

# Traffic Impact Study

## Cloverleaf

El Paso County, CO

Prepared for:

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Prepared by:



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**Mach 23, 2021**

**Sean K. Kellar, PE, PTOE**

**PCD File No. SP202**

This document, together with the concepts and recommendations presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization from Kellar Engineering LLC shall be without liability to Kellar Engineering LLC.



### **Traffic Engineer's Statement**

The attached traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.

\_\_\_\_\_  
*Sean K. Kellar, P.E. #38560*

3/23/2021  
Date

### **Developer's Statement**

I, the Developer, have read and will comply with all commitments made on my behalf within this report.

\_\_\_\_\_  
*Joseph W. Desjardin*  
*Cloverleaf, LLC*  
*1864 Woodmoor Drive, Suite 100*  
*Monument, CO 80132*

3/23/2021  
Date



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## 1.0 Introduction

The purpose of this Traffic Impact Study (TIS) is to identify project traffic generation characteristics, to identify potential traffic related impacts on the adjacent street system, and to develop mitigation measures required for identified traffic impacts. This TIS is for the proposed Cloverleaf project located at the northeast quadrant of the intersection of Higby Road and Bowstring Road in El Paso County, CO. See Figure 1: Vicinity Map.

Kellar Engineering LLC (KE) has prepared the TIS to document the results of the project's anticipated traffic conditions in accordance with the El Paso County Engineering Criteria Manual (ECM) and to identify projected impacts to the transportation system.

## 2.0 Existing Conditions and Roadway Network

The project site is located at the northeast quadrant of the intersection of Higby Road and Bowstring Road in El Paso County, CO. The existing perimeter roads (Bowstring Road and Cloverleaf Road) have already been constructed with previous development. Higby Road is an existing east-west street collector with a posted speed of 45 mph adjacent to the project site. Higby Road is classified as a collector in the 2040 Roadway Plan. Jackson Creek Parkway is an existing north-south collector with a posted speed of 40 mph near the project site. Bowstring Road is an existing north-south local street that borders the west side of the project site. Additionally, Cloverleaf Road is an existing north-south local street that borders the east side of the project site. The intersection of Higby Road/Jackson Creek Parkway is signalized with a four-section signal head facing the southbound left-turn lane and three-section signal heads facing westbound and northbound traffic. The Higby Road/Jackson Creek Parkway intersection currently has a southbound left-turn lane, a northbound right-turn lane, westbound left-turn lane, and a westbound right-turn lane. The Higby Road/Bowstring Road intersection currently has an eastbound left-turn lane, westbound right-turn lane, and a westbound acceleration lane. Additionally, the Higby Road/Cloverleaf Road intersection currently has an eastbound left-turn lane and a westbound acceleration lane.

## 2.1 Recent Traffic Volumes

Recent peak hour traffic volume counts were conducted using data collection cameras on Thursday, March 5, 2020 when Lewis-Palmer High School was still in session. The traffic counts were conducted during the peak hours of adjacent street traffic in 15-minute intervals from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. These turning movement counts are shown in Figure 3 with the count sheets provided in Appendix A. ADT volumes are referenced in the appropriate figures for Higby Road and Jackson Creek Parkway. Since ADT volumes for these roads are not provided in the Major Transportation Corridors (MTC) Plan Update, 10 times the highest peak hour was used (rounded up to be conservative). Per the Highway Capacity Manual (HCM) methodology, ADT volumes are not used for peak hour intersection level of service (LOS) analysis but are provided as a reference in this study.

Figure 1: Vicinity Map





Figure 2: Site Plan





### 3.0 Proposed Development

The Cloverleaf project consists of a total of 144 single-family homes. Access to the development is from two existing full-movement intersections to Higby Road (Higby Road/Bowstring Road and Higby Road/Cloverleaf Road). See Table 1: Trip Generation and Figure 2: Site Plan. Figure 7 also shows the peak hour site generated traffic for the project.

### 3.1 Trip Generation

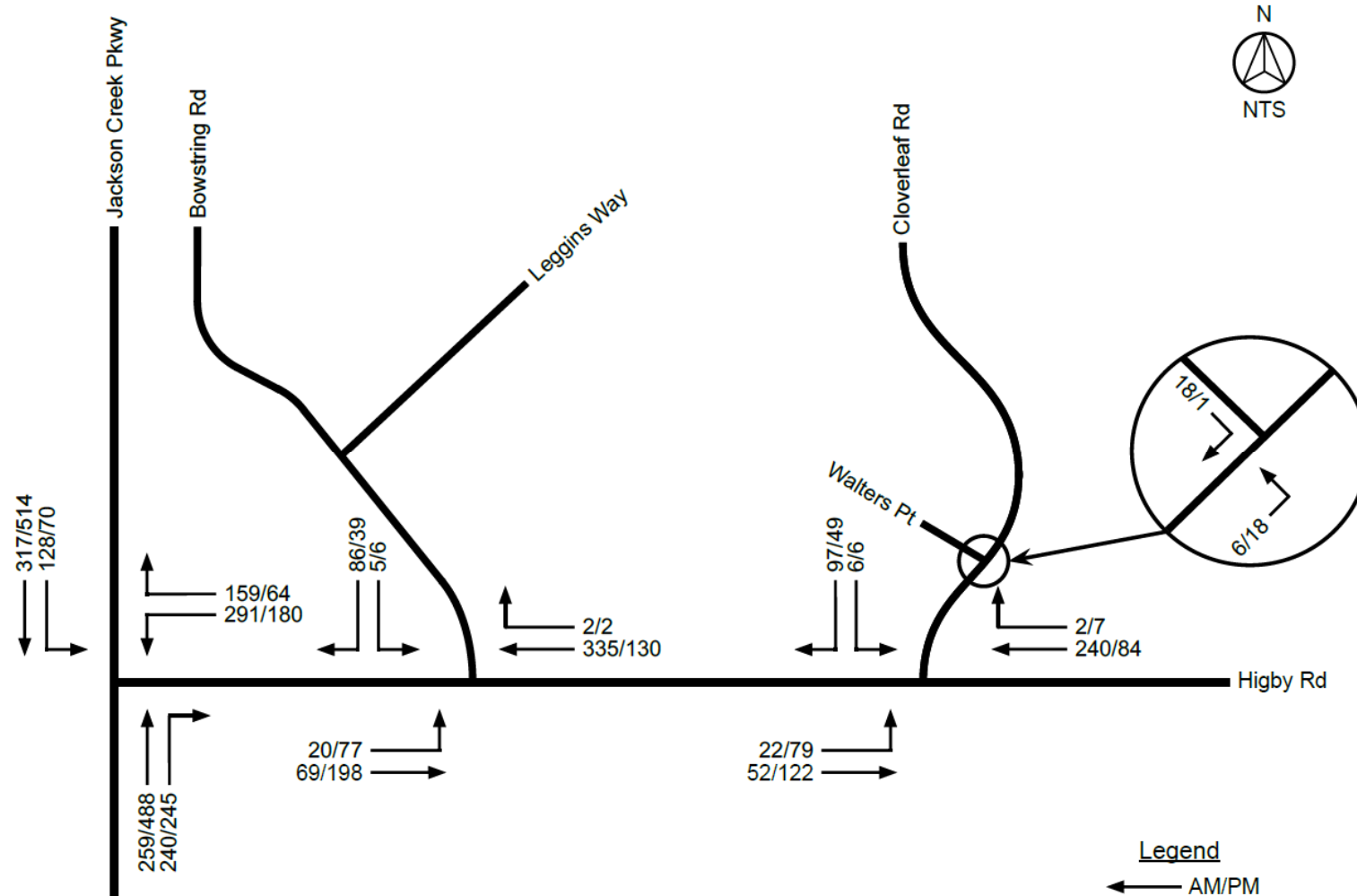
Site generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Report* published by the Institute of Transportation Engineers (ITE). ITE has established trip generation rates in nationwide studies of similar land uses. For this study, KE used the ITE 10<sup>th</sup> Edition Trip Generation Report average trip rates for the traffic associated with this proposed development. Per the ITE, full project build-out of the Cloverleaf project is anticipated to generate approximately: 1,359 daily weekday trips, 107 AM total peak hour trips, and 143 PM total peak hour trips. Table 1 summarizes the ITE Trip Generation for the proposed development.

**Table 1: Trip Generation**

ITE Code	Land Use	Size	Average Daily Trips		AM Peak Hour Trips						PM Peak Hour Trips					
			Rate	Total	Rate	% In	In	% Out	Out	Total	Rate	% In	In	% Out	Out	Total
210	Single Family	144 DU	9.44	1,359	0.74	25%	27	75%	80	107	0.99	63%	90	37%	53	143
<b>Total</b>				<b>1,359</b>			<b>27</b>		<b>80</b>	<b>107</b>			<b>90</b>		<b>53</b>	<b>143</b>

DU = Dwelling Units

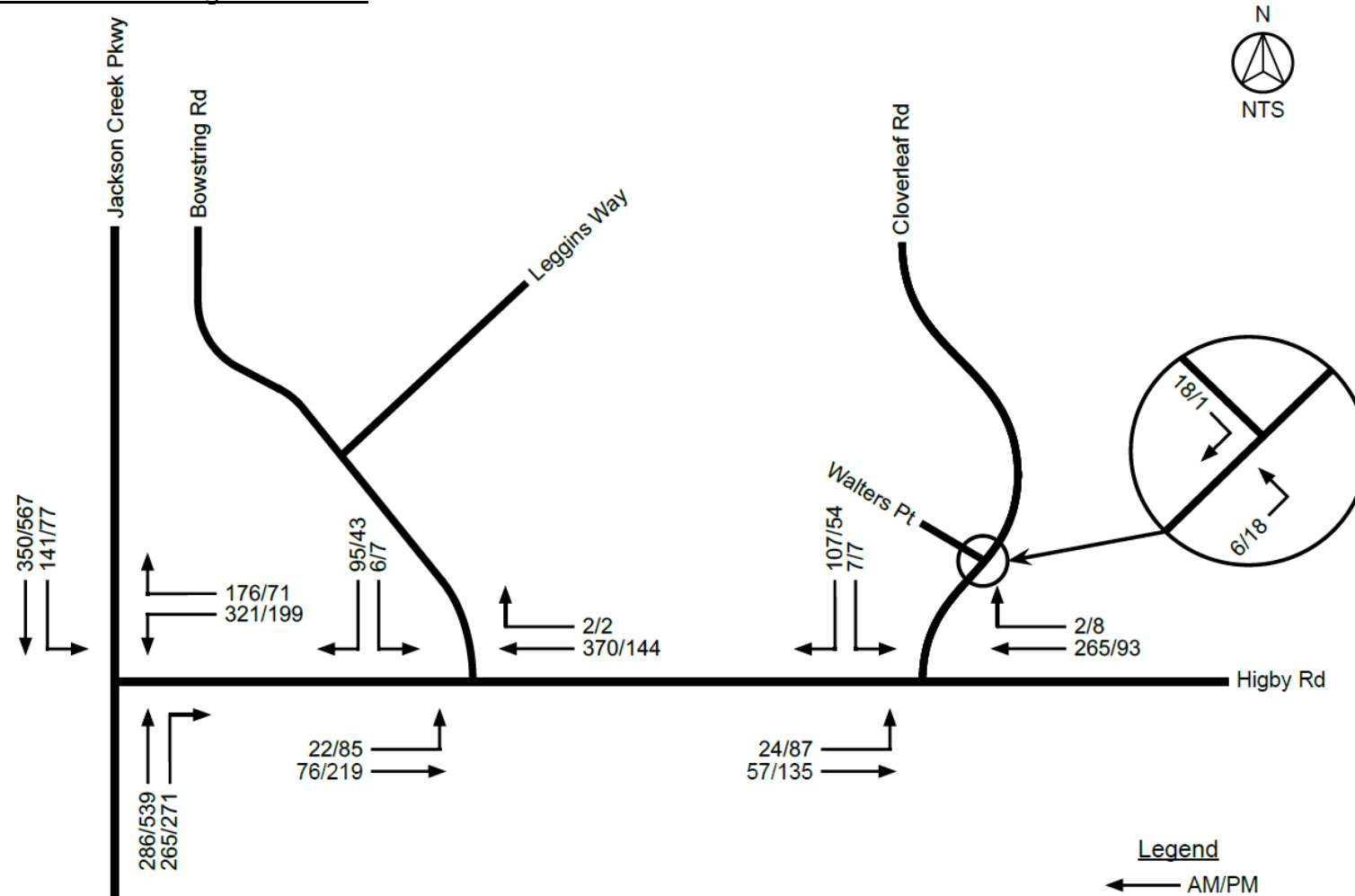
Figure 3: Recent Peak Hour Traffic



Higby Rd. ~ 8,200 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Jackson Creek Pkwy. ~ 15,700 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Bowstring Rd. ~ 1,000 ADT  
 Cloverleaf Way ~ 800 ADT  
 Leggins Way ~ 150 ADT  
 Walters Point ~ 437 ADT

\*See Section 4.1 for more information

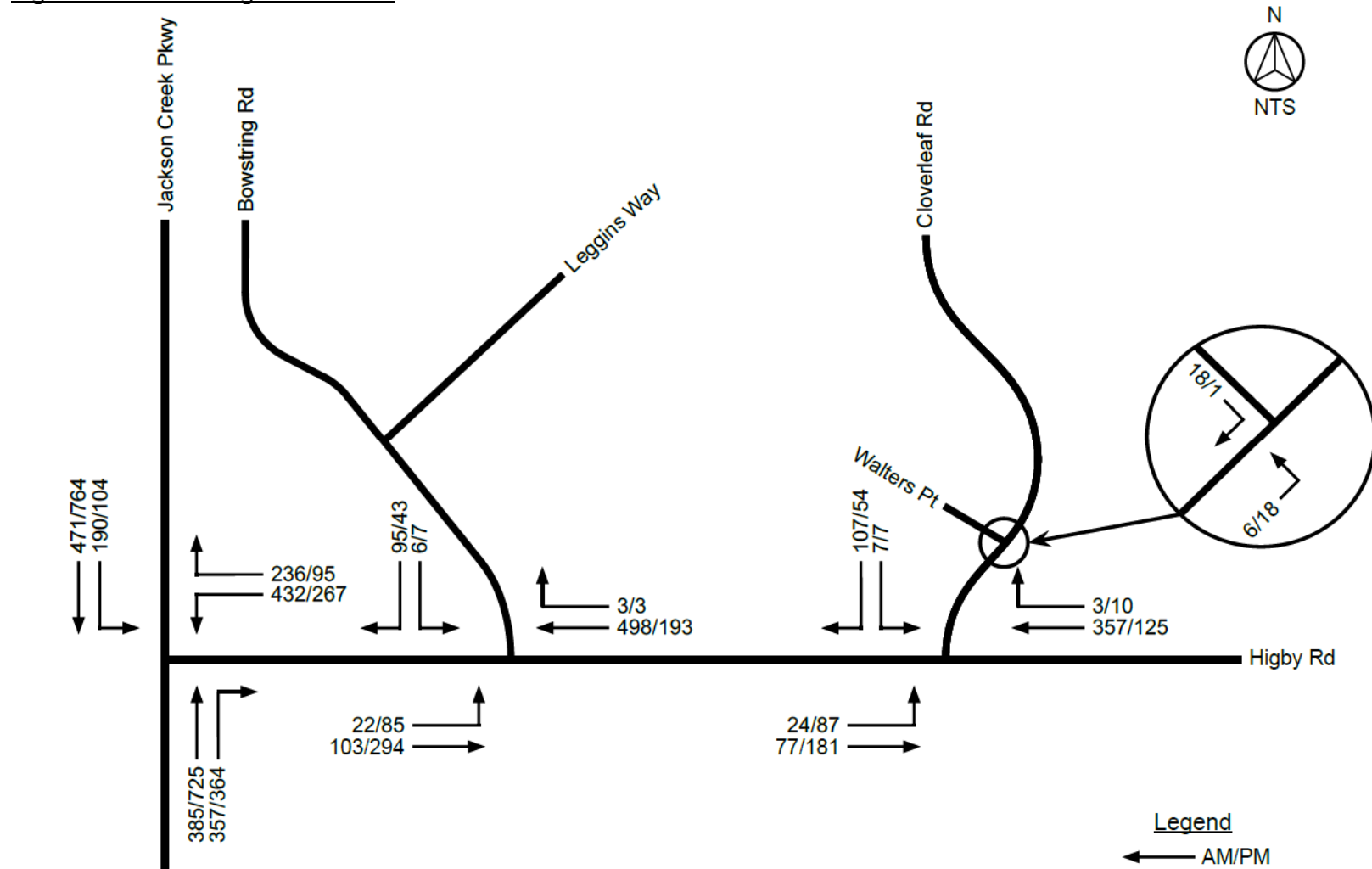
Figure 4: 2025 Background Traffic



Higby Rd. ~ 8,200 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Jackson Creek Pkwy. ~ 15,700 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Bowstring Rd. ~ 1,000 ADT  
 Cloverleaf Way ~ 800 ADT  
 Leggins Way ~ 150 ADT  
 Walters Point ~ 437 ADT

\*See Section 4.1 for more information

Figure 5: 2040 Background Traffic



Higby Rd. ~ 8,200 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Jackson Creek Pkwy. ~ 15,700 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Bowstring Rd. ~ 1,000 ADT  
 Cloverleaf Way ~ 800 ADT  
 Leggins Way ~ 150 ADT  
 Walters Point ~ 437 ADT

\*See Section 4.1 for more information

Figure 6: Trip Distribution

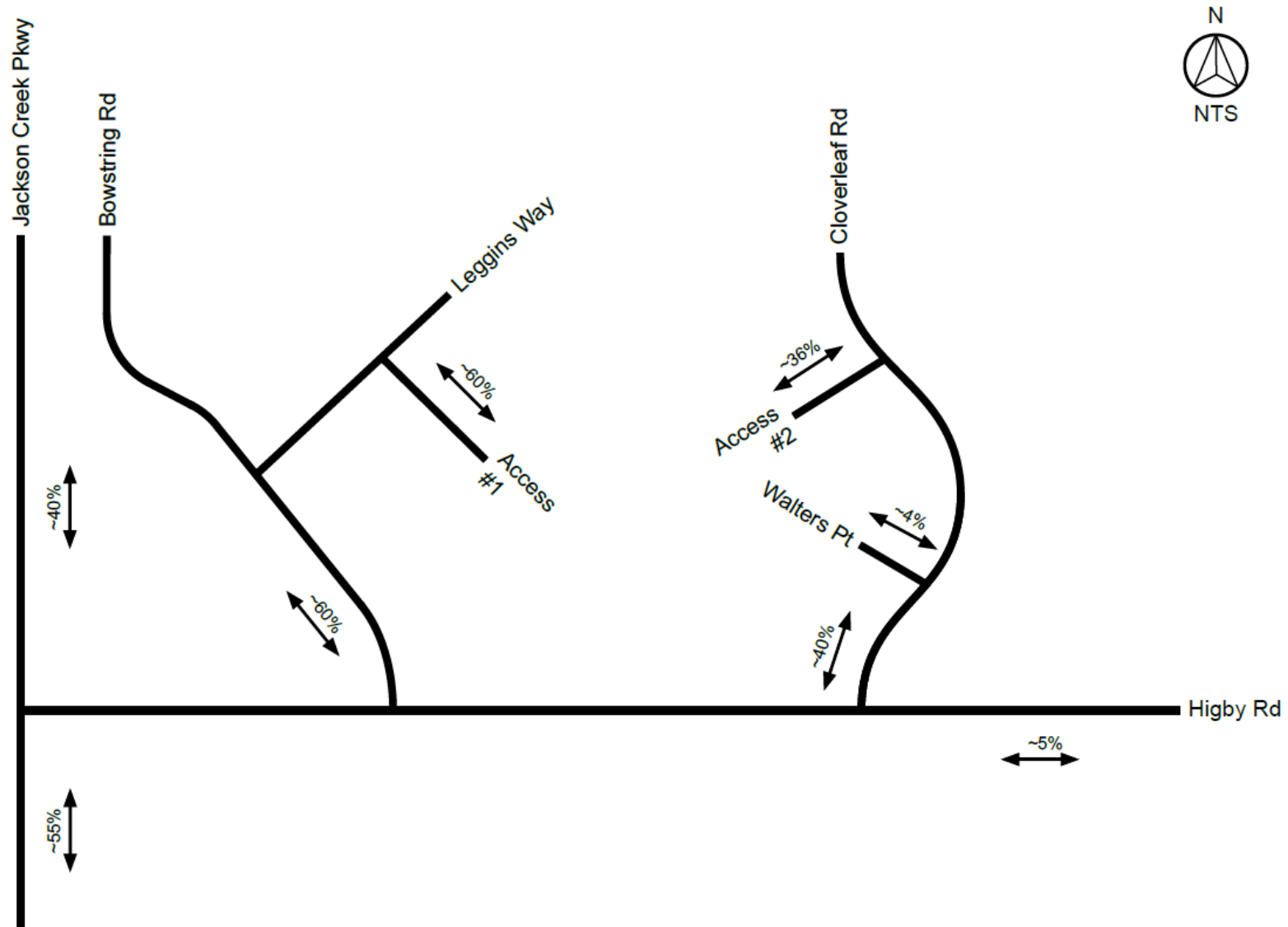




Figure 7: Site Generated Peak Hour Traffic

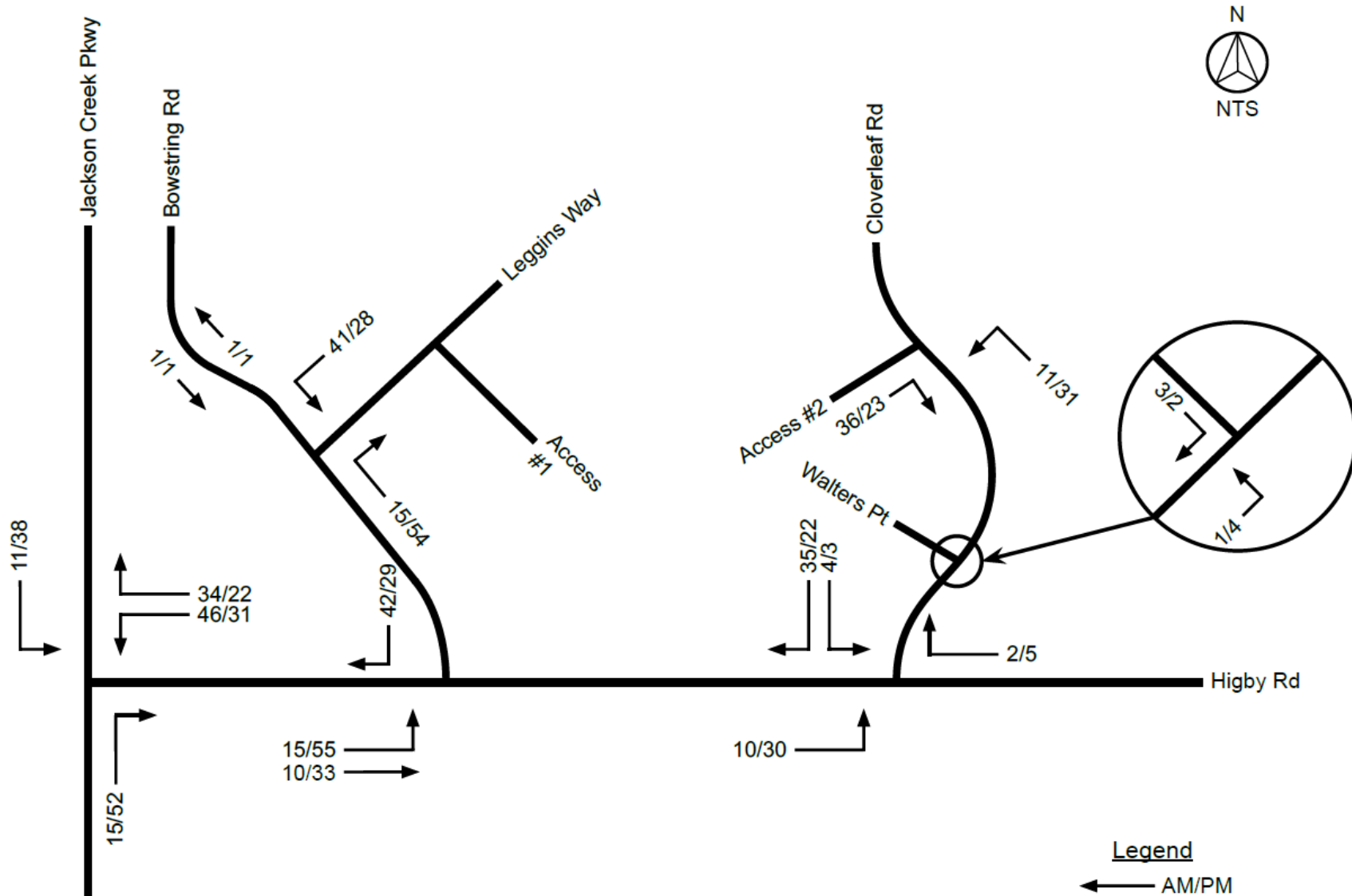
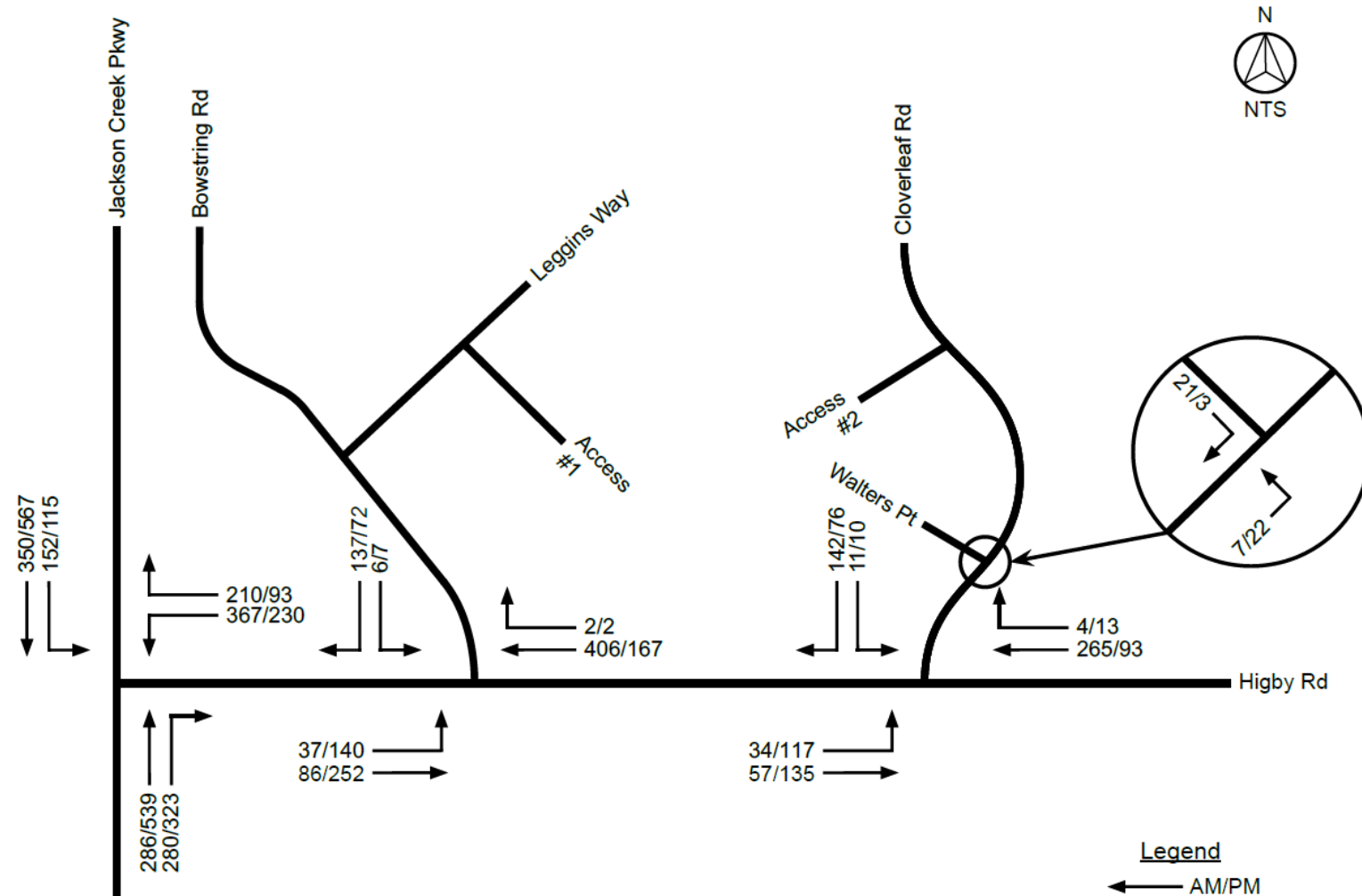


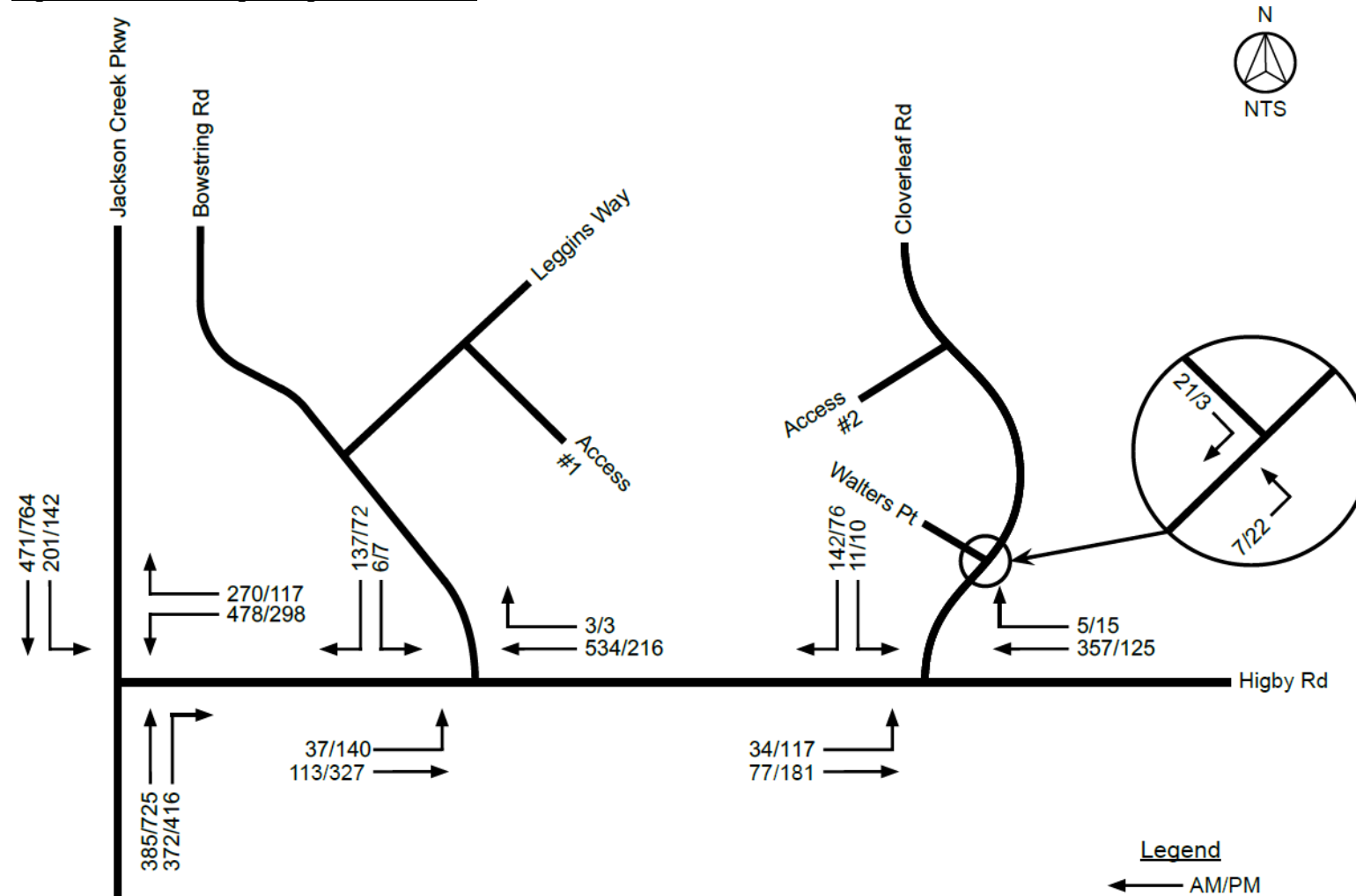
Figure 8: 2025 Short Range Total Traffic



Higby Rd. ~ 8,200 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Jackson Creek Pkwy. ~ 15,700 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Bowstring Rd. ~ 1,000 ADT  
 Cloverleaf Way ~ 800 ADT  
 Leggins Way ~ 150 ADT  
 Walters Point ~ 437 ADT

\*See Section 4.1 for more information

Figure 9: 2040 Long Range Total Traffic



Higby Rd. ~ 8,200 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Jackson Creek Pkwy. ~ 15,700 ADT (10 times the highest peak hour used, rounded up to be conservative)  
 Bowstring Rd. ~ 1,000 ADT  
 Cloverleaf Way ~ 800 ADT  
 Leggins Way ~ 150 ADT  
 Walters Point ~ 437 ADT

\*See Section 4.1 for more information

### 3.2 Trip Distribution

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns and volumes, anticipated surrounding development areas, and the proposed access system for the project. The directional distribution of traffic is a means to quantify the percentage of site generated traffic that approaches the site from a given direction and departs the site back to the original source. The trip distributions were obtained from looking at the traffic patterns associated with the traffic counts and the origins/destinations. This study reviews the typical weekday peak hour traffic associated with the weekday AM and PM peak hours. Figure 6 illustrates the trip distribution used for the project's analysis.

### 3.3 Traffic Assignment

Traffic assignment was obtained by applying the trip distributions to the estimated trip generation of the development. Figures 7 shows the site generated traffic assignment for the project.

### 3.4 Short Range Total Peak Hour Traffic

Site generated peak hour traffic volumes were added to the background traffic volumes to represent the estimated traffic conditions for the short range 2025 horizon. These background (2025) and short range (2025) total traffic volumes are shown in Figures 4 and 8. The short range analysis year 2025 includes the proposed development for this project plus an increase in background traffic. Background traffic growth rate (2%) obtained from the CDOT Online Transportation Information Systems (OTIS).

### 3.5 Long Range Total Peak Hour Traffic

Site generated peak hour traffic volumes were added to the background traffic volumes to represent the estimated traffic conditions for the long range 2040 horizon. These background (2040) and long range (2040) total traffic volumes are shown in Figures 5 and 9. The long range analysis year 2040 includes the proposed development for the project plus an increase in background traffic. Background traffic growth rate (2%) obtained from the most recent available

information in the CDOT Online Transportation Information Systems (OTIS).

#### 4.0 Traffic Operation Analysis

KE's analysis of traffic operations in the site vicinity was conducted to determine the capacity at the identified intersections. The acknowledged source for determining overall capacity is the 2010 Edition of the Highway Capacity Manual (HCM).

#### 4.1 Capacity Analysis

Capacity analysis results are listed in terms of level of service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. LOS ranges from an A (very little delay) to an F (long delays). A description of the level of service (LOS) for signalized and unsignalized intersections from the Highway Capacity Manual (HCM) are provided in Appendix B.

Below are the roadway classifications for the streets adjacent to and within the Cloverleaf project. The below roadways have levels of service (LOS) capacity to adequately accommodate the projected traffic volumes. While Average Daily Traffic (ADT) volumes are a useful tool in estimating roadway capacity, it is not a detailed level of service analysis tool. As such, the Highway Capacity Manual (HCM) recommends peak hour LOS service analysis for determining roadway capacity. Therefore, the detailed LOS service analysis per the Highway Capacity Manual (HCM) are provided in Appendix F.

- a) Higby Road – Rural Major Collector; ~10,100 ADT (2025 Short Range Total), ~13,700 ADT (2040 Long Range Total). ECM Table 2-5 shows design ADT of 3,000 for rural major collectors. Mitigation is not recommended since detailed analysis shows acceptable levels of service and the roadway meets the intent of the criteria. See Appendix F.
- b) Bowstring Road – Rural Local; ~ 1,000 ADT (2025 Short Range Total and 2040 Long Range Total traffic scenarios). ECM Table 2-5 shows design ADT of 750 for rural local. Mitigation is not recommended since detailed analysis shows acceptable levels of service and the roadway meets the intent of the criteria. See Appendix F.

- c) Cloverleaf Way – Rural Local; ~800 ADT (2025 Short Range Total and 2040 Long Range Total traffic scenarios). ECM Table 2-5 shows design ADT of 750 for rural local. Mitigation is not recommended since detailed analysis shows acceptable levels of service and the roadway meets the intent of the criteria. See Appendix F.
- d) Leggins Way – Rural Local; ~150 ADT (2025 Short Range Total and 2040 Long Range Total traffic scenarios). ECM Table 2-5 shows design ADT of 750 for rural local. The roadway meets the intent of the criteria.
- e) Walters Point – Existing Rural Local private road. Proposed Urban (Low Volume) Local private road with approximately 437 ADT (2025 Short Range Total and 2040 Long Range Total traffic scenarios). The ITE Trip Generation Manual (10th Edition) was used to calculate the existing ADT on Walters Point. The average trip rates for the land use on Walters Point was used to approximate the traffic on Walters Point. The Cloverleaf project is adding approximately 57 ADT to Walters Point. The existing ADT on Walters Point is approximately 380 ADT. Therefore, the total ADT on the portion of Walters Point that the Cloverleaf project is connecting into is approximately 437 ADT. Based upon the findings in this TIS and characteristics of Walters Point, the urban (low volume) local road classification is acceptable and the proposed design meets the intent of the criteria.

#### 4.2 Intersection Operational Analysis

Operational analysis was performed for the short range 2025 horizon and the long range 2040 horizon. The calculations for this analysis are provided in Appendix F. Using the short range and long range total traffic volumes, the project's study intersections are projected to operate acceptably. See Table 5 and Table 6 for the 2025 Short Range Total and 2040 Long Range Total Peak Hour Operation.



### 4.3 Auxiliary Lane Analysis

The auxiliary lane analysis for the study intersections were initially conducted using the criteria in the El Paso County Engineering Criteria Manual (ECM). Based upon this criteria, a left-turn deceleration lane is required in minor arterial roadways at intersections with a projected peak hour ingress turning volume greater than 25 vph. Additionally, right-turn deceleration lanes are required in minor arterial roadways at intersections with a projected peak hour ingress turning volume greater than 50 vph. Additionally, Figure 7: Site Generated Traffic shows 31 PM peak hour northbound entering left-turns at the Cloverleaf Road/Access #2 intersection and 41 AM/28 PM westbound exiting left-turns at the Leggins Way/Bowstring Road intersection. The Leggins Way/Bowstring road intersection is a T-intersection with no opposing traffic volume. Additionally, the opposing traffic volume at the Cloverleaf Road/Access #2 intersection is low (less than 100 vph). The CDOT State Highway Access Code (SHAC) Section 3.5 and NCHRP 279 Figure 4-12 both contain guidance that further defines when dedicated left-turn deceleration lanes are not required when the opposing traffic volume is low. Based upon the criteria contained within the CDOT SHAC Section 3.5 and NCHRP 279 Figure 4-12, a dedicated northbound left-turn deceleration lane at the Cloverleaf Road/Access #2 intersection is not warranted. Additionally, based upon the criteria contained within the CDOT SHAC Section 3.5 and NCHRP 279 Figure 4-12 (see Appendix E), a dedicated westbound left-turn deceleration lane at the Leggins Way/Bowstring Road intersection is not warranted. Therefore, in light of the above information, additional auxiliary lanes are not required and the existing auxiliary lanes at the study intersections are sufficient to accommodate the project's traffic.

### 4.4 Transportation Impact Fees

The developer is aware of the Transportation Impact Fees and will decide upon the option for the method of payment at a later date.

### 4.5 Sight Distance

The sight distance for the project's study intersections were reviewed. The sight distance at the study intersections were found to be acceptable. The Higby Road/Bowstring Road and Hibgy Road/Cloverleaf Road intersections are existing intersections. Per Table 2-21 of the El Paso County Engineering Criteria (ECM), the intersection sight distance for a design speed of 50 mph is 555 feet. Higby Road has a posted speed of 45 mph at the Higby Road/Bowstring Road

intersection and at the Higby Road/Cloverleaf Road intersection. Both of these intersections are existing stop controlled intersections. The intersection sight distance was reviewed and the study intersections comply with the sight distance criteria in Table 2-21 of the El Paso County Engineering Criteria Manual (ECM). See Appendix E.

#### 4.6 Pedestrian Routes to Schools

Pedestrian routes to schools within two miles of the project site were reviewed. Lewis Palmer High School is approximately 0.2 miles (4-minute walk) from the project site. Lewis Palmer Middle School is approximately 2.3 miles (44-minute walk) from the project site. Additionally, Bear Creek Elementary School is approximately 2 miles (40-minute walk) from the project site. The project site is located north of Higby Road, east of Bowstring Road, and west of Cloverleaf Road. The existing perimeter roads (Bowstring Road and Cloverleaf Road) have already been constructed with previous development. The project site is surrounded by existing residential development that already uses these schools. The intersection of Jackson Creek Parkway/Higby Road is signalized. Lewis Palmer Middle School and Bear Creek Elementary School are over two miles walking distance from the project site which is approximately a 40-minute walk. It is anticipated that most students, as well as students from the existing residences adjacent to the project site, are not walking to Lewis Palmer Middle School and Bear Creek Elementary School based upon the walking distance being greater than two miles. However, a pedestrian routing exhibit for these schools has been provided in Appendix C. Additionally, Lewis Palmer High School is approximately 0.2 miles (4-minute walk) from the project site. The recommended route for students to walk from the project site to Lewis Palmer High School is via Leggins Way to the school entrance on Bowstring Road. See Appendix C. As the project site is a proposed residential development surrounded by existing residential development, the existing roadway improvements are acceptable for providing adequate pedestrian routing to these existing schools. Also, a 6' breeze trail adjacent to the south edge of Leggins Way, from White Clover Drive to Bowstring Road is proposed. Additionally, crosswalk striping and two W11-2 pedestrian crossing signs are also proposed on Bowstring. See civil drawings and Appendix C.

#### 4.7 ECM Deviations

- None – No ECM Deviation requests for this project

**Table 2: Recent Peak Hour Operation**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Jackson Creek Pkwy.	WB Left	C	C
	WB Right	A	A
	WB Approach	B	C
	NB Thru	B	B
	NB Right	A	A
	NB Approach	A	B
	SB Left	A	A
	SB Thru	A	A
	SB Approach	A	A
	Overall	B	B

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Bowstring Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru	A	A
	WB Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

**Table 2: Recent Peak Hour Operation (Continued...)**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Cloverleaf Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru/Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

**Table 3: 2025 Background Peak Hour Operation**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Jackson Creek Pkwy.	WB Left	C	C
	WB Right	A	A
	WB Approach	B	C
	NB Thru	B	B
	NB Right	A	A
	NB Approach	B	B
	SB Left	A	A
	SB Thru	A	A
	SB Approach	A	A
	Overall	B	B

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Bowstring Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru	A	A
	WB Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	B



**Table 3: 2025 Background Peak Hour Operation (Continued...)**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Cloverleaf Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru/Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

**Table 4: 2040 Background Peak Hour Operation**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Jackson Creek Pkwy.	WB Left	C	D
	WB Right	A	A
	WB Approach	C	C
	NB Thru	C	C
	NB Right	A	A
	NB Approach	B	B
	SB Left	B	A
	SB Thru	B	B
	SB Approach	B	B
	Overall	B	B

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Bowstring Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru	A	A
	WB Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	B

**Table 4: 2040 Background Peak Hour Operation (Continued...)**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Cloverleaf Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru/Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

**Table 5: 2025 Short Range Total Peak Hour Operation**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Jackson Creek Pkwy.	WB Left	C	C
	WB Right	A	A
	WB Approach	C	C
	NB Thru	B	B
	NB Right	A	A
	NB Approach	B	B
	SB Left	A	A
	SB Thru	A	A
	SB Approach	A	A
	Overall	B	A

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Bowstring Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru	A	A
	WB Right	A	A
	WB Approach	A	A
	SB Left	B	C
	SB Right	B	A
	SB Approach	B	B

**Table 5: 2025 Short Range Total Peak Hour Operation (Continued...)**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Cloverleaf Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru/Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

**Table 6: 2040 Long Range Total Peak Hour Operation**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Jackson Creek Pkwy.	WB Left	C	D
	WB Right	A	A
	WB Approach	C	C
	NB Thru	C	C
	NB Right	A	A
	NB Approach	B	B
	SB Left	B	B
	SB Thru	B	B
	SB Approach	B	B
	Overall	B	B

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Bowstring Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru	A	A
	WB Right	A	A
	WB Approach	A	A
	SB Left	C	C
	SB Right	B	A
	SB Approach	B	B



**Table 6: 2040 Long Range Peak Hour Operation (Continued...)**

Intersection	Movement	Level of Service (LOS)	
		AM	PM
		LOS	LOS
Higby Rd./Cloverleaf Rd.	EB Left	A	A
	EB Thru	A	A
	EB Approach	A	A
	WB Thru/Right	A	A
	WB Approach	A	A
	SB Left	B	B
	SB Right	B	A
	SB Approach	B	A

## 5.0 Findings:

Based upon the analysis presented in this Traffic Impact Study (TIS), the Cloverleaf project will be able to successfully meet El Paso County's requirements. All study intersections are projected to operate acceptably upon full development of the Cloverleaf project.

- Total build-out (144 single family dwelling units) of the Cloverleaf project is anticipated to generate approximately 1,359 daily weekday trips, 107 AM total peak hour trips, and 143 PM total peak hour trips.
- The study intersections will operate acceptably with the development of the Cloverleaf project and background traffic in the 2025 Short Range and 2040 Long Range future.
- The existing perimeter roads (Bowstring Road and Cloverleaf Road) have already been constructed with previous development.
- The existing auxiliary lanes at the study intersections are sufficient to accommodate the Cloverleaf project's traffic. See Section 2.0.
- Traffic signal warrants are not anticipated to be warranted at the unsignalized study intersections with the full development of the Cloverleaf project and background traffic in the 2025 Short Range future and the 2040 Long Range future.
- The Cloverleaf project's access, layout, proposed land use, and size is appropriate from a traffic engineering perspective.
- The following are the year 2040 roadway classifications for the streets adjacent to and within the Cloverleaf project. The below roadways have levels of service (LOS) capacity to adequately accommodate the projected traffic volumes. See Appendix F.
  - f) Higby Road – Rural Major Collector
  - g) Bowstring Road – Rural Local
  - h) Cloverleaf Way – Rural Local
  - i) Leggins Way – Rural Local
  - j) Walters Point – Existing Rural Local private road. Proposed Urban (Low Volume) Local private road
  - k) Access #1 (Western Access) – Urban Local
  - l) Access #2 (Eastern Access) – Urban Local
- Table 4: 2040 Roadway Improvements Projects in the MTCP does not call for the



construction of improvements adjacent to the project site; along Higby Road or Jackson Creek Parkway.

- The proposed project is consistent with the El Paso County 2016 Major Transportation Corridors Plan Update and the 2040 Roadway Plan.

## APPENDICES:

## Appendix A: Traffic Counts



(303) 216-2439  
www.alltrafficdata.net

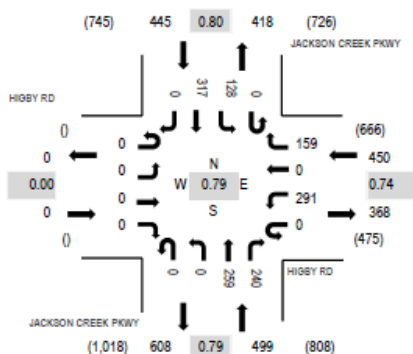
Location: 1 JACKSON CREEK PKWY & HIGBY RD AM

Date: Thursday, March 5, 2020

Peak Hour: 07:00 AM - 08:00 AM

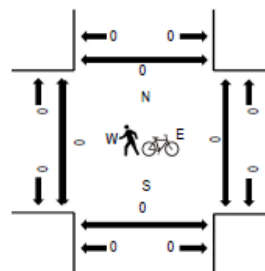
Peak 15-Minutes: 07:15 AM - 07:30 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				JACKSON CREEK PKWY Northbound				JACKSON CREEK PKWY Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	0	0	0	0	62	0	34	0	0	60	55	0	32	41	0	284	1,394	0	0	0	0
7:15 AM	0	0	0	0	0	99	0	54	0	0	67	91	0	54	78	0	443	1,297	0	0	0	0
7:30 AM	0	0	0	0	0	90	0	38	0	0	67	78	0	32	107	0	412	1,055	0	0	0	0
7:45 AM	0	0	0	0	0	40	0	33	0	0	65	16	0	10	91	0	255	851	0	0	0	0
8:00 AM	0	0	0	0	0	38	0	12	0	0	43	20	0	4	70	0	187	825	0	0	0	0
8:15 AM	0	0	0	0	0	29	0	26	0	0	66	15	0	9	56	0	201		0	0	0	0
8:30 AM	0	0	0	0	0	34	0	19	0	0	55	17	0	6	77	0	208		0	0	0	0
8:45 AM	0	0	0	0	0	40	0	18	0	0	69	24	0	12	66	0	229		0	0	0	0
Count Total	0	0	0	0	0	432	0	234	0	0	492	316	0	159	586	0	2,219		0	0	0	0
Peak Hour	0	0	0	0	0	291	0	159	0	0	259	240	0	128	317	0	1,394		0	0	0	0



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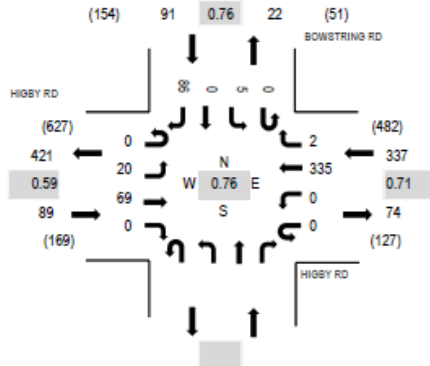
Location: 2 BOWSTRING RD & HIGBY RD AM

Date: Thursday, March 5, 2020

Peak Hour: 07:00 AM - 08:00 AM

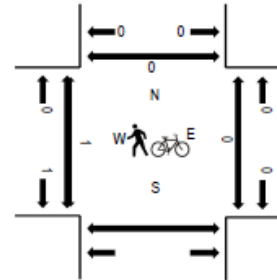
Peak 15-Minutes: 07:15 AM - 07:30 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				Northbound				BOWSTRING RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	4	9	0	0	0	66	1					0	1	0	23	104	517	0	0	0	0
7:15 AM	0	5	16	0	0	0	118	1					0	2	0	28	170	480	0	0	0	0
7:30 AM	0	6	34	0	0	0	103	0					0	1	0	21	165	378	0	0	0	0
7:45 AM	0	5	10	0	0	0	48	0					0	1	0	14	78	285	1	0	0	0
8:00 AM	1	6	12	0	0	0	29	0					0	0	0	19	67	288	0	0	0	0
8:15 AM	0	9	10	0	0	0	32	0					0	0	0	17	68		0	0	0	0
8:30 AM	0	4	12	0	0	0	41	1					0	1	0	13	72		0	0	0	0
8:45 AM	0	8	18	0	0	0	41	1					0	0	0	13	81		0	0	0	0
Count Total	1	47	121	0	0	0	478	4					0	6	0	148	805		1	0	0	0
Peak Hour	0	20	69	0	0	0	335	2					0	5	0	86	517		1	0	0	0



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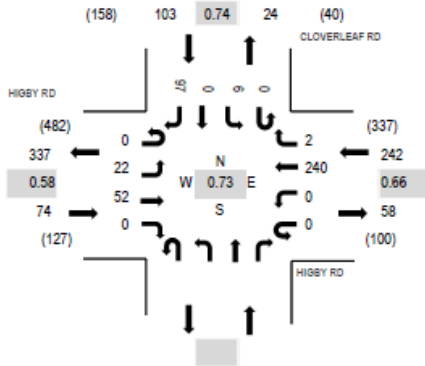
Location: 3 CLOVERLEAF RD & HIGBY RD AM

Date: Thursday, March 5, 2020

Peak Hour: 07:00 AM - 08:00 AM

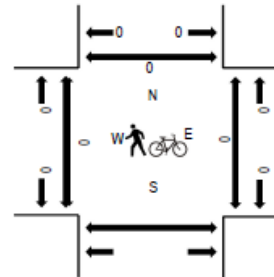
Peak 15-Minutes: 07:15 AM - 07:30 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				Northbound				CLOVERLEAF RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	3	7	0	0	0	0	47	0				0	0	0	20	77	419	0	0	0	0
7:15 AM	0	6	11	0	0	0	0	90	2				0	2	0	33	144	383	0	0	0	0
7:30 AM	0	8	25	0	0	0	0	67	0				0	2	0	30	132	282	0	0	0	0
7:45 AM	0	5	9	0	0	0	0	36	0				0	2	0	14	66	207	0	0	0	0
8:00 AM	0	4	8	0	0	0	0	12	1				0	1	0	15	41	203	0	0	0	0
8:15 AM	0	2	8	0	0	0	0	20	0				0	0	0	13	43		0	0	0	0
8:30 AM	0	3	10	0	0	0	0	31	0				0	2	0	11	57		0	0	0	0
8:45 AM	0	5	13	0	0	0	0	30	1				0	0	0	13	62		0	0	0	0
Count Total	0	36	91	0	0	0	0	333	4				0	9	0	149	622		0	0	0	0
Peak Hour	0	22	52	0	0	0	0	240	2				0	6	0	97	419		0	0	0	0



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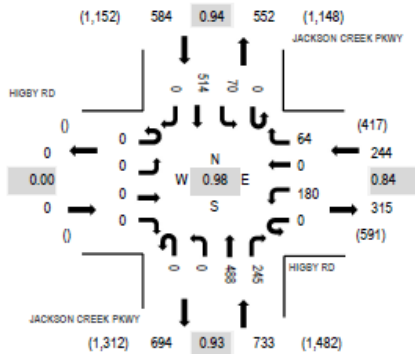
Location: 1 JACKSON CREEK PKWY & HIGBY RD PM

Date: Thursday, March 5, 2020

Peak Hour: 04:45 PM - 05:45 PM

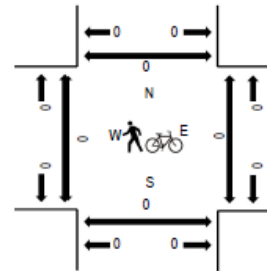
Peak 15-Minutes: 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				JACKSON CREEK PKWY Northbound				JACKSON CREEK PKWY Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	0	0	0	31	0	11	0	0	157	56	0	17	123	0	395	1,534	0	0	0	0
4:15 PM	0	0	0	0	0	27	0	16	0	0	133	59	0	12	129	0	376	1,524	0	0	0	0
4:30 PM	0	0	0	0	0	25	0	10	0	0	125	55	0	21	128	0	364	1,543	0	1	0	0
4:45 PM	0	0	0	0	0	41	0	11	0	0	118	91	0	9	129	0	399	1,561	0	0	0	0
5:00 PM	0	0	0	0	0	24	0	22	0	0	135	55	0	22	127	0	385	1,517	0	0	0	0
5:15 PM	0	0	0	0	0	55	0	18	0	0	119	61	0	20	122	0	395		0	0	0	0
5:30 PM	0	0	0	0	0	60	0	13	0	0	116	38	0	19	136	0	382		0	0	0	0
5:45 PM	0	0	0	0	0	37	0	16	0	0	128	36	0	20	118	0	355		0	0	0	0
Count Total	0	0	0	0	0	300	0	117	0	0	1,031	451	0	140	1,012	0	3,051		0	1	0	0
Peak Hour	0	0	0	0	0	180	0	64	0	0	488	245	0	70	514	0	1,561		0	0	0	0





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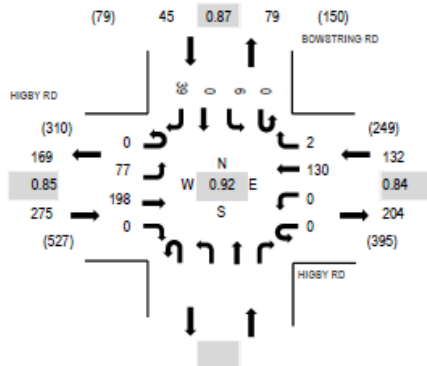
Location: 2 BOWSTRING RD & HIGBY RD PM

Date: Thursday, March 5, 2020

Peak Hour: 04:45 PM - 05:45 PM

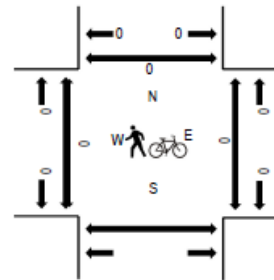
Peak 15-Minutes: 05:15 PM - 05:30 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				Northbound				BOWSTRING RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	15	53	0	0	0	0	27	1				0	2	0	8	106	431	0	0	0	0
4:15 PM	0	17	44	0	0	0	0	28	3				0	2	0	6	100	428	0	0	0	0
4:30 PM	0	18	49	0	0	0	0	28	1				0	1	0	6	103	451	0	0	0	0
4:45 PM	0	18	54	0	0	0	0	39	1				0	1	0	9	122	452	0	0	0	0
5:00 PM	0	14	42	0	0	0	0	34	0				0	2	0	11	103	424	0	0	0	0
5:15 PM	0	30	51	0	0	0	0	30	1				0	2	0	9	123		0	0	0	0
5:30 PM	0	15	51	0	0	0	0	27	0				0	1	0	10	104		0	0	0	0
5:45 PM	0	16	40	0	0	0	0	29	0				0	0	0	9	94		0	0	0	0
Count Total	0	143	384	0	0	0	0	242	7				0	11	0	68	855		0	0	0	0
Peak Hour	0	77	198	0	0	0	0	130	2				0	6	0	39	452		0	0	0	0



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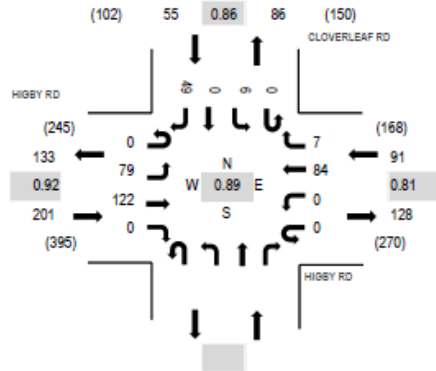
Location: 3 CLOVERLEAF RD & HIGBY RD PM

Date: Thursday, March 5, 2020

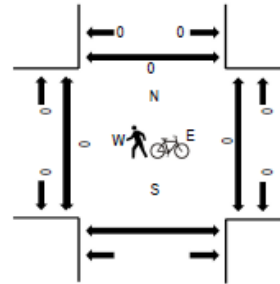
Peak Hour: 04:30 PM - 05:30 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



### Peak Hour - Pedestrians/Bicycles on Crosswalk



Note: Total study counts contained in parentheses.

### Traffic Counts

Interval Start Time	HIGBY RD Eastbound				HIGBY RD Westbound				CLOVERLEAF RD Northbound				CLOVERLEAF RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	19	37	0	0	0	16	1					0	5	0	12	90	345	0	0	0	0
4:15 PM	0	13	34	0	0	0	18	3					0	0	0	10	78	338	0	0	0	0
4:30 PM	0	20	29	0	0	0	20	0					0	2	0	9	80	347	0	0	0	0
4:45 PM	0	18	37	0	0	0	27	2					0	0	0	13	97	346	0	0	0	0
5:00 PM	0	17	27	0	0	0	20	4					0	2	0	13	83	320	0	0	0	0
5:15 PM	0	24	29	0	0	0	17	1					0	2	0	14	87		0	0	0	0
5:30 PM	0	13	38	0	0	0	18	1					0	0	0	9	79		0	0	0	0
5:45 PM	0	12	28	0	0	0	18	2					0	0	0	11	71		0	0	0	0
Count Total	0	136	259	0	0	0	154	14					0	11	0	91	665		0	0	0	0
Peak Hour	0	79	122	0	0	0	84	7					0	6	0	49	347		0	0	0	0

## Appendix B: Level of Service (LOS) Table

### Level of Service Definitions

Level of Service (LOS)	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	$\leq 10$	$\leq 10$
B	$> 10$ and $\leq 20$	$> 10$ and $\leq 15$
C	$> 20$ and $\leq 35$	$> 15$ and $\leq 25$
D	$> 35$ and $\leq 55$	$> 25$ and $\leq 35$
E	$> 55$ and $\leq 80$	$> 35$ and $\leq 50$
F	$> 80$	$> 50$

## Appendix C: Aerial Image and School Pedestrian Routing



Google

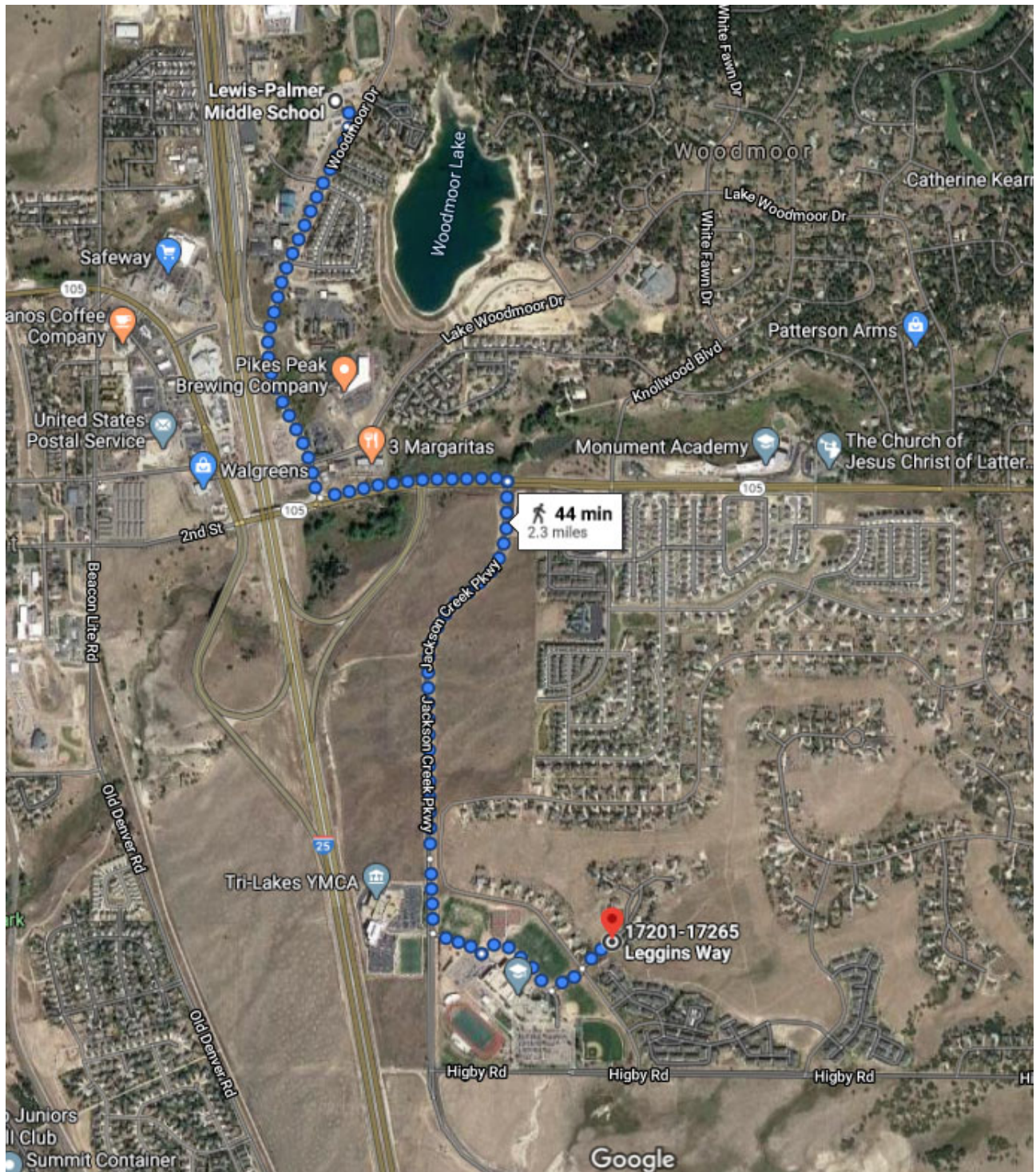


## School Pedestrian Routing to Lewis Palmer High School (0.2 miles)



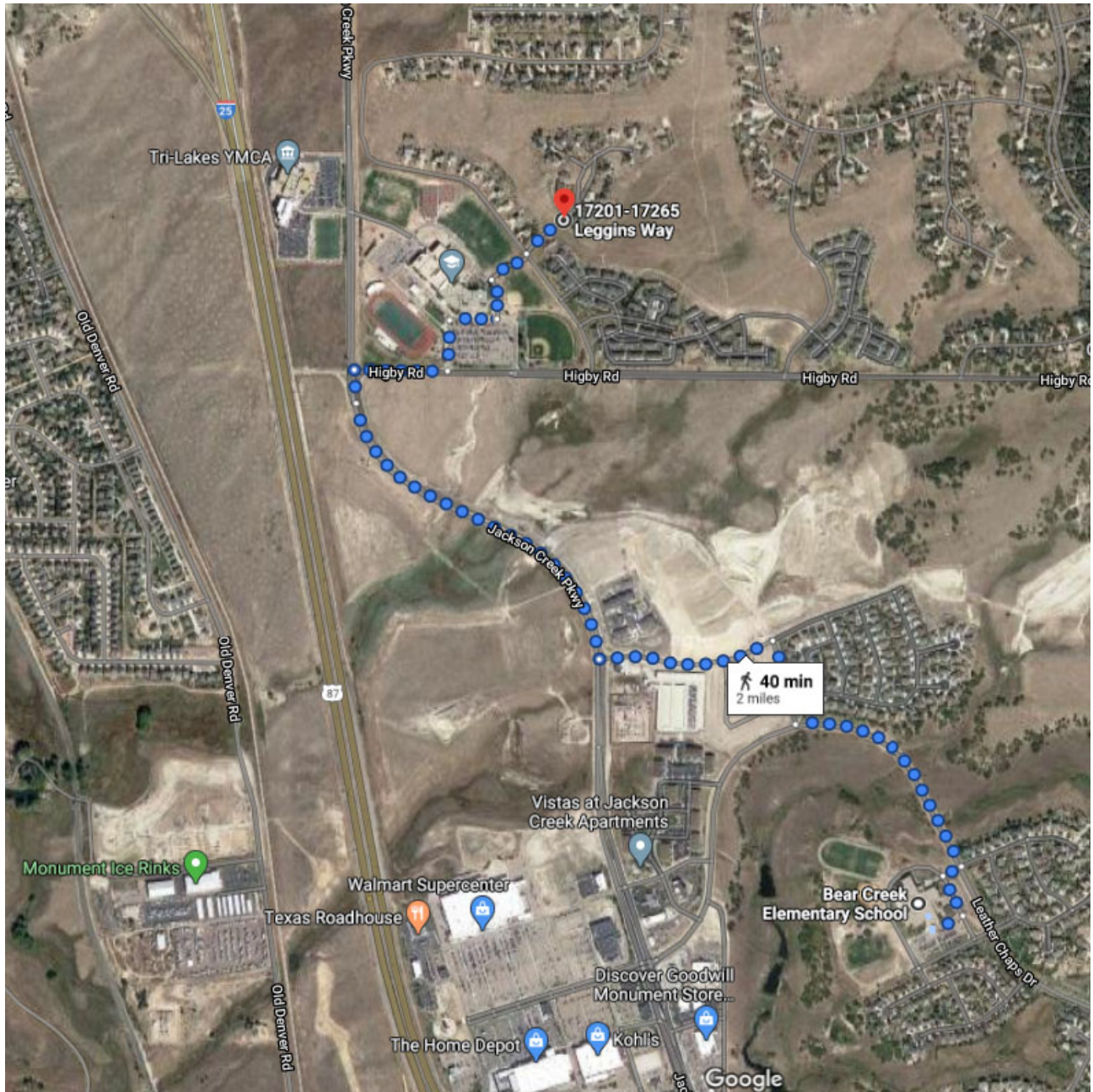


## School Pedestrian Routing to Lewis Palmer Middle School (2.3 miles)

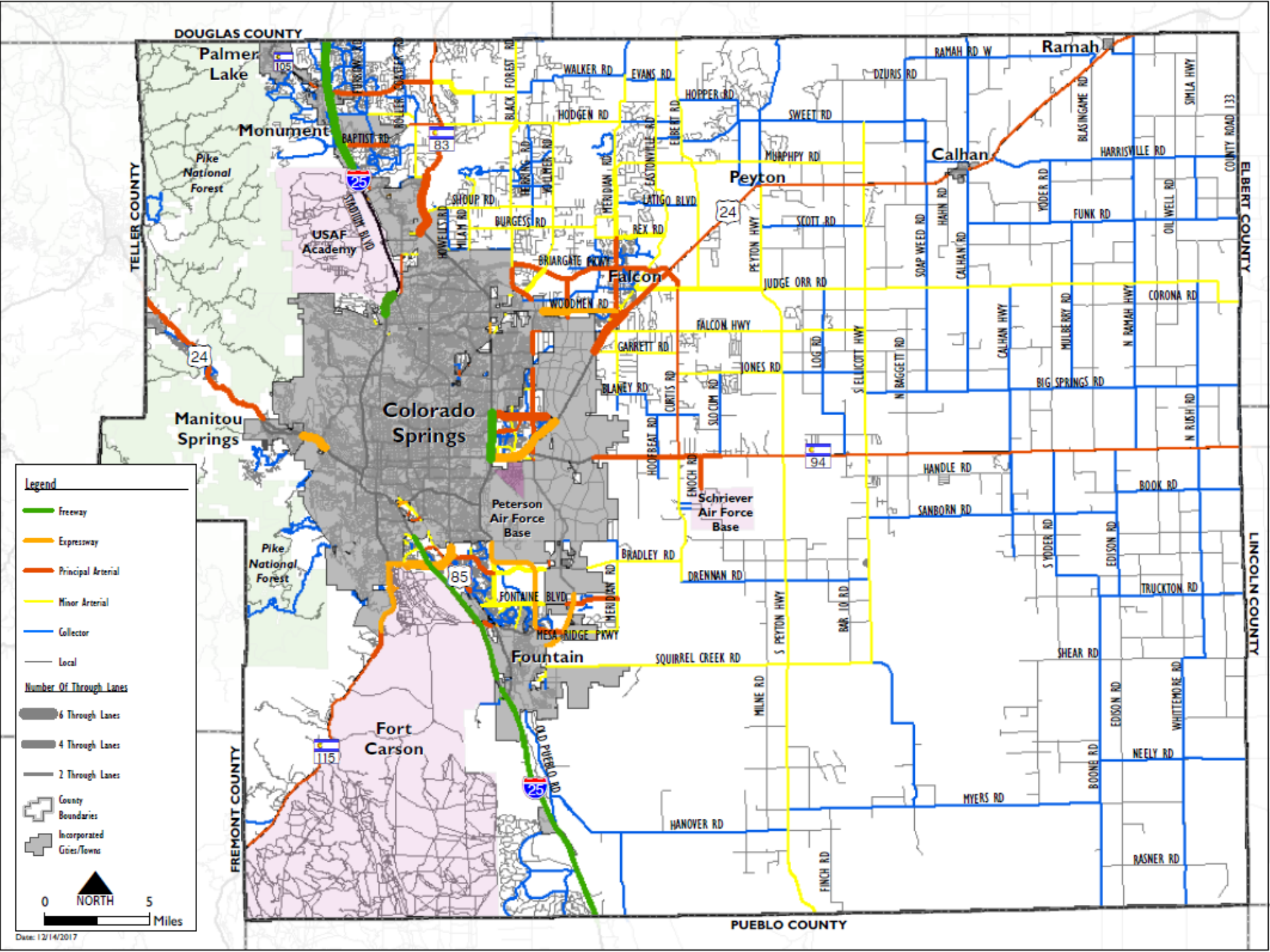




## School Pedestrian Routing to Bear Creek Elementary School (2 miles)



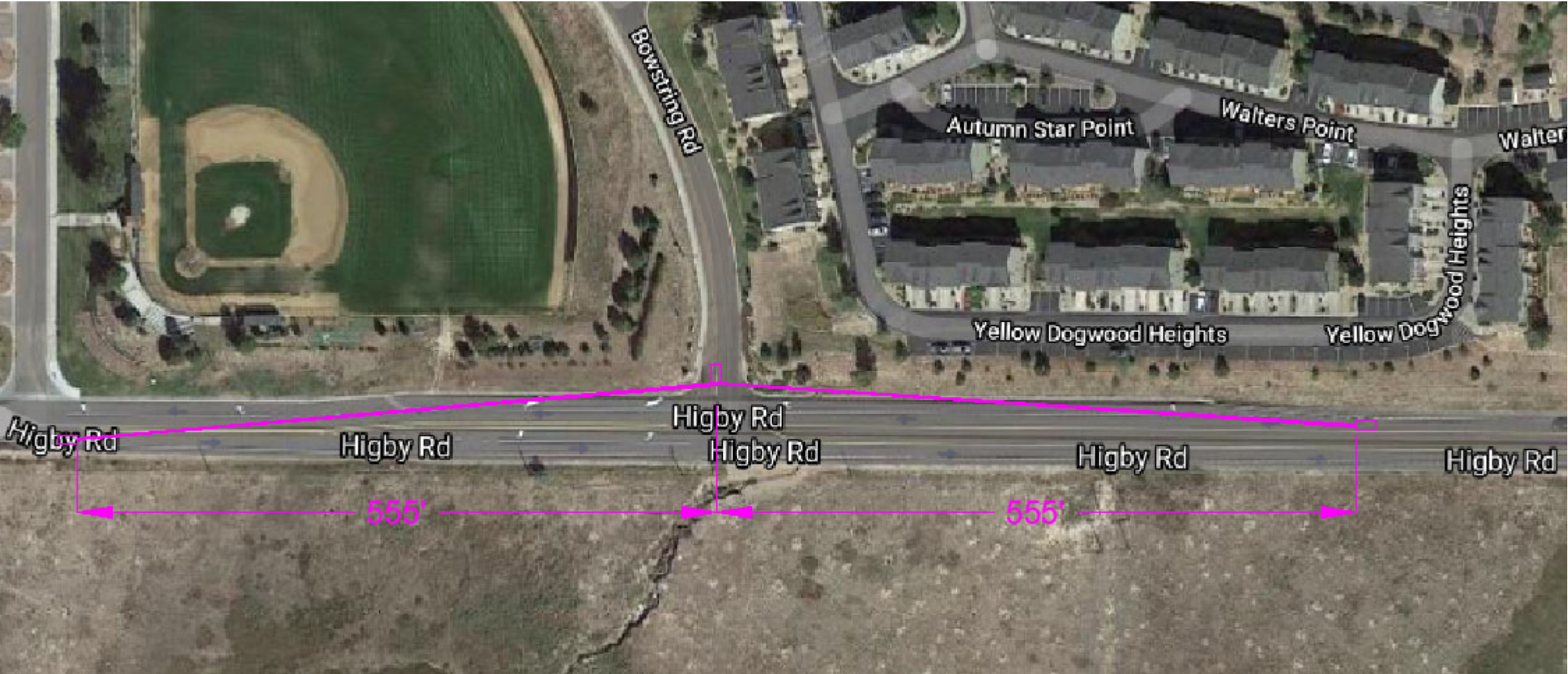
Map 14: 2040 Functional Classification





Appendix E: Sight Distance

Higby Road and Bowstring Road (555' Sight Distance):





Higby Road and Cloverleaf Road (555' Sight Distance):

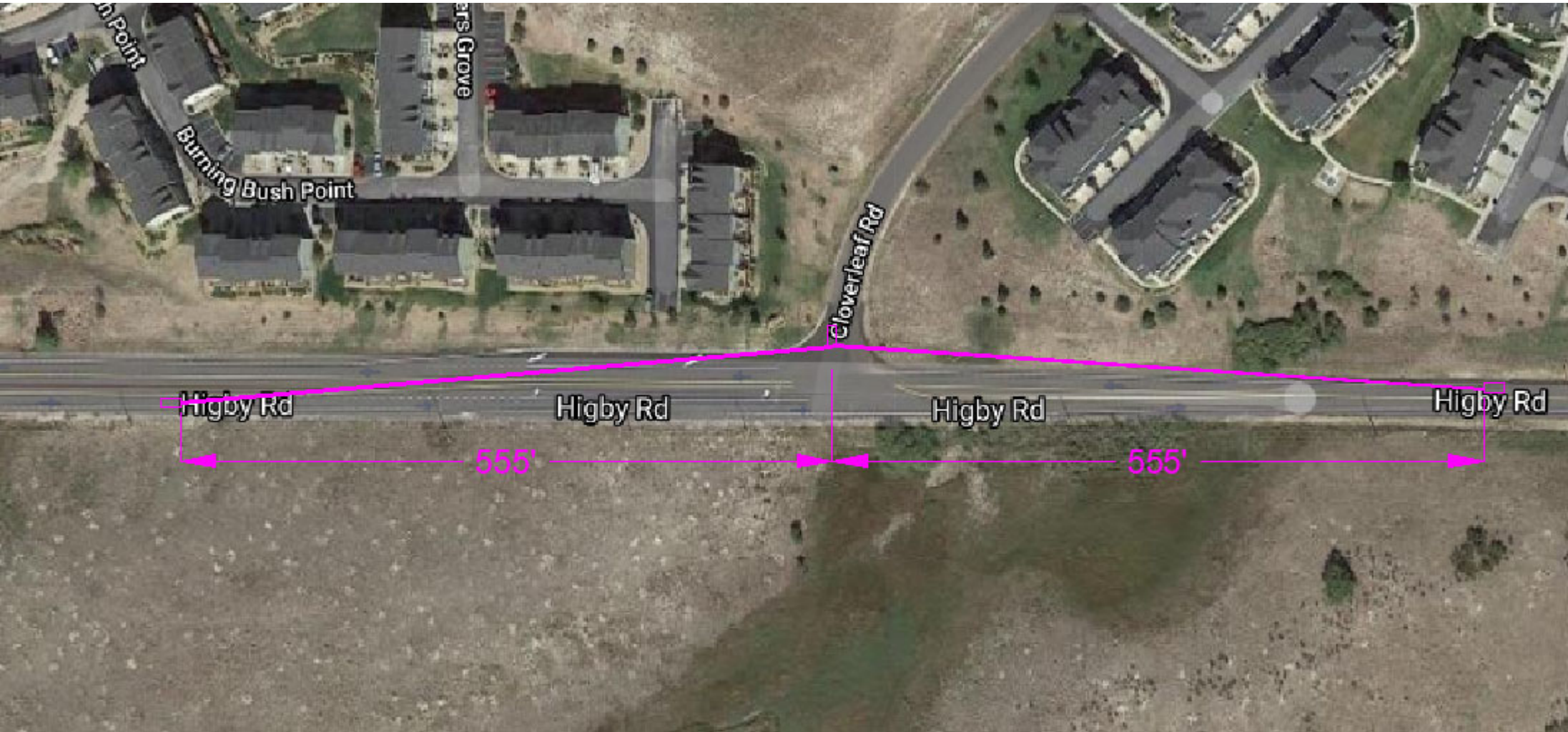


Figure 2-23. Sight Distance Triangle (Stop Controlled)

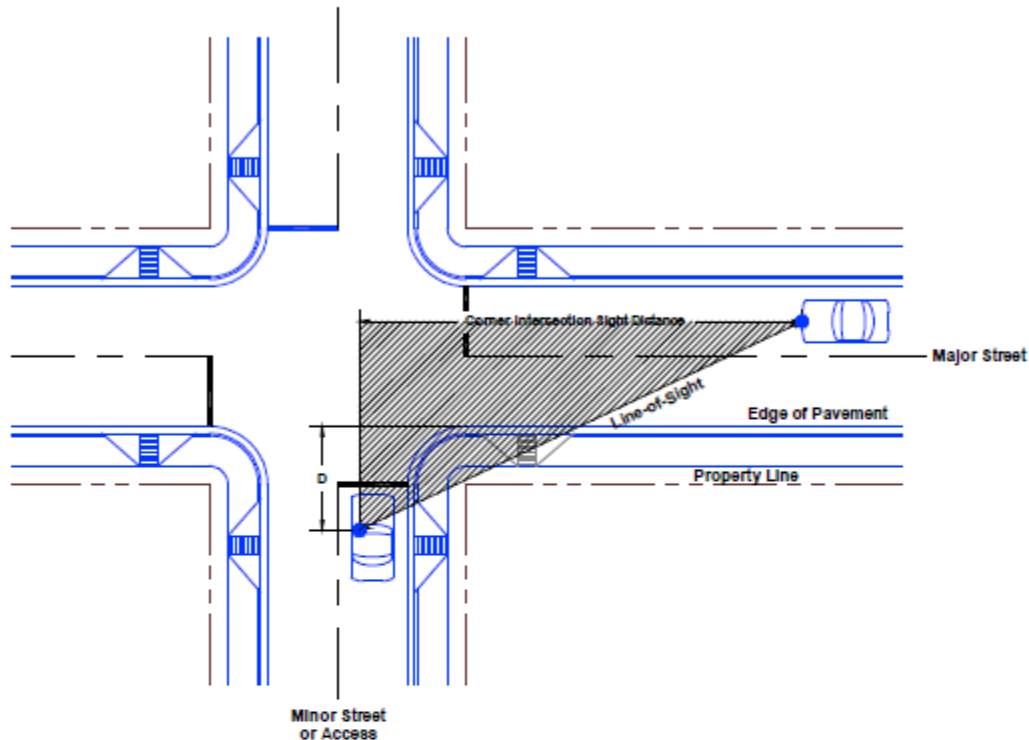
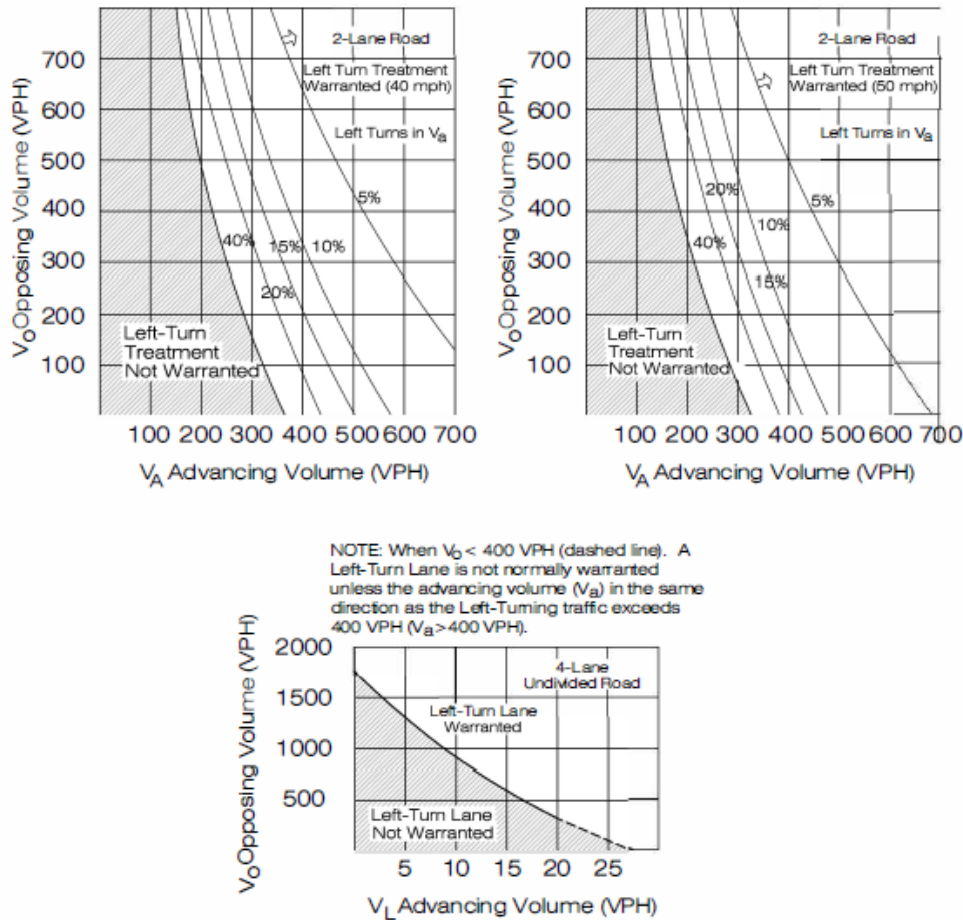


Table 2-21. Intersection sight distance

Higher Functional Classification Roadway Design Speed (MPH)	Intersection sight distance (feet) <sup>1,3</sup>
50	555
40	445
30	335 <sup>2</sup>
25	280 <sup>2</sup>

<sup>1</sup> Intersection sight distance measured from a point on the minor road at 13 feet back from the edge of the major road pavement ("D") and measured from a height of eye at 3.5 feet on the minor road to a height of object at 3.5 feet on the major road.  
<sup>2</sup> At local/local road intersections only, "D" shall be 10 feet and the sight distance shall be measured to the centerline of the road.  
<sup>3</sup> These values only apply to two-lane roads with stop control, all other situations require special design considerations.

NCHRP 279, Figure 4-12: Volume Warrants for left-turn lanes at unsignalized intersections












## Appendix F: HCM Calculations (Synchro)

Recent AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	291	159	259	240	128	317
Future Volume (vph)	291	159	259	240	128	317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.425	
Satd. Flow (perm)	1770	1583	1863	1583	792	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		187		282		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	342	187	305	282	151	373
Shared Lane Traffic (%)						
Lane Group Flow (vph)	342	187	305	282	151	373
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

Recent AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	23.0	23.0	9.5	32.5
Total Split (%)	40.9%	40.9%	41.8%	41.8%	17.3%	59.1%
Maximum Green (s)	18.0	18.0	18.5	18.5	5.0	28.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	14.9	14.9	22.6	22.6	31.1	31.1
Actuated g/C Ratio	0.27	0.27	0.41	0.41	0.57	0.57
v/c Ratio	0.71	0.33	0.40	0.35	0.27	0.35
Control Delay	26.4	4.5	15.5	3.5	8.0	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	4.5	15.5	3.5	8.0	8.5
LOS	C	A	B	A	A	A
Approach Delay	18.6		9.7			8.4
Approach LOS	B		A			A

Intersection Summary

Area Type: Other

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 12.2

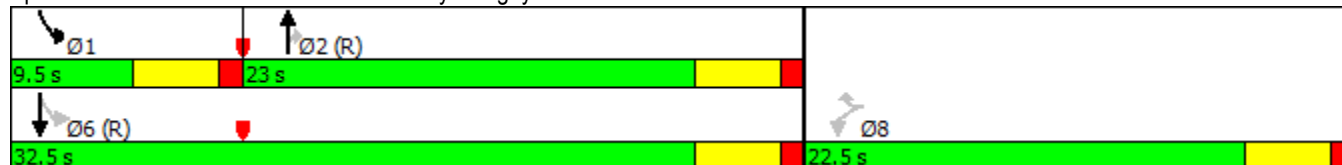
Intersection LOS: B

Intersection Capacity Utilization 48.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd











Recent AM Traffic  
5: Higby Rd & Bowstring Rd

Kellar Engineering LLC






03/24/2020

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	69	335	2	5	86
Future Vol, veh/h	20	69	335	2	5	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	81	394	2	6	101
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	396	0	-	0	523	394
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	129	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1163	-	-	-	514	655
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	897	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1163	-	-	-	503	655
Mov Cap-2 Maneuver	-	-	-	-	503	-
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	897	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.8	0		11.5		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1163	-	-	-	503	655
HCM Lane V/C Ratio	0.02	-	-	-	0.012	0.154
HCM Control Delay (s)	8.2	-	-	-	12.2	11.5
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.5



Intersection

Int Delay, s/veh 3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	52	240	2	6	97
Future Vol, veh/h	22	52	240	2	6	97
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	61	282	2	7	114








Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	284	0	0 396 283
Stage 1	-	-	- 283 -
Stage 2	-	-	- 113 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1278	-	- 609 756
Stage 1	-	-	- 765 -
Stage 2	-	-	- 912 -
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1278	-	- 597 756
Mov Cap-2 Maneuver	-	-	- 597 -
Stage 1	-	-	- 750 -
Stage 2	-	-	- 912 -

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1278	-	-	-	597	756
HCM Lane V/C Ratio	0.02	-	-	-	0.012	0.151
HCM Control Delay (s)	7.9	-	-	-	11.1	10.6
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.5

Recent PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	180	64	488	245	70	514
Future Volume (vph)	180	64	488	245	70	514
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.304	
Satd. Flow (perm)	1770	1583	1863	1583	566	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		75		263		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.93	0.93	0.94	0.94
Adj. Flow (vph)	212	75	525	263	74	547
Shared Lane Traffic (%)						
Lane Group Flow (vph)	212	75	525	263	74	547
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

Recent PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	28.0	28.0	9.5	37.5
Total Split (%)	37.5%	37.5%	46.7%	46.7%	15.8%	62.5%
Maximum Green (s)	18.0	18.0	23.5	23.5	5.0	33.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	12.3	12.3	32.1	32.1	38.7	38.7
Actuated g/C Ratio	0.20	0.20	0.54	0.54	0.64	0.64
v/c Ratio	0.58	0.19	0.53	0.27	0.15	0.46
Control Delay	27.5	6.4	14.6	2.8	5.7	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.5	6.4	14.6	2.8	5.7	7.7
LOS	C	A	B	A	A	A
Approach Delay	21.9		10.6			7.5
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 11.4

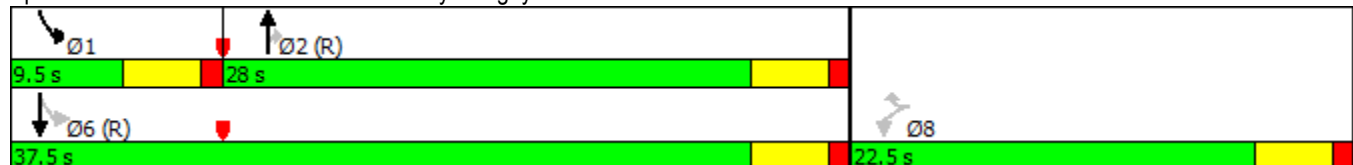
Intersection LOS: B

Intersection Capacity Utilization 51.1%

ICU Level of Service A







Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



Intersection

Int Delay, s/veh 2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	77	198	130	2	6	39
Future Vol, veh/h	77	198	130	2	6	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	91	233	153	2	7	45






Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	155	0	0 568 153
Stage 1	-	-	- 153 -
Stage 2	-	-	- 415 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1425	-	- 484 893
Stage 1	-	-	- 875 -
Stage 2	-	-	- 666 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1425	-	- 453 893
Mov Cap-2 Maneuver	-	-	- 453 -
Stage 1	-	-	- 819 -
Stage 2	-	-	- 666 -

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1425	-	-	-	453	893
HCM Lane V/C Ratio	0.064	-	-	-	0.015	0.05
HCM Control Delay (s)	7.7	-	-	-	13.1	9.2
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	0.2

Intersection

Int Delay, s/veh 3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	79	122	84	7	6	49
Future Vol, veh/h	79	122	84	7	6	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	86	133	99	8	7	57

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	107	0	0 408 103
Stage 1	-	-	- 103 -
Stage 2	-	-	- 305 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1484	-	- 599 952
Stage 1	-	-	- 921 -
Stage 2	-	-	- 748 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1484	-	- 564 952
Mov Cap-2 Maneuver	-	-	- 564 -
Stage 1	-	-	- 868 -
Stage 2	-	-	- 748 -








Approach	EB	WB	SB
HCM Control Delay, s	3	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1484	-	-	-	564	952
HCM Lane V/C Ratio	0.058	-	-	-	0.012	0.06
HCM Control Delay (s)	7.6	-	-	-	11.5	9
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	0.2

2025 Background AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	321	176	286	265	141	350
Future Volume (vph)	321	176	286	265	141	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.391	
Satd. Flow (perm)	1770	1583	1863	1583	728	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		207		312		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	378	207	336	312	166	412
Shared Lane Traffic (%)						
Lane Group Flow (vph)	378	207	336	312	166	412
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2025 Background AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	23.0	23.0	9.5	32.5
Total Split (%)	40.9%	40.9%	41.8%	41.8%	17.3%	59.1%
Maximum Green (s)	18.0	18.0	18.5	18.5	5.0	28.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	15.5	15.5	22.2	22.2	30.5	30.5
Actuated g/C Ratio	0.28	0.28	0.40	0.40	0.55	0.55
v/c Ratio	0.76	0.35	0.45	0.38	0.32	0.40
Control Delay	28.1	4.4	16.3	3.6	8.7	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	4.4	16.3	3.6	8.7	9.2
LOS	C	A	B	A	A	A
Approach Delay	19.7		10.2			9.1
Approach LOS	B		B			A

#### Intersection Summary

Area Type: Other

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 12.9

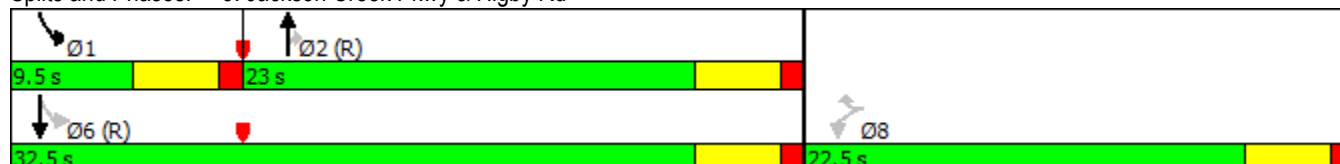
Intersection LOS: B

Intersection Capacity Utilization 51.9%

ICU Level of Service A







Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



Intersection

Int Delay, s/veh 2.5






Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	76	370	2	6	95
Future Vol, veh/h	22	76	370	2	6	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	89	435	2	7	112

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	437	0	0 576 435
Stage 1	-	-	- 435 -
Stage 2	-	-	- 141 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1123	-	- 479 621
Stage 1	-	-	- 653 -
Stage 2	-	-	- 886 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1123	-	- 468 621
Mov Cap-2 Maneuver	-	-	- 468 -
Stage 1	-	-	- 638 -
Stage 2	-	-	- 886 -

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1123	-	-	-	468	621
HCM Lane V/C Ratio	0.023	-	-	-	0.015	0.18
HCM Control Delay (s)	8.3	-	-	-	12.8	12.1
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.7










Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	24	57	265	2	7	107
Future Vol, veh/h	24	57	265	2	7	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	67	312	2	8	126
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	314	0	-	0	436	313
Stage 1	-	-	-	-	313	-
Stage 2	-	-	-	-	123	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1246	-	-	-	578	727
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	902	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1246	-	-	-	565	727
Mov Cap-2 Maneuver	-	-	-	-	565	-
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	902	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.4	0		11		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1246	-	-	-	565	727
HCM Lane V/C Ratio	0.023	-	-	-	0.015	0.173
HCM Control Delay (s)	8	-	-	-	11.5	11
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.6

2025 Background PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	199	71	539	271	77	567
Future Volume (vph)	199	71	539	271	77	567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.257	
Satd. Flow (perm)	1770	1583	1863	1583	479	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		84		291		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.93	0.93	0.94	0.94
Adj. Flow (vph)	234	84	580	291	82	603
Shared Lane Traffic (%)						
Lane Group Flow (vph)	234	84	580	291	82	603
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2025 Background PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020

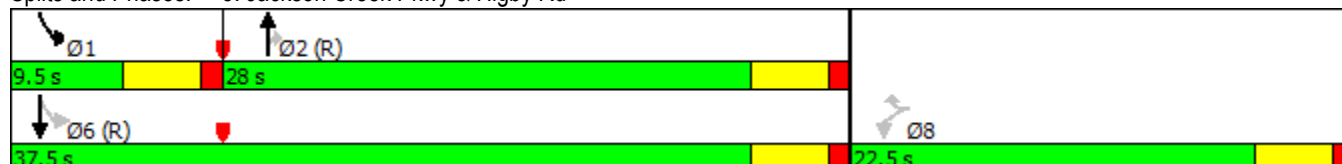


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	28.0	28.0	9.5	37.5
Total Split (%)	37.5%	37.5%	46.7%	46.7%	15.8%	62.5%
Maximum Green (s)	18.0	18.0	23.5	23.5	5.0	33.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	13.1	13.1	31.5	31.5	37.9	37.9
Actuated g/C Ratio	0.22	0.22	0.52	0.52	0.63	0.63
v/c Ratio	0.61	0.20	0.59	0.30	0.19	0.51
Control Delay	27.4	6.0	16.8	2.8	6.4	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	6.0	16.8	2.8	6.4	8.8
LOS	C	A	B	A	A	A
Approach Delay	21.8		12.1			8.5
Approach LOS	C		B			A

Intersection Summary







Area Type: Other  
Cycle Length: 60  
Actuated Cycle Length: 60  
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 60  
Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.61  
Intersection Signal Delay: 12.4 Intersection LOS: B  
Intersection Capacity Utilization 54.9% ICU Level of Service A  
Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



# Intersection






Int Delay, s/veh 2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	85	219	144	2	7	43
Future Vol, veh/h	85	219	144	2	7	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	100	258	169	2	8	49

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	171	0	0 627 169
Stage 1	-	-	- 169 -
Stage 2	-	-	- 458 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1406	-	- 447 875
Stage 1	-	-	- 861 -
Stage 2	-	-	- 637 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1406	-	- 415 875
Mov Cap-2 Maneuver	-	-	- 415 -
Stage 1	-	-	- 800 -
Stage 2	-	-	- 637 -

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	10
HCM LOS			B













Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1406	-	-	-	415	875
HCM Lane V/C Ratio	0.071	-	-	-	0.019	0.056
HCM Control Delay (s)	7.8	-	-	-	13.8	9.4
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.2

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	87	135	93	8	7	54
Future Vol, veh/h	87	135	93	8	7	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	95	147	109	9	8	63
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	118	0	-	0	451	114
Stage 1	-	-	-	-	114	-
Stage 2	-	-	-	-	337	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1470	-	-	-	566	939
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	723	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1470	-	-	-	529	939
Mov Cap-2 Maneuver	-	-	-	-	529	-
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	723	-
Approach	EB	WB		SB		
HCM Control Delay, s	3	0		9.4		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1470	-	-	-	529	939
HCM Lane V/C Ratio	0.064	-	-	-	0.015	0.067
HCM Control Delay (s)	7.6	-	-	-	11.9	9.1
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	0.2

2025 Short Range Total AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	367	210	286	280	152	350
Future Volume (vph)	367	210	286	280	152	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.383	
Satd. Flow (perm)	1770	1583	1863	1583	713	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		247		329		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	432	247	336	329	179	412
Shared Lane Traffic (%)						
Lane Group Flow (vph)	432	247	336	329	179	412
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2025 Short Range Total AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	23.0	23.0	9.5	32.5
Total Split (%)	40.9%	40.9%	41.8%	41.8%	17.3%	59.1%
Maximum Green (s)	18.0	18.0	18.5	18.5	5.0	28.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	16.5	16.5	21.5	21.5	29.5	29.5
Actuated g/C Ratio	0.30	0.30	0.39	0.39	0.54	0.54
v/c Ratio	0.81	0.38	0.46	0.40	0.37	0.41
Control Delay	31.8	4.3	16.7	3.7	9.5	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.8	4.3	16.7	3.7	9.5	9.7
LOS	C	A	B	A	A	A
Approach Delay	21.8		10.3			9.7
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 14.1

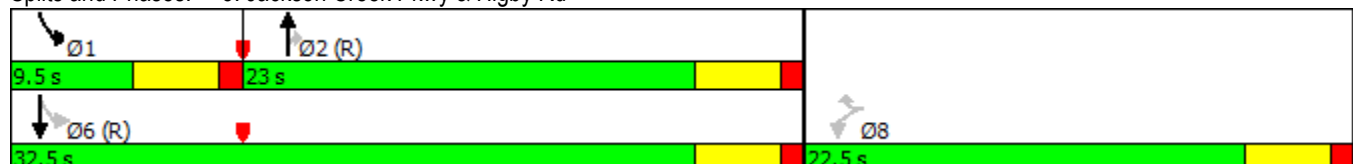
Intersection LOS: B

Intersection Capacity Utilization 55.1%

ICU Level of Service B

Analysis Period (min) 15







Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



2025 Short Range Total AM Traffic  
5: Higby Rd & Bowstring Rd

Kellar Engineering LLC






03/24/2020

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	86	406	2	6	139
Future Vol, veh/h	38	86	406	2	6	139
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	101	478	2	7	164
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	480	0	-	0	669	478
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	191	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1082	-	-	-	423	587
Stage 1	-	-	-	-	624	-
Stage 2	-	-	-	-	841	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1082	-	-	-	405	587
Mov Cap-2 Maneuver	-	-	-	-	405	-
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	841	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.6	0		13.5		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1082	-	-	-	405	587
HCM Lane V/C Ratio	0.041	-	-	-	0.017	0.279
HCM Control Delay (s)	8.5	-	-	-	14	13.5
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	1.1



2025 Short Range Total AM Traffic  
7: Higby Rd & Cloverleaf Rd













Kellar Engineering LLC  
03/24/2020

Intersection						
Int Delay, s/veh	4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	34	57	265	4	11	143
Future Vol, veh/h	34	57	265	4	11	143
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	67	312	5	13	168
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	317	0	-	0	462	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	147	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1243	-	-	-	558	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1243	-	-	-	540	725
Mov Cap-2 Maneuver	-	-	-	-	540	-
Stage 1	-	-	-	-	716	-
Stage 2	-	-	-	-	880	-
Approach	EB	WB		SB		
HCM Control Delay, s	3	0		11.5		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1243	-	-	-	540	725
HCM Lane V/C Ratio	0.032	-	-	-	0.024	0.232
HCM Control Delay (s)	8	-	-	-	11.8	11.5
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	0.9

2025 Short Range Total PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	230	93	539	323	115	567
Future Volume (vph)	230	93	539	323	115	567
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.231	
Satd. Flow (perm)	1770	1583	1863	1583	430	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		109		347		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.85	0.85	0.93	0.93	0.94	0.94
Adj. Flow (vph)	271	109	580	347	122	603
Shared Lane Traffic (%)						
Lane Group Flow (vph)	271	109	580	347	122	603
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2025 Short Range Total PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	28.0	28.0	9.5	37.5
Total Split (%)	37.5%	37.5%	46.7%	46.7%	15.8%	62.5%
Maximum Green (s)	18.0	18.0	23.5	23.5	5.0	33.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	14.0	14.0	28.4	28.4	37.0	37.0
Actuated g/C Ratio	0.23	0.23	0.47	0.47	0.62	0.62
v/c Ratio	0.66	0.24	0.66	0.37	0.30	0.52
Control Delay	28.3	5.5	19.6	3.0	7.7	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	5.5	19.6	3.0	7.7	9.4
LOS	C	A	B	A	A	A
Approach Delay	21.8		13.4			9.1
Approach LOS	C		B			A

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 13.5

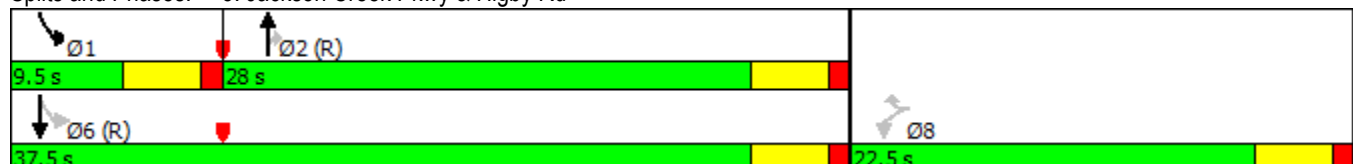
Intersection LOS: B

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15







Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



2025 Short Range Total PM Traffic  
5: Higby Rd & Bowstring Rd






Kellar Engineering LLC

03/24/2020

Intersection						
Int Delay, s/veh	3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	142	252	167	2	7	73
Future Vol, veh/h	142	252	167	2	7	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	167	296	196	2	8	84
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	198	0	-	0	826	196
Stage 1	-	-	-	-	196	-
Stage 2	-	-	-	-	630	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1375	-	-	-	342	845
Stage 1	-	-	-	-	837	-
Stage 2	-	-	-	-	531	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1375	-	-	-	301	845
Mov Cap-2 Maneuver	-	-	-	-	301	-
Stage 1	-	-	-	-	736	-
Stage 2	-	-	-	-	531	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.9	0		10.4		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1375	-	-	-	301	845
HCM Lane V/C Ratio	0.121	-	-	-	0.027	0.099
HCM Control Delay (s)	8	-	-	-	17.3	9.7
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1	0.3

2025 Short Range Total PM Traffic  
7: Higby Rd & Cloverleaf Rd













Kellar Engineering LLC  
03/24/2020

Intersection						
Int Delay, s/veh	3.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	120	135	93	13	10	77
Future Vol, veh/h	120	135	93	13	10	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	86	86
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	147	109	15	12	90
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	124	0	-	0	524	117
Stage 1	-	-	-	-	117	-
Stage 2	-	-	-	-	407	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1463	-	-	-	514	935
Stage 1	-	-	-	-	908	-
Stage 2	-	-	-	-	672	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1463	-	-	-	468	935
Mov Cap-2 Maneuver	-	-	-	-	468	-
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	672	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.6	0		9.7		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1463	-	-	-	468	935
HCM Lane V/C Ratio	0.089	-	-	-	0.025	0.096
HCM Control Delay (s)	7.7	-	-	-	12.9	9.3
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.1	0.3

2040 Background AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	432	236	385	357	190	471
Future Volume (vph)	432	236	385	357	190	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.291	
Satd. Flow (perm)	1770	1583	1863	1583	542	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		248		376		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	455	248	405	376	200	496
Shared Lane Traffic (%)						
Lane Group Flow (vph)	455	248	405	376	200	496
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2040 Background AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

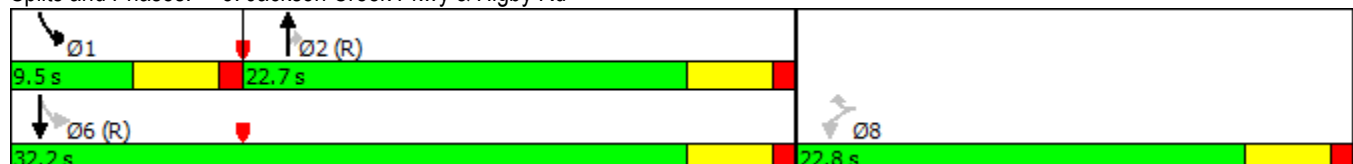
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	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.8	22.8	22.7	22.7	9.5	32.2
Total Split (%)	41.5%	41.5%	41.3%	41.3%	17.3%	58.5%
Maximum Green (s)	18.3	18.3	18.2	18.2	5.0	27.7
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	17.0	17.0	19.0	19.0	29.0	29.0
Actuated g/C Ratio	0.31	0.31	0.35	0.35	0.53	0.53
v/c Ratio	0.83	0.38	0.63	0.47	0.49	0.50
Control Delay	33.1	4.2	20.8	4.2	12.1	11.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	4.2	20.8	4.2	12.1	11.1
LOS	C	A	C	A	B	B
Approach Delay	22.9		12.8			11.4
Approach LOS	C		B			B

Intersection Summary






Area Type: Other  
 Cycle Length: 55  
 Actuated Cycle Length: 55  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 15.6  
 Intersection LOS: B  
 Intersection Capacity Utilization 66.0%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd



Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	103	498	3	6	95
Future Vol, veh/h	22	103	498	3	6	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	108	524	3	6	100
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	527	0	-	0	678	524
Stage 1	-	-	-	-	524	-
Stage 2	-	-	-	-	154	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1040	-	-	-	418	553
Stage 1	-	-	-	-	594	-
Stage 2	-	-	-	-	874	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1040	-	-	-	409	553
Mov Cap-2 Maneuver	-	-	-	-	409	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	874	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.5	0		13		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1040	-	-	-	409	553
HCM Lane V/C Ratio	0.022	-	-	-	0.015	0.181
HCM Control Delay (s)	8.5	-	-	-	13.9	12.9
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.7















Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	24	77	357	3	7	107
Future Vol, veh/h	24	77	357	3	7	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	81	376	3	7	113
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	379	0	-	0	509	378
Stage 1	-	-	-	-	378	-
Stage 2	-	-	-	-	131	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1179	-	-	-	524	669
Stage 1	-	-	-	-	693	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1179	-	-	-	513	669
Mov Cap-2 Maneuver	-	-	-	-	513	-
Stage 1	-	-	-	-	678	-
Stage 2	-	-	-	-	895	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.9	0		11.5		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1179	-	-	-	513	669
HCM Lane V/C Ratio	0.021	-	-	-	0.014	0.168
HCM Control Delay (s)	8.1	-	-	-	12.1	11.5
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0	0.6

2040 Background PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	267	95	725	364	104	764
Future Volume (vph)	267	95	725	364	104	764
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.151	
Satd. Flow (perm)	1770	1583	1863	1583	281	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		100		383		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	281	100	763	383	109	804
Shared Lane Traffic (%)						
Lane Group Flow (vph)	281	100	763	383	109	804
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2040 Background PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC  
03/24/2020







	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	38.0	38.0	9.5	47.5
Total Split (%)	32.1%	32.1%	54.3%	54.3%	13.6%	67.9%
Maximum Green (s)	18.0	18.0	33.5	33.5	5.0	43.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	15.3	15.3	37.5	37.5	45.7	45.7
Actuated g/C Ratio	0.22	0.22	0.54	0.54	0.65	0.65
v/c Ratio	0.73	0.24	0.76	0.37	0.36	0.66
Control Delay	36.7	6.6	21.7	2.5	8.5	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.7	6.6	21.7	2.5	8.5	11.5
LOS	D	A	C	A	A	B
Approach Delay	28.8		15.3			11.1
Approach LOS	C		B			B






Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.76  
 Intersection Signal Delay: 15.8  
 Intersection LOS: B  
 Intersection Capacity Utilization 70.0%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd















Intersection						
Int Delay, s/veh	1.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	85	294	193	3	7	43
Future Vol, veh/h	85	294	193	3	7	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	89	309	203	3	7	45
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	206	0	-	0	690	203
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	487	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1365	-	-	-	411	838
Stage 1	-	-	-	-	831	-
Stage 2	-	-	-	-	618	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1365	-	-	-	384	838
Mov Cap-2 Maneuver	-	-	-	-	384	-
Stage 1	-	-	-	-	777	-
Stage 2	-	-	-	-	618	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.8	0		10.2		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1365	-	-	-	384	838
HCM Lane V/C Ratio	0.066	-	-	-	0.019	0.054
HCM Control Delay (s)	7.8	-	-	-	14.6	9.5
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.2

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	87	181	125	10	7	54
Future Vol, veh/h	87	181	125	10	7	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	191	132	11	7	57
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	143	0	-	0	513	138
Stage 1	-	-	-	-	138	-
Stage 2	-	-	-	-	375	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1440	-	-	-	521	910
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1440	-	-	-	488	910
Mov Cap-2 Maneuver	-	-	-	-	488	-
Stage 1	-	-	-	-	832	-
Stage 2	-	-	-	-	695	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.5	0		9.6		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1440	-	-	-	488	910
HCM Lane V/C Ratio	0.064	-	-	-	0.015	0.062
HCM Control Delay (s)	7.7	-	-	-	12.5	9.2
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	0.2

2040 Long Range Total AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	478	270	385	372	201	471
Future Volume (vph)	478	270	385	372	201	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.274	
Satd. Flow (perm)	1770	1583	1863	1583	510	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		284		392		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	503	284	405	392	212	496
Shared Lane Traffic (%)						
Lane Group Flow (vph)	503	284	405	392	212	496
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2040 Long Range Total AM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

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	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	26.0	26.0	23.2	23.2	10.8	34.0
Total Split (%)	43.3%	43.3%	38.7%	38.7%	18.0%	56.7%
Maximum Green (s)	21.5	21.5	18.7	18.7	6.3	29.5
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	19.9	19.9	19.9	19.9	31.1	31.1
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.52	0.52
v/c Ratio	0.86	0.40	0.66	0.50	0.52	0.51
Control Delay	34.7	3.9	24.2	4.6	13.8	12.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	3.9	24.2	4.6	13.8	12.5
LOS	C	A	C	A	B	B
Approach Delay	23.6		14.6			12.9
Approach LOS	C		B			B

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 17.1

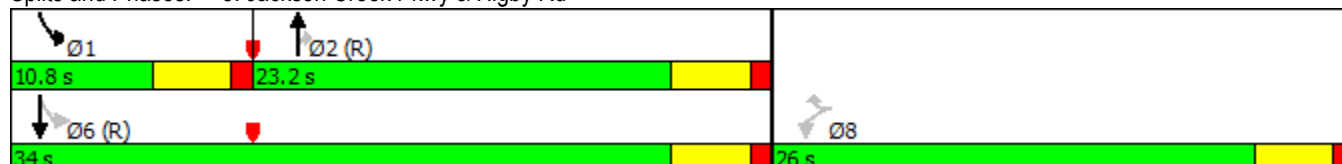
Intersection LOS: B

Intersection Capacity Utilization 69.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd











2040 Long Range Total AM Traffic  
5: Higby Rd & Bowstring Rd

Kellar Engineering LLC  
03/24/2020

Intersection

Int Delay, s/veh 2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	113	534	3	6	139
Future Vol, veh/h	38	113	534	3	6	139
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	119	562	3	6	146






Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	565	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1007	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1007	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	14.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1007	-	-	-	358	526
HCM Lane V/C Ratio	0.04	-	-	-	0.018	0.278
HCM Control Delay (s)	8.7	-	-	-	15.2	14.5
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	1.1

2040 Long Range Total AM Traffic  
7: Higby Rd & Cloverleaf Rd













Kellar Engineering LLC  
03/24/2020

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	34	77	357	5	11	143
Future Vol, veh/h	34	77	357	5	11	143
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	81	376	5	12	151
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	381	0	-	0	532	379
Stage 1	-	-	-	-	379	-
Stage 2	-	-	-	-	153	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1177	-	-	-	508	668
Stage 1	-	-	-	-	692	-
Stage 2	-	-	-	-	875	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1177	-	-	-	492	668
Mov Cap-2 Maneuver	-	-	-	-	492	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	875	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.5	0		12		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1177	-	-	-	492	668
HCM Lane V/C Ratio	0.03	-	-	-	0.024	0.225
HCM Control Delay (s)	8.2	-	-	-	12.5	12
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	0.9

2040 Long Range Total PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

Kellar Engineering LLC

03/24/2020

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	298	117	725	416	142	764
Future Volume (vph)	298	117	725	416	142	764
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190	190		180	610	
Storage Lanes	1	0		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.128	
Satd. Flow (perm)	1770	1583	1863	1583	238	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		123		438		
Link Speed (mph)	30		30			30
Link Distance (ft)	1876		1114			1443
Travel Time (s)	42.6		25.3			32.8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	314	123	763	438	149	804
Shared Lane Traffic (%)						
Lane Group Flow (vph)	314	123	763	438	149	804
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
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		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	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
Detector 1 Queue (s)	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
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	Perm	NA	Perm	pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8		2	6	

2040 Long Range Total PM Traffic  
3: Jackson Creek Pkwy & Higby Rd

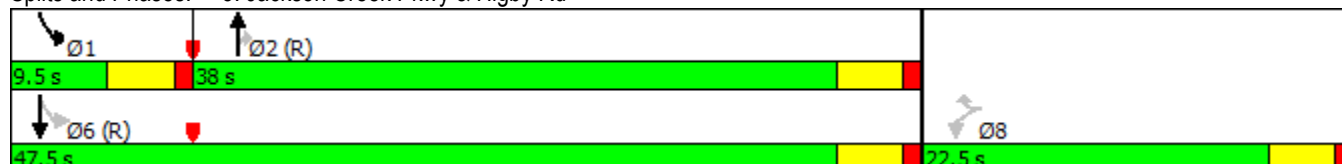
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03/24/2020

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	22.5	22.5	38.0	38.0	9.5	47.5
Total Split (%)	32.1%	32.1%	54.3%	54.3%	13.6%	67.9%
Maximum Green (s)	18.0	18.0	33.5	33.5	5.0	43.0
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	None	C-Max
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 Effect Green (s)	16.0	16.0	34.7	34.7	45.0	45.0
Actuated g/C Ratio	0.23	0.23	0.50	0.50	0.64	0.64
v/c Ratio	0.78	0.27	0.83	0.44	0.54	0.67
Control Delay	39.2	6.2	25.5	2.7	13.8	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.2	6.2	25.5	2.7	13.8	12.0
LOS	D	A	C	A	B	B
Approach Delay	29.9		17.2			12.3
Approach LOS	C		B			B

Intersection Summary

Area Type: Other  
 Cycle Length: 70  
 Actuated Cycle Length: 70  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 17.6  
 Intersection LOS: B  
 Intersection Capacity Utilization 73.8%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 3: Jackson Creek Pkwy & Higby Rd









2040 Long Range Total PM Traffic  
5: Higby Rd & Bowstring Rd

Kellar Engineering LLC  
03/24/2020

Intersection






Int Delay, s/veh 2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	142	327	216	3	7	73
Future Vol, veh/h	142	327	216	3	7	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	380	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	149	344	227	3	7	77

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	230	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1338	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1338	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.4	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1338	-	-	-	286	812
HCM Lane V/C Ratio	0.112	-	-	-	0.026	0.095
HCM Control Delay (s)	8	-	-	-	17.9	9.9
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1	0.3

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	120	181	125	15	10	77
Future Vol, veh/h	120	181	125	15	10	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	234	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	126	191	132	16	11	81
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	148	0	-	0	583	140
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	443	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1434	-	-	-	475	908
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	647	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1434	-	-	-	433	908
Mov Cap-2 Maneuver	-	-	-	-	433	-
Stage 1	-	-	-	-	809	-
Stage 2	-	-	-	-	647	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		9.9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1434	-	-	-	433	908
HCM Lane V/C Ratio	0.088	-	-	-	0.024	0.089
HCM Control Delay (s)	7.8	-	-	-	13.5	9.4
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.3	-	-	-	0.1	0.3



## Sean Kellar, PE, PTOE

Principal Engineer

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### Education

B.S., Civil Engineering, Arizona State University – Tempe, AZ

### Registration

Colorado, Professional Engineer (PE)  
Wyoming, Professional Engineer (PE)  
Arizona, Professional Engineer (PE)  
Kansas, Professional Engineer (PE)  
Missouri, Professional Engineer (PE)  
Professional Traffic Operations Engineer (PTOE)

### Professional Memberships

Institute of Transportation Engineers (ITE)

### Industry Tenure

21 Years

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Sean's wide range of expertise includes: transportation planning, traffic modeling, roadway design, bike and pedestrian facilities, traffic impact studies, traffic signal warrant analysis, parking studies, corridor planning and access management. Sean's experience in both the private and public sectors; passion for safety and excellence; and strong communication and collaboration skills can bring great value to any project. Prior to starting Kellar Engineering, Sean was employed at the Missouri Department of Transportation (MoDOT) as the District Traffic Engineer for the Kansas City District. Sean also worked for the City of Loveland, CO for over 10 years as a Senior Civil Engineer supervising a division of transportation/traffic engineers. While at the City of Loveland, Sean managed several capital improvement projects, presented several projects to the City Council and Planning Commission in public hearings, and managed the revisions to the City's Street Standards. Sean is also proficient in Highway Capacity Software, Synchro, PT Vissim, Rodel, GIS, and AutoCAD.



## WORK EXPERIENCE:

**Kellar Engineering**, Principal Engineer/President – January 2016 – Present

**Missouri Department of Transportation**, District Traffic Engineer, Kansas City District – June 2015 – January 2016

**City of Loveland, Colorado**, Senior Civil Engineer, Public Works Department – February 2005 – June 2015

**Kirkham Michael Consulting Engineers**, Project Manager - February 2004 – February 2005

**Dibble and Associates Consulting Engineers**, Project Engineer – August 1999 – February 2004