SEVIER MEADOWS SUBDIVISION

Traffic Impact Study

Maryville Pike (SR 33)

Knoxville, TN

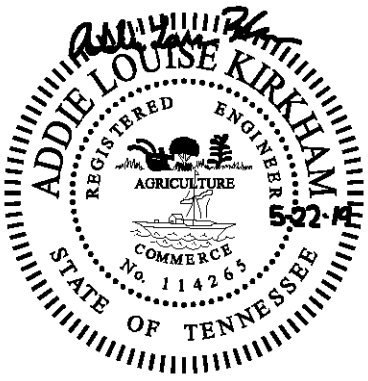
A Traffic Impact Study for the Sevier Meadows Subdivision

Submitted to

Knoxville – Knox County Planning Commission

Revised May 22, 2019
April 24, 2019
FMA Project No. 525.007

Submitted By:



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Executive Summary

Mesana Investments, LLC is proposing a residential development (i.e. Sevier Meadows Subdivision) with single family lots located in Knox County. The project is located east of Maryville Pike near the intersection of Maryville Pike at Rudder Road. The development will consist of 77 single family lots. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2022.

The proposed driveway connection for the Sevier Meadows Subdivision is located on Maryville Pike.

In order to maintain or provide an acceptable level-of-service for each of the intersections studied, some recommendations are presented.

Maryville Pike at Rudder Road
The full buildout traffic conditions at the unsignalized intersection of Maryville Pike at Rudder Road were analyzed using the Highway Capacity Software (HCS7). The westbound approach will operate at a LOS C during both the AM and PM peak hours.

Maryville Pike @ Driveway Connection
After the completion of the Sevier Meadows Subdivision the westbound approach will operate at a LOS C during both the AM and PM peak hours and the southbound approach will operate at a LOS A during both the AM and PM peak hours.

Neither a right turn lane nor a left turn lane on Maryville Pike at the driveway connection is warranted.

The minimum intersection sight distance per TDOT standard drawing RD11-SD-3 is 555 feet for a 2-lane undivided roadway with a speed limit of 50 mph. FMA measured the sight distance at the proposed intersection of Maryville Pike at the driveway connection. At 15 feet from the edge of pavement the sight distance at the existing intersection is 549 feet northbound and 610 feet southbound; therefore the sight distance at the proposed intersection is inadequate.

TDOT recommended shoulder improvements at the driveway in order to achieve the required sight distance. A six foot wide shoulder with a storage length of 115 feet and a taper length of 50 feet is provided on both sides of the proposed driveway connection.

1 Introduction

1.1 Project Description

This report provides a summary of a traffic impact study that was performed for the Sevier Meadows Subdivision. The project is located east of Maryville Pike near the intersection of Maryville Pike at Rudder Road. The location of the site is shown in Figure 1.

The full buildout of the development will consist of 77 single family lots. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2022.

The proposed driveway connection for the Sevier Meadows Subdivision is located on Maryville Pike. The proposed site layout is shown in Figure 2.

The proposed Sevier Meadows Subdivision will be within the Parent Responsibility Zone (PRZ) of Mount Olive Elementary School. The PRZ for an elementary school is defined as those who live within one (1) mile from a school by the shortest route, and are not eligible for transportation service.

The purpose of this study is to evaluate the impacts to the traffic conditions caused by the proposed development.

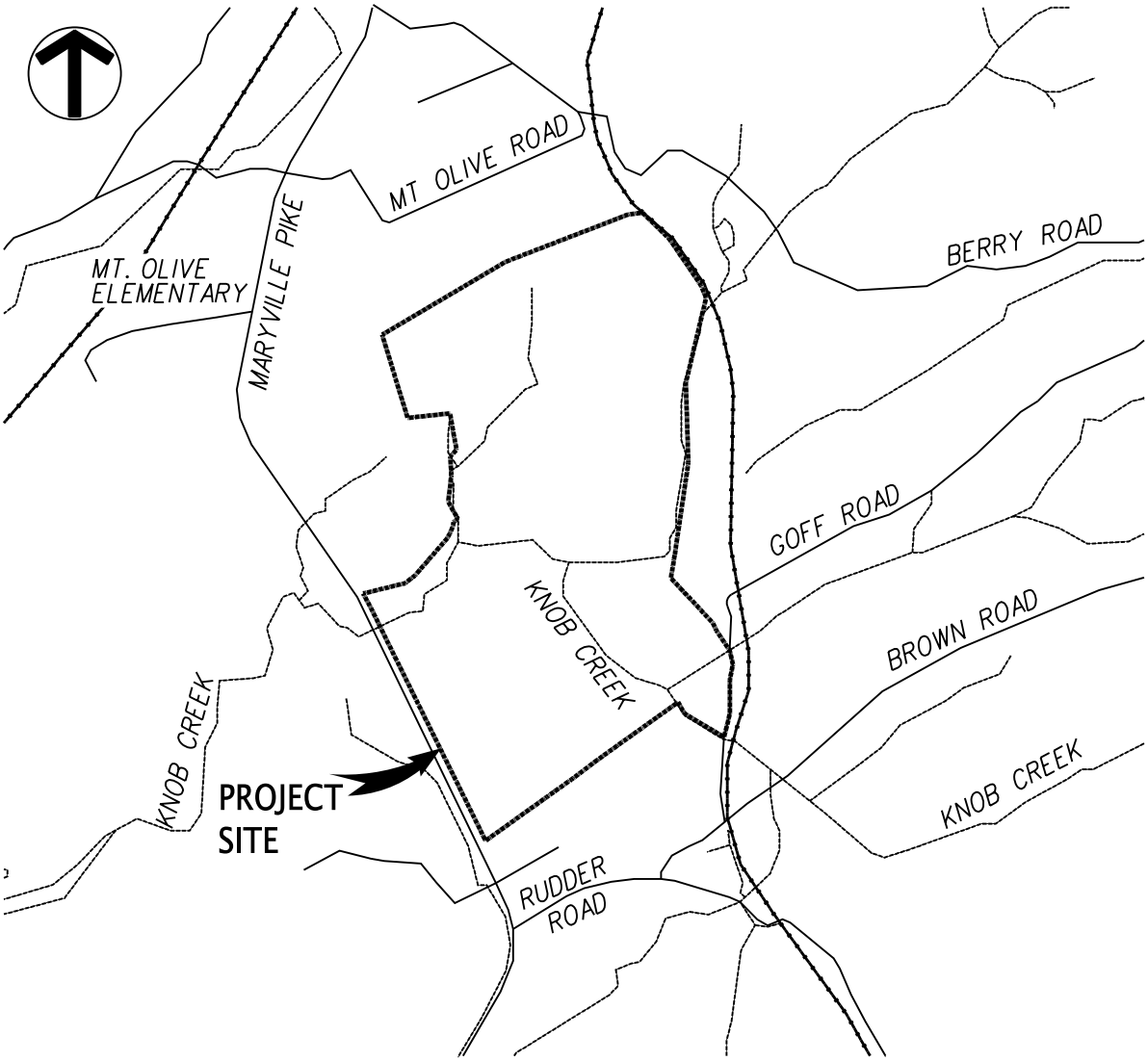


Figure 1: Location Map

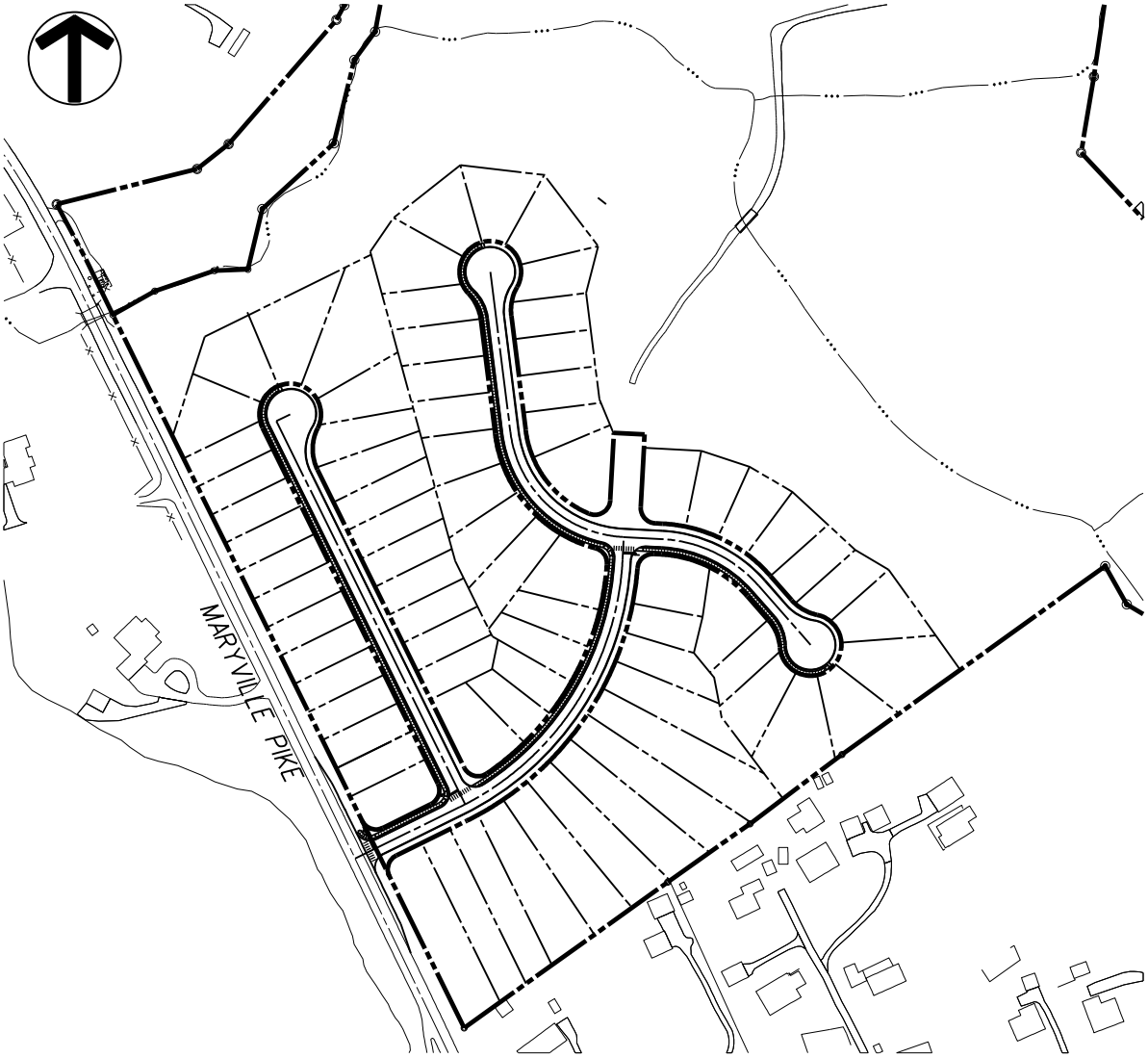


Figure 2: Site Plan

1.2 Existing Site Conditions

The proposed driveway connection to Maryville Pike is located approximately 850 feet north of the intersection with Rudder Road. The proposed driveway has a width of 26 feet and a sight distance of 549 feet north and 610 feet south of the intersection.

Maryville Pike at the intersection with Rudder Road is a two-lane road. The Knoxville-Knox County Planning Commission classifies Maryville Pike as a Minor Arterial with a 70 foot right-of-way per the Major Road Plan. The posted speed limit on Maryville Pike is 50 mph.

There are existing sidewalks on Maryville Pike near Mt. Olive Elementary School but these are limited to the school's property line, and do not extend down Maryville Pike. There is no sidewalk connection to Rudder Road.

An aerial photo of the existing intersection is included in Attachment 1.

2 Existing Traffic Volumes

FMA conducted a turning movement count at the intersection of Maryville Pike at Rudder Road on Wednesday April 10, 2019.

The current AM peak hour and PM peak hour were determined using the turning movement count that FMA conducted. At the intersection of Maryville Pike at Rudder Road, the AM peak hour occurred between 7:15 a.m. and 8:15 a.m., and the PM peak hour occurred between 4:45 p.m. and 5:45 p.m.

The existing volumes including the AM and PM peak hour traffic volumes at the count location are shown in Figure 3, and the count data collected is included in Attachment 2.

Figure 3: 2019 Existing Peak Hour Traffic

3 Background Growth

The Knoxville Regional Transportation Planning Organization (TPO) maintains count stations in the vicinity of the proposed development.

Knoxville TPO count station ID: 093M049 is located on Maryville Pike (SR 33) approximately 100' north of Gov John Sevier Highway (SR 168). The annual growth rate for this station over the last fifteen years is approximately 1.49% and the 2016 ADT was 5,750 vehicles per day.

Knoxville TPO count station ID: 093M258 is located on Brown Road, east of Maryville Pike. The annual growth rate for this station over the last eight years is approximately 1.10% and the 2016 ADT was 680 vehicles per day.

For the purpose of this study, an annual growth rate of 2.0% was assumed for traffic at the intersection of Maryville Pike and Rudder Road until full occupancy is reached in 2022. Attachment 3 shows the trend line growth charts for the Knoxville TPO count stations.

Figure 4 demonstrates the projected background peak hour volumes at the intersection of Maryville Pike at Rudder Road after applying the background growth rate to the existing conditions.

Figure 4: 2022 Background Peak Hour Traffic

4 Trip Generation and Trip Distribution

The Sevier Meadows Subdivision proposes 77 single family lots. Single- Family Detached Housing or Land Use 210 was used to calculate site trips for the subdivision using the fitted curve equations from the *Trip Generation, 10th Edition,* published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 4.

The total trips generated by the Sevier Meadows Subdivision was estimated to be 818 daily trips. The estimated trips are 59 trips during the AM peak hour and 79 trips during the PM peak hour. A trip generation summary is shown in Table 4-1.

Table 4-1
Sevier Meadows Subdivision
Trip Generation Summary

	77 Single Family Units LUC 210				
	Total New Trips	% Entering	%Exiting	Number Entering	Number Exiting
Weekday	818	50	50	409	409
A.M. Peak	59	25	75	15	44
P.M. Peak	79	63	37	50	29

Maryville Pike at the proposed driveway connection has a trip distribution of 64% northbound and 36% southbound during the AM peak hour and 43% northbound and 57% southbound during the PM peak hour.

The directional distribution of the traffic generated by the Sevier Meadows Subdivision was determined using the existing traffic volumes at the intersection of Maryville Pike at Rudder Road in combination with the concept plan layout

Figure 5 shows the AM peak hour trip distribution and Figure 6 shows the PM peak hour trip distribution.

Figure 7 shows the peak hour site traffic from the subdivision and Figure 8 shows the peak hour full buildout traffic.

Figure 5: AM Peak Hour Trip Distribution

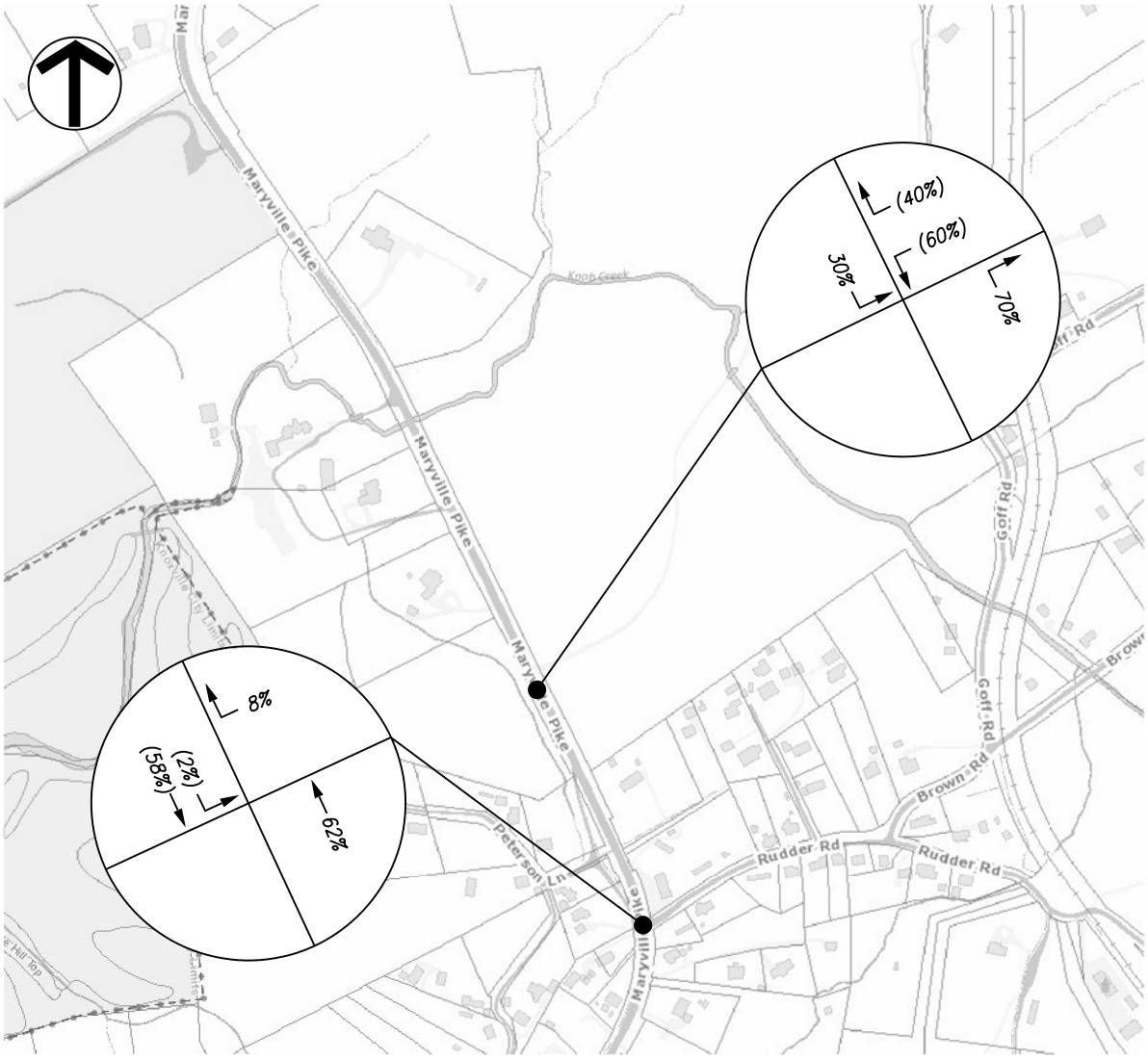


Figure 6: PM Peak Hour Trip Distribution

Figure 7: Peak Hour Site Traffic

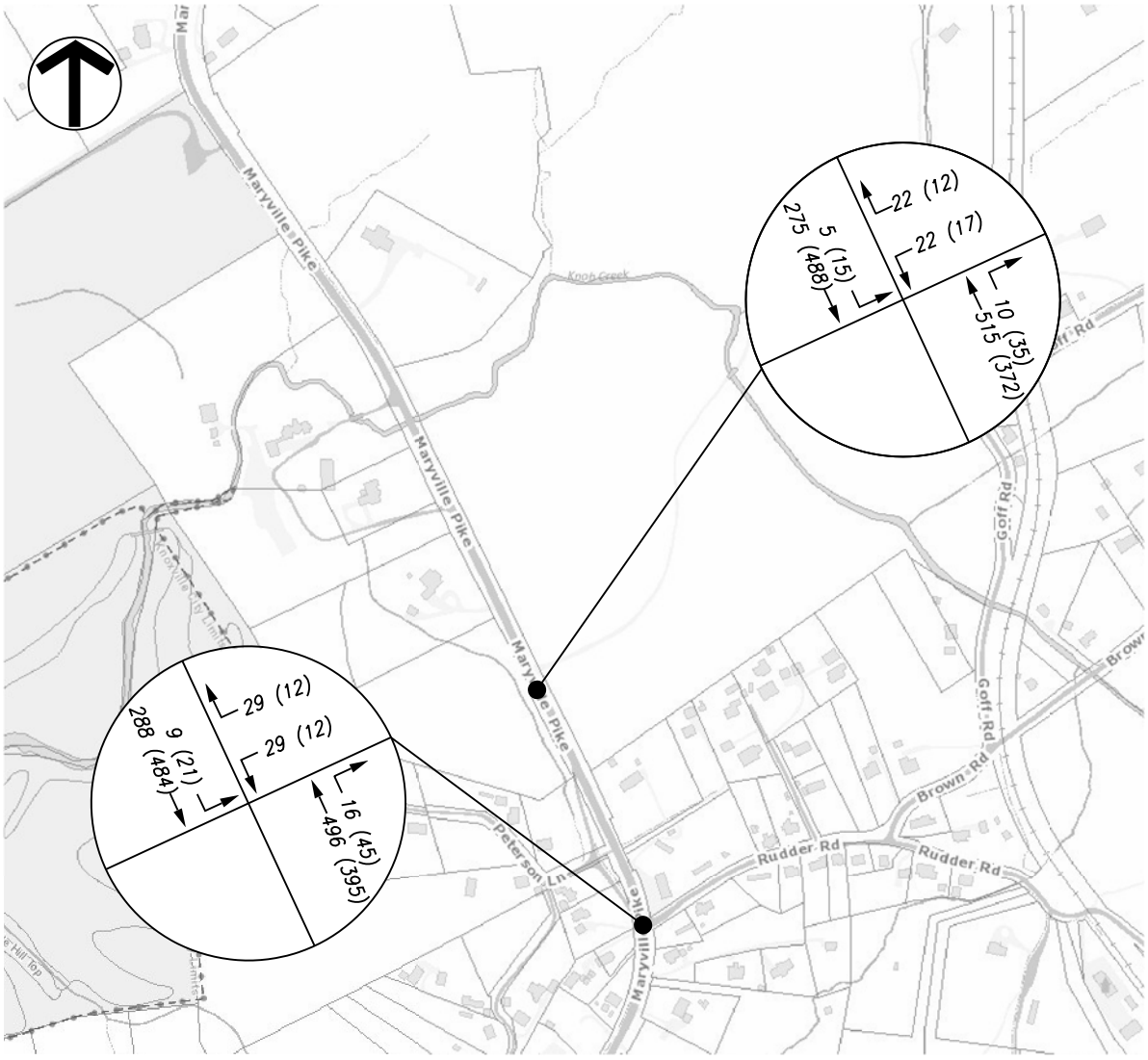


Figure 8: Peak Hour Full Buildout Traffic

5 Projected Capacity and Level of Service

Unsignalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) for the AM and PM peak hours to evaluate the traffic conditions at the intersections of Maryville Pike at Rudder Road and Maryville Pike at the driveway connection.

The results from the analyses are expressed with a term "level of service" (LOS), which is based on the amount of delay experienced at the intersection. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas. The existing, background and full buildout HCS7 worksheets are included in Attachments 5, 6 and 7.

Table 5-1 shows the results of the capacity analyses.

Table 5-1
Intersection Analysis
Level of Service (LOS) Summary

		Delay (sec)/LOS
Maryville Pike @ Rudder Road (Existing 2019)		
AM Peak	WB Approach	15.0 / C
	NB Approach	7.8 / A
	SB Approach	8.5 / A
PM Peak	WB Approach	15.2 / C
	NB Approach	8.4 / A
	SB Approach	8.2 / A
Maryville Pike @ Rudder Road (Background 2022)		
AM Peak	WB Approach	15.8 / C
	NB Approach	7.9 / A
	SB Approach	8.6 / A
PM Peak	WB Approach	16.0 / C
	NB Approach	8.5 / A
	SB Approach	8.4 / A
Maryville Pike @ Rudder Road (Full Buildout 2022)		
AM Peak	WB Approach	16.7 / C
	NB Approach	7.9 / A
	SB Approach	8.7 / A
PM Peak	WB Approach	16.0 / C
	NB Approach	8.5 / A
	SB Approach	8.4 / A
Maryville Pike @ Driveway Connection (Full Buildout 2022)		
AM Peak	WB Approach	15.3 / C
	SB Approach	8.6 / A
PM Peak	WB Approach	16.1 / C
	SB Approach	8.3 / A

6 Turn Lane Warrant Analysis

The intersection of Maryville Pike at the driveway connection was evaluated to determine if a right turn lane or a left turn lane is warranted. The Knox County Department of Engineering and Public Works handbook, "Access Control and Driveway Design Policy," was used to analyze the information. Neither a right turn lane nor a left turn lane on Maryville Pike at the driveway connection is warranted. The turn lane warrant worksheets and analysis are included in Attachment 8.

7 Conclusions and Recommendations

7.1 Maryville Pike @ Rudder Road

The existing traffic conditions at the unsignalized intersection of Maryville Pike at Rudder Road were analyzed using the Highway Capacity Software (HCS7). The westbound approach will operate at a LOS B during the AM peak hour and a LOS C during the PM peak hour.

The background traffic conditions at the unsignalized intersection of Maryville Pike at Rudder Road were analyzed using the Highway Capacity Software (HCS7). The westbound approach will operate at a LOS C during both the AM and PM peak hours.

The full buildout traffic conditions at the unsignalized intersection of Maryville Pike at Rudder Road were analyzed using the Highway Capacity Software (HCS7). The westbound approach will operate at a LOS C during both the AM and PM peak hours.

7.2 Maryville Pike @ Driveway Connection

After the completion of the Sevier Meadows Subdivision the westbound approach will operate at a LOS C during both the AM and PM peak hours and the southbound approach will operate at a LOS A during both the AM and PM peak hours.

The unsignalized intersection capacity analyses shows a 95% queue length at the full buildout for the driveway connection of less than one car length during both the AM and PM peak hours; therefore the existing storage at the intersection is adequate and no change is necessary.

Maryville Pike is classified as a minor arterial per the Major Road Plan. The minimum intersection spacing required on an arterial is 400 feet per the "Knoxville-Knox County Subdivision Regulations." The proposed driveway connection is located approximately 850 feet north of the intersection of Maryville Pike at Rudder Road. This driveway connection exceeds the typical minimum separation on an arterial; therefore, no change is necessary.

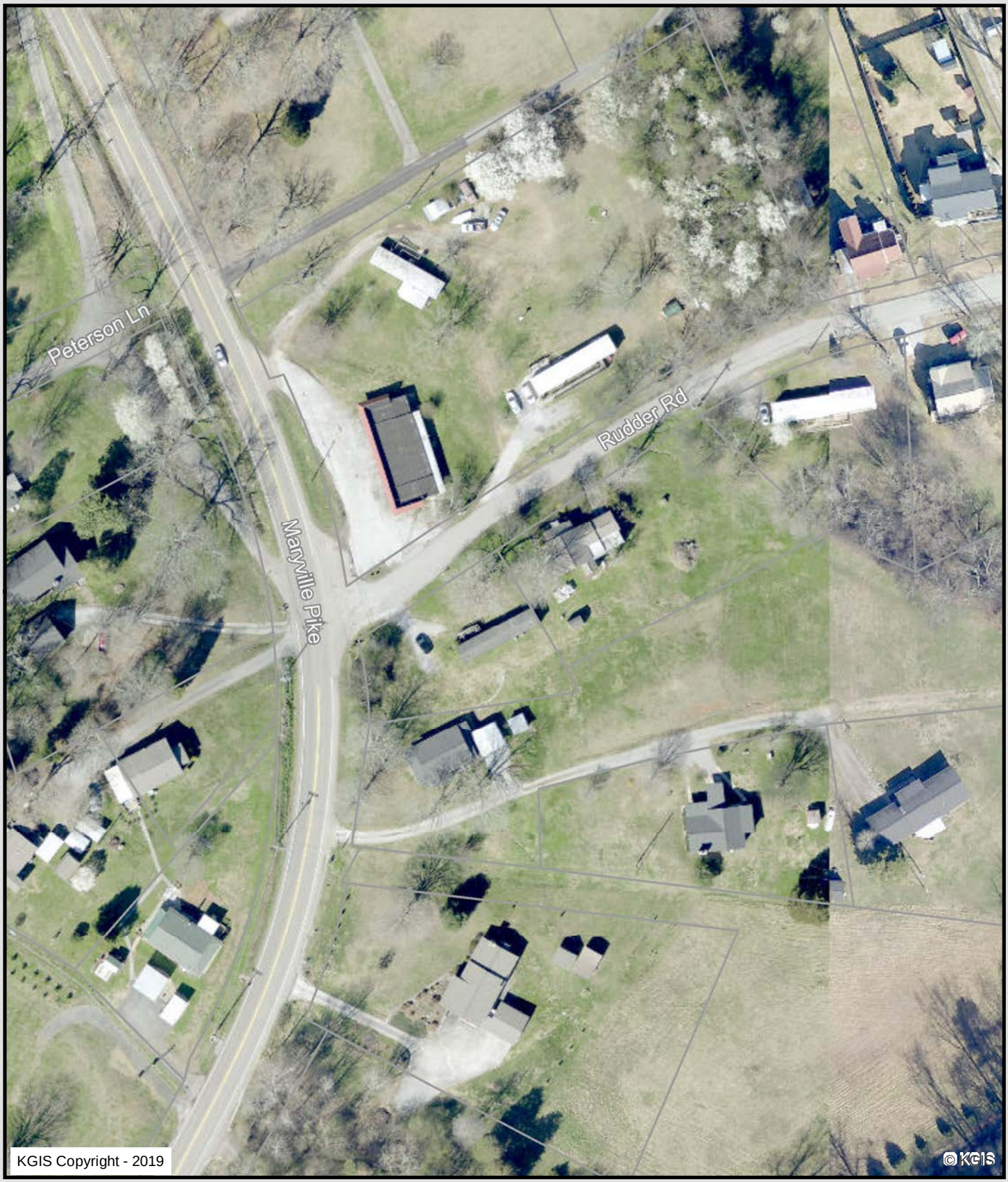
Neither a right turn lane nor a left turn lane on Maryville Pike at the driveway connection is warranted.

The minimum intersection sight distance per TDOT standard drawing RD11-SD-3 is 555 feet for a 2-lane undivided roadway with a speed limit of 50 mph. FMA measured the sight distance at the proposed intersection of Maryville Pike at the driveway connection. At 15 feet from the edge of pavement the sight distance at the existing intersection is 549 feet northbound and 610 feet southbound; therefore the sight distance at the proposed intersection is inadequate.

TDOT recommended shoulder improvements at the driveway in order to achieve the required sight distance. A six foot wide shoulder with a storage length of 115 feet and a taper length of 50 feet is provided on both sides of the proposed driveway connection.

The proposed Sevier Meadows Subdivision will be within the Parent Responsibility Zone (PRZ) of Mount Olive Elementary School. The PRZ for an elementary school is defined as those who live within one (1) mile from a school by the shortest route, and are not eligible for transportation service. There are existing sidewalks on Maryville Pike near Mt. Olive Elementary School but these are limited to the school's property line, and do not extend down Maryville Pike.

Attachment 1
Aerial Photo



Maryville Pike at Rudder Road

Printed: 4/18/2019 at 4:18:35 PM

0 50 100 200

ft

Knoxville - Knox County - KUB Geographic Information System

Attachment 2
Traffic Counts

Project: Sevier Meadows Subdivision
Intersection: Maryville Pike @ Rudder Road/Old Maryville Pike
Date Conducted: 04/10/2019

	Maryville Pike Northbound				Maryville Pike Southbound				Rudder Road Westbound				Old Maryville Pike Eastbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
7:00 AM	0	51	2	53	3	45	0	48	5	0	6	11	0	0	0	0	112
7:15 AM	0	99	2	101	2	64	0	66	7	0	6	13	0	0	0	0	180
7:30 AM	0	123	3	126	3	73	0	76	10	0	10	20	0	0	0	0	222
7:45 AM	0	114	8	122	1	52	0	53	6	0	7	13	0	0	0	0	188
Total	0	387	15	402	9	234	0	243	28	0	29	57	0	0	0	0	702
8:00 AM	0	105	2	107	2	63	0	65	4	0	4	8	0	0	0	0	180
8:15 AM	0	106	0	106	3	63	0	66	3	0	3	6	0	0	0	0	178
8:30 AM	0	124	1	125	0	59	0	59	2	0	2	4	0	0	0	0	188
8:45 AM	0	98	4	102	1	33	0	34	3	0	3	0	0	0	0	0	136
Total	0	433	7	440	6	218	0	224	12	0	12	18	0	0	0	0	682
11:00 AM	0	33	5	38	0	40	0	40	0	0	1	1	0	0	0	0	79
11:15 AM	0	29	1	30	1	66	0	67	3	0	1	4	0	0	0	0	101
11:30 AM	0	36	4	40	1	57	0	58	5	0	2	7	0	0	0	0	105
11:45 AM	0	43	3	46	2	47	0	49	8	0	0	8	0	0	0	0	103
Total	0	141	13	154	4	210	0	214	16	0	4	20	0	0	0	0	388
12:00 PM	0	40	5	45	1	39	0	40	3	0	2	5	0	0	0	0	90
12:15 PM	0	43	4	47	1	50	0	51	5	0	1	6	0	0	0	0	104
12:30 PM	0	35	5	40	0	41	0	41	3	0	0	3	0	0	0	0	84
12:45 PM	0	37	9	46	0	48	0	48	2	0	3	5	0	0	0	0	99
Total	0	155	23	178	2	178	0	180	13	0	6	19	0	0	0	0	377
2:00 PM	0	41	7	48	2	42	0	44	5	0	1	6	0	0	0	0	98
2:15 PM	0	43	6	49	2	55	0	57	5	0	0	5	0	0	0	0	111
2:30 PM	0	57	4	61	0	48	0	48	4	0	3	7	0	0	0	0	116
2:45 PM	0	60	2	62	5	63	0	68	3	0	2	5	0	0	0	0	135
Total	0	201	19	220	9	208	0	217	17	0	6	23	0	0	0	0	460
3:00 PM	0	40	8	48	2	66	0	68	2	0	0	2	0	0	0	0	118
3:15 PM	0	40	4	44	1	48	0	49	2	0	4	6	0	0	0	0	99
3:30 PM	0	61	8	69	0	41	0	41	5	0	2	7	0	0	0	0	117
3:45 PM	0	68	11	79	2	57	0	59	2	0	3	5	0	0	0	0	143
Total	0	209	31	240	5	212	0	217	11	0	9	20	0	0	0	0	477
4:00 PM	0	62	7	69	4	70	0	74	4	0	1	5	0	0	0	0	148
4:15 PM	0	55	6	61	2	66	0	68	6	0	3	9	0	0	0	0	138
4:30 PM	0	72	10	82	3	85	0	88	9	0	3	12	0	0	0	0	182
4:45 PM	0	72	12	84	2	120	0	122	5	0	1	6	0	0	0	0	212
Total	0	261	35	296	11	341	0	352	24	0	8	32	0	0	0	0	680
5:00 PM	0	84	11	95	5	120	0	125	3	0	2	5	0	0	0	0	225
5:15 PM	0	97	9	106	8	124	0	132	2	0	2	4	0	0	0	0	242
5:30 PM	0	90	10	100	4	94	0	98	1	0	3	4	0	0	0	0	202
5:45 PM	0	104	12	116	2	87	0	89	2	0	4	6	0	0	0	0	211
Total	0	375	42	417	19	425	0	444	8	0	11	19	0	0	0	0	880
Grand Total	0	1665	130	1795	50	1430	0	1480	83	0	69	146	0	0	0	0	3421
Approach %	0.0	92.8	7.2		3.4	96.6	0.0		56.8	0.0	47.3		N/A	N/A	N/A		
Total %	0.0	48.7	3.8	52.5	1.5	41.8	0.0	43.3	2.4	0.0	2.0	4.3	0.0	0.0	0.0	0.0	

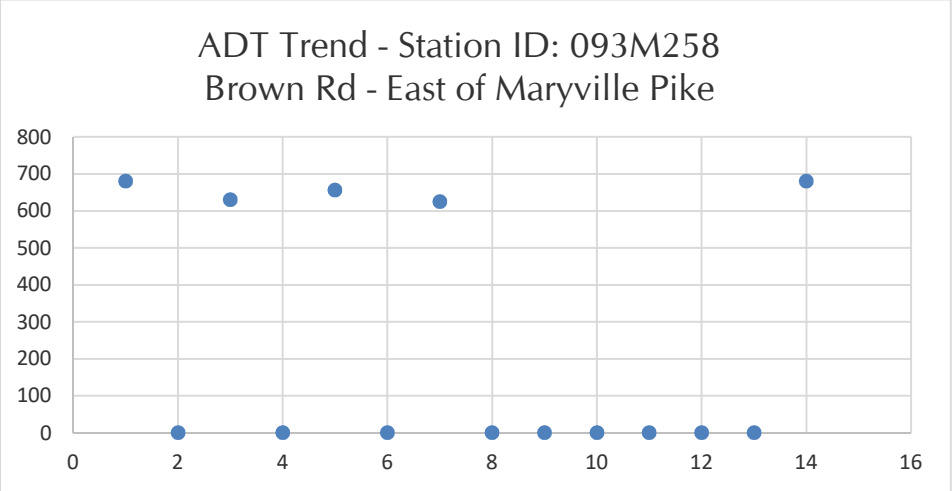
Project: Sevier Meadows Subdivision
Date Conducted: 4/10/2019

AM Peak Hour	7:15 AM - 8:15 AM	770
PM Peak Hour	4:45 PM - 5:45 PM	881

	Maryville Pike Northbound					Maryville Pike Southbound			Rudder Road Westbound				Old Maryville Pike Eastbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
Peak Hour Analysis from 7:00 AM to 9:00 AM																	
AM Peak Hour begins at 7:00 AM																	
7:15 AM	0	99	2	101	2	64	0	66	7	0	6	13	0	0	0	0	180
7:30 AM	0	**123**	3	**126**	**3**	**73**	0	**76**	**10**	0	**10**	**20**	0	0	0	0	**222**
7:45 AM	0	114	**8**	122	1	52	0	53	6	0	7	13	0	0	0	0	188
8:00 AM	0	105	2	107	2	63	0	65	4	0	4	8	0	0	0	0	180
Total Volume	0	441	15	456	8	252	0	260	27	0	27	54	0	0	0	0	770
Future (2% over 3 yrs)	0	468	16	484	8	267	0	276	29	0	29	57	0	0	0	0	817
PHF	N/A	0.90	0.47	0.90	0.67	0.86	N/A	0.86	0.68	N/A	0.68	0.68	N/A	N/A	N/A	N/A	0.87
Peak Hour Analysis from 2:30 PM to 6:00 PM																	
PM Peak Hour begins at 5:00 PM																	
4:45 PM	0	72	**12**	84	2	120	0	122	**5**	0	1	**6**	0	0	0	0	212
5:00 PM	0	84	11	95	5	120	0	125	3	0	2	5	0	0	0	0	225
5:15 PM	0	**97**	9	**106**	**8**	**124**	0	**132**	2	0	2	4	0	0	0	0	**242**
5:30 PM	0	90	10	100	4	94	0	98	1	0	**3**	4	0	0	0	0	202
Total Volume	0	343	42	385	19	458	0	477	11	0	8	19	0	0	0	0	881
Future (2% over 3 yrs)	0	364	45	409	20	486	0	506	12	0	8	20	0	0	0	0	935
PHF	N/A	0.88	0.88	0.91	0.59	0.92	N/A	0.90	0.55	N/A	0.67	0.79	N/A	N/A	N/A	N/A	0.91

Attachment 3
ADT Trends

Year	Adjusted Average Daily Traffic
2003	680
2004	0
2005	630
2006	0
2007	656
2008	0
2009	625
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0
2016	680

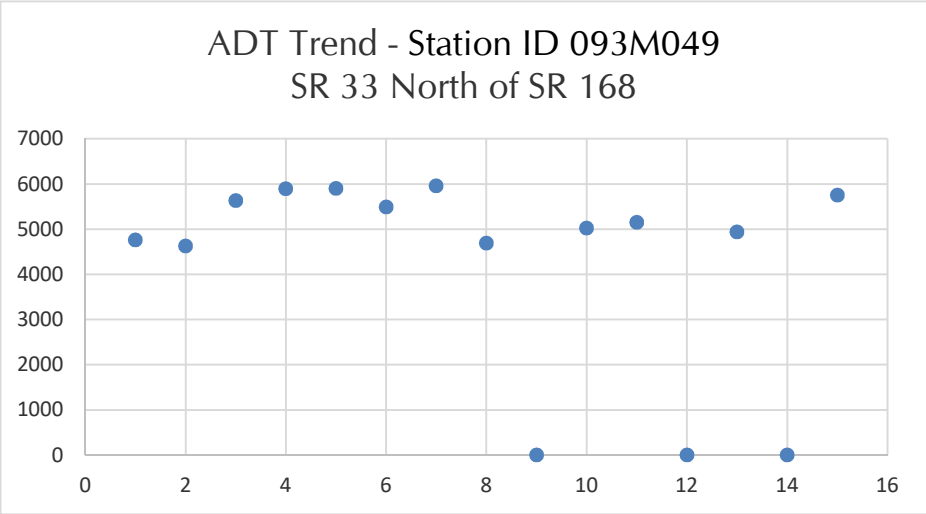


Most Recent Trend Line Growth

Year	ADT
2009	625
2016	680

Annual Percent Growth	**1.10%**

Year	Adjusted Average Daily Traffic
2002	4760
2003	4630
2004	5630
2005	5896
2006	5900
2007	5490
2008	5960
2009	4690
2010	0
2011	5020
2012	5150
2013	0
2014	4940
2015	0
2016	5750



Most Recent Trend Line Growth

Year	ADT
2002	4760
2016	5750

Annual Percent Growth	**1.49%**

Attachment 4
Trip Generation

Project: Sevier Meadows Subdivision
Date Conducted: 04/10/2019

Single-Family Detached Housing (LUC 210)
77 Single Family Lots

Average Daily Traffic
$Ln(T) = 0.92Ln(X) + 2.71$
$Ln(T) = 0.92Ln(77) + 2.71$
$T = 818$

Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.
$T = 0.71(X) + 4.80$
$T = 0.71(77) + 4.80$
$T = 59$

Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.
$Ln(T) = 0.96Ln(X) + 0.20$
$Ln(T) = 0.96Ln(77) + 0.20$
$T = 79$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	818	50%	50%	409	409
AM Peak Hour	59	25%	75%	15	44
PM Peak Hour	79	63%	37%	50	29

Single-Family Detached Housing
(210)

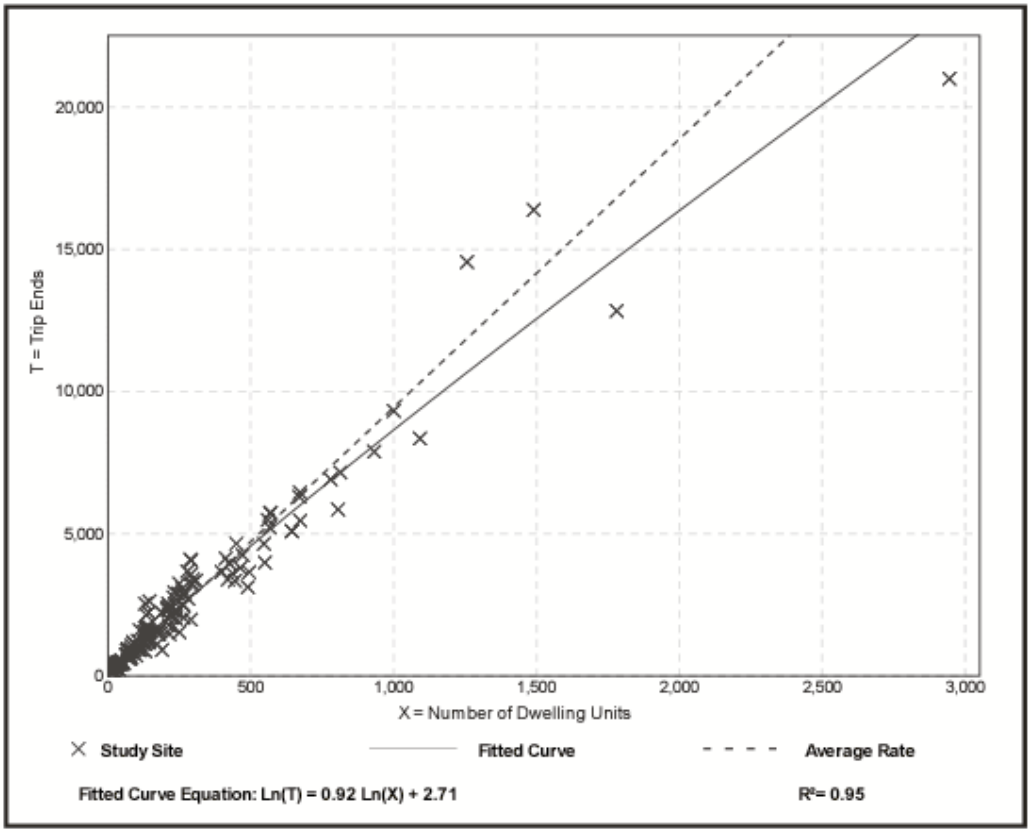
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



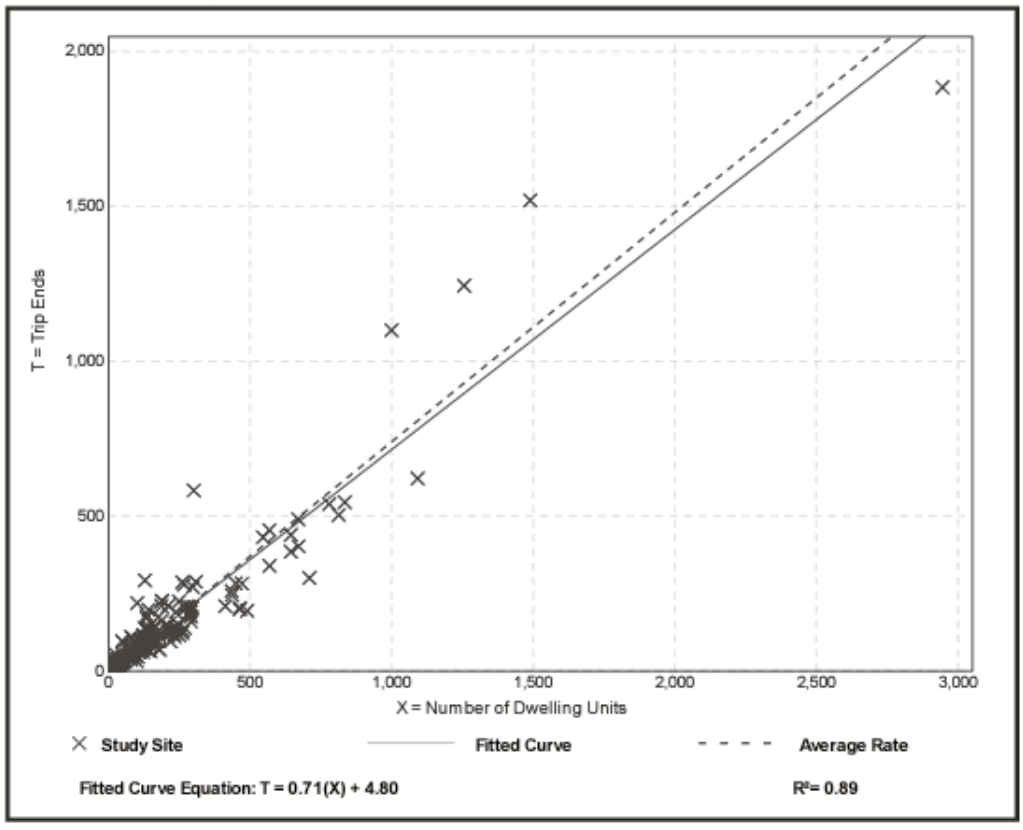
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



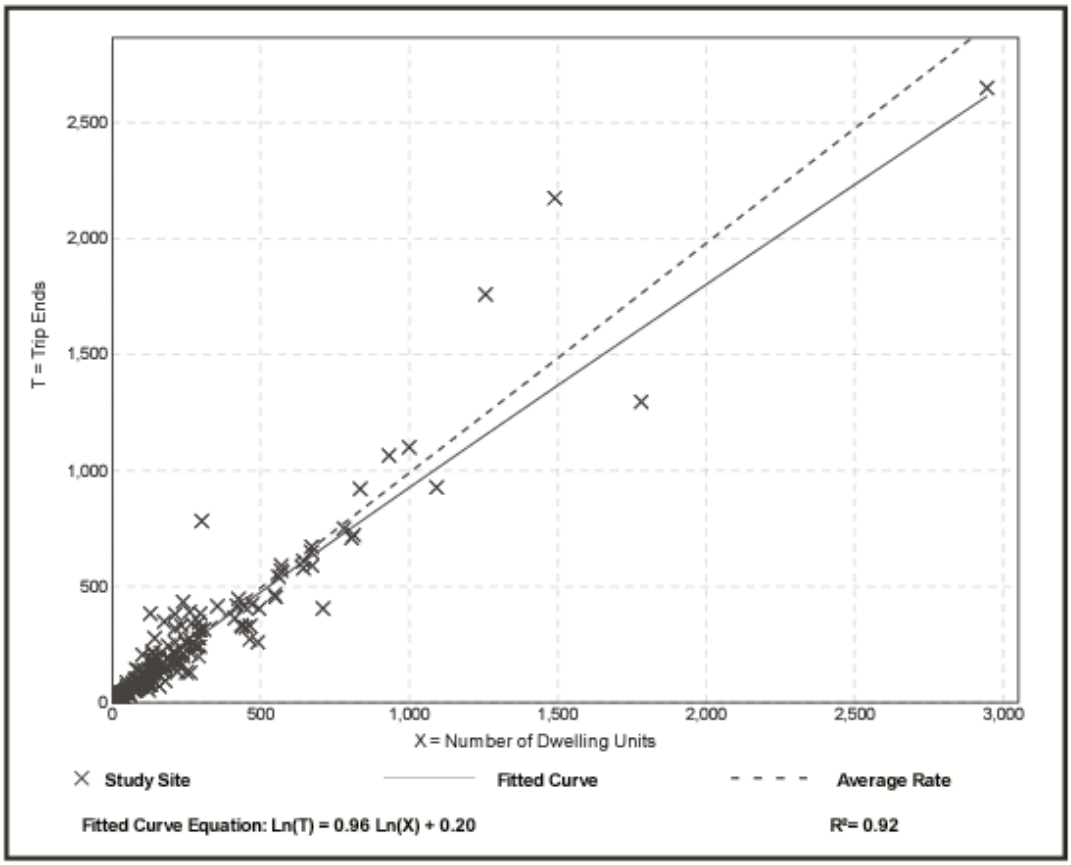
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Attachment 5
Intersection Worksheets – Existing AM/PM Peaks

HCS7 Two-Way Stop-Control Report

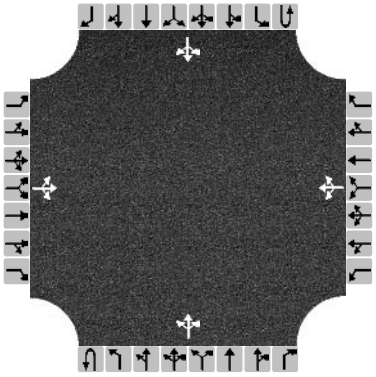
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	Existing AM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk @ Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
Peak Hour Factor	0.87
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		27	0	27		0	441	15		8	252	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				62			0				9		
Capacity, c (veh/h)			0				423			1271				1042		
v/c Ratio							0.15			0.00				0.01		
95% Queue Length, Q_{95} (veh)							0.5			0.0				0.0		
Control Delay (s/veh)			5.0				15.0			7.8				8.5		
Level of Service, LOS			A				B			A				A		
Approach Delay (s/veh)		5.0				15.0				0.0				0.3		
Approach LOS		A				B										

HCS7 Two-Way Stop-Control Report

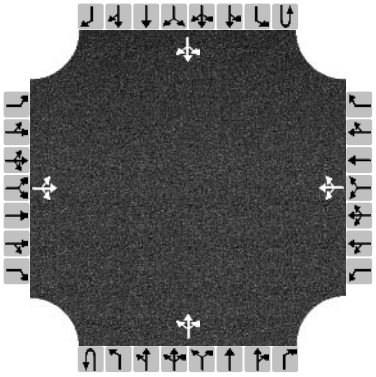
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	Existing PM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk @ Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		11	0	8		0	343	42		19	458	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				21			0				21		
Capacity, c (veh/h)			0				375			1061				1135		
v/c Ratio							0.06			0.00				0.02		
95% Queue Length, Q_{95} (veh)							0.2			0.0				0.1		
Control Delay (s/veh)			5.0				15.2			8.4				8.2		
Level of Service, LOS			A				C			A				A		
Approach Delay (s/veh)		5.0				15.2				0.0				0.5		
Approach LOS		A				C										

Attachment 6
Intersection Worksheets – Background AM/PM Peaks

HCS7 Two-Way Stop-Control Report

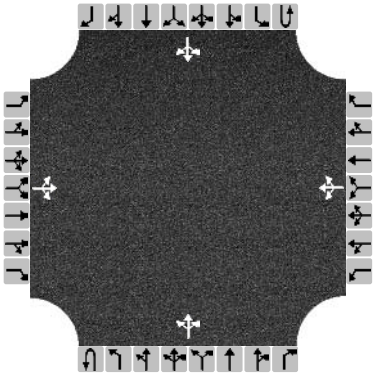
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	4/24/2019
Analysis Year	2022
Time Analyzed	Background AM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk @ Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
Peak Hour Factor	0.87
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		29	0	29		0	468	16		8	267	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				66			0				9		
Capacity, c (veh/h)			0				400			1253				1014		
v/c Ratio							0.17			0.00				0.01		
95% Queue Length, Q_{95} (veh)							0.6			0.0				0.0		
Control Delay (s/veh)			5.0				15.8			7.9				8.6		
Level of Service, LOS			A				C			A				A		
Approach Delay (s/veh)	5.0				15.8				0.0				0.3			
Approach LOS	A				C											

HCS7 Two-Way Stop-Control Report

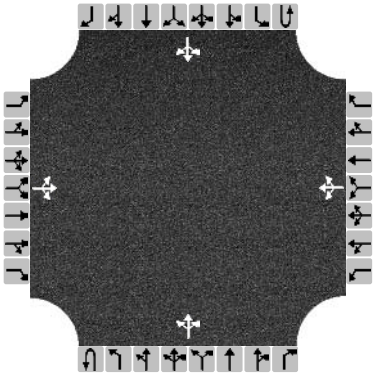
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	4/24/2019
Analysis Year	2022
Time Analyzed	Background PM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk @ Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		12	0	8		0	364	45		20	486	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				22			0				22		
Capacity, c (veh/h)			0				346			1033				1111		
v/c Ratio							0.06			0.00				0.02		
95% Queue Length, Q_{95} (veh)							0.2			0.0				0.1		
Control Delay (s/veh)			5.0				16.1			8.5				8.3		
Level of Service, LOS			A				C			A				A		
Approach Delay (s/veh)		5.0				16.1				0.0				0.6		
Approach LOS		A				C										

Attachment 7
Intersection Worksheets – Full Buildout AM/PM Peaks

HCS7 Two-Way Stop-Control Report

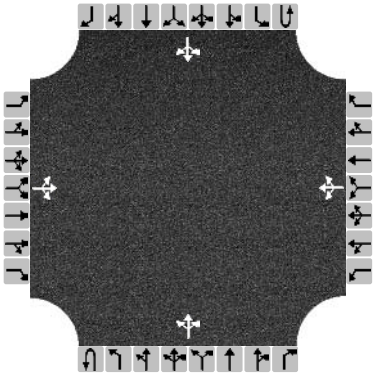
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2019
Analysis Year	2022
Time Analyzed	Buildout AM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk at Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
Peak Hour Factor	0.87
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		29	0	29		0	496	16		9	288	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				66			0				10		
Capacity, c (veh/h)			0				374			1228				987		
v/c Ratio							0.18			0.00				0.01		
95% Queue Length, Q_{95} (veh)							0.6			0.0				0.0		
Control Delay (s/veh)			5.0				16.7			7.9				8.7		
Level of Service, LOS			A				C			A				A		
Approach Delay (s/veh)		5.0				16.7				0.0				0.4		
Approach LOS		A				C										

HCS7 Two-Way Stop-Control Report

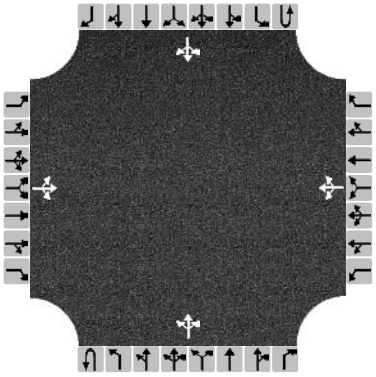
General Information

Analyst	Addie Kirkham
Agency/Co.	FMA
Date Performed	5/22/2019
Analysis Year	2022
Time Analyzed	Buildout PM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk @ Rudder Rd
Jurisdiction	Knox County
East/West Street	Rudder Road
North/South Street	Maryville Pike
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	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	0	0		12	0	12		0	395	45		21	484	0
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		6.42	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			0				26			0				23		
Capacity, c (veh/h)			0				354			1035				1079		
v/c Ratio							0.07			0.00				0.02		
95% Queue Length, Q_{95} (veh)							0.2			0.0				0.1		
Control Delay (s/veh)			5.0				16.0			8.5				8.4		
Level of Service, LOS			A				C			A				A		
Approach Delay (s/veh)		5.0				16.0				0.0				0.6		
Approach LOS		A				C										

HCS7 Two-Way Stop-Control Report

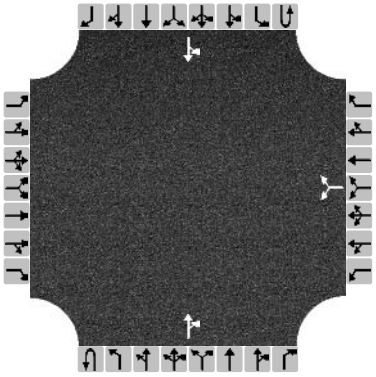
General Information

Analyst	Addie Kirkham
Agency/Co.	FMa
Date Performed	5/22/2019
Analysis Year	2022
Time Analyzed	Buildout AM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk at Driveway
Jurisdiction	Knox County
East/West Street	Driveway
North/South Street	Maryville Pike
Peak Hour Factor	0.92
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		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						22		22			515	10		5	275	
Percent Heavy Vehicles (%)						2		2						2		
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)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							48							5		
Capacity, c (veh/h)							396							1001		
v/c Ratio							0.12							0.00		
95% Queue Length, Q_{95} (veh)							0.4							0.0		
Control Delay (s/veh)							15.3							8.6		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						15.3								0.2		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

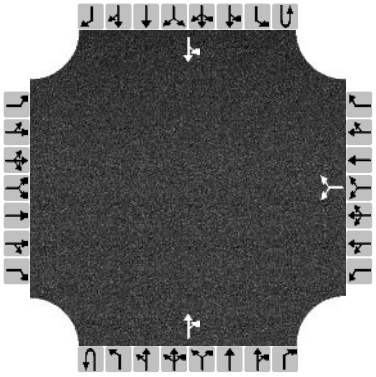
General Information

Analyst	Addie Kirkham
Agency/Co.	FMa
Date Performed	5/22/2019
Analysis Year	2022
Time Analyzed	Buildout PM Peak
Intersection Orientation	North-South
Project Description	525.007 Sevier Meadows Subdivision

Site Information

Intersection	Maryville Pk at Driveway
Jurisdiction	Knox County
East/West Street	Driveway
North/South Street	Maryville Pike
Peak Hour Factor	0.92
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		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						17		12			372	35		15	488	
Percent Heavy Vehicles (%)						2		2						2		
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)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							31							16		
Capacity, c (veh/h)							356							1117		
v/c Ratio							0.09							0.01		
95% Queue Length, Q_{95} (veh)							0.3							0.0		
Control Delay (s/veh)							16.1							8.3		
Level of Service, LOS							C							A		
Approach Delay (s/veh)							16.1							0.4		
Approach LOS							C									

Attachment 8
Turn Lane Warrant Analysis

Project: Sevier Meadows Subdivision

Maryville Pike at Driveway Connection

Maryville Pike at Driveway Connection	VOLUMES				
LEFT TURN	Opposing	Thru	LT	LT MAX	Warrant Met
AM	525	275	5	30	NO
PM	407	488	15	20	NO

Maryville Pike at Driveway Connection	VOLUMES			
RIGHT TURN	Thru	RT	RT MAX	Warrant Met
AM	515	10	25	NO
PM	372	35	149	NO

TABLE 6A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	200 175	140 120	100 85	75 65	60 55	50 45
200 - 249 250 - 299	150 130	100 85	75 65	60 55	50 45	40 35
300 - 349 350 - 399	110 95	75 65	60 55	50 45	40 35	30 25
400 - 449 450 - 499	80 70	60 55	50 45	40 35	30 25	25 20
500 - 549 550 - 599	60 50	50 45	35	AM Peak 5 LT 30 25	25 20	20 20
600 - 649 650 - 699	45 40	40 35	30 30	25 20	20 20	20 20
700 - 749 750 or More	35 35	35 35	25 25	20 20	20 15	15 15

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149 150 - 199	50 45	45 40	40 35	35 30	30 30	25 25
200 - 249 250 - 299	40 35	35 35	30 30	25 25	25 25	20 20
300 - 349 350 - 399	30 25	30 25	25 25	25 20	20 20	20 20
400 - 449 450 - 499	25 20	PM Peak 15 LT 20	20 20	20 20	20 20	15 15
500 - 549 550 - 599	20 20	20 20	20 20	20 15	15 15	15 15
600 - 649 650 - 699	20 20	20 15	15 15	15 15	15 15	15 15
700 - 749 750 or More	15 15	15 15	15 15	15 15	15 15	15 15

* Or through volume only if a right-turn lane exists.

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	< 100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						Yes
200 - 249 250 - 299				Yes	Yes Yes	Yes Yes
300 - 349 350 - 399			Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99	PM Peak 35 RT		Yes	AM Peak 10 RT Yes Yes	Yes Yes	Yes Yes
100 - 149 150 - 199	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

Date: May 22, 2019

Project Name: Sevier Meadows Subdivision

To: Knoxville-Knox County Planning

Subject: TIS Comment Response Document for Sevier Meadows Subdivision Traffic Impact Study Review Comments Dated May 22, 2019.

Dear Knoxville-Knox County Planning staff,

The following comment response document is submitted to address comments dated May 22, 2019:

1. **Reviewer Comment:** On page 2, change Figure 3 name to "2019 Existing Peak Hour Traffic" & Figure 4 name to "2022 Background Peak Hour Traffic".

   Response: Revised the Figure names on page 2.

   a. **Reviewer Comment:** Add sectional divider to Attachment 1 – Aerial Photo.

      Response: Added a sectional divider for Attachment 1 – Aerial Photo.

2. **Reviewer Comment:** On page 16, correct the site exiting traffic to match Figure 7 and correct the southbound Maryville Pike traffic so it balances with the volumes at Rudder Road. Also, correct the associated capacity analysis accordingly.

   Response: Revised both Figure 7 & Figure 8 to reflect the corrected traffic volumes and updated the associated capacity analysis.

3. **Reviewer Comment:** Add "Road" after "located on Brown" in the third paragraph on page 10.

   Response: Revised to "located on Brown Road."

4. **Reviewer Comment:** On page 11 Figure 4, please revise the southbound PM count on Maryville Pike. Growing the existing counts by 3 years would make the SB PM count 486, not 468.

   Response: Revised Figure 4 with the correct Southbound PM count.

5. **Reviewer Comment:** On page 12 third paragraph, are these splits supposed to reference exiting or entering traffic?

   Response: The trip distribution represents the through traffic on Maryville Pike at the proposed driveway connection.

Sincerely,

Addie Kirkham, P.E.