

**SOUTH CREEK SUBDIVISION**  
**Transportation Impact Analysis**  
**Tipton Station Road**  
**Knoxville, TN**

**A Transportation Impact Analysis for the South Creek Subdivision**

Submitted to

**Knoxville – Knox County  
Planning Commission**

Revised June 17, 2020  
May 18, 2020  
FMA Project No. 669.001

Submitted By:



7-SB-20-C  
7-B-20-UR  
6/17/2020

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## **Executive Summary**

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YSOS Holdings, LLC is proposing an addition to the existing South Creek Subdivision located in southeast Knox County. The project is located south of the intersection of Chapman Highway at Tipton Station Road. The existing entrance to South Creek Subdivision is located at the intersection of Tipton Station Road at White Creek Drive.

Phase 1 of the development was built in 2004 and included the construction of 22 single family homes. Phase 2 of the development will include an additional 99 single family lots for a total of 121 single family lots under full buildout conditions. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2023.

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

### **Tipton Station Road @ White Creek Drive**

The full buildout traffic conditions at the unsignalized intersection of Tipton Station Road at White Creek Drive were analyzed using the Highway Capacity Software (HCS7). The eastbound approach will operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS A during both the AM and PM peak hours.

After the completion of the South Creek Subdivision Phase 2 neither a northbound left turn lane nor a southbound right turn lane are warranted at the intersection of Tipton Station Road at White Creek Drive.

The minimum required sight distance for a road with a posted speed limit of 40 mph is 400 feet in each direction in accordance with the "Subdivision Regulations" for Knoxville and Knox County. FMA measured the sight distance at the existing intersection of Tipton Station Road at White Creek Drive in May 2020. At 15 feet from the edge of pavement the sight distance is 410 feet northbound to the intersection with Chapman Highway and 305 feet southbound. The intersection sight distance looking south is currently partially blocked by overgrown brush located in the right-of-way of Tipton Station Road. FMA recommends Knox County Engineering & Public Works clear the overgrown brush located in the right-of-way south of the intersection of Tipton Station Road at White Creek Drive for a distance of 400 feet in order to comply with the sight distance requirements.

# **1 Introduction**

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## **1.1 Project Description**

This report provides a summary of a transportation impact analysis that was performed for the South Creek Subdivision. The existing entrance to South Creek Subdivision is located at the intersection of Tipton Station Road at White Creek Drive in southeast Knox County. The location of the site is shown in Figure 1.

Phase 1 of the development was built in 2004 and included the construction of 22 single family homes. Phase 2 of the development will include an additional 99 single family lots for a total of 121 single family lots under full buildout conditions. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2023.

The existing driveway connection for the South Creek Subdivision is located at the intersection of Tipton Station Road at White Creek Drive approximately 505 feet north of the intersection of W Hendron Chapel Road and approximately 555 feet south of the intersection of Chapman Highway (SR 71). Phase 2 of the development will connect to the southern end of the existing Sweetwater Lane. The proposed site layout is shown in Figure 2.

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

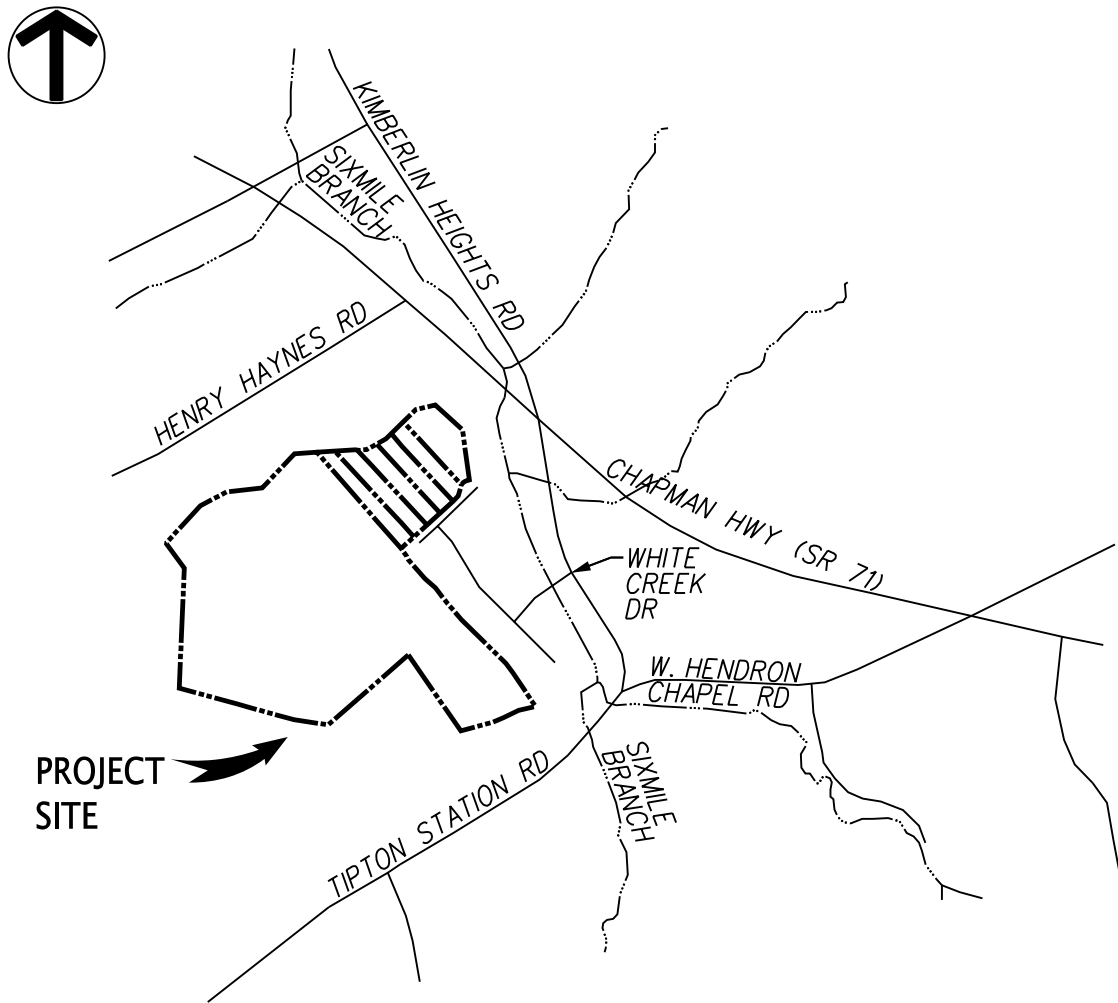


Figure 1: Location Map

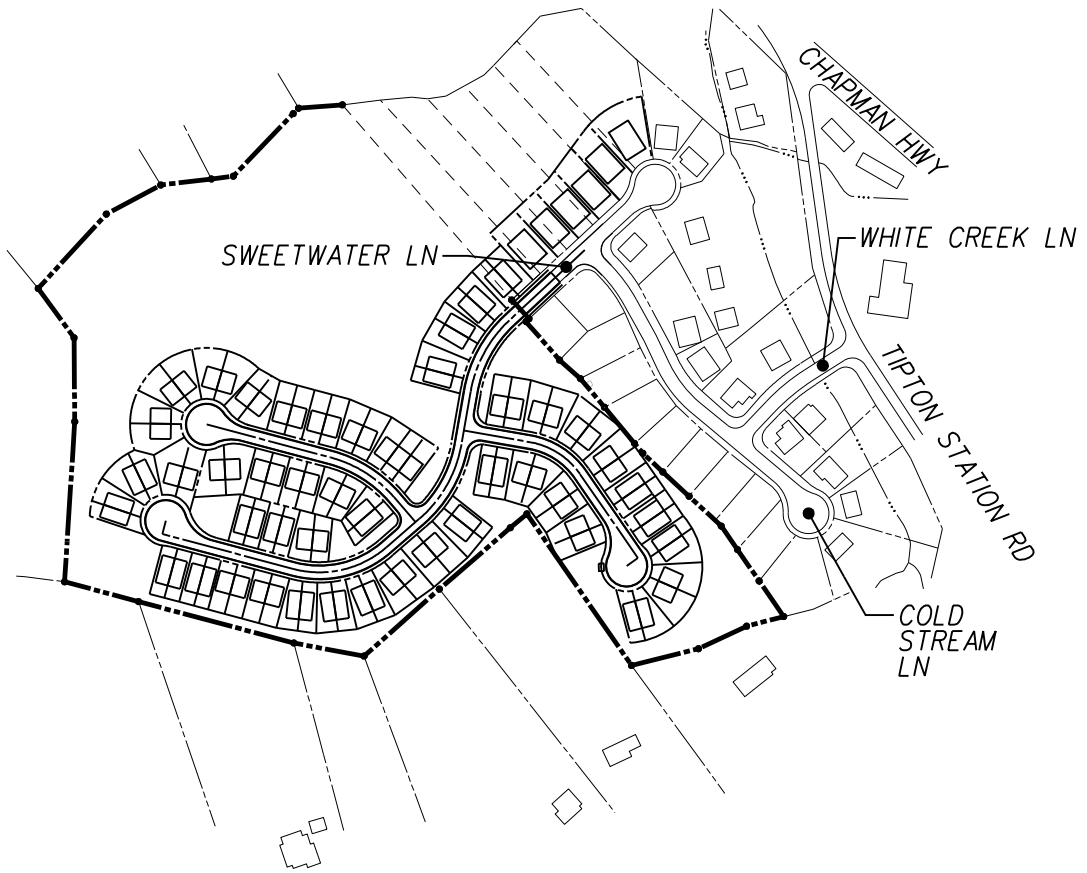


Figure 2: Site Plan

## **1.2 Existing Site Conditions**

Tipton Station Road is a two-lane road at the existing entrance to South Creek Subdivision. Knoxville-Knox County Planning classifies Tipton Station Road as a major collector (with a 60 foot right-of-way) per the Major Road Plan. The posted speed limit on Tipton Station Road is 40 mph.

White Creek Drive, Cold Stream Lane and Sweetwater Lane are all existing roads within South Creek Subdivision. All three roads are two-lane roads with an existing width of 26 feet. Knoxville-Knox County Planning does not classify White Creek Drive, Cold Stream Lane or Sweetwater Lane; therefore, they are considered local streets. The posted speed limit on White Creek Drive is 25 mph.

There are no existing sidewalks within the vicinity of the proposed development either within South Creek Subdivision, along Tipton Station Road or along Chapman Highway (SR 71).

An aerial photo of the existing intersection of Tipton Station Road at White Creek Drive and an aerial photo of Sweetwater Lane are included in Attachment 1.



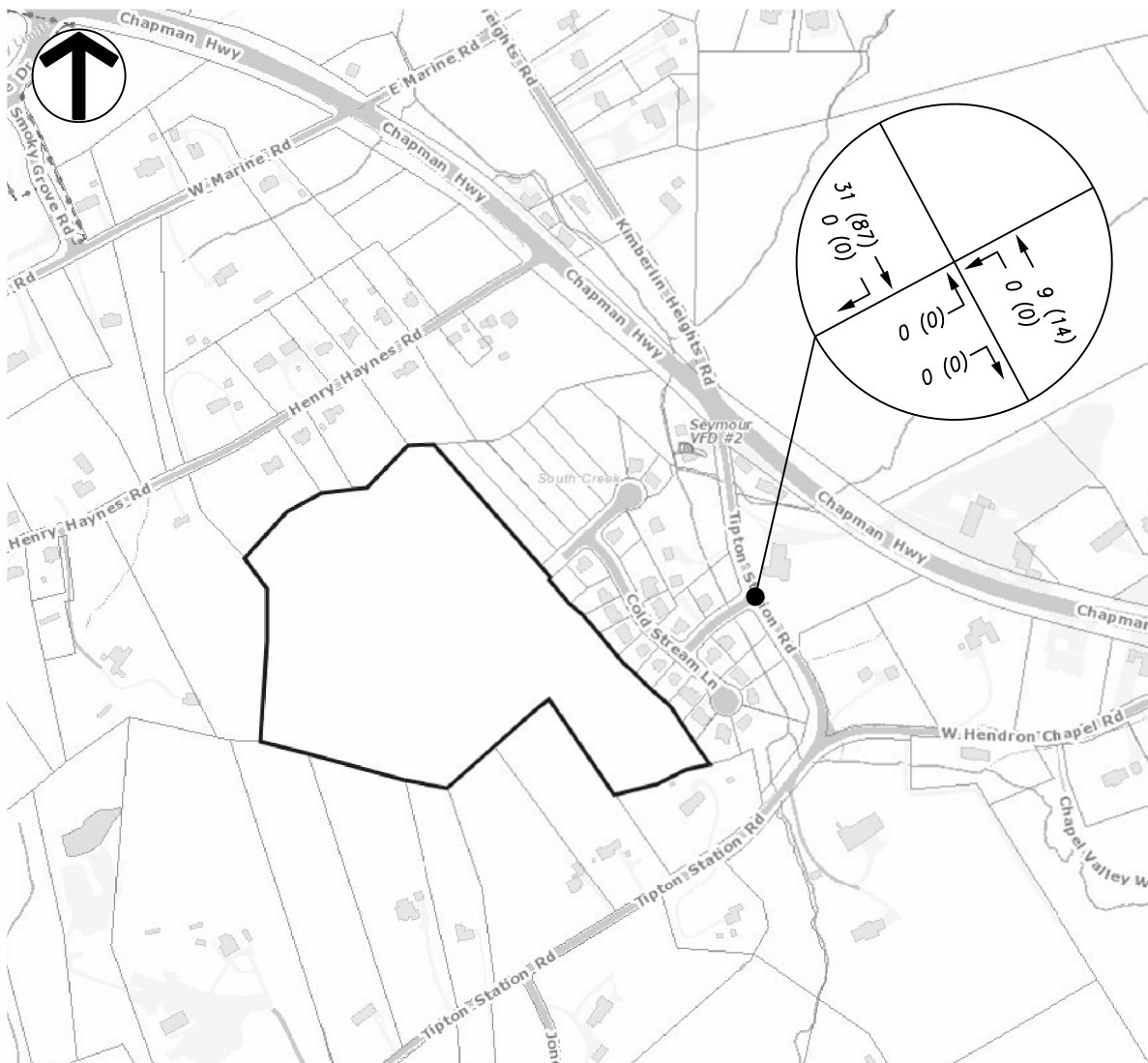
## **2 Existing Traffic Volumes**

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Due to the altered traffic patterns from COVID-19 FMA did not collect any new turning movement counts for the South Creek Subdivision transportation impact analysis.

As a part of the “Tipton Station Subdivision Traffic Impact Study” prepared by Wilbur Smith Associates in May 2004 a peak hour turning movement count was collected for the intersection of Tipton Station Road and Hendron Chapel Road. The turning movement count for Chapman Highway (SR 71) at Tipton Station Road came from “Intersection Evaluation Part 1”, which is a Knox County study performed by WSA, and was collected in July 2002. The 2002 data was factored by a 1.05 factor to represent 2004 traffic conditions. Wilbur Smith Associates estimated that the peak hours were between 7:00 a.m. to 8:30 a.m. and 4:45 p.m. to 6:00 p.m.

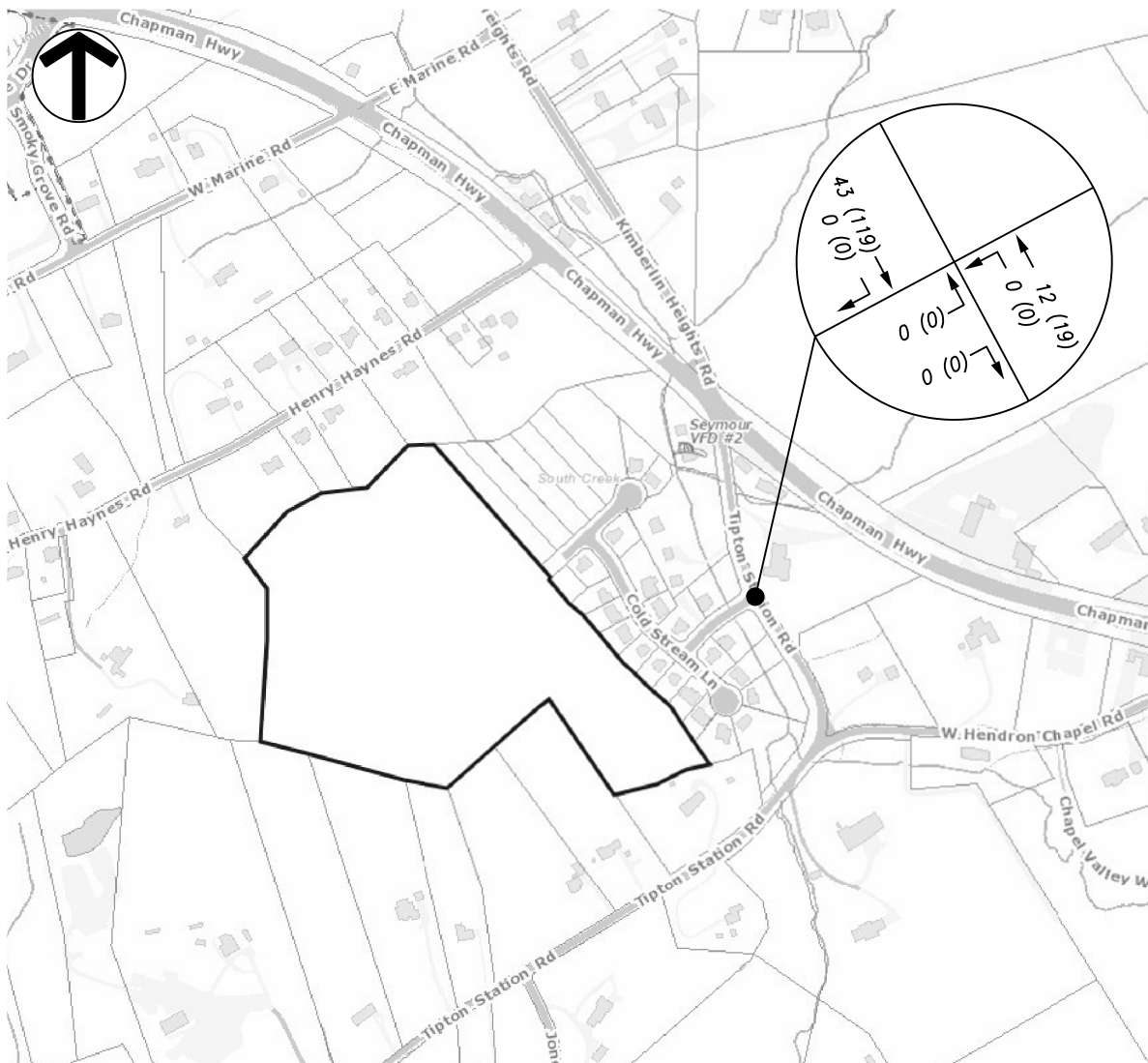
In order to calculate existing traffic conditions for the year 2020 FMA assumed a 2% growth rate at the intersection of Tipton Station Road at White Creek Drive. Figure 3 shows the existing 2004 traffic volumes and Figure 4 shows the projected 2020 traffic volumes at the intersection of Tipton Station Road at White Creek Drive including both the AM and PM peak hour traffic volumes. A copy of “Figure 3 2004 Existing Traffic – Tipton Station Subdivision” is included in Attachment 2.



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 3: WSA 2004 Existing Peak Hour Traffic



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 4: 2020 Existing Peak Hour Traffic

## 2.1 South Creek Subdivision

South Creek Subdivision is an existing subdivision located at the intersection of Tipton Station Road at White Creek Drive in southeast Knox County. South Creek Subdivision has 22 existing single family homes.

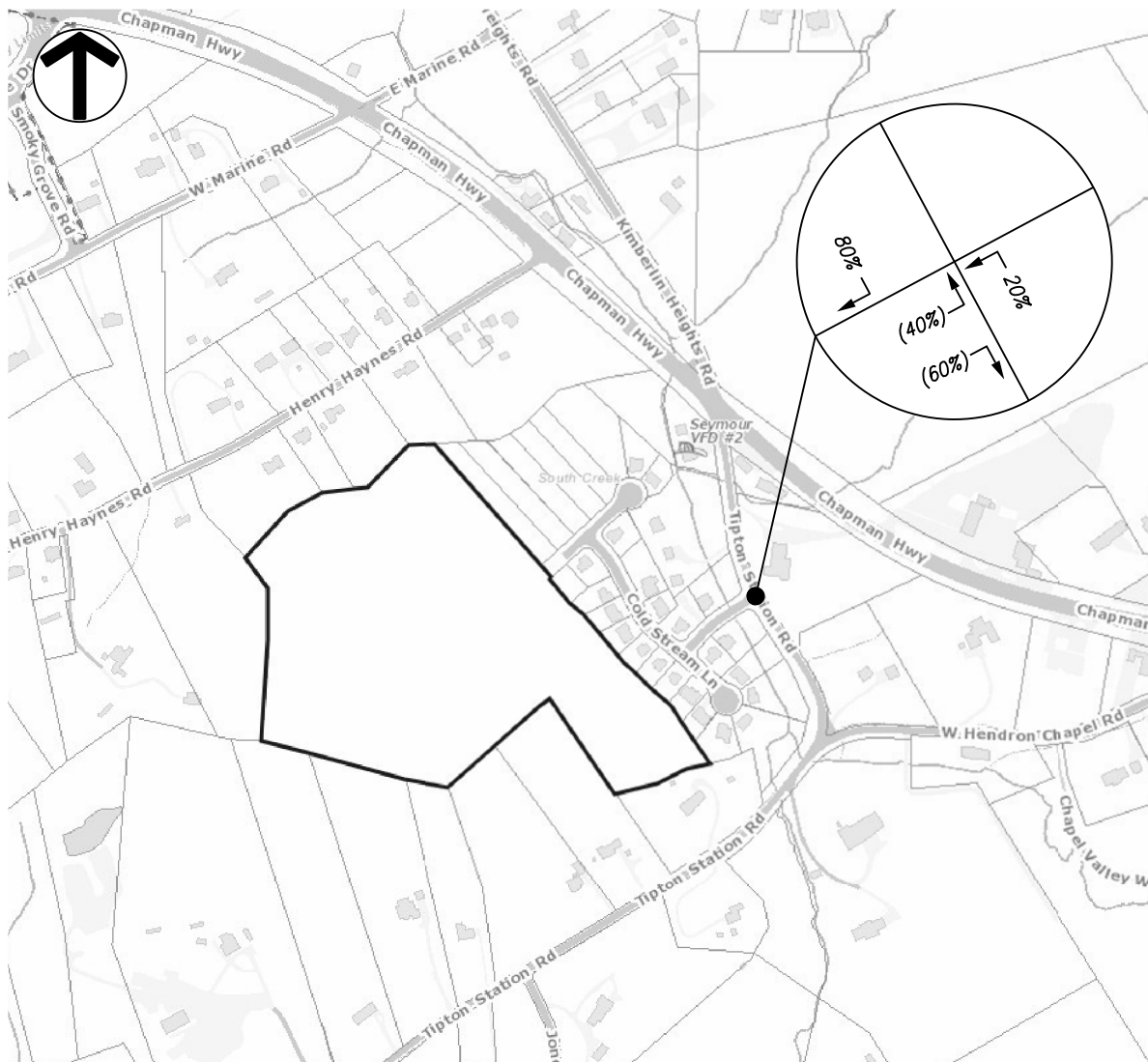
Single- Family Detached Housing or Land Use 210 was used to calculate site trips for the subdivision using the fitted curve equations from the *Trip Generation, 10<sup>th</sup> Edition*, published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 4.

**Table 2.1-1  
Tipton Station Subdivision  
Trip Generation Summary**

Land Use	Density	Daily Trips	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (LUC 210)	22 Lots	258	5	15	15	9

The directional distribution of the traffic generated by the South Creek Subdivision was referenced from the “Tipton Station Subdivision Traffic Impact Study” by Wilbur Smith Associates dated May 2004. Tipton Station Subdivision shows an entering trip distribution of 20% northbound left turns and 80% southbound right turns during both the AM and PM peak hours and an exiting trip distribution of 40% eastbound left turns and 60% eastbound right turns at the intersection of Tipton Station Road at White Creek Drive. A copy of “Figure 5 Distribution and Assignment Tipton Station Subdivision” is included in Attachment 2.

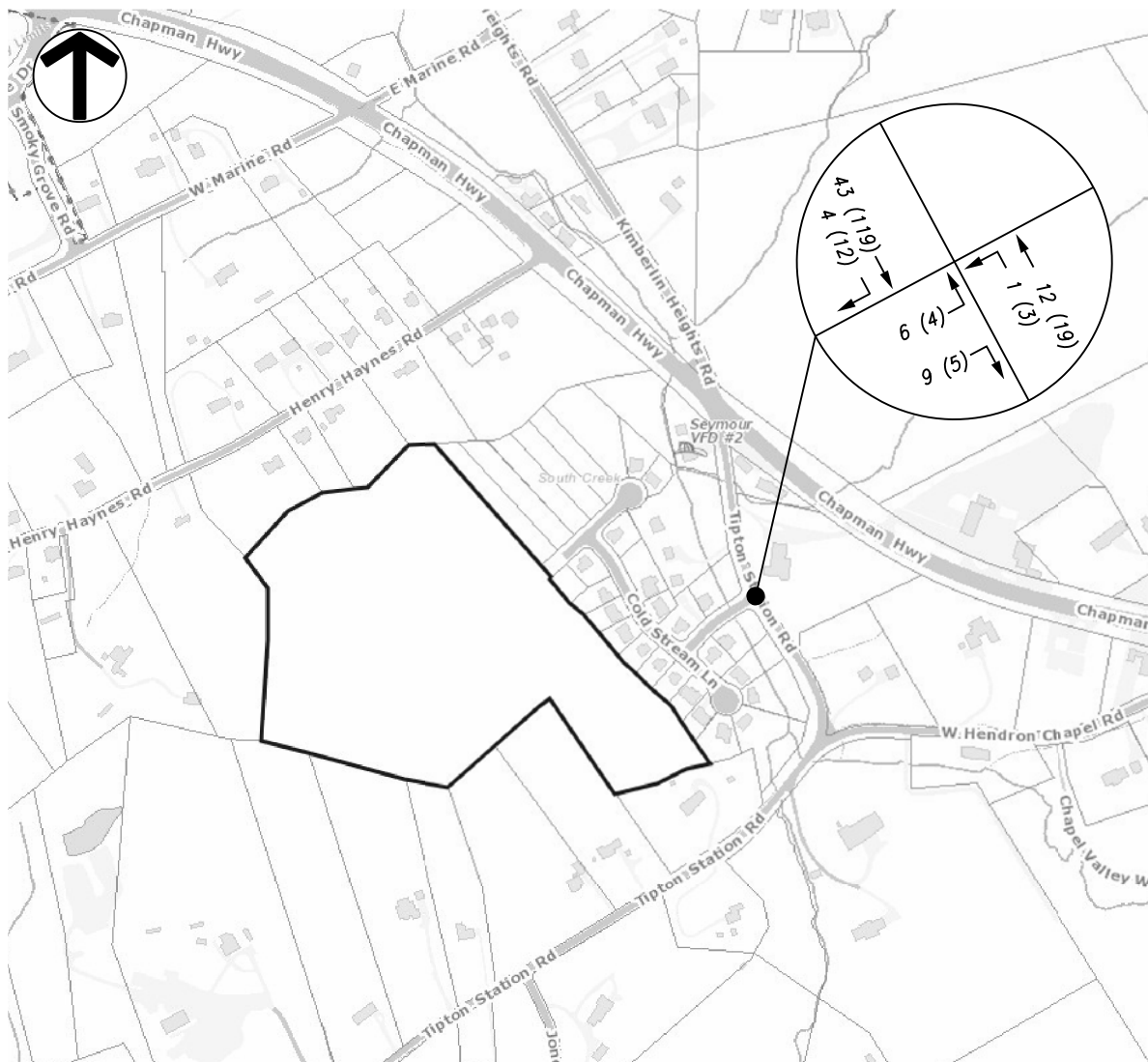
Figure 5 shows the peak hour trip distribution and Figure 6 shows the existing peak hour site traffic which combines the 2020 existing traffic volumes with the 2020 existing subdivision site traffic.



**LEGEND:**

← 50% (50%) TRIP DISTRIBUTION ENTERING (EXITING)

Figure 5: Peak Hour Trip Distribution



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 6: 2020 Existing Peak Hour Site Traffic

### **3 Background Growth**

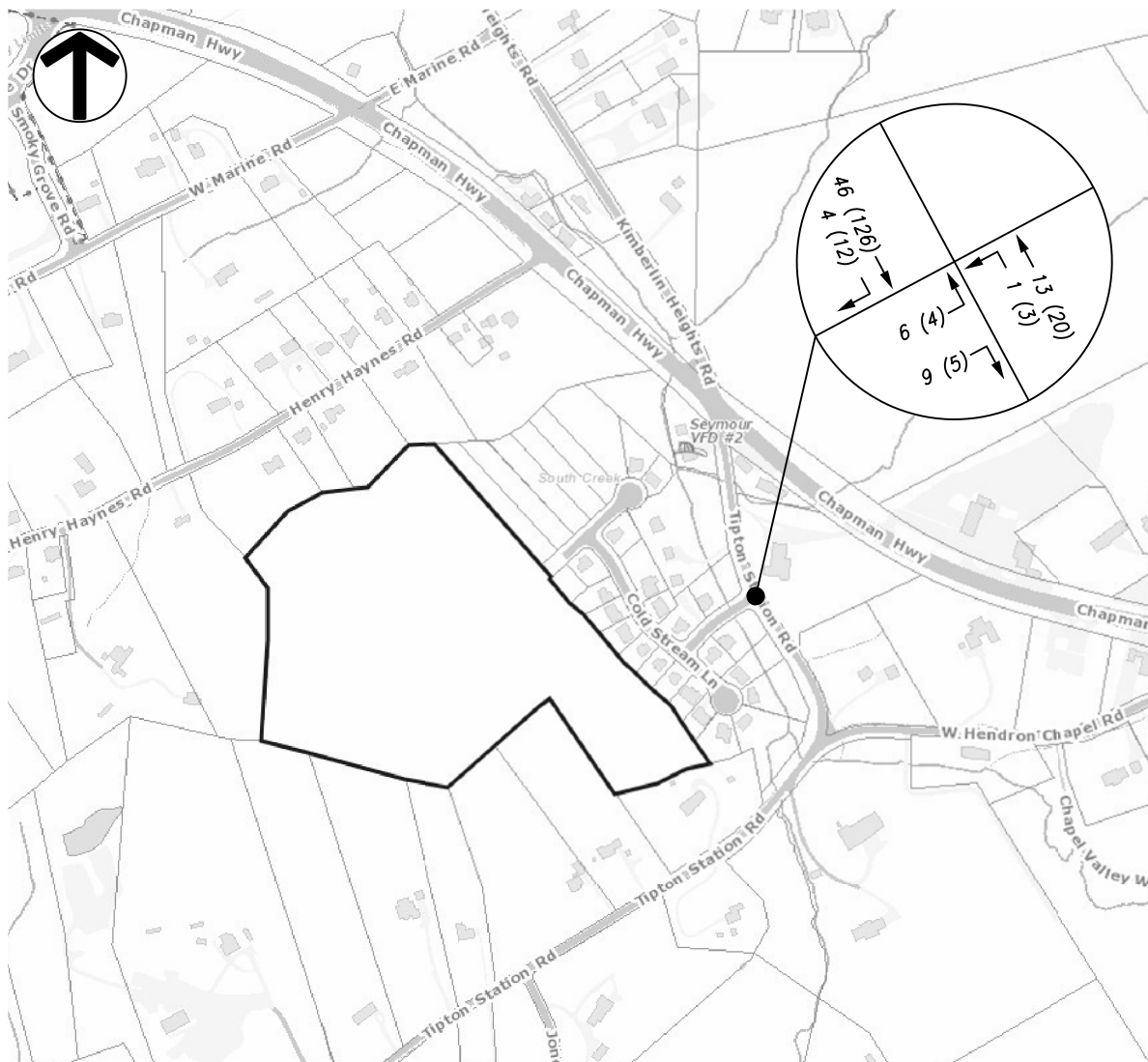
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The Tennessee Department of Transportation (TDOT) maintains a count station in the vicinity of the proposed development.

TDOT count station number 000104 is located on Chapman Highway (SR 71) east of proposed development. The annual growth rate for this station over the last ten years is approximately 0.42% and the 2018 ADT was 30,017 vehicles per day.

For the purpose of this study, an annual growth rate of 2.0% was assumed for thru traffic at the intersection of Tipton Station Road at White Creek Drive until full occupancy is reached in 2023. Attachment 3 shows the trend line growth charts for the TDOT count station.

Figure 7 demonstrates the projected 2023 background peak hour volumes at the intersection of Tipton Station Road at White Creek Drive after applying the background growth rate to the 2020 existing conditions.



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 7: 2023 Background Peak Hour Traffic



## **4 Trip Generation and Trip Distribution**

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The South Creek Subdivision proposes an additional 99 single family lots in Phase 2. 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, 10<sup>th</sup> Edition*, published by the Institute of Transportation Engineers. The land use worksheets are included in Attachment 4.

The total new trips generated by the South Creek Subdivision were estimated to be 1,030 daily trips. The estimated trips are 75 trips during the AM peak hour and 101 trips during the PM peak hour. A trip generation summary is shown in Table 4-1.

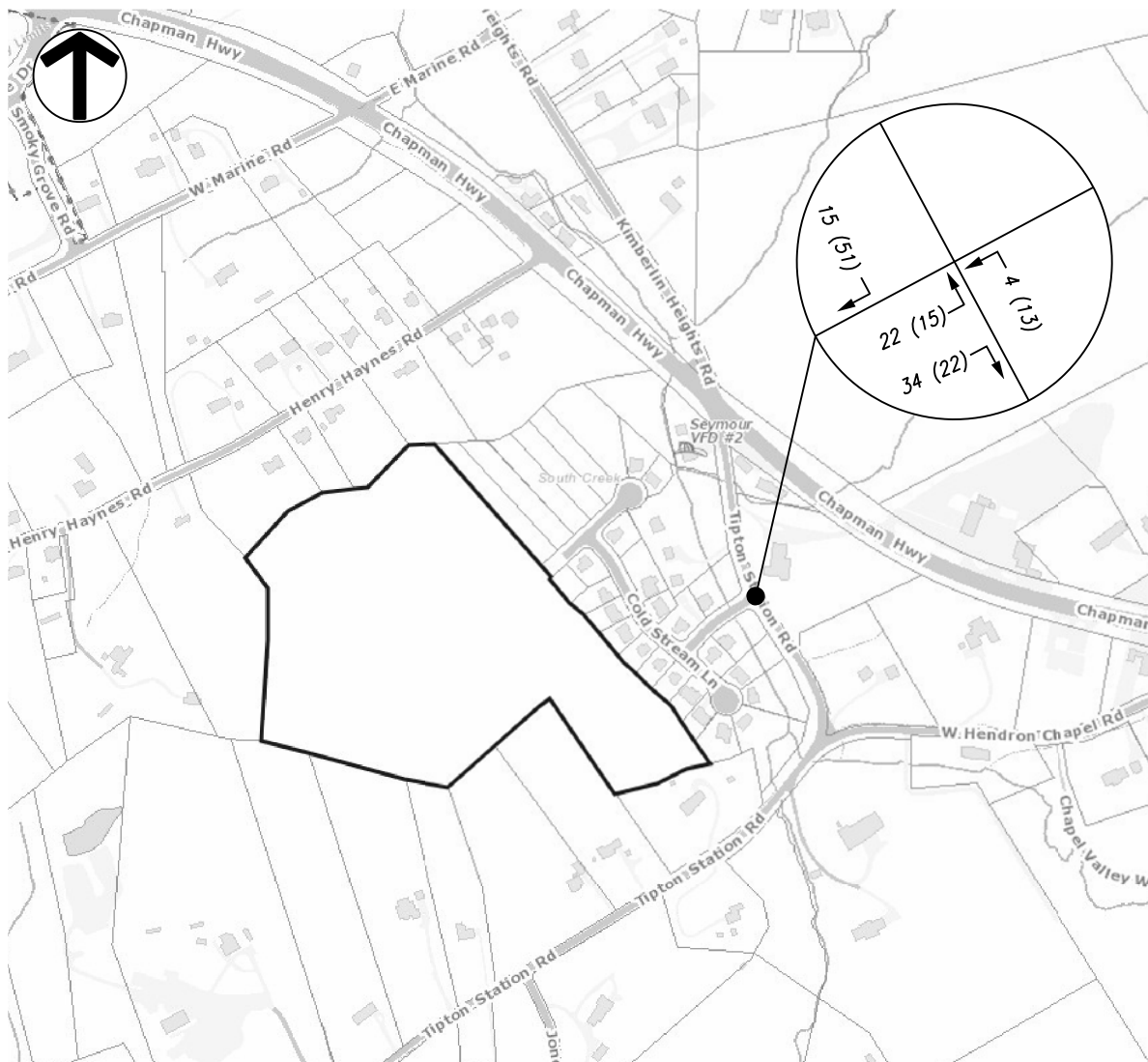
**Table 4-1  
South Creek Subdivision  
Trip Generation Summary**

Land Use	Density	Daily Trips	AM Peak Hour		PM Peak Hour	
			Enter	Exit	Enter	Exit
Single-Family Detached Housing (LUC 210)	99 Lots	1,030	19	56	64	37

Tipton Station Road at the existing intersection with White Creek Drive has an average trip distribution of 20% northbound and 80% southbound during both the AM and PM peak hours.

The directional distribution of the traffic generated by the South Creek Subdivision was referenced from the “Tipton Station Subdivision Traffic Impact Study” by Wilbur Smith Associates dated May 2004. Figure 5 Distribution and Assignment for the Tipton Station Subdivision shows an entering trip distribution of 20% northbound left turns and 80% southbound right turns during both the AM and PM peak hours and an existing trip distribution of 40% eastbound left turns and 60% eastbound right turns at the intersection of Tipton Station Road at White Creek Drive. Figure 5 shows the peak hour trip distribution.

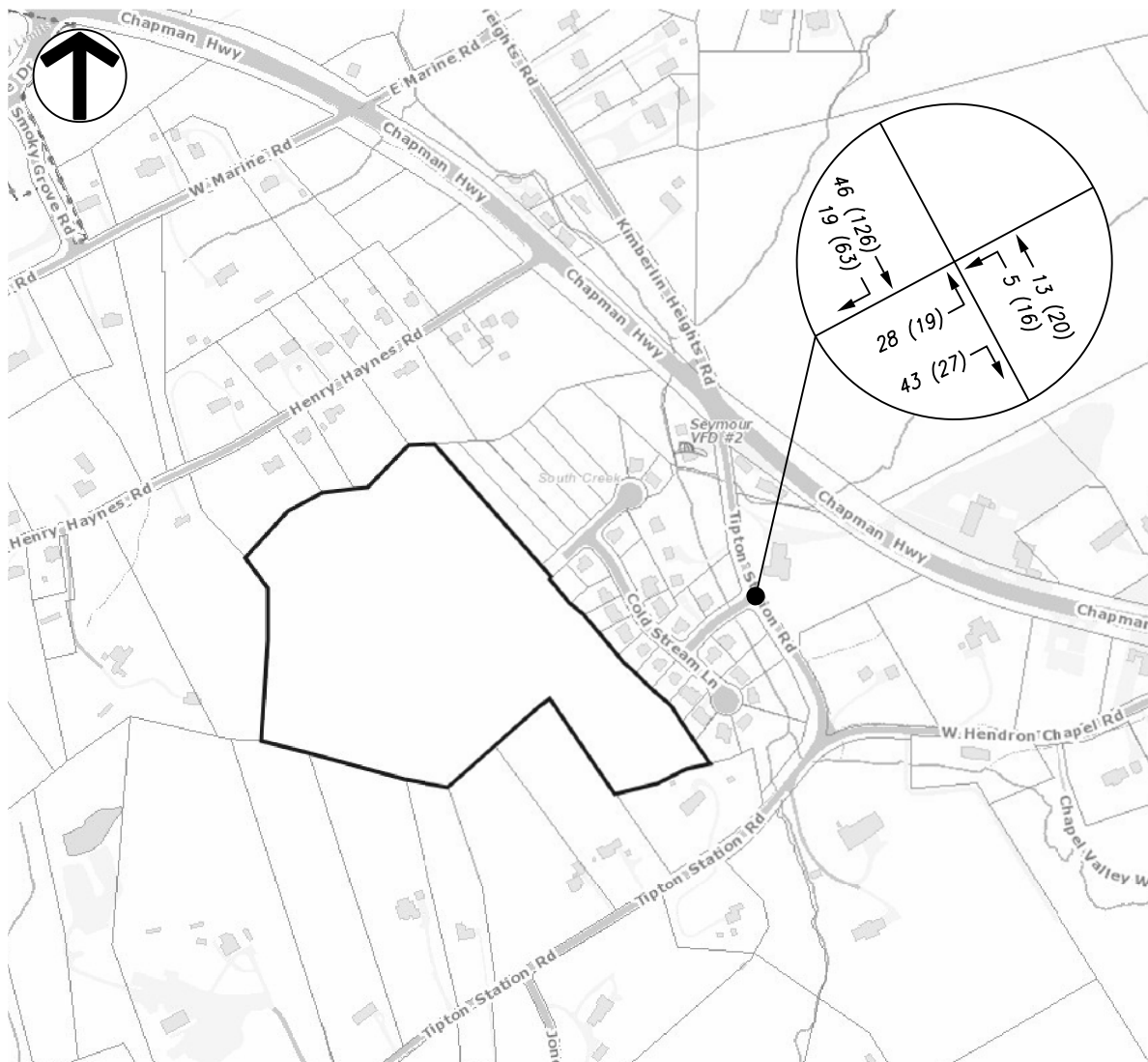
Figure 8 shows the Phase 2 peak hour site traffic from the subdivision and Figure 9 shows the peak hour full buildout traffic.



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 8: Phase 2 Peak Hour Site Traffic



**LEGEND:**

← 5 (16)      TURNING MOVEMENT VOLUME AM (PM)

Figure 9: 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 intersection of Tipton Station Road at White Creek Drive for the existing, background and full buildout conditions.

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		
<b>Tipton Station Road @ White Creek Drive (Existing 2020)</b>		
AM Peak	EB Approach	8.7 / A
	NB Approach	7.3 / A
PM Peak	EB Approach	9.2 / A
	BB Approach	7.5 / A
<b>Tipton Station Road @ White Creek Drive (Background 2023)</b>		
AM Peak	EB Approach	8.7 / A
	NB Approach	7.3 / A
PM Peak	EB Approach	9.2 / A
	NB Approach	7.5 / A
<b>Tipton Station Road @ White Creek Drive (Full Buildout 2023)</b>		
AM Peak	EB Approach	9.0 / A
	NB Approach	7.4 / A
PM Peak	EB Approach	9.7 / A
	NB Approach	7.7 / A

## **6 Turn Lane Warrant Analysis**

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The intersection of Tipton Station Road at White Creek Drive was evaluated to determine if a right turn lane or a left turn lane are 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 Tipton Station Road is warranted. The turn lane warrant worksheets and analysis are included in Attachment 8.

## **7 Conclusions and Recommendations**

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### **7.1 Tipton Station Road @ White Creek Drive**

The existing traffic conditions at the unsignalized intersection of Tipton Station Road at White Creek Drive were analyzed using the Highway Capacity Software (HCS7). The eastbound approach will operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS A during both the AM and PM peak hours.

The background traffic conditions at the unsignalized intersection of Tipton Station Road at White Creek Drive were analyzed using the Highway Capacity Software (HCS7). The eastbound approach will operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS A during both the AM and PM peak hours.

The full buildout traffic conditions at the unsignalized intersection of Tipton Station Road at White Creek Drive were analyzed using the Highway Capacity Software (HCS7). The eastbound approach will operate at a LOS A during both the AM and PM peak hours and the northbound approach will operate at a LOS A during both the AM and PM peak hours.

After the completion of the South Creek Subdivision Phase 2 neither a northbound left turn lane nor a southbound right turn lane are warranted at the intersection of Tipton Station Road at White Creek Drive.

The minimum required sight distance for a road with a posted speed limit of 40 mph is 400 feet in each direction in accordance with the "Subdivision Regulations" for Knoxville and Knox County. FMA measured the sight distance at the existing intersection of Tipton Station Road at White Creek Drive in May 2020. At 15 feet from the edge of pavement the sight distance is 410 feet northbound to the intersection with Chapman Highway and 305 feet southbound. The intersection

**South Creek Subdivision  
Transportation Impact Analysis  
June 17, 2020**

sight distance looking south is currently partially blocked by overgrown brush located in the right-of-way of Tipton Station Road. FMA recommends Knox County Engineering & Public Works clear the overgrown brush located in the right-of-way south of the intersection of Tipton Station Road at White Creek Drive for a distance of 400 feet in order to comply with the sight distance requirements.

**Attachment 1**  
**Aerial Photo**

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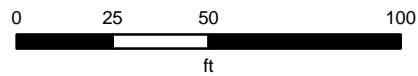


### Tipton Station at White Creek

**Knoxville - Knox County - KUB Geographic Information System**



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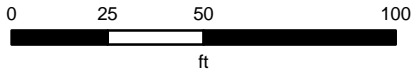
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# Sweetwater Lane

**Knoxville - Knox County - KUB Geographic Information System**



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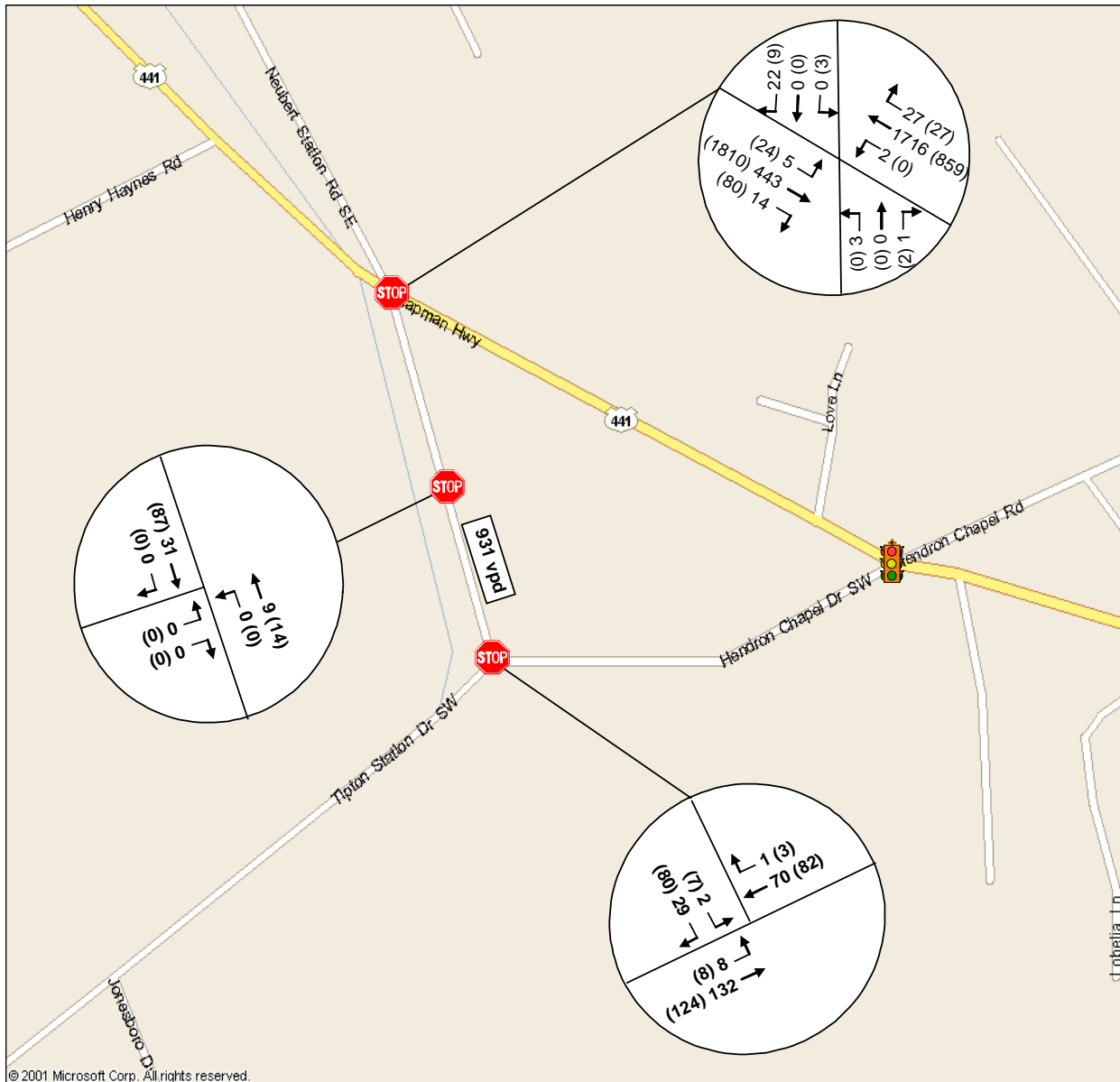


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**Attachment 2**  
**Traffic Counts**

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# 2004 EXISTING TRAFFIC Tipton Station Subdivision



**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



**Figure 3**

# DISTRIBUTION AND ASSIGNMENT Tipton Station Subdivision

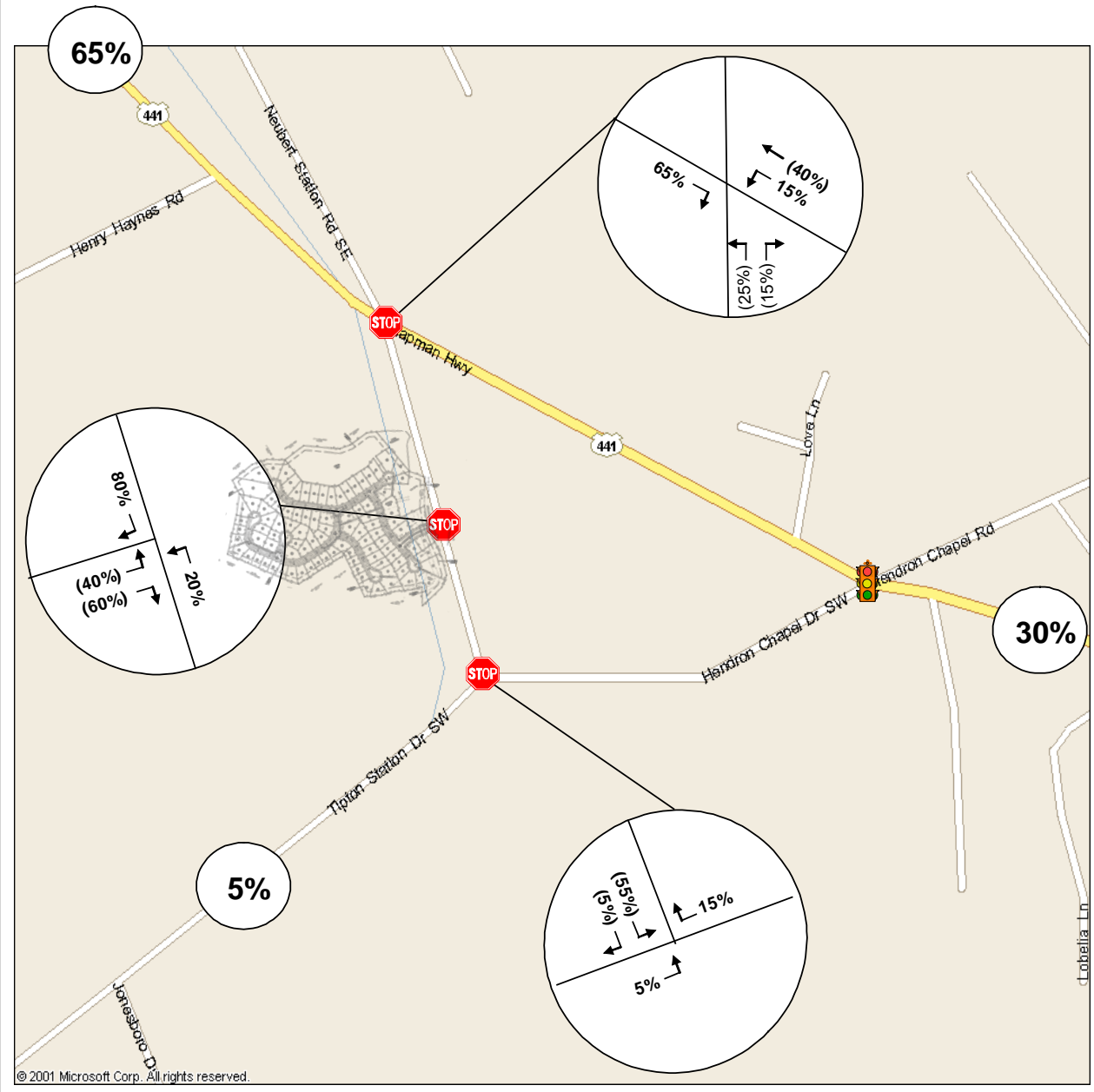
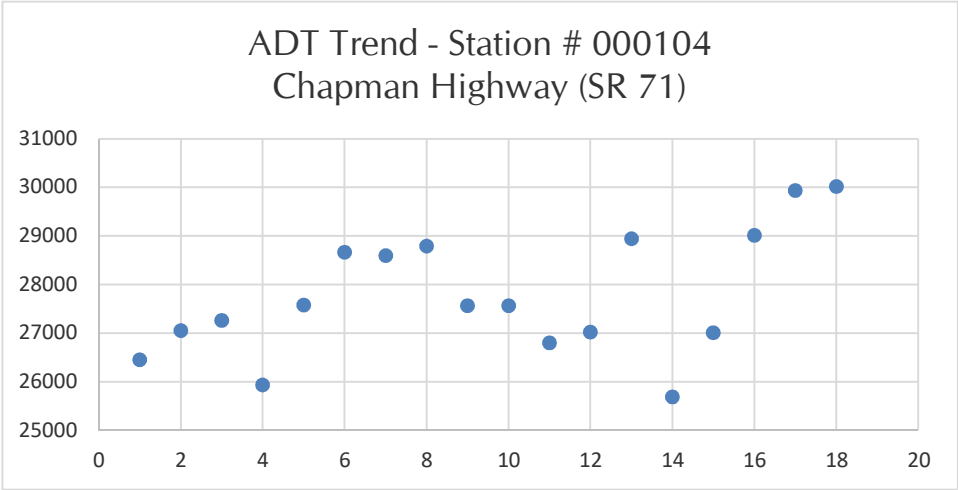


Figure 5

# Attachment 3 ADT Trends

Year	Adjusted Average Daily Traffic
2001	26452
2002	27056
2003	27265
2004	25937
2005	27579
2006	28668
2007	28599
2008	28795
2009	27567
2010	27566
2011	26800
2012	27024
2013	28947
2014	25689
2015	27011
2016	29013
2017	29938
2018	30017



Most Recent Trend Line Growth

Year	ADT
2008	28795
2018	30017

**Annual Percent Growth 0.42%**

# Attachment 4 Trip Generation

**Project: South Creek Subdivision**

**Date Conducted: 5/1/2020**

## Single-Family Detached Housing (LUC 210)

### 22 Existing Single Family Lots

#### Average Daily Traffic

$$\ln(T) = 0.92\ln(X) + 2.71$$

$$\ln(T) = 0.92\ln(22) + 2.71$$

$$T = 258$$

#### Peak Hour of Adjacent Street Traffic

##### One Hour Between 7 and 9 a.m.

$$T = 0.71(X) + 4.80$$

$$T = 0.71(22) + 4.80$$

$$T = 20$$

#### Peak Hour of Adjacent Street Traffic

##### One Hour Between 4 and 6 p.m.

$$\ln(T) = 0.96\ln(X) + 0.20$$

$$\ln(T) = 0.96\ln(22) + 0.20$$

$$T = 24$$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	258	50%	50%	129	129
AM Peak Hour	20	25%	75%	5	15
PM Peak Hour	24	63%	37%	15	9

**Project: South Creek Subdivision**

**Date Conducted: 4/30/2020**

**Single-Family Detached Housing (LUC 210)**

**99 Single Family Lots**

**Average Daily Traffic**

$$\ln(T) = 0.92\ln(X) + 2.71$$

$$\ln(T) = 0.92\ln(99) + 2.71$$

$$T = 1030$$

**Peak Hour of Adjacent Street Traffic**

**One Hour Between 7 and 9 a.m.**

$$T = 0.71(X) + 4.80$$

$$T = 0.71(99) + 4.80$$

$$T = 75$$

**Peak Hour of Adjacent Street Traffic**

**One Hour Between 4 and 6 p.m.**

$$\ln(T) = 0.96\ln(X) + 0.20$$

$$\ln(T) = 0.96\ln(99) + 0.20$$

$$T = 101$$

Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours)	1030	50%	50%	515	515
AM Peak Hour	75	25%	75%	19	56
PM Peak Hour	101	63%	37%	64	37

## Single-Family Detached Housing (210)

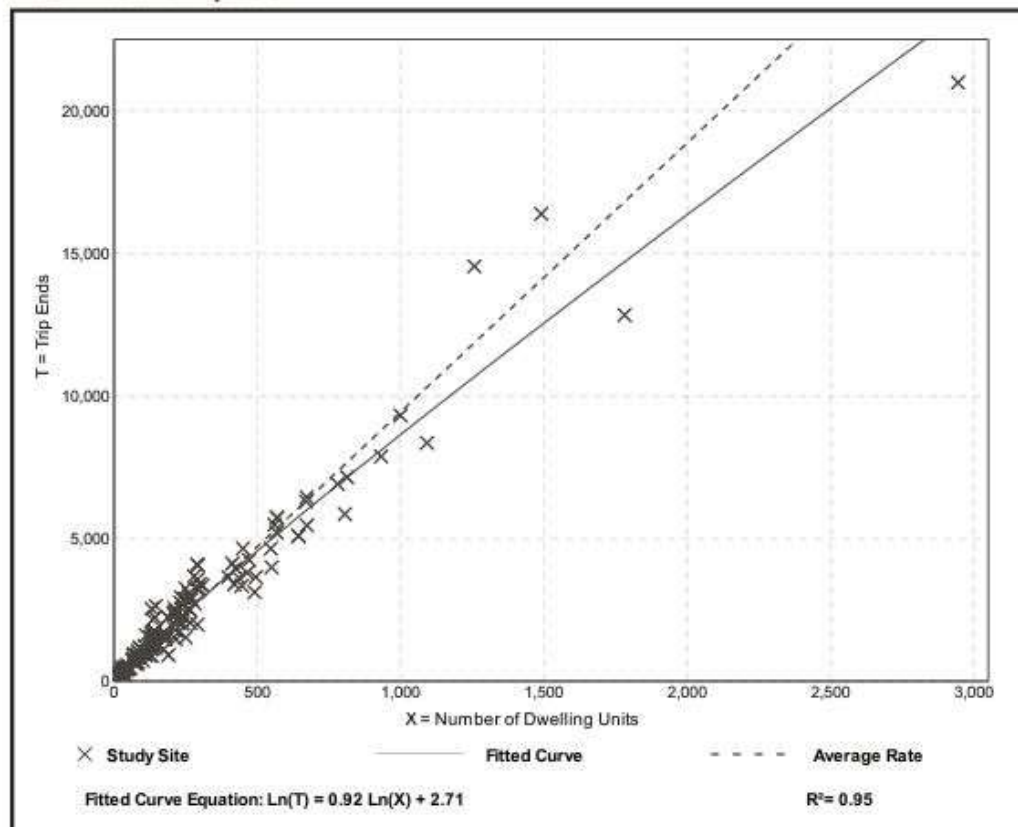
**Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday**

**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)

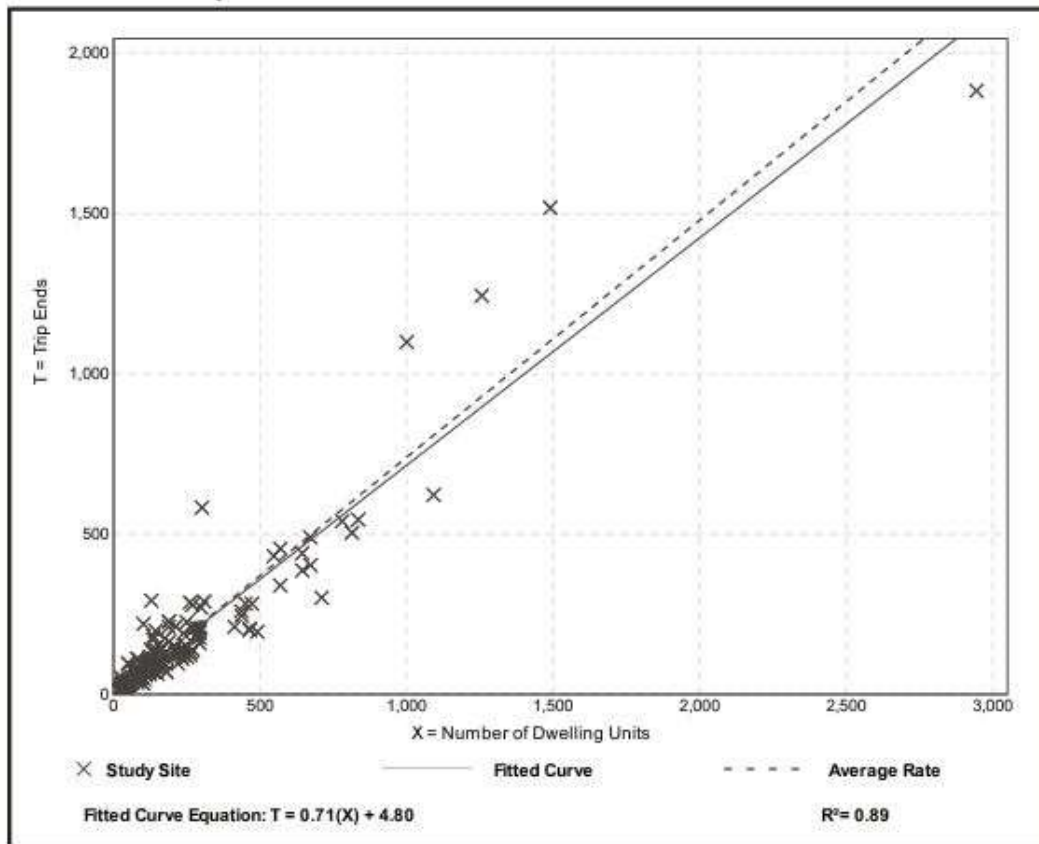
**Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

**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



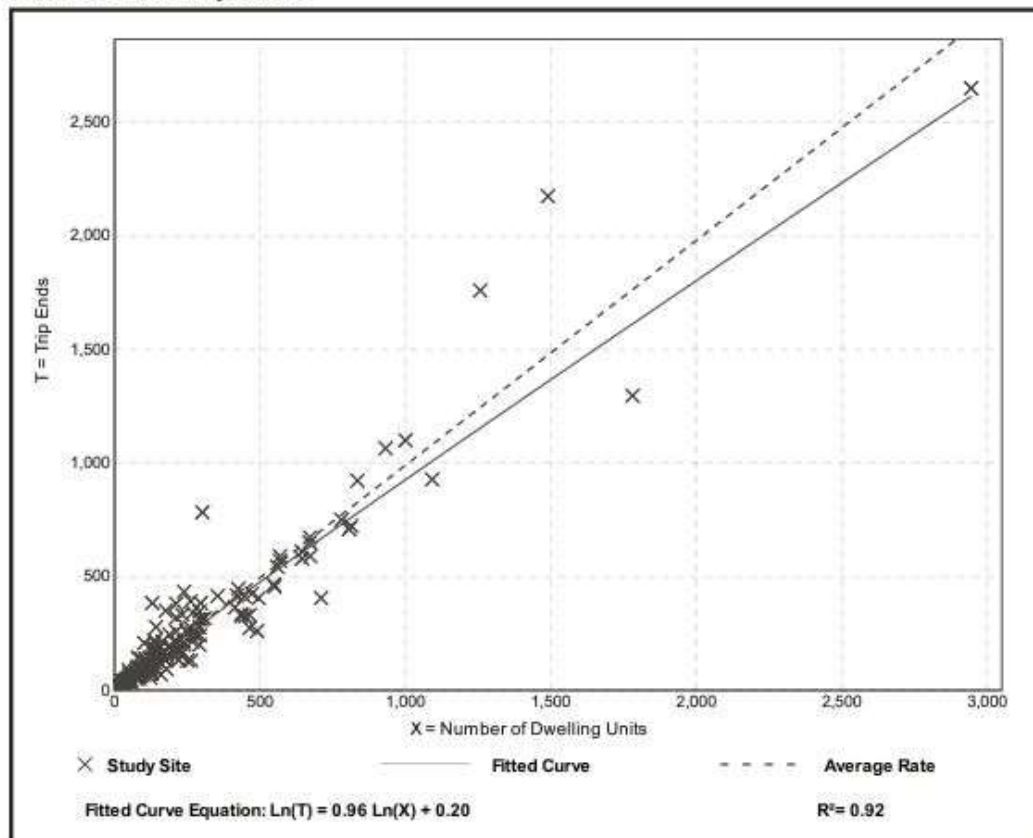
## Single-Family Detached Housing (210)

**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



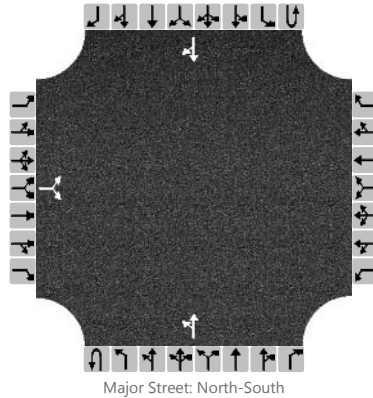
**Attachment 5**  
**Intersection Worksheets – Existing AM/PM Peaks**

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# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Addie Kirkham	Intersection	Tipton Sta at White Creek
Agency/Co.	FMA	Jurisdiction	Knox County
Date Performed	5/3/2020	East/West Street	White Creek Drive
Analysis Year	2020	North/South Street	Tipton Station Road
Time Analyzed	Existing AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	669.001 South Creek Subdivision		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0		0	1	0		0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		6		9						1	12				43	4
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						

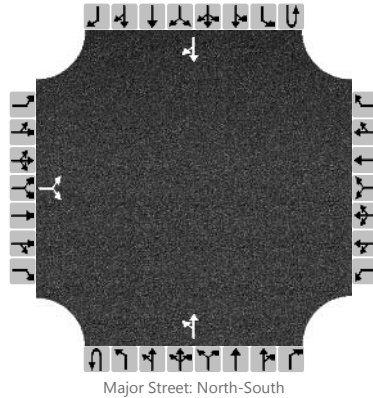
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17							1						
Capacity, c (veh/h)			985							1554						
v/c Ratio			0.02							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.1							0.0						
Control Delay (s/veh)			8.7							7.3						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	8.7								0.5							
Approach LOS	A															

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Addie Kirkham	Intersection	Tipton Sta at White Creek
Agency/Co.	FMA	Jurisdiction	Knox County
Date Performed	5/3/2020	East/West Street	White Creek Drive
Analysis Year	2020	North/South Street	Tipton Station Road
Time Analyzed	Existing PM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	669.001 South Creek Subdivision		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0		0	1	0		0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		4		5						3	19				119	12
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

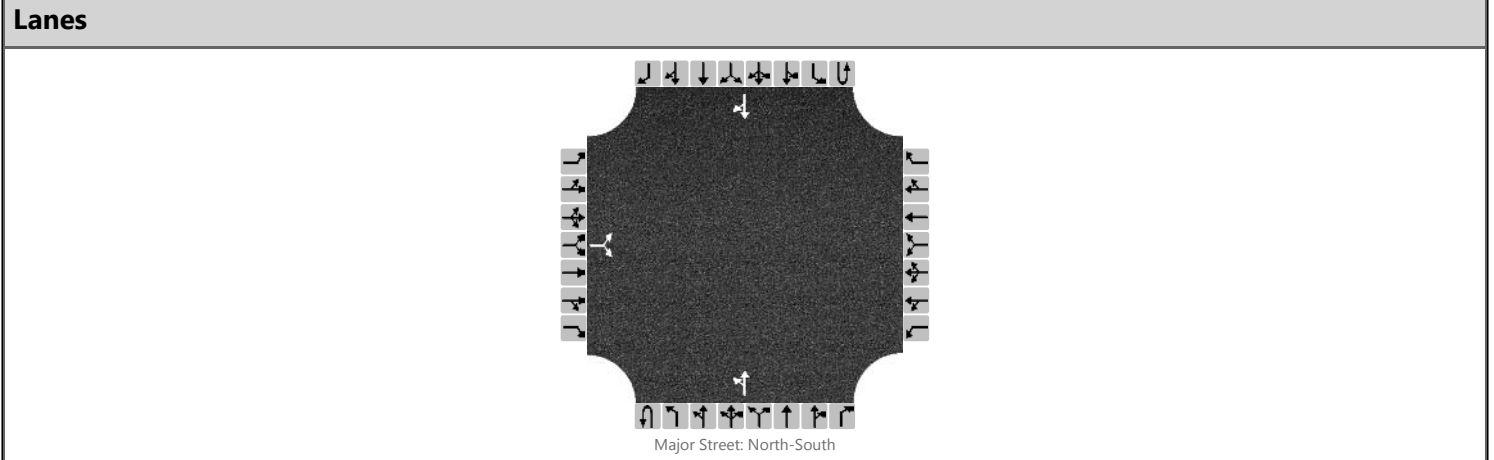
Flow Rate, v (veh/h)			9							3						
Capacity, c (veh/h)			872							1440						
v/c Ratio			0.01							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.0							0.0						
Control Delay (s/veh)			9.2							7.5						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.2								1.0							
Approach LOS	A															

**Attachment 6**  
**Intersection Worksheets – Background AM/PM Peaks**

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# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Addie Kirkham	Intersection	Tipton Sta at White Creek
Agency/Co.	FMA	Jurisdiction	Knox County
Date Performed	5/3/2020	East/West Street	White Creek Drive
Analysis Year	2023	North/South Street	Tipton Station Road
Time Analyzed	Background AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	669.001 South Creek Subdivision		



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0		0	1	0		0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		6		9						1	13				46	4
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**

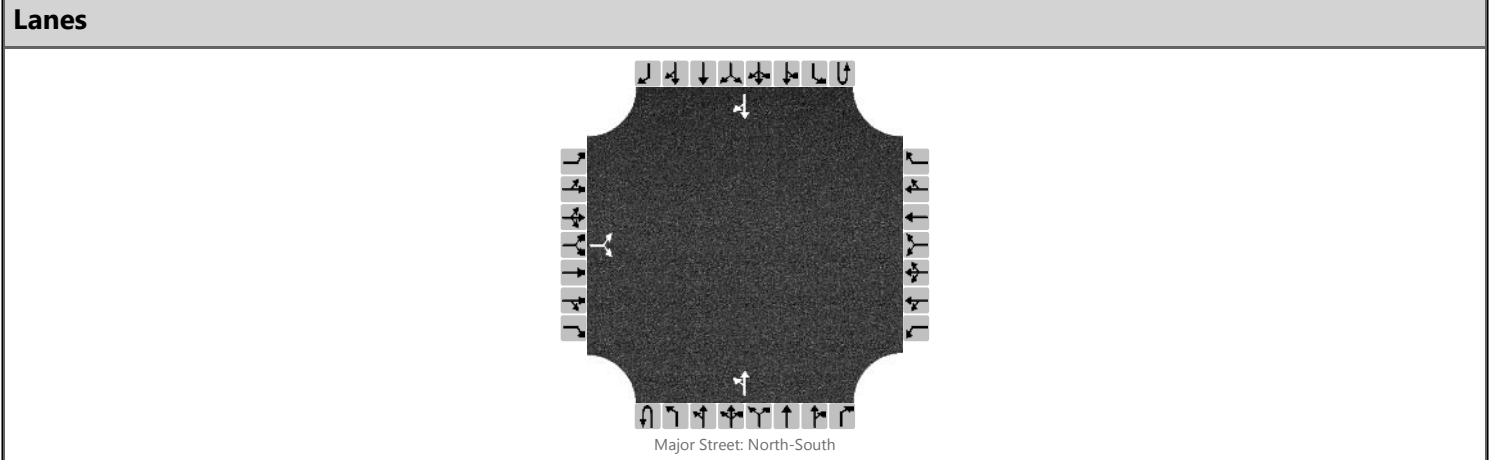
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

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

Flow Rate, v (veh/h)			17							1						
Capacity, c (veh/h)			981							1550						
v/c Ratio			0.02							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.1							0.0						
Control Delay (s/veh)			8.7							7.3						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	8.7								0.5							
Approach LOS	A															

# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Addie Kirkham	Intersection	Tipton Sta at White Creek
Agency/Co.	FMA	Jurisdiction	Knox County
Date Performed	5/3/2020	East/West Street	White Creek Drive
Analysis Year	2023	North/South Street	Tipton Station Road
Time Analyzed	Background PM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	669.001 South Creek Subdivision		



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound						
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Movement																			
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6			
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0			
Configuration			LR							LT							TR		
Volume, V (veh/h)		4		5						3	20					126	12		
Percent Heavy Vehicles (%)		2		2						2									
Proportion Time Blocked																			
Percent Grade (%)		0																	
Right Turn Channelized		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)			9							3							
Capacity, c (veh/h)			862							1430							
v/c Ratio			0.01							0.00							
95% Queue Length, Q <sub>95</sub> (veh)			0.0							0.0							
Control Delay (s/veh)			9.2							7.5							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.2								0.9							
Approach LOS		A															



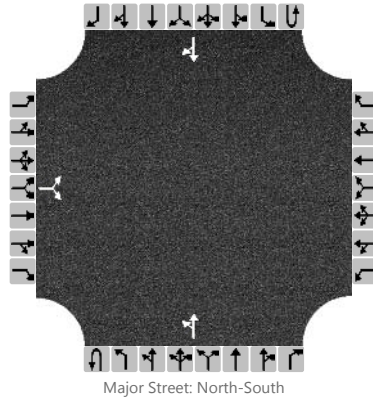
**Attachment 7**  
**Intersection Worksheets – Full Buildout AM/PM Peaks**

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# HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	Addie Kirkham	Intersection	Tipton Sta at White Creek
Agency/Co.	FMA	Jurisdiction	Knox County
Date Performed	5/3/2020	East/West Street	White Creek Drive
Analysis Year	2023	North/South Street	Tipton Station Road
Time Analyzed	Full Buildout AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	669.001 South Creek Subdivision		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0		0	1	0		0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		28		43						5	13				46	19
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

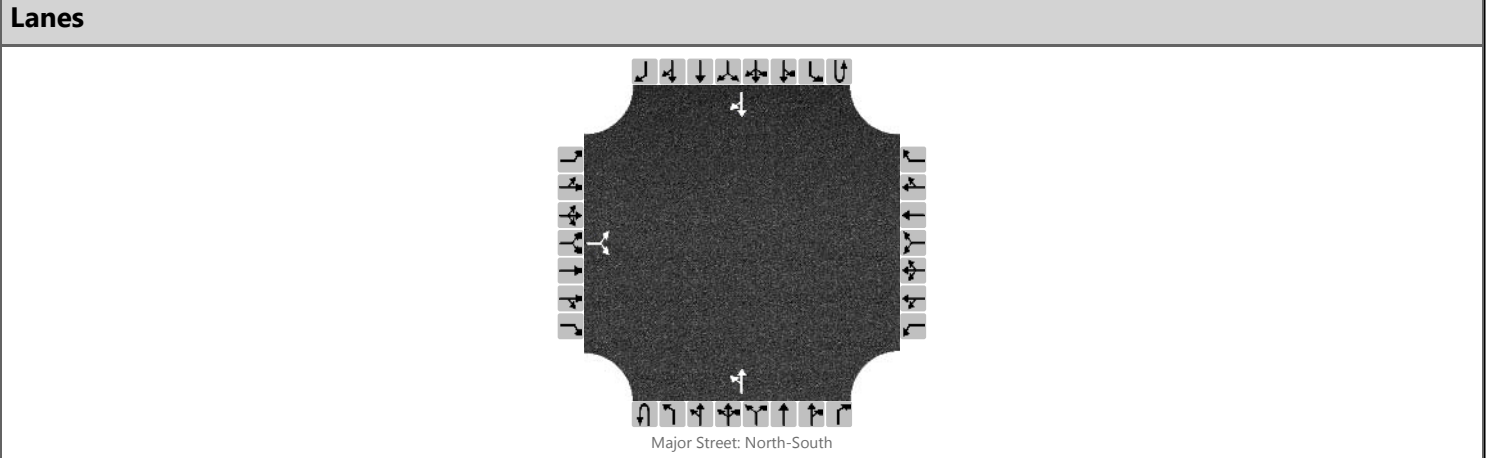
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			77							5						
Capacity, c (veh/h)			968							1528						
v/c Ratio			0.08							0.00						
95% Queue Length, Q <sub>95</sub> (veh)			0.3							0.0						
Control Delay (s/veh)			9.0							7.4						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.0								2.0							
Approach LOS	A															

# HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	Addie Kirkham			Intersection	Tipton Sta at White Creek		
Agency/Co.	FMA			Jurisdiction	Knox County		
Date Performed	5/3/2020			East/West Street	White Creek Drive		
Analysis Year	2023			North/South Street	Tipton Station Road		
Time Analyzed	Full Buildout PM Peak			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	669.001 South Creek Subdivision						



**Vehicle Volumes and Adjustments**

Approach	Eastbound				Westbound				Northbound				Southbound							
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R				
Movement																				
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6				
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0				
Configuration			LR								LT						TR			
Volume, V (veh/h)		19		27						16	20					126	63			
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)			50							17							
Capacity, c (veh/h)			817							1365							
v/c Ratio			0.06							0.01							
95% Queue Length, Q <sub>95</sub> (veh)			0.2							0.0							
Control Delay (s/veh)			9.7							7.7							
Level of Service, LOS			A							A							
Approach Delay (s/veh)		9.7								3.4							
Approach LOS		A															

# Attachment 8

## Turn Lane Warrant Analysis

**Project: South Creek Subdivision**

### Tipton Station Road at White Creek Drive

Tipton Station Road at White Creek Drive		VOLUMES				
LEFT TURN	Opposing	Thru	LT	LT MAX	Warrant Met	
AM	65	13	5	250	NO	
PM	189	20	16	200	NO	

### Tipton Station Road at White Creek Drive

Tipton Station Road at White Creek Drive		VOLUMES				
RIGHT TURN	Thru	RT	RT MAX	Warrant Met		
AM	46	19	549	NO		
PM	126	63	449	NO		

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS  
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 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	250	AM Peak 5 LT 80	140	110	80	70
150 - 199	200	PM Peak 16 LT 140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

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

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS  
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 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	○ AM Peak 19 RT	○ PM Peak 63 RT				
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	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				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		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.