



**1665 Scotch Line Road,
Woolwich, ON**

Transportation Impact Study

Paradigm Transportation Solutions Limited

2025-04
240259



Project Summary



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Executive Summary

Content

1000535725 Ontario Inc. has retained Paradigm Transportation Solutions Limited (Paradigm) to complete this Transportation Impact Study (TIS) for a proposed industrial development located at 1665 Scotch Line Road in the Township of Woolwich, Region of Waterloo, Ontario.

This TIS includes an analysis of existing traffic conditions, a description of the proposed development traffic, traffic forecasts for a five-year horizon from assumed opening year (Year 2032), and any recommendations required to support future traffic conditions.

Development Concept

The subject site is located at 1665 Scotch Line Road in Township of Woolwich. The property owner is proposing to develop the 59.927 ha property to include an Industrial Park containing ten separate blocks dedicated to future industrial uses. The total gross floor area based on 50% lot coverage is approximately 2,121,244 sq.ft.

Vehicle access is proposed via two new municipal road connections to South Field Drive.

Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating within acceptable levels of service with no critical movements during the AM and PM peak hours.
- ▶ **Development Trip Generation:** The development is forecast to generate approximately 721 and 252 trips during the AM and PM peak hours, respectively.
- ▶ **Background Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with no specific problem movements.
- ▶ **Total Traffic Conditions:** With the addition of the site generated traffic, the study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with critical movements noted at the following intersections:



- South Field Drive and Union Street; and
- Arthur Street and Scotch Line Road.
- ▶ The two new roadway connections to South Field Drive are forecast to operate at LOS E or better and v/c ratios of 0.81 or lower during the AM and PM peak hours.
- ▶ **Remedial Measures:** left-turn lanes on South Field Drive at the two new roadway connections are not warranted as the left-turn percentages are below 5%.
- ▶ Right-turn lanes on South Field Drive at Street A (West) and Street A (East) are warranted based on turning volumes.
- ▶ Traffic control signals are not justified at the intersection of South Field Drive and Union Street under future traffic conditions.

Recommendations

Based on the findings of this study, it is recommended that the development be approved with the following provisions:

- ▶ Right-turn lanes on South Field Drive at Street A (West) and Street A (East);
- ▶ Traffic control signals at the intersection of South Field Drive and Union Street.



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1 Introduction

1.1 Overview

1000535725 Ontario Inc. has retained Paradigm Transportation Solutions Limited (Paradigm) to complete this Transportation Impact Study (TIS) for a proposed industrial development located at 1665 Scotch Line Road in the Township of Woolwich, Region of Waterloo, Ontario. **Figure 1.1** illustrates the subject development location.

1.2 Purpose and Scope

The purpose of this report is to identify and assess the potential traffic impacts resulting from the proposed development. The scope of this study, developed in consultation with the Region of Waterloo and Township of Woolwich in June 2024, includes:

- ▶ Assessment of current traffic and site conditions within the study area;
- ▶ Estimates of background traffic growth for assumed five years from opening year (Year 2032);
- ▶ Estimates of additional traffic generated by the development;
- ▶ Analyses of the impact of the future traffic on the surrounding road network; and
- ▶ Recommendations necessary to mitigate the site generated traffic in a satisfactory manner.

Pre-study consultation confirmed the following study area intersections:

- ▶ Arthur Street South and South Field Drive/Whippoorwill Drive;
- ▶ South Field Drive and Union Street;
- ▶ Arthur Street South and Scotch Line Road; and
- ▶ Two new municipal connections to South Field Drive.

Appendix A contains the pre-study consultation material and responses from the Township. This study has been completed in accordance with the Township of Woolwich Transportation Impact

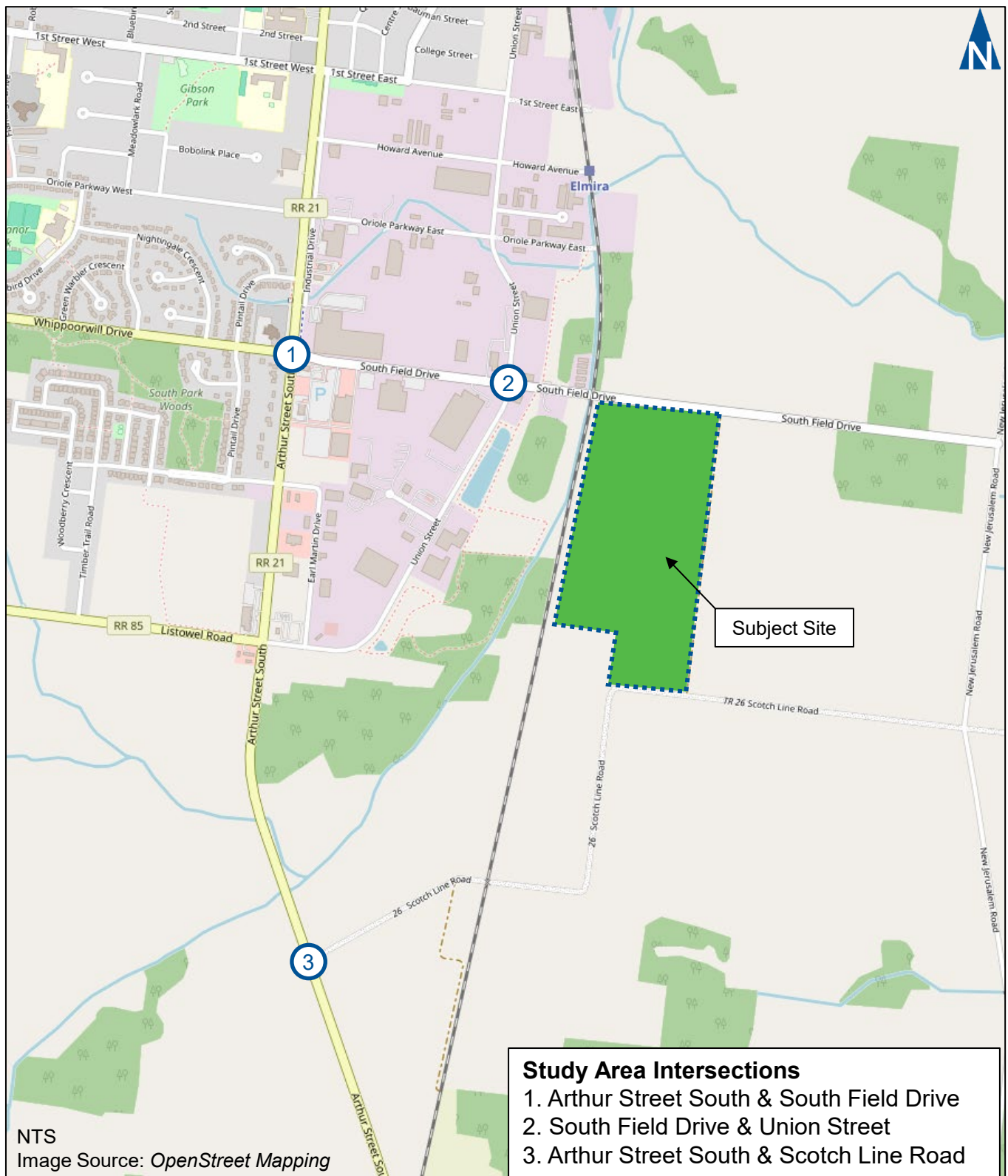


Study Guidelines¹, and Region of Waterloo Transportation Impact Study Guidelines².

¹ Township of Woolwich, *Engineering Development and Infrastructure Manual (EDIM)*, (Region of Waterloo, Woolwich, March 2022), Section 12 Transportation Impact Study Guidelines

² Region of Waterloo, *Transportation Impact Study Guidelines*, (Waterloo, September 2013).





2 Existing Conditions

This section documents current traffic conditions, operational deficiencies, and constraints experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of defining the required remedial measures.

2.1 Road Network

The main roadways under the jurisdiction³ of the Region of Waterloo near the subject site include:

- ▶ **Arthur Street South** is a three-lane (one travel lane per direction and a centre two-way left-turn lane), north-south Regional Road with a speed limit of 60 km/h.

The main roadways under the jurisdiction⁴ of the Township of Woolwich near the subject site include:

- ▶ **Union Street** is a north-south Collector Road with a two-lane cross-section and posted speed limit of 50 km/h.
- ▶ **South Field Drive** is an east-west Collector Road with a two-lane cross-section and posted speed limit of 50 km/h.

There is a stop-control traffic control on South Field Drive at the CN Waterloo Spur at-grade rail crossing.

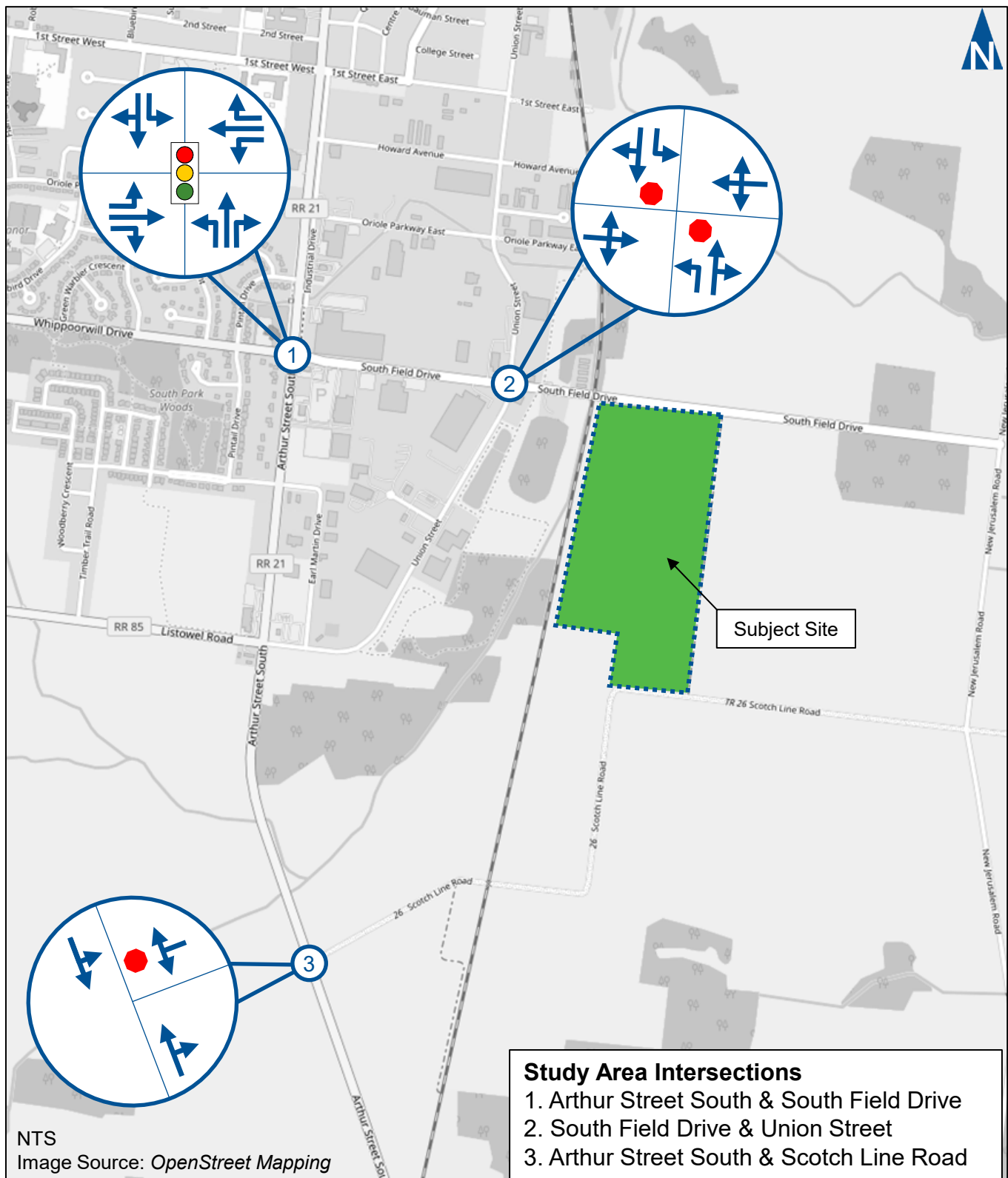
- ▶ **Scotch Line Road** is a two-lane gravel Township Road that provides access to farms between Arthur Street and Northfield Drive.

Figure 2.1 illustrates the existing lane configurations and traffic control at the study area intersections.

³ Region of Waterloo. *Official Plan Map 5b: Existing, Planned, and Proposed Roads and Corridors*. 2015.

⁴ Township of Woolwich, *Official Plan, Planning Horizon 2016 to 2031*, (August 2022).





2.2 Transit Network

Grand River Transit (GRT) currently operates one route into the community of Elmira along Arthur Street. **Route 21 (Elmira)** operates between Conestoga Station and the Arthur Street/Church Street intersection. It operates Monday to Fridays (6:05 AM to 7:45 PM) with headways approximately every 30 minutes, and on Saturdays (6:39 AM to 7:41 PM) with headways approximately every 30 minutes. There is no Sunday/Holiday service for this route.

The closest transit stops to the subject site are located at the Arthur Street South and South Field Drive/Whippoorwill Drive intersection. They are approximately 1 km (14 minute) walk.

2.3 Active Transportation

Arthur Street has sidewalks on both sides of the roadway. Arthur Street also has paved shoulders southwards from South Field Drive. Although not signed/marked as on-street cycle lanes, these could be used by cyclists. South Field Drive and Union Street does not have any sidewalks or cycling infrastructure. Travel by bicycle to/from the subject site is not restricted by any access-controlled roadways. Cyclists are permitted to ride on all roadways in the study area.

2.4 Traffic Volumes

Turning movement counts quantify the movement of vehicles through the area. Existing traffic data at an intersection or on a road section forms the foundation for the analysis. The counts are usually taken during peak periods at an intersection to complete level of service analyses under its worst-case operating conditions.

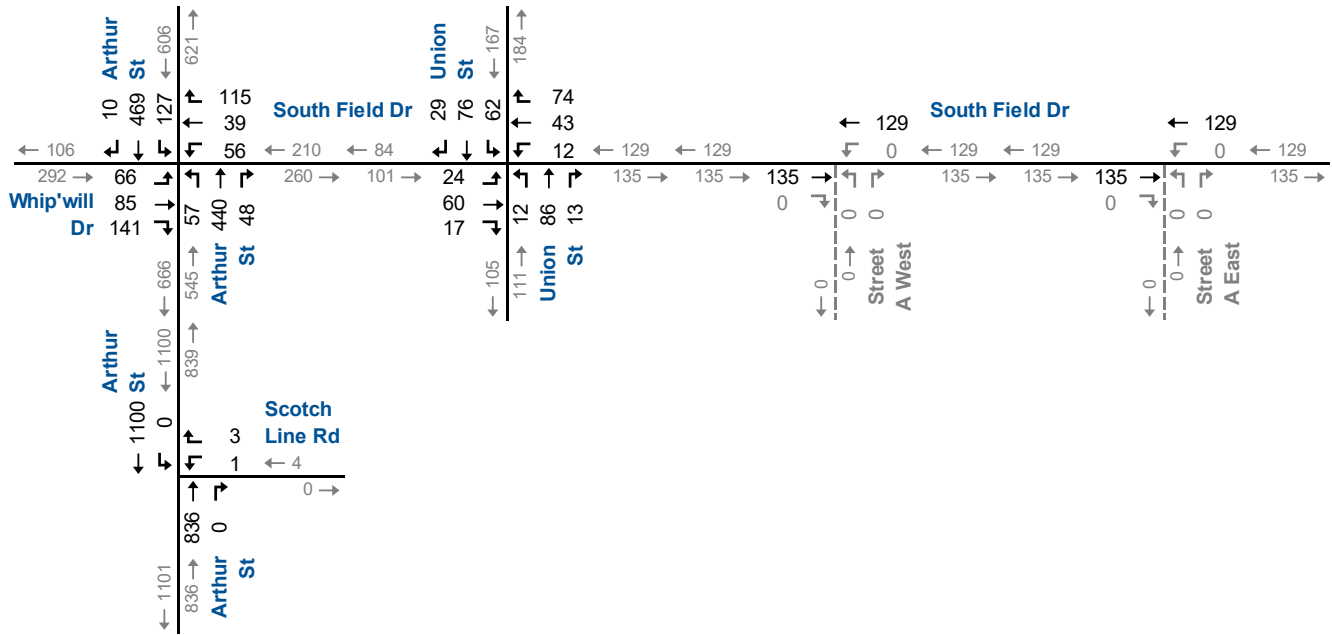
Eight-hour turning movement counts were conducted at the study area intersections on Wednesday May 29, 2024. **Appendix B** contains the existing count information and signal timing plans.

Figure 2.2 illustrates the base year weekday AM and PM peak hour traffic volumes.

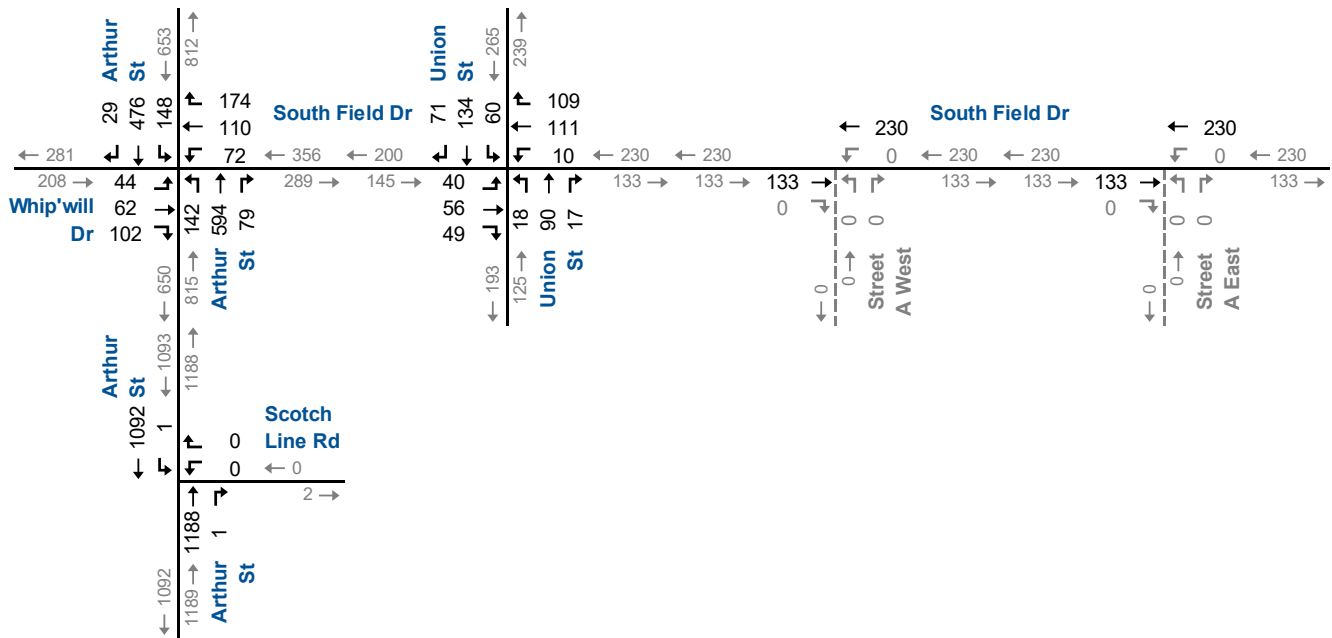




AM Peak Hour



PM Peak Hour



2.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to opposing traffic flows, intersection geometry, and at signalized intersections, signal timing.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.00, the movement is classed as LOS F, and remedial measures are usually implemented if they are feasible.

The operations of the study intersections have been analyzed using Synchro 11, with the existing lane configurations, traffic control, and estimated base year traffic volumes. The analysis considers three separate measures of performance:

- ▶ The Level of Service (LOS) for each turning movement
- ▶ The volume-to-capacity (v/c) ratio for each movement; and
- ▶ The 95th percentile queue lengths estimated using Synchro.

The Region of Waterloo's *Traffic Impact Study Guidelines*⁵ identify critical intersections as those operating at overall LOS E or F, regardless of control type (for example, signalized, unsignalized, or roundabout). The criteria for critical movements are where:

- ▶ The average control delay for individual movements is greater than 55 seconds
- ▶ The estimated 95th percentile queue length for an exclusive movement exceeds the available lane storages, or will block an existing access
- ▶ Exclusive turning lanes are inaccessible because of queue lengths in adjacent through lanes; and/or
- ▶ Poor quality of service for non-auto modes.

⁵ Region of Waterloo, *Transportation Impact Study Guidelines*, (Kitchener, Region of Waterloo, 2014).



Table 2.1 summarizes the base year level of service conditions. The results indicate that all study intersections are operating with acceptable levels of service and within capacity.

Appendix C contains the detailed Synchro reports



TABLE 2.1: BASE YEAR OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				Overall	
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	B 19 0.09 8 40 32	C 21 0.19 21 - -	B 13 0.26 24 40 16	B 17	C 20 0.16 15 25 10	B 19 0.08 11 - 13	A 7 0.24 12 25 13	B 13	A 5 0.11 5 40 35	B 13 0.46 2 58 -	A 1 0.07 2 40 38	B 11	A 6 0.24 10 30 20	B 15 0.54 64 -	> > > > >	B 13	B 13	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 2 0.02 0 - -	> > > > >	A 2	< < < < <	A 1 0.01 0 - -	> > > > >	A 1	B 12 0.02 1 25 24	B 12 0.15 4 - -	> > > > >	B 12	B 12 0.11 3 20 17	B 11 0.15 4 - -	> > > > >	B 11	A 7	
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		A 10 0.15 4 - -		A 10		A 10 0.14 4 - -		A 10										A 10
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					E 36 0.03 1 - -		> > > > >	E 45		A 0 0.49 0 - -	> > > > >	A 0	< < < < <	A 0 0.00 0 - -		A 0	A 0	
PM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	C 21 0.15 13 40 27	C 20 0.14 17 - -	B 14 0.17 20 40 20	B 17	C 22 0.23 19 25 6	C 21 0.23 26 - 10	A 7 0.36 15 25 10	B 14	A 7 0.34 12 40 28	B 17 0.68 85 -	A 3 0.11 5 40 35	B 14	A 6 0.34 11 30 19	C 26 0.80 81 -	> > > > >	C 21	B 17	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 2 0.03 1 - -	> > > > >	A 2	< < < < <	A 0 0.01 0 - -	> > > > >	A 0	C 16 0.05 1 25 24	B 13 0.20 6 - -	> > > > >	B 14	B 14 0.13 4 20 16	B 14 0.33 12 - -	> > > > >	B 14	A 8	
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		A 10 0.15 4 - -		A 10		B 10 0.26 8 - -		B 10										B 10
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					A 0 0.00 0 - -		> > > > >	A 0		A 0 0.70 0 - -	> > > > >	A 0	< < < < <	A 0 0.00 0 - -		A 0	A 0	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

< / > - Shared Turn Lane



3 Development Concept

3.1 Description

The subject site is located at 1665 Scotch Line Road in Township of Woolwich. The property owner is proposing to develop the 54.92 ha property to include an Industrial Park containing ten separate blocks dedicated to future industrial uses. **Table 3.1** outlines the size of each block as well as the assumed GFA for each block which is based on 50% lot coverage. It indicates that the subject site is proposed to have approximately 2,121,244 sq.ft. of GFA.

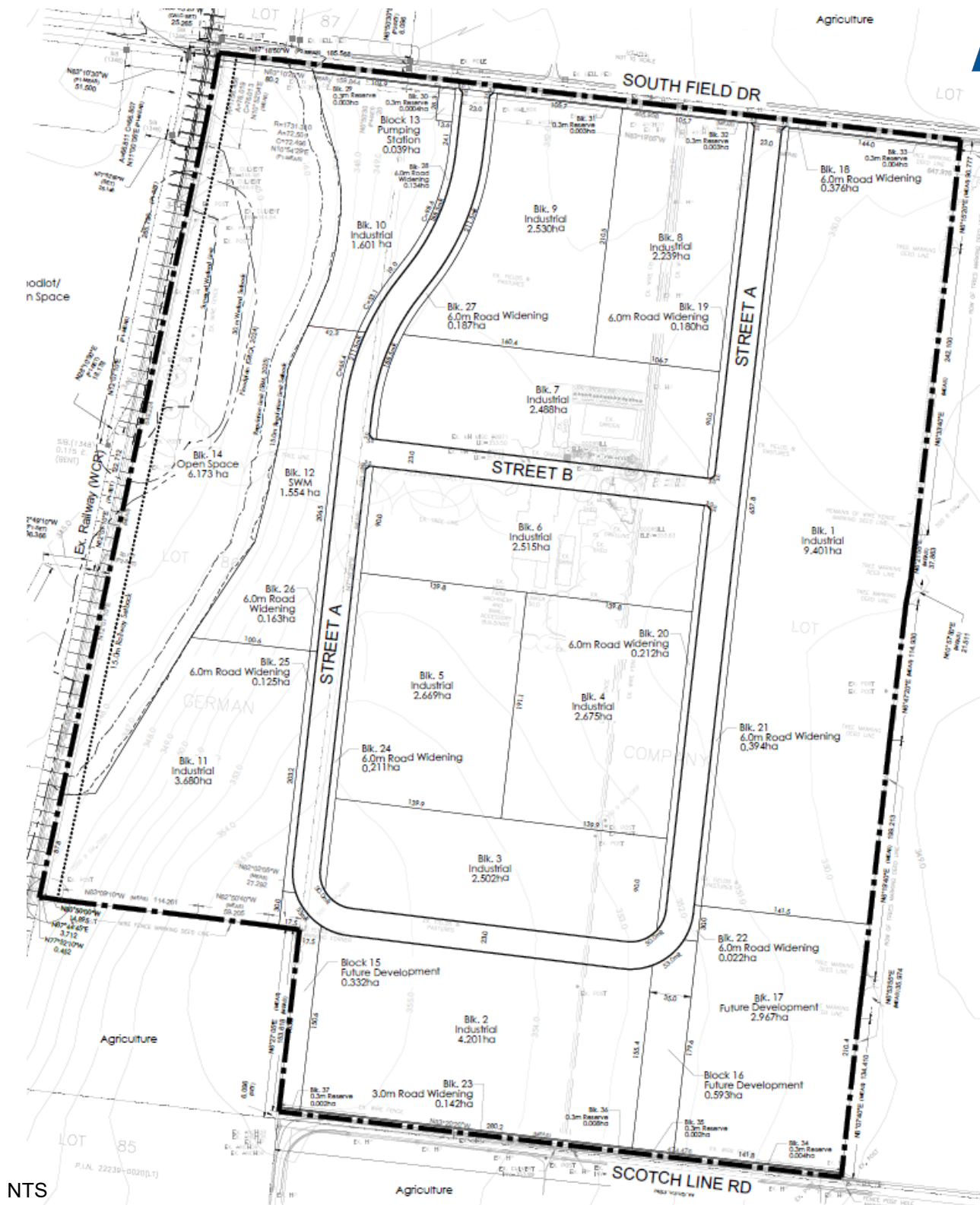
TABLE 3.1: BLOCK SIZE AND COVERAGE

Block #	Hectares (ha)	Square Feet (sq.ft.)	Coverage
			50%
1	9.450	1,017,189.5	508,594.7
2	4.319	464,893.3	232,446.6
3	2.555	275,017.9	137,509.0
4	2.690	289,549.2	144,774.6
5	2.682	288,688.1	144,344.0
6	2.538	273,188.0	136,594.0
7	2.532	272,542.2	136,271.1
8	2.931	315,490.2	157,745.1
9	2.947	317,212.4	158,606.2
10	6.770	728,716.7	364,358.4
Total	13.769	4,242,487.5	2,121,243.7

Vehicle access is proposed via two new municipal road connections to South Field Drive

Figure 3.1 shows the proposed concept plan.





3.2 Trip Generation & Distribution

The trip generation of the site has been estimated using information contained in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual*.⁶ The Land Use Code (LUC) 130 – Industrial Park (GFA/1,000 sq.ft.) was used to estimate the AM and PM peak hour site trips.

The average rates were used to calculate the trips generated by the site. No reductions for modal split were calculated to provide a conservative estimate.

Table 3.1 summarizes the trip generation calculations. The site is estimated to generate 721 net new trips in the AM peak hour, and 721 net new trips in the PM peak hour.

TABLE 3.2: TRIP GENERATION

ITE Trip Gen	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
130 - Industrial Park (GFA/1,000 sq.ft.)	2,121.2	584	137	721	159	562	721

AM Average Rate 0.34 / PM Average Rate 0.34

The site generated trips were assigned to the road network based on origin/destination information extracted from the 2016 Transportation Tomorrow Survey, and existing traffic patterns at the study intersections.⁷ **Appendix D** contains the TTS data and development of the trip distribution.

Table 3.3 summarizes the estimated trip distribution.

⁶ Institute of Transportation Engineers. *Trip Generation Manual (10th Edition)*. Washington, D.C. September 2017.

⁷ The Transportation Tomorrow Survey (TTS) is a comprehensive travel survey conducted in the Greater Toronto and Hamilton Area (GTHA) once every five years (2016) and includes the City of Kitchener.

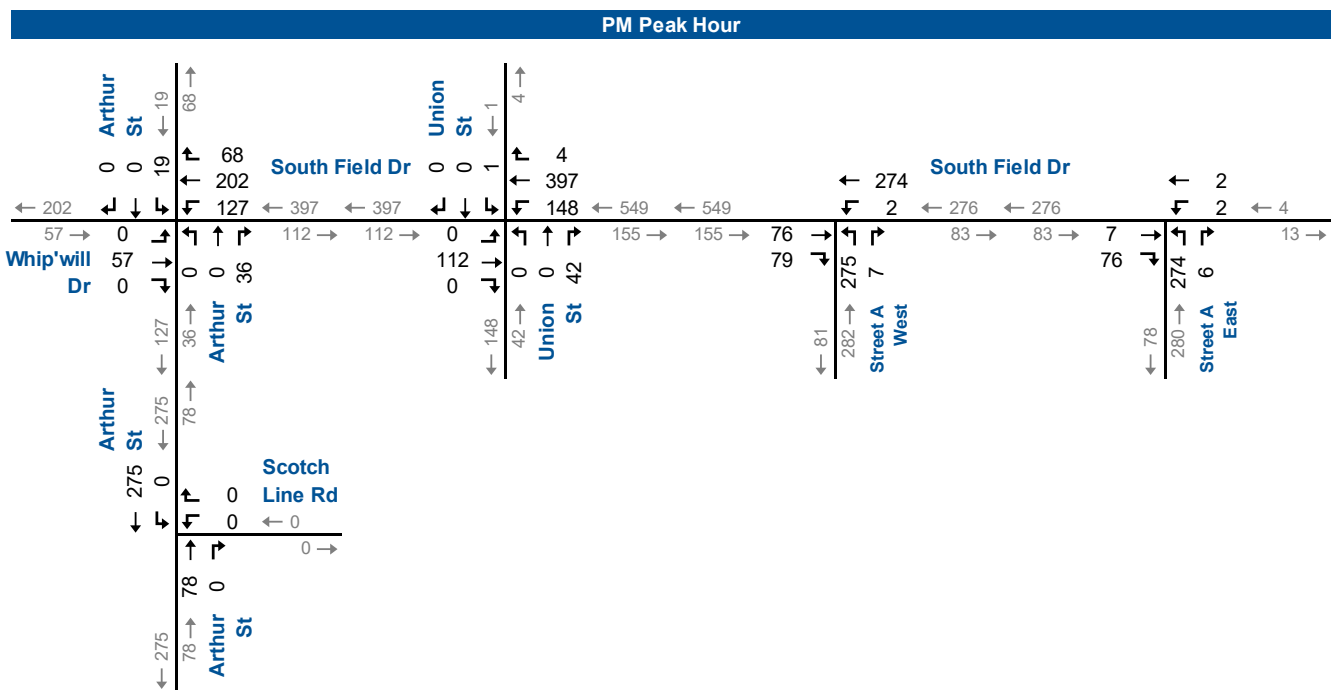
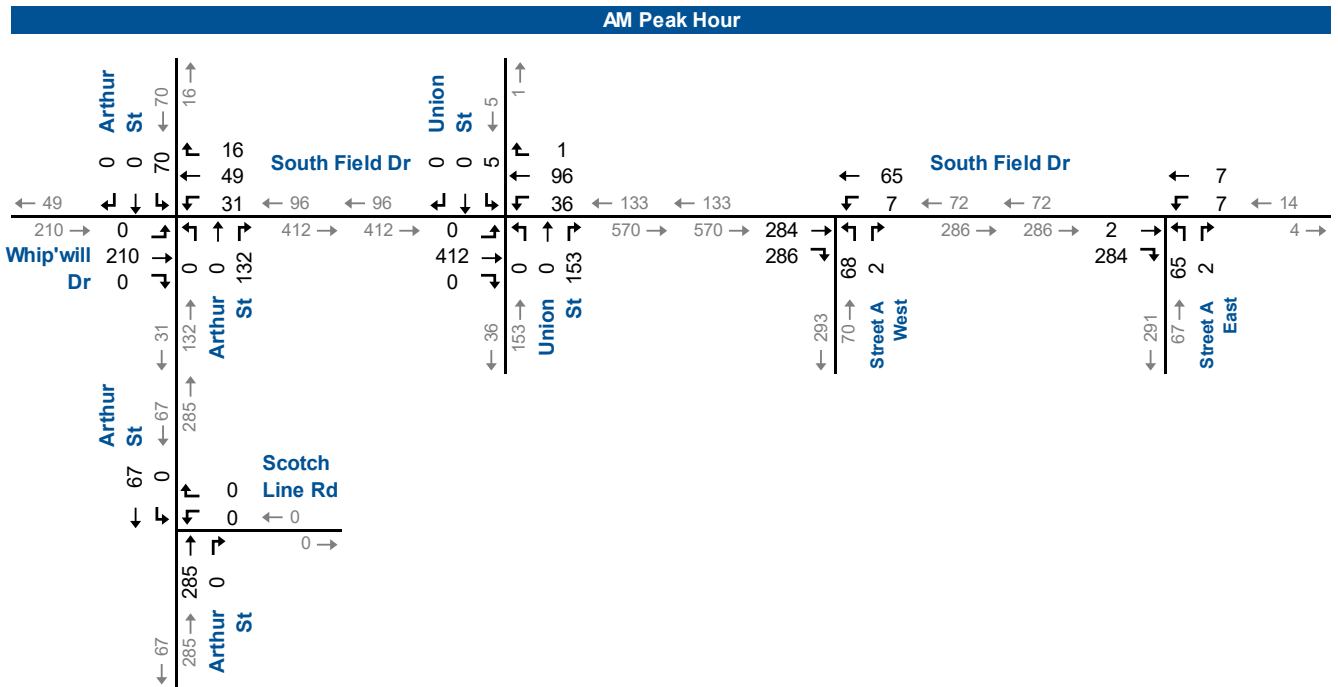


TABLE 3.1: ESTIMATED TRIP DISTRIBUTION

Direction/Route		Trips	%
North	Arthur Street	830	12%
	Union Street	55	1%
East	South Field Drive	169	2%
South	Arthur Street	1,559	23%
	Union Street	1,815	26%
West	Whippoorwill Drive	2,482	36%
Total		6,910	100%

Figure 3.2 illustrates the site generated traffic estimates.





4 Future Conditions

4.1 Horizon Years

Consistent with the established terms of reference, traffic forecasts and analyses have been completed for five years beyond assumed opening year (2032).

4.2 Future Roadway Improvements

The Region of Waterloo is currently undertaking a Class Environmental Assessment (EA) for a potential Elmira By-pass. The current plan has a by-pass to the west of the subject site and east of the CN Waterloo Spur. Recent discussions with the Region and the developer/owner of the subject site have resulted in two possible route options

- ▶ Northern extension of Scotch Line Road through to South Field Drive,
- ▶ Proposed Street A connection between Southfield and Scotch Line on the eastern side of the development.

As the Region have indicated that the by-pass will not be required until the 2051 horizon year, it has not been considered in this future analysis.

4.3 Future Traffic Volumes

4.3.1 Future Background Traffic Volumes

The future background traffic volumes in the study area are expected to comprise general background growth and specific traffic generated by approved or in-stream developments. A general background traffic has been estimated through the application of a 2.0% per annum growth rate.

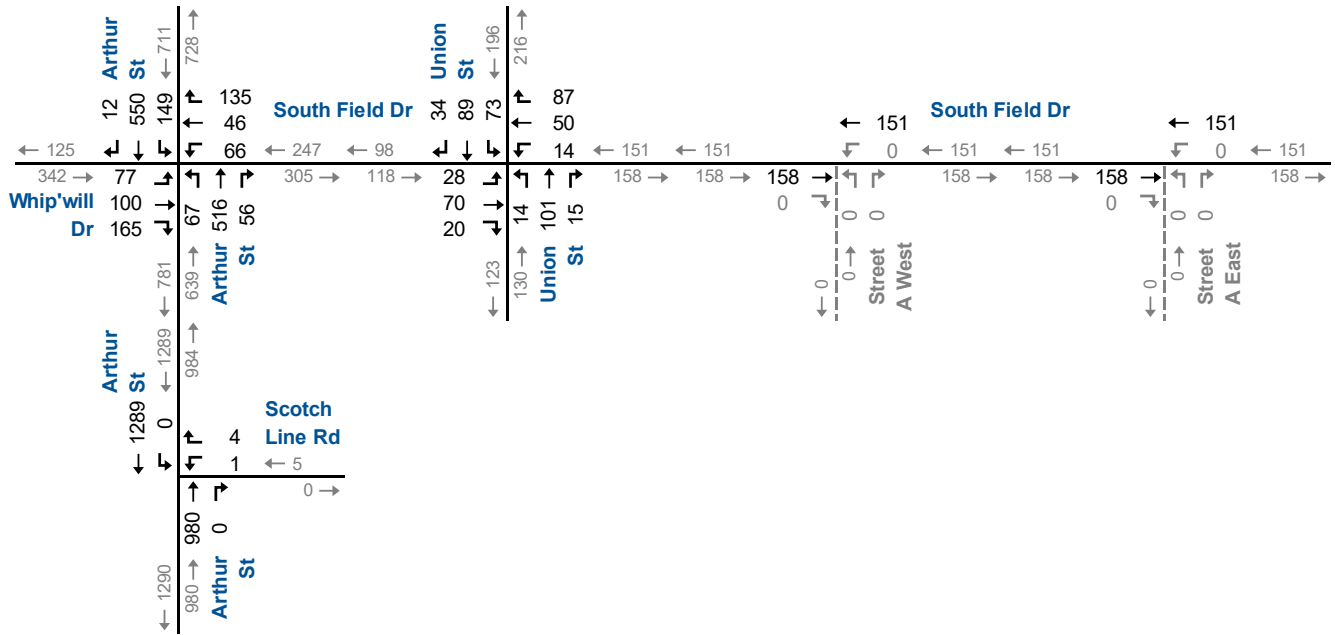
Regional/Township staff did not identify any background developments during the pre-study consultation.

Figure 4.1 illustrates the forecast background traffic volumes.

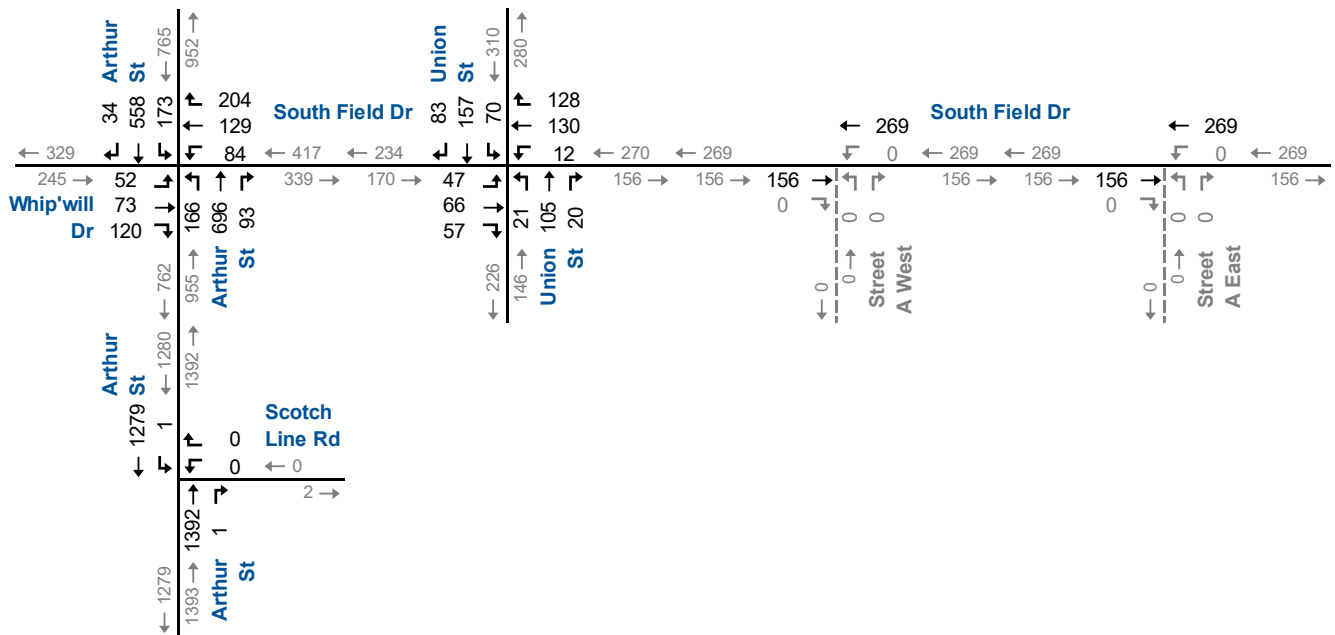




AM Peak Hour



PM Peak Hour

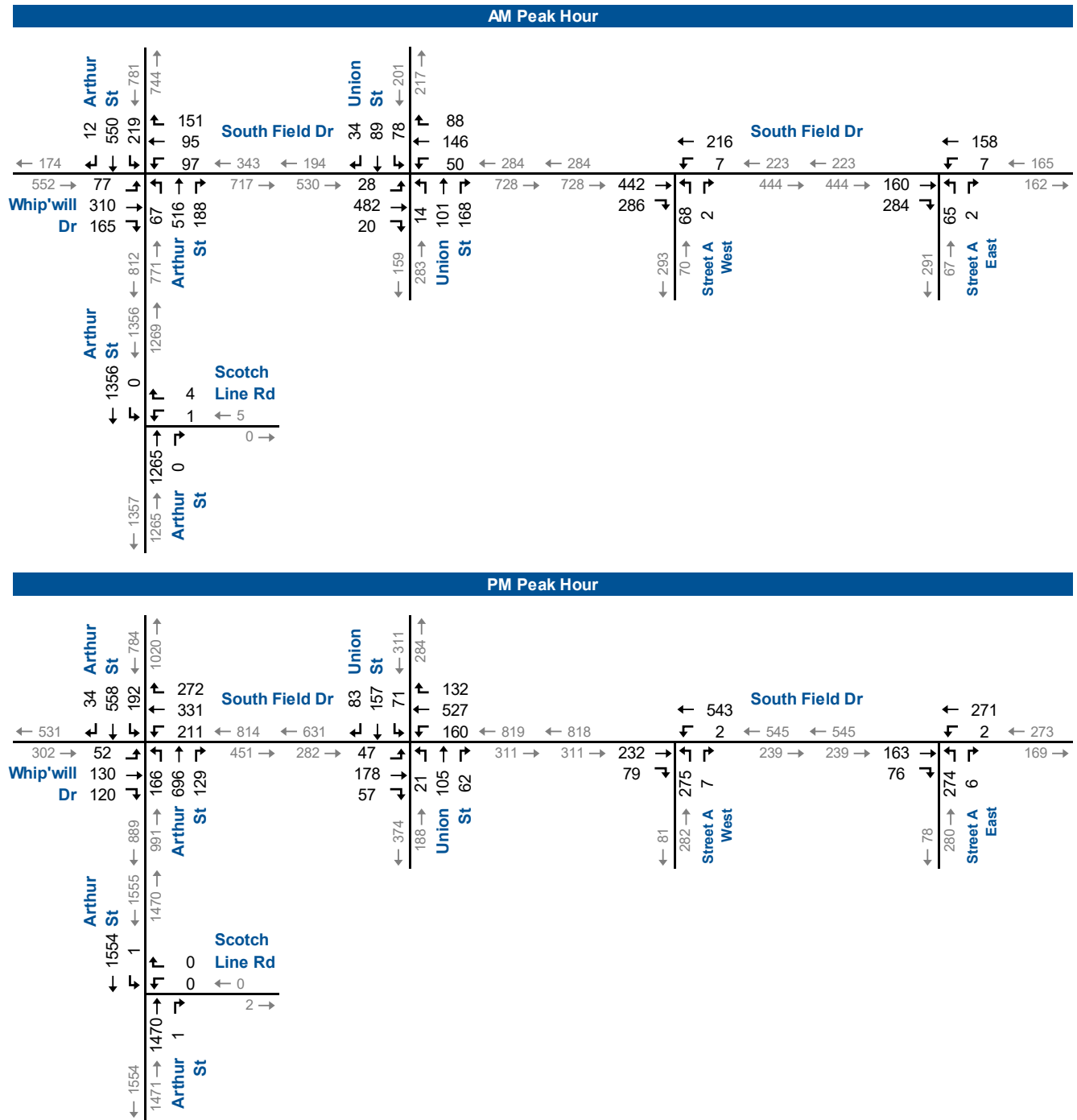


4.3.2 Future Total Traffic Volumes

The forecast total traffic volumes have been estimated through the summation of the forecast site generated traffic volumes to the forecast background traffic volumes.

Figure 4.2 illustrates the forecast total traffic volumes for the weekday AM and PM peak hours.





4.4 Future Traffic Operations

4.4.1 Background Traffic Operations

The study area intersection operations analysis for the background traffic scenario follows the same methodology used for existing traffic conditions. **Table 4.1** summarizes the level of service conditions. The study intersections are forecast to operate at acceptable levels of service and within capacity with no specific problem movements.

Appendix E contains the detailed Synchro reports.

4.3.2 Total Traffic Operations

The study area intersection operations analysis for the total traffic scenario follows the same methodology used for background traffic conditions. **Table 4.2** summarizes the level of service conditions.

The results forecast the study intersection to operate with acceptable levels of service and within capacity with the following critical movements noted:

- ▶ South Field Drive and Union Street:
 - Southbound left-turn movement with LOS F and v/c ratio greater than 1.00 during the PM peak hour;
 - Southbound through/right-turn movement with LOS F and v/c ratio greater than 1.00 during the PM peak hour;
 - Northbound left-turn movement with LOS R and v/c ratio of 0.87 during the AM peak hour and LOS F and v/c ratio greater than 1.00 during the PM peak hour; and
 - Northbound through/right-turn movement with LOS F and v/c ratio greater than 1.00 during the PM peak hour.
- ▶ Arthur Street and Scotch Line Road:
 - Westbound left/right-turn movement with LOS F and v/c ratio of 0.84 during the AM peak hour. The low v/c ratio indicates that while there is delay, there remains excess capacity for this movement.

The new municipal roadway connections to South Field Drive are forecast to operate at LOS E or better and v/c ratios of 0.81 or lower during the AM and PM peak hours.

Appendix F contains the detailed Synchro reports.



TABLE 4.1: FUTURE BACKGROUND OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				Overall	
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	C 25 0.24 23 40 18	C 24 0.21 26 - -	B 18 0.34 35 40 5	C 21	C 25 0.22 20 25 5	C 23 0.10 15 - -	A 8 0.30 14 25 11	B 15	A 5 0.15 6 40 34	B 14 0.57 73 - -	A 1 0.08 3 40 37	B 12	A 6 0.32 13 30 17	B 18 0.71 92 - -	> > > > >	B 16	B 15	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 2 0.02 1 - -	> > > > >	A 2	< < < < <	A 1 0.01 0 - -	> > > > >	A 1	B 12 0.03 1 25 24	B 12 0.19 6 - -	> > > > >	B 12	B 13 0.14 4 20 16	B 12 0.18 5 - -	> > > > >	B 12	A 7	
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		A 10 0.18 5 - -		A 10		A 10 0.17 5 - -		A 10										A 10
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					E 48 0.06 1 - -		> > > > >	E 48		A 0 0.58 0 - -	> > > > >	A 0	< < < < <	A 0 0.00 0 - -		A 0	A 0	
PM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	C 25 0.19 16 40 24	C 24 0.17 20 - -	B 17 0.21 26 40 14	C 21	C 26 0.29 24 25 1	C 25 0.29 33 - -	A 7 0.42 17 25 8	B 16	A 9 0.45 15 40 25	C 20 0.78 114 -	A 3 0.13 7 40 33	B 17	B 16 0.61 18 30 12	C 22 0.79 103 -	> > > > >	C 21	B 18	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 2 0.04 1 - -	> > > > >	A 2	< < < < <	A 0 0.01 0 - -	> > > > >	A 0	C 19 0.07 2 25 23	B 15 0.26 8 - -	> > > > >	C 15	C 17 0.18 5 20 15	C 16 0.42 17 - -	> > > > >	C 16	A 9	
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		A 10 0.17 5 - -		A 10		B 11 0.30 10 - -		B 11										B 10
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					A 0 0.00 0 - -		> > > > >	A 0		A 0 0.82 0 - -	> > > > >	A 0	< < < < <	A 0 0.00 0 - -		A 0	A 0	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

< / > - Shared Turn Lane



TABLE 4.2: FUTURE TOTAL OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	Overall
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	C 24 0.23 22 40 18	C 29 0.59 73 - 6	B 17 0.27 34 40 6	C 24	D 36 0.53 31 25 -6	C 22 0.19 24 - 11	A 6 0.31 14 25 11	B 19	A 8 0.20 10 40 30	C 20 0.66 99 - 40	A 4 0.28 13 40 27	B 15	B 16 0.61 29 30 1	C 27 0.81 123 - 1	> > > > >	C 24	C 21	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 1 0.02 1 - >	> > > > >	A 1	< < < < <	A 2 0.05 1 - >	> > > > >	A 2	D 29 0.08 2 25 23	E 35 0.72 43 - >	E 35	F 144 0.87 38 20 -18	C 22 0.37 13 - >	> > > > >	F 69	C 19		
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		C 24 0.81 73 -		C 23		B 11 0.32 11 -		B 11										C 20
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					F 84 0.10 3 -	> > > > >	F 84		A 0 0.74 0 -	> > > > >	A 0	< < < < <	A 0 0.00 0 -		A 0	A 0		
	South Field Drive & Street A (West)	TWSC	LOS Delay V/C Q Ex Avail.		A 0 0.43 0 -	> > > > >	A 0	< < < < <	A 0 0.01 0 -		A 0	C 18 0.20 6 -	> > > > >	C 18						A 1	
	South Field Drive & Street A (East)	TWSC	LOS Delay V/C Q Ex Avail.		A 0 0.26 0 -	> > > > >	A 0	< < < < <	A 0 0.01 0 -		A 0	B 13 0.12 3 -	> > > > >	B 13						A 1	
PM Peak Hour	Arthur Street & Whippoorwill Drive/South Field Drive	TCS	LOS Delay V/C Q Ex Avail.	C 28 0.29 17 40 23	C 24 0.25 32 - 15	B 17 0.19 25 40 15	C 22	D 35 0.64 57 25 -32	C 30 0.61 78 32 25 -7	B 11 0.50 32 25 -	C 25	B 14 0.51 22 40 18	C 28 0.83 150 - 40	A 6 0.19 13 40 27	C 23	C 32 0.76 39 30 -9	C 28 0.82 131 - >	> > > > >	C 29	C 25	
	South Field Drive & Union Street	TWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 2 0.05 1 - >	> > > > >	A 2	< < < < <	A 3 0.12 3 - >	> > > > >	A 3	F 93 Err 54 25 Err	> > > > >	F Err	F 763 2.10 64 20 -44	F 201 1.26 105 - >	> > > > >	F 329	F Err		
	South Field Drive & Rail Crossing	TWSC	LOS Delay V/C Q Ex Avail.		B 11 0.35 13 -		B 11		D 35 0.91 107 -		D 35										D 28
	Arthur Street & Scotch Line Road	TWSC	LOS Delay V/C Q Ex Avail.					A 0 0.00 0 -	> > > > >	A 0		A 0 0.87 0 -	> > > > >	A 0	< < < < <	A 0 0.00 0 -		A 0	A 0		
	South Field Drive & Street A (West)	TWSC	LOS Delay V/C Q Ex Avail.		A 0 0.18 0 -	> > > > >	A 0	< < < < <	A 0 0.00 0 -		A 0	E 47 0.81 55 -	> > > > >	E 47						B 12	
	South Field Drive & Street A (East)	TWSC	LOS Delay V/C Q Ex Avail.		A 0 0.14 0 -	> > > > >	A 0	< < < < <	A 0 0.00 0 -		A 0	C 18 0.51 23 -	> > > > >	C 18						A 6	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

< / > - Shared Turn Lane



5 Remedial Measures

5.1 Left-Turn Lanes

The need for dedicated left-turn lanes at unsignalized intersections within the study area was assessed using Ministry of Transportation (MTO) procedures outlined in the *Design Supplement for the TAC Guide*⁸.

The percentages of left-turning vehicles in the approaching volume were rounded to the nearest 5%, as nomographs are only provided for 5% increments. This apparent requirement is due to the nature of the warrant procedure that assumes a minimum of 5% of left turning vehicles in the advancing volume. Therefore, left-turn lanes are automatically not warranted for any left turning volume less than 5%.

Table 5.1 summarizes the left-turn lane analyzes for the two new roadway connections to South Field Drive. It indicates that the left-turn volume percentage is forecast to be less than 5% during the AM and PM peak hours for both roadways. Left-turn lanes on South Field Drive are not warranted.

TABLE 5.1: LEFT-TURN LANE WARRANT SUMMARY

Roadway	South Field Drive			
Intersection	Site Access (West)		Site Access (East)	
Approach Direction	Westbound		Westbound	
Design Speed	70 km/h		70 km/h	
Horizon	Total - 2032		Total - 2032	
Peak Hour	AM	PM	AM	PM
Advancing Volume	223	543	444	273
Opposing Volumes	729	311	165	239
Left Turning Traffic	7	2	7	2
% of Left Turning Traffic	3%	0%	2%	1%
Figure Used*				
Warranted	No	No	No	No
Storage Length Required				

Based on MTO Design Supplement, October 2023 for TAC Geometric Design Guide for Canadian Roads - October 2023

⁸ Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020),



5.2 Right-Turn Lanes

The proposed municipal connections to South Field Drive were assessed to determine if the forecast traffic volumes warrant installation of auxiliary right-turn lane.

Although right-turns are generally made more efficiently than left-turn movements, exclusive right-turn lanes are often provided for many of the same reasons that left-turn lanes are provided such as a reduction in rear-end collisions and less delay for the through traffic.

MTO guidelines (Geometric Design Standards for Ontario Highways) note that right-turn lanes or tapers may be considered where right-turn volumes exceed 60 vehicles per hour (vph) and where right-turning vehicles create a hazard or reduce capacity at the intersection.

Table 5.2 summarizes the highest forecast right-turn movements at the study area intersections. It indicates that an eastbound right-turn lane are warranted on South Field Drive at both the west and east Street A with full build-out of the site.

TABLE 5.2: FORECAST RIGHT-TURN TRAFFIC VOLUMES

Intersection	Direction	Forecast Right-Turn Volumes		> 60 vph
		Total (2033)		
		AM	PM	
South Field Drive & Site Access (West)	EBR	286	79	Yes
South Field Drive & Site Access (East)	EBR	284	76	Yes

5.3 South Field Drive and Union Street

The operational analysis indicates that the northbound and southbound minor approaches will operate with delay and capacity constraints under future total traffic conditions.

Table 5.3 summaries the Ontario Traffic Manual (OTM) Book 12 Justification 7⁹ analyses for the intersection of South Field Drive and Union Street.

It indicates that traffic signals are not justified at the three new municipal intersections under 2032 future traffic conditions.

Appendix G includes the signal warrant worksheets.

⁹ Ontario Ministry of Transportation, *Ontario Traffic Manual Book 12: Traffic Signals*, (Toronto: Queen's Printer for Ontario, 2012).



TABLE 5.3: TRAFFIC SIGNAL CONTROL JUSTIFICATION

Intersection	Horizon	OTM Warrant Summary				Warranted	
		1A	1B	2A	2B	120%	150%
South Field Drive & Union Street	Background 2032	53%	121%	25%	141%	No	No
	Total 2032	101%	145%	66%	143%	No	No

In order to mitigate the delay and capacity constraints, unwarranted traffic control signals was analyzed at the intersection of South Fields Drive and Union Street. **Table 5.4** summarizes the operations for South Field Drive and Union Street with unwarranted traffic control signals under 2032 total traffic conditions. It indicates that the intersection is forecast to operate with acceptable levels of service with exclusive turning lanes for all approaches.

Appendix H contains the detailed Synchro reports.

It is recommended that the Township of Woolwich consider the installing traffic control signals at the intersection of South Field Drive and Union Street upon the full build-out of the subject site.



TABLE 5.4: TOTAL TRAFFIC OPERATIONS WITH IMPROVEMENTS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	South Field Drive & Union Street	TCS	LOS	<	B	>	B	<	A	>	A	B	B	>	B	B	B	>	B	B
			Delay	<	16	>	15	<	9	>	9	14	14	>	14	18	12	>	15	14
			V/C	<	0.70	>		<	0.43	>		0.05	0.62	>		0.32	0.29	>		
			Q	<	86	>		<	32	>		4	29	>		16	18	>		
			Ex Avail.	<	-	>		<	-	>		25	-	>		20	-	>		
PM Peak Hour	South Field Drive & Union Street	TCS	LOS	<	A	>	A	<	C	>	C	C	C	>	C	D	D	>	D	C
			Delay	<	6	>	6	<	33	>	33	31	34	>	34	37	42	>	41	30
			V/C	<	0.33	>		<	0.94	>		0.14	0.58	>		0.38	0.73	>		
			Q	<	27	>		<	218	>		10	43	>		24	67	>		
			Ex Avail.	<	-	>		<	-	>		25	-	>		20	-	>		

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

< / > - Shared Turn Lane



6 Conclusions and Recommendations

6.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating within acceptable levels of service with no critical movements during the AM and PM peak hours.
- ▶ **Development Trip Generation:** The development is forecast to generate approximately 721 and 252 trips during the AM and PM peak hours, respectively. 721
- ▶ **Background Traffic Conditions:** The study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with no specific problem movements.
- ▶ **Total Traffic Conditions:** With the addition of the site generated traffic, the study area intersections are forecast to operate within acceptable levels of service during the AM and PM peak hours with critical movements noted at the following intersections:
 - South Field Drive and Union Street; and
 - Arthur Street and Scotch Line Road.
- ▶ The two new roadway connections to South Field Drive are forecast to operate at LOS E or better and v/c ratios of 0.81 or lower during the AM and PM peak hours.
- ▶ **Remedial Measures:** left-turn lanes on South Field Drive at the two new roadway connections are not warranted as the left-turn percentages are below 5%.
- ▶ Right-turn lanes on South Field Drive at Street A (West) and Street A (East) are warranted based on turning volumes.
- ▶ Traffic control signals are not justified at the intersection of South Field Drive and Union Street under future traffic conditions.

6.2 Recommendations

Based on the findings of this study, it is recommended that the development be approved with the following provisions:

- ▶ Right-turn lanes on South Field Drive at Street A (West) and Street A (East);



- ▶ Traffic control signals at the intersection of South Field Drive and Union Street.



Appendix A

Pre-Study Consultation



From: [Stephen Dykstra](#)
To: [Andrew Evans](#)
Cc: [JBhatia@regionofwaterloo.ca](#); [Bryan Bishop](#); [Erica Bayley](#)
Subject: RE: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work
Date: May 28, 2024 8:32:34 AM
Attachments: [image003.png](#)

Andrew,

My role as the Township Planner will not be to comment on the TOR for the TIS, however, you may want to speak with the applicant and the other consultants as I understand that the road pattern has been changed. This may have an impact on the parameters of the TIS.

Regards,

Stephen Dykstra MCIP, RPP
Senior Planner
Township of Woolwich

From: Jeremy Vink <jvink@woolwich.ca>
Sent: Monday, May 27, 2024 2:56 PM
To: Stephen Dykstra <sdykstra@woolwich.ca>
Subject: FW: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work

This is yours...

Jeremy Vink MCIP RPP
Manager of Planning
Development Services
Township of Woolwich



From: Andrew Evans <aevans@pts1.com>
Sent: Monday, May 27, 2024 2:50 PM
To: Joginder Bhatia <JBhatia@regionofwaterloo.ca>; Bryan Bishop <BBishop@woolwich.ca>; Jeremy Vink <jvink@woolwich.ca>
Cc: Erica Bayley <ebayley@pts1.com>
Subject: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work

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Greetings,

Paradigm Transportation Solutions Limited is preparing the Transportation Impact Assessment for a proposed industrial subdivision on the lands 1665 Scotch Line Road, Elmira, Township of Woolwich, ON.

Below is a brief description of the concept and our proposed terms of reference for the TIS. Please review and provide comment at your earliest convenience. The Region of Waterloo Pre-Study Consultation Form is also attached.

SITE DESCRIPTION

- The subject site is located at 1665 Scotch Line Road in Elmira, bounded by Scotch Line Road to the south and South Field Drive to the north. The property owner is proposing to redevelop the property to include a 43-hectare industrial park. Vehicle access is proposed via one new street connection to South Field Drive and emergency access to Scotch Line Road. **The concept plan is attached.**

PROPOSED TERMS OF REFERENCE

- Study Area Intersections:

- Arthur Street & South Field Drive/Whippoorwill Drive (signalized)
- South Field Drive & Union Street (unsignalized)
- Arthur Street and Scotch Line Road (unsignalized); and
- New Street Connection to South Field Drive.

Analysis Periods:

- Weekday AM peak hour; and
- Weekday PM peak hour.

Horizon Year

- Five-years from the assumed full build-out (Year 2032).

Existing Data:

- Eight Hour TMC at the study area intersections

Analysis

- Synchro 11

Background Traffic

- Generalized growth rate: **to be provided by Township/Region**
- Active Development Applications: **to be provided by Township/Region**

Future Road Improvements: **to be provided by Township/Region**

Trip Generation

- ITE Trip Generation Data 11th Edition with no modal split reductions.

Site Traffic Distribution

- Existing Traffic Patterns.

Report

- We will document the study methodologies, findings, and conclusions in a report with appendices containing the detailed analysis results and any data collected.

Please let us know your comments on the study.

Thank you and regards.

Andrew Evans, M.Sc.

Transportation Planner, Associate

Paradigm Transportation Solutions Limited

5A-150 Pinebush Road Cambridge ON N1R 8J8

p: 519.896.3163 x305

e: aevans@ptsl.com

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Office Hours: 07:30 – 17:30 M-T, closed Fridays



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From: [Cheryl Marcy](#)
To: [Erica Bayley](#); [Andrew Evans](#)
Cc: [Joginder Bhatia](#); [Tanikia Kinear](#)
Subject: FW: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work
Date: May 28, 2024 9:47:35 AM
Attachments: [image006.png](#)

Hi Erica and Andrew,

We've had some recent changes in our office and Tanikia Kinnear, Transportation Planner, would now be the Region contact for this project. Please send future information on this project to her, not to Jogi.

Thanks,
Cheryl Marcy, C.E.T.
Senior Transportation Planner

Regional Municipality of Waterloo
Planning, Development and Legislative Services
150 Frederick Street, 8th Floor
Kitchener, ON N2G 4J3

Phone: 226-753-1093
cmarcy@regionofwaterloo.ca

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From: Erica Bayley <ebayley@ptsl.com>
Sent: Tuesday, May 28, 2024 8:34 AM
To: Stephen Dykstra <sdykstra@woolwich.ca>; Andrew Evans <aevans@ptsl.com>
Cc: Joginder Bhatia <JBhatia@regionofwaterloo.ca>; Bryan Bishop <BBishop@woolwich.ca>
Subject: RE: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work

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Thanks Stephen. We'll review with our team.

Erica Bayley, P.Eng.

Senior Project Manager, Associate
(She/Her)

Paradigm Transportation Solutions Limited

p: 519.896.3163 x202
m: 519.635.5349

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Manager of Planning
Development Services
Township of Woolwich



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Sent: Monday, May 27, 2024 2:50 PM

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Cc: Erica Bayley <ebayley@ptsl.com>

Subject: [EXT] (240259) 1665 Scotch Line Road, Elmira TIS Scope of Work

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Thank you and regards.

Andrew Evans, M.Sc.

Transportation Planner, Associate

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APPENDIX A:
PRE-STUDY CONFERENCE FORM
1665 Scotch Line Road, Elmira, Woolwich

Item	Description	Details
ISSUES		
1	List any issues expected that may impact the content or recommendations of the subject Transportation Impact Study.	– To be determined
INTRODUCTION		
2	Nature of application (Attach a drawing)	– Official Plan Amendment – Zoning Amendment
3	TIS process, and relevant policies, procedures and approvals	– Guidelines for the preparation of Transportation Impact Studies in Support of Development Applications – Transportation Impact Studies Requirements for Capacity Analysis, Roundabouts, Turn Lanes – Synchro Lanes, Timings, and Queues preferred reporting format
	Public Meeting	– To be determined
CONTEXT		
5	Study intersections (Intersections to be analyzed) Note: the consultant is responsible to identify any further intersections impacted as the study progresses.	1. Arthur Street & South Field Drive/Whippoorwill Drive (signalized) 2. South Field Drive & Union Street (unsignalized) 3. Arthur Street & Scotch Line Road (unsignalized) 4. New Street Connection to South Field Drive
6	Size and number of phases of development	– 43 ha Industrial Park – Phasing TBD
7	Approved and pending approval development applications	– TBD
8	Planned transportation system improvements	– TBD
TRAVEL DEMAND		
9	Horizon years	– 5 years from expected year of completion (2032)

10	Peak hour determination	-AM weekday peak hour of adjacent roadway - PM weekday peak hour of adjacent roadway
11	Background	- Growth Rates: TBD - Traffic Generated from developments noted in Issue #7
12	Trip generation	- ITE average rates or fitted equation.
13	Trip reductions (TDM, internal, pass-by)	- TBD
14	Trip distribution	- ITE trip distribution IN/OUT split
15	Trip assignment	- Local traffic pattern
EVALUATION OF IMPACTS		
16	Traffic impact analysis (Use approved software)	- Signalized intersections - LOS, v/c, delay, queuing - Queuing analysis

Item	Description	Details
17	Roundabout feasibility (Use approved software)	– TBD
18	Transit assessment	– Presence of bus stops/LRT Stations
19	Pedestrian assessment	– Presence, connectivity, and width of sidewalks – Future needs (desire lines / policy / accessibility / demand)
20	Cycling assessment	– Presence of a dedicated facility – Network connectivity.
21	Safety analysis	– TBD
22	Site access and circulation	– TBD
23	Submission format	– Minimum one original electronic copy must be sealed by a professional engineer – Electronic copy of complete report and all appendices – Electronic copy of operational analysis files (e.g. Synchro)

Appendix B

Traffic Data





Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
Page No: 1

Turning Movement Data

Start Time	Whippoorwill Drive Eastbound						South Field Drive Westbound						Arthur Street Northbound						Arthur Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
6:00 AM	8	11	21	0	0	40	5	1	9	0	2	15	2	24	27	0	0	53	21	66	1	0	0	88	196
6:15 AM	2	13	13	0	1	28	9	4	10	0	1	23	2	53	38	0	0	93	27	93	0	0	0	120	264
6:30 AM	7	24	34	0	1	65	8	5	18	0	7	31	3	52	31	0	0	86	22	109	2	0	2	133	315
6:45 AM	5	12	25	0	2	42	7	3	9	0	1	19	12	77	23	0	0	112	34	98	0	0	2	132	305
Hourly Total	22	60	93	0	4	175	29	13	46	0	11	88	19	206	119	0	0	344	104	366	3	0	4	473	1080
7:00 AM	5	12	25	0	0	42	12	6	17	0	1	35	11	75	12	0	0	98	27	76	1	0	0	104	279
7:15 AM	11	17	38	0	0	66	13	4	13	0	3	30	6	123	9	0	0	138	15	100	2	0	2	117	351
7:30 AM	12	29	35	0	2	76	15	12	20	0	1	47	13	94	8	0	0	115	32	137	0	0	1	169	407
7:45 AM	26	22	34	0	2	82	13	6	39	0	0	58	15	134	16	0	0	165	30	125	3	0	0	158	463
Hourly Total	54	80	132	0	4	266	53	28	89	0	5	170	45	426	45	0	0	516	104	438	6	0	3	548	1500
8:00 AM	17	14	41	0	1	72	10	6	24	0	2	40	19	123	13	0	0	155	37	113	5	0	0	155	422
8:15 AM	11	20	31	0	3	62	18	15	32	0	1	65	10	89	11	0	0	110	28	94	2	0	1	124	361
8:30 AM	10	15	44	0	0	69	11	3	27	0	2	41	13	90	17	0	0	120	24	117	2	0	1	143	373
8:45 AM	18	14	32	0	0	64	11	6	29	0	2	46	11	103	12	0	0	126	36	103	6	0	3	145	381
Hourly Total	56	63	148	0	4	267	50	30	112	0	7	192	53	405	53	0	0	511	125	427	15	0	5	567	1537
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	9	10	22	0	0	41	15	14	43	0	8	72	17	101	8	0	0	126	23	101	3	0	1	127	366
11:45 AM	4	16	14	0	0	34	13	12	35	0	7	60	25	97	11	0	0	133	39	107	7	0	1	153	380
Hourly Total	13	26	36	0	0	75	28	26	78	0	15	132	42	198	19	0	0	259	62	208	10	0	2	280	746
12:00 PM	8	11	19	0	0	38	13	14	46	0	7	73	14	86	12	0	0	112	38	126	4	0	6	168	391
12:15 PM	6	12	22	0	0	40	24	13	31	0	4	68	19	106	11	0	0	136	31	113	2	1	0	147	391
12:30 PM	8	16	22	0	3	46	21	11	28	0	3	60	24	110	10	0	1	144	44	118	6	0	3	168	418
12:45 PM	16	11	13	0	2	40	16	6	51	0	6	73	27	100	9	0	0	136	35	123	3	0	4	161	410
Hourly Total	38	50	76	0	5	164	74	44	156	0	20	274	84	402	42	0	1	528	148	480	15	1	13	644	1610
1:00 PM	4	13	18	0	0	35	14	19	31	0	10	64	14	99	9	0	0	122	38	93	6	0	3	137	358
1:15 PM	7	14	9	0	2	30	15	13	33	0	7	61	19	93	15	0	0	127	34	96	3	0	3	133	351
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	11	27	27	0	2	65	29	32	64	0	17	125	33	192	24	0	0	249	72	189	9	0	6	270	709
3:00 PM	8	13	23	0	0	44	29	16	48	0	5	93	23	133	11	0	0	167	22	116	6	0	1	144	448
3:15 PM	9	7	13	0	3	29	20	20	43	0	4	83	33	160	9	0	1	202	35	127	6	0	4	168	482
3:30 PM	8	11	30	0	7	49	23	29	41	0	0	93	23	120	8	0	2	151	38	121	7	0	0	166	459
3:45 PM	7	6	20	0	4	33	12	23	38	0	7	73	24	151	9	0	1	184	20	108	2	0	3	130	420
Hourly Total	32	37	86	0	14	155	84	88	170	0	16	342	103	564	37	0	4	704	115	472	21	0	8	608	1809
4:00 PM	6	15	19	0	2	40	34	19	43	0	1	96	33	134	9	0	1	176	25	117	4	0	1	146	458
4:15 PM	9	9	25	0	0	43	26	28	50	0	7	104	31	128	5	0	0	164	36	109	11	0	0	156	467

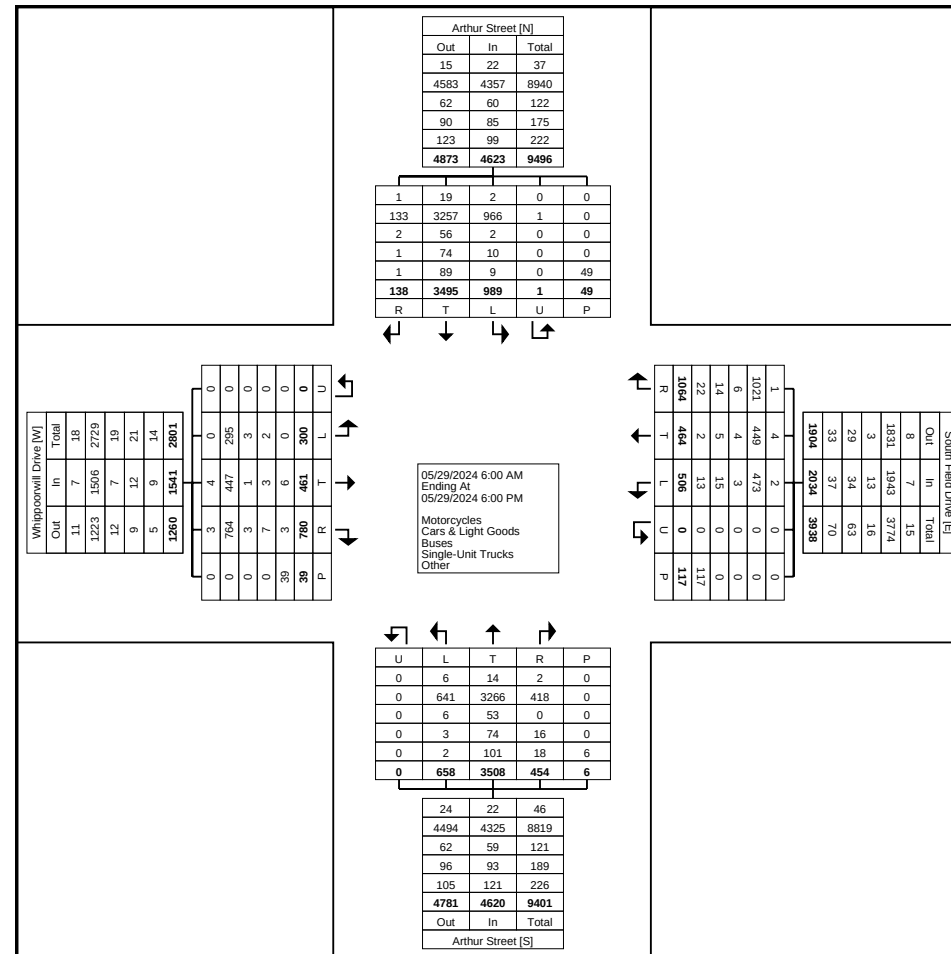
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4:45 PM	6	19	28	0	0	53	28	29	47	0	4	104	30	163	19	0	0	212	40	87	8	0	1	135	504
Hourly Total	35	54	96	0	2	185	101	103	182	0	14	386	132	589	43	0	1	764	132	456	33	0	2	621	1956
5:00 PM	13	16	23	0	0	52	15	30	49	0	4	94	37	141	22	0	0	200	41	125	5	0	2	171	517
5:15 PM	11	16	27	0	1	54	16	24	36	0	3	76	37	126	28	0	0	191	36	121	6	0	0	163	484
5:30 PM	6	15	14	0	1	35	12	30	39	0	4	81	46	127	16	0	0	189	30	117	6	0	3	153	458
5:45 PM	9	17	22	0	2	48	15	16	43	0	1	74	27	132	6	0	0	165	20	96	9	0	1	125	412
Hourly Total	39	64	86	0	4	189	58	100	167	0	12	325	147	526	72	0	0	745	127	459	26	0	6	612	1871
Grand Total	300	461	780	0	39	1541	506	464	1064	0	117	2034	658	3508	454	0	6	4620	989	3495	138	1	49	4623	12818
Approach %	19.5	29.9	50.6	0.0	-	-	24.9	22.8	52.3	0.0	-	-	14.2	75.9	9.8	0.0	-	-	21.4	75.6	3.0	0.0	-	-	-
Total %	2.3	3.6	6.1	0.0	-	12.0	3.9	3.6	8.3	0.0	-	15.9	5.1	27.4	3.5	0.0	-	36.0	7.7	27.3	1.1	0.0	-	36.1	-
Motorcycles	0	4	3	0	-	7	2	4	1	0	-	7	6	14	2	0	-	22	2	19	1	0	-	22	58
% Motorcycles	0.0	0.9	0.4	-	-	0.5	0.4	0.9	0.1	-	-	0.3	0.9	0.4	0.4	-	-	0.5	0.2	0.5	0.7	0.0	-	0.5	0.5
Cars & Light Goods	295	447	764	0	-	1506	473	449	1021	0	-	1943	641	3266	418	0	-	4325	966	3257	133	1	-	4357	12131
% Cars & Light Goods	98.3	97.0	97.9	-	-	97.7	93.5	96.8	96.0	-	-	95.5	97.4	93.1	92.1	-	-	93.6	97.7	93.2	96.4	100.0	-	94.2	94.6
Buses	3	1	3	0	-	7	3	4	6	0	-	13	6	53	0	0	-	59	2	56	2	0	-	60	139
% Buses	1.0	0.2	0.4	-	-	0.5	0.6	0.9	0.6	-	-	0.6	0.9	1.5	0.0	-	-	1.3	0.2	1.6	1.4	0.0	-	1.3	1.1
Single-Unit Trucks	2	3	7	0	-	12	15	5	14	0	-	34	3	74	16	0	-	93	10	74	1	0	-	85	224
% Single-Unit Trucks	0.7	0.7	0.9	-	-	0.8	3.0	1.1	1.3	-	-	1.7	0.5	2.1	3.5	-	-	2.0	1.0	2.1	0.7	0.0	-	1.8	1.7
Articulated Trucks	0	1	0	0	-	1	13	0	19	0	-	32	1	96	14	0	-	111	8	86	1	0	-	95	239
% Articulated Trucks	0.0	0.2	0.0	-	-	0.1	2.6	0.0	1.8	-	-	1.6	0.2	2.7	3.1	-	-	2.4	0.8	2.5	0.7	0.0	-	2.1	1.9
Bicycles on Road	0	5	3	0	-	8	0	2	3	0	-	5	1	5	4	0	-	10	1	3	0	0	-	4	27
% Bicycles on Road	0.0	1.1	0.4	-	-	0.5	0.0	0.4	0.3	-	-	0.2	0.2	0.1	0.9	-	-	0.2	0.1	0.1	0.0	0.0	-	0.1	0.2
Bicycles on Crosswalk	-	-	-	-	7	-	-	-	-	-	20	-	-	-	-	-	1	-	-	-	-	-	8	-	-
% Bicycles on Crosswalk	-	-	-	-	17.9	-	-	-	-	-	17.1	-	-	-	-	-	16.7	-	-	-	-	-	16.3	-	-
Pedestrians	-	-	-	-	32	-	-	-	-	-	97	-	-	-	-	-	5	-	-	-	-	-	41	-	-
% Pedestrians	-	-	-	-	82.1	-	-	-	-	-	82.9	-	-	-	-	-	83.3	-	-	-	-	-	83.7	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
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Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
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Turning Movement Data Plot



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
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Turning Movement Peak Hour Data (7:30 AM)

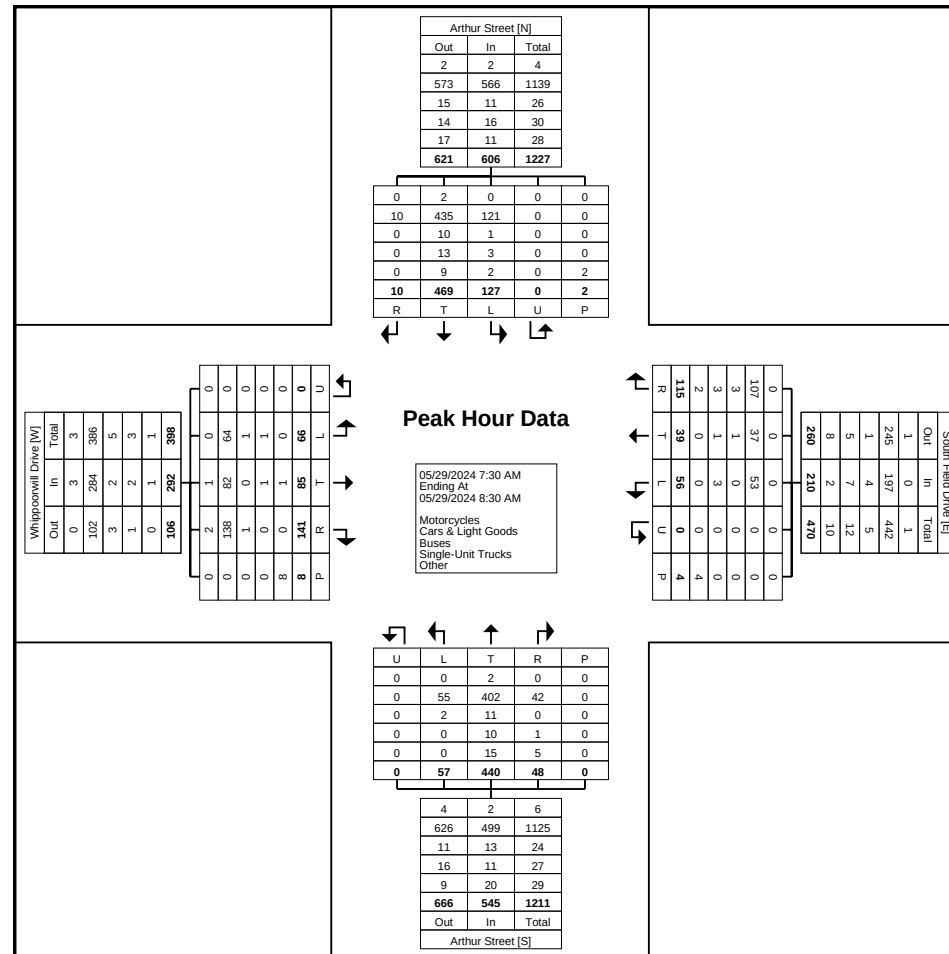
Start Time	Whippoorwill Drive Eastbound						South Field Drive Westbound						Arthur Street Northbound						Arthur Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:30 AM	12	29	35	0	2	76	15	12	20	0	1	47	13	94	8	0	0	115	32	137	0	0	1	169	407
7:45 AM	26	22	34	0	2	82	13	6	39	0	0	58	15	134	16	0	0	165	30	125	3	0	0	158	463
8:00 AM	17	14	41	0	1	72	10	6	24	0	2	40	19	123	13	0	0	155	37	113	5	0	0	155	422
8:15 AM	11	20	31	0	3	62	18	15	32	0	1	65	10	89	11	0	0	110	28	94	2	0	1	124	361
Total	66	85	141	0	8	292	56	39	115	0	4	210	57	440	48	0	0	545	127	469	10	0	2	606	1653
Approach %	22.6	29.1	48.3	0.0	-	-	26.7	18.6	54.8	0.0	-	-	10.5	80.7	8.8	0.0	-	-	21.0	77.4	1.7	0.0	-	-	-
Total %	4.0	5.1	8.5	0.0	-	17.7	3.4	2.4	7.0	0.0	-	12.7	3.4	26.6	2.9	0.0	-	33.0	7.7	28.4	0.6	0.0	-	36.7	-
PHF	0.635	0.733	0.860	0.000	-	0.890	0.778	0.650	0.737	0.000	-	0.808	0.750	0.821	0.750	0.000	-	0.826	0.858	0.856	0.500	0.000	-	0.896	0.893
Motorcycles	0	1	2	0	-	3	0	0	0	0	-	0	0	2	0	0	-	2	0	2	0	0	-	2	7
% Motorcycles	0.0	1.2	1.4	-	-	1.0	0.0	0.0	0.0	-	-	0.0	0.0	0.5	0.0	-	-	0.4	0.0	0.4	0.0	-	-	0.3	0.4
Cars & Light Goods	64	82	138	0	-	284	53	37	107	0	-	197	55	402	42	0	-	499	121	435	10	0	-	566	1546
% Cars & Light Goods	97.0	96.5	97.9	-	-	97.3	94.6	94.9	93.0	-	-	93.8	96.5	91.4	87.5	-	-	91.6	95.3	92.8	100.0	-	-	93.4	93.5
Buses	1	0	1	0	-	2	0	1	3	0	-	4	2	11	0	0	-	13	1	10	0	0	-	11	30
% Buses	1.5	0.0	0.7	-	-	0.7	0.0	2.6	2.6	-	-	1.9	3.5	2.5	0.0	-	-	2.4	0.8	2.1	0.0	-	-	1.8	1.8
Single-Unit Trucks	1	1	0	0	-	2	3	1	3	0	-	7	0	10	1	0	-	11	3	13	0	0	-	16	36
% Single-Unit Trucks	1.5	1.2	0.0	-	-	0.7	5.4	2.6	2.6	-	-	3.3	0.0	2.3	2.1	-	-	2.0	2.4	2.8	0.0	-	-	2.6	2.2
Articulated Trucks	0	0	0	0	-	0	0	0	2	0	-	2	0	15	4	0	-	19	1	9	0	0	-	10	31
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	1.7	-	-	1.0	0.0	3.4	8.3	-	-	3.5	0.8	1.9	0.0	-	-	1.7	1.9
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	0	1	0	-	1	1	0	0	0	-	1	3
% Bicycles on Road	0.0	1.2	0.0	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.0	0.0	2.1	-	-	0.2	0.8	0.0	0.0	-	-	0.2	0.2
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	12.5	-	-	-	-	-	25.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	7	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	87.5	-	-	-	-	-	75.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
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Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
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Turning Movement Peak Hour Data Plot (7:30 AM)



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
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Turning Movement Peak Hour Data (12:00 PM)

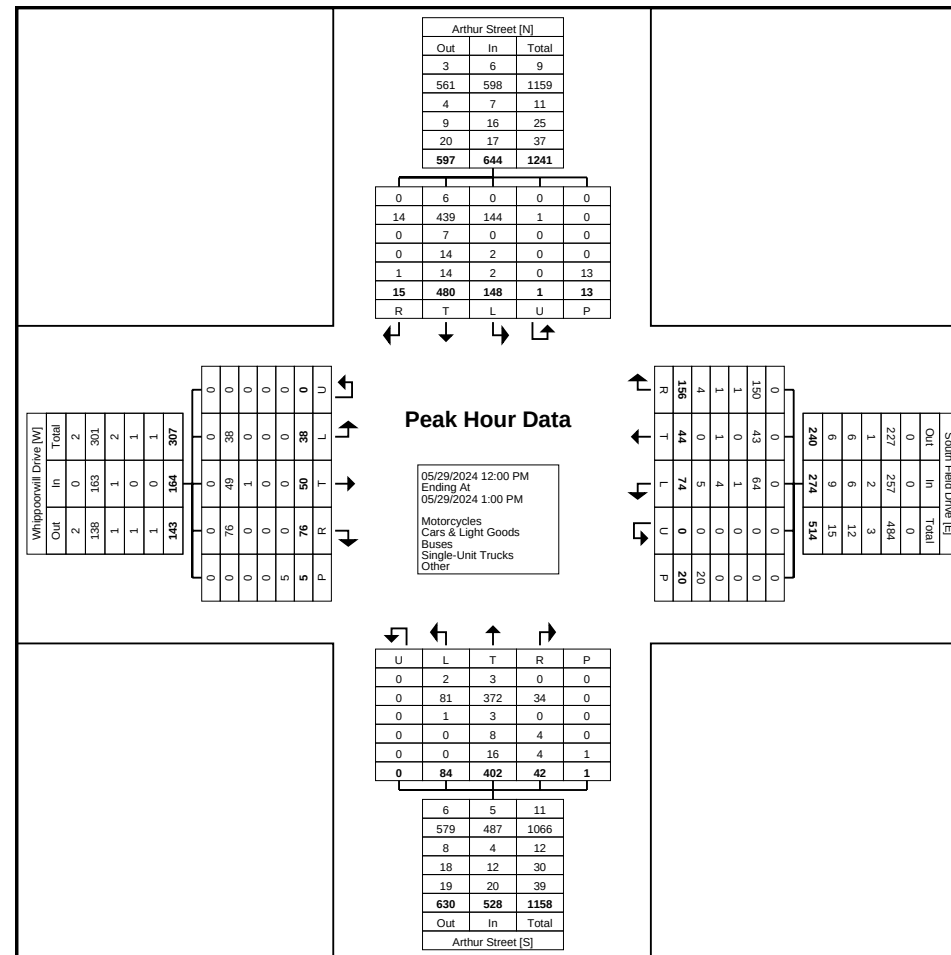
Start Time	Whippoorwill Drive Eastbound						South Field Drive Westbound						Arthur Street Northbound						Arthur Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:00 PM	8	11	19	0	0	38	13	14	46	0	7	73	14	86	12	0	0	112	38	126	4	0	6	168	391
12:15 PM	6	12	22	0	0	40	24	13	31	0	4	68	19	106	11	0	0	136	31	113	2	1	0	147	391
12:30 PM	8	16	22	0	3	46	21	11	28	0	3	60	24	110	10	0	1	144	44	118	6	0	3	168	418
12:45 PM	16	11	13	0	2	40	16	6	51	0	6	73	27	100	9	0	0	136	35	123	3	0	4	161	410
Total	38	50	76	0	5	164	74	44	156	0	20	274	84	402	42	0	1	528	148	480	15	1	13	644	1610
Approach %	23.2	30.5	46.3	0.0	-	-	27.0	16.1	56.9	0.0	-	-	15.9	76.1	8.0	0.0	-	-	23.0	74.5	2.3	0.2	-	-	-
Total %	2.4	3.1	4.7	0.0	-	10.2	4.6	2.7	9.7	0.0	-	17.0	5.2	25.0	2.6	0.0	-	32.8	9.2	29.8	0.9	0.1	-	40.0	-
PHF	0.594	0.781	0.864	0.000	-	0.891	0.771	0.786	0.765	0.000	-	0.938	0.778	0.914	0.875	0.000	-	0.917	0.841	0.952	0.625	0.250	-	0.958	0.963
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	2	3	0	0	-	5	0	6	0	0	-	6	11
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	2.4	0.7	0.0	-	-	0.9	0.0	1.3	0.0	0.0	-	0.9	0.7
Cars & Light Goods	38	49	76	0	-	163	64	43	150	0	-	257	81	372	34	0	-	487	144	439	14	1	-	598	1505
% Cars & Light Goods	100.0	98.0	100.0	-	-	99.4	86.5	97.7	96.2	-	-	93.8	96.4	92.5	81.0	-	-	92.2	97.3	91.5	93.3	100.0	-	92.9	93.5
Buses	0	1	0	0	-	1	1	0	1	0	-	2	1	3	0	0	-	4	0	7	0	0	-	7	14
% Buses	0.0	2.0	0.0	-	-	0.6	1.4	0.0	0.6	-	-	0.7	1.2	0.7	0.0	-	-	0.8	0.0	1.5	0.0	0.0	-	1.1	0.9
Single-Unit Trucks	0	0	0	0	-	0	4	1	1	0	-	6	0	8	4	0	-	12	2	14	0	0	-	16	34
% Single-Unit Trucks	0.0	0.0	0.0	-	-	0.0	5.4	2.3	0.6	-	-	2.2	0.0	2.0	9.5	-	-	2.3	1.4	2.9	0.0	0.0	-	2.5	2.1
Articulated Trucks	0	0	0	0	-	0	5	0	4	0	-	9	0	16	4	0	-	20	2	14	1	0	-	17	46
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	6.8	0.0	2.6	-	-	3.3	0.0	4.0	9.5	-	-	3.8	1.4	2.9	6.7	0.0	-	2.6	2.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	10.0	-	-	-	-	-	0.0	-	-	-	-	-	15.4	-	-
Pedestrians	-	-	-	-	5	-	-	-	-	-	18	-	-	-	-	-	1	-	-	-	-	-	11	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	90.0	-	-	-	-	-	100.0	-	-	-	-	-	84.6	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

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Count Name: Arthur Street & South Field Drive
Site Code: 240259
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Turning Movement Peak Hour Data Plot (12:00 PM)



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cdowness@ptsl.com

Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
Page No: 8

Turning Movement Peak Hour Data (4:30 PM)

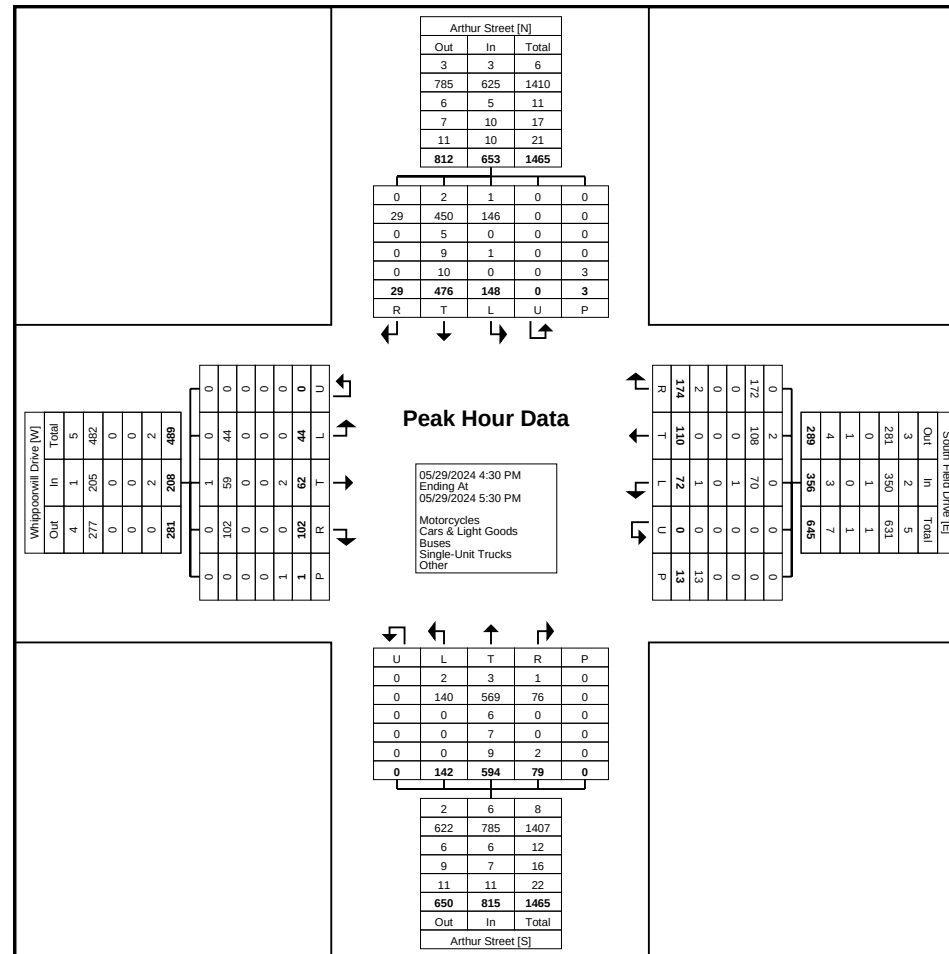
Start Time	Whippoorwill Drive Eastbound						South Field Drive Westbound						Arthur Street Northbound						Arthur Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:30 PM	14	11	24	0	0	49	13	27	42	0	2	82	38	164	10	0	0	212	31	143	10	0	0	184	527
4:45 PM	6	19	28	0	0	53	28	29	47	0	4	104	30	163	19	0	0	212	40	87	8	0	1	135	504
5:00 PM	13	16	23	0	0	52	15	30	49	0	4	94	37	141	22	0	0	200	41	125	5	0	2	171	517
5:15 PM	11	16	27	0	1	54	16	24	36	0	3	76	37	126	28	0	0	191	36	121	6	0	0	163	484
Total	44	62	102	0	1	208	72	110	174	0	13	356	142	594	79	0	0	815	148	476	29	0	3	653	2032
Approach %	21.2	29.8	49.0	0.0	-	-	20.2	30.9	48.9	0.0	-	-	17.4	72.9	9.7	0.0	-	-	22.7	72.9	4.4	0.0	-	-	-
Total %	2.2	3.1	5.0	0.0	-	10.2	3.5	5.4	8.6	0.0	-	17.5	7.0	29.2	3.9	0.0	-	40.1	7.3	23.4	1.4	0.0	-	32.1	-
PHF	0.786	0.816	0.911	0.000	-	0.963	0.643	0.917	0.888	0.000	-	0.856	0.934	0.905	0.705	0.000	-	0.961	0.902	0.832	0.725	0.000	-	0.887	0.964
Motorcycles	0	1	0	0	-	1	0	2	0	0	-	2	2	3	1	0	-	6	1	2	0	0	-	3	12
% Motorcycles	0.0	1.6	0.0	-	-	0.5	0.0	1.8	0.0	-	-	0.6	1.4	0.5	1.3	-	-	0.7	0.7	0.4	0.0	-	-	0.5	0.6
Cars & Light Goods	44	59	102	0	-	205	70	108	172	0	-	350	140	569	76	0	-	785	146	450	29	0	-	625	1965
% Cars & Light Goods	100.0	95.2	100.0	-	-	98.6	97.2	98.2	98.9	-	-	98.3	98.6	95.8	96.2	-	-	96.3	98.6	94.5	100.0	-	-	95.7	96.7
Buses	0	0	0	0	-	0	1	0	0	0	-	1	0	6	0	0	-	6	0	5	0	0	-	5	12
% Buses	0.0	0.0	0.0	-	-	0.0	1.4	0.0	0.0	-	-	0.3	0.0	1.0	0.0	-	-	0.7	0.0	1.1	0.0	-	-	0.8	0.6
Single-Unit Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	7	0	0	-	7	1	9	0	0	-	10	17
% Single-Unit Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.2	0.0	-	-	0.9	0.7	1.9	0.0	-	-	1.5	0.8
Articulated Trucks	0	0	0	0	-	0	1	0	2	0	-	3	0	7	1	0	-	8	0	10	0	0	-	10	21
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	1.4	0.0	1.1	-	-	0.8	0.0	1.2	1.3	-	-	1.0	0.0	2.1	0.0	-	-	1.5	1.0
Bicycles on Road	0	2	0	0	-	2	0	0	0	0	-	0	0	2	1	0	-	3	0	0	0	0	-	0	5
% Bicycles on Road	0.0	3.2	0.0	-	-	1.0	0.0	0.0	0.0	-	-	0.0	0.0	0.3	1.3	-	-	0.4	0.0	0.0	0.0	-	-	0.0	0.2
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	100.0	-	-	-	-	-	23.1	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	10	-	-	-	-	-	0	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	0.0	-	-	-	-	-	76.9	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Arthur Street & South Field Drive
Site Code: 240259
Start Date: 05/29/2024
Page No: 9



Turning Movement Peak Hour Data Plot (4:30 PM)



CURRENT TRAFFIC SIGNAL TIMING

INT # **841** **ARTHUR STREET @ Whippoorwill Dr-South Field Dr** T08-50/ **15WOOL**

Date Prepared: May 29, 2024

Mode of Control Pre-timed running SEMI-ACTUATED

Left Info Actuated SB LT - ARTHUR STREET
 Actuated NB LT - ARTHUR STREET

LPI 5 second **LPI in use 24/7 when ped. buttons pushed to cross north and south legs only.**

*Offsets are a percentage of the cycle length and refers to the beginning of Main Street green

<u>Pattern 1</u>		6:00-15:00 Monday-Friday, 8:30-20:00 Saturday, 11:00-18:00 Sunday									
ARTHUR STREET											
SBL	Green Arrow	Min	5.0	seconds	NBL	Green Arrow	OFFSET		25%		
		Ext	3.0	seconds			Min	5.0	seconds		
		Max	5.9	seconds			Ext	3.0	seconds		
SBL	Amber Arrow		3.0	seconds	NBL	Amber Arrow		3.0	seconds		
			1.0	seconds				1.0	seconds		
			41.7	seconds							
All Red			4.0	seconds	Walk		22.7	seconds			
Green			2.0	seconds	FDW		19.0	seconds			
Amber											
All Red											

Whippoorwill Dr-South Field Dr											
Green		Min	12.0	seconds	<u>Pedestrian Call</u>						
		Ext	3.0	seconds	Green/Walk		10.0	seconds			
		Max	26.4	seconds	Green/FDW		16.0	seconds			
					Green/SDW		0.4	seconds			
Amber			4.0	seconds	Amber		4.0	seconds			
All Red			2.0	seconds	All Red		2.0	seconds			
TOTAL			90.0	seconds							

<u>Pattern 2</u>		15:00-20:00 Monday-Friday									
ARTHUR STREET											
SBL	Green Arrow	Min	5.0	seconds	NBL	Green Arrow	OFFSET		53%		
		Ext	3.0	seconds			Min	5.0	seconds		
		Max	6.8	seconds			Ext	3.0	seconds		
SBL	Amber Arrow		3.0	seconds	NBL	Amber Arrow		3.0	seconds		
			1.0	seconds				1.0	seconds		
			40.8	seconds							
All Red			4.0	seconds	Walk		21.8	seconds			
Green			2.0	seconds	FDW		19.0	seconds			
Amber											
All Red											

Whippoorwill Dr-South Field Dr											
Green		Min	12.0	seconds	<u>Pedestrian Call</u>						
		Ext	3.0	seconds	Green/Walk		10.0	seconds			
		Max	26.4	seconds	Green/FDW		16.0	seconds			
					Green/SDW		0.4	seconds			
Amber			4.0	seconds	Amber		4.0	seconds			
All Red			2.0	seconds	All Red		2.0	seconds			
TOTAL			90.0	seconds							

Min=Minimum Time
 Ext=Extension Time
 Max=Maximum Time

**This signal timing cannot be
 presented as evidence in a court of law.**

Max 2 - TP 2**ALL OTHER TIMES****ARTHUR STREET**

Green	30.0	seconds			
Amber	4.0	seconds	Walk	11.0	seconds
All Red	2.0	seconds	FDW	19.0	seconds

Whippoorwill Dr-South Field DrPedestrian Call

Green	Min	12.0	seconds	Green/Walk	10.0	seconds
	Ext	3.0	seconds	Green/FDW	16.0	seconds
	Max	20.0	seconds	Green/SDW	0.0	seconds
Amber		4.0	seconds	Amber	4.0	seconds
All Red		2.0	seconds	All Red	2.0	seconds
TOTAL		62.0	seconds			

Min=Minimum Time
Ext=Extension Time
Max=Maximum Time

**This signal timing cannot be
presented as evidence in a court of law.**



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
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Count Name: South Field Drive & Union Street
Site Code: 240259
Start Date: 05/29/2024
Page No: 1

Turning Movement Data

Start Time	South Field Drive Eastbound						South Field Drive Westbound						Union Street Northbound						Union Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
6:00 AM	4	2	9	0	0	15	1	3	1	0	0	5	6	7	1	0	0	14	1	6	6	0	0	13	47
6:15 AM	4	7	6	0	0	17	0	13	5	0	0	18	7	5	0	0	0	12	3	18	7	0	0	28	75
6:30 AM	10	12	6	0	1	28	7	8	6	0	0	21	11	10	6	0	0	27	2	15	6	0	0	23	99
6:45 AM	9	12	14	0	0	35	1	7	13	0	0	21	4	23	6	0	0	33	5	25	7	0	0	37	126
Hourly Total	27	33	35	0	1	95	9	31	25	0	0	65	28	45	13	0	0	86	11	64	26	0	0	101	347
7:00 AM	7	9	5	0	0	21	7	5	3	0	0	15	6	13	2	0	0	21	5	15	5	0	0	25	82
7:15 AM	8	12	3	0	0	23	6	6	7	0	0	19	1	18	1	0	0	20	8	22	7	0	0	37	99
7:30 AM	3	15	7	0	0	25	5	9	18	0	0	32	3	13	4	0	0	20	9	19	3	0	0	31	108
7:45 AM	5	17	5	0	0	27	3	13	20	0	0	36	2	34	1	0	0	37	13	16	12	0	0	41	141
Hourly Total	23	53	20	0	0	96	21	33	48	0	0	102	12	78	8	0	0	98	35	72	27	0	0	134	430
8:00 AM	7	11	4	0	0	22	2	2	20	0	0	24	4	20	6	0	0	30	23	23	8	0	0	54	130
8:15 AM	9	17	1	0	0	27	2	19	16	0	0	37	3	19	2	0	0	24	17	18	6	0	0	41	129
8:30 AM	6	9	3	0	0	18	1	8	9	0	0	18	1	22	2	0	0	25	2	20	6	0	0	28	89
8:45 AM	5	15	6	0	0	26	3	13	2	0	0	18	1	12	4	0	0	17	8	14	7	0	0	29	90
Hourly Total	27	52	14	0	0	93	8	42	47	0	0	97	9	73	14	0	0	96	50	75	27	0	0	152	438
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	6	6	4	0	0	16	3	13	12	0	0	28	3	19	2	0	0	24	12	13	12	0	0	37	105
11:45 AM	13	17	4	0	0	34	4	5	9	0	0	18	5	8	0	0	0	13	9	8	8	0	0	25	90
Hourly Total	19	23	8	0	0	50	7	18	21	0	0	46	8	27	2	0	0	37	21	21	20	0	0	62	195
12:00 PM	8	17	10	0	0	35	1	16	7	0	0	24	11	17	3	0	0	31	11	24	15	0	0	50	140
12:15 PM	14	15	12	0	0	41	1	15	6	0	0	22	11	13	2	0	0	26	4	15	11	0	0	30	119
12:30 PM	16	10	20	0	0	46	4	12	12	0	0	28	5	14	4	0	0	23	8	16	9	0	0	33	130
12:45 PM	15	12	4	0	0	31	7	8	5	0	0	20	5	15	0	0	0	20	9	13	10	0	0	32	103
Hourly Total	53	54	46	0	0	153	13	51	30	0	0	94	32	59	9	0	0	100	32	68	45	0	0	145	492
1:00 PM	8	13	6	0	1	27	2	10	11	0	0	23	2	14	3	0	0	19	9	21	13	0	0	43	112
1:15 PM	10	12	8	0	0	30	1	12	8	0	0	21	0	9	2	0	0	11	9	10	5	0	0	24	86
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	18	25	14	0	1	57	3	22	19	0	0	44	2	23	5	0	0	30	18	31	18	0	0	67	198
3:00 PM	7	12	9	0	0	28	2	17	8	0	0	27	5	13	2	0	0	20	14	44	13	0	0	71	146
3:15 PM	6	10	8	0	0	24	3	17	12	0	0	32	3	6	4	0	0	13	13	23	11	0	0	47	116
3:30 PM	7	23	14	0	0	44	4	24	13	0	0	41	6	27	4	0	0	37	8	25	10	0	0	43	165
3:45 PM	12	14	10	0	0	36	0	24	14	0	0	38	5	13	3	0	1	21	12	22	6	0	0	40	135
Hourly Total	32	59	41	0	0	132	9	82	47	0	0	138	19	59	13	0	1	91	47	114	40	0	0	201	562
4:00 PM	10	24	28	0	0	62	7	23	11	0	0	41	3	25	4	0	0	32	17	25	11	0	0	53	188
4:15 PM	4	15	27	0	0	46	1	29	27	0	0	57	6	27	9	0	0	42	12	30	9	0	0	51	196

4:30 PM	10	10	8	0	0	28	1	27	24	0	0	52	3	25	1	0	0	29	22	39	27	0	0	88	197
4:45 PM	10	17	4	0	0	31	5	25	23	0	0	53	3	18	3	0	0	24	14	26	14	0	0	54	162
Hourly Total	34	66	67	0	0	167	14	104	85	0	0	203	15	95	17	0	0	127	65	120	61	0	0	246	743
5:00 PM	16	14	10	0	0	40	3	30	35	0	0	68	6	20	4	0	0	30	12	39	21	0	0	72	210
5:15 PM	8	14	11	0	0	33	7	27	14	0	0	48	3	21	7	0	2	31	24	22	10	0	0	56	168
5:30 PM	7	6	7	0	0	20	6	37	10	0	0	53	4	15	4	0	0	23	8	19	14	0	0	41	137
5:45 PM	10	10	1	0	0	21	4	20	9	0	0	33	5	16	3	0	0	24	9	21	4	0	0	34	112
Hourly Total	41	44	29	0	0	114	20	114	68	0	0	202	18	72	18	0	2	108	53	101	49	0	0	203	627
Grand Total	274	409	274	0	2	957	104	497	390	0	0	991	143	531	99	0	3	773	332	666	313	0	0	1311	4032
Approach %	28.6	42.7	28.6	0.0	-	-	10.5	50.2	39.4	0.0	-	-	18.5	68.7	12.8	0.0	-	-	25.3	50.8	23.9	0.0	-	-	-
Total %	6.8	10.1	6.8	0.0	-	23.7	2.6	12.3	9.7	0.0	-	24.6	3.5	13.2	2.5	0.0	-	19.2	8.2	16.5	7.8	0.0	-	32.5	-
Motorcycles	1	4	2	0	-	7	0	4	4	0	-	8	3	4	0	0	-	7	6	3	0	0	-	9	31
% Motorcycles	0.4	1.0	0.7	-	-	0.7	0.0	0.8	1.0	-	-	0.8	2.1	0.8	0.0	-	-	0.9	1.8	0.5	0.0	-	-	0.7	0.8
Cars & Light Goods	253	383	258	0	-	894	71	465	366	0	-	902	131	464	70	0	-	665	305	590	292	0	-	1187	3648
% Cars & Light Goods	92.3	93.6	94.2	-	-	93.4	68.3	93.6	93.8	-	-	91.0	91.6	87.4	70.7	-	-	86.0	91.9	88.6	93.3	-	-	90.5	90.5
Buses	8	3	0	0	-	11	17	9	7	0	-	33	0	14	7	0	-	21	6	10	2	0	-	18	83
% Buses	2.9	0.7	0.0	-	-	1.1	16.3	1.8	1.8	-	-	3.3	0.0	2.6	7.1	-	-	2.7	1.8	1.5	0.6	-	-	1.4	2.1
Single-Unit Trucks	7	4	7	0	-	18	6	11	3	0	-	20	4	21	13	0	-	38	6	30	9	0	-	45	121
% Single-Unit Trucks	2.6	1.0	2.6	-	-	1.9	5.8	2.2	0.8	-	-	2.0	2.8	4.0	13.1	-	-	4.9	1.8	4.5	2.9	-	-	3.4	3.0
Articulated Trucks	5	5	6	0	-	16	9	3	1	0	-	13	5	27	6	0	-	38	1	32	10	0	-	43	110
% Articulated Trucks	1.8	1.2	2.2	-	-	1.7	8.7	0.6	0.3	-	-	1.3	3.5	5.1	6.1	-	-	4.9	0.3	4.8	3.2	-	-	3.3	2.7
Bicycles on Road	0	10	1	0	-	11	1	5	9	0	-	15	0	1	3	0	-	4	8	1	0	0	-	9	39
% Bicycles on Road	0.0	2.4	0.4	-	-	1.1	1.0	1.0	2.3	-	-	1.5	0.0	0.2	3.0	-	-	0.5	2.4	0.2	0.0	-	-	0.7	1.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	0	-	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	0	-	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-

Turning Movement Data Plot

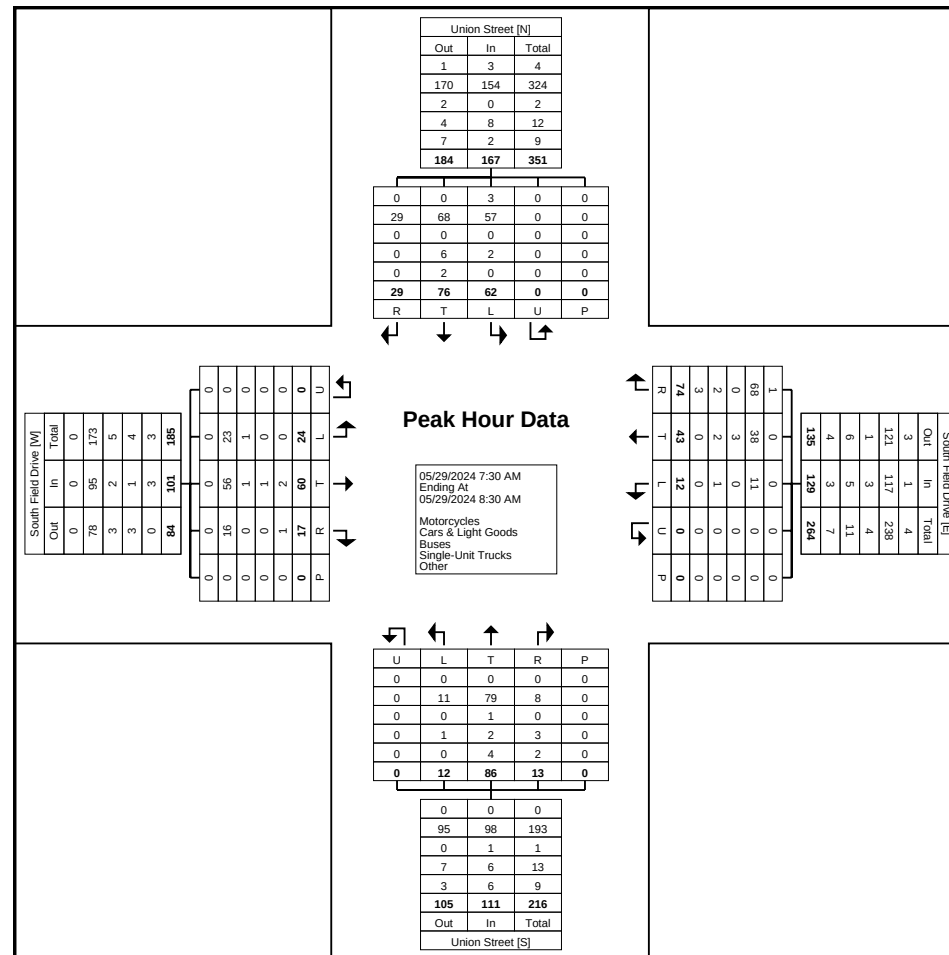
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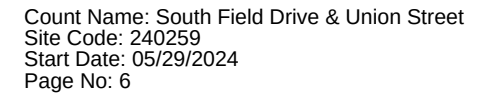


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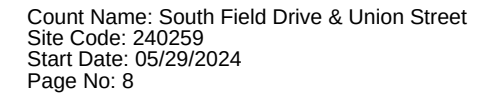
Count Name: South Field Drive & Union Street
Site Code: 240259
Start Date: 05/29/2024
Page No: 5





Start Time	South Field Drive Eastbound						South Field Drive Westbound						Union Street Northbound						Union Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:00 PM	8	17	10	0	0	35	1	16	7	0	0	24	11	17	3	0	0	31	11	24	15	0	0	50	140
12:15 PM	14	15	12	0	0	41	1	15	6	0	0	22	11	13	2	0	0	26	4	15	11	0	0	30	119
12:30 PM	16	10	20	0	0	46	4	12	12	0	0	28	5	14	4	0	0	23	8	16	9	0	0	33	130
12:45 PM	15	12	4	0	0	31	7	8	5	0	0	20	5	15	0	0	0	20	9	13	10	0	0	32	103
Total	53	54	46	0	0	153	13	51	30	0	0	94	32	59	9	0	0	100	32	68	45	0	0	145	492
Approach %	34.6	35.3	30.1	0.0	-	-	13.8	54.3	31.9	0.0	-	-	32.0	59.0	9.0	0.0	-	-	22.1	46.9	31.0	0.0	-	-	-
Total %	10.8	11.0	9.3	0.0	-	31.1	2.6	10.4	6.1	0.0	-	19.1	6.5	12.0	1.8	0.0	-	20.3	6.5	13.8	9.1	0.0	-	29.5	-
PHF	0.828	0.794	0.575	0.000	-	0.832	0.464	0.797	0.625	0.000	-	0.839	0.727	0.868	0.563	0.000	-	0.806	0.727	0.708	0.750	0.000	-	0.725	0.879
Motorcycles	0	0	1	0	-	1	0	0	1	0	-	1	1	0	0	0	-	1	0	0	0	0	-	0	3
% Motorcycles	0.0	0.0	2.2	-	-	0.7	0.0	0.0	3.3	-	-	1.1	3.1	0.0	0.0	-	-	1.0	0.0	0.0	0.0	-	-	0.0	0.6
Cars & Light Goods	51	49	43	0	-	143	6	45	28	0	-	79	29	53	6	0	-	88	30	57	43	0	-	130	440
% Cars & Light Goods	96.2	90.7	93.5	-	-	93.5	46.2	88.2	93.3	-	-	84.0	90.6	89.8	66.7	-	-	88.0	93.8	83.8	95.6	-	-	89.7	89.4
Buses	0	1	0	0	-	1	5	2	1	0	-	8	0	0	0	0	-	0	1	0	0	0	-	1	10
% Buses	0.0	1.9	0.0	-	-	0.7	38.5	3.9	3.3	-	-	8.5	0.0	0.0	0.0	-	-	0.0	3.1	0.0	0.0	-	-	0.7	2.0
Single-Unit Trucks	2	1	0	0	-	3	0	0	0	0	-	0	0	0	1	0	-	1	0	3	0	0	-	3	7
% Single-Unit Trucks	3.8	1.9	0.0	-	-	2.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	11.1	-	-	1.0	0.0	4.4	0.0	-	-	2.1	1.4
Articulated Trucks	0	2	2	0	-	4	2	1	0	0	-	3	2	6	2	0	-	10	0	8	2	0	-	10	27
% Articulated Trucks	0.0	3.7	4.3	-	-	2.6	15.4	2.0	0.0	-	-	3.2	6.3	10.2	22.2	-	-	10.0	0.0	11.8	4.4	-	-	6.9	5.5
Bicycles on Road	0	1	0	0	-	1	0	3	0	0	-	3	0	0	0	0	-	0	1	0	0	0	-	1	5
% Bicycles on Road	0.0	1.9	0.0	-	-	0.7	0.0	5.9	0.0	-	-	3.2	0.0	0.0	0.0	-	-	0.0	3.1	0.0	0.0	-	-	0.7	1.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	0	-	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	0	-	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning Movement Peak Hour Data Plot (12:00 PM)



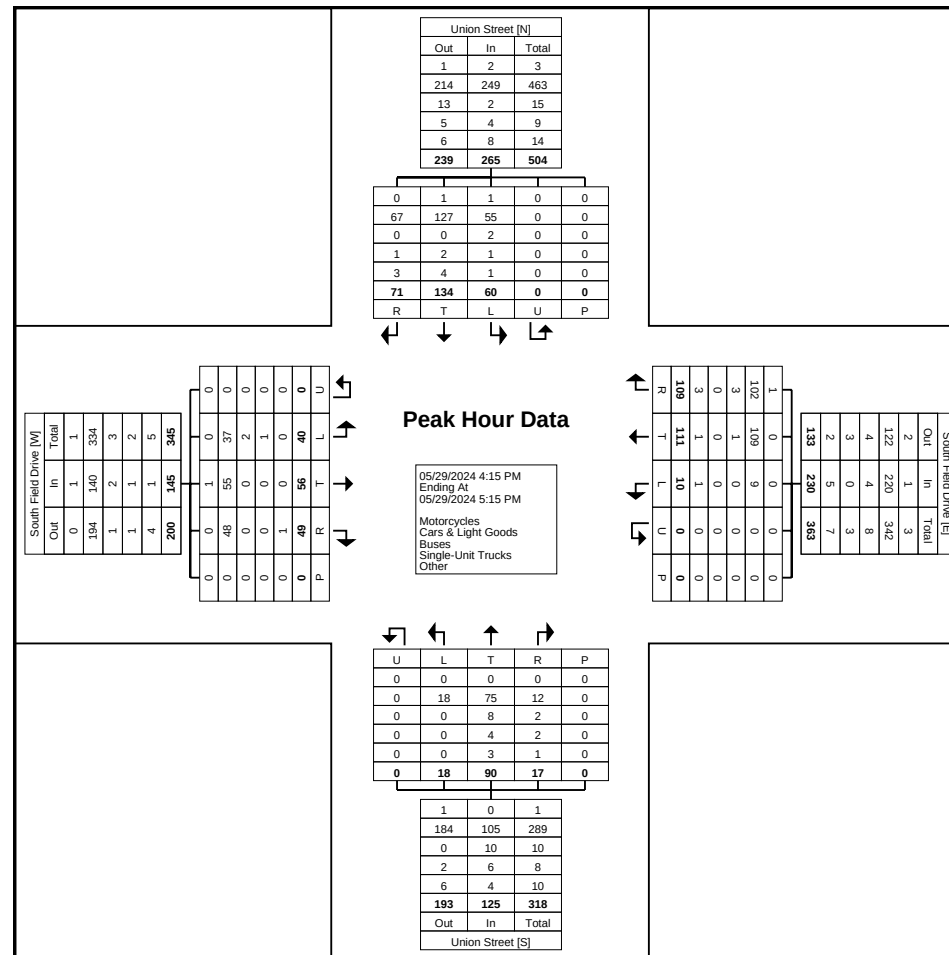
Start Time	South Field Drive Eastbound						South Field Drive Westbound						Union Street Northbound						Union Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	4	15	27	0	0	46	1	29	27	0	0	57	6	27	9	0	0	42	12	30	9	0	0	51	196
4:30 PM	10	10	8	0	0	28	1	27	24	0	0	52	3	25	1	0	0	29	22	39	27	0	0	88	197
4:45 PM	10	17	4	0	0	31	5	25	23	0	0	53	3	18	3	0	0	24	14	26	14	0	0	54	162
5:00 PM	16	14	10	0	0	40	3	30	35	0	0	68	6	20	4	0	0	30	12	39	21	0	0	72	210
Total	40	56	49	0	0	145	10	111	109	0	0	230	18	90	17	0	0	125	60	134	71	0	0	265	765
Approach %	27.6	38.6	33.8	0.0	-	-	4.3	48.3	47.4	0.0	-	-	14.4	72.0	13.6	0.0	-	-	22.6	50.6	26.8	0.0	-	-	-
Total %	5.2	7.3	6.4	0.0	-	19.0	1.3	14.5	14.2	0.0	-	30.1	2.4	11.8	2.2	0.0	-	16.3	7.8	17.5	9.3	0.0	-	34.6	-
PHF	0.625	0.824	0.454	0.000	-	0.788	0.500	0.925	0.779	0.000	-	0.846	0.750	0.833	0.472	0.000	-	0.744	0.682	0.859	0.657	0.000	-	0.753	0.911
Motorcycles	0	1	0	0	-	1	0	0	1	0	-	1	0	0	0	0	-	0	1	1	0	0	-	2	4
% Motorcycles	0.0	1.8	0.0	-	-	0.7	0.0	0.0	0.9	-	-	0.4	0.0	0.0	0.0	-	-	0.0	1.7	0.7	0.0	-	-	0.8	0.5
Cars & Light Goods	37	55	48	0	-	140	9	109	102	0	-	220	18	75	12	0	-	105	55	127	67	0	-	249	714
% Cars & Light Goods	92.5	98.2	98.0	-	-	96.6	90.0	98.2	93.6	-	-	95.7	100.0	83.3	70.6	-	-	84.0	91.7	94.8	94.4	-	-	94.0	93.3
Buses	2	0	0	0	-	2	0	1	3	0	-	4	0	8	2	0	-	10	2	0	0	0	-	2	18
% Buses	5.0	0.0	0.0	-	-	1.4	0.0	0.9	2.8	-	-	1.7	0.0	8.9	11.8	-	-	8.0	3.3	0.0	0.0	-	-	0.8	2.4
Single-Unit Trucks	1	0	0	0	-	1	0	0	0	0	-	0	0	4	2	0	-	6	1	2	1	0	-	4	11
% Single-Unit Trucks	2.5	0.0	0.0	-	-	0.7	0.0	0.0	0.0	-	-	0.0	0.0	4.4	11.8	-	-	4.8	1.7	1.5	1.4	-	-	1.5	1.4
Articulated Trucks	0	0	1	0	-	1	1	0	0	0	-	1	0	2	0	0	-	2	0	4	3	0	-	7	11
% Articulated Trucks	0.0	0.0	2.0	-	-	0.7	10.0	0.0	0.0	-	-	0.4	0.0	2.2	0.0	-	-	1.6	0.0	3.0	4.2	-	-	2.6	1.4
Bicycles on Road	0	0	0	0	-	0	0	1	3	0	-	4	0	1	1	0	-	2	1	0	0	0	-	1	7
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.9	2.8	-	-	1.7	0.0	1.1	5.9	-	-	1.6	1.7	0.0	0.0	-	-	0.4	0.9
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsI.com

Count Name: South Field Drive & Union Street
Site Code: 240259
Start Date: 05/29/2024
Page No: 9



Turning Movement Peak Hour Data Plot (4:15 PM)



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Arthur Street & Scotch Line Road
Site Code: 240259
Start Date: 05/29/2024
Page No: 1

Turning Movement Data

Start Time	Scotch Line Road Westbound					Arthur Street Northbound					Arthur Street Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
6:00 AM	0	0	0	0	0	148	0	0	0	148	0	135	0	0	135	283
6:15 AM	0	0	0	0	0	176	0	0	0	176	1	197	0	0	198	374
6:30 AM	0	0	0	0	0	177	0	0	0	177	0	249	0	0	249	426
6:45 AM	0	1	0	0	1	207	0	0	0	207	0	195	0	0	195	403
Hourly Total	0	1	0	0	1	708	0	0	0	708	1	776	0	0	777	1486
7:00 AM	0	0	0	0	0	186	0	0	0	186	1	215	0	0	216	402
7:15 AM	0	1	0	0	1	193	0	0	0	193	0	233	0	0	233	427
7:30 AM	0	0	0	0	0	190	0	0	0	190	0	264	0	0	264	454
7:45 AM	0	2	0	0	2	256	0	0	0	256	0	276	0	0	276	534
Hourly Total	0	3	0	0	3	825	0	0	0	825	1	988	0	0	989	1817
8:00 AM	0	0	0	0	0	209	0	0	0	209	0	304	0	0	304	513
8:15 AM	1	1	0	0	2	181	0	0	0	181	0	256	0	0	256	439
8:30 AM	1	0	0	0	1	158	1	0	0	159	0	263	0	0	263	423
8:45 AM	0	1	0	0	1	169	0	0	0	169	0	239	0	0	239	409
Hourly Total	2	2	0	0	4	717	1	0	0	718	0	1062	0	0	1062	1784
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	0	2	0	0	2	180	1	0	0	181	1	169	0	0	170	353
11:45 AM	1	2	0	0	3	158	0	0	0	158	0	178	0	0	178	339
Hourly Total	1	4	0	0	5	338	1	0	0	339	1	347	0	0	348	692
12:00 PM	0	0	0	0	0	149	0	0	0	149	0	182	0	0	182	331
12:15 PM	1	1	0	0	2	161	0	0	0	161	2	195	0	0	197	360
12:30 PM	0	0	0	0	0	178	0	0	0	178	0	183	0	0	183	361
12:45 PM	0	0	0	0	0	193	1	0	0	194	1	199	0	0	200	394
Hourly Total	1	1	0	0	2	681	1	0	0	682	3	759	0	0	762	1446
1:00 PM	1	0	0	0	1	171	0	0	0	171	1	162	0	0	163	335
1:15 PM	1	0	0	0	1	175	0	0	0	175	0	172	0	0	172	348
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	2	0	0	0	2	346	0	0	0	346	1	334	0	0	335	683
3:00 PM	0	0	0	0	0	216	0	0	0	216	0	236	0	0	236	452
3:15 PM	0	0	0	0	0	258	0	0	0	258	0	241	0	0	241	499
3:30 PM	1	0	0	0	1	253	0	0	0	253	0	253	0	0	253	507
3:45 PM	0	0	0	0	0	263	0	0	0	263	0	215	0	0	215	478
Hourly Total	1	0	0	0	1	990	0	0	0	990	0	945	0	0	945	1936
4:00 PM	0	0	0	0	0	274	0	0	0	274	1	267	0	0	268	542
4:15 PM	0	0	0	0	0	297	0	0	0	297	0	281	1	0	282	579
4:30 PM	0	0	0	0	0	291	0	0	0	291	0	302	0	0	302	593

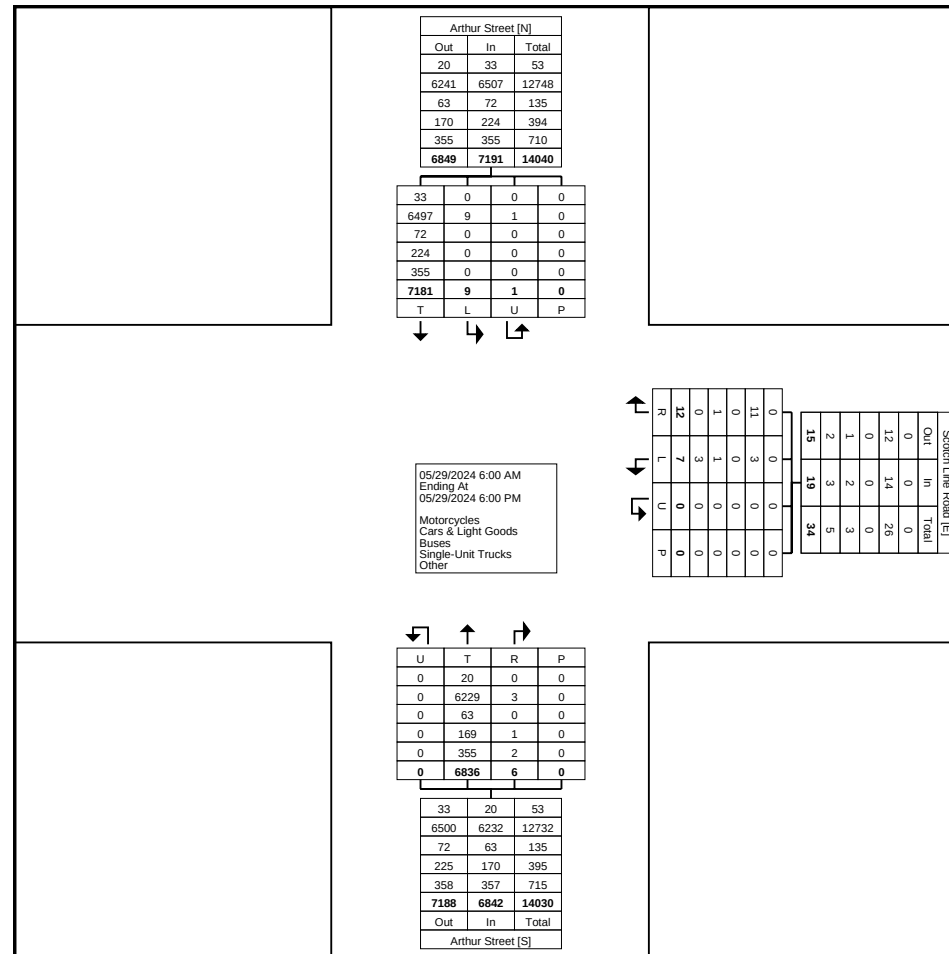
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Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Arthur Street & Scotch Line Road
Site Code: 240259
Start Date: 05/29/2024
Page No: 3



Turning Movement Data Plot

[illegible]

Turning Movement Peak Hour Data Plot (7:30 AM)

[illegible]

Turning Movement Peak Hour Data Plot (12:15 PM)

Start Time	Scotch Line Road Westbound					Arthur Street Northbound					Arthur Street Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	
4:00 PM	0	0	0	0	0	274	0	0	0	274	1	267	0	0	268	542
4:15 PM	0	0	0	0	0	297	0	0	0	297	0	281	1	0	282	579
4:30 PM	0	0	0	0	0	291	0	0	0	291	0	302	0	0	302	593
4:45 PM	0	0	0	0	0	326	1	0	0	327	0	242	0	0	242	569
Total	0	0	0	0	0	1188	1	0	0	1189	1	1092	1	0	1094	2283
Approach %	0.0	0.0	0.0	-	-	99.9	0.1	0.0	-	-	0.1	99.8	0.1	-	-	-
Total %	0.0	0.0	0.0	-	0.0	52.0	0.0	0.0	-	52.1	0.0	47.8	0.0	-	47.9	-
PHF	0.000	0.000	0.000	-	0.000	0.911	0.250	0.000	-	0.909	0.250	0.904	0.250	-	0.906	0.962
Motorcycles	0	0	0	-	0	4	0	0	-	4	0	5	0	-	5	9
% Motorcycles	-	-	-	-	-	0.3	0.0	-	-	0.3	0.0	0.5	0.0	-	0.5	0.4
Cars & Light Goods	0	0	0	-	0	1114	1	0	-	1115	1	1015	1	-	1017	2132
% Cars & Light Goods	-	-	-	-	-	93.8	100.0	-	-	93.8	100.0	92.9	100.0	-	93.0	93.4
Buses	0	0	0	-	0	11	0	0	-	11	0	9	0	-	9	20
% Buses	-	-	-	-	-	0.9	0.0	-	-	0.9	0.0	0.8	0.0	-	0.8	0.9
Single-Unit Trucks	0	0	0	-	0	24	0	0	-	24	0	32	0	-	32	56
% Single-Unit Trucks	-	-	-	-	-	2.0	0.0	-	-	2.0	0.0	2.9	0.0	-	2.9	2.5
Articulated Trucks	0	0	0	-	0	31	0	0	-	31	0	29	0	-	29	60
% Articulated Trucks	-	-	-	-	-	2.6	0.0	-	-	2.6	0.0	2.7	0.0	-	2.7	2.6
Bicycles on Road	0	0	0	-	0	4	0	0	-	4	0	2	0	-	2	6
% Bicycles on Road	-	-	-	-	-	0.3	0.0	-	-	0.3	0.0	0.2	0.0	-	0.2	0.3
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning Movement Peak Hour Data Plot (4:00 PM)

Appendix C

Base Year Operation Synchro Reports



Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↘	↔	↑	↘	↔	↑	↘	↔	↑	↘
Traffic Volume (vph)	66	85	141	56	39	115	57	440	48	127	439	10
Future Volume (vph)	66	85	141	56	39	115	57	440	48	127	439	10
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	2		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.99	1.00		0.98	1.00	1.00	
Frt			0.850			0.850			0.850		0.997	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3141	1842	1456	1588	1789	1375	1603	1740	1302	1588	1522	0
Flt Permitted	0.732			0.702			0.402			0.410		
Satd. Flow (perm)	2412	1842	1456	1174	1789	1355	676	1740	1270	684	1522	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						115			85		2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	2					2	8		4	4		8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Adj. Flow (vph)	66	85	141	56	39	115	57	440	48	127	439	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	66	85	141	56	39	115	57	440	48	127	449	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		7.0			7.0			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

1665 Scotch Line, Elmira
PTSL (240259)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.5	47.7	
Total Split (s)	32.0	32.0	10.0	32.0	32.0	32.0	10.0	48.0	48.0	10.0	48.0	
Total Split (%)	35.6%	35.6%	11.1%	35.6%	35.6%	35.6%	11.1%	53.3%	53.3%	11.1%	53.3%	
Maximum Green (s)	26.0	26.0	6.0	26.0	26.0	26.0	6.0	42.0	42.0	6.0	42.0	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	0.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		22.7	22.7		22.7	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	15.1	13.0	19.7	15.1	15.1	15.1	31.6	28.6	28.6	31.6	28.6	
Actuated g/C Ratio	0.29	0.25	0.38	0.29	0.29	0.29	0.61	0.55	0.55	0.61	0.55	
v/c Ratio	0.09	0.19	0.26	0.16	0.08	0.24	0.11	0.46	0.07	0.24	0.54	
Control Delay	18.6	21.3	13.3	20.2	18.8	6.5	4.9	13.1	1.1	6.0	14.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.6	21.3	13.3	20.2	18.8	6.5	4.9	13.1	1.1	6.0	14.8	
LOS	B	C	B	C	B	A	A	B	A	A	B	
Approach Delay		16.8			12.5			11.2			12.8	
Approach LOS		B			B			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 52.1

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 13.0

Intersection LOS: B

Intersection Capacity Utilization 58.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	66	85	141	56	39	115	57	440	48	127	449
v/c Ratio	0.09	0.19	0.26	0.16	0.08	0.24	0.11	0.46	0.07	0.24	0.54
Control Delay	18.6	21.3	13.3	20.2	18.8	6.5	4.9	13.1	1.1	6.0	14.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	21.3	13.3	20.2	18.8	6.5	4.9	13.1	1.1	6.0	14.8
Queue Length 50th (m)	2.6	7.3	8.6	4.6	3.1	0.0	2.1	34.1	0.0	4.9	36.6
Queue Length 95th (m)	8.1	20.5	24.4	14.9	11.1	11.5	5.4	57.9	2.1	10.3	64.4
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	1390	986	549	676	1031	830	525	1421	1052	527	1243
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.09	0.26	0.08	0.04	0.14	0.11	0.31	0.05	0.24	0.36
Intersection Summary											

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑	↔	↔	↑	↔	↔	↑	↔	↔	↔	↔
Traffic Volume (vph)	66	85	141	56	39	115	57	440	48	127	439	10
Future Volume (vph)	66	85	141	56	39	115	57	440	48	127	439	10
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3135	1842	1456	1588	1789	1357	1602	1740	1272	1587	1521	
Flt Permitted	0.73	1.00	1.00	0.70	1.00	1.00	0.40	1.00	1.00	0.41	1.00	
Satd. Flow (perm)	2414	1842	1456	1173	1789	1357	677	1740	1272	685	1521	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	66	85	141	56	39	115	57	440	48	127	439	10
RTOR Reduction (vph)	0	0	0	0	0	92	0	0	24	0	1	0
Lane Group Flow (vph)	66	85	141	56	39	23	57	440	24	127	448	0
Confl. Peds. (#/hr)	2					2	8		4	4		8
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2		6	
Actuated Green, G (s)	8.9	8.9	13.3	8.9	8.9	8.9	29.5	25.1	25.1	29.5	25.1	
Effective Green, g (s)	10.9	8.9	13.3	10.9	10.9	10.9	29.5	27.1	27.1	29.5	27.1	
Actuated g/C Ratio	0.20	0.16	0.24	0.20	0.20	0.20	0.54	0.50	0.50	0.54	0.50	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	483	301	355	235	358	271	441	866	633	444	757	
v/s Ratio Prot		0.05	c0.03		0.02		0.01	0.25		0.02	c0.29	
v/s Ratio Perm	0.03		0.06	0.05		0.02	0.06		0.02	0.13		
v/c Ratio	0.14	0.28	0.40	0.24	0.11	0.09	0.13	0.51	0.04	0.29	0.59	
Uniform Delay, d1	17.9	19.9	17.2	18.3	17.8	17.7	6.2	9.2	7.0	6.4	9.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.5	0.7	0.5	0.1	0.1	0.1	0.5	0.0	0.4	1.2	
Delay (s)	18.0	20.5	17.9	18.8	17.9	17.8	6.3	9.6	7.0	6.8	11.0	
Level of Service	B	C	B	B	B	B	A	A	A	A	B	
Approach Delay (s)	18.7			18.1			9.1			10.0		
Approach LOS	B			B			A			B		
Intersection Summary												
HCM 2000 Control Delay	12.3			HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio	0.53											
Actuated Cycle Length (s)	54.4			Sum of lost time (s)						14.0		
Intersection Capacity Utilization	58.5%			ICU Level of Service						B		
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
102: Union St & South Field Dr

Base Year - 2024
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	60	17	12	43	74	12	86	13	62	76	29
Future Volume (vph)	24	60	17	12	43	74	12	86	13	62	76	29
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	40.0	25.0	25.0	25.0	25.0	25.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.977	0.977	0.977	0.977	0.977	0.977	0.923	0.980	0.980	0.959	0.959	0.959
Flt Protected	0.988	0.988	0.988	0.988	0.988	0.988	0.995	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	0	1394	0	0	1294	0	1544	1428	0	1619	1449	0
Flt Permitted	0.988	0.988	0.988	0.988	0.988	0.988	0.995	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	0	1394	0	0	1294	0	1544	1428	0	1619	1449	0
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	669.7	669.7	669.7	669.7	669.7	669.7	258.4	319.4	319.4	256.9	256.9	256.9
Travel Time (s)	48.2	48.2	48.2	48.2	48.2	48.2	18.6	23.0	23.0	18.5	18.5	18.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	7%	6%	8%	12%	7%	8%	8%	38%	3%	11%	0%
Adj. Flow (vph)	24	60	17	12	43	74	12	86	13	62	76	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	101	0	0	129	0	12	99	0	62	105	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25	25	15	25	25	25	25	25	25	25	25	25
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	30.2%
ICU Level of Service A	
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Base Year - 2024
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	60	17	12	43	74	12	86	13	62	76	29
Future Volume (Veh/h)	24	60	17	12	43	74	12	86	13	62	76	29
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	24	60	17	12	43	74	12	86	13	62	76	29
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	117			77			288	258	68	276	229	80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	117			77			288	258	68	276	229	80
tC, single (s)	4.1			4.2			7.2	6.6	6.6	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.6	3.5	4.1	3.3
p0 queue free %	98			99			98	86	99	89	88	97
cM capacity (veh/h)	1459			1484			565	621	903	583	639	986
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	101	129	12	99	62	105						
Volume Left	24	12	12	0	62	0						
Volume Right	17	74	0	13	0	29						
cSH	1459	1484	565	648	583	708						
Volume to Capacity	0.02	0.01	0.02	0.15	0.11	0.15						
Queue Length 95th (m)	0.4	0.2	0.5	4.3	2.8	4.2						
Control Delay (s)	1.9	0.8	11.5	11.6	11.9	11.0						
Lane LOS	A	A	B	B	B	B						
Approach Delay (s)	1.9	0.8	11.6	11.3								
Approach LOS			B	B								

Intersection Summary

Average Delay	6.8
Intersection Capacity Utilization	30.2%
ICU Level of Service A	
Analysis Period (min)	15

Lanes, Volumes, Timings

103: Rail Crossing & South Field Dr

Base Year - 2024

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	135	0	0	129	0	0	0	0	0	0	0
Future Volume (vph)	0	135	0	0	129	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1000	1900	1000	1000	1900	1000	1000	1900	1000	1000	1900	1000
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit												
Fit Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Fit Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	258.4			1129.7			175.3			172.7		
Travel Time (s)	18.6			81.3			12.6			12.4		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	135	0	0	129	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	135	0	0	129	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	0.0			0.0			0.0			0.0		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Free			Free		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 10.4% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

103: Rail Crossing & South Field Dr

Base Year - 2024

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	135	0	0	129	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	135	0	0	129	0	0	0	0	0	0	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	135	0	0	129	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	64	0	0	68	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64	0	0	68	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	85	100	100	86	100	100			100		
cM capacity (veh/h)	827	896	1085	818	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	135	129	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.15	0.14	0.00	0.00								
Queue Length 95th (m)	4.2	4.0	0.0	0.0								
Control Delay (s)	9.7	9.7	0.0	0.0								
Lane LOS	A	A										
Approach Delay (s)	9.7	9.7	0.0	0.0								
Approach LOS	A	A										

Intersection Summary

Average Delay 9.7

Intersection Capacity Utilization 10.4% ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Base Year - 2024
AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	T	T	T	T	T
Traffic Volume (vph)	1	3	836	0	0	1100
Future Volume (vph)	1	3	836	0	0	1100
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.899					
Flt Protected	0.988					
Satd. Flow (prot)	1240	0	1539	0	0	1525
Flt Permitted	0.988					
Satd. Flow (perm)	1240	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	100%	0%	6%	0%	0%	7%
Adj. Flow (vph)	1	3	836	0	0	1100
Shared Lane Traffic (%)						
Lane Group Flow (vph)	4	0	836	0	0	1100
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 76.7%	ICU Level of Service D					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Base Year - 2024
AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	T	T	T	T	T
Traffic Volume (veh/h)	1	3	836	0	0	1100
Future Volume (Veh/h)	1	3	836	0	0	1100
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	3	836	0	0	1100
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1936	836			836	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1936	836			836	
tC, single (s)	7.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	4.4	3.3			2.2	
p0 queue free %	97	99			100	
cM capacity (veh/h)	40	370			807	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	836	1100			
Volume Left	1	0	0			
Volume Right	3	0	0			
cSH	121	1700	807			
Volume to Capacity	0.03	0.49	0.00			
Queue Length 95th (m)	0.8	0.0	0.0			
Control Delay (s)	35.8	0.0	0.0			
Lane LOS	E					
Approach Delay (s)	35.8	0.0	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization		76.7%		ICU Level of Service		D
Analysis Period (min)		15				

Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	44	62	102	72	110	174	142	594	79	148	473	29
Future Volume (vph)	44	62	102	72	110	174	142	594	79	148	473	29
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00						0.97	1.00		0.97	1.00	1.00
Frt			0.850				0.850			0.850		0.991
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	1824	1471	1619	1879	1456	1668	1807	1428	1651	1542	0
Flt Permitted	0.686			0.717			0.313			0.286		
Satd. Flow (perm)	1199	1824	1471	1222	1879	1420	549	1807	1379	495	1542	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						174			85		5	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	3					3	1		13	13		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Adj. Flow (vph)	44	62	102	72	110	174	142	594	79	148	473	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	44	62	102	72	110	174	142	594	79	148	502	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane							Yes					
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

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PTSL (240259)Synchro 11 Report
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Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.0	47.7	
Total Split (s)	32.0	32.0	9.6	32.0	32.0	32.0	9.6	49.0	49.0	9.0	48.4	
Total Split (%)	35.6%	35.6%	10.7%	35.6%	35.6%	35.6%	10.7%	54.4%	54.4%	10.0%	53.8%	
Maximum Green (s)	26.0	26.0	5.6	26.0	26.0	26.0	5.6	43.0	43.0	5.0	42.4	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	6.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		21.8	21.8		21.8	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	14.6	14.6	24.4	14.6	14.6	14.6	32.5	28.2	28.2	34.6	23.4	
Actuated g/C Ratio	0.25	0.25	0.42	0.25	0.25	0.25	0.56	0.49	0.49	0.60	0.40	
v/c Ratio	0.15	0.14	0.17	0.23	0.23	0.36	0.34	0.68	0.11	0.34	0.80	
Control Delay	21.2	20.4	13.8	22.3	21.3	6.6	7.0	16.5	2.5	6.1	25.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	21.2	20.4	13.8	22.3	21.3	6.6	7.0	16.5	2.5	6.1	25.6	
LOS	C	C	B	C	C	A	A	B	A	A	C	
Approach Delay		17.3			14.3			13.5			21.1	
Approach LOS		B			B			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 57.9

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 16.5

Intersection LOS: B

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	44	62	102	72	110	174	142	594	79	148	502
v/c Ratio	0.15	0.14	0.17	0.23	0.23	0.36	0.34	0.68	0.11	0.34	0.80
Control Delay	21.2	20.4	13.8	22.3	21.3	6.6	7.0	16.5	2.5	6.1	25.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.2	20.4	13.8	22.3	21.3	6.6	7.0	16.5	2.5	6.1	25.6
Queue Length 50th (m)	3.7	5.2	6.5	6.2	9.4	0.0	5.6	49.2	0.0	5.1	45.2
Queue Length 95th (m)	13.1	16.5	20.2	19.3	25.9	14.5	12.0	84.8	5.1	11.1	81.3
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	589	897	618	601	924	786	418	1429	1108	437	1188
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.07	0.17	0.12	0.12	0.22	0.34	0.42	0.07	0.34	0.42
Intersection Summary											

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Base Year - 2024

PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↑	↖	↓	↖	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑	↗	↖	↗	
Traffic Volume (vph)	44	62	102	72	110	174	142	594	79	148	473	29
Future Volume (vph)	44	62	102	72	110	174	142	594	79	148	473	29
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1663	1824	1471	1619	1879	1422	1667	1807	1386	1650	1543	
Flt Permitted	0.69	1.00	1.00	0.72	1.00	1.00	0.31	1.00	1.00	0.29	1.00	
Satd. Flow (perm)	1201	1824	1471	1221	1879	1422	549	1807	1386	496	1543	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	44	62	102	72	110	174	142	594	79	148	473	29
RTOR Reduction (vph)	0	0	0	0	0	131	0	0	41	0	3	0
Lane Group Flow (vph)	44	62	102	72	110	43	142	594	38	148	499	0
Confl. Peds. (#/hr)	3					3	1		13	13		1
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	12.6	12.6	18.3	12.6	12.6	12.6	31.8	26.1	26.1	28.2	24.3	
Effective Green, g (s)	14.6	14.6	18.3	14.6	14.6	14.6	31.8	28.1	28.1	32.2	24.3	
Actuated g/C Ratio	0.25	0.25	0.31	0.25	0.25	0.25	0.54	0.48	0.48	0.55	0.41	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	299	454	459	304	468	354	406	866	664	388	639	
v/s Ratio Prot		0.03	0.02		0.06		c0.03	c0.33		c0.04	0.32	
v/s Ratio Perm	0.04		0.05	c0.06		0.03	0.16		0.03	0.17		
v/c Ratio	0.15	0.14	0.22	0.24	0.24	0.12	0.35	0.69	0.06	0.38	0.78	
Uniform Delay, d1	17.1	17.1	14.9	17.6	17.5	17.0	7.5	11.8	8.2	7.4	14.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.1	0.2	0.4	0.3	0.2	0.5	2.3	0.0	0.6	6.2	
Delay (s)	17.4	17.2	15.1	18.0	17.8	17.2	8.1	14.1	8.2	8.1	21.0	
Level of Service	B	B	B	B	B	B	A	B	A	A	C	
Approach Delay (s)	16.2			17.5			12.5			18.1		
Approach LOS	B			B			B			B		
Intersection Summary												
HCM 2000 Control Delay	15.5			HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio	0.56											
Actuated Cycle Length (s)	58.6			Sum of lost time (s)					14.0			
Intersection Capacity Utilization	65.2%			ICU Level of Service					C			
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
102: Union St & South Field Dr

Base Year - 2024
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	56	49	10	111	109	18	90	17	60	134	71
Future Volume (vph)	40	56	49	10	111	109	18	90	17	60	134	71
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	40.0	25.0	25.0	25.0	25.0	25.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.954	0.954	0.954	0.954	0.954	0.954	0.976	0.976	0.976	0.976	0.976	0.976
Flt Protected	0.986	0.986	0.986	0.986	0.986	0.986	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	0	1401	0	0	1374	0	1668	1339	0	1558	1477	0
Flt Permitted	0.986	0.986	0.986	0.986	0.986	0.986	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	0	1401	0	0	1374	0	1668	1339	0	1558	1477	0
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	669.7	669.7	669.7	669.7	669.7	669.7	319.4	319.4	319.4	319.4	319.4	319.4
Travel Time (s)	48.2	48.2	48.2	48.2	48.2	48.2	23.0	23.0	23.0	23.0	23.0	23.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	0%	2%	10%	2%	6%	0%	17%	29%	7%	4%	6%
Adj. Flow (vph)	40	56	49	10	111	109	18	90	17	60	134	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	145	0	0	230	0	18	107	0	60	205	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25	25	15	25	25	25	25	25	25	25	25	25
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	52.0%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Base Year - 2024
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	56	49	10	111	109	18	90	17	60	134	71
Future Volume (Veh/h)	40	56	49	10	111	109	18	90	17	60	134	71
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	40	56	49	10	111	109	18	90	17	60	134	71
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	220			105			484	400	80	408	370	166
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	220			105			484	400	80	408	370	166
tC, single (s)	4.2			4.2			7.1	6.7	6.5	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.2	3.6	3.6	4.0	3.4
p0 queue free %	97			99			95	82	98	87	75	92
cM capacity (veh/h)	1314			1438			358	496	910	448	535	869
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	145	230	18	107	60	205						
Volume Left	40	10	18	0	60	0						
Volume Right	49	109	0	17	0	71						
cSH	1314	1438	358	535	448	617						
Volume to Capacity	0.03	0.01	0.05	0.20	0.13	0.33						
Queue Length 95th (m)	0.8	0.2	1.3	5.9	3.7	11.6						
Control Delay (s)	2.3	0.4	15.6	13.4	14.3	13.7						
Lane LOS	A	A	C	B	B	B						
Approach Delay (s)	2.3	0.4	13.7	13.8								
Approach LOS			B	B								

Intersection Summary

Average Delay	7.6
Intersection Capacity Utilization	52.0%
ICU Level of Service	A
Analysis Period (min)	15

Lanes, Volumes, Timings

103: Rail Crossing & South Field Dr

Base Year - 2024

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (vph)	0	133	0	0	230	0	0	0	0	0	0	0
Future Volume (vph)	0	133	0	0	230	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1000	1900	1000	1000	1900	1000	1000	1900	1000	1000	1900	1000
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Flt Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		255.5			1132.6			164.4			156.0	
Travel Time (s)		18.4			81.5			11.8			11.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	133	0	0	230	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	133	0	0	230	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 15.4% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

103: Rail Crossing & South Field Dr

Base Year - 2024

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (veh/h)	0	133	0	0	230	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	133	0	0	230	0	0	0	0	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	133	0	0	230	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	115	0	0	66	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	115	0	0	66	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	85	100	100	74	100	100			100		
cM capacity (veh/h)	691	896	1085	821	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	133	230	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.15	0.26	0.00	0.00								
Queue Length 95th (m)	4.2	8.2	0.0	0.0								
Control Delay (s)	9.7	10.4	0.0	0.0								
Lane LOS	A	B										
Approach Delay (s)	9.7	10.4	0.0	0.0								
Approach LOS	A	B										

Intersection Summary

Average Delay 10.1

Intersection Capacity Utilization 15.4% ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Base Year - 2024
PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T		T	
Traffic Volume (vph)	0	0	1188	1	1	1092
Future Volume (vph)	0	0	1188	1	1	1092
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr						
Flt Protected						
Satd. Flow (prot)	1745	0	1539	0	0	1525
Flt Permitted						
Satd. Flow (perm)	1745	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	6%	0%	0%	7%
Adj. Flow (vph)	0	0	1188	1	1	1092
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	1189	0	0	1093
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 75.4%	ICU Level of Service D					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Base Year - 2024
PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T		T	
Traffic Volume (veh/h)	0	0	1188	1	1	1092
Future Volume (Veh/h)	0	0	1188	1	1	1092
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	1188	1	1	1092
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2282	1188			1189	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2282	1188			1189	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	44	231			594	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	0	1189	1093			
Volume Left	0	0	1			
Volume Right	0	1	0			
cSH	1700	1700	594			
Volume to Capacity	0.00	0.70	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.1			
Lane LOS	A		A			
Approach Delay (s)	0.0	0.0	0.1			
Approach LOS	A					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		75.4%		ICU Level of Service		D
Analysis Period (min)		15				

Appendix D

TTS Distribution Data



Tue Jun 04 2024 14:51:01 GMT-0400 (Eastern Daylight Time) - Run Time: 2167ms

Cross Tabulation Query Form - Trip - 2016

Row: 2006 GTA zone of household - gta06_hhld

Column: 2006 GTA zone of employment - gta06_emp

RowG:

ColG:(7547)

TblG:

Filters:

No Filters

Trip 2016

ROW : gta06_hhld

COLUMN : gta06_emp

gta06_hhld gta06_emp total

7002	SU	82
7014	SU	24
7025	SU	65
7055	SU	20
7056	SU	49
7081	SA	151
7099	SA	156
7125	SA	100
7126	SA	177
7138	SU	20
7154	SU	56
7157	SU	45
7167	SU	19
7174	SU	21
7175	SA	124
7176	SU	96
7192	SU	88
7194	SU	52
7208	SU	42
7213	SU	54
7214	SU	92
7230	SU	45
7246	SU	90
7252	SU	91
7253	SU	85
7256	SU	52
7281	SA	121
7302	SU	28
7314	SU	27
7329	SU	30
7359	SU	83
7389	SU	73
7390	SA	440
7458	SA	75
7466	SU	64
7509	SU	91
7517	SU	29
7536	SA	85
7545	SA	97
7547	SU	202
7548	WW	2482
7549	NA	484
7553	NA	81
7554	NA	24
7555	NU	55
7562	ES	169
8073	NA	41
8351	NA	200
8513	1	53
8960	SA	33

NA
NU
ES
SA
SU
WW

Direction/Route		Trips	%
North	Arthur Street	830	12%
	Union Street	55	1%
East	South Field Drive	169	2%
South	Arthur Street	1,559	23%
	Union Street	1,815	26%
West	Whippoorwill Drive	2,482	36%
Total		6,910	100%

Appendix E

Background Operation Synchro Reports



Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	77	100	165	66	46	135	67	516	56	149	550	12
Future Volume (vph)	77	100	165	66	46	135	67	516	56	149	550	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00						0.98	1.00		0.98	1.00	1.00
Frt			0.850				0.850			0.850		0.997
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1619	1842	1456	1588	1789	1375	1603	1740	1302	1588	1522	0
Flt Permitted	0.727			0.692			0.307			0.342		
Satd. Flow (perm)	1235	1842	1456	1157	1789	1343	517	1740	1270	571	1522	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						135			85		2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	2					2	8		4	4		8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Adj. Flow (vph)	77	100	165	66	46	135	67	516	56	149	550	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	100	165	66	46	135	67	516	56	149	562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane							Yes					
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

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PTSL (240259)Synchro 11 Report
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Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.5	47.7	
Total Split (s)	32.0	32.0	10.0	32.0	32.0	32.0	10.0	48.0	48.0	10.0	48.0	
Total Split (%)	35.6%	35.6%	11.1%	35.6%	35.6%	35.6%	11.1%	53.3%	53.3%	11.1%	53.3%	
Maximum Green (s)	26.0	26.0	6.0	26.0	26.0	26.0	6.0	42.0	42.0	6.0	42.0	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		22.7	22.7		22.7	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	15.4	15.4	20.0	15.4	15.4	15.4	37.1	30.8	30.8	37.4	30.9	
Actuated g/c Ratio	0.26	0.26	0.34	0.26	0.26	0.26	0.62	0.52	0.52	0.63	0.52	
v/c Ratio	0.24	0.21	0.34	0.22	0.10	0.30	0.15	0.57	0.08	0.32	0.71	
Control Delay	25.2	23.8	18.1	25.1	22.9	7.5	5.0	14.0	1.2	6.3	18.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	25.2	23.8	18.1	25.1	22.9	7.5	5.0	14.0	1.2	6.3	18.1	
LOS	C	C	B	C	C	A	A	B	A	A	B	
Approach Delay		21.4			15.0			11.9			15.7	
Approach LOS		C			B			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 59.5

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 15.4

Intersection LOS: B

Intersection Capacity Utilization 65.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	77	100	165	66	46	135	67	516	56	149	562
v/c Ratio	0.24	0.21	0.34	0.22	0.10	0.30	0.15	0.57	0.08	0.32	0.71
Control Delay	25.2	23.8	18.1	25.1	22.9	7.5	5.0	14.0	1.2	6.3	18.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.2	23.8	18.1	25.1	22.9	7.5	5.0	14.0	1.2	6.3	18.1
Queue Length 50th (m)	7.5	9.6	12.8	6.4	4.3	0.0	2.5	42.4	0.0	5.9	51.3
Queue Length 95th (m)	22.5	26.4	35.0	20.0	14.6	13.9	6.4	72.8	2.6	12.7	91.9
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	624	932	491	585	905	745	441	1296	967	469	1134
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.11	0.34	0.11	0.05	0.18	0.15	0.40	0.06	0.32	0.50
Intersection Summary											

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	100	165	66	46	135	67	516	56	149	550	12
Future Volume (vph)	77	100	165	66	46	135	67	516	56	149	550	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1615	1842	1456	1588	1789	1344	1602	1740	1272	1587	1521	
Flt Permitted	0.73	1.00	1.00	0.69	1.00	1.00	0.31	1.00	1.00	0.34	1.00	
Satd. Flow (perm)	1236	1842	1456	1157	1789	1344	517	1740	1272	571	1521	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	77	100	165	66	46	135	67	516	56	149	550	12
RTOR Reduction (vph)	0	0	0	0	0	110	0	0	27	0	1	0
Lane Group Flow (vph)	77	100	165	66	46	25	67	516	29	149	561	0
Confl. Peds. (#/hr)	2					2	8		4	4		8
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	9.2	9.2	15.5	9.2	9.2	9.2	35.0	28.7	28.7	35.2	28.8	
Effective Green, g (s)	11.2	11.2	15.5	11.2	11.2	11.2	35.0	30.7	30.7	35.2	30.8	
Actuated g/C Ratio	0.19	0.19	0.26	0.19	0.19	0.19	0.58	0.51	0.51	0.58	0.51	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	229	342	374	214	332	249	413	885	647	441	776	
v/s Ratio Prot		0.05	c0.05		0.03		0.02	0.30		0.04	c0.37	
v/s Ratio Perm	0.06		0.07	0.06		0.02	0.08		0.02	0.16		
v/c Ratio	0.34	0.29	0.44	0.31	0.14	0.10	0.16	0.58	0.04	0.34	0.72	
Uniform Delay, d1	21.3	21.1	18.8	21.2	20.5	20.4	6.3	10.3	7.4	6.4	11.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	0.5	0.8	0.8	0.2	0.2	0.2	1.0	0.0	0.5	3.3	
Delay (s)	22.2	21.6	19.6	22.0	20.7	20.5	6.5	11.3	7.5	6.9	14.8	
Level of Service	C	C	B	C	C	C	A	B	A	A	B	
Approach Delay (s)	20.8			21.0			10.5			13.1		
Approach LOS	C			C			B			B		
Intersection Summary												
HCM 2000 Control Delay	14.6			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.60											
Actuated Cycle Length (s)	60.3			Sum of lost time (s)			12.0					
Intersection Capacity Utilization	65.4%			ICU Level of Service			C					
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
102: Union St & South Field Dr

Background - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	70	20	14	50	87	14	101	15	73	89	34
Future Volume (vph)	28	70	20	14	50	87	14	101	15	73	89	34
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	40.0	25.0	25.0	25.0	25.0	25.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.977	0.977	0.977	0.977	0.977	0.977	0.981	0.981	0.981	0.959	0.959	0.959
Flt Protected	0.988	0.988	0.988	0.988	0.988	0.988	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	0	1394	0	0	1293	0	1544	1431	0	1619	1449	0
Flt Permitted	0.988	0.988	0.988	0.988	0.988	0.988	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	0	1394	0	0	1293	0	1544	1431	0	1619	1449	0
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	669.7	669.7	669.7	669.7	669.7	669.7	319.4	319.4	319.4	256.9	256.9	256.9
Travel Time (s)	48.2	48.2	48.2	48.2	48.2	48.2	23.0	23.0	23.0	18.5	18.5	18.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	7%	6%	8%	12%	7%	8%	8%	38%	3%	11%	0%
Adj. Flow (vph)	28	70	20	14	50	87	14	101	15	73	89	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	118	0	0	151	0	14	116	0	73	123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25	25	15	25	25	25	25	25	25	25	25	25
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	34.6%
ICU Level of Service A	
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Background - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	70	20	14	50	87	14	101	15	73	89	34
Future Volume (Veh/h)	28	70	20	14	50	87	14	101	15	73	89	34
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	28	70	20	14	50	87	14	101	15	73	89	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	137			90			336	301	80	323	268	94
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	137			90			336	301	80	323	268	94
tC, single (s)	4.1			4.2			7.2	6.6	6.6	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.6	3.5	4.1	3.3
p0 queue free %	98			99			97	83	98	86	85	96
cM capacity (veh/h)	1435			1468			508	584	889	524	605	969
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	118	151	14	116	73	123						
Volume Left	28	14	14	0	73	0						
Volume Right	20	87	0	15	0	34						
cSH	1435	1468	508	611	524	675						
Volume to Capacity	0.02	0.01	0.03	0.19	0.14	0.18						
Queue Length 95th (m)	0.5	0.2	0.7	5.6	3.9	5.3						
Control Delay (s)	1.9	0.8	12.3	12.3	13.0	11.5						
Lane LOS	A	A	B	B	B	B						
Approach Delay (s)	1.9	0.8	12.3	12.1								
Approach LOS			B	B								
Intersection Summary												
Average Delay			7.2									
Intersection Capacity Utilization			34.6%									
ICU Level of Service A												
Analysis Period (min)			15									

Lanes, Volumes, Timings
103: Rail Crossing & South Field Dr

Background - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (vph)	0	158	0	0	151	0	0	0	0	0	0	0
Future Volume (vph)	0	158	0	0	151	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1000	1900	1000	1000	1900	1000	1000	1900	1000	1000	1900	1000
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit												
Fit Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Fit Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	258.4			1129.7			175.3			172.7		
Travel Time (s)	18.6			81.3			12.6			12.4		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	158	0	0	151	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	158	0	0	151	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	0.0			0.0			0.0			0.0		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Free			Free		

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization 11.6%	ICU Level of Service A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
103: Rail Crossing & South Field Dr

Background - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (veh/h)	0	158	0	0	151	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	158	0	0	151	0	0	0	0	0	0	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	158	0	0	151	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	76	0	0	79	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76	0	0	79	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	82	100	100	83	100	100			100		
cM capacity (veh/h)	796	896	1085	786	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	158	151	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.18	0.17	0.00	0.00								
Queue Length 95th (m)	5.1	4.8	0.0	0.0								
Control Delay (s)	9.9	9.8	0.0	0.0								
Lane LOS	A	A										
Approach Delay (s)	9.9	9.8	0.0	0.0								
Approach LOS	A	A										

Intersection Summary

Average Delay	9.9
Intersection Capacity Utilization 11.6%	ICU Level of Service A
Analysis Period (min)	15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Background - 2032
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	4	980	0	0	1289
Future Volume (vph)	1	4	980	0	0	1289
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.892					
Flt Protected	0.990					
Satd. Flow (prot)	1284	0	1539	0	0	1525
Flt Permitted	0.990					
Satd. Flow (perm)	1284	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	100%	0%	6%	0%	0%	7%
Adj. Flow (vph)	1	4	980	0	0	1289
Shared Lane Traffic (%)						
Lane Group Flow (vph)	5	0	980	0	0	1289
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	88.1%			ICU Level of Service E		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Background - 2032
AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	4	980	0	0	1289
Future Volume (Veh/h)	1	4	980	0	0	1289
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	4	980	0	0	1289
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2269	980			980	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2269	980			980	
tC, single (s)	7.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	4.4	3.3			2.2	
p0 queue free %	96	99			100	
cM capacity (veh/h)	23	306			712	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	5	980	1289			
Volume Left	1	0	0			
Volume Right	4	0	0			
cSH	88	1700	712			
Volume to Capacity	0.06	0.58	0.00			
Queue Length 95th (m)	1.4	0.0	0.0			
Control Delay (s)	48.4	0.0	0.0			
Lane LOS	E					
Approach Delay (s)	48.4	0.0	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			88.1%	ICU Level of Service		E
Analysis Period (min)			15			

Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	52	73	120	84	129	204	166	696	93	173	558	34
Future Volume (vph)	52	73	120	84	129	204	166	696	93	173	558	34
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00						0.97	1.00		0.97	1.00	1.00
Frt			0.850				0.850			0.850		0.991
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	1824	1471	1619	1879	1456	1668	1807	1428	1651	1542	0
Flt Permitted	0.674			0.709			0.251			0.182		
Satd. Flow (perm)	1178	1824	1471	1208	1879	1420	440	1807	1379	315	1542	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						204			85		5	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	3					3	1		13	13		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Adj. Flow (vph)	52	73	120	84	129	204	166	696	93	173	558	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	73	120	84	129	204	166	696	93	173	592	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane							Yes					
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

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Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.0	47.7	
Total Split (s)	32.0	32.0	9.6	32.0	32.0	32.0	9.6	49.0	49.0	9.0	48.4	
Total Split (%)	35.6%	35.6%	10.7%	35.6%	35.6%	35.6%	10.7%	54.4%	54.4%	10.0%	53.8%	
Maximum Green (s)	26.0	26.0	5.6	26.0	26.0	26.0	5.6	43.0	43.0	5.0	42.4	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		21.8	21.8		21.8	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	15.1	15.1	24.9	15.1	15.1	15.1	37.2	31.5	31.5	36.0	30.9	
Actuated g/C Ratio	0.24	0.24	0.39	0.24	0.24	0.24	0.58	0.49	0.49	0.56	0.48	
v/c Ratio	0.19	0.17	0.21	0.29	0.29	0.42	0.45	0.78	0.13	0.61	0.79	
Control Delay	24.7	23.5	16.9	26.3	24.7	7.1	8.9	20.3	2.9	15.6	22.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	24.7	23.5	16.9	26.3	24.7	7.1	8.9	20.3	2.9	15.6	22.4	
LOS	C	C	B	C	C	A	A	C	A	B	C	
Approach Delay		20.5			16.4			16.6			20.9	
Approach LOS		C			B			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 64

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.4

Intersection LOS: B

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	52	73	120	84	129	204	166	696	93	173	558
v/c Ratio	0.19	0.17	0.21	0.29	0.29	0.42	0.45	0.78	0.13	0.61	0.79
Control Delay	24.7	23.5	16.9	26.3	24.7	7.1	8.9	20.3	2.9	15.6	22.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	23.5	16.9	26.3	24.7	7.1	8.9	20.3	2.9	15.6	22.4
Queue Length 50th (m)	5.1	7.1	9.4	8.4	13.0	0.0	6.6	63.0	0.5	6.9	54.2
Queue Length 95th (m)	16.3	20.4	26.3	24.1	32.5	16.5	15.1	114.2	6.6	#17.5	103.2
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	527	816	573	540	841	748	365	1300	1016	284	1096
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.09	0.21	0.16	0.15	0.27	0.45	0.54	0.09	0.61	0.54

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Background - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	52	73	120	84	129	204	166	696	93	173	558	34
Future Volume (vph)	52	73	120	84	129	204	166	696	93	173	558	34
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1662	1824	1471	1619	1879	1422	1667	1807	1385	1650	1543	1543
Flt Permitted	0.67	1.00	1.00	0.71	1.00	1.00	0.25	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	1180	1824	1471	1209	1879	1422	440	1807	1385	316	1543	1543
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	73	120	84	129	204	166	696	93	173	558	34
RTOR Reduction (vph)	0	0	0	0	0	156	0	0	43	0	3	0
Lane Group Flow (vph)	52	73	120	84	129	48	166	696	50	173	589	0
Confl. Peds. (#/hr)	3					3	1		13	13		1
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	NA
Protected Phases	4		5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	13.1	13.1	18.8	13.1	13.1	13.1	35.1	29.4	29.4	33.9	28.8	
Effective Green, g (s)	15.1	15.1	18.8	15.1	15.1	15.1	35.1	31.4	31.4	33.9	30.8	
Actuated g/C Ratio	0.24	0.24	0.30	0.24	0.24	0.24	0.55	0.49	0.49	0.53	0.48	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	280	433	434	287	446	337	352	892	683	275	747	
v/s Ratio Prot		0.04	0.02		0.07		0.04	c0.39		c0.05	0.38	
v/s Ratio Perm	0.04		0.06	c0.07		0.03	0.22		0.04	0.28		
v/c Ratio	0.19	0.17	0.28	0.29	0.29	0.14	0.47	0.78	0.07	0.63	0.79	
Uniform Delay, d1	19.3	19.3	17.2	19.9	19.9	19.1	8.7	13.3	8.5	10.3	13.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.2	0.3	0.6	0.4	0.2	1.0	4.5	0.0	4.5	5.6	
Delay (s)	19.7	19.4	17.5	20.4	20.2	19.3	9.7	17.7	8.5	14.8	19.2	
Level of Service	B	B	B	C	C	B	A	B	A	B	B	
Approach Delay (s)	18.6			19.8			15.4			18.2		
Approach LOS	B			B			B			B		

Intersection Summary

HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	63.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
102: Union St & South Field Dr

Background - 2032
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	66	57	12	130	128	21	105	20	70	157	83
Future Volume (vph)	47	66	57	12	130	128	21	105	20	70	157	83
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	40.0	25.0	25.0	25.0	25.0	25.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.955	0.955	0.955	0.936	0.936	0.936	0.976	0.976	0.976	0.948	0.948	0.948
Flt Protected	0.986	0.986	0.986	0.986	0.986	0.986	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	0	1403	0	0	1373	0	1668	1339	0	1558	1478	0
Flt Permitted	0.986	0.986	0.986	0.986	0.986	0.986	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	0	1403	0	0	1373	0	1668	1339	0	1558	1478	0
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	669.7	669.7	669.7	260.6	260.6	260.6	319.4	319.4	319.4	256.9	256.9	256.9
Travel Time (s)	48.2	48.2	48.2	18.8	18.8	18.8	23.0	23.0	23.0	18.5	18.5	18.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	0%	2%	10%	2%	6%	0%	17%	29%	7%	4%	6%
Adj. Flow (vph)	47	66	57	12	130	128	21	105	20	70	157	83
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	170	0	0	270	0	21	125	0	70	240	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25	25	15	25	25	15	25	25	15	25	25	15
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	62.5%
ICU Level of Service	B
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Background - 2032
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	66	57	12	130	128	21	105	20	70	157	83
Future Volume (Veh/h)	47	66	57	12	130	128	21	105	20	70	157	83
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	47	66	57	12	130	128	21	105	20	70	157	83
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None	None	None	None	None	None	None	None	None	None	None	None
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	258			123			568	470	94	479	435	194
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	258			123			568	470	94	479	435	194
tC, single (s)	4.2			4.2			7.1	6.7	6.5	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.2	3.6	3.6	4.0	3.4
p0 queue free %	96			99			93	77	98	82	68	90
cM capacity (veh/h)	1273			1416			286	449	893	379	488	837
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	170	270	21	125	70	240						
Volume Left	47	12	21	0	70	0						
Volume Right	57	128	0	20	0	83						
cSH	1273	1416	286	487	379	571						
Volume to Capacity	0.04	0.01	0.07	0.26	0.18	0.42						
Queue Length 95th (m)	0.9	0.2	1.9	8.1	5.4	16.6						
Control Delay (s)	2.4	0.4	18.6	14.9	16.7	15.8						
Lane LOS	A	A	C	B	C	C						
Approach Delay (s)	2.4	0.4	15.4		16.0							
Approach LOS			C		C							

Intersection Summary

Average Delay	8.6
Intersection Capacity Utilization	62.5%
ICU Level of Service	B
Analysis Period (min)	15

Lanes, Volumes, Timings

103: Rail Crossing & South Field Dr

Background - 2032

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (vph)	0	156	0	0	269	0	0	0	0	0	0	0
Future Volume (vph)	0	156	0	0	269	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1000	1900	1000	1000	1900	1000	1000	1900	1000	1000	1900	1000
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Flt Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	260.6			1127.4			104.6			118.7		
Travel Time (s)	18.8			81.2			7.5			8.5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	156	0	0	269	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	0	0	269	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	0.0			0.0			0.0			0.0		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Free			Free		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 17.5% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

103: Rail Crossing & South Field Dr

Background - 2032

PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (veh/h)	0	156	0	0	269	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	156	0	0	269	0	0	0	0	0	0	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	156	0	0	269	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	134	0	0	78	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	134	0	0	78	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	83	100	100	70	100	100			100		
cM capacity (veh/h)	642	896	1085	789	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	156	269	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.17	0.30	0.00	0.00								
Queue Length 95th (m)	5.0	10.1	0.0	0.0								
Control Delay (s)	9.9	10.7	0.0	0.0								
Lane LOS	A	B										
Approach Delay (s)	9.9	10.7	0.0	0.0								
Approach LOS	A	B										

Intersection Summary

Average Delay 10.4

Intersection Capacity Utilization 17.5% ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Background - 2032
PM Peak Hour

	←	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Volume (vph)	0	0	1392	1	1	1279
Future Volume (vph)	0	0	1392	1	1	1279
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr						
Flt Protected						
Satd. Flow (prot)	1745	0	1539	0	0	1525
Flt Permitted						
Satd. Flow (perm)	1745	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	6%	0%	0%	7%
Adj. Flow (vph)	0	0	1392	1	1	1279
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	1393	0	0	1280
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 87.8%	ICU Level of Service E					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Background - 2032
PM Peak Hour

	←	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Volume (veh/h)	0	0	1392	1	1	1279
Future Volume (Veh/h)	0	0	1392	1	1	1279
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	1392	1	1	1279
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2674	1392			1393	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2674	1392			1393	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	25	176			497	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	0	1393	1280			
Volume Left	0	0	1			
Volume Right	0	1	0			
cSH	1700	1700	497			
Volume to Capacity	0.00	0.82	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.1			
Lane LOS	A		A			
Approach Delay (s)	0.0	0.0	0.1			
Approach LOS	A					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			87.8%		ICU Level of Service	E
Analysis Period (min)			15			

Appendix F

Total Operation Synchro Reports



Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	77	310	165	97	95	151	67	516	188	219	550	12
Future Volume (vph)	77	310	165	97	95	151	67	516	188	219	550	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00						0.98	1.00		0.98	1.00	1.00
Frt			0.850				0.850			0.850		0.997
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1619	1842	1456	1588	1789	1375	1603	1740	1302	1588	1522	0
Flt Permitted	0.695			0.388			0.258			0.288		
Satd. Flow (perm)	1181	1842	1456	649	1789	1343	434	1740	1270	481	1522	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						151			171		2	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	2					2	8		4	4		8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Adj. Flow (vph)	77	310	165	97	95	151	67	516	188	219	550	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	310	165	97	95	151	67	516	188	219	562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane							Yes					
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

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PTSL (240259)Synchro 11 Report
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Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.5	47.7	
Total Split (s)	32.0	32.0	9.6	32.0	32.0	32.0	9.6	48.0	48.0	10.0	48.4	
Total Split (%)	35.6%	35.6%	10.7%	35.6%	35.6%	35.6%	10.7%	53.3%	53.3%	11.1%	53.8%	
Maximum Green (s)	26.0	26.0	5.6	26.0	26.0	26.0	5.6	42.0	42.0	6.0	42.4	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		22.7	22.7		22.7	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	20.0	20.0	30.0	20.0	20.0	20.0	37.5	31.6	31.6	38.3	32.0	
Actuated g/C Ratio	0.28	0.28	0.43	0.28	0.28	0.28	0.53	0.45	0.45	0.54	0.45	
v/c Ratio	0.23	0.59	0.27	0.53	0.19	0.31	0.20	0.66	0.28	0.61	0.81	
Control Delay	23.7	28.6	16.6	35.7	22.3	6.2	8.3	20.1	4.0	16.3	27.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	23.7	28.6	16.6	35.7	22.3	6.2	8.3	20.1	4.0	16.3	27.4	
LOS	C	C	B	D	C	A	A	C	A	B	C	
Approach Delay		24.3			19.0			15.1			24.3	
Approach LOS		C			B			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 70.4

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 20.7

Intersection LOS: C

Intersection Capacity Utilization 80.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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PTSL (240259)Synchro 11 Report
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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	77	310	165	97	95	151	67	516	188	219	550
v/c Ratio	0.23	0.59	0.27	0.53	0.19	0.31	0.20	0.66	0.28	0.61	0.81
Control Delay	23.7	28.6	16.6	35.7	22.3	6.2	8.3	20.1	4.0	16.3	27.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.7	28.6	16.6	35.7	22.3	6.2	8.3	20.1	4.0	16.3	27.4
Queue Length 50th (m)	8.1	36.6	14.3	11.2	9.9	0.0	3.3	51.1	1.2	12.1	61.0
Queue Length 95th (m)	21.5	72.8	34.0	30.8	24.3	13.5	10.0	98.5	12.6	28.5	122.5
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	490	765	620	269	742	645	328	1135	888	360	1003
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.41	0.27	0.36	0.13	0.23	0.20	0.45	0.21	0.61	0.56
Intersection Summary											

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	77	310	165	97	95	151	67	516	188	219	550	12
Traffic Volume (vph)	77	310	165	97	95	151	67	516	188	219	550	12
Future Volume (vph)	77	310	165	97	95	151	67	516	188	219	550	12
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1615	1842	1456	1588	1789	1344	1602	1740	1271	1588	1521	
Flt Permitted	0.70	1.00	1.00	0.39	1.00	1.00	0.26	1.00	1.00	0.29	1.00	
Satd. Flow (perm)	1182	1842	1456	649	1789	1344	435	1740	1271	481	1521	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	77	310	165	97	95	151	67	516	188	219	550	12
RTOR Reduction (vph)	0	0	0	0	0	108	0	0	94	0	1	0
Lane Group Flow (vph)	77	310	165	97	95	43	67	516	94	219	561	0
Confl. Peds. (#/hr)	2					2	8		4	4		8
Heavy Vehicles (%)	3%	2%	1%	5%	5%	7%	4%	8%	13%	5%	7%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	4		5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	17.9	17.9	23.8	17.9	17.9	17.9	35.5	29.6	29.6	36.3	30.0	
Effective Green, g (s)	19.9	19.9	23.8	19.9	19.9	19.9	35.5	31.6	31.6	36.3	32.0	
Actuated g/C Ratio	0.29	0.29	0.34	0.29	0.29	0.29	0.51	0.45	0.45	0.52	0.46	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	336	525	496	185	510	383	319	787	575	350	697	
v/s Ratio Prot		c0.17	0.03		0.05		0.02	0.30		c0.06	c0.37	
v/s Ratio Perm	0.07		0.09	0.15		0.03	0.09		0.07	0.27		
v/c Ratio	0.23	0.59	0.33	0.52	0.19	0.11	0.21	0.66	0.16	0.63	0.80	
Uniform Delay, d1	19.1	21.4	17.1	21.0	18.8	18.4	10.1	14.9	11.3	10.7	16.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	1.8	0.4	2.7	0.2	0.1	0.3	2.0	0.1	3.5	6.7	
Delay (s)	19.4	23.2	17.5	23.6	19.0	18.6	10.4	16.8	11.4	14.2	22.9	
Level of Service	B	C	B	C	B	B	B	B	B	B	C	
Approach Delay (s)		21.0			20.1			15.0			20.5	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM 2000 Control Delay			18.8									
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			69.8							12.0		
Intersection Capacity Utilization			80.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
102: Union St & South Field Dr

Total - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Future Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5			7.5			40.0			25.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.995			0.958			0.906			0.959		
Flt Protected	0.997			0.991			0.950			0.950		
Satd. Flow (prot)	0	1424	0	0	1326	0	1544	1166	0	1619	1449	0
Flt Permitted	0.997			0.991			0.950			0.950		
Satd. Flow (perm)	0	1424	0	0	1326	0	1544	1166	0	1619	1449	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	669.7			252.0			319.4			256.9		
Travel Time (s)	48.2			18.1			23.0			18.5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	7%	6%	8%	12%	7%	8%	8%	38%	3%	11%	0%
Adj. Flow (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	530	0	0	284	0	14	269	0	78	123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5			3.5			3.5			3.5		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Free			Free			Stop			Stop		

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	72.0%
ICU Level of Service	C
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Total - 2032
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	28	482	20	50	146	88	14	101	168	78	89	34
Future Volume (Veh/h)	28	482	20	50	146	88	14	101	168	78	89	34
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	234			502			916	882	492	1056	848	190
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	234			502			916	882	492	1056	848	190
tC, single (s)	4.1			4.2			7.2	6.6	6.6	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.6	3.5	4.1	3.3
p0 queue free %	98			95			92	61	67	13	67	96
cM capacity (veh/h)	1322			1032			167	260	511	90	269	857
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	530	284	14	269	78	123						
Volume Left	28	50	14	0	78	0						
Volume Right	20	88	0	168	0	34						
cSH	1322	1032	167	375	90	332						
Volume to Capacity	0.02	0.05	0.08	0.72	0.87	0.37						
Queue Length 95th (m)	0.5	1.2	2.2	43.4	37.7	13.3						
Control Delay (s)	0.6	1.9	28.5	35.6	143.7	22.1						
Lane LOS	A	A	D	E	F	C						
Approach Delay (s)	0.6	1.9	35.3		69.3							
Approach LOS			E		F							

Intersection Summary

Average Delay	19.1
Intersection Capacity Utilization	72.0%
ICU Level of Service	C
Analysis Period (min)	15

Lanes, Volumes, Timings

103: Rail Crossing & South Field Dr

Total - 2032

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	728	0	0	284	0	0	0	0	0	0	0
Future Volume (vph)	0	728	0	0	284	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Flt Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	252.0			109.8			189.1			203.9		
Travel Time (s)	18.1			7.9			13.6			14.7		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	728	0	0	284	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	728	0	0	284	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Left	Right	Right
Median Width(m)	0.0			0.0			0.0			0.0		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Free			Free		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 41.6% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

103: Rail Crossing & South Field Dr

Total - 2032

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	728	0	0	284	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	728	0	0	284	0	0	0	0	0	0	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	728	0	0	284	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	142	0	0	364	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	142	0	0	364	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	19	100	100	68	100	100			100		
cM capacity (veh/h)	624	896	1085	191	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	728	284	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.81	0.32	0.00	0.00								
Queue Length 95th (m)	72.6	10.9	0.0	0.0								
Control Delay (s)	23.8	10.9	0.0	0.0								
Lane LOS	C	B										
Approach Delay (s)	23.8	10.9	0.0	0.0								
Approach LOS	C	B										

Intersection Summary

Average Delay 20.2

Intersection Capacity Utilization 41.6% ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Total - 2032
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	4	1265	0	0	1356
Future Volume (vph)	1	4	1265	0	0	1356
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.892					
Flt Protected	0.990					
Satd. Flow (prot)	1284	0	1539	0	0	1525
Flt Permitted	0.990					
Satd. Flow (perm)	1284	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	100%	0%	6%	0%	0%	7%
Adj. Flow (vph)	1	4	1265	0	0	1356
Shared Lane Traffic (%)						
Lane Group Flow (vph)	5	0	1265	0	0	1356
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	92.2%		ICU Level of Service F			
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Total - 2032
AM Peak Hour

	←	↖	↑	↗	↘	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Volume (veh/h)	1	4	1265	0	0	1356
Future Volume (Veh/h)	1	4	1265	0	0	1356
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	4	1265	0	0	1356
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2621	1265			1265	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2621	1265			1265	
tC, single (s)	7.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	4.4	3.3			2.2	
p0 queue free %	92	98			100	
cM capacity (veh/h)	12	209			556	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	5	1265	1356			
Volume Left	1	0	0			
Volume Right	4	0	0			
cSH	50	1700	556			
Volume to Capacity	0.10	0.74	0.00			
Queue Length 95th (m)	2.5	0.0	0.0			
Control Delay (s)	84.2	0.0	0.0			
Lane LOS	F					
Approach Delay (s)	84.2	0.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		92.2%		ICU Level of Service		F
Analysis Period (min)		15				

Lanes, Volumes, Timings
201: Street A (West) & South Field Dr

Total - 2032
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Traffic Volume (vph)	442	286	7	216	68	2
Future Volume (vph)	442	286	7	216	68	2
Ideal Flow (vphpl)	1650	1650	1650	1650	1765	1765
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.947				0.996	
Flt Protected				0.998	0.954	
Satd. Flow (prot)	1515	0	0	1596	1626	0
Flt Permitted				0.998	0.954	
Satd. Flow (perm)	1515	0	0	1596	1626	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	109.8			160.3	166.7	
Travel Time (s)	7.9			11.5	12.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	442	286	7	216	68	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	728	0	0	223	70	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.21	1.21	1.21	1.21	1.12	1.12
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 57.7%	ICU Level of Service B					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
201: Street A (West) & South Field Dr

Total - 2032
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Traffic Volume (veh/h)	442	286	7	216	68	2
Future Volume (Veh/h)	442	286	7	216	68	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	442	286	7	216	68	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			728		815	585
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			728		815	585
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		80	100
cM capacity (veh/h)			876		344	511
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	728	223	70			
Volume Left	0	7	68			
Volume Right	286	0	2			
cSH	1700	876	347			
Volume to Capacity	0.43	0.01	0.20			
Queue Length 95th (m)	0.0	0.2	5.9			
Control Delay (s)	0.0	0.4	18.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.4	18.0			
Approach LOS			C			
Intersection Summary						
Average Delay		1.3				
Intersection Capacity Utilization		57.7%		ICU Level of Service		B
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Street A (East) & South Field Dr

Total - 2032
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Traffic Volume (vph)	160	284	7	158	65	2
Future Volume (vph)	160	284	7	158	65	2
Ideal Flow (vphpl)	1650	1650	1650	1650	1765	1765
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.914				0.996	
Flt Protected				0.998	0.954	
Satd. Flow (prot)	1462	0	0	1596	1626	0
Flt Permitted				0.998	0.954	
Satd. Flow (perm)	1462	0	0	1596	1626	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	160.3			865.9	164.4	
Travel Time (s)	11.5			62.3	11.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	160	284	7	158	65	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	444	0	0	165	67	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.21	1.21	1.21	1.21	1.12	1.12
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 40.4%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Street A (East) & South Field Dr

Total - 2032
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Traffic Volume (veh/h)	160	284	7	158	65	2
Future Volume (Veh/h)	160	284	7	158	65	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	160	284	7	158	65	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			444		474	302
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			444		474	302
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		88	100
cM capacity (veh/h)			1116		546	738
Direction, Lane #						
Volume Total	444	165	67			
Volume Left	0	7	65			
Volume Right	284	0	2			
cSH	1700	1116	550			
Volume to Capacity	0.26	0.01	0.12			
Queue Length 95th (m)	0.0	0.2	3.3			
Control Delay (s)	0.0	0.4	12.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.4	12.5			
Approach LOS			B			
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization 40.4%			ICU Level of Service			A
Analysis Period (min)			15			

Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↩	↑	↪	↩	↑	↪	↩	↑	↪	↩	↑	↪
Traffic Volume (vph)	52	130	120	211	331	272	166	696	129	192	558	34
Future Volume (vph)	52	130	120	211	331	272	166	696	129	192	558	34
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Storage Length (m)	40.0		40.0	25.0		25.0	45.0		40.0	30.0		1.0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (m)	50.0			50.0			40.0			60.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.97	1.00		0.97	1.00	1.00	
Frt			0.850			0.850			0.850		0.991	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1668	1824	1471	1619	1879	1456	1668	1807	1428	1651	1542	0
Flt Permitted	0.354			0.669			0.241			0.142		
Satd. Flow (perm)	620	1824	1471	1140	1879	1420	423	1807	1379	246	1542	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)						197			87		5	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		886.0			669.7			1249.7			887.4	
Travel Time (s)		63.8			48.2			75.0			53.2	
Confl. Peds. (#/hr)	3					3	1		13	13		1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Adj. Flow (vph)	52	130	120	211	331	272	166	696	129	192	558	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	130	120	211	331	272	166	696	129	192	592	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane							Yes					
Headway Factor	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.01	1.13	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

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Lanes, Volumes, Timings

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Detector Phase	4	4	5	8	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	12.0	12.0	5.0	12.0	12.0	12.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	32.0	32.0	9.5	32.0	32.0	32.0	9.5	47.7	47.7	9.0	47.7	
Total Split (s)	32.0	32.0	9.6	32.0	32.0	32.0	9.6	48.0	48.0	10.0	48.4	
Total Split (%)	35.6%	35.6%	10.7%	35.6%	35.6%	35.6%	10.7%	53.3%	53.3%	11.1%	53.8%	
Maximum Green (s)	26.0	26.0	5.6	26.0	26.0	26.0	5.6	42.0	42.0	6.0	42.4	
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	0.0	-2.0	-2.0	-2.0	0.0	-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag			Lead				Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes				Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	Min	Min	None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		21.8	21.8		21.8	
Flash Dont Walk (s)	16.0	16.0		16.0	16.0	16.0		19.0	19.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0	0		0	
Act Effct Green (s)	21.8	21.8	31.8	21.8	21.8	21.8	40.9	35.1	35.1	41.7	35.5	
Actuated g/C Ratio	0.29	0.29	0.42	0.29	0.29	0.29	0.54	0.46	0.46	0.55	0.47	
v/c Ratio	0.29	0.25	0.19	0.64	0.61	0.50	0.51	0.83	0.19	0.76	0.82	
Control Delay	28.0	23.6	16.8	35.2	29.9	11.0	13.8	28.2	5.9	32.3	28.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	28.0	23.6	16.8	35.2	29.9	11.0	13.8	28.2	5.9	32.3	28.2	
LOS	C	C	B	D	C	B	B	C	A	C	C	
Approach Delay		21.7			25.0			22.9			29.2	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 75.6

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 89.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 101: Arthur St & Whippoorwill Dr/South Field Dr

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Queues

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	52	130	120	211	331	272	166	696	129	192	558
v/c Ratio	0.29	0.25	0.19	0.64	0.61	0.50	0.51	0.83	0.19	0.76	0.82
Control Delay	28.0	23.6	16.8	35.2	29.9	11.0	13.8	28.2	5.9	32.3	28.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	23.6	16.8	35.2	29.9	11.0	13.8	28.2	5.9	32.3	28.2
Queue Length 50th (m)	6.3	15.6	11.8	28.8	44.7	8.8	10.3	88.7	3.4	12.2	73.7
Queue Length 95th (m)	17.4	31.8	25.4	56.8	77.5	31.6	21.5	150.3	13.3	#39.1	131.3
Internal Link Dist (m)	862.0			645.7			1225.7			863.4	
Turn Bay Length (m)	40.0	40.0		25.0	25.0		45.0	40.0		30.0	
Base Capacity (vph)	239	704	618	439	725	669	324	1095	870	251	945
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.18	0.19	0.48	0.46	0.41	0.51	0.64	0.15	0.76	0.63

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Arthur St & Whippoorwill Dr/South Field Dr

Total - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	52	130	120	211	331	272	166	696	129	192	558	34
Future Volume (vph)	52	130	120	211	331	272	166	696	129	192	558	34
Ideal Flow (vphpl)	1775	1900	1750	1775	1900	1750	1775	1900	1750	1775	1650	1650
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1664	1824	1471	1619	1879	1421	1667	1807	1383	1650	1543	1543
Flt Permitted	0.35	1.00	1.00	0.67	1.00	1.00	0.24	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	621	1824	1471	1141	1879	1421	423	1807	1383	247	1543	1543
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	130	120	211	331	272	166	696	129	192	558	34
RTOR Reduction (vph)	0	0	0	0	0	140	0	0	46	0	3	0
Lane Group Flow (vph)	52	130	120	211	331	132	166	696	83	192	589	0
Confl. Peds. (#/hr)	3					3	1		13	13		1
Heavy Vehicles (%)	0%	3%	0%	3%	0%	1%	0%	4%	3%	1%	5%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	NA
Protected Phases	4		5		8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	19.7	19.7	25.5	19.7	19.7	19.7	38.8	33.0	33.0	39.6	33.4	
Effective Green, g (s)	21.7	21.7	25.5	21.7	21.7	21.7	38.8	35.0	35.0	39.6	35.4	
Actuated g/C Ratio	0.29	0.29	0.34	0.29	0.29	0.29	0.52	0.47	0.47	0.53	0.47	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	179	528	500	330	544	411	315	844	646	246	729	
v/s Ratio Prot		0.07	0.02		0.18		0.04	c0.39		c0.06	0.38	
v/s Ratio Perm	0.08		0.06	c0.18		0.09	0.23		0.06	0.35		
v/c Ratio	0.29	0.25	0.24	0.64	0.61	0.32	0.53	0.82	0.13	0.78	0.81	
Uniform Delay, d1	20.6	20.3	17.7	23.2	22.9	20.8	11.6	17.3	11.3	13.7	16.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	0.2	0.2	4.0	1.9	0.5	1.6	6.6	0.1	14.8	6.6	
Delay (s)	21.5	20.6	18.0	27.2	24.9	21.3	13.2	23.9	11.4	28.5	23.4	
Level of Service	C	C	B	C	C	C	B	C	B	C	C	
Approach Delay (s)	19.7			24.3			20.5			24.7		
Approach LOS	B			C			C			C		

Intersection Summary

HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	74.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
102: Union St & South Field Dr

Total - 2032
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Future Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0		0.0	0.0		0.0	25.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			40.0			25.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.973			0.978			0.944			0.948	
Flt Protected		0.992			0.990		0.950			0.950		
Satd. Flow (prot)	0	1454	0	0	1424	0	1668	1268	0	1558	1478	0
Flt Permitted		0.992			0.990		0.950			0.950		
Satd. Flow (perm)	0	1454	0	0	1424	0	1668	1268	0	1558	1478	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		669.7			260.6			319.4			256.9	
Travel Time (s)		48.2			18.8			23.0			18.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	0%	2%	10%	2%	6%	0%	17%	29%	7%	4%	6%
Adj. Flow (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	282	0	0	819	0	21	167	0	71	240	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	105.6%
ICU Level of Service	G
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
102: Union St & South Field Dr

Total - 2032
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (veh/h)	47	178	57	160	527	132	21	105	62	71	157	83
Future Volume (Veh/h)	47	178	57	160	527	132	21	105	62	71	157	83
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	659			235			1375	1280	206	1328	1242	593
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	659			235			1375	1280	206	1328	1242	593
tC, single (s)	4.2			4.2			7.1	6.7	6.5	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.5	4.2	3.6	3.6	4.0	3.4
p0 queue free %	95			88			0	18	92	0	0	83
cM capacity (veh/h)	901			1287			0	129	770	34	144	498
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	282	819	21	167	71	240						
Volume Left	47	160	21	0	71	0						
Volume Right	57	132	0	62	0	83						
cSH	901	1287	0	186	34	191						
Volume to Capacity	0.05	0.12	Err	0.90	2.10	1.26						
Queue Length 95th (m)	1.3	3.4	Err	54.4	63.9	104.5						
Control Delay (s)	2.0	2.9	Err	92.5	762.6	201.1						
Lane LOS	A	A	F	F	F	F						
Approach Delay (s)	2.0	2.9	Err	329.3								
Approach LOS			F	F								

Intersection Summary

Average Delay	Err
Intersection Capacity Utilization	105.6%
ICU Level of Service	G
Analysis Period (min)	15

Lanes, Volumes, Timings

103: Rail Crossing & South Field Dr

Total - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (vph)	0	311	0	0	819	0	0	0	0	0	0	0
Future Volume (vph)	0	311	0	0	819	0	0	0	0	0	0	0
Ideal Flow (vphpl)	1000	1900	1000	1000	1900	1000	1000	1900	1000	1000	1900	1000
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit												
Fit Protected												
Satd. Flow (prot)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Fit Permitted												
Satd. Flow (perm)	0	1842	0	0	1842	0	0	1842	0	0	1842	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	260.6			86.9			104.6			118.7		
Travel Time (s)	18.8			6.3			7.5			8.5		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	311	0	0	819	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	311	0	0	819	0	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	0.0			0.0			0.0			0.0		
Link Offset(m)	0.0			0.0			0.0			0.0		
Crosswalk Width(m)	4.8			4.8			4.8			4.8		
Two way Left Turn Lane												
Headway Factor	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20	2.20	1.01	2.20
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Free			Free		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 46.4% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

103: Rail Crossing & South Field Dr

Total - 2032

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑			↑			↑			↑	
Traffic Volume (veh/h)	0	311	0	0	819	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	311	0	0	819	0	0	0	0	0	0	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	311	0	0	819	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	410	0	0	156	0	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	410	0	0	156	0	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	65	100	100	9	100	100			100		
cM capacity (veh/h)	113	896	1085	592	896	1085	1623			1623		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	311	819	0	0								
Volume Left	0	0	0	0								
Volume Right	0	0	0	0								
cSH	896	896	1700	1700								
Volume to Capacity	0.35	0.91	0.00	0.00								
Queue Length 95th (m)	12.5	106.9	0.0	0.0								
Control Delay (s)	11.1	34.7	0.0	0.0								
Lane LOS	B	D										
Approach Delay (s)	11.1	34.7	0.0	0.0								
Approach LOS	B	D										

Intersection Summary

Average Delay 28.2

Intersection Capacity Utilization 46.4% ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
104: Arthur St & Scotch Line Rd

Total - 2032
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	1470	1	1	1554
Future Volume (vph)	0	0	1470	1	1	1554
Ideal Flow (vphpl)	1765	1765	1650	1650	1650	1650
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1745	0	1539	0	0	1525
Flt Permitted						
Satd. Flow (perm)	1745	0	1539	0	0	1525
Link Speed (k/h)	60		80			80
Link Distance (m)	527.8		756.1			487.8
Travel Time (s)	31.7		34.0			22.0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	6%	0%	0%	7%
Adj. Flow (vph)	0	0	1470	1	1	1554
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	1471	0	0	1555
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.5		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.12	1.12	1.21	1.21	1.21	1.21
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	98.4%			ICU Level of Service F		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
104: Arthur St & Scotch Line Rd

Total - 2032
PM Peak Hour

	WBL	WBR	NBT	NBR	SBL	SBT
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Volume (veh/h)	0	0	1470	1	1	1554
Future Volume (Veh/h)	0	0	1470	1	1	1554
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	1470	1	1	1554
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3026	1470			1471	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3026	1470			1471	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	15	158			464	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	0	1471	1555			
Volume Left	0	0	1			
Volume Right	0	1	0			
cSH	1700	1700	464			
Volume to Capacity	0.00	0.87	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.0	0.3			
Lane LOS	A		A			
Approach Delay (s)	0.0	0.0	0.3			
Approach LOS	A					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			98.4%		ICU Level of Service F	
Analysis Period (min)			15			

Lanes, Volumes, Timings
201: Street A (West) & South Field Dr

Total - 2032
PM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	232	79	2	543	275	7
Future Volume (vph)	232	79	2	543	275	7
Ideal Flow (vphpl)	1650	1650	1650	1650	1765	1765
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.966				0.997	
Flt Protected					0.954	
Satd. Flow (prot)	1545	0	0	1600	1628	0
Flt Permitted					0.954	
Satd. Flow (perm)	1545	0	0	1600	1628	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	86.9			216.9	161.1	
Travel Time (s)	6.3			15.6	11.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	232	79	2	543	275	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	311	0	0	545	282	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.21	1.21	1.21	1.21	1.12	1.12
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	58.3%			ICU Level of Service B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Street A (West) & South Field Dr

Total - 2032
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	232	79	2	543	275	7
Future Volume (Veh/h)	232	79	2	543	275	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	232	79	2	543	275	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			311		818	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			311		818	272
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		20	99
cM capacity (veh/h)			1249		345	767
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	311	545	282			
Volume Left	0	2	275			
Volume Right	79	0	7			
cSH	1700	1249	350			
Volume to Capacity	0.18	0.00	0.81			
Queue Length 95th (m)	0.0	0.0	55.1			
Control Delay (s)	0.0	0.0	46.8			
Lane LOS		A	E			
Approach Delay (s)	0.0	0.0	46.8			
Approach LOS			E			
Intersection Summary						
Average Delay			11.6			
Intersection Capacity Utilization			58.3%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings
202: Street A (East) & South Field Dr

Total - 2032
PM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	163	76	2	271	274	6
Future Volume (vph)	163	76	2	271	274	6
Ideal Flow (vphpl)	1650	1650	1650	1650	1765	1765
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.957				0.997	
Flt Protected					0.953	
Satd. Flow (prot)	1531	0	0	1600	1626	0
Flt Permitted					0.953	
Satd. Flow (perm)	1531	0	0	1600	1626	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	216.9			823.7	169.7	
Travel Time (s)	15.6			59.3	12.2	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	163	76	2	271	274	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	239	0	0	273	280	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.5	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.21	1.21	1.21	1.21	1.12	1.12
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	41.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
202: Street A (East) & South Field Dr

Total - 2032
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↘	↗	
Traffic Volume (veh/h)	163	76	2	271	274	6
Future Volume (Veh/h)	163	76	2	271	274	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	163	76	2	271	274	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			239		476	201
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			239		476	201
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		50	99
cM capacity (veh/h)			1328		547	840
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	239	273	280			
Volume Left	0	2	274			
Volume Right	76	0	6			
cSH	1700	1328	551			
Volume to Capacity	0.14	0.00	0.51			
Queue Length 95th (m)	0.0	0.0	22.9			
Control Delay (s)	0.0	0.1	18.1			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.1	18.1			
Approach LOS			C			
Intersection Summary						
Average Delay		6.4				
Intersection Capacity Utilization		41.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Appendix G

Traffic Control Signal Justification



Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: Background - 2032
Region/City/Township: Woolwich (Elmira)

Major Street: South Field Drive
Minor Street: Union Street

North/South?: N

Number of Approach Lanes: 1
Tee Intersection?: N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	South Field Drive						Union Street						
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	28	70	20	14	50	87	14	101	15	73	89	73	0
PM Peak Hour	47	66	57	12	130	128	21	105	20	70	157	83	0
Average Hourly Volume	19	34	19	7	45	54	9	52	9	36	62	39	0

Warrant	AHV
1A - All	383
1B - Minor	205
2A - Major	177
2B - Cross	106

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	
% Fulfilled						53.1%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	
% Fulfilled						120.7%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	
% Fulfilled						24.6%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						141.3%

Signal Justification Calculation for Forecasted Volumes (OTM Book 12 - Justification 7)



Horizon Year: Total - 2032
Region/City/Township: Woolwich (Elmira)

Major Street: South Field Drive
Minor Street: Union Street

North/South?: N

Number of Approach Lanes: 1
Tee Intersection?: N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	South Field Drive						Union Street						
	Eastbound			Westbound			Northbound			Southbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	28	482	20	50	146	88	14	101	168	78	89	34	0
PM Peak Hour	47	178	57	160	527	132	21	105	62	71	157	83	0
Average Hourly Volume	19	165	19	53	168	55	9	52	58	37	62	29	0

Warrant	AHV
1A - All	725
1B - Minor	246
2A - Major	479
2B - Cross	108

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	
% Fulfilled						100.6%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	
% Fulfilled						144.6%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	
% Fulfilled						66.5%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						143.3%

Appendix H

Total with Improvements Operation Synchro Reports



Lanes, Volumes, Timings

102: Union St & South Field Dr

Total - 2032 w/ Improvements

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Future Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0		0.0	0.0		0.0	25.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			40.0			25.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.995				0.958			0.906			0.959	
Flt Protected		0.997				0.991		0.950		0.950		
Satd. Flow (prot)	0	1424	0	0	1326	0	1544	1166	0	1619	1449	0
Flt Permitted		0.975				0.868		0.678		0.510		
Satd. Flow (perm)	0	1392	0	0	1161	0	1102	1166	0	869	1449	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			56			154			34	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		669.7			252.0			319.4			256.9	
Travel Time (s)		48.2			18.1			23.0			18.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	7%	6%	8%	12%	7%	8%	8%	38%	3%	11%	0%
Adj. Flow (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	530	0	0	284	0	14	269	0	78	123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.5			3.5			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.21	1.11	1.21	1.21
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

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Lanes, Volumes, Timings

102: Union St & South Field Dr

Total - 2032 w/ Improvements

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0	24.0		24.0	24.0	
Total Split (s)	35.0	35.0		35.0	35.0		25.0	25.0		25.0	25.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%		41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	29.0	29.0		29.0	29.0		19.0	19.0		19.0	19.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		25.3			25.3		13.1	13.1		13.1	13.1	
Actuated g/C Ratio		0.54			0.54		0.28	0.28		0.28	0.28	
v/c Ratio		0.70			0.43		0.05	0.62		0.32	0.29	
Control Delay		15.6			8.5		13.5	13.8		18.0	12.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		15.6			8.5		13.5	13.8		18.0	12.4	
LOS		B			A		B	B		B	B	
Approach Delay		15.6			8.5			13.8			14.6	
Approach LOS		B			A			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 46.7

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 13.5

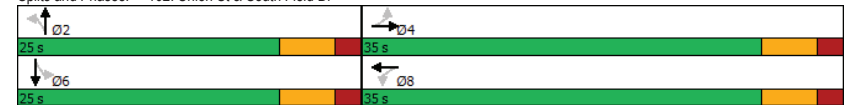
Intersection LOS: B

Intersection Capacity Utilization 72.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 102: Union St & South Field Dr

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Queues

102: Union St & South Field Dr

Total - 2032 w/ Improvements

AM Peak Hour

	→	←	↖	↑	↗	↓
Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	530	284	14	269	78	123
v/c Ratio	0.70	0.43	0.05	0.62	0.32	0.29
Control Delay	15.6	8.5	13.5	13.8	18.0	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.6	8.5	13.5	13.8	18.0	12.4
Queue Length 50th (m)	27.6	9.3	0.8	7.3	4.9	5.4
Queue Length 95th (m)	#86.0	31.7	4.3	28.8	15.7	17.5
Internal Link Dist (m)	645.7	228.0		295.4		232.9
Turn Bay Length (m)			25.0		20.0	
Base Capacity (vph)	966	822	517	629	408	698
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.35	0.03	0.43	0.19	0.18

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

102: Union St & South Field Dr

Total - 2032 w/ Improvements

AM Peak Hour

	↖	→	↗	↖	←	↗	↖	↑	↗	↖	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↖	↖		↖	↖	
Traffic Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Future Volume (vph)	28	482	20	50	146	88	14	101	168	78	89	34
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Flt		0.99			0.96		1.00	0.91		1.00	0.96	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1424			1327		1544	1167		1619	1449	
Flt Permitted		0.98			0.87		0.68	1.00		0.51	1.00	
Satd. Flow (perm)		1393			1162		1102	1167		869	1449	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	482	20	50	146	88	14	101	168	78	89	34
RTOR Reduction (vph)	0	2	0	0	25	0	0	111	0	0	24	0
Lane Group Flow (vph)	0	528	0	0	259	0	14	158	0	78	99	0
Heavy Vehicles (%)	4%	7%	6%	8%	12%	7%	8%	8%	38%	3%	11%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		23.2			23.2		11.0	11.0		11.0	11.0	
Effective Green, g (s)		25.2			25.2		13.0	13.0		13.0	13.0	
Actuated g/C Ratio		0.55			0.55		0.28	0.28		0.28	0.28	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		759			633		310	328		244	407	
v/s Ratio Prot								c0.14			0.07	
v/s Ratio Perm		c0.38			0.22		0.01			0.09		
v/c Ratio		0.70			0.41		0.05	0.48		0.32	0.24	
Uniform Delay, d1		7.7			6.1		12.1	13.8		13.1	12.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.8			0.4		0.1	1.1		0.8	0.3	
Delay (s)		10.5			6.6		12.1	14.9		13.9	13.1	
Level of Service		B			A		B	B		B	B	
Approach Delay (s)		10.5			6.6			14.8			13.4	
Approach LOS		B			A			B			B	

Intersection Summary

HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	46.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

102: Union St & South Field Dr

Total - 2032

PM Peak Hour w/ Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Future Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Storage Length (m)	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	20.0	0.0	0.0
Storage Lanes	0	0	0	0	0	0	1	0	0	1	0	0
Taper Length (m)	7.5	7.5	7.5	7.5	7.5	7.5	40.0	25.0	25.0	40.0	25.0	25.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.973	0.973	0.973	0.973	0.973	0.973	0.944	0.944	0.944	0.944	0.948	0.948
Flt Protected	0.992	0.992	0.992	0.992	0.992	0.992	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	0	1454	0	0	1424	0	1668	1268	0	1558	1478	0
Flt Permitted	0.821	0.821	0.821	0.821	0.821	0.821	0.395	0.395	0.395	0.549	0.549	0.549
Satd. Flow (perm)	0	1204	0	0	1247	0	693	1268	0	901	1478	0
Right Turn on Red												
Satd. Flow (RTOR)	33	33	33	33	33	33	25	30	27	27	27	27
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	669.7	669.7	669.7	669.7	669.7	669.7	260.6	319.4	256.9	256.9	256.9	256.9
Travel Time (s)	48.2	48.2	48.2	48.2	48.2	48.2	18.8	23.0	18.5	18.5	18.5	18.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	8%	0%	2%	10%	2%	6%	0%	17%	29%	7%	4%	6%
Adj. Flow (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	282	0	0	819	0	21	167	0	71	240	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Link Offset(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane												
Headway Factor	1.31	1.31	1.31	1.31	1.31	1.31	1.11	1.21	1.11	1.21	1.21	1.21
Turning Speed (k/h)	25	25	25	25	25	25	25	25	25	25	25	25
Number of Detectors	1	2	1	2	1	2	1	2	1	2	1	2
Detector Template	Left	Thru	Left	Thru	Left	Thru	Left	Thru	Left	Thru	Left	Thru
Leading Detector (m)	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Detector 2 Size(m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Detector 2 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4	4	4	4	4	4	4	4	4	4	4	4

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Lanes, Volumes, Timings

102: Union St & South Field Dr

Total - 2032

PM Peak Hour w/ Improvements

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4	4	4	4	4	4	4	4	4	4	4	4
Detector Phase	4	4	4	4	4	4	4	4	4	4	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	73.3%	73.3%	73.3%	73.3%	73.3%	73.3%	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%
Maximum Green (s)	60.0	60.0	60.0	60.0	60.0	60.0	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Min	Min	Min	Min	Min	Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	58.3	58.3	58.3	58.3	58.3	58.3	17.6	17.6	17.6	17.6	17.6	17.6
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69	0.21	0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.33	0.33	0.33	0.33	0.33	0.33	0.14	0.58	0.38	0.73	0.38	0.73
Control Delay	6.0	6.0	6.0	6.0	6.0	6.0	31.1	34.2	36.5	42.3	36.5	42.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	6.0	6.0	6.0	6.0	6.0	31.1	34.2	36.5	42.3	36.5	42.3
LOS	A	A	A	A	A	A	C	C	D	D	D	D
Approach Delay	6.0	6.0	6.0	6.0	6.0	6.0	33.8	33.8	40.9	40.9	40.9	40.9
Approach LOS	A	A	A	A	A	A	C	C	D	D	D	D

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 84.1

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 29.8

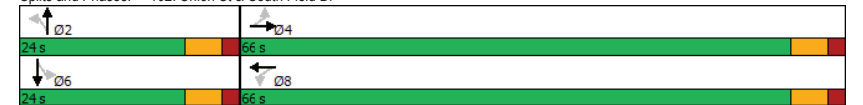
Intersection LOS: C

Intersection Capacity Utilization 106.4%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 102: Union St & South Field Dr

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Queues

102: Union St & South Field Dr

Total - 2032

PM Peak Hour w/ Improvements

	→	←	↖	↗	↘	↙
Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	282	819	21	167	71	240
v/c Ratio	0.33	0.94	0.14	0.58	0.38	0.73
Control Delay	6.0	32.8	31.1	34.2	36.5	42.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	32.8	31.1	34.2	36.5	42.3
Queue Length 50th (m)	15.4	112.3	3.1	22.0	11.0	35.8
Queue Length 95th (m)	27.4	#218.3	9.7	43.1	24.2	#67.2
Internal Link Dist (m)	645.7	236.6		295.4		232.9
Turn Bay Length (m)			25.0		20.0	
Base Capacity (vph)	912	943	168	330	218	378
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.87	0.13	0.51	0.33	0.63

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

102: Union St & South Field Dr

Total - 2032

PM Peak Hour w/ Improvements

	↖	→	↘	↗	←	↖	↗	↘	↙	↗	↘	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Future Volume (vph)	47	178	57	160	527	132	21	105	62	71	157	83
Ideal Flow (vphpl)	1550	1550	1550	1550	1550	1550	1775	1650	1650	1775	1650	1650
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Flt		0.97			0.98		1.00	0.94		1.00	0.95	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1453			1425		1668	1269		1558	1478	
Flt Permitted		0.82			0.87		0.39	1.00		0.55	1.00	
Satd. Flow (perm)		1204			1248		693	1269		900	1478	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	47	178	57	160	527	132	21	105	62	71	157	83
RTOR Reduction (vph)	0	10	0	0	8	0	0	24	0	0	21	0
Lane Group Flow (vph)	0	272	0	0	811	0	21	143	0	71	219	0
Heavy Vehicles (%)	8%	0%	2%	10%	2%	6%	0%	17%	29%	7%	4%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		56.3			56.3		15.6	15.6		15.6	15.6	
Effective Green, g (s)		58.3			58.3		17.6	17.6		17.6	17.6	
Actuated g/C Ratio		0.69			0.69		0.21	0.21		0.21	0.21	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		836			867		145	266		188	310	
v/s Ratio Prot							0.11				c0.15	
v/s Ratio Perm		0.23			c0.65		0.03			0.08		
v/c Ratio		0.33			0.94		0.14	0.54		0.38	0.71	
Uniform Delay, d1		5.0			11.2		27.0	29.5		28.4	30.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			16.9		0.5	2.1		1.3	7.1	
Delay (s)		5.3			28.1		27.5	31.6		29.7	37.9	
Level of Service		A			C		C	C		C	D	
Approach Delay (s)		5.3			28.1		31.2				36.0	
Approach LOS		A			C			C			D	

Intersection Summary

HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	83.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	106.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			