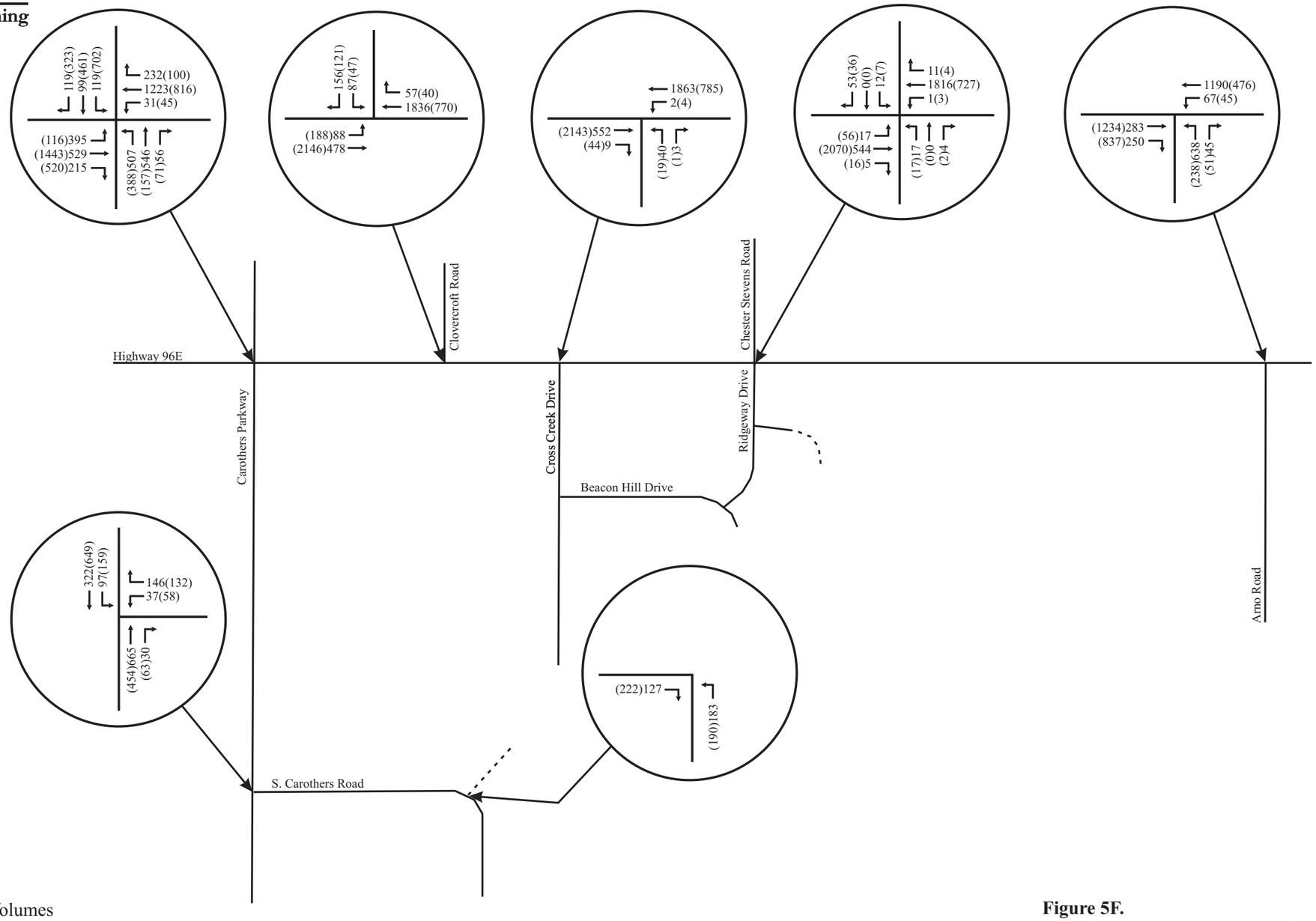

No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 5F.
Final Background Peak Hour Traffic Volumes

TABLE 6. BACKGROUND PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		LEVEL OF SERVICE	95TH %-ILE QUEUE	LEVEL OF SERVICE	95TH %-ILE QUEUE
Highway 96E and Carothers Parkway (signalized)	Eastbound Left Turns	LOS F	146 feet	LOS C	27 feet
	Eastbound Thrus	LOS B	84 feet	LOS D	536 feet
	Eastbound Right Turns	LOS A	30 feet	LOS B	159 feet
	Westbound Left Turns	LOS A	10 feet	LOS F	23 feet
	Westbound Thru/Right Turns	LOS B	185 feet	LOS B	142 feet
	Northbound Left Turns	LOS B	89 feet	LOS C	115 feet
	Northbound Thrus	LOS B	86 feet	LOS B	36 feet
	Northbound Right Turns	LOS A	15 feet	LOS B	25 feet
	Southbound Left Turns	LOS B	24 feet	LOS C	223 feet
	Southbound Thrus	LOS A	19 feet	LOS C	116 feet
	Southbound Right Turns	LOS A	39 feet	LOS B	123 feet
	Overall Intersection	**LOS C**		**LOS C**	
Highway 96E and Clovercroft Road (signalized)	Eastbound Left Turns	LOS F	171 feet	LOS A	27 feet
	Eastbound Thrus	LOS A	31 feet	LOS A	227 feet
	Westbound Thrus/Right Turns	LOS A	248 feet	LOS A	49 feet
	Southbound Left Turn Lane	LOS D	88 feet	LOS D	72 feet
	Southbound Right Turn Lane	LOS D	137 feet	LOS B	57 feet
	Overall Intersection	**LOS B**		**LOS A**	

Highway 96E and Cross Creek Drive (unsignalized)	Westbound Left Turn Lane	LOS A	0 veh	LOS C	1 veh
	Northbound Left / Right Turn Lane	LOS D	1 veh	LOS F	2 veh
Highway 96E and Ridgeway Drive / Chester Stevens Drive (unsignalized)	Eastbound Left Turn Lane	LOS C	1 veh	LOS A	1 veh
	Westbound Left Turn Lane	LOS A	0 veh	LOS C	0 veh
	Northbound Lane	LOS D	1 veh	LOS F	2 veh
	Southbound Lane	LOS F	2 veh	LOS C	1 veh
Highway 96E and Arno Road (signalized)	Eastbound Thrus / Right Turns	LOS B	96 feet	LOS B	231 feet
	Westbound Left Turns	LOS C	60 feet	LOS E	56 veh
	Westbound Thrus	LOS C	456 feet	LOS A	78 veh
	Northbound Left Turns	LOS C	498 feet	LOS D	261 veh
	Northbound Right Turns	LOS A	18 feet	LOS B	34 veh
	Overall Intersection	**LOS C**		**LOS B**	
Carothers Parkway and S. Carothers Road (unsignalized)	Southbound Left Turns	LOS A	1 veh	LOS A	1 veh
	Westbound Left Turns	LOS D	1 veh	LOS F	3 veh
	Westbound Right Turns	LOS C	2 veh	LOS B	1 veh

5. IMPACTS OF PROPOSED DEVELOPMENT

5.1 TRIP GENERATION

Trip generation calculations were conducted in order to identify how much traffic will be generated by the proposed project. Trip generation data for daily and peak hour trips were identified from Trip Generation, Ninth Edition, which was published by the Institute of Transportation Engineers (ITE) in 2012. Table 7 presents the daily and peak hour trip generations for the proposed homes, and these calculations are included in Appendix E.

TABLE 7. TRIP GENERATION

LAND USE	SIZE	DAILY TRAFFIC	GENERATED TRAFFIC			
			AM PEAK HOUR		PM PEAK HOUR	
			ENTER	EXIT	ENTER	EXIT
Single-Family (LUC 210)	199 homes	1,894	37	112	125	74

5.2 TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

For the purposes of this study, it was estimated that the trips generated by the proposed project will access the project site according to the directional distribution shown in Figure 6. The development of this distribution was based on the following factors:

- existing land use characteristics,
- the directions of approach of the existing traffic,
- the access proposed for the project, and
- the locations of population centers in the area.

The peak hour trip generation and directional distribution were used to add the site-generated trips to the roadway system. Figure 7 includes the peak hour traffic volumes that are expected to be generated by the proposed project.

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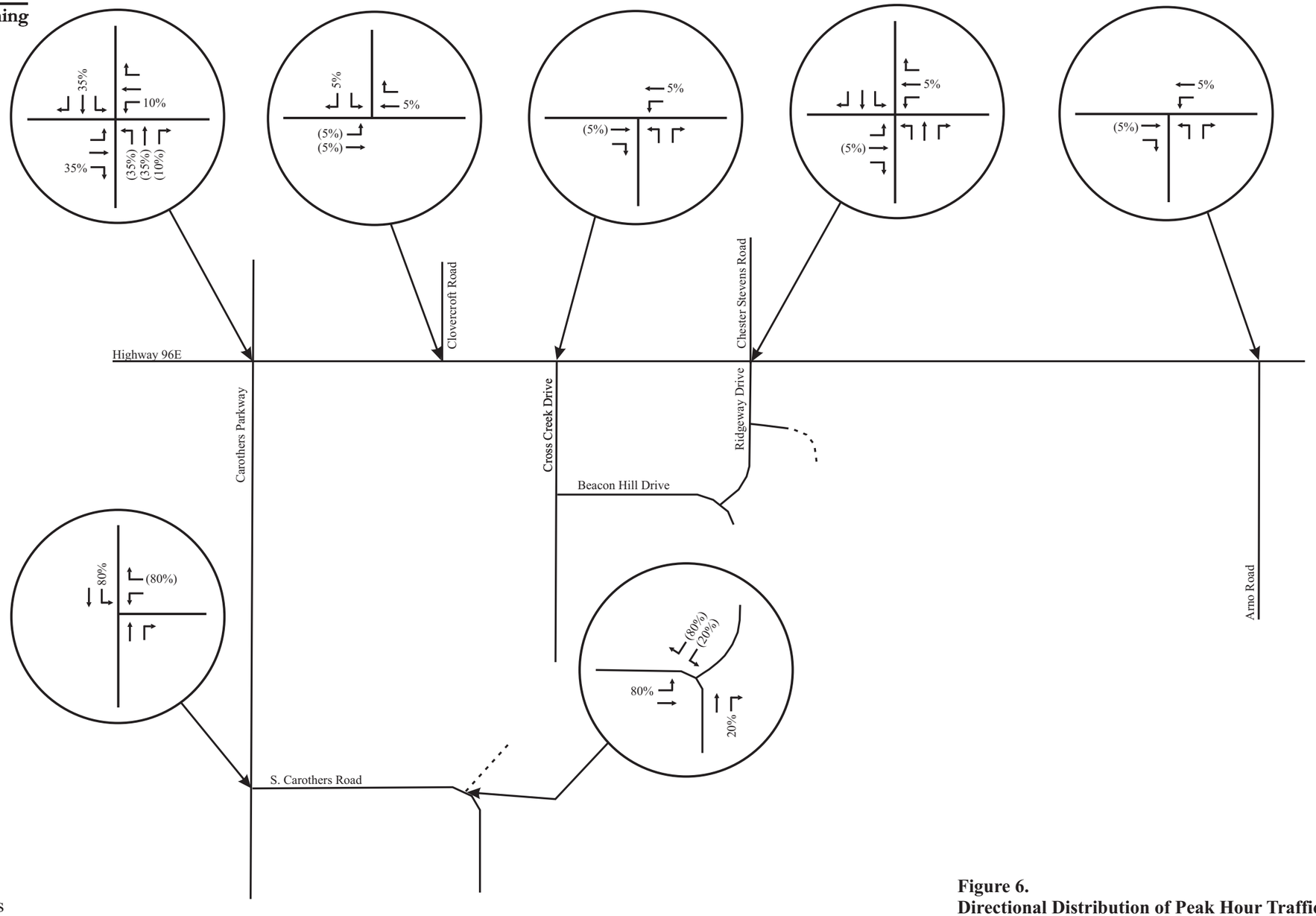

No Scale

XX - Entering Volumes
(XX) - Exiting Volumes

Figure 6.
Directional Distribution of Peak Hour Traffic Volumes Generated by the Proposed Residential Project

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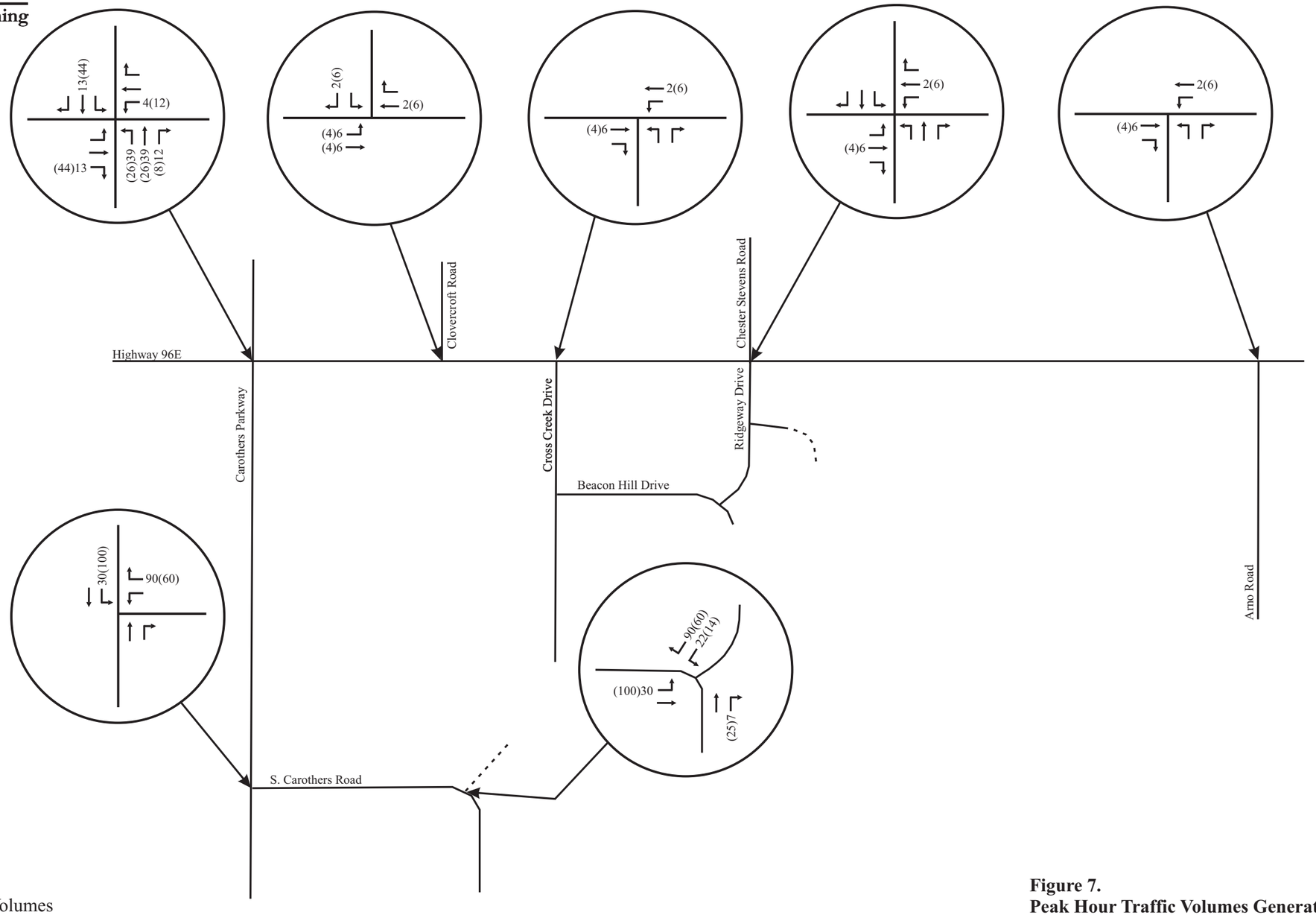


No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 7.
Peak Hour Traffic Volumes Generated by the Proposed Residential Project

5.3 CAPACITY ANALYSES

In order to identify the projected peak hour traffic volumes at the completion of the proposed project, the trips generated by the project were added to the background peak hour traffic volumes. The resulting peak hour volumes are shown in Figure 8.

Using the total projected peak hour traffic volumes, capacity analyses were conducted in order to determine the impact of the project on the roadway system. Specifically, these capacity analyses were used to evaluate the need for roadway and traffic control improvements within the study area. For these analyses, the following assumptions were made:

- All existing laneage and traffic control will be maintained and no improvements will be provided.
- The project access on S. Carothers Road will be constructed to include one entering lane and one exiting lane.

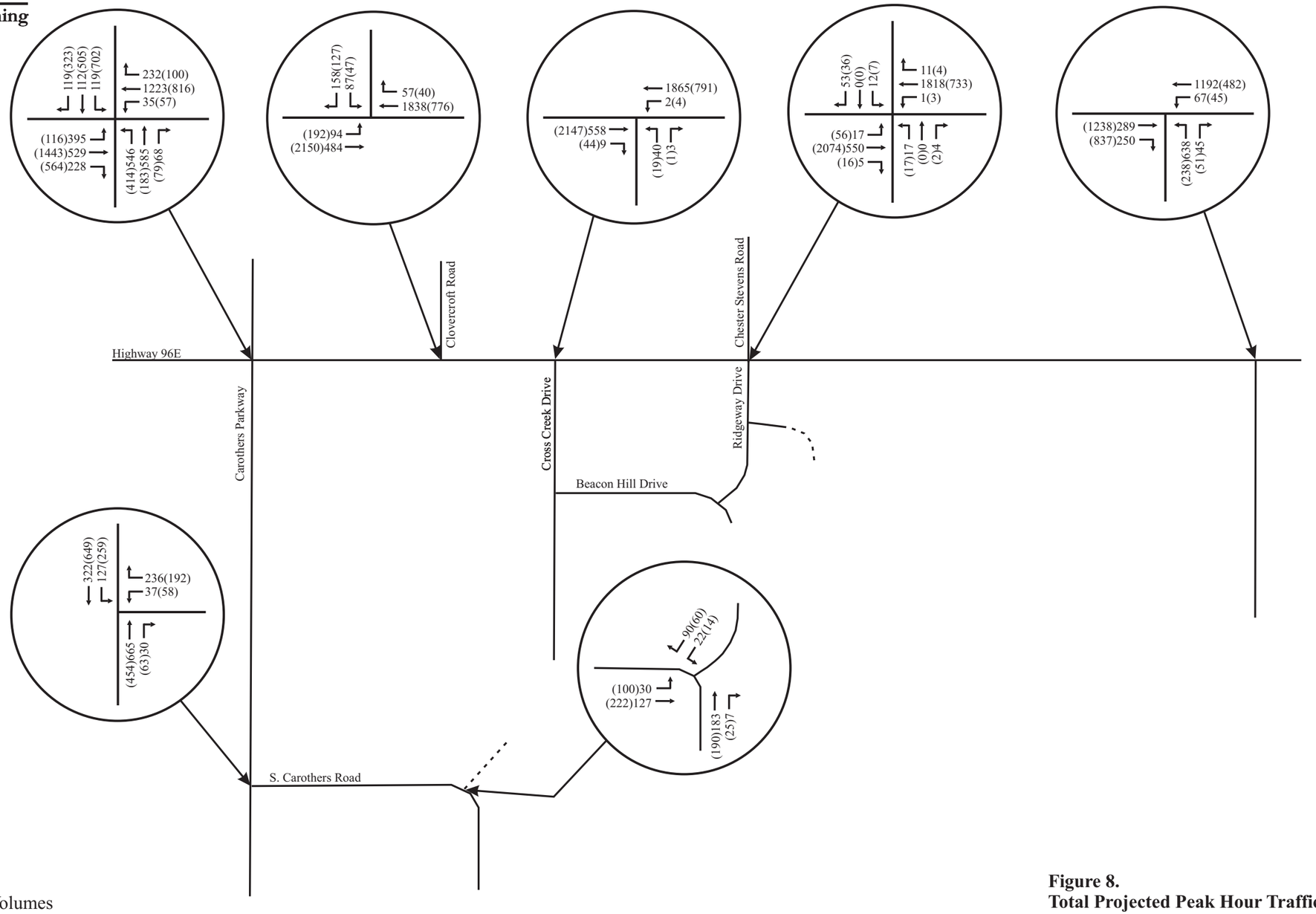
The results of the capacity analyses for the total projected peak hour traffic volumes are shown in Table 8, and Appendix B includes the capacity analyses worksheets. These analyses indicate that the total projected conditions with full build-out of the project are largely consistent with the background conditions within the study area. Also, these analyses indicate that all of the critical turning movements at the intersection of S. Carothers Road and the project access will operate acceptably during both peak hours.

Further analyses were conducted to determine the need for the following dedicated turn lanes within the study area:

- A dedicated left turn lane on S. Carothers Road at the project access.
- A dedicated right turn lane on S. Carothers Road at the project access.
- A dedicated northbound right turn lane on Carothers Parkway at S. Carothers Road.

These analyses were based on the method outlined in *NCHRP Report 457: Engineering Study Guide for Evaluating Intersection Improvements*. The relevant charts are included in Appendix F. The results of these analyses indicate that a dedicated northbound right turn lane is warranted for construction on Carothers Parkway at S. Carothers Road. Also, a dedicated eastbound right turn lane is warranted for construction on Highway 96E at Ridgeway Drive. However, dedicated turn lanes are not warranted on S. Carothers Road at the project access.

Fischbach
Transportation Group, LLC
Traffic Engineering and Planning



No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 8.
Total Projected Peak Hour Traffic Volumes at the Completion of the Proposed Project

TABLE 8. PROJECTED PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	AM PEAK HOUR		PM PEAK HOUR	
		LEVEL OF SERVICE	95TH %-ILE QUEUE	LEVEL OF SERVICE	95TH %-ILE QUEUE
Highway 96E and Carothers Parkway (signalized)	Eastbound Left Turns	LOS F	146 feet	LOS C	65 feet
	Eastbound Thrus	LOS B	84 feet	LOS D	853 feet
	Eastbound Right Turns	LOS A	31 feet	LOS C	449 feet
	Westbound Left Turns	LOS A	11 feet	LOS F	182 feet
	Westbound Thru/Right Turns	LOS B	180 feet	LOS B	195 feet
	Northbound Left Turns	LOS B	99 feet	LOS D	257 feet
	Northbound Thrus	LOS B	93 feet	LOS C	84 feet
	Northbound Right Turns	LOS A	17 feet	LOS C	76 feet
	Southbound Left Turns	LOS B	25 feet	LOS D	396 feet
	Southbound Thrus	LOS A	21 feet	LOS C	225 feet
	Southbound Right Turns	LOS A	39 feet	LOS C	257 feet
	Overall Intersection	**LOS C**		**LOS C**	
Highway 96E and Clovercroft Road (signalized)	Eastbound Left Turns	LOS F	181 feet	LOS A	34 feet
	Eastbound Thrus	LOS A	32 feet	LOS A	262 feet
	Westbound Thrus/Right Turns	LOS A	235 feet	LOS A	53 feet
	Southbound Left Turn Lane	LOS D	89 feet	LOS F	94 feet
	Southbound Right Turn Lane	LOS D	139 feet	LOS C	69 feet
	Overall Intersection	**LOS B**		**LOS A**	

Highway 96E and Cross Creek Drive (unsignalized)	Westbound Left Turn Lane	LOS A	0 veh	LOS C	1 veh
	Northbound Left / Right Turn Lane	LOS D	1 veh	LOS F	2 veh
Highway 96E and Ridgeway Drive / Chester Stevens Drive (unsignalized)	Eastbound Left Turn Lane	LOS C	1 veh	LOS A	1 veh
	Westbound Left Turn Lane	LOS A	0 veh	LOS C	0 veh
	Northbound Lane	LOS D	1 veh	LOS F	2 veh
	Southbound Lane	LOS F	2 veh	LOS C	1 veh
Highway 96E and Arno Road (signalized)	Eastbound Thrus / Right Turns	LOS B	96 feet	LOS A	433 feet
	Westbound Left Turns	LOS C	60 feet	LOS F	95 veh
	Westbound Thrus	LOS C	460 feet	LOS A	86 veh
	Northbound Left Turns	LOS C	498 feet	LOS F	381 veh
	Northbound Right Turns	LOS A	18 feet	LOS B	41 veh
	Overall Intersection	**LOS C**		**LOS B**	
Carothers Parkway and S. Carothers Road (unsignalized)	Southbound Left Turns	LOS A	1 veh	LOS A	1 veh
	Westbound Left Turns	LOS E	1 veh	LOS F	5 veh
	Westbound Right Turns	LOS C	4 veh	LOS C	2 veh
S. Carothers Road and Project Access	Eastbound Left Turns/Thrus	LOS A	1 veh	LOS A	1 veh
	Southbound Left and Right Turns	LOS B	1 veh	LOS B	1 veh

5.4 TRAFFIC SIGNAL WARRANT ANALYSES

Based on the total projected conditions with the proposed project, as well as the residential projects that have already been approved for construction, updated traffic signal warrant analyses were conducted for the intersection of Carothers Parkway and S. Carothers Road.

Specifically, for the purposes of this study, it was estimated that the proposed Colletta Park project and the approved residential projects (Simmon's Ridge, Lockwood Glen, Echelon, and Water's Edge) will include a total of 951 single-family homes, 613 townhomes, and 240 apartments, as shown below:

Colletta Park – 199 single-family homes
Simmons Ridge – 421 townhomes
Lockwood Glen – 347 single-family homes, 32 townhomes, and 240 apartments
Water's Edge – 211 single-family homes and 126 townhomes
Echelon – 134 single-family homes and 34 townhomes

Trip generation data for daily and peak hour trips were identified from Trip Generation, Ninth Edition, which was published by the Institute of Transportation Engineers (ITE) in 2012. Table 9 presents the daily and peak hour trip generations for the homes that have been approved for construction near the intersection of Carothers Parkway and S. Carothers Road.

TABLE 9. TRIP GENERATION (APPROVED AND PROPOSED HOMES)

LAND USE	SIZE	DAILY TRAFFIC	GENERATED TRAFFIC			
			AM PEAK HOUR		PM PEAK HOUR	
			ENTER	EXIT	ENTER	EXIT
Single-Family (LUC 210)	891 homes	8,482	167	501	561	330
Townhomes (LUC 230)	613 homes	3,562	46	224	214	105
Multi-Family (LUC 220)	240 homes	1,596	24	98	97	52
TOTAL	**1,744 homes**	**13,640**	**237**	**823**	**872**	**487**

Based on the daily trip generations shown in Table 9, hourly traffic volumes entering and exiting the project sites were estimated as shown in Table 10.

For the purposes of this study, it was assumed that 100% of the total traffic entering the project sites and 70% of the total traffic exiting the project sites will travel northbound and southbound on Carothers Parkway. Also, it was assumed that 30% of the total traffic exiting the project sites will travel westbound on S. Carothers Road. Based on these assumptions, the hourly traffic volumes on Carothers Parkway and S. Carothers Road were added to the existing traffic volumes in Table 4 in order to establish the projected traffic volumes shown in Table 11. The results of these updated traffic signal warrant analyses are also included in Table 11. **These results indicate that the projected traffic volumes at the intersection of Carothers Parkway and S. Carothers Road will satisfy two of the volume-related signal warrants.**

TABLE 10. HOURLY TRAFFIC VOLUMES
EXPECTED TO BE GENERATED BY APPROVED AND PROPOSED HOMES

HOUR	% OF DAILY TRAFFIC	TOTAL TRAFFIC	% ENTER	ENTERING TRAFFIC	% EXIT	EXITING TRAFFIC
12:00 - 1:00 AM	0.6%	75	50%	38	50%	38
1:00 - 2:00 AM	0.5%	68	45%	31	55%	38
2:00 - 3:00 AM	1.0%	136	40%	55	60%	82
3:00 - 4:00 AM	2.0%	273	35%	95	65%	177
4:00 - 5:00 AM	3.0%	409	30%	123	70%	286
5:00 - 6:00 AM	4.0%	546	25%	136	75%	409
6:00 - 7:00 AM	5.0%	682	25%	170	75%	511
7:00 - 8:00 AM	7.8%	1,060	22%	237	78%	823
8:00 - 9:00 AM	6.0%	818	35%	286	65%	532
9:00 - 10:00 AM	5.0%	682	40%	273	60%	409
10:00 - 11:00 AM	5.0%	682	50%	341	50%	341
11:00 - 12:00 N	5.0%	682	50%	341	50%	341
12:00 - 1:00 PM	5.0%	682	50%	341	50%	341
1:00 - 2:00 PM	5.0%	682	50%	341	50%	341
2:00 - 3:00 PM	5.0%	682	50%	341	50%	341
3:00 - 4:00 PM	5.0%	682	55%	375	45%	307
4:00 - 5:00 PM	7.0%	955	60%	573	40%	382
5:00 - 6:00 PM	10.0%	1,359	64%	872	36%	487
6:00 - 7:00 PM	8.0%	1,091	70%	764	30%	327
7:00 - 8:00 PM	5.0%	682	80%	546	20%	136
8:00 - 9:00 PM	3.0%	409	80%	327	20%	82
9:00 - 10:00 PM	1.0%	136	75%	102	25%	34
10:00 - 11:00 PM	0.6%	82	70%	57	30%	25
11:00 - 12:00 M	0.6%	82	65%	53	35%	29
TOTAL	**100.0%**	**13,638**		**6,819**		**6,819**

TABLE 11. TRAFFIC SIGNAL WARRANT ANALYSIS
INTERSECTION OF CAROTHERS PARKWAY AND S. CAROTHERS ROAD

HOUR	TOTAL VEHICLES BOTH DIRECTIONS OF CAROTHERS PARKWAY	WESTBOUND VEHICLES ON S. CAROTHERS ROAD	SATISFY FULL WARRANTS?		
			Warrant 1 Condition A	Warrant 1 Condition B	Warrant 2
6:00 - 7:00 AM	869	184	Yes	Yes	Yes
7:00 - 8:00 AM	1,468	295	Yes	Yes	Yes
8:00 - 9:00 AM	1,205	210	Yes	Yes	Yes
9:00 - 10:00 AM	927	144	---	Yes	Yes
10:00 - 11:00 AM	923	121	---	Yes	Yes
11:00 - 12:00 N	1,001	130	---	Yes	Yes
12:00 - 1:00 PM	1,040	133	---	Yes	Yes
1:00 - 2:00 PM	1,043	136	---	Yes	Yes
2:00 - 3:00 PM	1,006	130	---	Yes	Yes
3:00 - 4:00 PM	1,070	117	---	---	Yes
4:00 - 5:00 PM	1,416	131	---	Yes	Yes
5:00 - 6:00 PM	1,942	169	Yes	Yes	Yes
6:00 - 7:00 PM	1,552	127	---	Yes	Yes

6. CONCLUSIONS AND RECOMMENDATIONS

The analyses presented in this study indicate that the following infrastructure improvements should be provided in order to accommodate the existing, background, and total projected traffic volumes with the completion of the proposed project:

1. A northbound right turn lane should be provided on Carothers Parkway at the intersection with S. Carothers Road. This turn lane should include at least 100 feet of storage and should be designed and constructed according to AASHTO standards.

2. A traffic signal will likely be warranted at the intersection of Carothers Parkway and S. Carothers Road as all of the approved residential projects on Carothers Parkway and S. Carothers Road are developed. If constructed, this traffic signal should be designed and constructed to include protected and permissive signal phases for southbound motorists, as well as right turn overlap signal phases for northbound and westbound approaches.

3. The analyses conducted for the purposes of this study indicate that all of the critical turning movements at the intersection of S. Carothers Road and the project access will operate acceptably even if dedicated turn lanes are not provided at this location.

4. In conjunction with the preparation of final construction documents for the proposed project, sight triangles should be provided to identify the sight distances which will be available, based on the specific location of the project access and its design parameters. These sight triangles should be developed based on guidelines that are included in A Policy on Geometric Design of Highways and Streets, which is published by the American Association of State Highway and Transportation Officials (AASHTO) and commonly known as The Green Book. Specifically, The Green Book indicates that for a speed of 40 mph, the minimum stopping sight distance is 305 feet. This is the distance that motorists on S. Carothers Road will need to come to a stop if a vehicle turning from the project access creates a conflict. Also, based on The Green Book, the minimum intersection sight distance is 445 feet. This is the distance that motorists on the project access will need to safely complete a turn onto S. Carothers Road.

APPENDIX A
EXISTING TRAFFIC COUNTS

Type of peak hour being reported: Intersection Peak

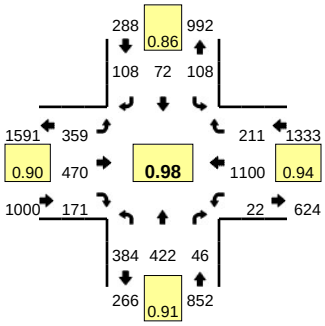
Method for determining peak hour: Total Entering Volume

LOCATION: Carothers Pkwy -- Murfreesboro Rd

QC JOB #: 14408501

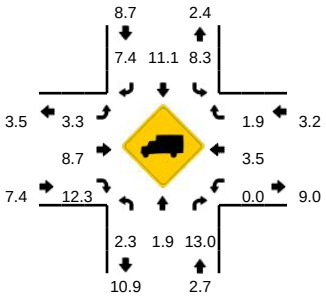
CITY/STATE: Franklin, TN

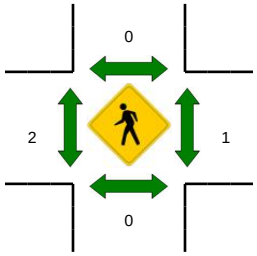
DATE: Wed, May 10 2017

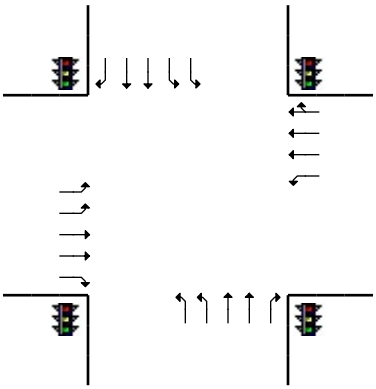


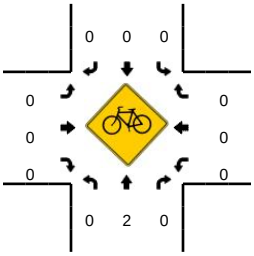
Peak-Hour: 7:00 AM -- 8:00 AM

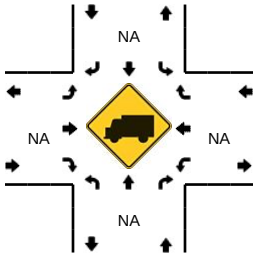
Peak 15-Min: 7:30 AM -- 7:45 AM

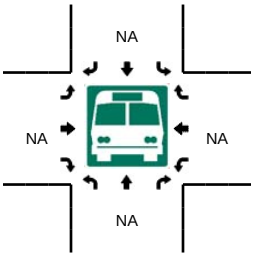












15-Min Count Period Beginning At	Carothers Pkwy (Northbound)				Carothers Pkwy (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	42	6	1	0	2	2	6	0	20	43	28	0	3	174	20	0	347	
6:15 AM	84	18	8	0	9	6	9	0	33	75	25	0	4	286	23	0	580	
6:30 AM	102	41	13	0	23	13	18	0	49	119	47	0	7	323	19	0	774	
6:45 AM	94	72	6	0	25	9	21	0	72	106	52	0	9	331	30	0	827	2528
7:00 AM	82	84	8	0	30	16	23	0	91	120	43	0	4	290	53	0	844	3025
7:15 AM	79	116	9	0	33	16	34	0	104	111	43	0	5	269	44	0	863	3308
7:30 AM	119	117	12	0	17	20	32	0	75	101	35	0	8	293	55	0	884	3418
7:45 AM	103	105	17	1	28	20	19	0	89	138	50	0	5	248	59	0	882	3473
8:00 AM	119	92	13	0	33	25	13	0	60	111	52	0	9	251	41	0	819	3448
8:15 AM	118	54	28	1	15	20	26	0	60	129	44	0	11	301	40	0	847	3432
8:30 AM	103	51	11	0	31	15	46	0	49	112	63	0	14	282	43	0	820	3368
8:45 AM	101	67	11	0	31	26	34	0	58	142	61	0	6	252	41	0	830	3316

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	476	468	48	0	68	80	128	0	300	404	140	0	32	1172	220	0	3536
Heavy Trucks	24	12	4		8	8	12		12	36	20		0	40	8		184
Pedestrians		0				0				4				0			4
Bicycles	0	1	0		0	0	0		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

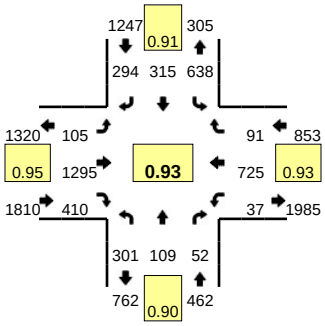
Method for determining peak hour: Total Entering Volume

LOCATION: Carothers Pkwy -- Murfreesboro Rd

CITY/STATE: Franklin, TN

QC JOB #: 14408502

DATE: Wed, May 10 2017



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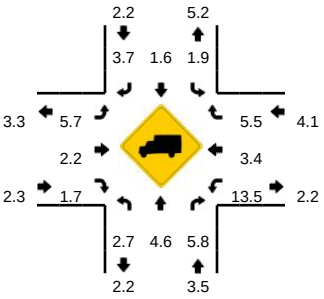
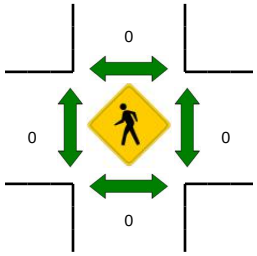
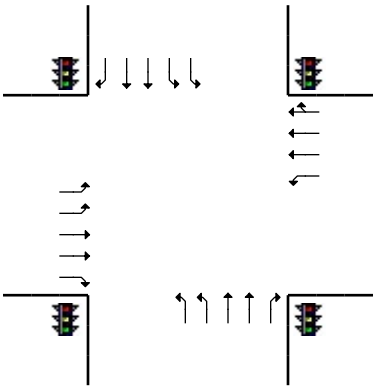
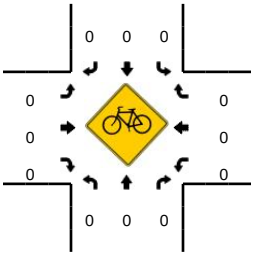
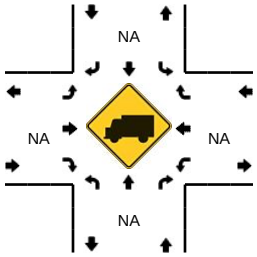
Peak 15-Min: 5:15 PM -- 5:30 PM

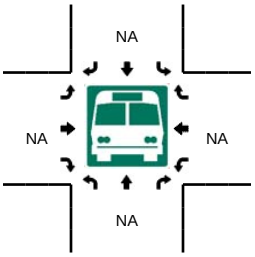












15-Min Count Period Beginning At	Carothers Pkwy (Northbound)				Carothers Pkwy (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	74	27	15	0	159	53	72	0	34	259	76	0	8	172	26	0	975	
4:15 PM	71	25	8	0	135	74	56	0	25	294	93	0	13	201	22	0	1017	
4:30 PM	58	21	14	0	173	75	93	0	33	331	95	0	7	174	20	0	1094	
4:45 PM	72	25	11	0	138	74	65	0	22	310	92	0	10	158	26	0	1003	4089
5:00 PM	91	32	15	0	163	74	62	0	21	311	119	0	8	176	25	0	1097	4211
5:15 PM	80	31	12	0	164	92	74	0	29	343	104	0	12	217	20	0	1178	4372
5:30 PM	87	23	14	0	149	84	46	0	35	260	103	0	10	190	26	0	1027	4305
5:45 PM	79	24	14	0	119	69	26	0	38	275	97	0	7	204	22	0	974	4276
6:00 PM	94	35	12	0	96	48	57	0	26	251	85	1	4	188	24	0	921	4100
6:15 PM	80	19	9	0	83	57	31	0	31	259	97	0	16	177	17	0	876	3798
6:30 PM	89	19	10	0	73	55	29	0	23	222	88	2	7	163	7	0	787	3558
6:45 PM	52	15	8	0	65	40	24	0	29	198	74	0	7	144	19	0	675	3259

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	320	124	48	0	656	368	296	0	116	1372	416	0	48	868	80	0	4712
Heavy Trucks	8	8	0		8	4	8		4	32	0		0	40	4		116
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

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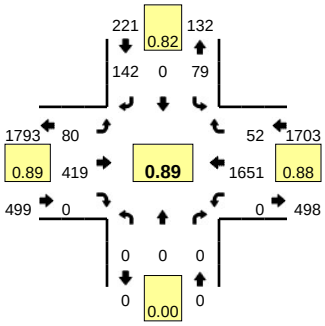
QC JOB #: 14408503

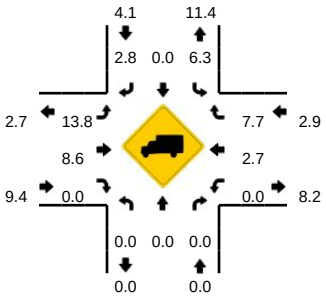
CITY/STATE: Franklin, TN

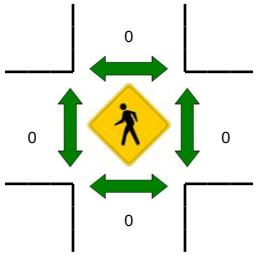
DATE: Wed, May 10 2017

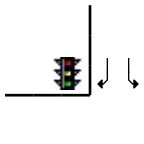


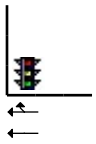
Peak-Hour: 6:30 AM -- 7:30 AM

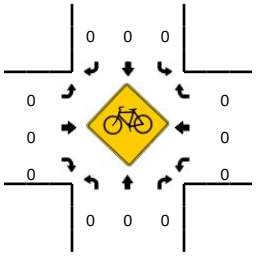
Peak 15-Min: 6:45 AM -- 7:00 AM

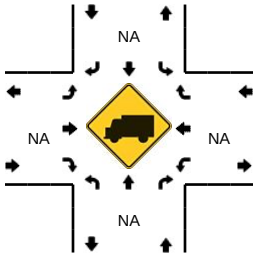


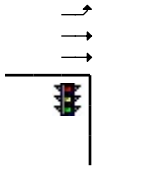


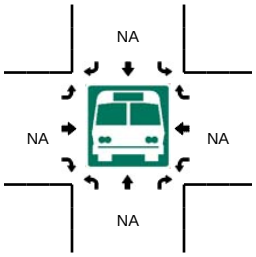












15-Min Count Period Beginning At	Clovercroft Rd (Northbound)				Clovercroft Rd (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	0	0	20	0	11	34	0	0	0	194	1	0	260	
6:15 AM	0	0	0	0	3	0	26	0	10	57	0	0	0	342	2	0	440	
6:30 AM	0	0	0	0	24	0	31	0	14	117	0	0	0	385	5	0	576	
6:45 AM	0	0	0	0	39	0	30	0	18	99	0	0	0	483	8	0	677	1953
7:00 AM	0	0	0	0	16	0	37	0	25	94	0	0	0	389	20	0	581	2274
7:15 AM	0	0	0	0	0	0	44	0	23	109	0	0	0	394	19	0	589	2423
7:30 AM	0	0	0	0	4	0	57	0	24	76	0	0	0	389	17	0	567	2414
7:45 AM	0	0	0	0	1	0	48	0	29	131	0	0	0	350	8	0	567	2304
8:00 AM	0	0	0	0	4	0	30	0	18	113	0	0	0	332	5	0	502	2225
8:15 AM	0	0	0	0	5	0	43	0	23	124	0	0	0	347	5	0	547	2183
8:30 AM	0	0	0	0	2	0	59	0	24	107	0	0	0	353	3	0	548	2164
8:45 AM	0	0	0	0	2	0	39	0	28	112	0	0	0	270	11	0	462	2059

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	156	0	120	0	72	396	0	0	0	1932	32	0	2708
Heavy Trucks	0	0	0		4	0	0		0	20	0		0	40	0		64
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

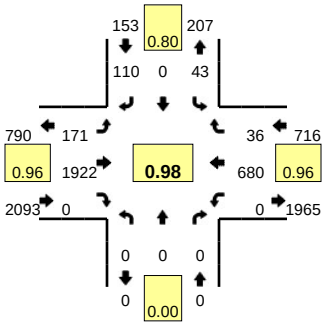
Method for determining peak hour: Total Entering Volume

LOCATION: Clovercroft Rd -- Murfreesboro Rd

CITY/STATE: Franklin, TN

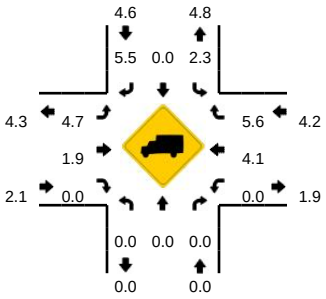
QC JOB #: 14408504

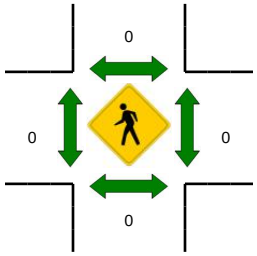
DATE: Wed, May 10 2017

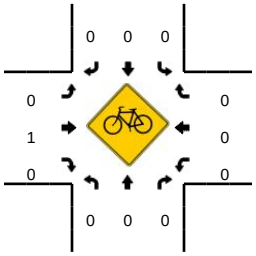


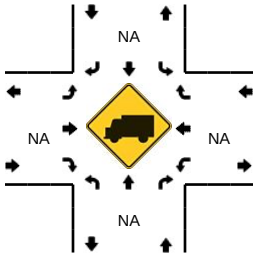
Peak-Hour: 4:30 PM -- 5:30 PM

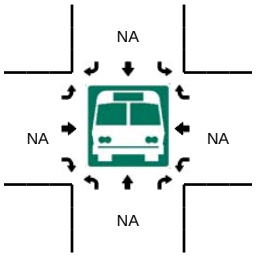
Peak 15-Min: 4:30 PM -- 4:45 PM











15-Min Count Period Beginning At	Clovercroft Rd (Northbound)				Clovercroft Rd (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	13	0	30	0	52	409	0	0	0	171	8	0	683	
4:15 PM	0	0	0	0	9	0	25	0	34	426	0	0	0	188	8	0	690	
4:30 PM	0	0	0	0	10	0	34	0	37	503	0	0	0	164	9	0	757	
4:45 PM	0	0	0	0	11	0	20	0	44	447	0	0	0	159	11	0	692	2822
5:00 PM	0	0	0	0	13	0	34	0	42	475	0	0	0	183	10	0	757	2896
5:15 PM	0	0	0	0	9	0	22	0	48	497	0	0	0	174	6	0	756	2962
5:30 PM	0	0	0	0	9	0	42	0	46	413	0	0	0	193	3	0	706	2911
5:45 PM	0	0	0	0	7	0	27	0	37	395	0	0	0	176	5	0	647	2866
6:00 PM	0	0	0	0	6	0	19	0	38	323	0	0	0	186	4	0	576	2685
6:15 PM	0	0	0	0	5	0	23	0	28	337	0	0	0	165	3	0	561	2490
6:30 PM	0	0	0	0	4	0	29	0	31	263	0	0	0	146	2	0	475	2259
6:45 PM	0	0	0	0	7	0	30	0	20	248	0	0	0	126	4	0	435	2047

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	40	0	136	0	148	2012	0	0	0	656	36	0	3028
Heavy Trucks	0	0	0		0	0	12		8	60	0		0	24	0		104
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

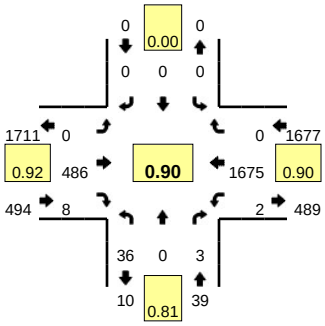
Method for determining peak hour: Total Entering Volume

LOCATION: Cross Creek Dr -- Murfreesboro Rd

CITY/STATE: Franklin, TN

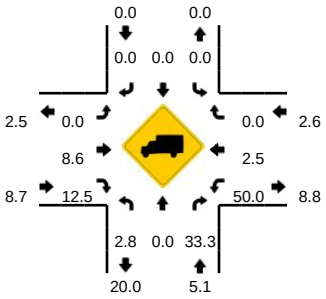
QC JOB #: 14408505

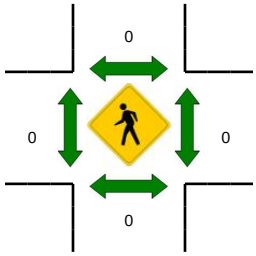
DATE: Wed, May 10 2017

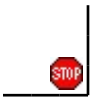


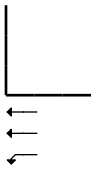
Peak-Hour: 6:30 AM -- 7:30 AM

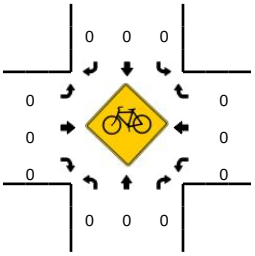
Peak 15-Min: 6:45 AM -- 7:00 AM

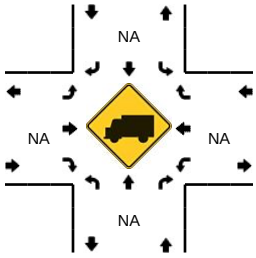


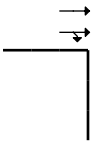


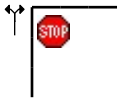


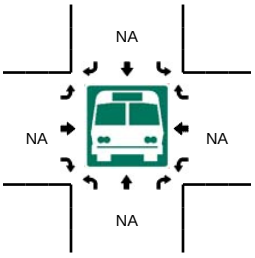












15-Min Count Period Beginning At	Cross Creek Dr (Northbound)				Cross Creek Dr (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	4	0	0	0	0	0	0	0	0	35	0	0	0	188	0	0	227	
6:15 AM	3	0	2	0	0	0	0	0	0	61	1	0	0	343	0	0	410	
6:30 AM	8	0	1	0	0	0	0	0	0	136	2	0	1	398	0	0	546	
6:45 AM	9	0	0	0	0	0	0	0	0	134	3	0	1	467	0	0	614	1797
7:00 AM	12	0	0	0	0	0	0	0	0	106	3	0	0	411	0	0	532	2102
7:15 AM	7	0	2	0	0	0	0	0	0	110	0	0	0	399	0	0	518	2210
7:30 AM	7	0	0	0	0	0	0	0	0	76	4	0	0	400	0	0	487	2151
7:45 AM	6	0	1	0	0	0	0	0	0	132	2	0	0	353	0	0	494	2031
8:00 AM	7	0	0	0	0	0	0	0	0	114	2	0	1	334	0	0	458	1957
8:15 AM	3	0	0	0	0	0	0	0	0	125	4	0	2	349	0	0	483	1922
8:30 AM	5	0	0	0	0	0	0	0	0	111	5	0	1	344	0	0	466	1901
8:45 AM	6	0	0	0	0	0	0	0	0	101	8	0	0	273	0	0	388	1795

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	36	0	0	0	0	0	0	0	0	536	12	0	4	1868	0	0	2456
Heavy Trucks	0	0	0		0	0	0		0	32	0		0	36	0		68
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Cross Creek Dr -- Murfreesboro Rd

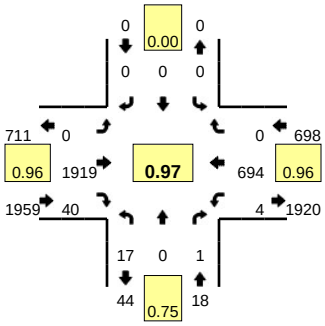
CITY/STATE: Franklin, TN

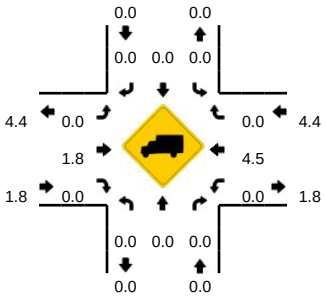
QC JOB #: 14408506

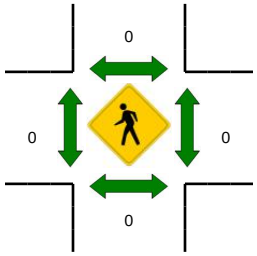
DATE: Wed, May 10 2017

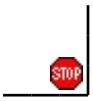
Peak-Hour: 4:30 PM -- 5:30 PM

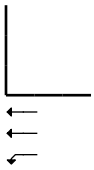
Peak 15-Min: 4:30 PM -- 4:45 PM

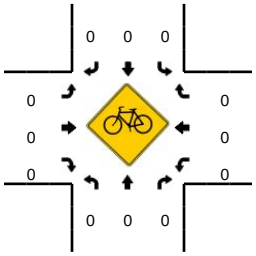


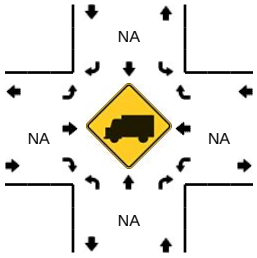


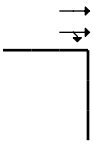


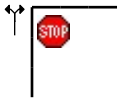


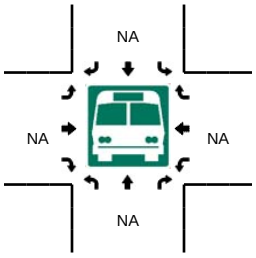












15-Min Count Period Beginning At	Cross Creek Dr (Northbound)				Cross Creek Dr (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	2	0	1	0	0	0	0	0	0	410	9	0	1	180	0	0	603	
4:15 PM	4	0	0	0	0	0	0	0	0	425	9	1	0	190	0	0	629	
4:30 PM	4	0	0	0	0	0	0	0	0	495	14	0	1	175	0	0	689	
4:45 PM	4	0	0	0	0	0	0	0	0	452	8	0	0	161	0	0	625	2546
5:00 PM	4	0	0	0	0	0	0	0	0	478	6	0	2	186	0	0	676	2619
5:15 PM	5	0	1	0	0	0	0	0	0	494	12	0	1	172	0	0	685	2675
5:30 PM	6	0	0	0	0	0	0	0	0	417	7	0	0	185	0	0	615	2601
5:45 PM	5	0	0	0	0	0	0	0	0	400	6	0	0	177	0	0	588	2564
6:00 PM	6	0	2	0	0	0	0	0	0	328	9	0	0	185	0	0	530	2418
6:15 PM	5	0	0	0	0	0	0	0	0	330	9	0	1	164	0	0	509	2242
6:30 PM	9	0	0	0	0	0	0	0	0	264	6	0	0	136	0	0	415	2042
6:45 PM	3	0	0	0	0	0	0	0	0	250	6	0	1	127	0	0	387	1841

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	0	0	0	0	0	0	0	0	1980	56	0	4	700	0	0	2756
Heavy Trucks	0	0	0		0	0	0		0	64	0		0	24	0		88
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Ridgeway Dr -- Murfreesboro Rd

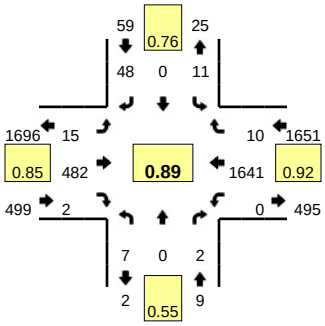
CITY/STATE: Franklin, TN

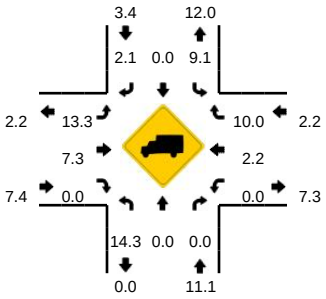
QC JOB #: 14408509

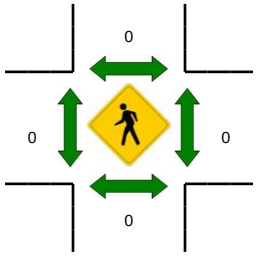
DATE: Wed, May 10 2017

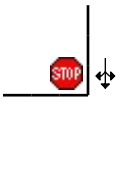
Peak-Hour: 6:30 AM -- 7:30 AM

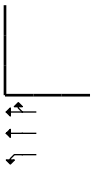
Peak 15-Min: 6:45 AM -- 7:00 AM

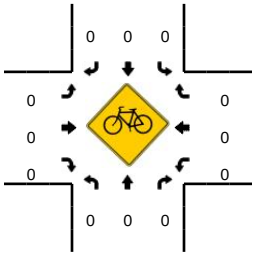


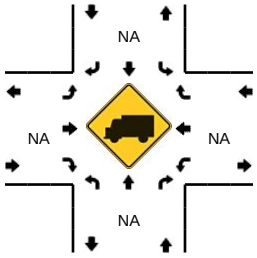


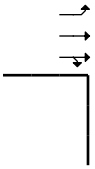


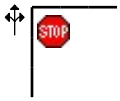


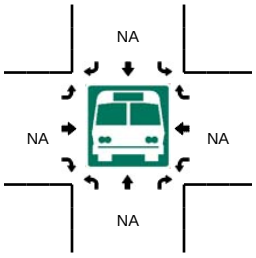












15-Min Count Period Beginning At	Ridgeway Dr (Northbound)				Ridgeway Dr (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	1	0	0	0	0	0	7	0	2	32	0	0	0	181	0	0	223	
6:15 AM	1	0	0	0	0	0	10	0	3	60	0	0	0	329	0	0	403	
6:30 AM	1	0	1	0	3	0	10	0	4	128	1	0	0	402	0	0	550	
6:45 AM	3	0	0	0	8	0	18	0	2	143	0	0	0	447	0	0	621	1797
7:00 AM	2	0	1	0	0	0	7	0	2	106	0	0	0	399	3	0	520	2094
7:15 AM	1	0	0	0	0	0	13	0	7	105	1	0	0	393	7	0	527	2218
7:30 AM	2	0	0	0	0	0	14	0	2	74	0	0	0	379	2	0	473	2141
7:45 AM	1	0	0	0	0	0	16	0	2	126	1	0	0	333	1	0	480	2000
8:00 AM	2	0	3	0	1	0	9	0	6	108	1	0	1	320	1	0	452	1932
8:15 AM	3	0	0	0	4	0	16	0	4	117	2	0	2	330	1	0	479	1884
8:30 AM	2	0	0	0	0	0	15	0	6	98	1	0	0	329	2	0	453	1864
8:45 AM	1	0	0	0	0	0	14	0	9	95	1	0	0	260	0	0	380	1764
9:00 AM	2	0	0	0	1	0	7	0	2	115	0	0	0	217	0	0	344	1656
9:15 AM	0	0	0	0	1	0	8	0	7	102	0	0	0	205	1	0	324	1501
9:30 AM	1	0	0	0	0	0	11	0	9	110	1	0	0	221	0	0	353	1401
9:45 AM	3	0	1	0	0	0	13	0	6	129	3	0	1	236	0	0	392	1413
10:00 AM	1	0	1	0	0	0	8	0	1	106	0	0	0	185	2	0	304	1373
10:15 AM	0	0	0	0	1	0	8	0	5	117	2	1	0	163	2	0	299	1348
10:30 AM	2	0	1	0	1	0	8	0	8	117	0	0	2	185	0	0	324	1319
10:45 AM	0	0	0	0	2	0	11	0	10	140	0	0	0	157	0	0	320	1247

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	0	0	0	32	0	72	0	8	572	0	0	0	1788	0	0	2484
Heavy Trucks	0	0	0		0	0	0		0	24	0		0	40	0		64
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Ridgeway Dr -- Murfreesboro Rd

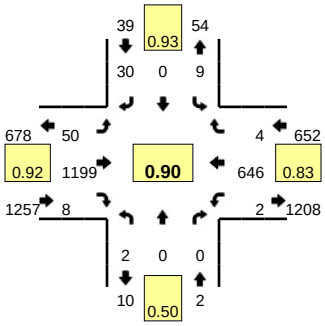
CITY/STATE: Franklin, TN

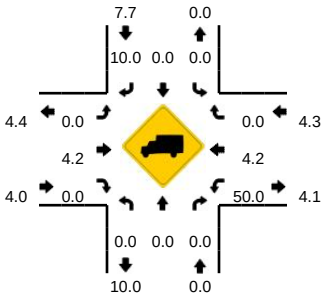
QC JOB #: 14408510

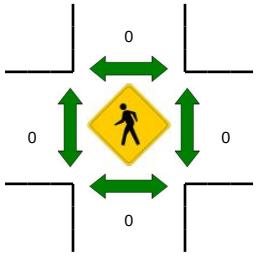
DATE: Wed, May 10 2017

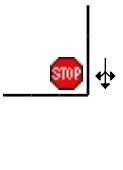
Peak-Hour: 3:00 PM -- 4:00 PM

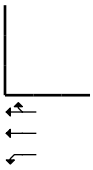
Peak 15-Min: 3:45 PM -- 4:00 PM

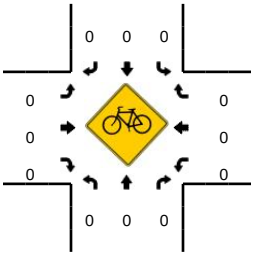


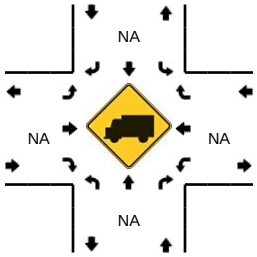


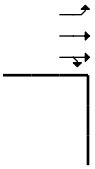


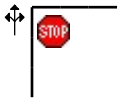


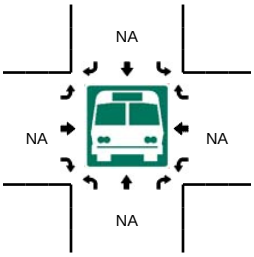












15-Min Count Period Beginning At	Ridgeway Dr (Northbound)				Ridgeway Dr (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
11:00 AM	1	0	0	0	0	0	11	0	8	144	2	0	0	198	0	0	364	
11:15 AM	1	0	1	0	1	0	9	0	3	171	0	0	0	149	0	0	335	
11:30 AM	2	0	1	0	0	0	11	0	12	155	0	0	0	161	2	0	344	
11:45 AM	5	1	0	0	0	0	9	0	7	146	1	0	2	163	0	0	334	1377
12:00 PM	1	0	0	0	0	0	7	0	10	157	2	0	0	150	0	1	328	1341
12:15 PM	1	0	0	0	1	0	6	0	12	164	4	0	0	156	3	0	347	1353
12:30 PM	2	0	1	0	1	0	4	0	7	177	5	0	0	140	1	0	338	1347
12:45 PM	4	0	1	0	1	0	13	0	9	177	0	0	0	135	0	0	340	1353
1:00 PM	2	0	0	0	0	0	7	0	7	179	0	0	0	150	0	0	345	1370
1:15 PM	1	1	0	0	0	0	8	0	13	191	2	0	0	153	0	0	369	1392
1:30 PM	0	0	0	0	1	0	9	0	8	200	0	0	1	151	0	0	370	1424
1:45 PM	1	0	0	0	3	0	3	0	8	195	4	0	0	164	1	0	379	1463
2:00 PM	1	0	0	0	1	0	6	0	9	203	1	0	0	164	0	0	385	1503
2:15 PM	0	0	0	0	3	0	9	0	7	244	1	0	0	146	1	0	411	1545
2:30 PM	0	0	1	0	2	0	9	0	8	216	2	0	1	167	1	0	407	1582
2:45 PM	0	0	0	0	2	0	5	0	9	231	0	0	0	205	5	0	457	1660
3:00 PM	0	0	0	0	3	0	7	0	10	238	1	0	1	174	0	0	434	1709
3:15 PM	1	0	0	0	2	0	7	0	14	311	0	0	0	144	1	0	480	1778
3:30 PM	1	0	0	0	1	0	9	0	12	326	3	0	1	141	1	0	495	1866
3:45 PM	0	0	0	0	3	0	7	0	14	324	4	0	0	187	2	0	541	1950

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	12	0	28	0	56	1296	16	0	0	748	8	0	2164
Heavy Trucks	0	0	0		0	0	4		0	72	0		0	20	0		96
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

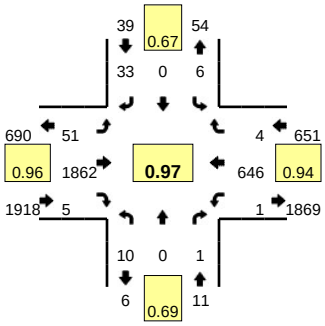
Method for determining peak hour: Total Entering Volume

LOCATION: Ridgeway Dr -- Murfreesboro Rd

CITY/STATE: Franklin, TN

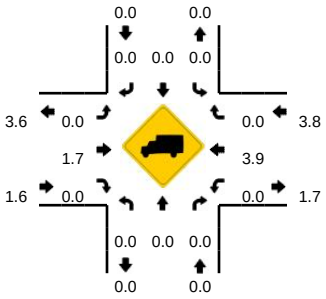
QC JOB #: 14408511

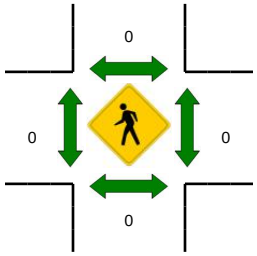
DATE: Wed, May 10 2017

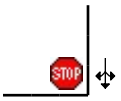


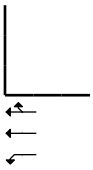
Peak-Hour: 4:30 PM -- 5:30 PM

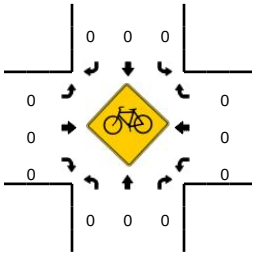
Peak 15-Min: 4:30 PM -- 4:45 PM

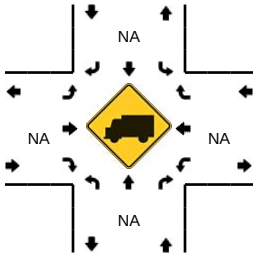


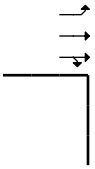


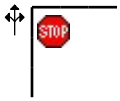


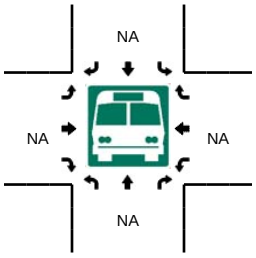












15-Min Count Period Beginning At	Ridgeway Dr (Northbound)				Ridgeway Dr (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	0	0	0	0	0	6	0	9	394	0	0	1	169	0	0	580	
4:15 PM	0	0	0	0	2	0	16	0	14	413	6	0	1	172	2	0	626	
4:30 PM	3	0	1	0	1	0	9	0	12	481	1	0	0	164	1	0	673	
4:45 PM	3	0	0	0	4	0	7	0	18	435	2	0	0	151	1	0	621	2500
5:00 PM	3	0	0	0	1	0	8	0	8	461	1	1	0	170	2	0	655	2575
5:15 PM	1	0	0	0	0	0	9	0	12	485	1	0	1	161	0	0	670	2619
5:30 PM	0	0	0	0	1	0	7	0	12	406	0	0	0	178	2	0	606	2552
5:45 PM	1	0	0	0	0	0	12	0	12	388	2	0	0	162	0	0	577	2508
6:00 PM	1	0	0	0	1	0	14	0	10	316	2	0	1	166	1	0	512	2365
6:15 PM	1	0	2	0	0	0	3	0	21	308	1	0	0	158	1	0	495	2190
6:30 PM	0	0	0	0	0	0	17	0	13	244	1	0	0	125	1	0	401	1985
6:45 PM	5	0	0	0	1	0	10	0	7	244	0	0	1	118	0	0	386	1794

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	0	4	0	4	0	36	0	48	1924	4	0	0	656	4	0	2692
Heavy Trucks	0	0	0		0	0	0		0	52	0		0	20	0		72
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

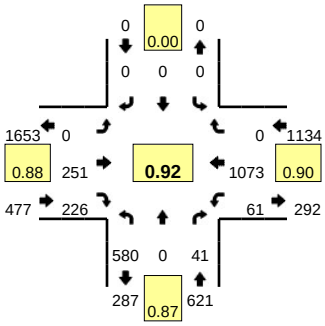
Method for determining peak hour: Total Entering Volume

LOCATION: Arno Rd -- Murfreesboro Rd

CITY/STATE: Franklin, TN

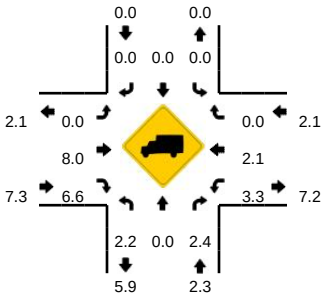
QC JOB #: 14408507

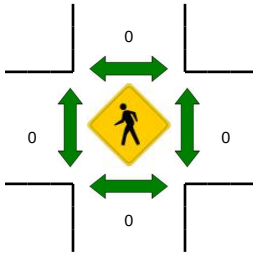
DATE: Wed, May 10 2017

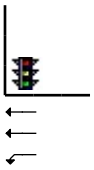


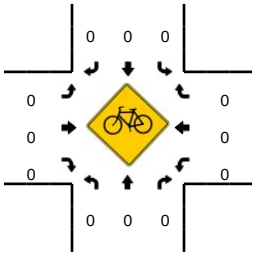
Peak-Hour: 6:30 AM -- 7:30 AM

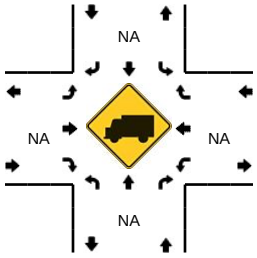
Peak 15-Min: 6:45 AM -- 7:00 AM

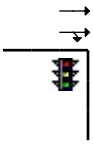


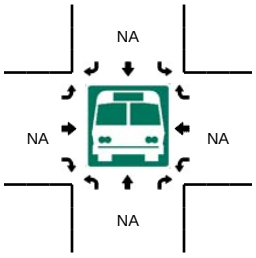












15-Min Count Period Beginning At	Arno Rd (Northbound)				Arno Rd (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	46	0	0	0	0	0	0	0	0	18	9	0	2	144	0	0	219	
6:15 AM	86	0	2	0	0	0	0	0	0	40	16	0	3	243	0	0	390	
6:30 AM	118	0	8	0	0	0	0	0	0	55	75	0	9	287	0	0	552	
6:45 AM	151	0	8	0	0	0	0	0	0	53	82	0	35	280	0	0	609	1770
7:00 AM	142	0	7	0	0	0	0	0	0	67	43	0	8	272	0	0	539	2090
7:15 AM	169	0	18	0	0	0	0	0	0	76	26	0	9	234	0	0	532	2232
7:30 AM	147	0	7	0	0	0	0	0	0	42	14	0	6	227	0	0	443	2123
7:45 AM	149	0	11	0	0	0	0	0	0	94	30	0	1	192	0	0	477	1991
8:00 AM	129	0	18	0	0	0	0	0	0	82	35	0	8	177	0	0	449	1901
8:15 AM	121	0	32	0	0	0	0	0	0	94	25	0	16	203	0	0	491	1860
8:30 AM	102	0	5	0	0	0	0	0	0	60	36	0	9	231	0	0	443	1860
8:45 AM	107	0	7	0	0	0	0	0	0	66	31	0	4	154	0	0	369	1752

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	604	0	32	0	0	0	0	0	0	212	328	0	140	1120	0	0	2436
Heavy Trucks	16	0	0		0	0	0		0	4	12		4	16	0		52
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

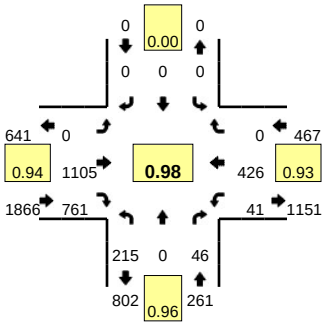
Method for determining peak hour: Total Entering Volume

LOCATION: Arno Rd -- Murfreesboro Rd

CITY/STATE: Franklin, TN

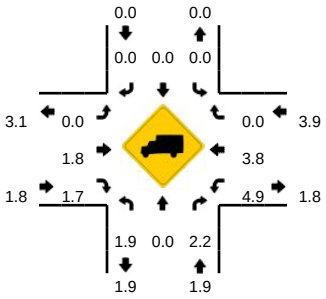
QC JOB #: 14408508

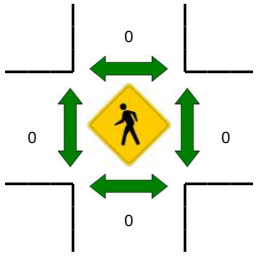
DATE: Wed, May 10 2017

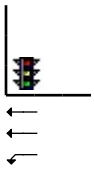


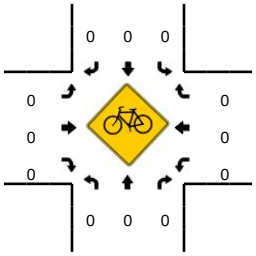
Peak-Hour: 4:30 PM -- 5:30 PM

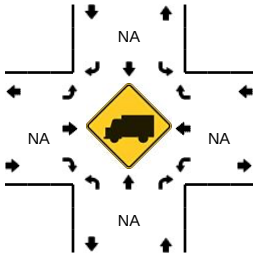
Peak 15-Min: 5:15 PM -- 5:30 PM

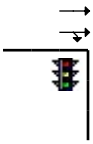


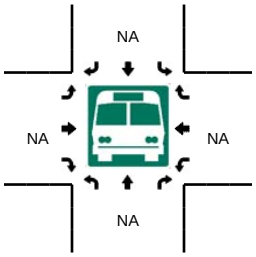












15-Min Count Period Beginning At	Arno Rd (Northbound)				Arno Rd (Southbound)				Murfreesboro Rd (Eastbound)				Murfreesboro Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	56	0	7	0	0	0	0	0	0	253	150	0	13	106	0	0	585	
4:15 PM	59	0	11	0	0	0	0	0	0	287	157	0	9	99	0	0	622	
4:30 PM	57	0	13	0	0	0	0	0	0	266	192	0	9	106	0	0	643	
4:45 PM	52	0	11	0	0	0	0	0	0	284	200	0	9	99	0	0	655	2505
5:00 PM	58	0	13	0	0	0	0	0	0	242	185	0	16	117	0	0	631	2551
5:15 PM	48	0	9	0	0	0	0	0	0	313	184	0	7	104	0	0	665	2594
5:30 PM	74	0	6	0	0	0	0	0	0	271	152	0	13	110	0	0	626	2577
5:45 PM	49	0	2	0	0	0	0	0	0	265	131	0	7	121	0	0	575	2497
6:00 PM	46	0	2	0	0	0	0	0	0	223	100	0	4	118	0	0	493	2359
6:15 PM	43	0	2	0	0	0	0	0	0	204	90	0	5	103	0	0	447	2141
6:30 PM	51	0	1	0	0	0	0	0	0	181	60	0	5	72	0	0	370	1885
6:45 PM	39	0	4	0	0	0	0	0	0	184	72	0	8	81	0	0	388	1698

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	192	0	36	0	0	0	0	0	0	1252	736	0	28	416	0	0	2660
Heavy Trucks	8	0	0		0	0	0		0	20	12		4	20	0		64
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

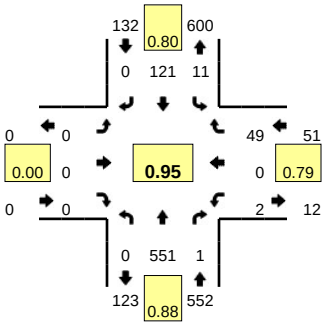
Method for determining peak hour: Total Entering Volume

LOCATION: Carothers Pkwy -- S Carothers Rd

CITY/STATE: Franklin, TN

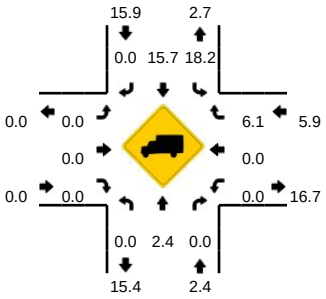
QC JOB #: 14408512

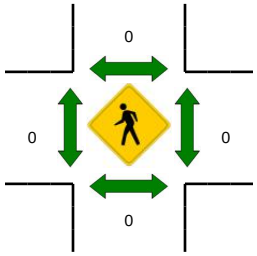
DATE: Wed, May 10 2017

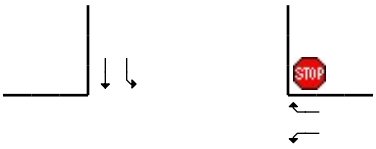


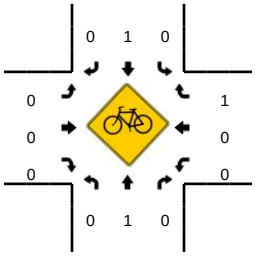
Peak-Hour: 7:15 AM -- 8:15 AM

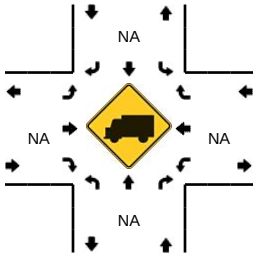
Peak 15-Min: 7:30 AM -- 7:45 AM

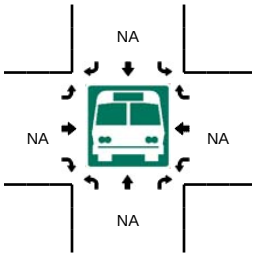












15-Min Count Period Beginning At	Carothers Pkwy (Northbound)				Carothers Pkwy (Southbound)				S Carothers Rd (Eastbound)				S Carothers Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	27	0	0	3	19	0	0	0	0	0	0	0	0	1	0	50	
6:15 AM	0	36	0	0	0	12	0	0	0	0	0	0	0	0	10	0	58	
6:30 AM	0	61	0	0	5	43	0	0	0	0	0	0	0	0	13	0	122	
6:45 AM	0	88	1	0	3	42	0	0	0	0	0	0	0	0	7	0	141	371
7:00 AM	0	102	0	0	4	31	0	0	0	0	0	0	0	0	7	0	144	465
7:15 AM	0	143	0	0	0	24	0	0	0	0	0	0	1	0	9	0	177	584
7:30 AM	0	155	1	0	2	22	0	0	0	0	0	0	0	0	14	0	194	656
7:45 AM	0	126	0	0	5	40	0	0	0	0	0	0	0	0	17	0	188	703
8:00 AM	0	127	0	0	4	35	0	0	0	0	0	0	1	0	9	0	176	735
8:15 AM	0	118	0	0	2	34	0	0	0	0	0	0	0	0	13	0	167	725
8:30 AM	0	64	0	0	1	32	0	0	0	0	0	0	0	0	13	0	110	641
8:45 AM	0	88	0	0	3	38	0	0	0	0	0	0	2	0	12	0	143	596
9:00 AM	0	67	0	0	7	39	0	0	0	0	0	0	0	0	9	0	122	542
9:15 AM	0	41	0	0	1	30	0	0	0	0	0	0	0	0	6	0	78	453
9:30 AM	0	49	1	0	6	36	0	1	0	0	0	0	0	0	3	0	96	439
9:45 AM	0	57	1	0	4	29	0	0	0	0	0	0	0	0	3	0	94	390
10:00 AM	0	36	0	0	9	42	0	0	0	0	0	0	1	0	3	0	91	359
10:15 AM	0	42	0	0	7	26	0	0	0	0	0	0	1	0	6	0	82	363
10:30 AM	0	43	1	0	2	37	0	0	0	0	0	0	0	0	3	0	86	353
10:45 AM	0	42	0	0	6	50	0	0	0	0	0	0	0	0	5	0	103	362

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	620	4	0	8	88	0	0	0	0	0	0	0	0	56	0	776
Heavy Trucks	0	12	0		4	12	0		0	0	0		0	0	8		36
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	1		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

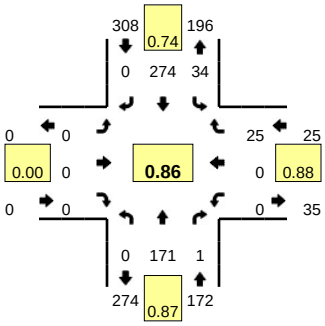
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

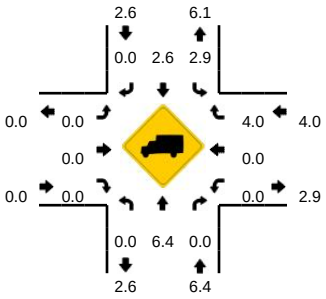
Method for determining peak hour: Total Entering Volume

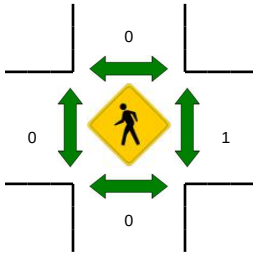
LOCATION: Carothers Pkwy -- S Carothers Rd
CITY/STATE: Franklin, TN

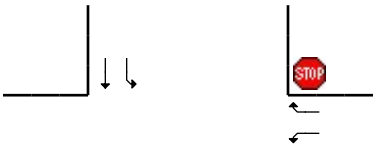
QC JOB #: 14408513
DATE: Wed, May 10 2017

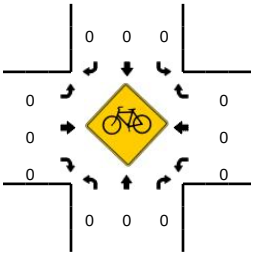


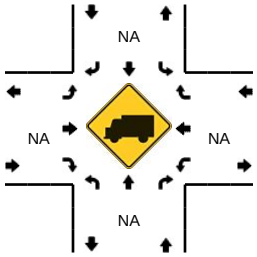
Peak-Hour: 3:00 PM -- 4:00 PM
Peak 15-Min: 3:45 PM -- 4:00 PM

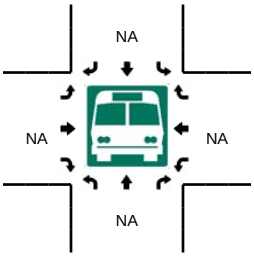












15-Min Count Period Beginning At	Carothers Pkwy (Northbound)				Carothers Pkwy (Southbound)				S Carothers Rd (Eastbound)				S Carothers Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
11:00 AM	0	54	2	0	3	32	0	0	0	0	0	0	0	0	4	0	95	
11:15 AM	0	58	0	0	8	43	0	0	0	0	0	0	0	0	8	0	117	
11:30 AM	0	42	2	0	7	46	0	0	0	0	0	0	1	0	8	0	106	
11:45 AM	0	61	3	0	6	54	0	0	0	0	0	0	1	0	6	0	131	449
12:00 PM	0	56	1	0	5	61	0	0	0	0	0	0	0	0	9	0	132	486
12:15 PM	0	42	0	0	11	63	0	0	0	0	0	0	0	0	10	0	126	495
12:30 PM	0	58	1	0	5	46	0	0	0	0	0	0	0	0	4	0	114	503
12:45 PM	0	47	1	0	3	60	0	0	0	0	0	0	2	0	6	0	119	491
1:00 PM	0	52	1	0	5	66	0	0	0	0	0	0	1	0	7	0	132	491
1:15 PM	0	56	0	0	10	59	0	0	0	0	0	0	1	0	12	0	138	503
1:30 PM	0	36	0	0	8	52	0	0	0	0	0	0	0	0	6	0	102	491
1:45 PM	0	42	1	0	9	66	0	0	0	0	0	0	0	0	7	0	125	497
2:00 PM	0	54	1	0	8	50	0	0	0	0	0	0	0	0	7	0	120	485
2:15 PM	0	41	1	0	3	57	0	1	0	0	0	0	0	0	9	0	112	459
2:30 PM	0	30	1	0	11	64	0	0	0	0	0	0	0	0	3	0	109	466
2:45 PM	0	43	0	0	8	54	0	0	0	0	0	0	0	0	9	0	114	455
3:00 PM	0	42	0	0	4	45	0	0	0	0	0	0	0	0	7	0	98	433
3:15 PM	0	51	0	0	9	72	0	0	0	0	0	0	0	0	9	0	141	462
3:30 PM	0	40	0	0	8	66	0	0	0	0	0	0	0	0	5	0	119	472
3:45 PM	0	38	1	0	13	91	0	0	0	0	0	0	0	0	4	0	147	505

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	152	4	0	52	364	0	0	0	0	0	0	0	0	16	0	588
Heavy Trucks	0	4	0		4	8	0		0	0	0		0	0	0		16
Pedestrians		0				0				0				4			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/22/2017 1:25 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

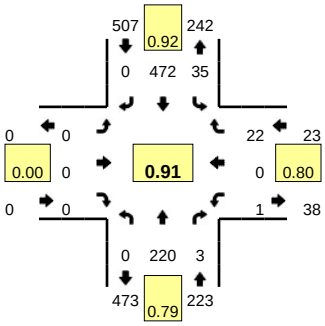
Method for determining peak hour: Total Entering Volume

LOCATION: Carothers Pkwy -- S Carothers Rd

CITY/STATE: Franklin, TN

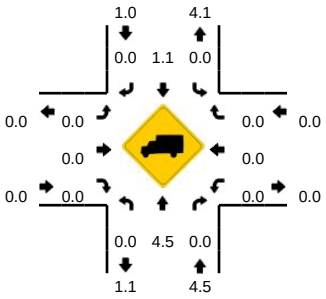
QC JOB #: 14408514

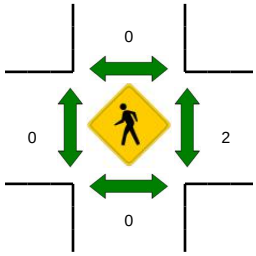
DATE: Wed, May 10 2017

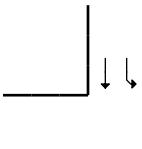


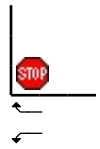
Peak-Hour: 5:00 PM -- 6:00 PM

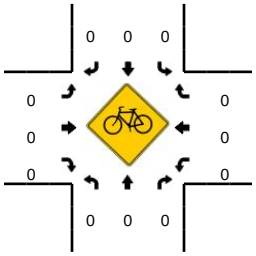
Peak 15-Min: 5:00 PM -- 5:15 PM

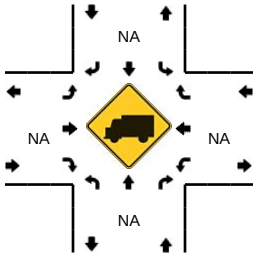


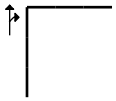


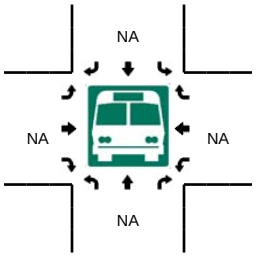












15-Min Count Period Beginning At	Carothers Pkwy (Northbound)				Carothers Pkwy (Southbound)				S Carothers Rd (Eastbound)				S Carothers Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	45	0	0	8	71	0	0	0	0	0	0	0	0	3	0	127	
4:15 PM	0	42	1	0	5	98	0	0	0	0	0	0	0	0	3	0	149	
4:30 PM	0	32	0	0	8	109	0	0	0	0	0	0	0	0	7	0	156	
4:45 PM	0	58	1	0	10	88	0	0	0	0	0	0	0	0	3	0	160	592
5:00 PM	0	70	1	0	9	122	0	0	0	0	0	0	0	0	4	0	206	671
5:15 PM	0	51	0	0	12	126	0	0	0	0	0	0	0	0	6	0	195	717
5:30 PM	0	47	2	0	8	117	0	0	0	0	0	0	1	0	9	0	184	745
5:45 PM	0	52	0	0	6	107	0	0	0	0	0	0	0	0	3	0	168	753
6:00 PM	0	73	0	0	3	96	0	0	0	0	0	0	0	0	9	0	181	728
6:15 PM	0	52	0	0	11	88	0	0	0	0	0	0	0	0	10	0	161	694
6:30 PM	0	54	0	0	9	73	0	0	0	0	0	0	1	0	6	0	143	653
6:45 PM	0	32	2	0	12	54	0	0	0	0	0	0	2	0	1	0	103	588

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	280	4	0	36	488	0	0	0	0	0	0	0	0	16	0	824
Heavy Trucks	0	8	0		0	12	0		0	0	0		0	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

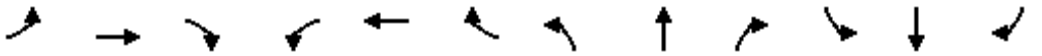
Comments:

Report generated on 5/22/2017 1:25 PM

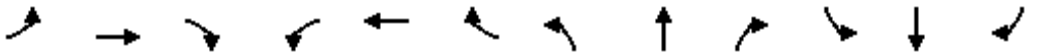
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

APPENDIX B
CAPACITY ANALYSES

EXISTING CONDITIONS (AM PEAK HOUR)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	359	470	171	22	1100	211	384	422	46	108	72	108
Future Volume (vph)	359	470	171	22	1100	211	384	422	46	108	72	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.976				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	4963	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.176			0.458			0.704			0.477		
Satd. Flow (perm)	636	3539	1583	853	4963	0	2544	3539	1583	1724	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186		103				50			33
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	390	511	186	24	1196	229	417	459	50	117	78	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	390	511	186	24	1425	0	417	459	50	117	78	117
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0

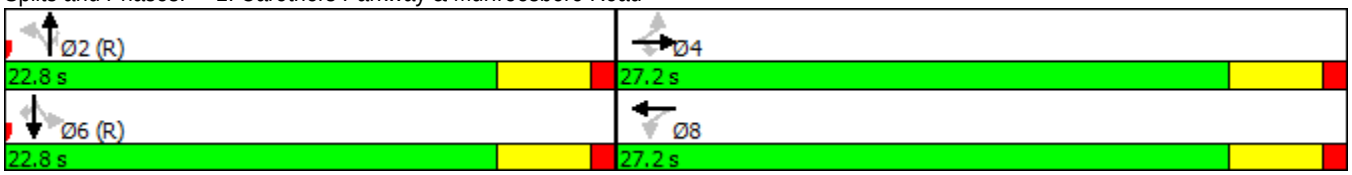


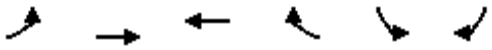
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.2	27.2	27.2	27.2	27.2		22.8	22.8	22.8	22.8	22.8	22.8
Total Split (%)	54.4%	54.4%	54.4%	54.4%	54.4%		45.6%	45.6%	45.6%	45.6%	45.6%	45.6%
Maximum Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.45		0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	1.35	0.32	0.23	0.06	0.62		0.45	0.35	0.08	0.19	0.06	0.20
Control Delay	201.2	9.4	2.5	6.9	8.3		13.9	12.5	4.3	11.8	10.5	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	201.2	9.4	2.5	6.9	8.3		13.9	12.5	4.3	11.8	10.5	9.3
LOS	F	A	A	A	A		B	B	A	B	B	A
Approach Delay		77.1			8.3			12.7			10.6	
Approach LOS		E			A			B			B	
90th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
70th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
50th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
30th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		18.3	18.3	18.3	18.3	18.3	18.3
10th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	272	273	21	11	696		273	286	12	68	45	54
Fuel Used(gal)	18	5	1	0	20		11	12	1	1	1	1
CO Emissions (g/hr)	1289	332	36	23	1432		801	864	79	72	47	59
NOx Emissions (g/hr)	251	65	7	4	279		156	168	15	14	9	11
VOC Emissions (g/hr)	299	77	8	5	332		186	200	18	17	11	14
Dilemma Vehicles (#)	0	47	0	0	114		0	42	0	0	7	0
Queue Length 50th (ft)	~80	46	0	3	89		45	49	0	11	7	16
Queue Length 95th (ft)	#150	73	25	m9	187		77	79	16	25	17	43
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	288	1606	820	387	2309		931	1295	611	630	1295	600
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.35	0.32	0.23	0.06	0.62		0.45	0.35	0.08	0.19	0.06	0.20

Intersection Summary		
Area Type:	Other	
Cycle Length: 50		
Actuated Cycle Length: 50		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.35		
Intersection Signal Delay: 29.4		Intersection LOS: C
Intersection Capacity Utilization 67.0%		ICU Level of Service C
Analysis Period (min) 15		
Description: Hwy 96 and Carothers Pkwy		

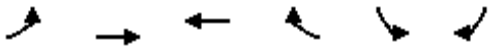
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





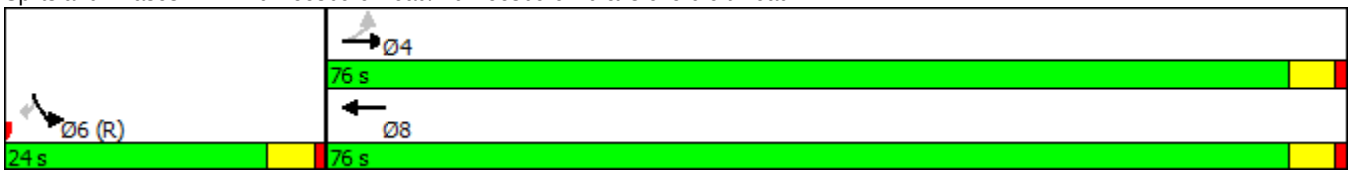
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	80	419	1651	52	79	142
Future Volume (vph)	80	419	1651	52	79	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3522	0	1770	1583
Flt Permitted	0.072				0.950	
Satd. Flow (perm)	134	3539	3522	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			37
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	455	1795	57	86	154
Shared Lane Traffic (%)						
Lane Group Flow (vph)	87	455	1852	0	86	154
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	76.0	76.0	76.0		24.0	24.0
Total Split (%)	76.0%	76.0%	76.0%		24.0%	24.0%
Maximum Green (s)	71.5	71.5	71.5		19.5	19.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	71.6	71.6	71.6		19.4	19.4
Actuated g/C Ratio	0.72	0.72	0.72		0.19	0.19
v/c Ratio	0.92	0.18	0.73		0.25	0.46
Control Delay	90.9	4.7	10.5		38.6	33.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	90.9	4.7	10.5		38.6	33.5
LOS	F	A	B		D	C
Approach Delay		18.5	10.5		35.4	
Approach LOS		B	B		D	
90th %ile Green (s)	72.2	72.2	72.2		18.8	18.8
90th %ile Term Code	Max	Max	Max		Coord	Coord
70th %ile Green (s)	75.7	75.7	75.7		15.3	15.3
70th %ile Term Code	Max	Max	Hold		Coord	Coord
50th %ile Green (s)	78.2	78.2	78.2		12.8	12.8
50th %ile Term Code	Max	Max	Hold		Coord	Coord
30th %ile Green (s)	73.4	73.4	73.4		17.6	17.6
30th %ile Term Code	Gap	Gap	Hold		Coord	Coord
10th %ile Green (s)	58.4	58.4	58.4		32.6	32.6
10th %ile Term Code	Hold	Hold	Gap		Coord	Coord
Stops (vph)	58	149	913		67	98
Fuel Used(gal)	3	5	17		1	2
CO Emissions (g/hr)	195	372	1172		103	159
NOx Emissions (g/hr)	38	72	228		20	31
VOC Emissions (g/hr)	45	86	272		24	37
Dilemma Vehicles (#)	0	7	72		0	0
Queue Length 50th (ft)	30	50	224		51	71
Queue Length 95th (ft)	#156	78	390		92	129
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	99	2626	2615		391	378
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.88	0.17	0.71		0.22	0.41

Intersection Summary		
Area Type:	Other	
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 84 (84%), Referenced to phase 2: and 6:SBL, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.92		
Intersection Signal Delay: 14.4		Intersection LOS: B
Intersection Capacity Utilization 67.4%		ICU Level of Service C
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road

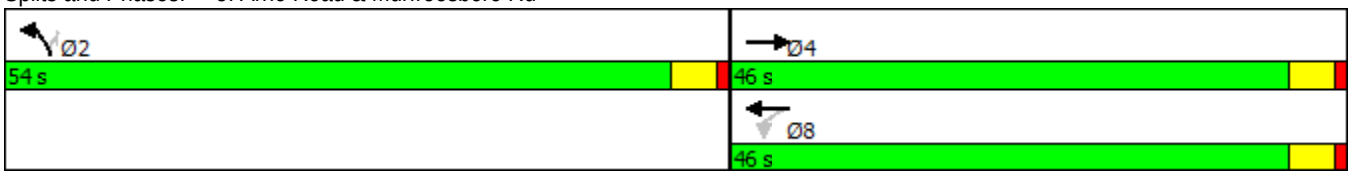


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	251	226	61	1073	580	41
Future Volume (vph)	251	226	61	1073	580	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.929					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3288	0	1770	3539	1770	1583
Flt Permitted			0.416		0.950	
Satd. Flow (perm)	3288	0	775	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	246					45
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	273	246	66	1166	630	45
Shared Lane Traffic (%)						
Lane Group Flow (vph)	519	0	66	1166	630	45
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	46.0		46.0	46.0	54.0	54.0
Total Split (%)	46.0%		46.0%	46.0%	54.0%	54.0%
Maximum Green (s)	41.5		41.5	41.5	49.5	49.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Min	Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	32.4		32.4	32.4	33.5	33.5
Actuated g/C Ratio	0.43		0.43	0.43	0.44	0.44
v/c Ratio	0.34		0.20	0.77	0.80	0.06
Control Delay	8.7		18.0	23.7	27.9	4.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	8.7		18.0	23.7	27.9	4.5
LOS	A		B	C	C	A
Approach Delay	8.7			23.4	26.3	
Approach LOS	A			C	C	
90th %ile Green (s)	41.5		41.5	41.5	49.5	49.5
90th %ile Term Code	Hold		Max	Max	Max	Max
70th %ile Green (s)	41.5		41.5	41.5	41.9	41.9
70th %ile Term Code	Hold		Max	Max	Gap	Gap
50th %ile Green (s)	33.2		33.2	33.2	34.1	34.1
50th %ile Term Code	Hold		Gap	Gap	Gap	Gap
30th %ile Green (s)	26.9		26.9	26.9	26.7	26.7
30th %ile Term Code	Hold		Gap	Gap	Gap	Gap
10th %ile Green (s)	19.2		19.2	19.2	18.5	18.5
10th %ile Term Code	Hold		Gap	Gap	Gap	Gap
Stops (vph)	144		37	846	460	6
Fuel Used(gal)	7		1	16	13	0
CO Emissions (g/hr)	520		50	1128	899	22
NOx Emissions (g/hr)	101		10	220	175	4
VOC Emissions (g/hr)	120		11	262	208	5
Dilemma Vehicles (#)	25		0	63	0	0
Queue Length 50th (ft)	40		19	235	246	0
Queue Length 95th (ft)	95		57	420	441	18
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	2046		458	2094	1228	1112
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.25		0.14	0.56	0.51	0.04

Intersection Summary		
Area Type:	Other	
Cycle Length: 100		
Actuated Cycle Length: 75.6		
Natural Cycle: 45		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.80		
Intersection Signal Delay: 21.1		Intersection LOS: C
Intersection Capacity Utilization 69.3%		ICU Level of Service C
Analysis Period (min) 15		
90th %ile Actuated Cycle: 100		
70th %ile Actuated Cycle: 92.4		
50th %ile Actuated Cycle: 76.3		
30th %ile Actuated Cycle: 62.6		
10th %ile Actuated Cycle: 46.7		

Splits and Phases: 5: Arno Road & Murfreesboro Rd



HCS7 Two-Way Stop-Control Report

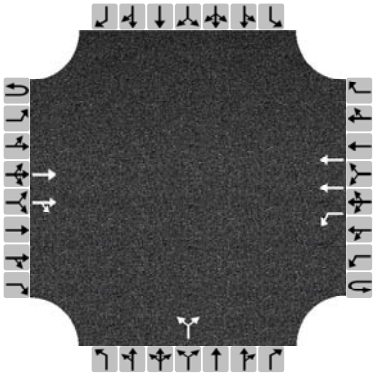
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			486	8		2	1675			36		3				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						2					43					
Capacity, c (veh/h)						1031					215					
v/c Ratio						0.00					0.20					
95% Queue Length, Q_{95} (veh)						0.0					0.7					
Control Delay (s/veh)						8.5					25.9					
Level of Service, LOS						A					D					
Approach Delay (s/veh)						0.0				25.9						
Approach LOS										D						

HCS7 Two-Way Stop-Control Report

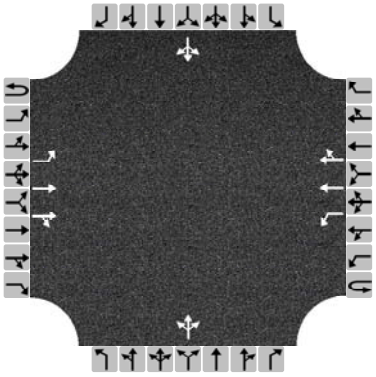
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		15	482	2		0	1641	10		7	0	2		11	0	48
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		17				0					10				66	
Capacity, c (veh/h)		331				1035					190				177	
v/c Ratio		0.05				0.00					0.05				0.37	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.2				1.6	
Control Delay (s/veh)		16.5				8.5					25.0				37.1	
Level of Service, LOS		C				A					C				E	
Approach Delay (s/veh)		0.5				0.0				25.0				37.1		
Approach LOS										C				E		

HCS7 Two-Way Stop-Control Report

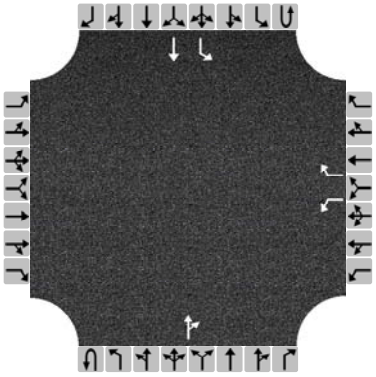
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	10647 (Existing)

Site Information

Intersection	Carothers and S. Carother
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road
North/South Street	Carothers Parkway
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						2		49			551	1		11	121	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

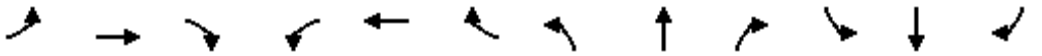
Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

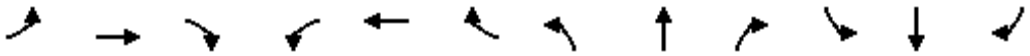
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						2		52						12		
Capacity, c (veh/h)						387		512						1003		
v/c Ratio						0.01		0.10						0.01		
95% Queue Length, Q_{95} (veh)						0.0		0.3						0.0		
Control Delay (s/veh)						14.4		12.8						8.6		
Level of Service, LOS						B		B						A		
Approach Delay (s/veh)						12.9								0.7		
Approach LOS						B										

EXISTING CONDITIONS (PM PEAK HOUR)



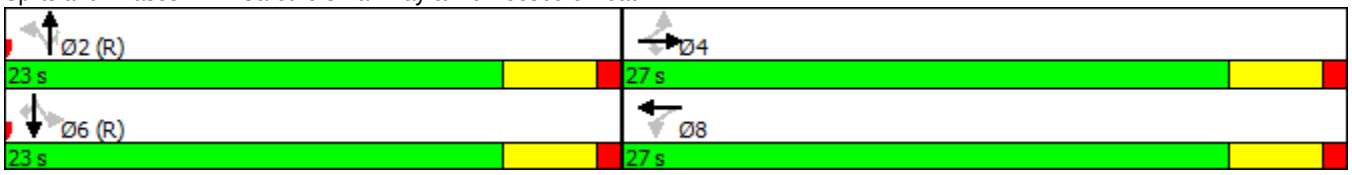
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	1295	410	37	725	91	301	109	52	638	315	294
Future Volume (vph)	105	1295	410	37	725	91	301	109	52	638	315	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.983				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	4999	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.287			0.178			0.546			0.677		
Satd. Flow (perm)	1037	3539	1583	332	4999	0	1973	3539	1583	2446	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			329		57				33			107
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	1408	446	40	788	99	327	118	57	693	342	320
Shared Lane Traffic (%)												
Lane Group Flow (vph)	114	1408	446	40	887	0	327	118	57	693	342	320
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0

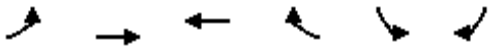


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	27.0	27.0	27.0		23.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	54.0%	54.0%	54.0%	54.0%	54.0%		46.0%	46.0%	46.0%	46.0%	46.0%	46.0%
Maximum Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.45		0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	0.24	0.88	0.50	0.27	0.39		0.45	0.09	0.09	0.77	0.26	0.49
Control Delay	10.3	21.7	5.0	12.1	8.1		14.3	10.6	6.7	21.3	11.7	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	21.7	5.0	12.1	8.1		14.3	10.6	6.7	21.3	11.7	10.9
LOS	B	C	A	B	A		B	B	A	C	B	B
Approach Delay		17.2			8.3			12.6			16.4	
Approach LOS		B			A			B			B	
90th %ile Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
70th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
50th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
30th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	22.5	22.5	22.5	22.5	22.5		18.5	18.5	18.5	18.5	18.5	18.5
10th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	63	1038	88	26	509		215	66	21	515	203	146
Fuel Used(gal)	1	20	2	1	14		9	3	1	8	3	2
CO Emissions (g/hr)	77	1390	134	48	955		630	216	95	592	214	167
NOx Emissions (g/hr)	15	270	26	9	186		123	42	18	115	42	32
VOC Emissions (g/hr)	18	322	31	11	221		146	50	22	137	50	39
Dilemma Vehicles (#)	0	125	0	0	66		0	11	0	0	31	0
Queue Length 50th (ft)	9	184	19	9	84		35	11	4	88	35	44
Queue Length 95th (ft)	23	#317	64	18	67		64	24	22	#165	59	100
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	466	1592	893	149	2280		730	1309	606	905	1309	653
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.88	0.50	0.27	0.39		0.45	0.09	0.09	0.77	0.26	0.49

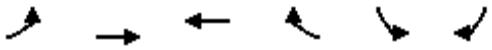
Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 14.8		Intersection LOS: B	
Intersection Capacity Utilization 77.3%		ICU Level of Service D	
Analysis Period (min) 15			
Description: Hwy 96 and Carothers Pkwy			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





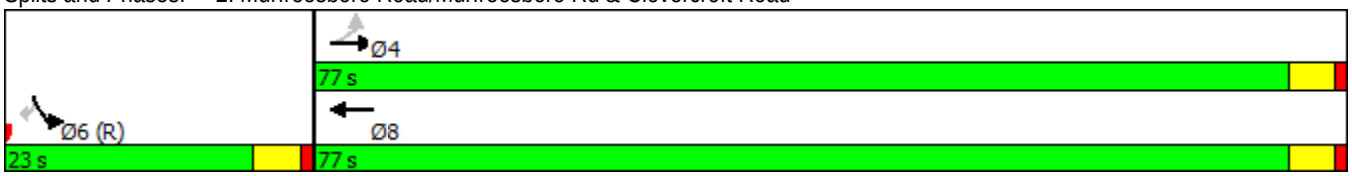
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	171	1922	680	36	43	110
Future Volume (vph)	171	1922	680	36	43	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.992			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3511	0	1770	1583
Flt Permitted	0.342				0.950	
Satd. Flow (perm)	637	3539	3511	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			14			120
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	186	2089	739	39	47	120
Shared Lane Traffic (%)						
Lane Group Flow (vph)	186	2089	778	0	47	120
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	77.0	77.0	77.0		23.0	23.0
Total Split (%)	77.0%	77.0%	77.0%		23.0%	23.0%
Maximum Green (s)	72.5	72.5	72.5		18.5	18.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	74.1	74.1	74.1		16.9	16.9
Actuated g/C Ratio	0.74	0.74	0.74		0.17	0.17
v/c Ratio	0.39	0.80	0.30		0.16	0.33
Control Delay	6.1	9.9	5.1		38.5	10.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	6.1	9.9	5.1		38.5	10.2
LOS	A	A	A		D	B
Approach Delay		9.6	5.1		18.1	
Approach LOS		A	A		B	
90th %ile Green (s)	80.0	80.0	80.0		11.0	11.0
90th %ile Term Code	Max	Max	Hold		Coord	Coord
70th %ile Green (s)	71.3	71.3	71.3		19.7	19.7
70th %ile Term Code	Gap	Gap	Hold		Coord	Coord
50th %ile Green (s)	72.4	72.4	72.4		18.6	18.6
50th %ile Term Code	Gap	Gap	Hold		Coord	Coord
30th %ile Green (s)	75.2	75.2	75.2		15.8	15.8
30th %ile Term Code	Gap	Gap	Hold		Coord	Coord
10th %ile Green (s)	71.6	71.6	71.6		19.4	19.4
10th %ile Term Code	Gap	Gap	Hold		Coord	Coord
Stops (vph)	63	1093	191		38	20
Fuel Used(gal)	2	32	4		1	1
CO Emissions (g/hr)	157	2207	270		57	48
NOx Emissions (g/hr)	31	429	52		11	9
VOC Emissions (g/hr)	36	512	63		13	11
Dilemma Vehicles (#)	0	84	39		0	0
Queue Length 50th (ft)	38	413	103		25	0
Queue Length 95th (ft)	m34	351	41		64	52
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	474	2637	2620		335	397
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.39	0.79	0.30		0.14	0.30

Intersection Summary		
Area Type:	Other	
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 34 (34%), Referenced to phase 2: and 6:SBL, Start of Green		
Natural Cycle: 75		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.80		
Intersection Signal Delay: 9.0		Intersection LOS: A
Intersection Capacity Utilization 64.8%		ICU Level of Service C
Analysis Period (min) 15		
m Volume for 95th percentile queue is metered by upstream signal.		

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1105	761	41	426	215	46
Future Volume (vph)	1105	761	41	426	215	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.939					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3323	0	1770	3539	1770	1583
Flt Permitted			0.058		0.950	
Satd. Flow (perm)	3323	0	108	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	407					50
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1201	827	45	463	234	50
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2028	0	45	463	234	50
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	74.0		74.0	74.0	26.0	26.0
Total Split (%)	74.0%		74.0%	74.0%	26.0%	26.0%
Maximum Green (s)	69.5		69.5	69.5	21.5	21.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Min	C-Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	68.7		68.7	68.7	22.3	22.3
Actuated g/C Ratio	0.69		0.69	0.69	0.22	0.22
v/c Ratio	0.84		0.61	0.19	0.60	0.13
Control Delay	6.6		48.1	5.7	42.7	10.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	6.6		48.1	5.7	42.7	10.2
LOS	A		D	A	D	B
Approach Delay	6.6			9.4	36.9	
Approach LOS	A			A	D	
90th %ile Green (s)	69.5		69.5	69.5	21.5	21.5
90th %ile Term Code	Max		Max	Max	Coord	Coord
70th %ile Green (s)	70.1		70.1	70.1	20.9	20.9
70th %ile Term Code	Max		Max	Max	Coord	Coord
50th %ile Green (s)	70.9		70.9	70.9	20.1	20.1
50th %ile Term Code	Gap		Hold	Hold	Coord	Coord
30th %ile Green (s)	70.0		70.0	70.0	21.0	21.0
30th %ile Term Code	Gap		Hold	Hold	Coord	Coord
10th %ile Green (s)	63.2		63.2	63.2	27.8	27.8
10th %ile Term Code	Gap		Hold	Hold	Coord	Coord
Stops (vph)	988		27	138	191	11
Fuel Used(gal)	34		1	2	6	0
CO Emissions (g/hr)	2346		53	167	401	32
NOx Emissions (g/hr)	456		10	32	78	6
VOC Emissions (g/hr)	544		12	39	93	8
Dilemma Vehicles (#)	51		0	19	0	0
Queue Length 50th (ft)	35		12	44	138	0
Queue Length 95th (ft)	263		#83	65	217	30
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	2448		75	2477	402	398
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.83		0.60	0.19	0.58	0.13

Intersection Summary		
Area Type:	Other	
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 64 (64%), Referenced to phase 2:NBL and 6:, Start of Green		
Natural Cycle: 70		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.84		
Intersection Signal Delay: 10.2		Intersection LOS: B
Intersection Capacity Utilization 74.4%		ICU Level of Service D
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 5: Arno Road & Murfreesboro Rd

HCS7 Two-Way Stop-Control Report

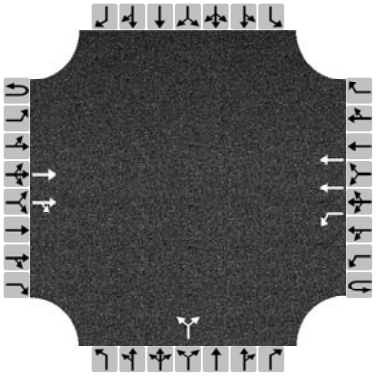
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			1919	40		4	694			17		1				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No				No				No				No	
Median Type/Storage			Left Only								1					

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					19					
Capacity, c (veh/h)						286					57					
v/c Ratio						0.01					0.33					
95% Queue Length, Q_{95} (veh)						0.0					1.2					
Control Delay (s/veh)						17.8					96.3					
Level of Service, LOS						C					F					
Approach Delay (s/veh)						0.1				96.3						
Approach LOS										F						

HCS7 Two-Way Stop-Control Report

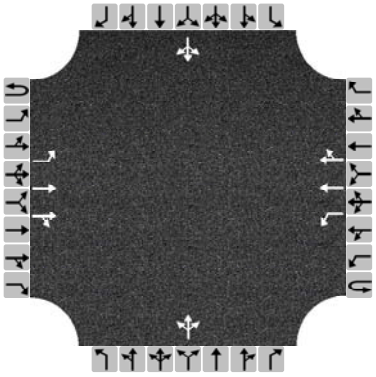
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		51	1862	5		1	646	4		10	0	1		6	0	33
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		53				1					11				40	
Capacity, c (veh/h)		930				311					54				447	
v/c Ratio		0.06				0.00					0.21				0.09	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.7				0.3	
Control Delay (s/veh)		9.1				16.6					88.7				13.8	
Level of Service, LOS		A				C					F				B	
Approach Delay (s/veh)		0.2				0.0				88.7				13.8		
Approach LOS										F				B		

HCS7 Two-Way Stop-Control Report

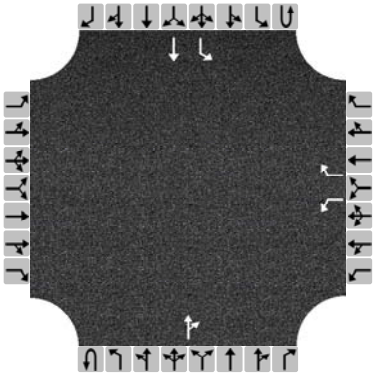
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	10647 (Existing)

Site Information

Intersection	Carothers and S. Carother
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road
North/South Street	Carothers Parkway
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						1		22			220	3		35	472	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

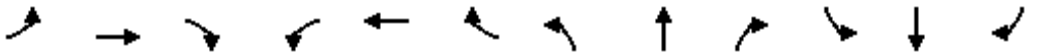
Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

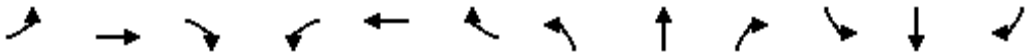
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1		24						38		
Capacity, c (veh/h)						329		792						1333		
v/c Ratio						0.00		0.03						0.03		
95% Queue Length, Q_{95} (veh)						0.0		0.1						0.1		
Control Delay (s/veh)						16.0		9.7						7.8		
Level of Service, LOS						C		A						A		
Approach Delay (s/veh)						9.9								0.5		
Approach LOS						A										

BACKGROUND CONDITIONS (AM PEAK HOUR)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	395	529	215	31	1223	232	507	546	56	119	99	119
Future Volume (vph)	395	529	215	31	1223	232	507	546	56	119	99	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.976				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	4963	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.222			0.412			0.684			0.400		
Satd. Flow (perm)	802	3539	1583	767	4963	0	2472	3539	1583	1445	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			234		103				61			36
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	429	575	234	34	1329	252	551	593	61	129	108	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	429	575	234	34	1581	0	551	593	61	129	108	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0

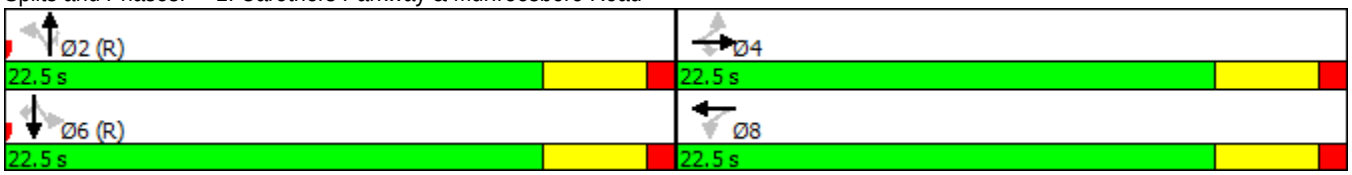


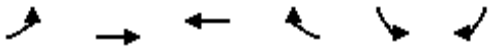
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40		0.40	0.40	0.40	0.40	0.40	0.40
v/c Ratio	1.34	0.41	0.30	0.11	0.77		0.56	0.42	0.09	0.22	0.08	0.20
Control Delay	193.7	10.8	2.9	9.4	13.1		13.1	10.9	3.5	10.2	8.6	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	193.7	10.8	2.9	9.4	13.1		13.1	10.9	3.5	10.2	8.6	7.7
LOS	F	B	A	A	B		B	B	A	B	A	A
Approach Delay		72.7			13.1			11.5			8.9	
Approach LOS		E			B			B			A	
90th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
70th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
50th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
30th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
10th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	307	346	28	21	1121		364	361	13	74	57	55
Fuel Used(gal)	20	6	1	1	29		15	16	1	1	1	1
CO Emissions (g/hr)	1382	418	48	38	1993		1054	1101	94	76	58	59
NOx Emissions (g/hr)	269	81	9	7	388		205	214	18	15	11	12
VOC Emissions (g/hr)	320	97	11	9	462		244	255	22	18	13	14
Dilemma Vehicles (#)	0	59	0	0	131		0	61	0	0	11	0
Queue Length 50th (ft)	~78	52	0	8	135		53	54	0	10	8	14
Queue Length 95th (ft)	#146	84	30	m10	185		89	86	15	24	19	39
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	320	1415	773	306	2047		988	1415	669	578	1415	654
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.34	0.41	0.30	0.11	0.77		0.56	0.42	0.09	0.22	0.08	0.20

Intersection Summary		
Area Type:	Other	
Cycle Length: 45		
Actuated Cycle Length: 45		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection		
Natural Cycle: 45		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.34		
Intersection Signal Delay: 29.0		Intersection LOS: C
Intersection Capacity Utilization 74.3%		ICU Level of Service D
Analysis Period (min) 15		
Description: Hwy 96 and Carothers Pkwy		

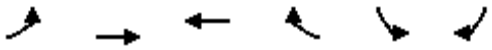
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





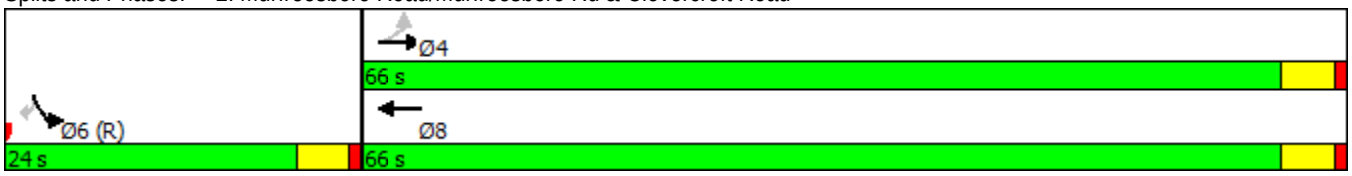
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	88	478	1836	57	87	156
Future Volume (vph)	88	478	1836	57	87	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3522	0	1770	1583
Flt Permitted	0.060				0.950	
Satd. Flow (perm)	112	3539	3522	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			20
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	520	1996	62	95	170
Shared Lane Traffic (%)						
Lane Group Flow (vph)	96	520	2058	0	95	170
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	66.0	66.0	66.0		24.0	24.0
Total Split (%)	73.3%	73.3%	73.3%		26.7%	26.7%
Maximum Green (s)	61.5	61.5	61.5		19.5	19.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	67.2	67.2	67.2		13.8	13.8
Actuated g/C Ratio	0.75	0.75	0.75		0.15	0.15
v/c Ratio	1.16	0.20	0.78		0.35	0.65
Control Delay	171.1	2.2	6.1		36.2	42.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	171.1	2.2	6.1		36.2	42.8
LOS	F	A	A		D	D
Approach Delay		28.5	6.1		40.5	
Approach LOS		C	A		D	
90th %ile Green (s)	61.5	61.5	61.5		19.5	19.5
90th %ile Term Code	Max	Max	Max		Coord	Coord
70th %ile Green (s)	64.7	64.7	64.7		16.3	16.3
70th %ile Term Code	Max	Max	Max		Coord	Coord
50th %ile Green (s)	67.1	67.1	67.1		13.9	13.9
50th %ile Term Code	Max	Max	Hold		Coord	Coord
30th %ile Green (s)	69.5	69.5	69.5		11.5	11.5
30th %ile Term Code	Max	Max	Hold		Coord	Coord
10th %ile Green (s)	73.1	73.1	73.1		7.9	7.9
10th %ile Term Code	Max	Max	Hold		Coord	Coord
Stops (vph)	63	60	663		74	125
Fuel Used(gal)	4	4	13		2	3
CO Emissions (g/hr)	314	312	878		110	207
NOx Emissions (g/hr)	61	61	171		21	40
VOC Emissions (g/hr)	73	72	203		26	48
Dilemma Vehicles (#)	0	22	41		0	0
Queue Length 50th (ft)	~66	19	213		49	81
Queue Length 95th (ft)	#171	31	248		88	137
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	83	2641	2631		383	358
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	1.16	0.20	0.78		0.25	0.47

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 14 (16%), Referenced to phase 2: and 6:SBL, Start of Green		
Natural Cycle: 140		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.16		
Intersection Signal Delay: 13.9		Intersection LOS: B
Intersection Capacity Utilization 73.5%		ICU Level of Service D
Analysis Period (min) 15		
~ Volume exceeds capacity, queue is theoretically infinite.		
Queue shown is maximum after two cycles.		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road

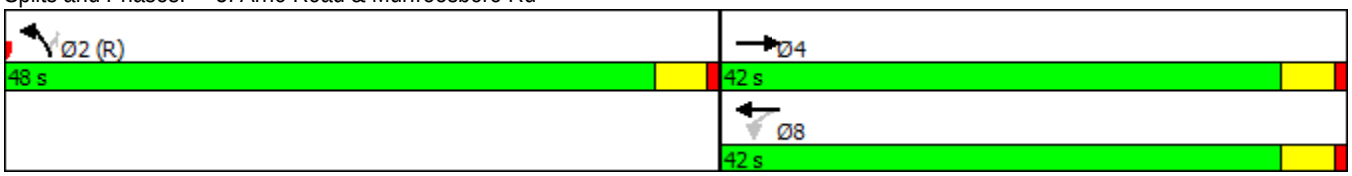


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	283	250	67	1190	638	45
Future Volume (vph)	283	250	67	1190	638	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.930					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3291	0	1770	3539	1770	1583
Flt Permitted			0.361		0.950	
Satd. Flow (perm)	3291	0	672	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	272					49
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	308	272	73	1293	693	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	580	0	73	1293	693	49
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	42.0		42.0	42.0	48.0	48.0
Total Split (%)	46.7%		46.7%	46.7%	53.3%	53.3%
Maximum Green (s)	37.5		37.5	37.5	43.5	43.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Min	C-Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	37.3		37.3	37.3	43.7	43.7
Actuated g/C Ratio	0.41		0.41	0.41	0.49	0.49
v/c Ratio	0.38		0.26	0.88	0.81	0.06
Control Delay	14.1		20.2	32.9	28.9	4.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	14.1		20.2	32.9	28.9	4.1
LOS	B		C	C	C	A
Approach Delay	14.1			32.2	27.3	
Approach LOS	B			C	C	
90th %ile Green (s)	37.5		37.5	37.5	43.5	43.5
90th %ile Term Code	Hold		Max	Max	Coord	Coord
70th %ile Green (s)	37.5		37.5	37.5	43.5	43.5
70th %ile Term Code	Hold		Max	Max	Coord	Coord
50th %ile Green (s)	39.4		39.4	39.4	41.6	41.6
50th %ile Term Code	Hold		Max	Max	Coord	Coord
30th %ile Green (s)	38.2		38.2	38.2	42.8	42.8
30th %ile Term Code	Hold		Gap	Gap	Coord	Coord
10th %ile Green (s)	33.7		33.7	33.7	47.3	47.3
10th %ile Term Code	Hold		Gap	Gap	Coord	Coord
Stops (vph)	314		43	1027	517	7
Fuel Used(gal)	11		1	21	14	0
CO Emissions (g/hr)	755		59	1484	1010	24
NOx Emissions (g/hr)	147		11	289	197	5
VOC Emissions (g/hr)	175		14	344	234	6
Dilemma Vehicles (#)	13		0	60	0	0
Queue Length 50th (ft)	57		25	332	336	0
Queue Length 95th (ft)	96		60	#456	#498	18
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	1547		284	1495	870	803
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.37		0.26	0.86	0.80	0.06

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 68 (76%), Referenced to phase 2:NBL and 6:, Start of Green		
Natural Cycle: 65		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.88		
Intersection Signal Delay: 26.9		Intersection LOS: C
Intersection Capacity Utilization 75.7%		ICU Level of Service D
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 5: Arno Road & Murfreesboro Rd



HCS7 Two-Way Stop-Control Report

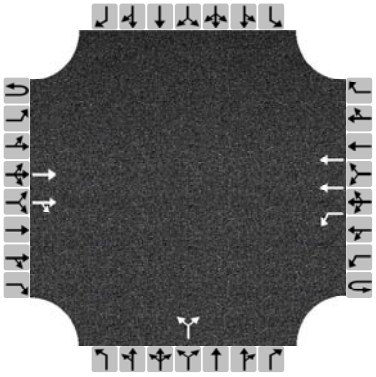
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Background)

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			552	9		2	1863			40		3				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						2					47					
Capacity, c (veh/h)						968					182					
v/c Ratio						0.00					0.26					
95% Queue Length, Q_{95} (veh)						0.0					1.0					
Control Delay (s/veh)						8.7					31.5					
Level of Service, LOS						A					D					
Approach Delay (s/veh)						0.0				31.5						
Approach LOS										D						

HCS7 Two-Way Stop-Control Report

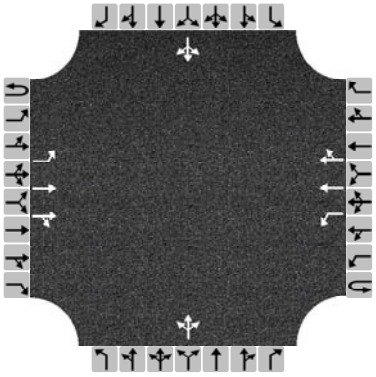
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Background)

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		17	544	5		1	1816	11		17	0	4		12	0	53
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		19				1					23				73	
Capacity, c (veh/h)		278				973					147				143	
v/c Ratio		0.07				0.00					0.16				0.51	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.5				2.4	
Control Delay (s/veh)		18.9				8.7					33.9				53.6	
Level of Service, LOS		C				A					D				F	
Approach Delay (s/veh)		0.6				0.0				33.9				53.6		
Approach LOS										D				F		

HCS7 Two-Way Stop-Control Report

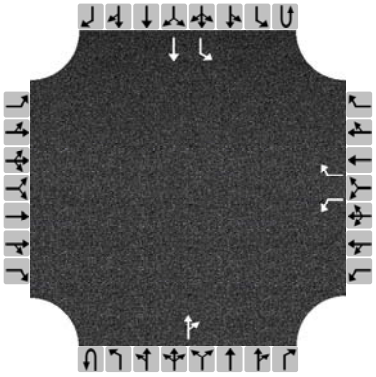
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	10647 (Background)

Site Information

Intersection	Carothers and S. Carother
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road
North/South Street	Carothers Parkway
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						37		146			665	30		97	322	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

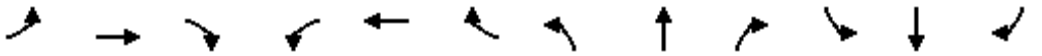
Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

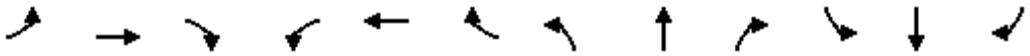
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						39		154						102		
Capacity, c (veh/h)						168		428						882		
v/c Ratio						0.23		0.36						0.12		
95% Queue Length, Q_{95} (veh)						0.9		1.6						0.4		
Control Delay (s/veh)						32.7		18.1						9.6		
Level of Service, LOS						D		C						A		
Approach Delay (s/veh)						21.0								2.2		
Approach LOS						C										

BACKGROUND CONDITIONS (PM PEAK HOUR)



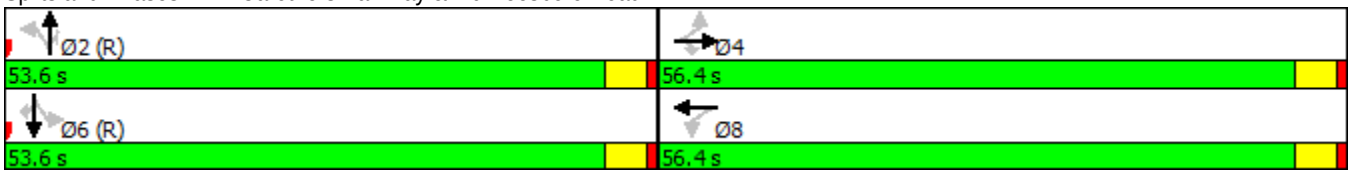
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	1443	520	45	816	100	388	157	71	702	461	323
Future Volume (vph)	116	1443	520	45	816	100	388	157	71	702	461	323
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.984				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	5004	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.221			0.077			0.411			0.644		
Satd. Flow (perm)	799	3539	1583	143	5004	0	1485	3539	1583	2327	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			253		26				15			90
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	126	1568	565	49	887	109	422	171	77	763	501	351
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	1568	565	49	996	0	422	171	77	763	501	351
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0

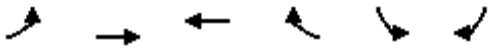


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	56.4	56.4	56.4	56.4	56.4		53.6	53.6	53.6	53.6	53.6	53.6
Total Split (%)	51.3%	51.3%	51.3%	51.3%	51.3%		48.7%	48.7%	48.7%	48.7%	48.7%	48.7%
Maximum Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
Actuated g/C Ratio	0.47	0.47	0.47	0.47	0.47		0.45	0.45	0.45	0.45	0.45	0.45
v/c Ratio	0.34	0.94	0.64	0.73	0.42		0.64	0.11	0.11	0.74	0.32	0.46
Control Delay	21.4	39.9	15.3	81.4	17.8		29.0	18.0	14.8	30.3	20.3	17.7
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	39.9	15.3	81.4	17.8		29.0	18.0	14.8	30.3	20.3	17.7
LOS	C	D	B	F	B		C	B	B	C	C	B
Approach Delay		32.7			20.7			24.5			24.5	
Approach LOS		C			C			C			C	
90th %ile Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
70th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
50th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
30th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	51.9	51.9	51.9	51.9	51.9		49.1	49.1	49.1	49.1	49.1	49.1
10th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	72	1263	229	33	498		296	87	33	565	285	166
Fuel Used(gal)	2	29	5	1	16		13	5	2	11	5	3
CO Emissions (g/hr)	106	2015	348	104	1134		903	324	140	740	361	218
NOx Emissions (g/hr)	21	392	68	20	221		176	63	27	144	70	42
VOC Emissions (g/hr)	25	467	81	24	263		209	75	32	171	84	51
Dilemma Vehicles (#)	0	64	0	0	69		0	7	0	0	21	0
Queue Length 50th (ft)	27	536	159	23	142		115	36	25	223	116	123
Queue Length 95th (ft)	52	#707	281	#106	200		173	57	54	299	157	203
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	376	1669	880	67	2374		662	1579	714	1038	1579	756
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.94	0.64	0.73	0.42		0.64	0.11	0.11	0.74	0.32	0.46

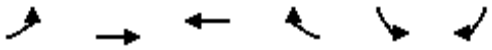
Intersection Summary		
Area Type:	Other	
Cycle Length: 110		
Actuated Cycle Length: 110		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection		
Natural Cycle: 60		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.94		
Intersection Signal Delay: 27.1		Intersection LOS: C
Intersection Capacity Utilization 83.4%		ICU Level of Service E
Analysis Period (min) 15		
Description: Hwy 96 and Carothers Pkwy		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





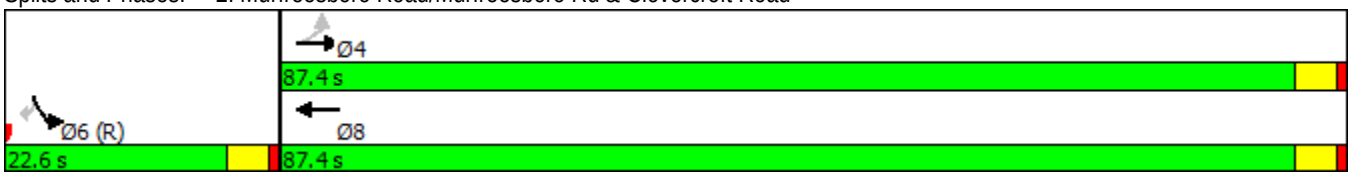
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	188	2146	770	40	47	121
Future Volume (vph)	188	2146	770	40	47	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.993			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3514	0	1770	1583
Flt Permitted	0.309				0.950	
Satd. Flow (perm)	576	3539	3514	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			14			132
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	204	2333	837	43	51	132
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	2333	880	0	51	132
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	87.4	87.4	87.4		22.6	22.6
Total Split (%)	79.5%	79.5%	79.5%		20.5%	20.5%
Maximum Green (s)	82.9	82.9	82.9		18.1	18.1
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	86.4	86.4	86.4		14.6	14.6
Actuated g/C Ratio	0.79	0.79	0.79		0.13	0.13
v/c Ratio	0.45	0.84	0.32		0.22	0.41
Control Delay	5.1	7.5	2.5		46.1	12.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	5.1	7.5	2.5		46.1	12.2
LOS	A	A	A		D	B
Approach Delay		7.3	2.5		21.6	
Approach LOS		A	A		C	
90th %ile Green (s)	89.3	89.3	89.3		11.7	11.7
90th %ile Term Code	Max	Max	Hold		Coord	Coord
70th %ile Green (s)	91.2	91.2	91.2		9.8	9.8
70th %ile Term Code	Max	Max	Hold		Coord	Coord
50th %ile Green (s)	78.2	78.2	78.2		22.8	22.8
50th %ile Term Code	Gap	Gap	Hold		Coord	Coord
30th %ile Green (s)	84.8	84.8	84.8		16.2	16.2
30th %ile Term Code	Gap	Gap	Hold		Coord	Coord
10th %ile Green (s)	88.6	88.6	88.6		12.4	12.4
10th %ile Term Code	Gap	Gap	Hold		Coord	Coord
Stops (vph)	44	786	131		41	20
Fuel Used(gal)	2	29	3		1	1
CO Emissions (g/hr)	148	2012	201		67	55
NOx Emissions (g/hr)	29	391	39		13	11
VOC Emissions (g/hr)	34	466	47		16	13
Dilemma Vehicles (#)	0	79	21		0	0
Queue Length 50th (ft)	56	460	70		30	0
Queue Length 95th (ft)	m27	m227	49		72	57
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	457	2810	2793		306	382
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.45	0.83	0.32		0.17	0.35

Intersection Summary		
Area Type:	Other	
Cycle Length: 110		
Actuated Cycle Length: 110		
Offset: 16 (15%), Referenced to phase 2: and 6:SBL, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.84		
Intersection Signal Delay: 6.8		Intersection LOS: A
Intersection Capacity Utilization 71.0%		ICU Level of Service C
Analysis Period (min) 15		
m Volume for 95th percentile queue is metered by upstream signal.		

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1234	837	45	476	238	51
Future Volume (vph)	1234	837	45	476	238	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.939					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3323	0	1770	3539	1770	1583
Flt Permitted			0.051		0.950	
Satd. Flow (perm)	3323	0	95	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	367					55
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1341	910	49	517	259	55
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2251	0	49	517	259	55
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	82.0		82.0	82.0	28.0	28.0
Total Split (%)	74.5%		74.5%	74.5%	25.5%	25.5%
Maximum Green (s)	77.5		77.5	77.5	23.5	23.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Min	C-Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	78.2		78.2	78.2	22.8	22.8
Actuated g/C Ratio	0.71		0.71	0.71	0.21	0.21
v/c Ratio	0.91		0.73	0.21	0.71	0.15
Control Delay	12.4		71.9	5.7	52.0	10.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	12.4		71.9	5.7	52.0	10.5
LOS	B		E	A	D	B
Approach Delay	12.4			11.4	44.7	
Approach LOS	B			B	D	
90th %ile Green (s)	77.5		77.5	77.5	23.5	23.5
90th %ile Term Code	Max		Max	Max	Coord	Coord
70th %ile Green (s)	77.5		77.5	77.5	23.5	23.5
70th %ile Term Code	Max		Max	Max	Coord	Coord
50th %ile Green (s)	79.8		79.8	79.8	21.2	21.2
50th %ile Term Code	Max		Hold	Hold	Coord	Coord
30th %ile Green (s)	77.2		77.2	77.2	23.8	23.8
30th %ile Term Code	Gap		Hold	Hold	Coord	Coord
10th %ile Green (s)	78.9		78.9	78.9	22.1	22.1
10th %ile Term Code	Gap		Hold	Hold	Coord	Coord
Stops (vph)	499		29	149	218	11
Fuel Used(gal)	32		1	3	7	0
CO Emissions (g/hr)	2256		73	181	482	35
NOx Emissions (g/hr)	439		14	35	94	7
VOC Emissions (g/hr)	523		17	42	112	8
Dilemma Vehicles (#)	124		0	20	0	0
Queue Length 50th (ft)	75		17	53	175	0
Queue Length 95th (ft)	231		#56	78	261	34
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	2469		67	2517	379	382
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.91		0.73	0.21	0.68	0.14

Intersection Summary		
Area Type:	Other	
Cycle Length: 110		
Actuated Cycle Length: 110		
Offset: 28 (25%), Referenced to phase 2:NBL and 6:, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.91		
Intersection Signal Delay: 15.5		Intersection LOS: B
Intersection Capacity Utilization 81.6%		ICU Level of Service D
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 5: Arno Road & Murfreesboro Rd

HCS7 Two-Way Stop-Control Report

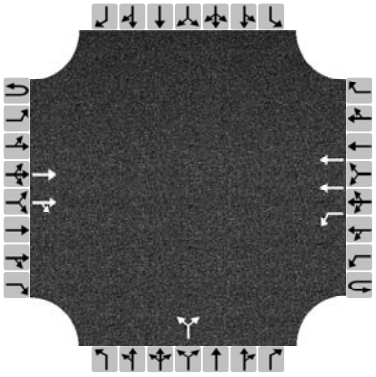
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Background)

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			2143	44		4	785			19		1				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					21					
Capacity, c (veh/h)						231					41					
v/c Ratio						0.02					0.51					
95% Queue Length, Q_{95} (veh)						0.1					1.8					
Control Delay (s/veh)						20.8					164.0					
Level of Service, LOS						C					F					
Approach Delay (s/veh)						0.1				164.0						
Approach LOS										F						

HCS7 Two-Way Stop-Control Report

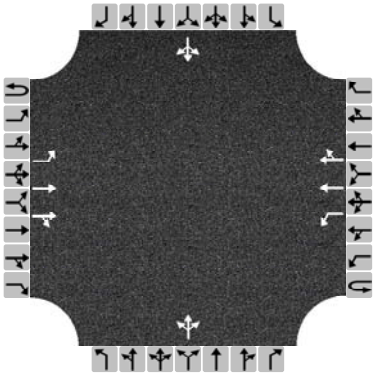
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	June 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Background)

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		56	2070	16		3	727	4		17	0	2		7	0	36
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		58				3					20				44	
Capacity, c (veh/h)		866				254					38				387	
v/c Ratio		0.07				0.01					0.52				0.11	
95% Queue Length, Q_{95} (veh)		0.2				0.0					1.8				0.4	
Control Delay (s/veh)		9.5				19.3					174.0				15.5	
Level of Service, LOS		A				C					F				C	
Approach Delay (s/veh)		0.2				0.1				174.0				15.5		
Approach LOS										F				C		

HCS7 Two-Way Stop-Control Report

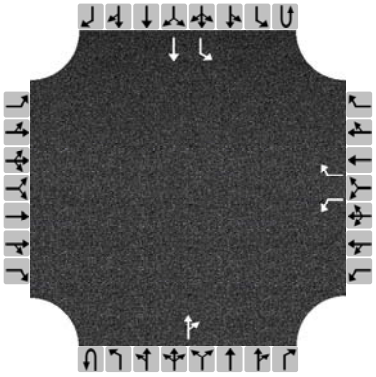
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	10647 (Background)

Site Information

Intersection	Carothers and S. Carother
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road
North/South Street	Carothers Parkway
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						58		132			454	63		159	649	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

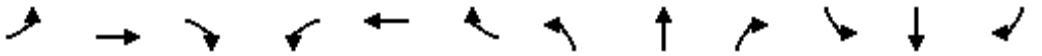
Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

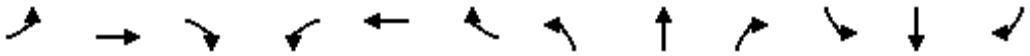
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						64		145						175		
Capacity, c (veh/h)						98		544						1014		
v/c Ratio						0.65		0.27						0.17		
95% Queue Length, Q_{95} (veh)						3.2		1.1						0.6		
Control Delay (s/veh)						93.3		14.0						9.3		
Level of Service, LOS						F		B						A		
Approach Delay (s/veh)						38.3								1.8		
Approach LOS						E										

TOTAL PROJECTED CONDITIONS (AM PEAK HOUR)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	395	529	228	35	1223	232	546	585	68	119	112	119
Future Volume (vph)	395	529	228	35	1223	232	546	585	68	119	112	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.976				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	4963	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.222			0.412			0.675			0.372		
Satd. Flow (perm)	802	3539	1583	767	4963	0	2439	3539	1583	1344	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			248		103				74			36
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	429	575	248	38	1329	252	593	636	74	129	122	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	429	575	248	38	1581	0	593	636	74	129	122	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0

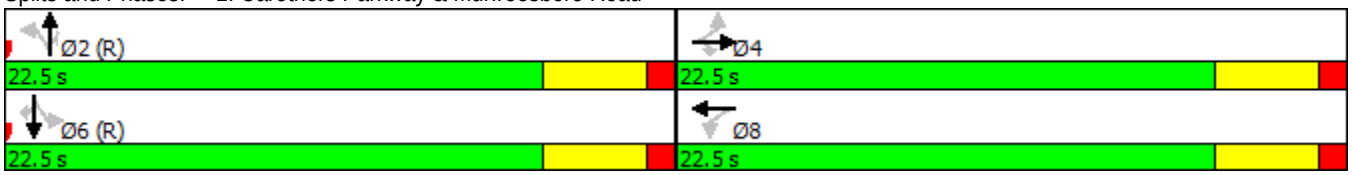


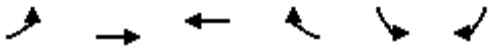
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40		0.40	0.40	0.40	0.40	0.40	0.40
v/c Ratio	1.34	0.41	0.32	0.12	0.77		0.61	0.45	0.11	0.24	0.09	0.20
Control Delay	193.7	10.8	2.9	9.6	13.2		14.0	11.2	3.3	10.5	8.6	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	193.7	10.8	2.9	9.6	13.2		14.0	11.2	3.3	10.5	8.6	7.7
LOS	F	B	A	A	B		B	B	A	B	A	A
Approach Delay		71.9			13.1			12.0			9.0	
Approach LOS		E			B			B			A	
90th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
70th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
50th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
30th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	18.0
10th %ile Term Code	Max	Max	Max	Hold	Hold		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	307	346	30	24	1126		406	393	14	75	65	55
Fuel Used(gal)	20	6	1	1	29		16	17	2	1	1	1
CO Emissions (g/hr)	1382	418	51	44	1998		1149	1185	114	78	66	59
NOx Emissions (g/hr)	269	81	10	8	389		223	231	22	15	13	12
VOC Emissions (g/hr)	320	97	12	10	463		266	275	26	18	15	14
Dilemma Vehicles (#)	0	59	0	0	131		0	65	0	0	13	0
Queue Length 50th (ft)	~78	52	0	8	135		58	59	0	10	9	14
Queue Length 95th (ft)	#146	84	31	m11	180		99	93	17	25	21	39
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	320	1415	782	306	2047		975	1415	677	537	1415	654
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.34	0.41	0.32	0.12	0.77		0.61	0.45	0.11	0.24	0.09	0.20

Intersection Summary		
Area Type:	Other	
Cycle Length: 45		
Actuated Cycle Length: 45		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection		
Natural Cycle: 45		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.34		
Intersection Signal Delay: 28.6		Intersection LOS: C
Intersection Capacity Utilization 75.4%		ICU Level of Service D
Analysis Period (min) 15		
Description: Hwy 96 and Carothers Pkwy		

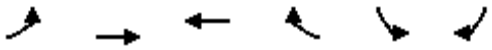
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





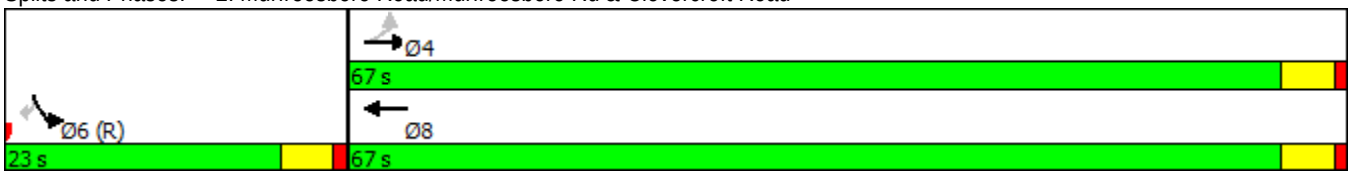
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	94	484	1838	57	87	158
Future Volume (vph)	94	484	1838	57	87	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3522	0	1770	1583
Flt Permitted	0.059				0.950	
Satd. Flow (perm)	110	3539	3522	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			22
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	526	1998	62	95	172
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	526	2060	0	95	172
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	67.0	67.0	67.0		23.0	23.0
Total Split (%)	74.4%	74.4%	74.4%		25.6%	25.6%
Maximum Green (s)	62.5	62.5	62.5		18.5	18.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	67.4	67.4	67.4		13.6	13.6
Actuated g/C Ratio	0.75	0.75	0.75		0.15	0.15
v/c Ratio	1.24	0.20	0.78		0.36	0.67
Control Delay	200.7	2.1	5.8		36.7	43.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	200.7	2.1	5.8		36.7	43.5
LOS	F	A	A		D	D
Approach Delay		34.4	5.8		41.1	
Approach LOS		C	A		D	
90th %ile Green (s)	62.5	62.5	62.5		18.5	18.5
90th %ile Term Code	Max	Max	Max		Coord	Coord
70th %ile Green (s)	64.7	64.7	64.7		16.3	16.3
70th %ile Term Code	Max	Max	Max		Coord	Coord
50th %ile Green (s)	67.1	67.1	67.1		13.9	13.9
50th %ile Term Code	Max	Max	Hold		Coord	Coord
30th %ile Green (s)	69.6	69.6	69.6		11.4	11.4
30th %ile Term Code	Max	Max	Hold		Coord	Coord
10th %ile Green (s)	73.1	73.1	73.1		7.9	7.9
10th %ile Term Code	Max	Max	Hold		Coord	Coord
Stops (vph)	69	61	619		74	126
Fuel Used(gal)	5	5	12		2	3
CO Emissions (g/hr)	377	316	831		111	211
NOx Emissions (g/hr)	73	61	162		22	41
VOC Emissions (g/hr)	87	73	193		26	49
Dilemma Vehicles (#)	0	22	41		0	0
Queue Length 50th (ft)	~74	20	213		49	81
Queue Length 95th (ft)	#181	32	235		89	139
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	82	2650	2639		363	342
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	1.24	0.20	0.78		0.26	0.50

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 14 (16%), Referenced to phase 2: and 6:SBL, Start of Green		
Natural Cycle: 150		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.24		
Intersection Signal Delay: 15.0		Intersection LOS: B
Intersection Capacity Utilization 73.9%		ICU Level of Service D
Analysis Period (min) 15		
~ Volume exceeds capacity, queue is theoretically infinite.		
Queue shown is maximum after two cycles.		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road

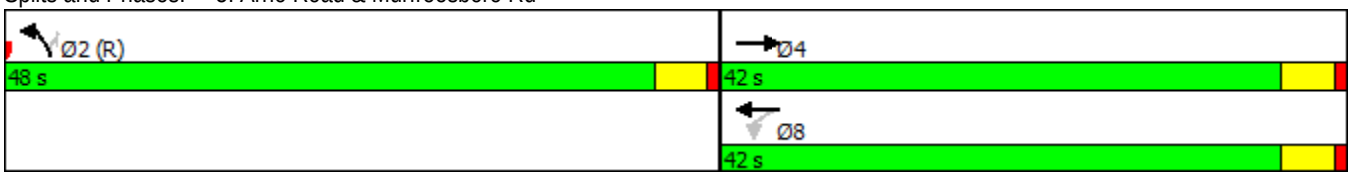


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	289	250	67	1192	638	45
Future Volume (vph)	289	250	67	1192	638	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.930					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3291	0	1770	3539	1770	1583
Flt Permitted			0.357		0.950	
Satd. Flow (perm)	3291	0	665	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	272					49
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	314	272	73	1296	693	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	586	0	73	1296	693	49
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	42.0		42.0	42.0	48.0	48.0
Total Split (%)	46.7%		46.7%	46.7%	53.3%	53.3%
Maximum Green (s)	37.5		37.5	37.5	43.5	43.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Min	C-Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	37.3		37.3	37.3	43.7	43.7
Actuated g/C Ratio	0.41		0.41	0.41	0.49	0.49
v/c Ratio	0.39		0.27	0.88	0.81	0.06
Control Delay	14.2		20.3	33.1	28.9	4.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	14.2		20.3	33.1	28.9	4.1
LOS	B		C	C	C	A
Approach Delay	14.2			32.4	27.3	
Approach LOS	B			C	C	
90th %ile Green (s)	37.5		37.5	37.5	43.5	43.5
90th %ile Term Code	Hold		Max	Max	Coord	Coord
70th %ile Green (s)	37.5		37.5	37.5	43.5	43.5
70th %ile Term Code	Hold		Max	Max	Coord	Coord
50th %ile Green (s)	39.4		39.4	39.4	41.6	41.6
50th %ile Term Code	Hold		Max	Max	Coord	Coord
30th %ile Green (s)	38.2		38.2	38.2	42.8	42.8
30th %ile Term Code	Hold		Gap	Gap	Coord	Coord
10th %ile Green (s)	33.7		33.7	33.7	47.3	47.3
10th %ile Term Code	Hold		Gap	Gap	Coord	Coord
Stops (vph)	323		43	1028	517	7
Fuel Used(gal)	11		1	21	14	0
CO Emissions (g/hr)	769		59	1489	1010	24
NOx Emissions (g/hr)	150		11	290	197	5
VOC Emissions (g/hr)	178		14	345	234	6
Dilemma Vehicles (#)	13		0	61	0	0
Queue Length 50th (ft)	58		25	333	336	0
Queue Length 95th (ft)	96		60	#460	#498	18
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	1547		281	1495	870	803
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.38		0.26	0.87	0.80	0.06

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 68 (76%), Referenced to phase 2:NBL and 6:, Start of Green		
Natural Cycle: 65		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.88		
Intersection Signal Delay: 27.0		Intersection LOS: C
Intersection Capacity Utilization 75.8%		ICU Level of Service D
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 5: Arno Road & Murfreesboro Rd



HCS7 Two-Way Stop-Control Report

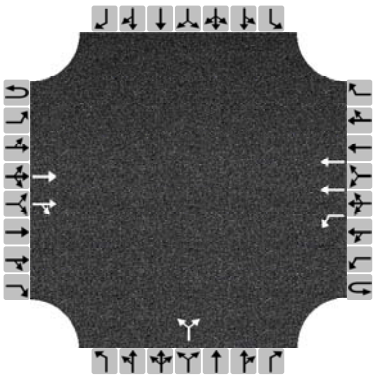
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			558	9		2	1865			40		3				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						2					47					
Capacity, c (veh/h)						962					181					
v/c Ratio						0.00					0.26					
95% Queue Length, Q_{95} (veh)						0.0					1.0					
Control Delay (s/veh)						8.7					31.7					
Level of Service, LOS						A					D					
Approach Delay (s/veh)						0.0					31.7					
Approach LOS											D					

HCS7 Two-Way Stop-Control Report

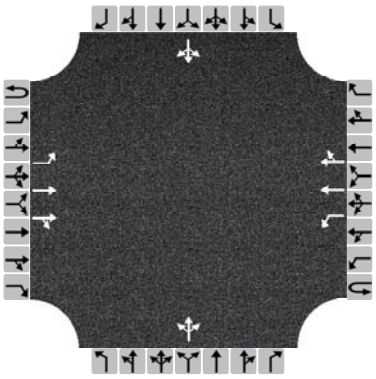
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		17	550	5		1	1818	11		17	0	4		12	0	53
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		19				1					23				73	
Capacity, c (veh/h)		277				967					146				143	
v/c Ratio		0.07				0.00					0.16				0.51	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.5				2.4	
Control Delay (s/veh)		19.0				8.7					34.2				54.0	
Level of Service, LOS		C				A					D				F	
Approach Delay (s/veh)		0.6				0.0				34.2				54.0		
Approach LOS										D				F		

HCS7 Two-Way Stop-Control Report

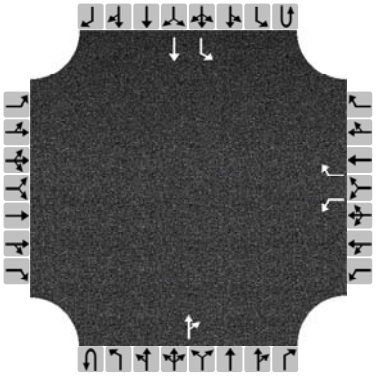
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	10647 (Total)

Site Information

Intersection	Carothers and S. Carother
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road
North/South Street	Carothers Parkway
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						37		236			665	30		127	322	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						39		248						134		
Capacity, c (veh/h)						148		428						882		
v/c Ratio						0.26		0.58						0.15		
95% Queue Length, Q_{95} (veh)						1.0		3.6						0.5		
Control Delay (s/veh)						37.9		24.3						9.8		
Level of Service, LOS						E		C						A		
Approach Delay (s/veh)						26.2								2.8		
Approach LOS						D										

HCS7 Two-Way Stop-Control Report

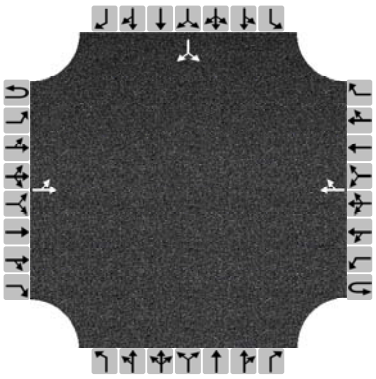
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	S. Carothers and Project
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road / Proje
North/South Street	S. Carothers Road
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume, V (veh/h)		30	127				183	7						22		90
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

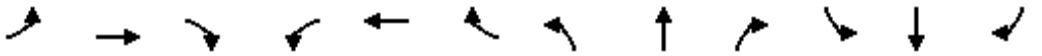
Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												7.10		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

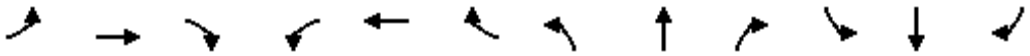
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		32													118	
Capacity, c (veh/h)		1384													772	
v/c Ratio		0.02													0.15	
95% Queue Length, Q_{95} (veh)		0.1													0.5	
Control Delay (s/veh)		7.7													10.5	
Level of Service, LOS		A													B	
Approach Delay (s/veh)	1.6												10.5			
Approach LOS													B			

TOTAL PROJECTED CONDITIONS (PM PEAK HOUR)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	1443	564	57	816	100	414	183	79	702	505	323
Future Volume (vph)	116	1443	564	57	816	100	414	183	79	702	505	323
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	0.91	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850		0.984				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	1770	5004	0	3433	3539	1583	3433	3539	1583
Flt Permitted	0.218			0.055			0.375			0.622		
Satd. Flow (perm)	788	3539	1583	102	5004	0	1355	3539	1583	2248	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			227		20				13			95
Link Speed (mph)		45			45			35			40	
Link Distance (ft)		150			1130			3000			147	
Travel Time (s)		2.3			17.1			58.4			2.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	126	1568	613	62	887	109	450	199	86	763	549	351
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	1568	613	62	996	0	450	199	86	763	549	351
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway 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
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0



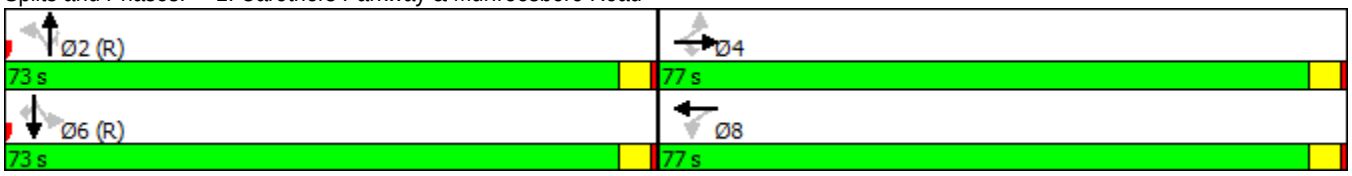
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	77.0	77.0	77.0	77.0	77.0		73.0	73.0	73.0	73.0	73.0	73.0
Total Split (%)	51.3%	51.3%	51.3%	51.3%	51.3%		48.7%	48.7%	48.7%	48.7%	48.7%	48.7%
Maximum Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0	0	0	0	0
Act Effct Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48		0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio	0.33	0.92	0.70	1.27	0.41		0.73	0.12	0.12	0.74	0.34	0.45
Control Delay	26.9	45.6	22.9	244.1	17.8		41.5	23.7	20.3	39.0	27.0	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.9	45.6	22.9	244.1	17.8		41.5	23.7	20.3	39.0	27.0	21.9
LOS	C	D	C	F	B		D	C	C	D	C	C
Approach Delay		38.5			31.1			34.2			31.4	
Approach LOS		D			C			C			C	
90th %ile Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
90th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
70th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
50th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
30th %ile Term Code	Max	Max	Max	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	72.5	72.5	72.5	72.5	72.5		68.5	68.5	68.5	68.5	68.5	68.5
10th %ile Term Code	Hold	Hold	Hold	Max	Max		Coord	Coord	Coord	Coord	Coord	Coord
Stops (vph)	71	1275	295	35	412		335	102	38	569	316	160
Fuel Used(gal)	2	31	7	4	15		15	6	2	12	6	3
CO Emissions (g/hr)	114	2143	478	258	1060		1048	393	162	830	446	233
NOx Emissions (g/hr)	22	417	93	50	206		204	76	32	161	87	45
VOC Emissions (g/hr)	26	497	111	60	246		243	91	38	192	103	54
Dilemma Vehicles (#)	0	46	0	0	23		0	6	0	0	17	0
Queue Length 50th (ft)	38	736	297	~77	160		181	58	40	312	179	167
Queue Length 95th (ft)	65	853	449	#182	195		257	84	76	396	225	257
Internal Link Dist (ft)		70			1050			2920			67	
Turn Bay Length (ft)												
Base Capacity (vph)	380	1710	882	49	2428		618	1616	729	1026	1616	774
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.92	0.70	1.27	0.41		0.73	0.12	0.12	0.74	0.34	0.45

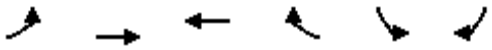
Intersection Summary		
Area Type:	Other	
Cycle Length: 150		
Actuated Cycle Length: 150		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green, Master Intersection		
Natural Cycle: 55		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.27		
Intersection Signal Delay: 34.6		Intersection LOS: C
Intersection Capacity Utilization 84.8%		ICU Level of Service E
Analysis Period (min) 15		
Description: Hwy 96 and Carothers Pkwy		

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

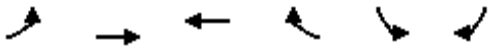
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carothers Parkway & Murfreesboro Road





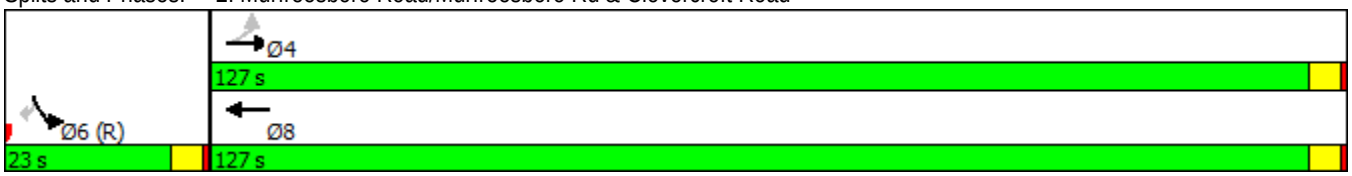
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	192	2150	776	40	47	127
Future Volume (vph)	192	2150	776	40	47	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.993			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3514	0	1770	1583
Flt Permitted	0.316				0.950	
Satd. Flow (perm)	589	3539	3514	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			13			138
Link Speed (mph)		45	45		40	
Link Distance (ft)		1130	160		355	
Travel Time (s)		17.1	2.4		6.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	209	2337	843	43	51	138
Shared Lane Traffic (%)						
Lane Group Flow (vph)	209	2337	886	0	51	138
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Detector Phase	4	4	8		6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	22.5	22.5	22.5		22.5	22.5
Total Split (s)	127.0	127.0	127.0		23.0	23.0
Total Split (%)	84.7%	84.7%	84.7%		15.3%	15.3%
Maximum Green (s)	122.5	122.5	122.5		18.5	18.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Min	C-Min
Walk Time (s)	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
Act Effct Green (s)	131.9	131.9	131.9		9.1	9.1
Actuated g/C Ratio	0.88	0.88	0.88		0.06	0.06
v/c Ratio	0.40	0.75	0.29		0.47	0.61
Control Delay	2.8	3.3	1.2		81.5	21.7
Queue Delay	0.0	0.1	0.0		0.0	0.0
Total Delay	2.8	3.4	1.2		81.5	21.7
LOS	A	A	A		F	C
Approach Delay		3.3	1.2		37.8	
Approach LOS		A	A		D	
90th %ile Green (s)	127.6	127.6	127.6		13.4	13.4
90th %ile Term Code	Max	Max	Hold		Coord	Coord
70th %ile Green (s)	130.4	130.4	130.4		10.6	10.6
70th %ile Term Code	Max	Max	Hold		Coord	Coord
50th %ile Green (s)	132.3	132.3	132.3		8.7	8.7
50th %ile Term Code	Max	Max	Hold		Coord	Coord
30th %ile Green (s)	133.7	133.7	133.7		7.3	7.3
30th %ile Term Code	Max	Max	Hold		Coord	Coord
10th %ile Green (s)	135.3	135.3	135.3		5.7	5.7
10th %ile Term Code	Max	Max	Hold		Coord	Coord
Stops (vph)	26	504	75		44	19
Fuel Used(gal)	2	23	2		1	1
CO Emissions (g/hr)	129	1642	139		93	74
NOx Emissions (g/hr)	25	320	27		18	14
VOC Emissions (g/hr)	30	381	32		21	17
Dilemma Vehicles (#)	0	38	15		0	0
Queue Length 50th (ft)	21	218	32		49	0
Queue Length 95th (ft)	m34	262	53		94	69
Internal Link Dist (ft)		1050	80		275	
Turn Bay Length (ft)						
Base Capacity (vph)	517	3111	3090		218	316
Starvation Cap Reductn	0	57	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.40	0.77	0.29		0.23	0.44

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 16 (11%), Referenced to phase 2: and 6:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 4.6		Intersection LOS: A	
Intersection Capacity Utilization 71.1%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 2: Murfreesboro Road/Murfreesboro Rd & Clovercroft Road



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1238	837	45	482	238	51
Future Volume (vph)	1238	837	45	482	238	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.939					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3323	0	1770	3539	1770	1583
Flt Permitted			0.035		0.950	
Satd. Flow (perm)	3323	0	65	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	324					55
Link Speed (mph)	45			45	50	
Link Distance (ft)	1550			63	683	
Travel Time (s)	23.5			1.0	9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1346	910	49	524	259	55
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2256	0	49	524	259	55
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2		1	2	1	1
Detector Template	Thru		Left	Thru	Left	Right
Leading Detector (ft)	100		20	100	20	20
Trailing Detector (ft)	0		0	0	0	0
Detector 1 Position(ft)	0		0	0	0	0
Detector 1 Size(ft)	6		20	6	20	20
Detector 1 Type	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Detector Phase	4		8	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	118.0		118.0	118.0	32.0	32.0
Total Split (%)	78.7%		78.7%	78.7%	21.3%	21.3%
Maximum Green (s)	113.5		113.5	113.5	27.5	27.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Min	C-Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	114.7		114.7	114.7	26.3	26.3
Actuated g/C Ratio	0.76		0.76	0.76	0.18	0.18
v/c Ratio	0.86		1.00	0.19	0.84	0.17
Control Delay	7.7		152.7	5.1	82.3	13.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.7		152.7	5.1	82.3	13.5
LOS	A		F	A	F	B
Approach Delay	7.7			17.8	70.3	
Approach LOS	A			B	E	
90th %ile Green (s)	113.5		113.5	113.5	27.5	27.5
90th %ile Term Code	Max		Max	Max	Coord	Coord
70th %ile Green (s)	113.5		113.5	113.5	27.5	27.5
70th %ile Term Code	Max		Max	Max	Coord	Coord
50th %ile Green (s)	113.5		113.5	113.5	27.5	27.5
50th %ile Term Code	Hold		Max	Max	Coord	Coord
30th %ile Green (s)	116.5		116.5	116.5	24.5	24.5
30th %ile Term Code	Hold		Gap	Gap	Coord	Coord
10th %ile Green (s)	116.5		116.5	116.5	24.5	24.5
10th %ile Term Code	Hold		Gap	Gap	Coord	Coord
Stops (vph)	713		28	124	221	10
Fuel Used(gal)	33		2	2	8	1
CO Emissions (g/hr)	2308		123	157	588	36
NOx Emissions (g/hr)	449		24	31	114	7
VOC Emissions (g/hr)	535		29	36	136	8
Dilemma Vehicles (#)	32		0	15	0	0
Queue Length 50th (ft)	387		42	68	245	0
Queue Length 95th (ft)	433		#95	86	#381	41
Internal Link Dist (ft)	1470			1	603	
Turn Bay Length (ft)						
Base Capacity (vph)	2617		49	2705	324	335
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.86		1.00	0.19	0.80	0.16

Intersection Summary		
Area Type:	Other	
Cycle Length: 150		
Actuated Cycle Length: 150		
Offset: 48 (32%), Referenced to phase 2:NBL and 6:, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.00		
Intersection Signal Delay: 15.8		Intersection LOS: B
Intersection Capacity Utilization 81.7%		ICU Level of Service D
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 5: Arno Road & Murfreesboro Rd

HCS7 Two-Way Stop-Control Report

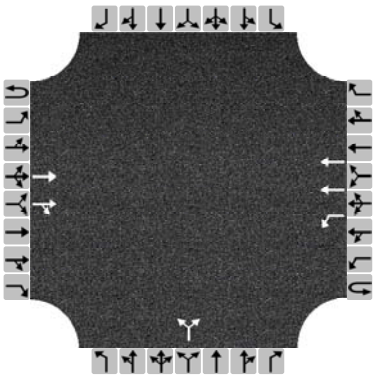
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	Hwy 96E and Cross Creek
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Cross Creek Drive
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	1	0		0	0	0
Configuration			T	TR		L	T				LR					
Volume, V (veh/h)			2147	44		4	791			19		1				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No				No				No				No	
Median Type/Storage			Left Only								1					

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.10				7.50		6.90				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					21					
Capacity, c (veh/h)						231					41					
v/c Ratio						0.02					0.52					
95% Queue Length, Q_{95} (veh)						0.1					1.8					
Control Delay (s/veh)						20.9					165.6					
Level of Service, LOS						C					F					
Approach Delay (s/veh)						0.1					165.6					
Approach LOS											F					

HCS7 Two-Way Stop-Control Report

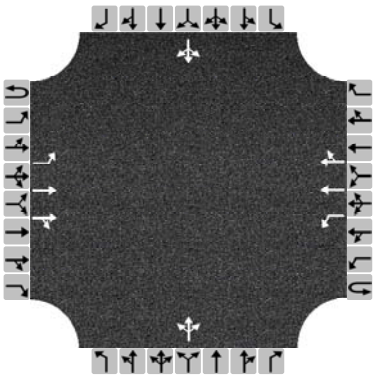
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	Highway 96E and Ridgeway
Jurisdiction	Franklin, TN
East/West Street	Highway 96E
North/South Street	Chester Stevens/Ridgeway
Peak Hour Factor	0.97
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	T	TR		L	T	TR			LTR				LTR	
Volume, V (veh/h)		56	2074	16		3	733	4		17	0	2		7	0	36
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Left Only								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

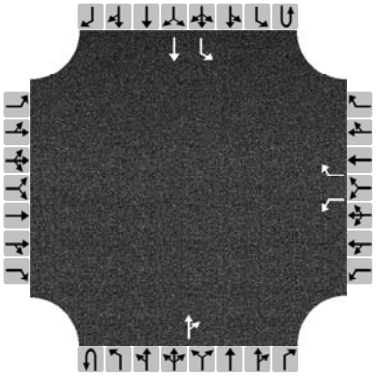
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		58				3					20				44	
Capacity, c (veh/h)		861				253					38				384	
v/c Ratio		0.07				0.01					0.52				0.11	
95% Queue Length, Q_{95} (veh)		0.2				0.0					1.8				0.4	
Control Delay (s/veh)		9.5				19.4					175.9				15.6	
Level of Service, LOS		A				C					F				C	
Approach Delay (s/veh)		0.2				0.1				175.9				15.6		
Approach LOS										F				C		

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	FTG	Intersection	Carothers and S. Carother
Agency/Co.	FTG	Jurisdiction	Franklin, TN
Date Performed	Oct 2017	East/West Street	S. Carothers Road
Analysis Year	2017	North/South Street	Carothers Parkway
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.91
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	10647 (Total)		

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		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						58		192			454	63		259	649	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						64		211						285		
Capacity, c (veh/h)						62		544						1014		
v/c Ratio						1.03		0.39						0.28		
95% Queue Length, Q_{95} (veh)						5.0		1.8						1.2		
Control Delay (s/veh)						231.5		15.8						9.9		
Level of Service, LOS						F		C						A		
Approach Delay (s/veh)						66.0								2.8		
Approach LOS						F										

HCS7 Two-Way Stop-Control Report

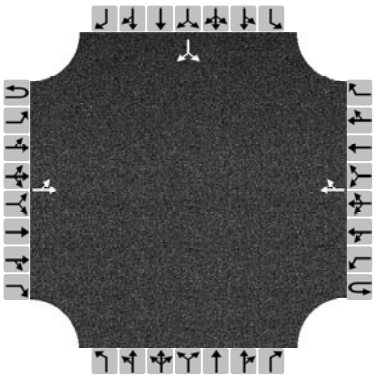
General Information

Analyst	FTG
Agency/Co.	FTG
Date Performed	Oct 2017
Analysis Year	2017
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	10647 (Total)

Site Information

Intersection	S. Carothers and Project
Jurisdiction	Franklin, TN
East/West Street	S. Carothers Road / Proje
North/South Street	S. Carothers Road
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

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	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume, V (veh/h)		100	222				190	25						14		60
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												7.10		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		110													81	
Capacity, c (veh/h)		1343													650	
v/c Ratio		0.08													0.12	
95% Queue Length, Q_{95} (veh)		0.3													0.4	
Control Delay (s/veh)		7.9													11.3	
Level of Service, LOS		A													B	
Approach Delay (s/veh)		3.0												11.3		
Approach LOS														B		

APPENDIX C
TRAFFIC SIGNAL WARRANTS

The Federal Highway Administration has published the Manual on Uniform Traffic Control Devices 2010 (MUTCD 2010), which includes eight traffic signal warrants that help traffic engineering professionals to identify when a traffic signal installation is justified at a particular location. These eight warrants include minimum conditions that are compared to existing or projected traffic conditions, and typically, traffic signals should not be installed unless at least one of the MUTCD warrants is met. Of the eight total signal warrants, the following are relevant to the intersection considered as part of this study:

Warrant 1, Eight-Hour Vehicular Volume

The Minimum Vehicular Volume, Condition A, is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal. The Interruption of Continuous Traffic, Condition B, is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exists for each of any eight hours of an average day:

A. The vehicles per hour given in both of the 100% columns of Condition A in Table C1 exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection, or

B. The vehicles per hour given in both of the 100% columns of Condition B in Table C1 exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection.

In applying each condition, the major street and minor street volumes shall be for the same eight hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these eight hours.

Option: If the posted or statutory speed limit or the 85th percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70% columns in Table C1 may be used in place of the 100% columns.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exists for each of any eight hours of an average day:

A. The vehicles per hour given in both of the 80% columns of Condition A in Table C1 exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection, and

B. The vehicles per hour given in both of the 80% columns of Condition B in Table C1 exist on the major street and on the higher volume minor-street approaches, respectively, to the intersection.

These major street and minor street volumes shall be for the same eight hours for each condition; however, the eight hours satisfied in Condition A shall not be required to be the same eight hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of these eight hours.

TABLE C1. WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

CONDITION A – MINIMUM VEHICULAR VOLUME							
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**			**Vehicles per hour on higher-volume minor street approach (one direction only)**		
Major Street	**Minor Street**	**100%**	**80%**	**70%**	**100%**	**80%**	**70%**
1 lane	1 lane	500	400	350	150	120	105
2 or more lanes	1 lane	600	480	420	150	120	105
2 or more lanes	2 or more lanes	600	480	420	200	160	140
1 lane	2 or more lanes	500	400	350	200	160	140

CONDITION B – INTERRUPTION OF CONTINUOUS TRAFFIC							
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**			**Vehicles per hour on higher-volume minor street approach (one direction only)**		
Major Street	**Minor Street**	**100%**	**80%**	**70%**	**100%**	**80%**	**70%**
1 lane	1 lane	750	600	525	75	60	53
2 or more lanes	1 lane	900	720	630	75	60	53
2 or more lanes	2 or more lanes	900	720	630	100	80	70
1 lane	2 or more lanes	750	600	525	100	80	70

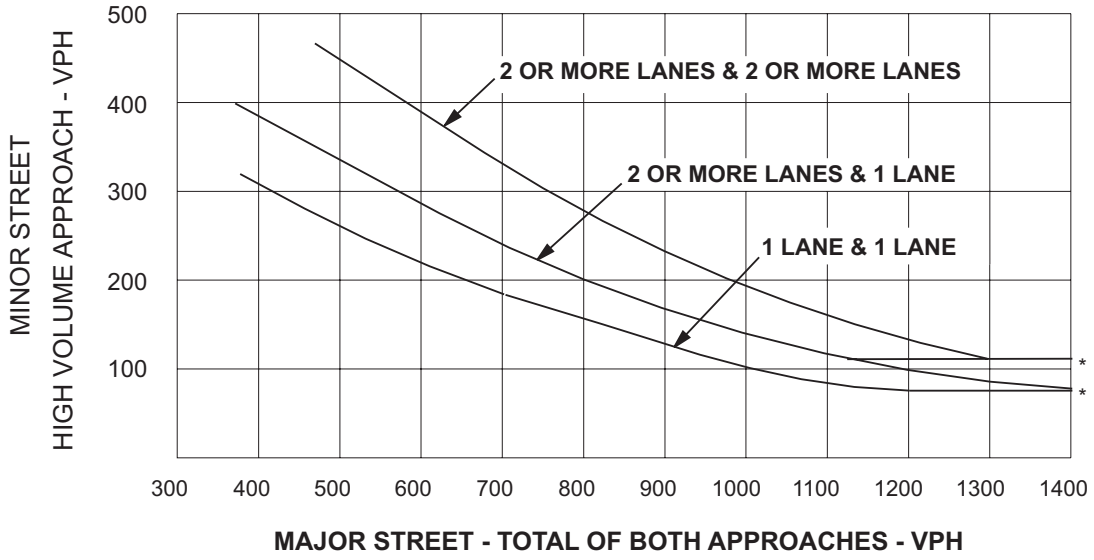
Warrant 2, Four-Hour Vehicular Volume

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic signal.

Standard: The need for a traffic control signal shall be considered if an engineering study finds that for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the applicable curve in Figure C1-Graph A for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these four hours.

Option: If the posted or statutory speed limit or the 85th percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure C1-Graph B may be used in place of Figure C1-Graph A.

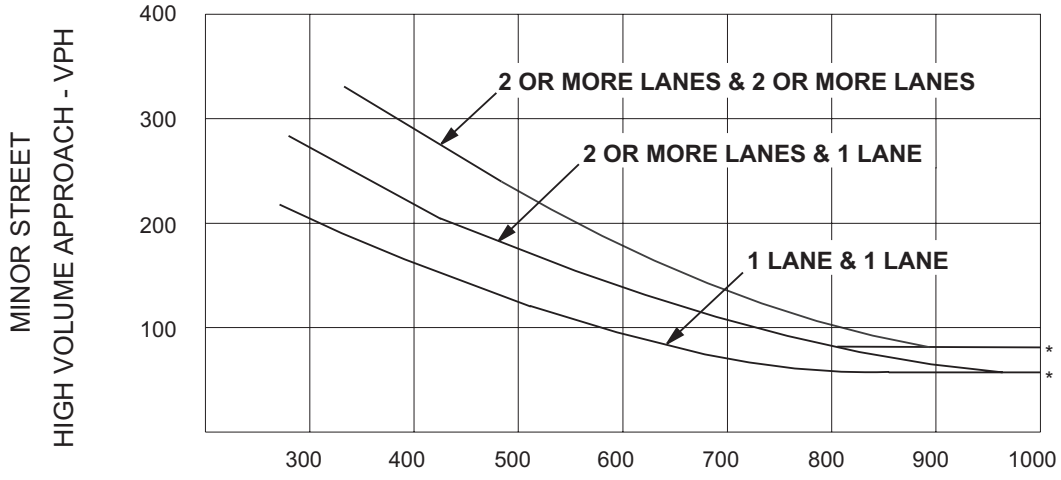
GRAPH A: FOUR HOUR VOLUME WARRANT



*NOTE: 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

GRAPH B: FOUR HOUR VOLUME WARRANT

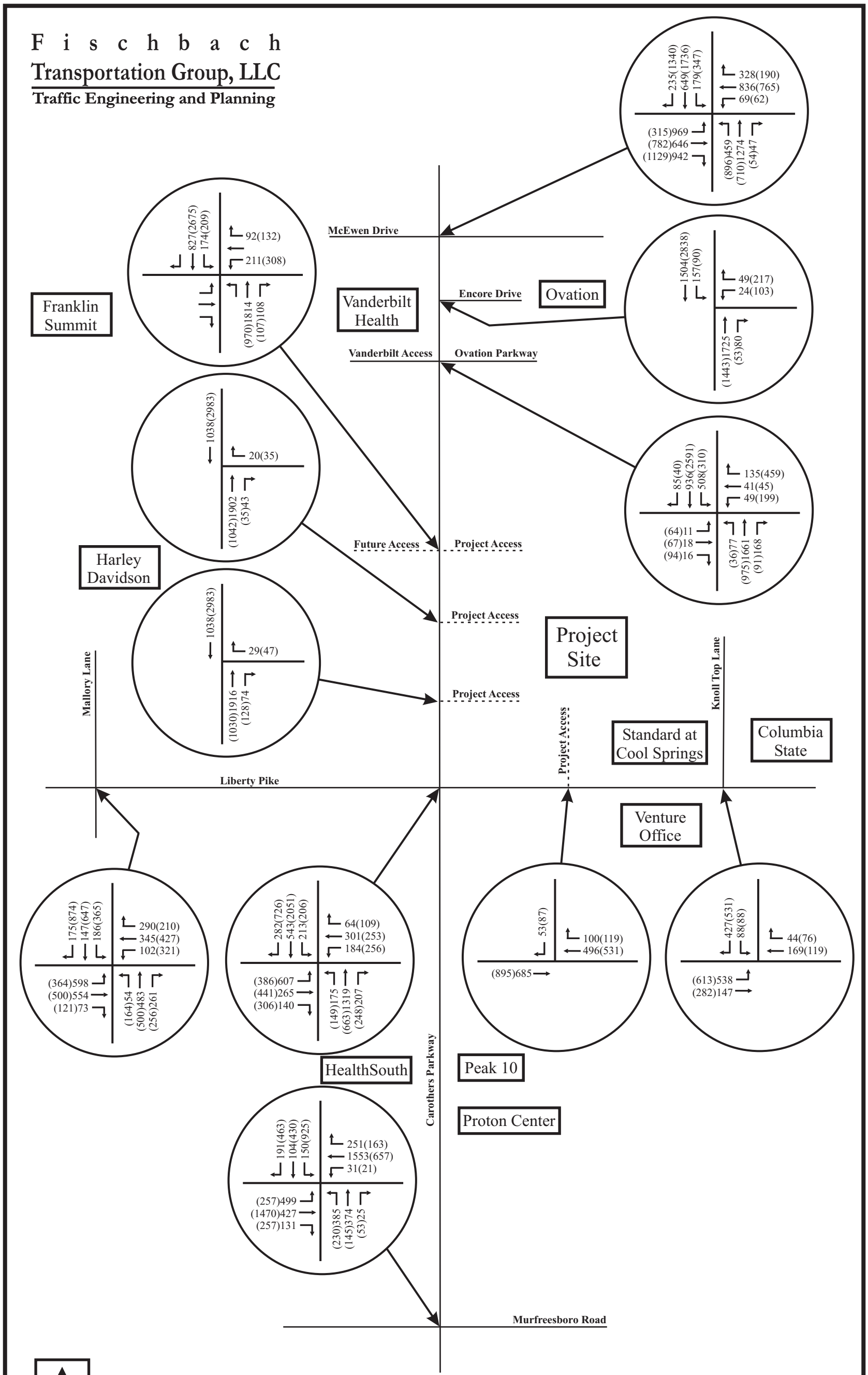
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*NOTE: 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 60 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

APPENDIX D
INFORMATION ABOUT APPROVED PROJECTS
IN THE VICINITY OF THE PROJECT SITE

Fischbach
Transportation Group, LLC
Traffic Engineering and Planning

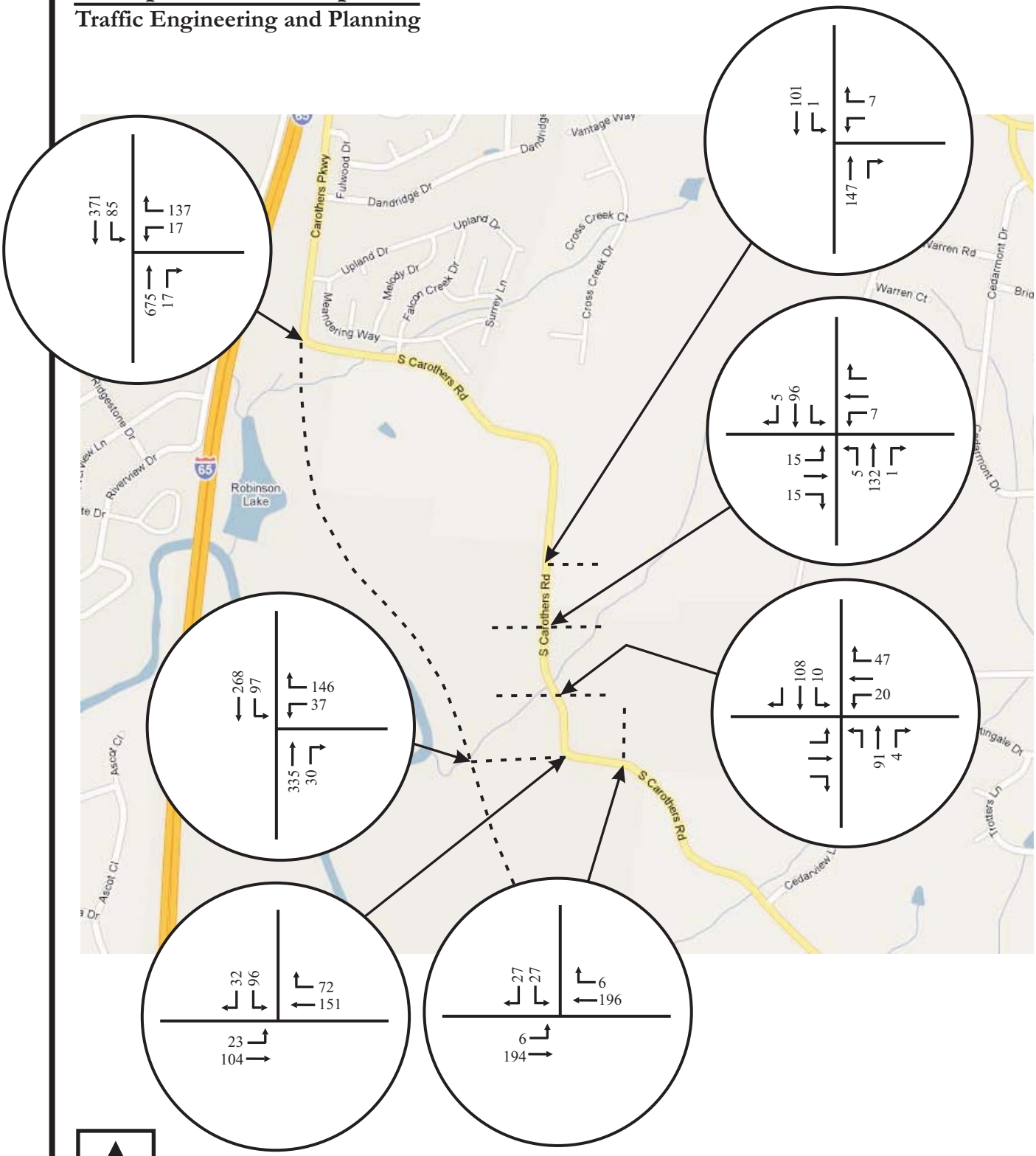


No Scale

XX - AM Peak Hour Volumes
(XX) - PM Peak Hour Volumes

Figure 7.
Total Projected Peak Hour Traffic Volumes

Fischbach
Transportation Group, Inc.
Traffic Engineering and Planning

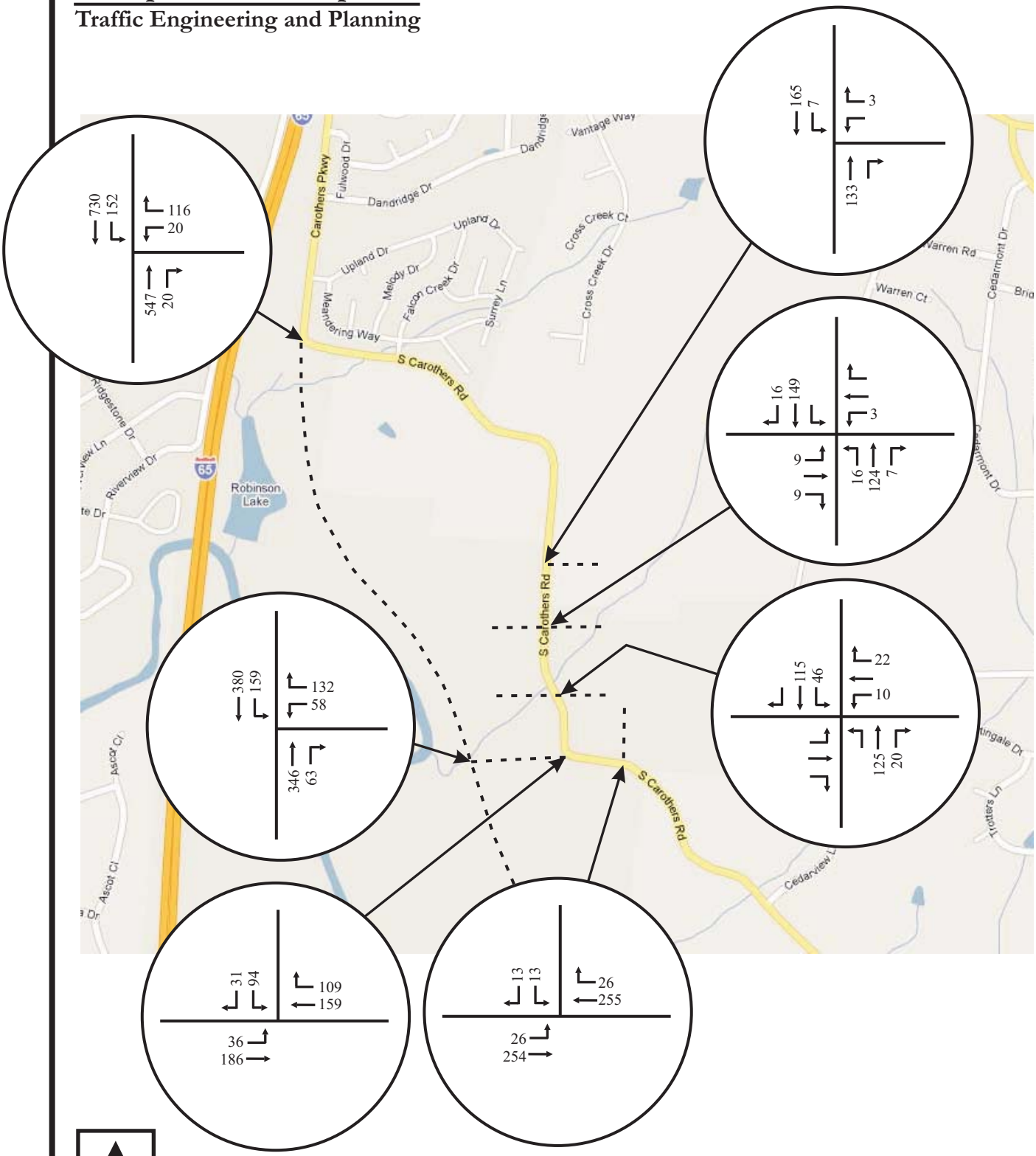


N

No Scale

Figure 7A.
Year 2016 AM Peak Hour
Total Projected Peak Hour Traffic Volumes
With Carothers Parkway

Fischbach
Transportation Group, Inc.
Traffic Engineering and Planning



N

No Scale

Figure 7C.
Year 2016 PM Peak Hour
Total Projected Peak Hour Traffic Volumes
With Carothers Parkway

100' TVA EASEMENT

TVA LINE

100 YR. FLOOD

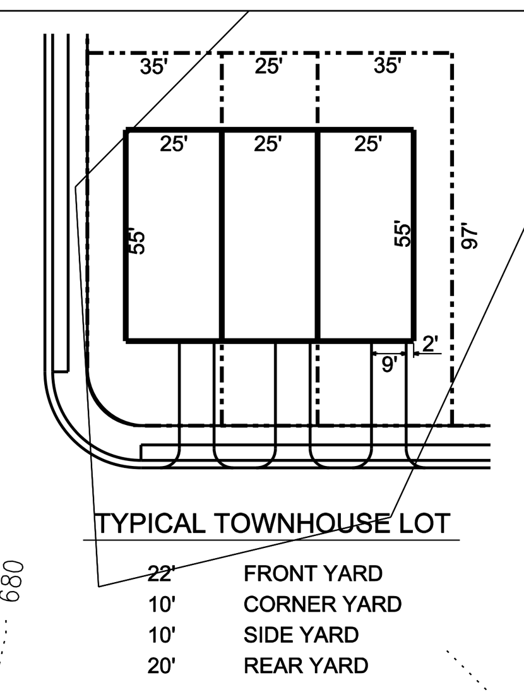
FLOODWAY

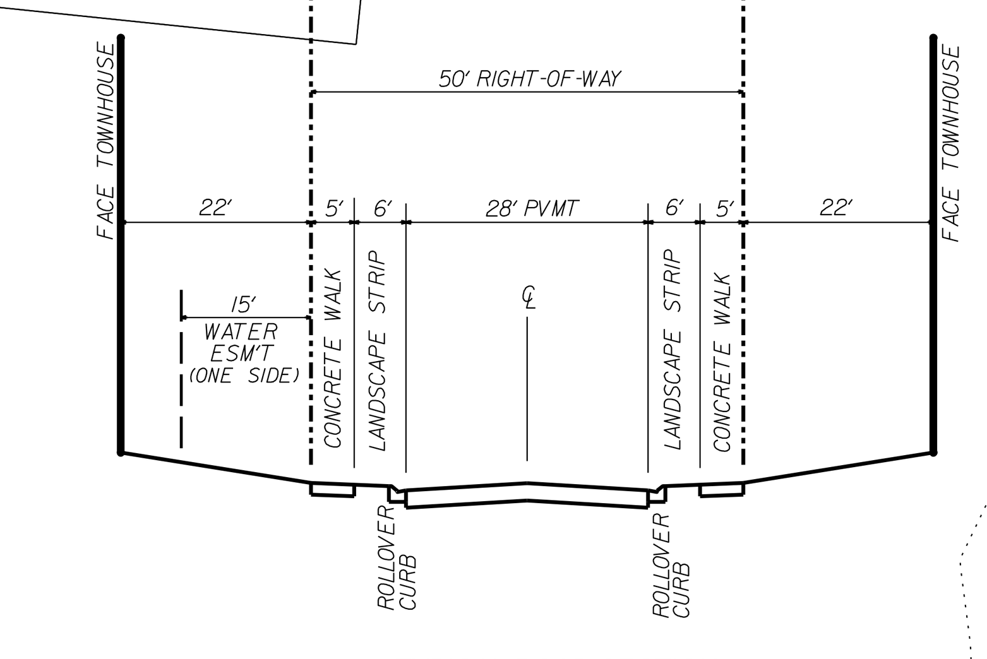
FLOODWAY

100 YR. FLOOD

0' 50' 100' 200' NORTH

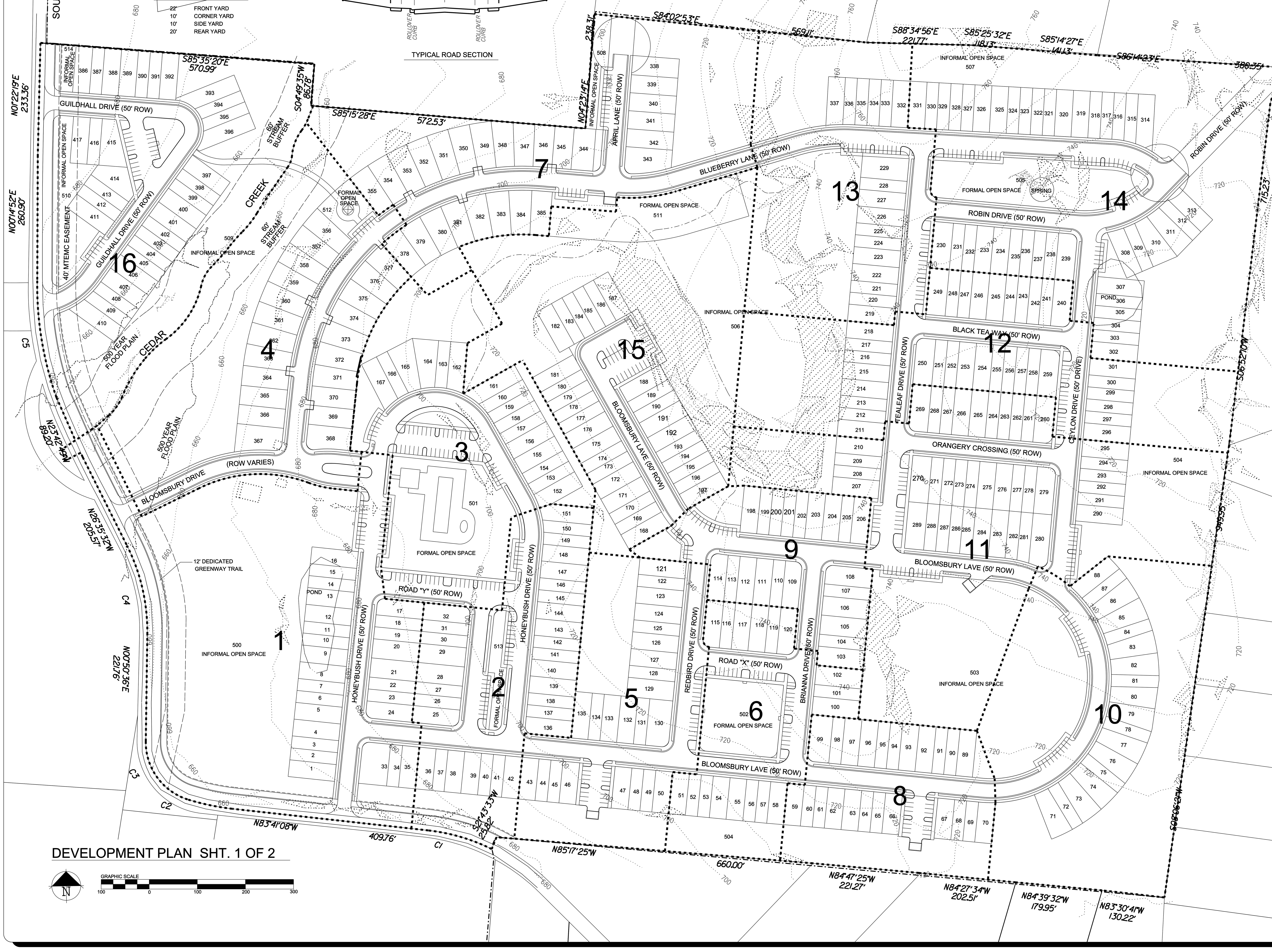
EDGE
www.edgela.com
PLANNING
LANDSCAPE ARCHITECTURE
GRAPHIC DESIGN

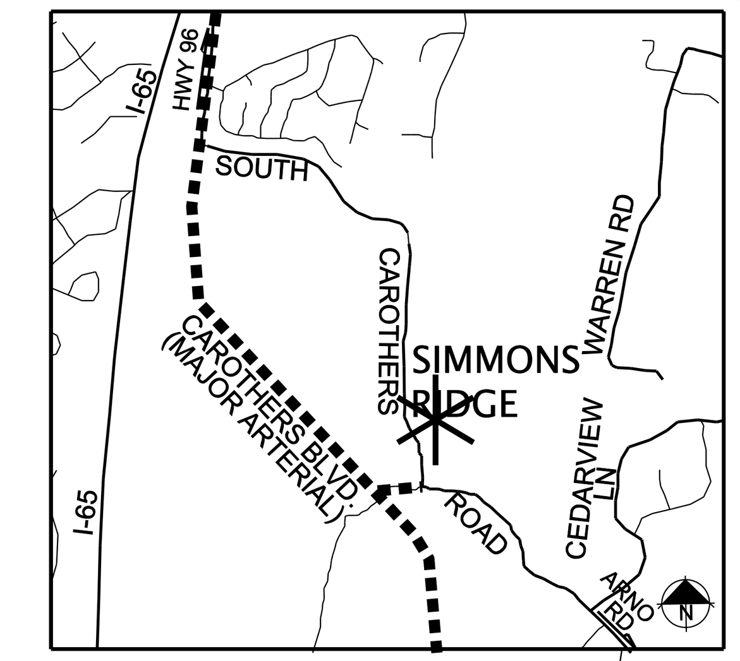




NOTES

1. A PORTION OF THE SUBJECT PROPERTY IS LOCATED IN ZONE "X" AS SHOWN HEREON ACCORDING TO FEDERAL EMERGENCY MANAGEMENT AGENCY FIRM (FLOOD INSURANCE RATE MAP) COMMUNITY PANEL No. 47187C0214F DATED SEPTEMBER 29th, 2006.
2. NO MINERAL RIGHTS ARE HELD BY PARTIES OUTSIDE OF THE OWNER.
3. SURVEY INFORMATION PROVIDED BY:
   JOHN DUFFER, RLS
   615.297.5509
   johnduffer@comcast.net





VICINITY MAP
NOT TO SCALE

SITE DATA

PROJECT NAME:	SIMMONS RIDGE PUD SUBDIVISION
COF PROJECT No:	
SUBDIVISION:	SIMMONS RIDGE
LOT NUMBER:	
ADDRESS:	4408 SOUTH CAROTHERS SOUTH
CITY:	FRANKLIN
COUNTY:	WILLIAMSON
STATE:	TENNESSEE
CIVIL DISTRICT:	14th
MAP, GROUP, PARCEL NUMBER:	MAP 89, PARCEL 37
EXISTING ZONING:	RESIDENTIAL VARIETY (RX)
PROPOSED ZONING:	RESIDENTIAL VARIETY (RX)
CHARACTER AREA OVERLAY:	MCEWEN (MECO-6)
APPLICABLE DEVELOPMENT STD:	CONVENTIONAL
TOTAL AC:	88.67 ACRES
TOTAL SF:	3,862,465 SF
OWNER/APPLICANT:	SIMMONS RIDGE LLC
ADDRESS:	235 NOAH DRIVE FRANKLIN, TN 37064
CONTACT:	JAY FRANKS
OFFICE PHONE:	615.300.0001
EMAIL ADDRESS:	jfranks130@msn.com
PLANNER/LANDSCAPE ARCHITECT:	GREG GAMBLE
ADDRESS:	144 SOUTHEAST PARKWAY SUITE 230 FRANKLIN, TN 37064
OFFICE PHONE:	615.975.5765
EMAIL ADDRESS:	greggamble@gmail.com

SLOPES 14% TO 19%

SLOPES 20% AND ABOVE

GREG GAMBLE
DEVELOPMENT PLANNING AND LANDSCAPE ARCHITECTURE
144 SOUTHEAST PARKWAY
SUITE 230
FRANKLIN, TENNESSEE 37064
615.975.5765
greggamble209@gmail.com

REVISIONS

GCG JOB No. 2012-__

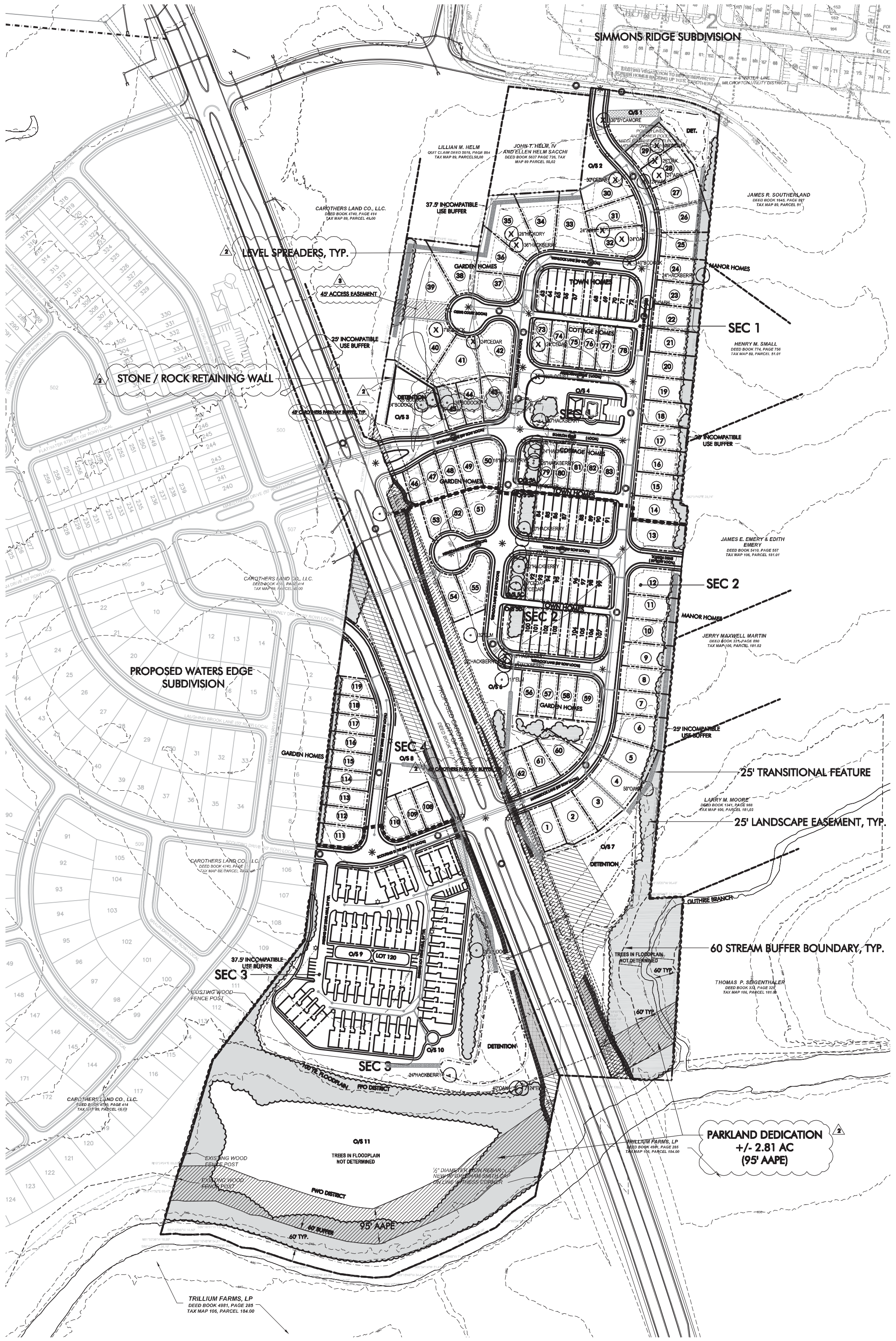
JULY 09, 2012

DEVELOPMENT PLAN SHT. 1 OF 2
SIMMONS RIDGE PUD SUBDIVISION
DEVELOPMENT PLAN

4408 SOUTH CAROTHERS ROAD
WILLIAMSON COUNTY, FRANKLIN, TN 37064
COF PROJECT No. ____

GREGORY C. GAMBLE
LANDSCAPE ARCHITECT

SHEET #
SHEET C 2.0
OF 15



LEGEND:

- EXISTING CONTOURS
- PROPOSED CONTOURS
- PARKLAND DEDICATION AREA
- CONNECTIVITY LINK
- CONNECTIVITY NODE
- 60' STREAM BUFFER
- SF — SILT FENCE
- TP — TREE PROTECTION FENCE
- PRESERVED TREE CANOPY
- STREET LIGHT

PROPOSED SOUTH CAROTHERS PKWY LEGEND:

- SLOPE EASEMENT
  DEED BOOK 4971 PAGES 322-335
- TEMPORARY. CONSTRUCTION. EASEMENT
  DEED BOOK 4971 PAGES 322-335
- PERMANENT DRAINAGE EASEMENT
  DEED BOOK 4971 PAGES 335

DEVELOPMENT PLAN NOTES:

1. BOUNDARY INFORMATION PROVIDED BY GRESHAM SMITH PARTNERS. TOPOGRAPHIC INFORMATION PROVIDED BY CITY OF FRANKLIN GIS DEPARTMENT.

2. THIS PROPERTY CAN BE REFERENCED AS TAX MAP 89 &106, PARCELS 05001 & 18121.

3. THERE ARE NO HISTORICAL STRUCTURES ON THIS SITE.

4. THE PUD DEVELOPMENT PLAN WILL RESULT IN A TOTAL OF 168 PROPOSED UNITS. BASED ON AN AVERAGE OF 10 VEHICLE TRIPS PER DAY PER HOUSEHOLD UNIT, THIS WILL GENERATE A TOTAL OF 1,680 TOTAL VEHICLE TRIPS PER DAY.

5. ADEQUATE TURNING MOVEMENTS SHALL BE PROVIDED FOR UTILITY AND SERVICE VEHICLES. ALL STREETS SHALL MEET THE CITY OF FRANKLIN TRANSPORTATION AND STREET TECHNICAL STANDARDS.

6. INITIAL DISCUSSION WITH THE CITY OF FRANKLIN ENGINEERING INDICATES THERE IS ADEQUATE CAPACITY TO SERVE THE PROPOSED DEVELOPMENT WITH SEWER SERVICES.

7. ALL PUBLIC IMPROVEMENTS TO BE LOCATED WITHIN AN EASEMENT

8. THE APPLICANT WILL ENDEAVOR, TO THE EXTENT POSSIBLE, TO PRESERVE EXISTING SUITABLE TREES ALONG THE EDGES AND THE INTERIOR OF THE SITE. EXISTING TREES TO BE SAVED WILL BE FLAGGED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. DURING THE CONSTRUCTION PHASE, THREE PROTECTION FENCING SHALL BE INSTALLED NEAR THE DRIP LINE OF THE PRESERVED TREES. NO CONSTRUCTION ACTIVITY OR STORAGE SHALL OCCUR WITHIN THE TREE PROTECTION ZONES.

9. LIGHTING WILL BE PEDESTRIAN IN SCALE AND LOCATED TO ENSURE SAFE MOVEMENT OF PEDESTRIAN / VEHICLES AND FOR SECURITY PURPOSES WHILE ADHERING TO THE CITY OF FRANKLIN DESIGN STANDARDS. MIDDLE TENNESSEE ELECTRIC SHALL APPROVE STREET LIGHT STANDARDS. DIRECTIONAL LIGHTING WILL BE DESIGNED SO AS TO MINIMIZE GLARE AND REFLECTION ON ADJACENT PROPERTIES.

10. SIGNS WILL MEET THE REQUIREMENTS OF THE CITY OF FRANKLIN ZONING ORDINANCE, CHAPTER 8.7 SIGNS. SIGN CONTROLS WILL BE ESTABLISHED, FOR THE DEVELOPMENT, TO SAFELY FACILITATE PEDESTRIAN AND VEHICULAR MOVEMENT IN AN ATTRACTIVE AND EFFICIENT MANNER. SIGNAGE WILL BE COMPATIBLE WITH THE SURROUNDINGS, WILL BE APPROPRIATE TO RESIDENTIAL SCALE AND EXPRESS THE IDENTITY OF THE DEVELOPMENT.

11. WATER FACILITIES
WATER SERVICE WILL BE COORDINATED WITH THE CITY OF FRANKLIN TO PROVIDE ADEQUATE FLOW AND CAPACITY. ALL WATER MAINS SHALL BE LOCATED IN A 20' PUBLIC UTILITY EASEMENT.

12. SEWER FACILITIES - SEWER SERVICE WILL BE COORDINATED WITH THE CITY OF FRANKLIN TO PROVIDE ADEQUATE FLOW AND CAPACITY. ALL SEWER LINES SHALL BE LOCATED IN A 20' SANITARY SEWER EASEMENT.

13. A 25' TRANSITIONAL FEATURE HAS BEEN PROVIDED ON THE EASTERN BOUNDARY OF THE PROPERTY.

14. ALL FACILITIES SHALL BE DESIGNED TO MEET ALL CITY OF FRANKLIN ORDINANCE.

15. DEVELOPMENT STANDARDS WITHIN 500' OF THE SITE ARE CONVENTIONAL.

16. SIMMONS RIDGE IS A PLANNED DEVELOPMENT TO THE NORTH OF OUR PROJECT SITE. THERE IS ALSO A FUTURE PROPOSED DEVELOPMENT TO THE WEST OF PROJECT BOUNDARY. MEETINGS HAVE BEEN CONDUCTED WITH THE OWNER REPRESENTATIVES FOR THE ADJACENT PROPOSED DEVELOPMENTS TO COORDINATE ACCESS POINTS AND CONNECTIVITY BETWEEN THE PROPERTIES.

17. WATER, SEWER & REPURIFIED WATER FACILITIES
- I) EXISTING FACILITIES
  - 1) SANITARY SEWER SYSTEM
    - A) UTILITY DISTRICT JURISDICTION: CITY OF FRANKLIN
    - B) UTILITY DISTRICT ADDITIONAL FLOW IS 168 SFUE.
      1 SFUE = 350 GALLONS/UNIT/DAY
      SFUE - SINGLE FAMILY UNIT EQUIVALENT
  - 2) DOMESTIC WATER SUPPLY
    - A) UTILITY DISTRICT JURISDICTION: MILCROFTON
  - 3) NATURAL GAS SERVICE
    - A) UTILITY DISTRICT JURISDICTION: ATMOS ENERGY
  - 4) ELECTRIC SERVICE
    - A) UTILITY DISTRICT JURISDICTION:
      MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION
- II) PROPOSED FACILITIES
  - A) DEMAND IN GALLONS PER DAY
    168 X 350 GPD = 58,800 GPD

18. THERE ARE NO ANTICIPATED IMPACTS ON STREETS SHOWN IN THE MAJOR THOROUGHFARE PLAN, THE LOCAL STREET PLAN, OR THE BIKE PEDESTRIAN PLAN.

19. FROM THIS SITE, IT IS APPROXIMATELY 2.5 MILES TO THE FIRE STATION ON HWY. 96/JORDAN ROAD AND 4 MILES TO THE CITY POLICE DEPARTMENT LOCATED DOWNTOWN AT CITY HALL. THE NEAREST PARK AND RECREATIONAL FACILITIES ARE LOCATED APPROXIMATELY 3.7 MILES WEST OF THE DEVELOPMENT ON HWY. 96 (PINKERTON PARK). CHEEK PARK AND THE WILLIAMSON COUNTY RECREATION CENTER ARE APPROXIMATELY 5.5 MILES FROM THE PROPOSED DEVELOPMENT.

20. THIS DEVELOPMENT WILL RESULT IN AN INCREASE OF 168 HOUSEHOLD UNITS. BASED ON AN AVERAGE OF 0.64 SCHOOL AGE STUDENTS PER SINGLE FAMILY HOUSEHOLD, THIS WILL INCREASE THE CURRENT STUDENT SCHOOL POPULATION BY A TOTAL OF +/- 108 STUDENTS WITHIN THE FOLLOWING CATEGORIES: PAGE HIGH SCHOOL, PAGE MIDDLE SCHOOL, AND TRINITY ELEMENTARY SCHOOL.

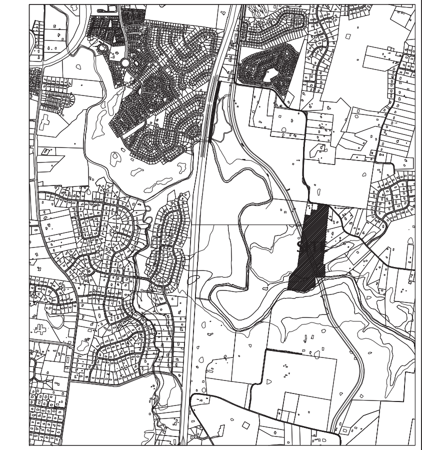
21. THE SUBJECT PROPERTY IS CONSISTENT WITH THE McEWEN CHARACTER AREA INCLUDING THE GUIDING PRINCIPALS OF SPECIAL AREA 6:

-REFLECTS SAME CHARACTER OF CURRENT AND PROPOSED DEVELOPMENT.

22. THE PROPOSED DEVELOPMENT PATTERN CONSISTS OF LOTS WHICH ARE COMPARABLE TO THE EXISTING AND PROPOSED SURROUNDING DEVELOPMENT.

23. ALL PARKING REQUIREMENTS SHALL BE MET WITH GARAGES AND DRIVEWAYS AT EACH RESIDENTIAL UNIT AS WELL AS SUPPLEMENTAL ONSTREET PARKING WHERE VILLA UNITS ARE PLANNED.

24. RESIDENTIAL FIRE SPRINKLER SYSTEMS SHALL BE PROVIDED IF 1,500 GPM / 20 PSI IS NOT AVAILABLE. (3)



VICINITY MAP - NTS

SITE DATA

PROJECT NAME:	ECHELON
TAX MAP:	89 & 106
PACREL:	089-05001 & 106-18121
CITY:	FRANKLIN
COUNTY:	WILLIAMSON
STATE:	TENNESSEE
CIVIL DISTRICT:	14
LAND USE/ZONING:	AG (AGRICULTURAL DISTRICT)
ADDRESS:	4419 S CAROTHERS ROAD FRANKLIN, TENNESSEE
DEED BOOK:	
OWNER:	JOHN T. HELM IV & ELLEN HELM SACCHI

EXISTING ZONING AND CHARACTER AREA OVERLAY:	AG - McEWEN-6
PROPOSED ZONING:	PUD RX RESIDENTIAL VARIETY
OTHER APPLICABLE OVERLAYS:	FFO & FWO
APPLICABLE DEVELOPMENT STANDARD:	CONVENTIONAL
ACREAGE OF SITE	+/- 57.23
TOTAL UNITS:	168
DENSITY:	
SECTION 1:	3.55 DU/AC
SECTION 2:	2.91 DU/AC
SECTION 3:	2.02 DU/AC
SECTION 4:	2.55 DU/AC
RESIDENTIAL UNITS:	
MANOR:	32
GARDEN:	43
COTTAGE:	11
VILLA:	48
TOWN HOMES:	34
OPEN SPACE REQUIREMENTS	
FORMAL OPEN SPACE REQUIRED	+/- 2.86 AC.
INFORMAL OPEN SPACE REQUIRED	+/- 5.75 AC.
FORMAL OPEN SPACE PROVIDED	+/- 2.86 AC.
INFORMAL OPEN SPACE PROVIDED	+/- 11.80 AC.
OPEN SPACE CHART	
OPEN SPACE #1: INFORMAL	+/- 0.55 AC.
OPEN SPACE #2: INFORMAL	+/- 0.17 AC.
OPEN SPACE #3: INFORMAL	+/- 0.56 AC.
OPEN SPACE #4: FORMAL	+/- 0.68 AC.
OPEN SPACE #5A-5D: INFORMAL	+/- 0.05 AC.
OPEN SPACE #6: INFORMAL	+/- 1.25 AC.
OPEN SPACE #7: INFORMAL	+/- 1.73 AC.
OPEN SPACE #8: INFORMAL	+/- 0.75 AC.
OPEN SPACE #9: FORMAL	+/- 0.18 AC.
OPEN SPACE #10: FORMAL	+/- 2.00 AC.
OPEN SPACE #11: INFORMAL	+/- 6.74 AC.
PARKLAND DEDICATION PROVIDED (35 UN x 1,200SF)+(134 UN x 600SF) = 122,400SF (+/-2.81 AC)	+/- 2.81 AC. (122,400 SF)
CONNECTIVITY INDEX	1.73 (26 LINKS / x15NODES = 1.73)
PROPOSED BUILDING SETBACKS - MANOR LOTS	
FRONT BUILDING SETBACK:	15' MINIMUM
SIDE BUILDING SETBACK:	5' MINIMUM
REAR BUILDING SETBACK:	10' MINIMUM
PROPOSED BUILDING SETBACKS - GARDEN, COTTAGE LOTS LOTS	
FRONT BUILDING SETBACK:	8' MINIMUM
SIDE BUILDING SETBACK:	5' MINIMUM
REAR BUILDING SETBACK:	10' MINIMUM
PROPOSED BUILDING SETBACKS - VILLA, TOWN HOME LOTS	
FRONT BUILDING SETBACK:	5' / 8' MINIMUM (SEE SHEET A1.00)
SIDE BUILDING SETBACK:	5' MINIMUM
REAR BUILDING SETBACK:	4' MINIMUM

ENGINEERING PROVIDED BY:
MICHAEL RAY
FISHER & ARNOLD INC.
1420 DONELSON PIKE, SUITE A-12
NASHVILLE, TN. 37217
(615) 383-6300
mray@fisherarnold.com

APPLICANT:
JOHN HAAS
EDGE
210 12TH AVE. SOUTH
SUITE 202
NASHVILLE TN, 37203
(615) 250-8154
jhaas@edgela.com

DEVELOPER:
T. KEITH GLENN
CRESCENT RESOURCES
227 W. TRADE STREET
SUITE 1000
CHARLOTTE, NC. 28202

DEVELOPER:
KHRIS PASCARELLA
PEARL STREET PARTNERS, LLC
205 POWELL PLACE
BRENTWOOD TN 37027
kpascarella@pearlstreetpartners.com

IF YOU DIG TENNESSEE...
CALL US FIRST!
1-800-351-1111
TENNESSEE ONE CALL
IT'S THE LAW

0' 100' 200' 400'

NORTH

CONSULTANTS

EDGE
PLANNING LANDSCAPE ARCHITECTURE GRAPHIC DESIGN
210 Twelfth Avenue South
Suite 202
Nashville, Tennessee 37203
P 615-250-8154
F 615-250-8155

FISHER & ARNOLD, INC.

SEAL

JOHN DAVID HAAS III
REGISTERED LANDSCAPE ARCHITECT
TENNESSEE
10/10/2013

PROJECT TITLE

Echelon
PUD Development Plan
Franklin, TN
COF #2667

CLIENT

Crescent Resources
Charlotte, NC

PROJECT NO.	13007
Date	2/11/13
Revisions	
1	03/07/2013
2	08/23/2013 POST PC
3	10/10/2013 POST PC

Sheet Title

DEVELOPMENT PLAN

Sheet Number

L 1.00

gamble design collaborative

January 8th, 2013

WATER'S EDGE

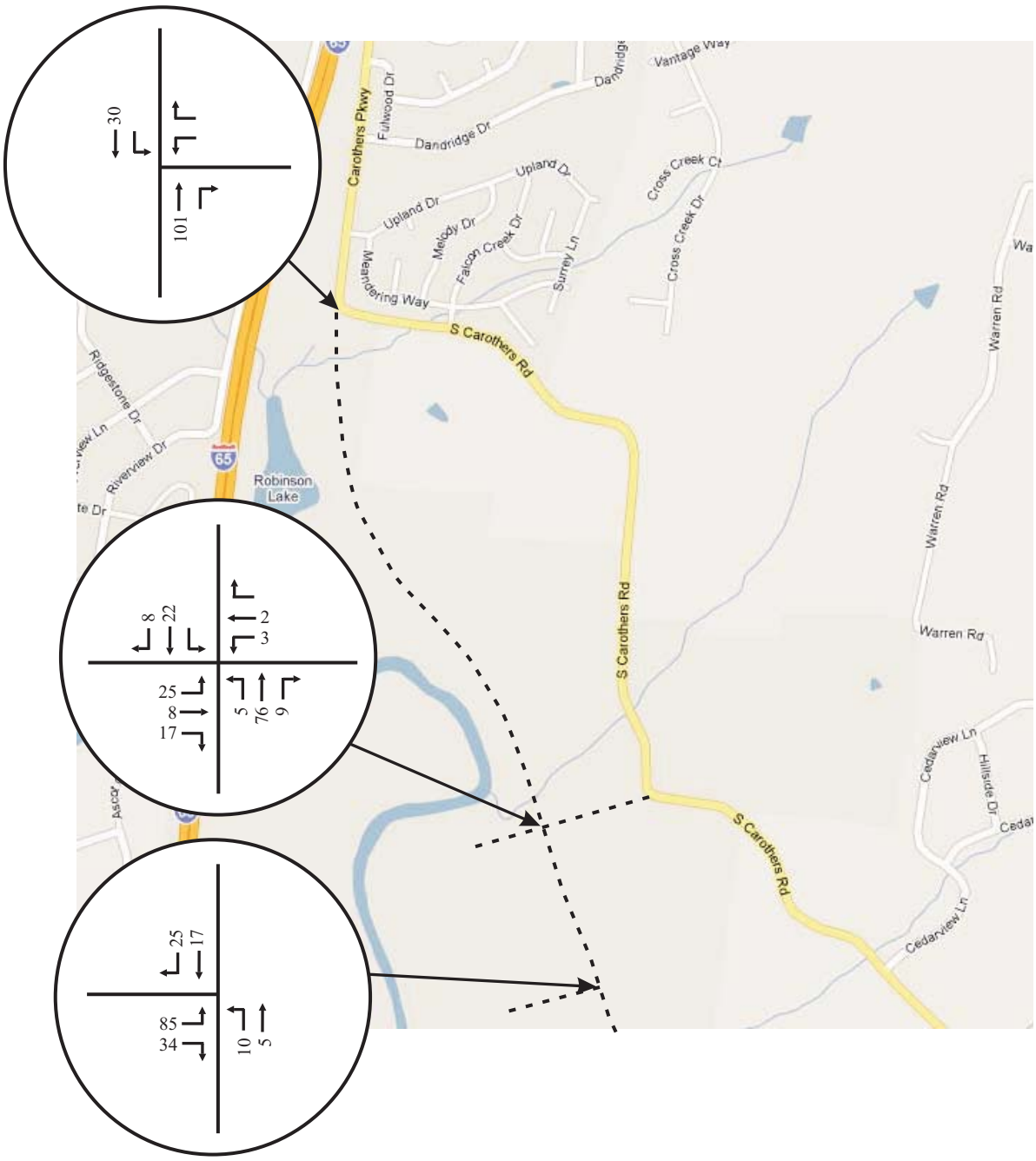
FRANKLIN, TENNESSEE

CONCEPTUAL MASTER PLAN

Goodall HOMES

Your Dream Starts Here

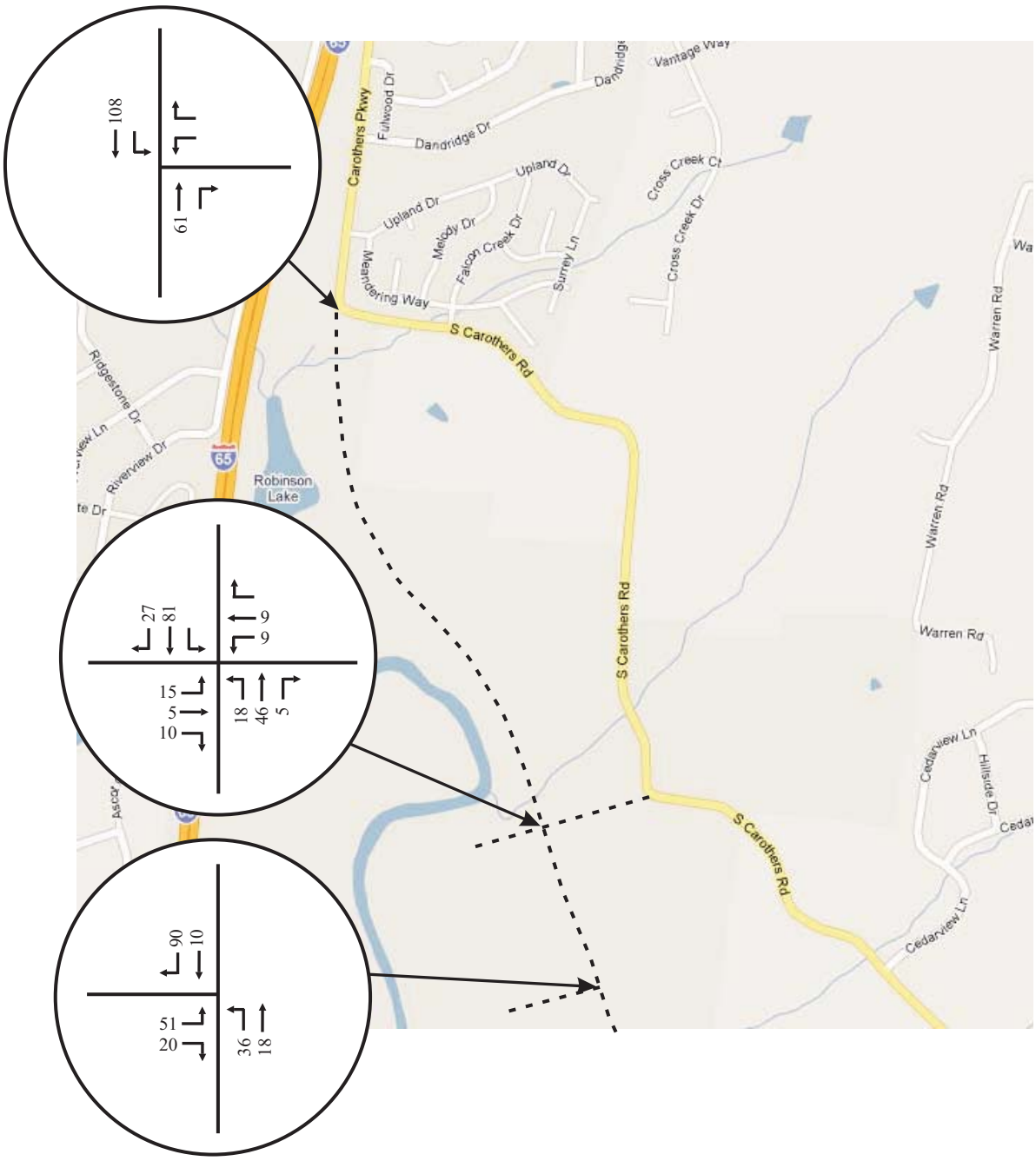
F i s c h b a c h
Transportation Group, LLC
Traffic Engineering and Planning



No Scale

Figure 6A.
AM Peak Hour Traffic Volumes
Generated by the Water's Edge Project

F i s c h b a c h
Transportation Group, LLC
Traffic Engineering and Planning



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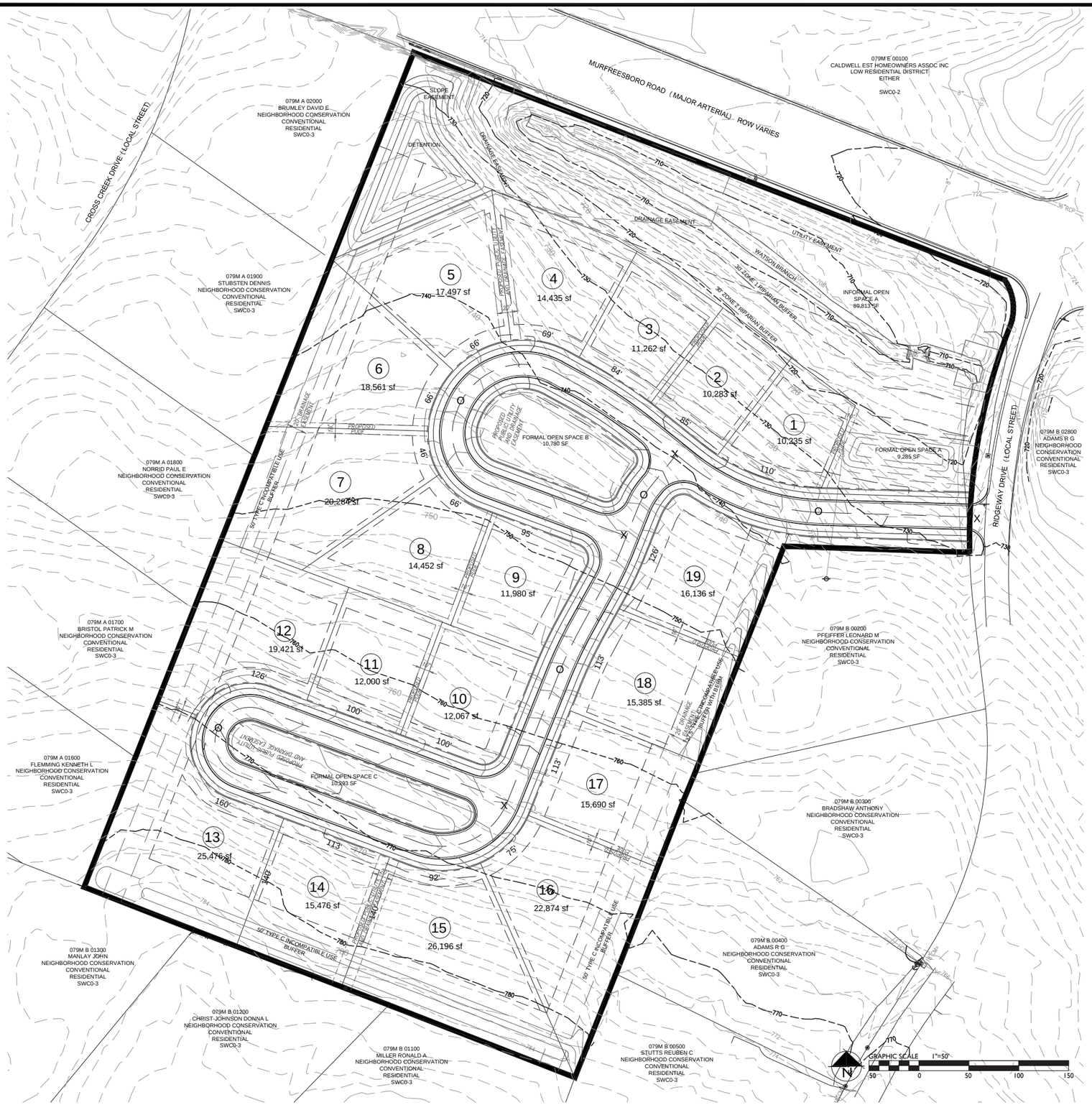
No Scale

Figure 6C.
PM Peak Hour Traffic Volumes
Generated by the Water's Edge Project



LAND USE PLAN COMPLIANCE

CHARACTER AREA OVERLAY: SWC0-3
APPLICABLE DEVELOPMENT STANDARD: CONVENTIONAL

1. THE EXISTING USES WITHIN SEWARD HALL CHARACTER AREA 3 ARE PREDOMINANTLY SINGLE FAMILY DETACHED HOMES. THE PROPOSED PLAN PROVIDES SINGLE FAMILY HOME LOTS.

2. THE PROPOSED DEVELOPMENT PLAN PRESERVES THE FRONT PORTION OF THE PROPERTY ALONG MURFREESBORO ROAD AS OPEN SPACE. THIS OPEN SPACE "FRONT YARD" IS CONSISTENT WITH THE CHARACTER OF THE CORRIDOR.

3. THE PROPOSED DEVELOPMENT WILL BE ACCESSED FROM RIDGEWAY DRIVE.

LOCAL COMPATIBILITY

THE PROPOSED SUBDIVISION IS PLANNED WITH TWO STORY SINGLE FAMILY HOMES RANGING IN SIZE BETWEEN 3500 SQUARE FEET AND 4600 SQUARE FEET. THESE HOMES ARE COMPATIBLE WITH THE HOMES WITHIN THE ADJACENT NEIGHBORHOODS, RIDGEWAY AND CROSS CREEK SUBDIVISIONS EVEN THOUGH THEY ARE PROPOSED ON LOTS LESS THAN ONE ACRE, .

THE HOMES WITHIN THE RIDGEWAY AND CROSS CREEK SUBDIVISIONS ARE BETWEEN 1900 TO 5700 SQUARE FEET IN SIZE. THE AVERAGE HOME IS 3500 SQUARE FEET IN SIZE. THESE HOMES WERE BUILT ON ONE ACRE LOTS WITH SEPTIC TANKS ACCORDING TO WILLIAMSON COUNTY DEVELOPMENT REGULATIONS. SINCE THE DEVELOPMENT OF THESE HOMES, SEWER HAS BEEN MADE ACCESSIBLE BY THE CITY OF FRANKLIN WITH A SEWER MAIN ALONG MURFREESBORO ROAD.

THE PROPOSED PUD PLAN FOLLOWS THE ZONING ORDINANCE'S REQUIREMENTS FOR PROVIDING A TYPE 'C' INCOMPATIBLE USE BUFFERS WHERE ADJACENT LOTS ARE LESS THAN 75% OF THE ADJACENT LOTS. A TYPE 'C' BUFFER IS PLANNED ON 3 BOUNDARIES OF THE SITE ADJOINING ADJACENT LOTS ZONED NEIGHBORHOOD CONSERVATION (WILLIAMSON COUNTY). IN ADDITION TO SPACIAL REQUIREMENTS, THIS BUFFER WILL INCLUDE 16 TREES AND 40 SHRUBS EVERY ONE HUNDRED LINEAR FEET. THE NEIGHBORING HOMES AVERAGE A REAR SETBACK OF 88 FEET FROM OCTOBER PARK'S BOUNDARY. HOMES ARE AS CLOSE AS 25 FEET TO THE PROPERTY AND AS FAR AWAY AS 165 FEET. THE AVERAGE DISTANCE BETWEEN THE NEW HOMES AND THE EXISTING HOMES WILL BE 138 FEET.

COMPATIBILITY OF LOT SIZE SHOULD NOT BE THE ONLY FACTOR TO DETERMINE APPROPRIATENESS OF THE DEVELOPMENT PLAN. THE PROPOSED PLAN IS COMPATIBLE IN THE SIZE OF HOME AND COST OF HOME, AND ARE FULLY SCREENED FOR THE PRIVACY OF THE EXISTING NEIGHBORS AND THE NEW RESIDENTS.

THE DEVELOPMENT OF ONE ACRE LOTS WITHIN THE CITY OF FRANKLIN IS OFTEN BOTH COST PROHIBITIVE FOR DEVELOPMENT AND COST PROHIBITIVE FOR LONG TERM MAINTENANCE OF INFRASTRUCTURE. THE DENSITY AND LOT SIZES PROPOSED IN THE PUD ARE NECESSARY DUE TO THE COST OF INFRASTRUCTURE AND COST OF LAND. BOTH RIDGEWAY AND CROSS CREEK SUBDIVISIONS WERE DEVELOPED WITHOUT STORMWATER DETENTION BASINS, SEWER, CURB AND GUTTER, SIDEWALKS, FORMAL OPEN SPACE, NOR INFORMAL OPEN SPACE PRESERVATION AREAS. THE PER LOT COST OF DEVELOPMENT, INSTALLATION, AND MAINTENANCE IS DISPROPORTIONATELY HIGHER FOR NEW DEVELOPMENT THAN THE ADJACENT EXISTING SUBDIVISIONS DUE TO THE CITY'S DESIGN STANDARDS.

CONNECTIVITY INDEX

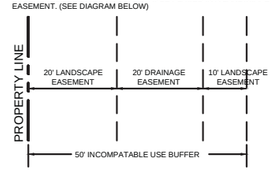
0 LINKS 1
X NODES 4

INDEX = 1.0

DUE TO EXISTING CONDITIONS OF THIS PROPERTY, AND ADJACENT EXISTING SUBDIVISION, OFF-SITE CONNECTIONS ARE NOT POSSIBLE AND ARE NOT PROVIDED WITH THIS PUD. A SPECIAL EXCEPTION IS REQUESTED FROM THE ENGINEERING DEPARTMENT FOR OFF SITE CONNECTIONS.

INCOMPATIBLE USE BUFFER

THE SOUTHERN, EASTERN, AND WESTERN BOUNDARIES SHALL HAVE A TYPE 'C' INCOMPATIBLE USE BUFFER AS SHOWN ON THE SITE PLAN. INCOMPATIBLE USE BUFFERS ARE TO BE PLACED IN A LANDSCAPE EASEMENT. (SEE DIAGRAM BELOW)



PARKLAND DEDICATION

PARKLAND DEDICATION SHALL BE FEE IN LIEU OF FOR THIS DEVELOPMENT PLAN.

19 X 1200SF = 22,800 SF (0.52 ACRES)

HYDRANT FIRE FLOW

(HYDRANT LOCATED 500' EAST OF THE INTERSECTION OF RIDGEWAY DR AND HWY 96)
WATER MAIN 16" DUCTILE IRON
FLOW: 1455 GPM
STATIC PRESSURE: 99 PSI
RESIDUAL PRESSURE: 75 PSI

STREAMSIDE BUFFER ENHANCEMENT

ENHANCEMENT SHALL INCLUDE REMOVAL OF INVASIVE SPECIES AND THE RE-ESTABLISHMENT OF NATIVE SPECIES WHICH PROVIDES A MIX OF CANOPY TREES, UNDERSTORY SHRUBS, AND A NATIVE SEED MIX OF FORBES/GRASSES/SEDGES/RUSHES SUITABLE FOR A MOIST SHADED UNDERSTORY.

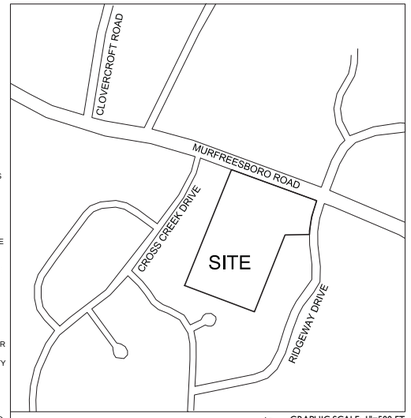
THERE SHALL BE NO CLEARING, GRADING, CONSTRUCTION, STORAGE, OR DISTURBANCE OF VEGETATION ALLOWED IN THE STREAM BUFFER EXCEPT AS PERMITTED BY THE CITY ENGINEER.

PHASING

THE DEVELOPMENT WILL BE CONSTRUCTED AS A SINGLE PHASE.

CRITCAL TREE LOTS

LOTS 3, 4, 5, 6, 14, 16 & 20 ARE CRITICAL TREE LOTS.



SITE DATA:

PROJECT NAME:	OCTOBER PARK
PROJECT NUMBER:	4686
SUBDIVISION:	NA
LOT NUMBER:	NA
ADDRESS:	1110 RIDGEWAY DRIVE
CITY:	FRANKLIN, TN
COUNTY:	WILLIAMSON
STATE:	TENNESSEE
CIVIL DISTRICT:	14TH CIVIL DISTRICT
MAP, GROUP, PARCEL NUMBERS:	MAP 79, PARCELS 60.07, 60.01, AND MAP 79M GROUP B PARCEL 1.00
EXISTING ZONING:	WILLIAMSON COUNTY NEIGHBORHOOD CONSERVATION
PROPOSED ZONING:	SD-R 1.6 D/UA
CHARACTER AREA OVERLAY:	SWCO-3
APPLICABLE DEVELOPMENT STANDARD:	CONVENTIONAL
TOTAL ACREAGE:	11.88 AC
TOTAL SQUARE FOOTAGE:	517,412 SF
MINIMUM REQUIRED SETBACKS:	
FRONT YARD: 15'	
REAR YARD: VARIES WITH BUFFER TREATMENT	
SIDE YARD: 5'	

OWNER:	R. GLENN ADAMS
ADDRESS	1100 RIDGEWAY DRIVE FRANKLIN, TN 37067
CONTACT	GLENN ADAMS
APPLICANT:	VERTEX DEVELOPMENTN, LLC
ADDRESS	1212 HOSS ROAD POWELL, TN 37849
OFFICE PHONE	865-384-8124
EMAIL ADDRESS	sbethel.bethel@gmail.com
CONTACT	STEVE BETHEL
PLANNER/LANDSCAPE ARCHITECT:	GAMBLE DESIGN COLLABORATIVE
ADDRESS	144 SOUTHEAST PARKWAY SUITE 200 FRANKLIN, TN 37064
OFFICE PHONE	615.975.5765
EMAIL ADDRESS	greggamble209@gmail.com
CONTACT	GREG GAMBLE

PROJECT CHARACTERISTICS	
BUILDING SQUARE FOOTAGE:	N/A
BUILDING HEIGHT:	2 STORY
LANDSCAPE SURFACE RATIO:	0.84
MINIMUM LANDSCAPE RATIO:	0.40
INCOMPATIBLE-USE BUFFER REQUIRED:	YES TYPE A BUFFER TO NORTH TYPE C BUFFER, SOUTH, EAST, AND WEST
MINIMUM PARKING REQUIRED:	N/A
MAXIMUM PARKING LIMIT:	N/A
EXISTING PARKING:	N/A
PARKING PROVIDED:	SINGLE FAMILY DETACHED 2 PER UNIT
RESIDENTIAL DENSITY:	1.60 DU/A (19 UNITS)
EXISTING TREE CANOPY:	1.66 AC
PRESERVED TREE CANOPY:	1.48 AC
PARKLAND	FEE IN LIEU
OPEN SPACE:	2.76 AC PROVIDED (23.22%)
TOTAL REQUIRED: 1.79 AC (15% OF ACREAGE)	
TOTAL PROVIDED: 2.76 AC (23.22%)	
FORMAL: .70 AC (39.1% OF REQUIRED)	
REQUIRED: .59 AC (33%)	
PROVIDED: .70 AC (39.1%)	
INFORMAL PROVIDED: 2.06 AC	

STATEMENT OF IMPACTS

WATER
WATER SERVICE WILL BE PROVIDED BY THE MILCROFTON UTILITY DISTRICT. THE WATER MAIN WILL BE SERVED FROM A MAIN IN RIDGEWAY DRIVE.
19 x 350 GDP = 6,650 GDP

SEWER
SEWER SERVICE WILL BE PROVIDED BY THE CITY OF FRANKLIN. SEWER MAIN CONNECTION AT MANHOLE LOCATED AT THE INTERSECTION OF RIDGEWAY DRIVE AND HIGHWAY 96.

DRAINAGE FACILITIES
THE PROPERTY WILL BE DRAINED TO THE NORTH TO DETENTION FACILITY. THE DETENTION POND WILL DRAIN TO WATSONS BRANCH BETWEEN THE SITE AND HWY 96.

POLICE AND FIREP
FRANKLIN FIRE DEPT STATION #2 - 2.2 MILES DRIVING DISTANCE
COLUMBIA AVE POLICE STATION - 3.8 MILES DRIVING DISTANCE

RECREATION FACILITIES
LIBERTY PARK - 3.0 MILES DRIVING DISTANCE

PROJECTED STUDENT POPULATION
THE STUDENT POPULATION IS PROJECTED AT A RATE OF .64 STUDENTS PER HOME: 19 x .64 = 12.2 STUDENTS

TRINITY ELEMENTARY SCHOOL	2.7 MILES
PAGE MIDDLE SCHOOL	6.0 MILES
PAGE HIGH SCHOOL	6.0 MILES

REFUSE COLLECTION
REFUSE COLLECTION SERVICE WILL BE PROVIDED BY THE CITY OF FRANKLIN SOLID WASTE.

RESTRICTIVE COVENANTS
A HOME OWNER'S ASSOCIATION WILL BE ESTABLISHED PRIOR TO THE FIRST OCCUPANCY OF RESIDENTS. THE HOME OWNER'S ASSOCIATION WILL REGULATE ARCHITECTURAL STANDARDS AND THE MAINTENANCE OF THE COMMUNITY. THE HOA WILL MAINTAIN ALL COMMON OPEN SPACE AND RECREATIONAL AREAS.

MINERAL RIGHTS
NO THIRD PARTY MINERAL RIGHTS ARE ASSOCIATED WITH THIS PROPERTY.

COF 4686

Revisions:
1. 11.10.2014
2. 12.03.2014

Drawing Notes:

GDC
GAMBLE
DESIGN COLLABORATIVE
DEVELOPMENT PLANNING AND LANDSCAPE ARCHITECTURE

Date: OCT 13, 2014

OCTOBER PARK PUD SUBDIVISION
DEVELOPMENT PLAN

Parcels 60.07, 60.01 on Map 79M
Map 79 and 1.00 in Group B on Tax Map 79M
Franklin, Williamson County, Tennessee

GREGORY C. GAMBLE
TENNESSEE
REGISTERED
LANDSCAPE ARCHITECT

GAMBLE DESIGN COLLABORATIVE
144 SOUTHEAST PARKWAY
SUITE 230
FRANKLIN, TENNESSEE 37064
GREG GAMBLE
greggamble209@gmail.com
615.975.5765

DEVELOPMENT PLAN

C 3.0

SITE DATA CHART

PROJECT NAME: FOUNTAINS OF FRANKLIN, SITE PLAN, SECTION 2.
PROJECT #: 4523
SUBDIVISION: SILVER GRACE
LOT NUMBER: 1 AND 2
ADDRESS: 4100 MURFREESBORO ROAD
CITY: FRANKLIN
COUNTY: WILLIAMSON
STATE: TENNESSEE
CIVIL DISTRICT: 14TH

EXISTING ZONING AND CHARACTER AREA OVERLAY:
RX RESIDENTIAL VARIETY DIST. / SEWARD HALL SH2
OTHER APPLICABLE OVERLAYS: –
APPLICABLE DEVELOPMENT STANDARD: CONVENTIONAL
ACREAGE OF SITE: 14.88
SQUARE FOOTAGE OF SITE: 648,134.2
MINIMUM REQUIRED SETBACK LINES:
STREET FRONTING: 30' LOCAL/50' ARTERIAL (VILLAS)
STREET FRONTING: 60' (SINGLE FAMILY LOTS)
SIDE YARD: 10'
REAR YARD: 30'

OWNER LOTS 1 & 2:
FOUNTAINS OF FRANKLIN, L.L.C.
2202 JEFFERSON COURT
FRANKLIN, TN 37064
(615)790-7041
MAP 79, PARCEL 59
MAP 80, PARCEL 39.04
BOOK 5006, PAGE 86
CONTAINING 13.51 ACRES (588,615.2 S.F.) &
CONTAINING 1.37 ACRES (59,519 S.F.)

APPLICANT/DEVELOPER:
GOODWORKS UNLIMITED, LLC
GARY KECKLEY
2202 JEFFERSON COURT
FRANKLIN, TN 37064
(615)790-7041
GKECKLEY@YAHOO.COM

BUILDING SQUARE FOOTAGE:
MEMORY CARE BUILDING: ±9,548
PHASE 2 VILLAS: ±23,213

BUILDING HEIGHT:
MEMORY CARE: ONE STORY-26'
VILLAS: ONE STORY-30'

LANDSCAPE SURFACE RATIO: 0.22
MIN. LANDSCAPE SURFACE RATIO: 0.10
INCOMPATIBLE-USE BUFFER REQUIRED: 37.5' CLASS C ALONG EAST PROPERTY BOUNDARY (25% REDUCTION W/6' OPAQUE FENCE)

MINIMUM PARKING REQUIREMENT:
MAIN BUILDING: 0.25 PER PATIENT + 1 PER EMPLOYEE = .25 (59) + 15 = 30 SPACES (TEMPORARY CARE FACILITY)
TOTAL: 30 SPACES
MAXIMUM PARKING LIMIT: 120% OF 30 = 36 SPACES

PARKING PROVIDED:
MAIN BUILDING: 59 SPACES
TOTAL: 59 SPACES
ADDITIONAL SPACES FOR FUTURE SECTIONS

RESIDENTIAL DENSITY: 3.96 UNITS PER ACRE

PARKLAND DEDICATION: PAYMENT IN-LIEU BASED ON 30 UNITS AT 1,200 S.F./UNIT = 36,000 S.F.

TREE CANOPY: 34,570 S.F. TO REMAIN; 58% OF LOT 2

OPEN SPACE:
REQUIRED:
FORMAL: 5%=14.88AC(.05)=32,409 S.F.
INFORMAL: 10%=14.88AC(.10)=64,817 S.F.
PROVIDED:
FORMAL: 45,907 S.F. = 7.08%
INFORMAL: 173,508 S.F. = 26.77%

WATER SUPPLY:
THE WATER UTILITY DISTRICT THAT SERVICES THIS DEVELOPMENT IS THE MILCROFTON UTILITY DISTRICT 6333 ARNO RD FRANKLIN, TN 37064. THE CONTACT PERSON AT MILCROFTON IS CARL SCOTT AT 615-794-5947. THE RECORDED DATA FOR THIS HYDRANT IS 105 PSI STATIC PRESSURE AND 96 PSI RESIDUAL PRESSURE WITH A FLOW RATE OF 1,300+ GPM.

ALL VILLAS AND ASSISTED SUITES TO HAVE AUTOMATIC FIRE SPRINKLERS.

SANITARY SEWER SERVICE:
THE UTILITY DISTRICT THAT SERVICES THIS DEVELOPMENT IS THE CITY OF FRANKLIN. THE SEWER INFRASTRUCTURE FOR THIS DEVELOPMENT WAS INSTALLED IN PHASE 1. CLEAN-OUTS FOR THE VILLAS HAVE BEEN STUBBED OUT FOR CONNECTION DURING THIS PHASE. THE MEMORY CARE ADDITION WILL BE SERVED INTERNALLY BY THE EXISTING FACILITY. ALL SEWER CONNECTIONS MUST BE APPROVED BY THE CITY OF FRANKLIN (COF) AND CONSTRUCTION WILL ADHERE TO THE SPECIFICATIONS OF THE COF.

STORMWATER CONTROL:
ALL STORMWATER TREATMENT FOR QUALITY AND QUANTITY WERE INSTALLED DURING PHASE 1 FOR THE COMPLETE BUILD-OUT OF THIS DEVELOPMENT. NO NEW TREATMENT IS REQUIRED FOR THIS PHASE. ON SITE DETENTION WAS DESIGNED TO TREAT A MAXIMUM IMPERVIOUS AREA OF 266,588 S.F.

ELECTRIC SERVICE:
THE UTILITY DISTRICT THAT SERVICES THIS DEVELOPMENT IS MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORP. (MTEMC). MTEMC HAS PROVIDED THE LAYOUT. ALL ELECTRIC SERVICE LINES TO BE UNDERGROUND. ALL CONSTRUCTION TO ADHERE TO THE SPECIFICATIONS OF MTEMC.

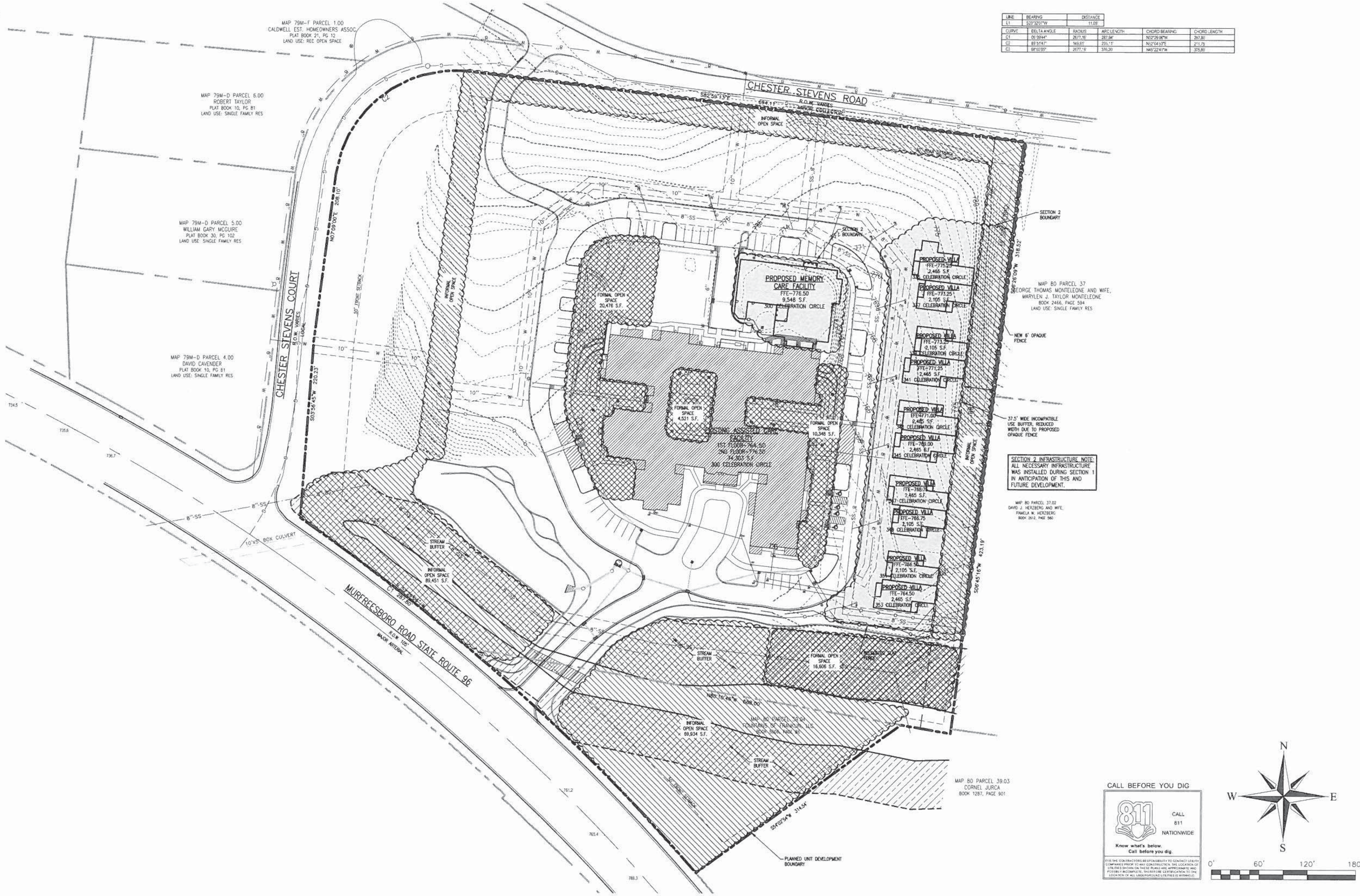
TREE PROTECTION NOTE:
ALL TREE PROTECTION FENCING SHALL BE INSTALLED PRIOR TO ISSUANCE OF A GRADING PERMIT AND SHALL BE MAINTAINED IN GOOD WORKING ORDER UNTIL ALL CONSTRUCTION ACTIVITY IS COMPLETE. ANY REQUIRED EROSION CONTROL MEASURES SHALL BE PLACED OUTSIDE OF ANY TREE PROTECTION FENCING.

UTILITY NOTE:
WITHIN NEW DEVELOPMENTS AND FOR OFFSITE LINES CONSTRUCTED AS A RESULT OF, OR TO PROVIDE SERVICE TO THE NEW DEVELOPMENT, ALL UTILITIES, SUCH AS CABLE TELEVISION, ELECTRICAL(EXCLUDING TRANSFORMERS), GAS, SEWER, TELEPHONE, AND WATER LINES SHALL BE PLACED UNDERGROUND.

SOLID WASTE SERVICE:
THE SITE IS CURRENTLY SERVICED BY A DUMPSTER LOCATED AT THE REAR OF THE EXISTING FACILITY. THIS WILL CONTINUE TO BE USED FOR THE PRESENT FACILITY AS WELL AS THE PHASE 2 ADDITIONS, MEMORY CARE UNIT AND VILLAS.

APPROVAL NOTE:
THIS SITE PLAN HAS BEEN DESIGNED TO MEET THE CITY OF FRANKLIN STANDARDS AND THE APPROVAL OF THE PLANNING COMMISSION CHANGES SHALL NOT BE MADE TO THE APPROVED SITE PLAN UNLESS APPROVED BY EITHER THE RELEVANT DEPARTMENT SUPERINTENDENT OR THE PLANNING COMMISSION.

RETAINING WALL NOTE:
ALL RETAINING WALLS ON SITE SHALL MEET THE STANDARDS OF SECTION 5.6 OF THE FRANKLIN ZONING ORDINANCE. DETAILS OF RETAINING WALLS SHALL BE SUBMITTED TO THE DEPT. OF BUILDING AND NEIGHBORHOOD SERVICES FOR REVIEW. REFER TO LANDSCAPE PLANS IN THIS SUBMITTAL FOR PLANTINGS AROUND WALLS.



CIVIL CONTRACTOR NOTES:

1. THE SCOPE OF WORK IS THE TOTALITY OF THE CONTRACT DOCUMENTS INCLUDING PLANS, SPECIFICATIONS, FIELD ORDERS, SHOP DRAWING APPROVAL CONDITIONS AND PERFORMANCE REQUIREMENTS OF THE SCOPE OF WORK. THE SCOPE OF WORK IS IDENTIFIED WITH SPECIFICATION SECTIONS AND SHEET ALPHA NUMERIC CONVENTION, BUT SUCH IDENTIFICATION DOES NOT DEFINE, RESTRICT OR ASSIGN THE SCOPE OF WORK OR ORGANIZE THE CONTRACT.
2. THE SCOPE OF WORK IS SUBJECT TO AND SHALL INCLUDE THE REQUIREMENTS OF THE APPLICABLE CODES, STANDARDS AND ORDINANCES FOR THE LOCATION OF THIS PROJECT AND THE INTERPRETATIONS OF THE CODES, STANDARDS AND ORDINANCES BY THE AUTHORITIES HAVING JURISDICTION OF THIS PROJECT. SUCH INTERPRETATION SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO BIDDING. ANY VARIANCE FROM THE CONTRACT DOCUMENTS SHALL BE INCLUDED IN THE BIDDING AS A QUALIFICATION OF ANY BID AND SHALL BE INCLUDED IN THE SCOPE OF WORK BY THE CONTRACTOR. FAILURE TO IDENTIFY ANY SUCH VARIANCE AS A QUALIFICATION IN A BID SHALL NOT BE A BASIS FOR A CHANGE ORDER.
3 DO NOT SCALE DRAWINGS. IF DIMENSIONS OR ELEVATIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLARIFICATION FROM THE ARCHITECT BEFORE IMPLEMENTATION OF CONSTRUCTION.
4. CONTRACTOR SHALL VERIFY ALL CONDITIONS AND SHALL REPORT ANY CONDITION THAT VARIES FROM THE CONSTRUCTION AS SHOWN.
5. CONTRACTOR SHALL VERIFY ALL EQUIPMENT REQUIREMENTS, FIXTURE REQUIREMENTS, SYSTEM REQUIREMENTS WHETHER OWNER FURNISHED OR CONTRACTOR FURNISHED, PRIOR TO IMPLEMENTATION OF ANY WORK ASSOCIATED WITH THE EQUIPMENT.
6. CONTRACTOR SHALL PROVIDE WORK AS NEEDED FOR ALL SITE UTILITIES WHERE UTILITIES ARE INSTALLED BY OTHERS INCLUDING, BUT NOT LIMITED TO TRENCHING, CONDUIT, JUNCTION BOXES.
7. CONTRACTOR SHALL PROVIDE FOR FIRE LINES AND DOMESTIC WATER LINES IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITIES HAVING JURISDICTION INCLUDING BUT NOT LIMITED TO LICENSED INSTALLERS, TESTING, MATERIALS.
8. NO IMPROVEMENT MAY BE ENCASED, CLOSED OR COVERED PRIOR TO INSPECTION AND ACCEPTANCE BY THE ARCHITECT. PROVIDE ARCHITECT WITH ADEQUATE NOTICE TO INSPECT ANY IMPROVEMENT READY FOR ENCLOSURE.
9. CONTRACTOR SHALL LAYOUT BUILDING PAD, PAVING, SIDEWALKS AND ESTABLISH FINISH FLOOR ELEVATION FOR REVIEW AND APPROVAL OF ARCHITECT PRIOR TO IMPLEMENTATION.

GENERAL CONTRACTOR NOTES:

1. THE SCOPE OF WORK IS THE TOTALITY OF THE CONTRACT DOCUMENTS INCLUDING PLANS, SPECIFICATIONS, FIELD ORDERS, SHOP DRAWING APPROVAL CONDITIONS AND PERFORMANCE REQUIREMENTS OF THE SCOPE OF WORK. THE SCOPE OF WORK IS IDENTIFIED WITH SPECIFICATION SECTIONS AND SHEET ALPHA NUMERIC CONVENTION, BUT SUCH IDENTIFICATION DOES NOT DEFINE, RESTRICT OR ASSIGN THE SCOPE OF WORK OR ORGANIZE THE CONTRACT.
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4. CONTRACTOR SHALL VERIFY ALL CONDITIONS AND SHALL REPORT ANY CONDITION THAT VARIES FROM THE CONSTRUCTION AS SHOWN.
5. CONTRACTOR SHALL VERIFY ALL EQUIPMENT REQUIREMENTS, FIXTURE REQUIREMENTS, SYSTEM REQUIREMENTS WHETHER OWNER FURNISHED OR CONTRACTOR FURNISHED, PRIOR TO IMPLEMENTATION OF ANY WORK ASSOCIATED WITH THE EQUIPMENT. PROVIDE PLUMBING SUPPLY AND DRAINS FOR ALL FIXTURES AND EQUIPMENT AS SHOWN ON ARCHITECTURAL, MECHANICAL, FIRE PROTECTION AND PLUMBING PLANS. LOCATE ALL ELECTRICAL SWITCHES AND PLUGS AS SHOWN ON ELECTRICAL OR ARCHITECTURAL PLANS AND INTERIOR ELEVATIONS.
6. DIMENSIONS ARE NOMINAL TO THE FACE OF THE WALL OR CENTERLINE OF COLUMNS.
7. ALL RATED WALLS EXTEND ONLY TO CEILINGS; RATED WALLS IN ATTICS ARE SHOWN ON ROOF PLAN.
8. PROVIDED RATED WALLS AS NOTED BEHIND ALL FIRE EXTINGUISHER CABINETS AND OTHER PENETRATIONS.
9. CONCEAL ALL PIPING IN WALLS OR FUR OUT WALL TO ENCASE PIPING; REVIEW ANY CONDITION REQUIRING FURRING WITH ARCHITECT PRIOR TO IMPLEMENTATION.
10. PROVIDE APPROPRIATE STRUCTURAL SUPPORT FOR EQUIPMENT, LAVATORIES OR OTHER IMPROVEMENTS AS REQUIRED TO SUPPORT A MINIMUM LOAD OF 250 LBS.
11. NO IMPROVEMENT MAY BE ENCASED, CLOSED OR COVERED PRIOR TO INSPECTION AND ACCEPTANCE BY THE ARCHITECT. PROVIDE ARCHITECT WITH ADEQUATE NOTICE TO INSPECT ANY IMPROVEMENT READY FOR ENCLOSURE.
12. TO COORDINATE ALL WORK, MARK THE FLOORS AND WALLS FOR LOCATION OF WALLS, CABINETS, EQUIPMENT, TOILETS, SHOWERS, AIR HANDLING EQUIPMENT, DIFFUSERS, EXHAUSTS, SPRINKLER HEADS, DRAINS AND TEST VALVES, ELECTRICAL, SYSTEMS AND JUNCTION BOXES FOR REVIEW AND APPROVAL OF ARCHITECT PRIOR TO IMPLEMENTATION.

SILVER GRACE LAND USE DATA:

DEVELOPMENT	APPROVAL DATE	RX ZONED ACRES	SINGLE FAMILY DWELLING UNITS	MAIN BUILDING	VILLAS	TOTAL DWELLING UNITS	LOT NUMBERS OF BUILDABLE UNITS	LOT DENSITY (UNITS/AC)	REMAINING ACREAGE	REMAINING DWELLINGS
CONCEPT PLAN	9/8/09	14.88	3	94	27	124	1	8.33	0	–
REGULATING PLAN	3/25/10	14.88	3	94	27	124	1	8.33	0	–
SECTION 1	11/18/10	14.88	–	59	–	59	1	3.97	0	65
SECTION 2	TBD	14.88	–	18	10	87	1	5.84	0	37

DEVELOPMENT	APPROVAL DATE	RX ZONED ACRES	USE	PHASE TOTAL FLOOR AREA	ASSISTED LIVING FLOOR AREA	MEMORY CARE FLOOR AREA	VILLA FLOOR AREA	SINGLE FAMILY FLOOR AREA	PUD PROJECT TOTAL FLOOR AREA	PUD REMAINING FLOOR AREA	IMPERVIOUS SURVACE	TOTAL IMPERVIOUS SURFACE	TOTAL I.S.R.
CONCEPT PLAN	9/8/09	14.88	ASSISTED LIVING FACILITY, VILLAS, SINGLE FAMILY	153,658	–	–	–	–	153,658	–	238,806	238,806	0.37
REGULATING PLAN	3/25/10	14.88	ASSISTED LIVING FACILITY, VILLAS, SINGLE FAMILY	153,658	–	–	–	–	153,658	–	238,806	238,806	0.37
SECTION 1	11/18/10	14.88	ASSISTED LIVING FACILITY	74,303	74,303	–	–	–	74,303	79,355	140,059	140,059	0.22
SECTION 2	TBD	14.88	VILLAS, MEMORY CARE	32,761	–	9,548	23,213	–	107,064	46,594	46,764	186,823	0.29
SECTION 3	TBD	14.88	ASSISTED LIVING FACILITY, VILLAS	30,942	5,157	–	24,785	–	138,006	15,652	0	–	–
SECTION 4	TBD	14.88	VILLAS, SINGLE FAMILY	15,652	–	–	11,660	3,992	153,658	0	0	–	–

FRANKLIN PROJECT #:
- THE CITY OF FRANKLIN PROJECT NUMBER IS COF #4523

GOOD WORKS UNLIMITED, LLC
Development, Design and Management of Senior Living Communities
2202 JEFFERSON COURT
FRANKLIN, TN 37064
615.790.7041 P/F

KLOBER ENGINEERING SERVICES

DATE	DESCRIPTION
3/19/14	PRICING AND PERMITS

VILLA AND MEMORY CARE ADDITION FOR
Silver Grace
PUD SUBDIVISION, SITE PLAN, SECTION 2
300 CELEBRATION CIRCLE, FRANKLIN TN, 37067

DRAWING TITLE:
OVERALL PLAN

SCALE: 1"=60'

C1.2

APPENDIX E
TRIP GENERATION

TRIP GENERATION CALCULATIONS - Single-family Homes

The following calculations are based on the data compiled for ITE Land Use Code 210.

Average Daily Traffic

T = 9.52 (X)
T = 9.52 (**199**)
T = 1,894 vehicles

Enter = 0.50 (1,894) = 947 vehicles
Exit = 0.50 (1,894) = 947 vehicles

AM traffic during peak hour of adjacent street

T = 0.75 (X)
T = 0.75 (**199**)
T = 149 vehicles

Enter = 0.25 (149) = 37 vehicles
Exit = 0.75 (149) = 112 vehicles

PM traffic during peak hour of adjacent street

T = 1.00 (X)
T = 1.00 (**199**)
T = 199 vehicles

Enter = 0.63 (199) = 125 vehicles
Exit = 0.37 (199) = 74 vehicles

APPENDIX F
RELEVANT PAGES FROM NCHRP REPORT 457:
ENGINEERING STUDY GUIDE FOR EVALUATING INTERSECTION IMPROVEMENTS

NCHRP
REPORT 457

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Evaluating Intersection Improvements: An Engineering Study Guide

TRANSPORTATION RESEARCH BOARD

NATIONAL RESEARCH COUNCIL

can also indirectly reduce the delay to the left-turn or through movements by lessening their need to compete for service with the right-turn movement.

One disadvantage of adding a lane to the minor-road approach is that it may require reallocating the existing pavement or widening of the approach cross section. Sometimes the pavement width needed for the additional lane is available within the existing roadway cross section. In this instance, the only impact is a reallocation of the paved surface through modification of the pavement markings. However, in downtown settings this reallocation may require the removal of some curb parking stalls and can affect adjacent business significantly. Occasionally, the cross section must be widened to provide for the additional lane. If the needed lane width can be provided within the available right-of-way, the cost may be limited to that of construction. However, if additional right-of-way is needed, the costs of acquiring this property in urban settings can be high.

Guidance. The literature does not offer guidance regarding conditions where a second approach lane would benefit from the operation of a minor-road approach. However, the procedures in Chapter 17 of the *Highway Capacity Manual 2000* (*15*) can be used to identify major- and minor- road volume combinations that would benefit operationally from the provision of a second approach lane or bay. Bonneson and Fontaine (*20*) developed Figure 2-4 using these procedures and an assumed upper limit of 0.7 for the shared-lane, minor-road volume-to-capacity ratio.

Application. Figure 2-4 indicates the conditions that may justify the use of two approach lanes. Use of the information in this figure requires two types of data:

1. Major-road approach volume for the peak hour of the average day and
2. Minor-road turn movement volume for the peak hour of the average day (used to compute right-turn percentage).

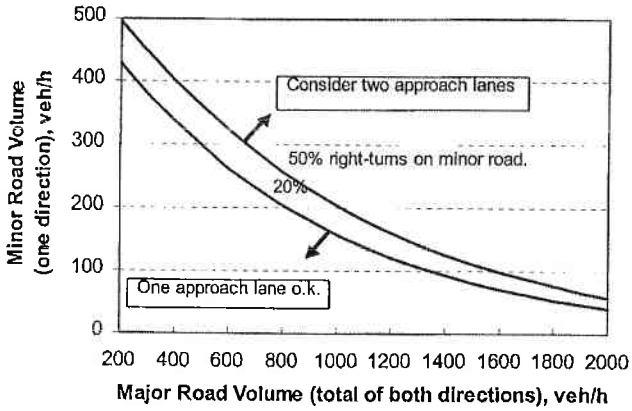

Figure 2-4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

Figure 2-4 would be used once for each minor-road approach to the intersection. The appropriate trend line would be identified on the basis of the percentage of right-turns on the subject minor-road approach. If the volume combination for the major and minor roads intersects above or to the right of this trend line, a second traffic lane should be considered for the subject minor-road approach. If a bay is selected for addition to the intersection, it should be long enough to store vehicles 95 percent of the time (i.e., the bay should not overflow more than 5 percent of the time). Techniques for estimating the 95th percentile storage length are provided in the section, Increase the Length of the Turn Bay.

Add a Left-Turn Bay on the Major Road

Introduction. Provision of a left-turn bay on the major road to a two-way stop-controlled intersection can significantly improve operations and safety at the intersection. A left-turn bay effectively separates those vehicles that are slowing or stopped to turn from those vehicles in through traffic lanes. This separation minimizes turn-related crashes and eliminates unnecessary delay to through vehicles. Data reported by Neuman (*21*) indicate that the crash rate for unsignalized intersections can be reduced by 35 to 75 percent through the provision of a left-turn bay.

One disadvantage of adding a bay to the major-road approach is that it may require reallocating the existing pavement or widening of the approach cross section. Sometimes the pavement width needed for the additional lane is available within the existing roadway cross section. However, in downtown settings this reallocation may require the removal of some curb parking stalls and can affect adjacent business significantly. Occasionally, the cross section must be widened to provide for the turn bay. If the needed width can be provided within the available right-of-way, the cost may be limited to that of construction. However, if additional right-of-way is needed, the costs of acquiring this property in urban settings can be high.

Guidance. Neuman (*21*) suggests that the following guidelines should be used to determine when to provide a left-turn bay on the major road of a two-way stop-controlled intersection:

1. A left-turn lane should be considered at any median crossover on a divided, high-speed road.
2. A left-turn lane should be provided on the unstopped approach of a high-speed rural highway when it intersects with other arterials or collectors.
3. A left-turn lane is recommended on the unstopped approach of any intersection when the combination of intersection volumes intersect above or to the right of the appropriate trend line shown in Figure 2-5.

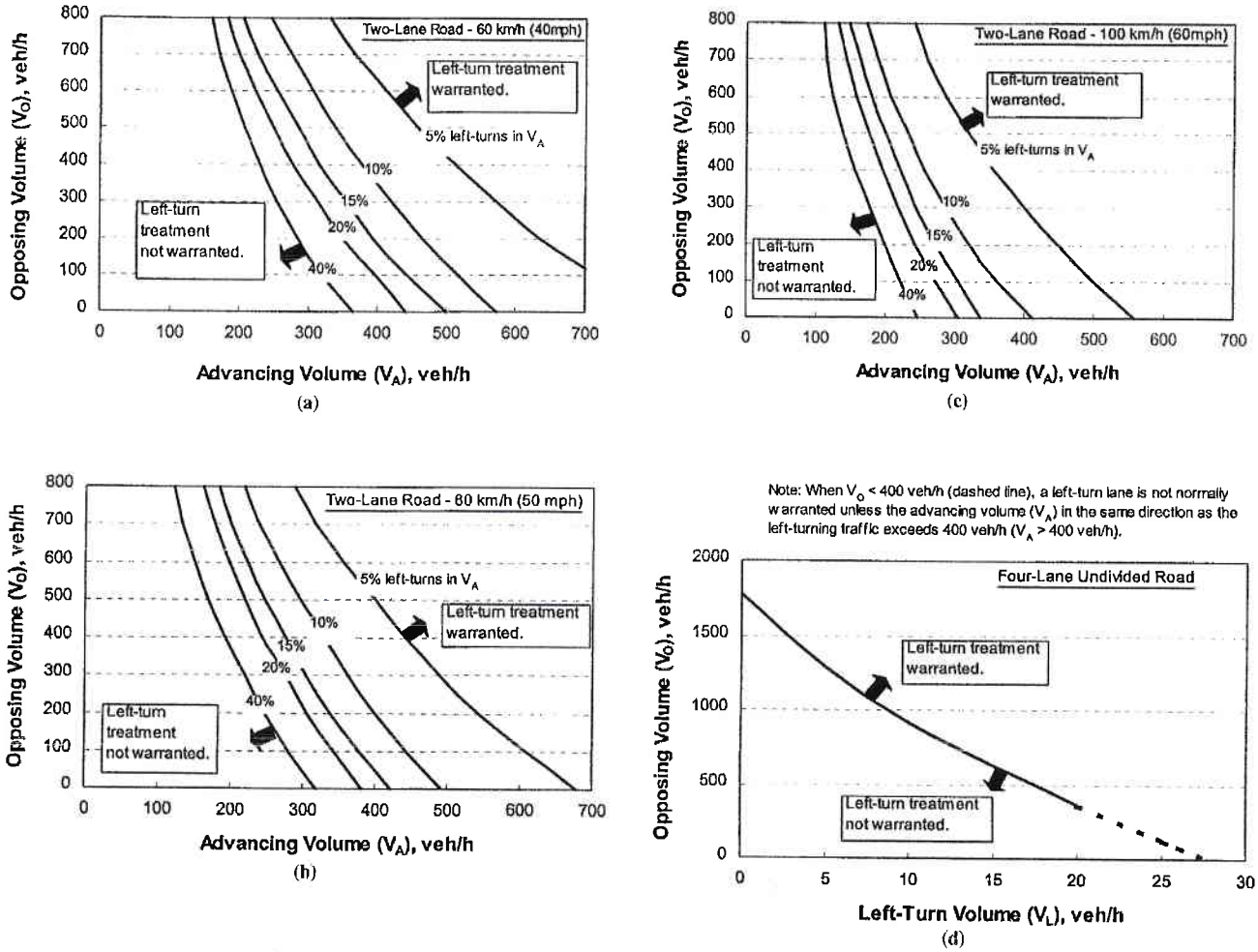

Figure 2-5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

Application. The guidance stated in the preceding section defines the conditions that may justify the provision of a left-turn bay. Application of this guidance requires two types of data:

1. Major-road turn movement volume for the peak hour of the average day and
2. Major-road 85th percentile speed (posted speed can be substituted if data are unavailable).

Use of Figure 2-5 requires determination of the opposing volume, the advancing volume, and the operating speed. The opposing volume should include only the right-turn and through movements on the approach across from (and heading in the opposite direction of) the subject major-road approach. The advancing volume should include the left-turn, right-turn, and through movements on the subject approach. The operating speed can be estimated as the 85th percentile speed. If the operating speed does not coincide with 60, 80, or 100 km/h (i.e., 40, 50, or 60 mph), then interpolation can be used or, as a more conservative approach, the operating speed can be rounded up to the nearest speed for which a figure is provided.

In application, Figure 2-5 is used once for each major-road approach to the intersection. The appropriate trend line is identified on the basis of the percentage of left-turns on the subject major-road approach. If the advancing and opposing volume combination intersects above or to the right of this trend line, a left-turn bay should be considered for the subject approach. If a bay is included at the intersection, it should be long enough to store left-turn vehicles 99.5 percent of the time (i.e., the bay should not overflow more than 0.5 percent of the time). Techniques for estimating this storage length are provided in the section, Increase the Length of the Turn Bay.

Add a Right-Turn Bay on the Major Road

Introduction. Provision of a right-turn bay on the major road to a two-way stop-controlled intersection can signifi-

cantly improve operations and safety at the intersection. A right-turn bay effectively separates those vehicles that are slowing or stopped to turn from those vehicles in the through traffic lanes. This separation minimizes turn-related collisions (e.g., angle, rear-end, and same-direction-sideswipe) and eliminates unnecessary delay to through vehicles.

One disadvantage of adding a bay to the major-road approach is that it may require reallocating the existing pavement or widening of the approach cross section. Sometimes the pavement width needed for the additional lane is available within the existing roadway cross section. However, in downtown settings this reallocation may require the removal of some curb parking stalls and can affect adjacent business significantly. Occasionally, the cross section must be widened to provide for the turn bay. If the needed width can be provided within the available right-of-way, the cost may be limited to that of construction. However, if additional right-of-way is needed, the costs of acquiring this property in urban settings can be high.

Guidance. Hasan and Stokes (*22*) developed guidelines for determining when to provide a right-turn bay on the major road of a two-way stop-controlled intersection. These guidelines were based on an evaluation of the operating and collision costs associated with the right-turn maneuver relative to the cost of constructing a right-turn bay. The operating costs included those of road-user fuel and delay. Separate guidelines were developed for two-lane and four-lane roadways. These guidelines are shown in Figure 2-6.

Application. The guidance described in the preceding section defines conditions that may justify the provision of a right-turn bay. Application of this guidance requires two types of data:

1. Major-road turn movement volume for the peak hour of the average day and
2. Major-road 85th percentile speed (posted speed can be substituted if data are unavailable).

Figure 2-6 should be consulted once for each major-road approach. If the combination of major-road approach volume and right-turn volume intersects above or to the right of the trend line corresponding to the major-road operating speed, then a right-turn bay is a viable alternative.

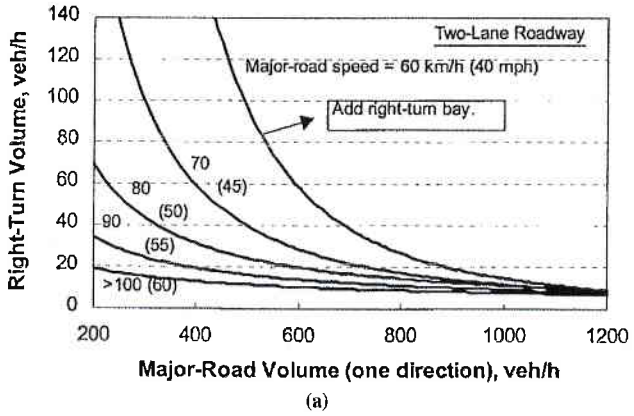

Figure 2-6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

Increase Length of Turn Bay

Introduction. Turn bay length can affect the safety and operation of the intersection approach significantly. This effect becomes more negative as the frequency with which vehicles exceed the available storage increases. Also, for unstopped approaches, this effect becomes more negative as more of the turning vehicle's deceleration occurs in the through lane, prior to the bay. The need to provide adequate storage length, deceleration length, or both is dependent on the type of approach control used and whether the vehicle is turning left or right. Table 2-13 identifies the appropriate bay

TABLE 2-13 Turn-bay length components at unsignalized intersections

Approach Control	Length Components	
	Left-Turn Bay	Right-Turn Bay
Unstopped	Storage Length + Deceleration Length	Deceleration Length
Stopped	Storage Length	Storage Length