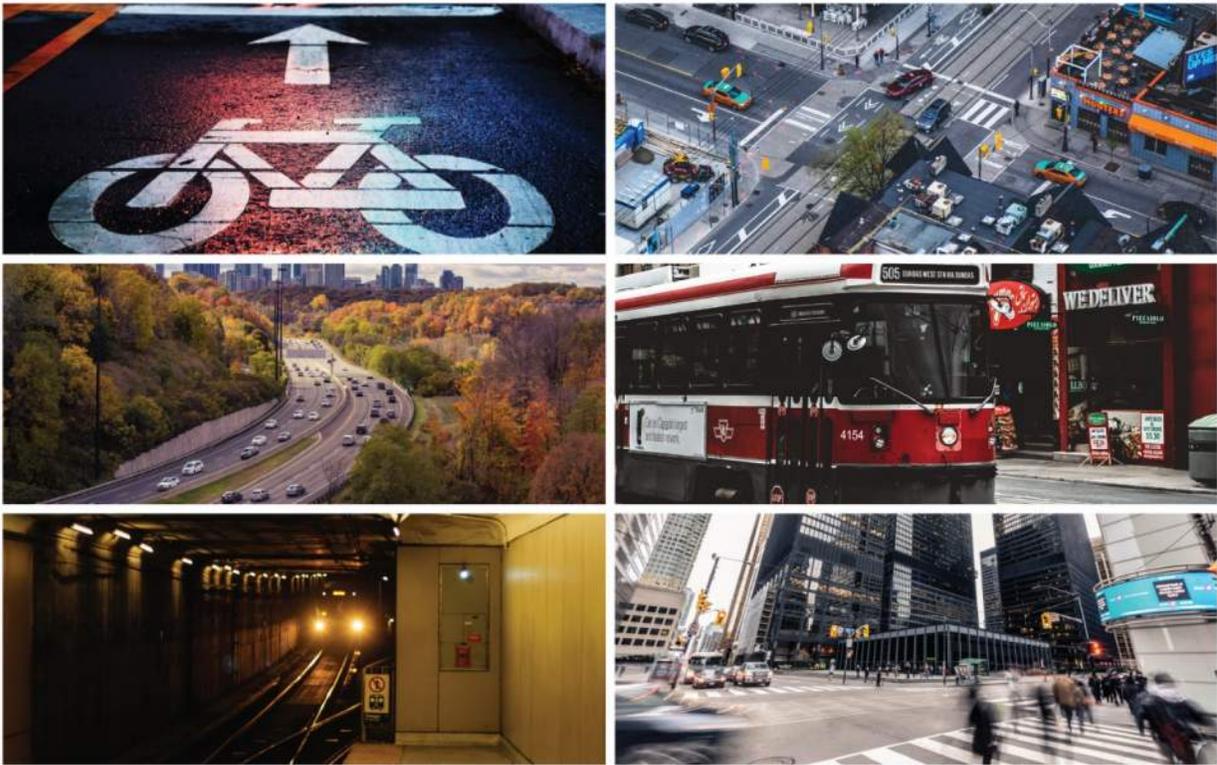


2501563 ONTARIO INC.

SAUGEEN CEDAR HEIGHTS EAST TOWN OF HANOVER

JULY 11, 2018





SAUGEEN CEDAR HEIGHTS EAST TOWN OF HANOVER

2501563 ONTARIO INC.

PROJECT NO.: 17M-02462-00
DATE: JULY 2018

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July 11, 2018

2501563 Ontario Inc.
302300 Concession 2, RR1
Hanover, Ontario N4N 3B8

Attention: Mr. Joerg Weller

Dear Sir:

**Subject: Traffic Impact Study
Saugeen Cedar Heights East
Town of Hanover, Ontario**

WSP Canada Inc. is pleased to submit this traffic impact study for the subject lands located east of Grey County Road no. 28, across from 14th Street.

The findings of the study indicate that the traffic impacts from this development are not expected to impact the traffic operations within the study area.

We thank you for the opportunity to undertake this study. If you have any questions, please do not hesitate to contact the undersigned.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Ismet Medic'.

Ismet Medic, B.A.Sc.
Project Manager,
Transportation Planning and Advisory

WSP ref.: 17M-02462-00

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date				
Prepared by	Denny Yip			
Signature				
Checked by	Jordan Hart-Bishop			
Signature				
Authorised by	Ismet Medic			
Signature				
Project number				
Report number				
File reference				

PRODUCTION TEAM

WSP

Manager Ismet Medic, B.A.Sc.

Designer (EIT) Jordan Hart-Bishop, EIT

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SUBCONSULTANTS

Traffic Counters Ontario Traffic Inc.



TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Development Proposal	1
1.2	Access	1
2	EXISTING TRANSPORTATION CONDITIONS	4
2.1	Boundary Roadways	4
2.2	Traffic Data	4
2.3	Public Transit.....	4
2.4	Existing Intersection Operations	7
3	FUTURE BACKGROUND TRAFFIC CONDITIONS.....	8
3.1	Time Frame.....	8
3.2	Background Corridor Traffic Growth.....	8
3.3	Traffic Increases Related to Other Developments	8
3.4	Background Traffic Operations.....	10
4	SITE GENERATED TRAFFIC	14
4.1	Trip Generation.....	14
4.2	Trip Distribution and Assignment.....	15
5	TOTAL FUTURE TRAFFIC CONDITIONS.....	18
5.1	Basis of Assessment	18
5.2	Total Future Intersection Operations.....	18
6	CONCLUSIONS AND RECOMMENDATIONS	21

TABLES

TABLE 2.1: EXISTING INTERSECTION OPERATIONS	7
TABLE 3.1: BACKGROUND DEVELOPMENTS	8
TABLE 3.2: FUTURE BACKGROUND INTERSECTION OPERATIONS.....	10
TABLE 4.1: SITE GENERATED VEHICULAR TRIPS.....	14
TABLE 5.1: TOTAL FUTURE INTERSECTION OPERATIONS	18

FIGURES

FIGURE 1.1: SITE LOCATION AND CONTEXT	2
FIGURE 1.2: PROPOSED SITE PLAN.....	3
FIGURE 2.1: EXISTING LANE CONFIGURATIONS	5
FIGURE 2.2: EXISTING TRAFFIC VOLUMES.....	6
FIGURE 3.1: FUTURE BACKGROUND DEVELOPMENT LOCATIONS.....	9
FIGURE 3.2: WEST SAUGEEN CEDAR HEIGHTS TRAFFIC VOLUMES	11
FIGURE 3.3: KRAEMER SUBDIVISION TRAFFIC VOLUMES.....	12
FIGURE 3.4: FUTURE BACKGROUND TRAFFIC VOLUMES.....	13
FIGURE 4.1: TRIP DISTRIBUTION	16
FIGURE 4.2: SITE GENERATED TRAFFIC.....	17
FIGURE 5.1: FUTURE LANE CONFIGURATIONS	19
FIGURE 5.2: TOTAL FUTURE TRAFFIC FORECASTS	20

APPENDICES

A	MODE SPLIT
B	TRAFFIC DATA
C	LEVEL OF SERVICE DEFINITIONS
D	EXISTING INTERSECTION OPERATIONS
E	FUTURE BACKGROUND INTERSECTION OPERATIONS
F	TOTAL FUTURE INTERSECTION OPERATIONS

1 INTRODUCTION

2501563 Ontario Inc. has retained WSP Canada Inc. to produce a Traffic Impact Study in support of the subject lands located east of Grey County Road no. 28, across from 14th Street, in the town of Hanover, Ontario.

Figure 1.1 illustrates the site location and context.

1.1 DEVELOPMENT PROPOSAL

The Saugeen Cedar Heights East subdivision will consist of 98 single detached homes.

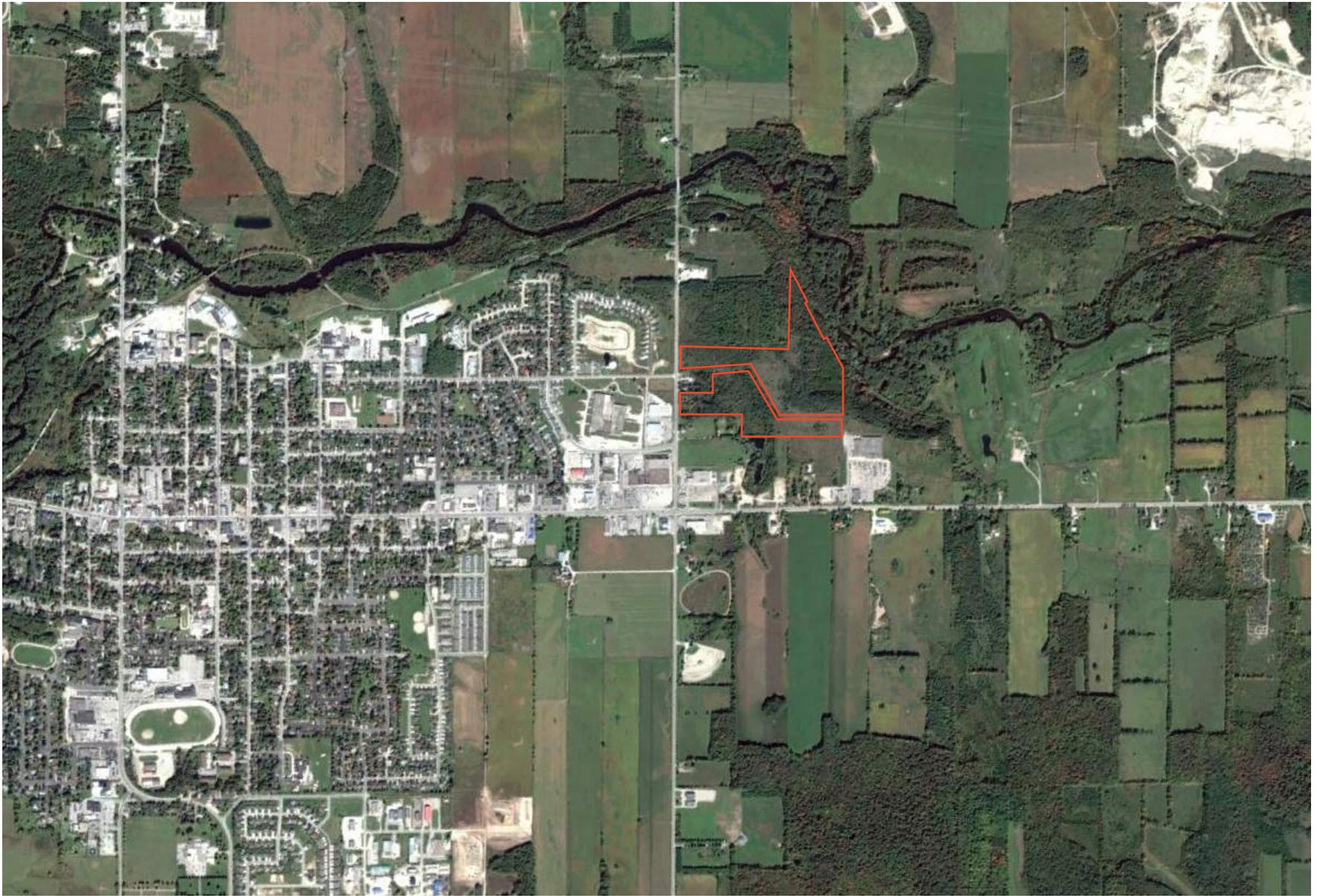
Figure 1.2 illustrates the proposed site plan.

1.2 ACCESS

Access for the Saugeen Cedar Heights East subdivision will be through the existing 14th Street and Grey County Road no. 28 intersection. A new full-moves eastern leg at this intersection will connect into the subdivision.

A future site access will also be available at the north end (into the future Kraemer subdivision) and the southeast end of the site.

For the purposes of an assessment, it has been assumed that all traffic will utilize the 14th Street and Grey County Road no. 28 access.

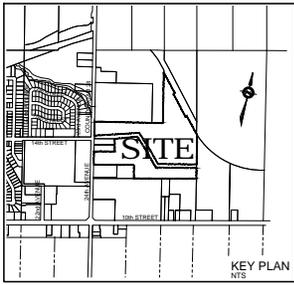


Not to Scale



 Subject Site

FIGURE 1.1
Saugeen Cedar Heights Subdivision East
Site Location and Context



CAUTION:
THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE DRAWING, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTE:
1. TOPOGRAPHICAL INFORMATION DERIVED FROM FIELD SURVEY BY WSP CANADA INC. COMPLETED ON JUNE 9, 2016.
2. PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN 188-10088.

LEGEND

---	PROPERTY BOUNDARY	---	EXISTING CABLE TV PEDESTAL
---	PROPOSED STREET PROPERTY LINES	---	EXISTING TELEPHONE PEDESTAL
---	EDGE OF EXISTING PAVEMENT	---	STANDARD IRON BAR
---	EDGE OF EXISTING GRAVEL	---	BENCHMARK
---	EXISTING SANITARY SEWER	---	EXISTING DECIDUOUS TREE
---	EXISTING STORM SEWER	---	EXISTING CONIFEROUS TREE
---	EXISTING WATERMAN	---	EXISTING TREE LINE
---	EXISTING SANITARY MANHOLE	---	BENCHMARK
---	EXISTING STORM MANHOLE	---	PROPOSED TREE RETENTION AREAS
---	EXISTING GATE BASIN	---	PROPOSED TREE REPLACEMENT AREAS
---	EXISTING FIRE HYDRANT		
---	EXISTING GATE VALVE		
---	EXISTING HYDRO GLY WISE		
---	EXISTING HYDRO POLE		

Benchmark Information
BMT1
SOUTHEAST CORNER OF CONCRETE TRANSFORMER VAULT AT THE INTERSECTION OF 14th STREET AND GREY COUNTY ROAD No. 28.
ELEVATION: 230.10m

No.	DATE	DESCRIPTION	TLB	SJC	BY	APPRO
0	JUN 11/16	PRELIMINARY SUBMISSION				
Do not void unless signed and dated						



PROPOSED SUBDIVISION
PART OF LOTS 11, 12, 13 & 14
CONCESSION 1 N.D.R.
TOWN OF HANOVER
CONCEPT PLAN 1

Drawn: TLB
Scale: 1:1000
Checked: SJC
Date: JUN 2016
Design Engineer: [Signature]

DRAWING No. 00502-CP1

Not to Scale



FIGURE 1.2
Saugeen Cedar Heights Subdivision East
Proposed Site Plan

2 EXISTING TRANSPORTATION CONDITIONS

2.1 BOUNDARY ROADWAYS

The following boundary roadways were identified within the vicinity of the subject site:

Grey County Road no. 28 is a north-south County road located immediately west of the subject site. It has a two-lane cross section and a local speed limit of 50 km/h.

Grey County Road no. 4 is an east-west County road located south of the subject site. It has a two-lane cross section and a local speed limit of 50 km/h. West of Grey County Road no. 28, this roadway continues as **10th Street**. 10th Street is under the jurisdiction of Grey County.

14th Street is an east-west local road located west of the subject site. It has a two-lane cross section and a local speed limit of 50 km/h.

Figure 2.1 illustrates the existing lane configurations of all the above-noted roads along with the type of traffic control used at the intersections on these roads.

2.2 TRAFFIC DATA

Turning movement counts were undertaken by Ontario Traffic Inc. on behalf of WSP Canada Inc. and are summarized in **Appendix A**. The counts were undertaken on January 10, 2018 from 7:00 a.m. to 9:00 a.m., and 4:00 p.m. to 6:00 p.m., at the following intersections:

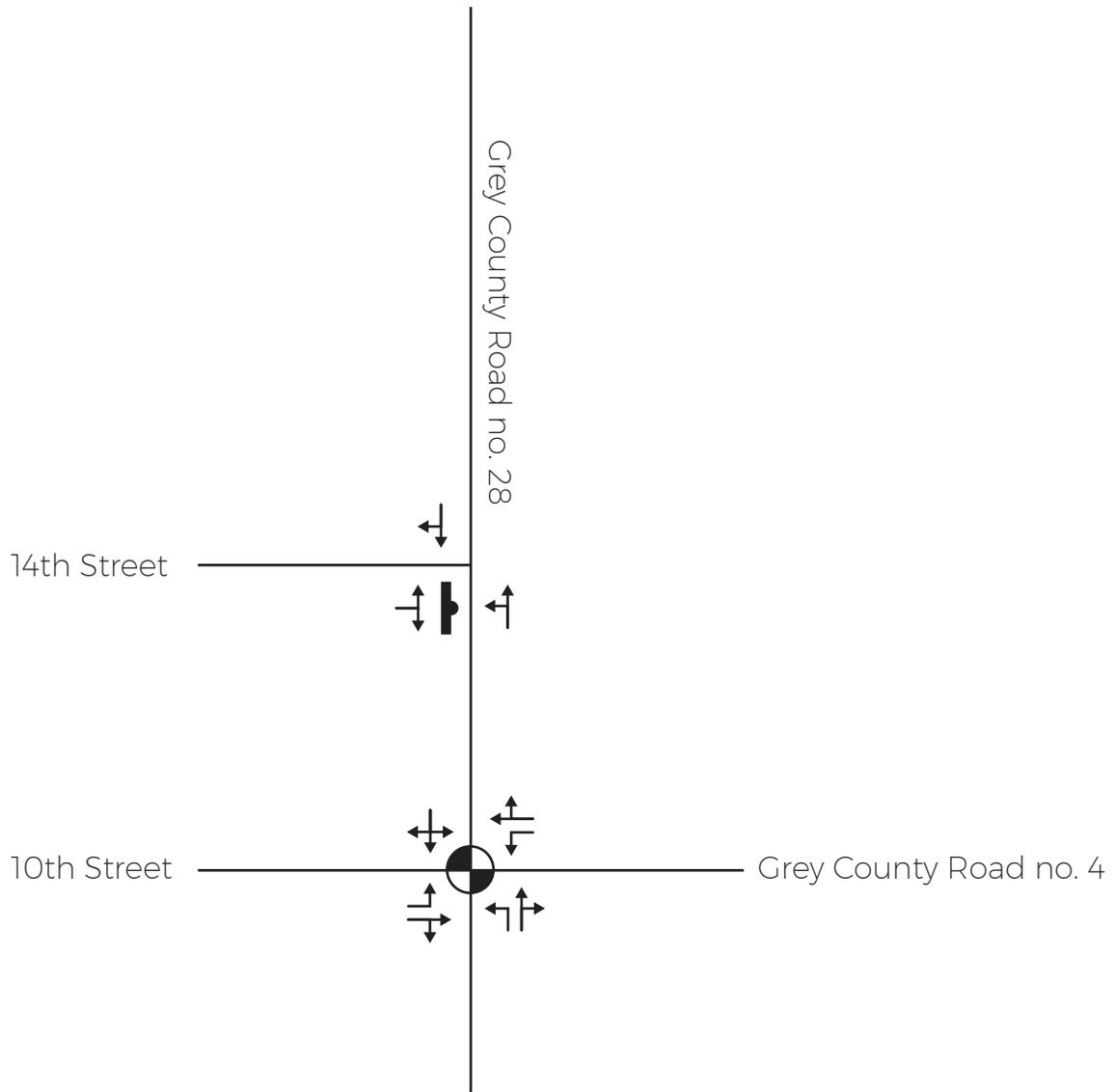
Intersection	Traffic Control
Grey County Road no. 28 and 10 th Street/Grey County Road no. 4	Signalized
Grey County Road no. 28 and 14 th Street	Stop Controlled

The signal timing plan for the above-noted signalized intersection was acquired from Grey County and is included in Appendix B.

Existing traffic volumes along the study roadways are illustrated in **Figure 2.2**.

2.3 PUBLIC TRANSIT

No fixed-route regular transit service operates in Hanover. However, specialized transit is available through Saugeen Mobility and Regional Transit, who provides transportation services to people with physical or mental impairments.

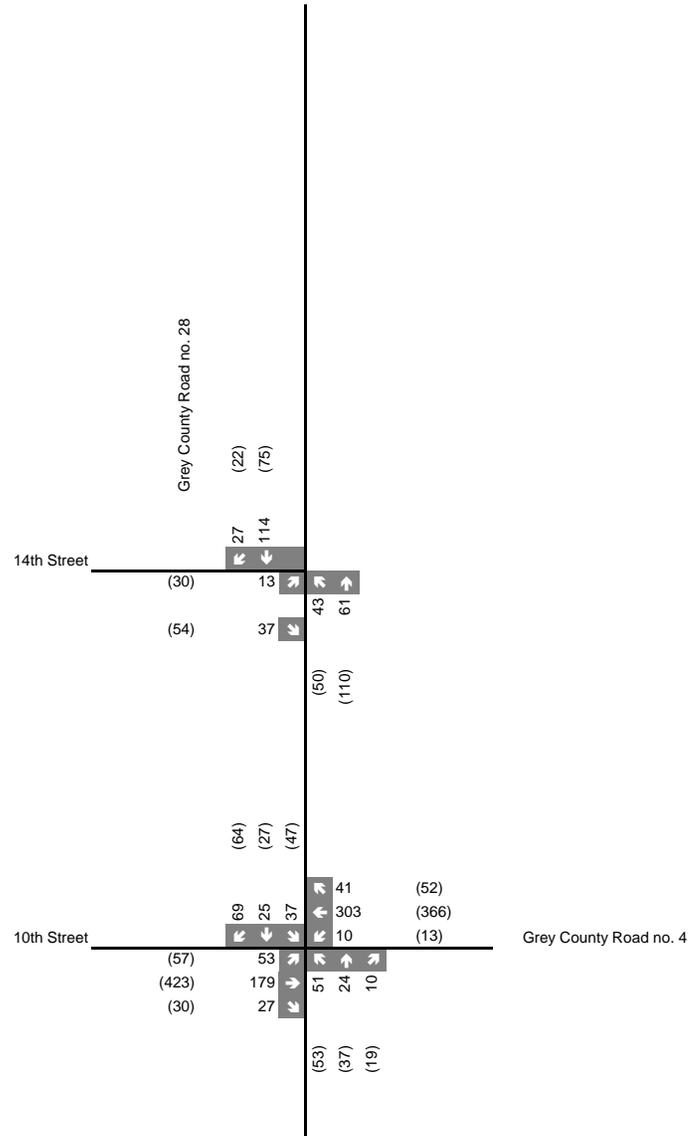


Not to Scale



-  Signalized Intersection
-  Stop-controlled Leg

FIGURE 2.1
 Saugeen Cedar Heights Subdivision East
 Existing Lane Configurations



xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 2.2
 Existing Traffic Volumes



2.4 EXISTING INTERSECTION OPERATIONS

The 2018 existing intersection operations were analyzed on the basis of the roadway weekday a.m. and p.m. peak hour traffic volumes illustrated in Figure 2.2. The intersections were analyzed using the Synchro Traffic Software 9.0, which incorporates analysis of intersection capacity based on the approach outlined in the Highway Capacity Manual 2000 (HCM 2000).

Appendix B provides the Level of Service (LOS) definitions according to the HCM 2000 methodology.

Table 2.1 outlines the existing LOS. Detailed Synchro analysis worksheets are provided in **Appendix C**.

Table 2.1: Existing Intersection Operations

Intersection	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay in Seconds)	Volume/Capacity Ratio	LOS (Delay in Seconds)	Volume/Capacity Ratio
10 th Street/Grey County Road No. 4 and Grey County Road No. 28	B (13)	-	B (14)	-
14 th Street and Grey County Road No. 28	A (10)	EB-LR (0.07)	A (10)	EB-LR (0.11)

- 1 For signalized intersections, the level of service is based on the overall delay of the intersection. Critical v/c ratios are only listed for movements with values over 0.85.
- 2 For two-way stop controlled intersections, the level of service is based on the delay associated with the critical movement.
- 3 For all-way stop controlled intersections, the level of service is based on the overall intersection delay.

As illustrated in Table 2.1, the intersections are currently operating at a level of service 'B' or better, with minimal delays found to impact traffic.

3 FUTURE BACKGROUND TRAFFIC CONDITIONS

3.1 TIME FRAME

The year 2023 was selected for analysis. The subject site is expected to be in place at this time.

3.2 BACKGROUND CORRIDOR TRAFFIC GROWTH

Consistent with the Kraemer Subdivision Traffic Impact Study completed by WSP Canada Inc. in 2015, a growth rate of 2.5% was applied to traffic volumes along Grey County Road no. 28, and a growth rate of 0.5% was applied to traffic volumes along Grey County Road no. 4.

3.3 TRAFFIC INCREASES RELATED TO OTHER DEVELOPMENTS

Two background developments were identified within the vicinity of the subject site. **Table 3.1** illustrates the characteristics of the background developments.

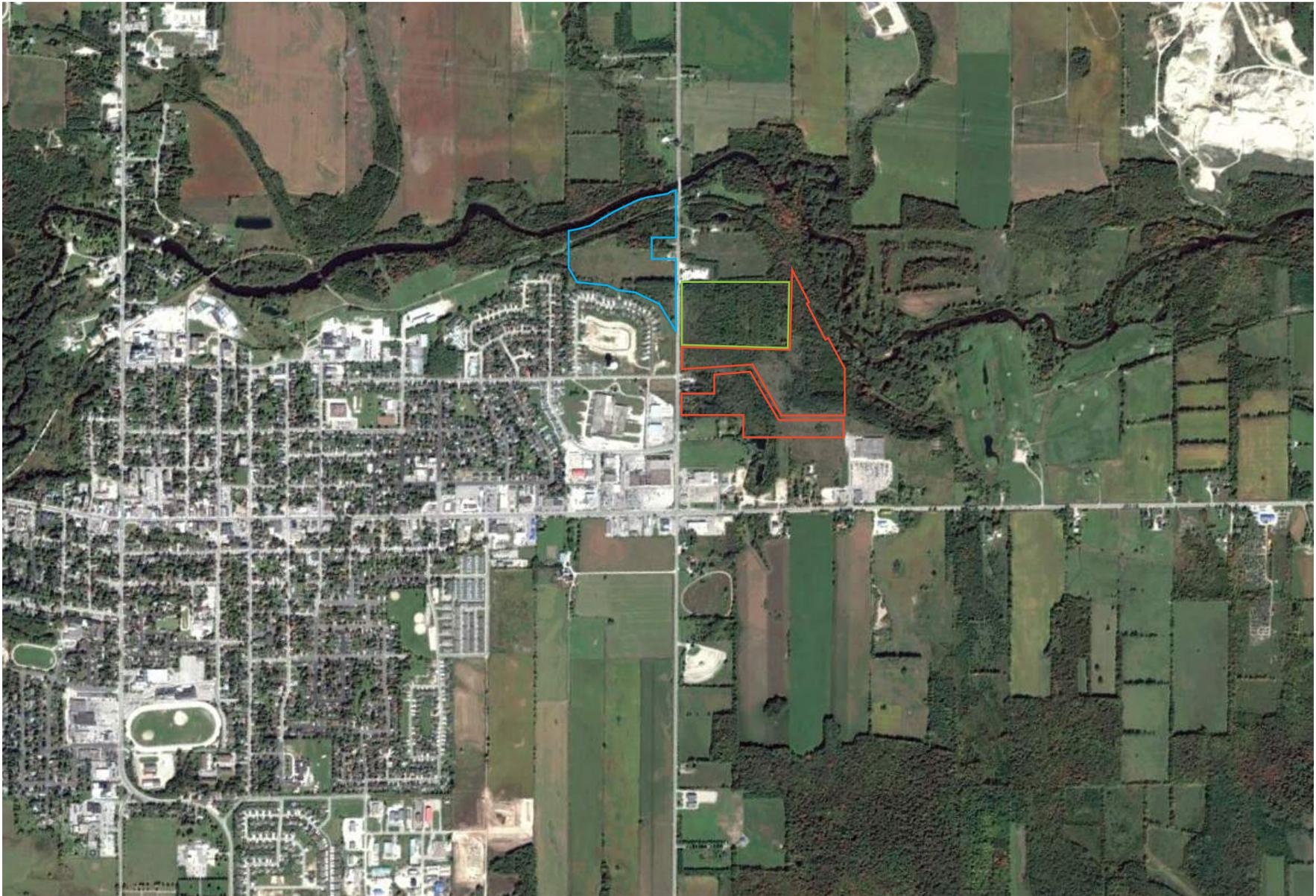
Table 3.1: Background Developments

Location	Development Characteristics	Source
Saugeen Cedar Heights West Subdivision	91 total units 73 single family detached dwelling units 18 semi-detached homes	WSP Canada Inc. (February 2018) ¹
Kraemer Subdivision	47 total units 29 single family detached dwelling units 18 semi-detached dwelling units	WSP Canada Inc. (October 2015)

¹ Both traffic impact studies for the Saugeen Cedar Heights East Subdivision and the Saugeen Cedar Heights East Subdivision were completed in conjunction by WSP Canada Inc.

Figure 3.1 illustrates the location of the above-noted background developments.

Site trips associated with each of the above developments were extracted from the respective site specific traffic impact studies. The traffic volumes associated with the Saugeen Cedar Heights West Subdivision are summarized in **Figure 3.2**, and the volumes associated with the Kraemer Subdivision are summarized in **Figure 3.3**.



Not to Scale

- Subject Site
- Saugeen Cedar Heights Subdivision West
- Kraemer Subdivision



FIGURE 3.1
Saugeen Cedar Heights Subdivision East
Background Development Locations

3.4 BACKGROUND TRAFFIC OPERATIONS

The background traffic operations were analyzed on the basis of the future background traffic forecasts shown in **Figure 3.4**.

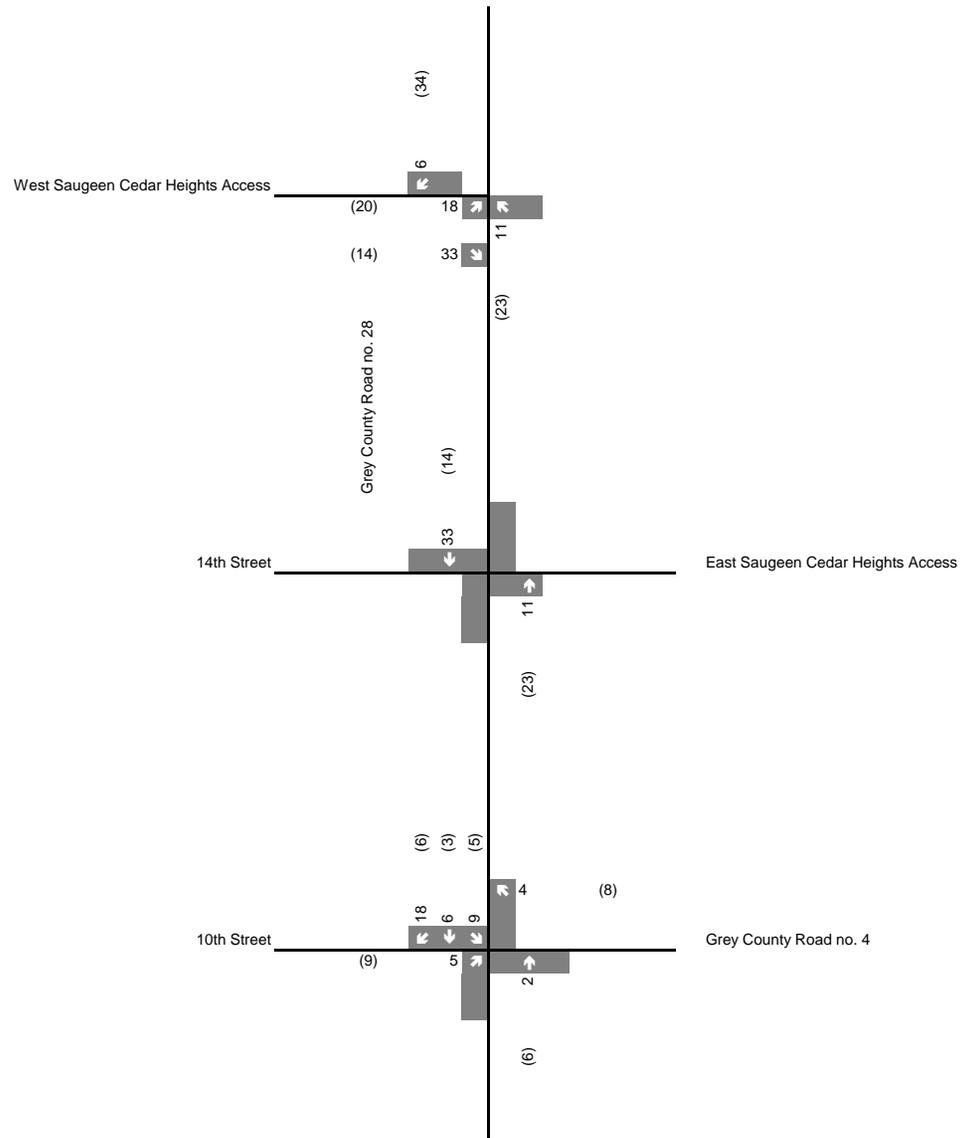
The resulting levels of service are outlined in **Table 3.2** with the details related to the intersection operations provided in **Appendix D**.

Table 3.2: Future Background Intersection Operations

Intersection	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay in Seconds)	Volume/Capacity Ratio	LOS (Delay in Seconds)	Volume/Capacity Ratio
10 th Street/Grey County Road No. 4 and Grey County Road No. 28	B (17)	-	B (16)	-
14 th Street and Grey County Road No. 28	B (11)	EB-LTR (0.08)	B (11)	EB-LTR (0.13)
Saugeen Cedar Heights West Access and Grey County Road No. 28	A (10)	EB-LTR (0.07)	B (12)	EB-LTR (0.05)

- 1 For signalized intersections, the level of service is based on the overall delay of the intersection. Critical v/c ratios are only listed for movements with values over 0.85.
- 2 For two-way stop controlled intersections, the level of service is based on the delay associated with the critical movement.

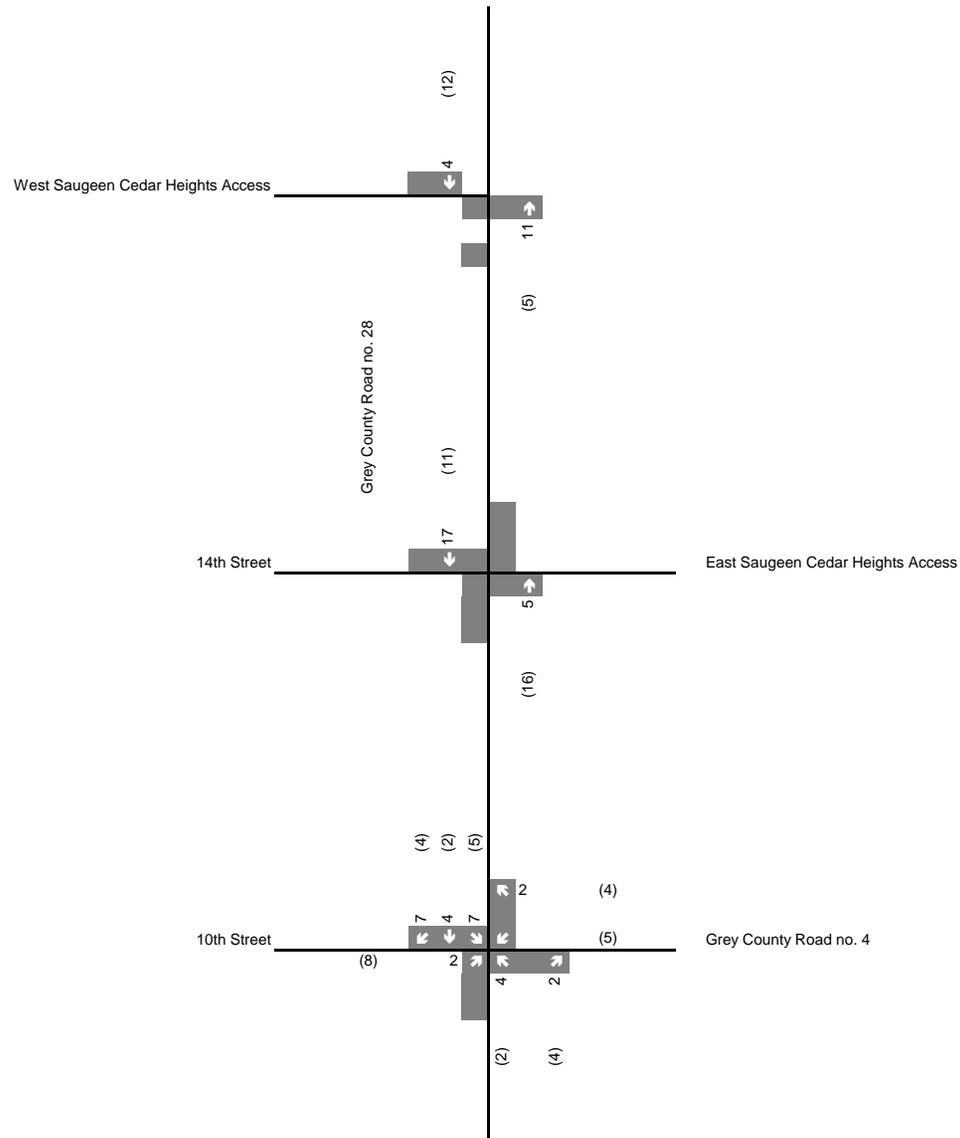
As illustrated in Table 3.2, the study intersections are forecast to operate at a level of service 'B' or better, with minimal delays found to impact traffic. Little to no change is experienced over the existing condition.



xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 3.2
 West Saugeen Cedar Heights
 Background Development Traffic Volumes

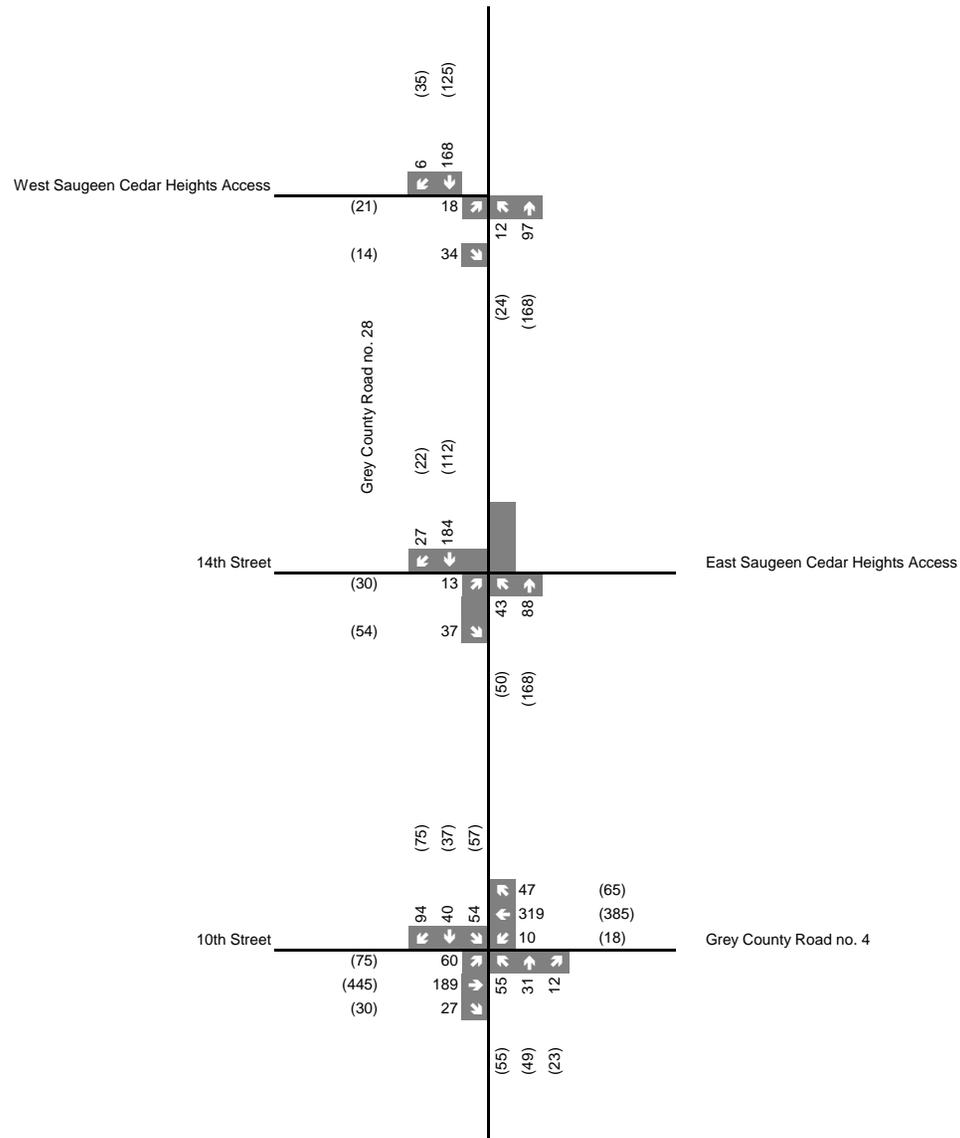




xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 3.3
 Kraemer Subdivision
 Background Development Traffic Volumes





xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 3.4
 Future Background Traffic Volumes

4 SITE GENERATED TRAFFIC

4.1 TRIP GENERATION

The vehicle trips generated by the proposed development during the weekday a.m. and p.m. peak hours were estimated using the trip generation rates outlined in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition*.

The following equations for Land Use 210 (Single-Family Detached Housing) were used with the following inbound/outbound splits, where T represents total trips and X represents number of units:

- A.M. Peak Hour: $T = 0.75X$, inbound 25% and outbound 75%
- P.M. Peak Hour: $T = 1.00X$, inbound 63% and outbound 37%

The following equations for Land Use 230 (Residential Townhouse/Condominium) were used with the following inbound/outbound splits, where T represents total trips and X represents number of units:

- A.M. Peak Hour: $T = 0.44X$, inbound 17% and outbound 83%
- P.M. Peak Hour: $T = 0.52X$, inbound 67% and outbound 33%

The overall vehicle trips generated are shown in **Table 4.1**.

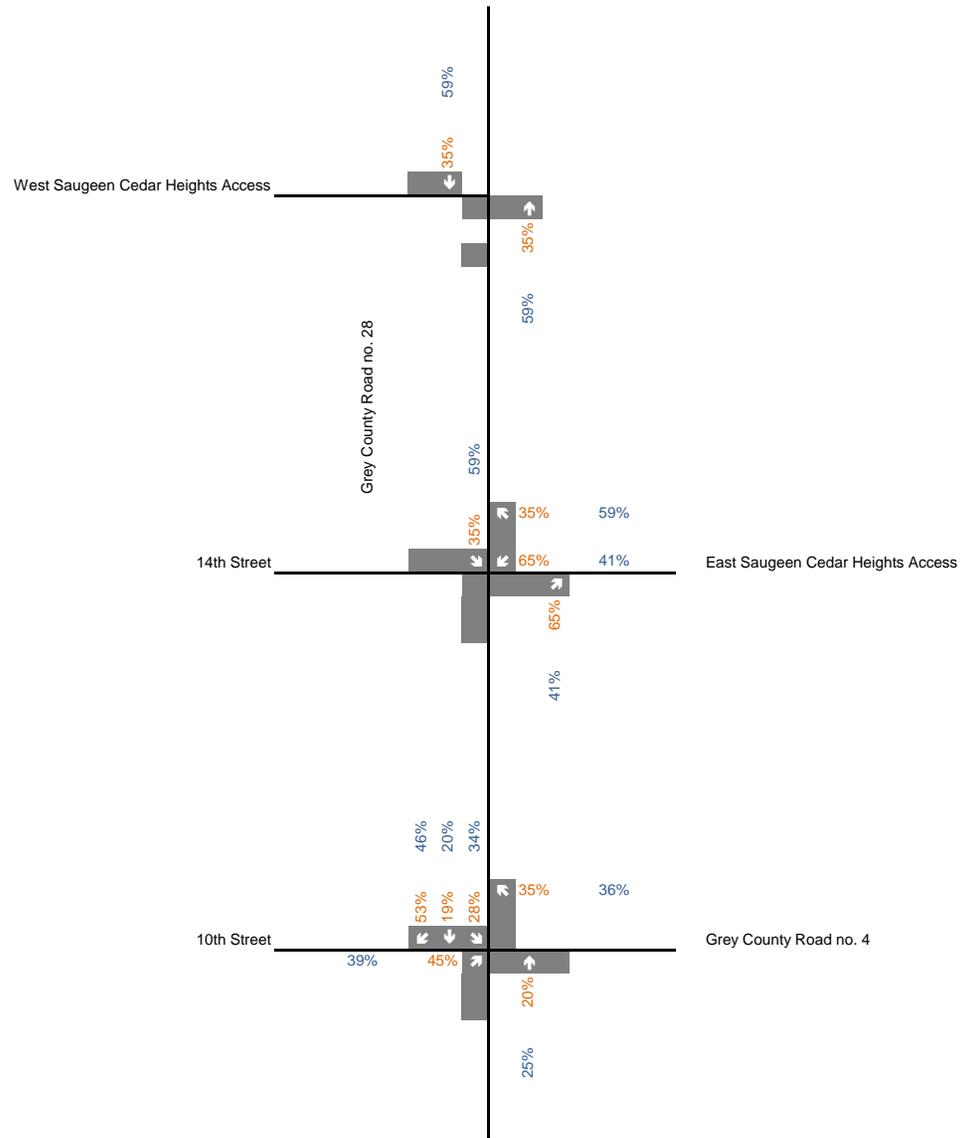
Table 4.1: Site Generated Vehicular Trips

Land Use	Basis/Parameter	Vehicle Trips			
		Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
		Inbound	Outbound	Inbound	Outbound
Single Detached and Semi-Detached Houses (78 Units)	ITE Land Use 210 (Single-Family Detached Housing)	15	44	49	29
Townhouses (20 Units)	ITE Land Use 230 (Residential Townhouse/Condominium)	1	7	7	3
	Total Houses	16	51	56	32

As shown in Table 4.1, the proposed development is expected to generate **16 inbound auto trips and 51 outbound auto trips** during the a.m. peak hour, and **56 inbound auto trips and 32 outbound auto trips** during the p.m. peak hour.

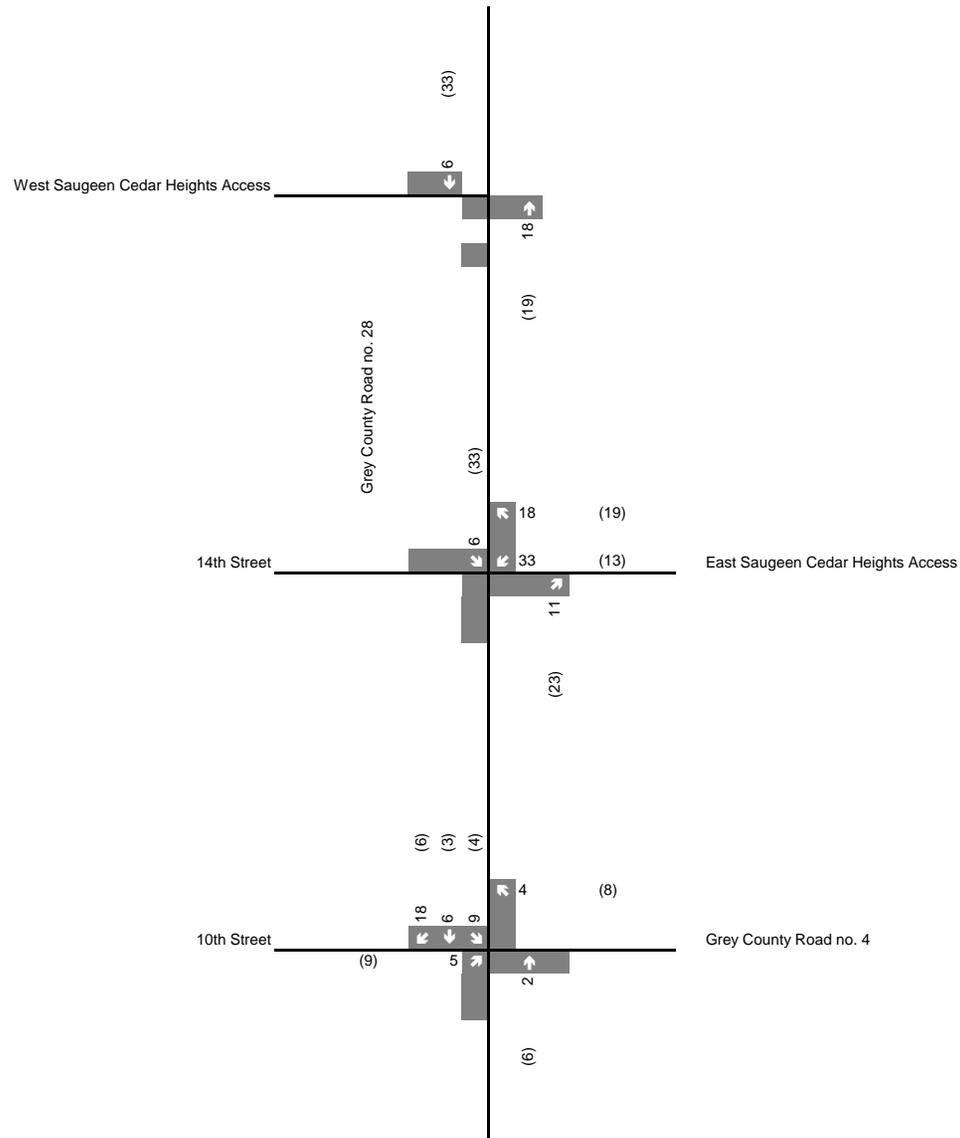
4.2 TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution and assignment for the Saugeen Cedar Heights East subdivision was based on the existing turning movement counts at the study intersections. **Figure 4.1** illustrates the trip distribution based on the turning movement counts, and **Figure 4.2** illustrates the resulting traffic assignment to the boundary road network.



xx % A.M. Peak Hour Trip Distribution
 xx % P.M. Peak Hour Trip Distribution

FIGURE 4.1
 Site Traffic Trip Distribution



xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 4.2
 Site Generated Traffic Volumes



5 TOTAL FUTURE TRAFFIC CONDITIONS

5.1 BASIS OF ASSESSMENT

The total future traffic conditions were estimated by superimposing the site generated traffic volumes illustrated in Figure 4.1 onto the future background traffic volumes.

To accommodate background developments and the proposed site access, the lane configurations were updated as illustrated in Figure 5.1.

The resulting total future traffic forecasts are illustrated in Figure 5.2.

5.2 TOTAL FUTURE INTERSECTION OPERATIONS

The total future traffic operations at the study intersections were analyzed on the basis of the total future traffic forecasts. The resulting levels of service are outlined in Table 5.1. Detailed Synchro worksheets are available in Appendix E.

Table 5.1: Total Future Intersection Operations

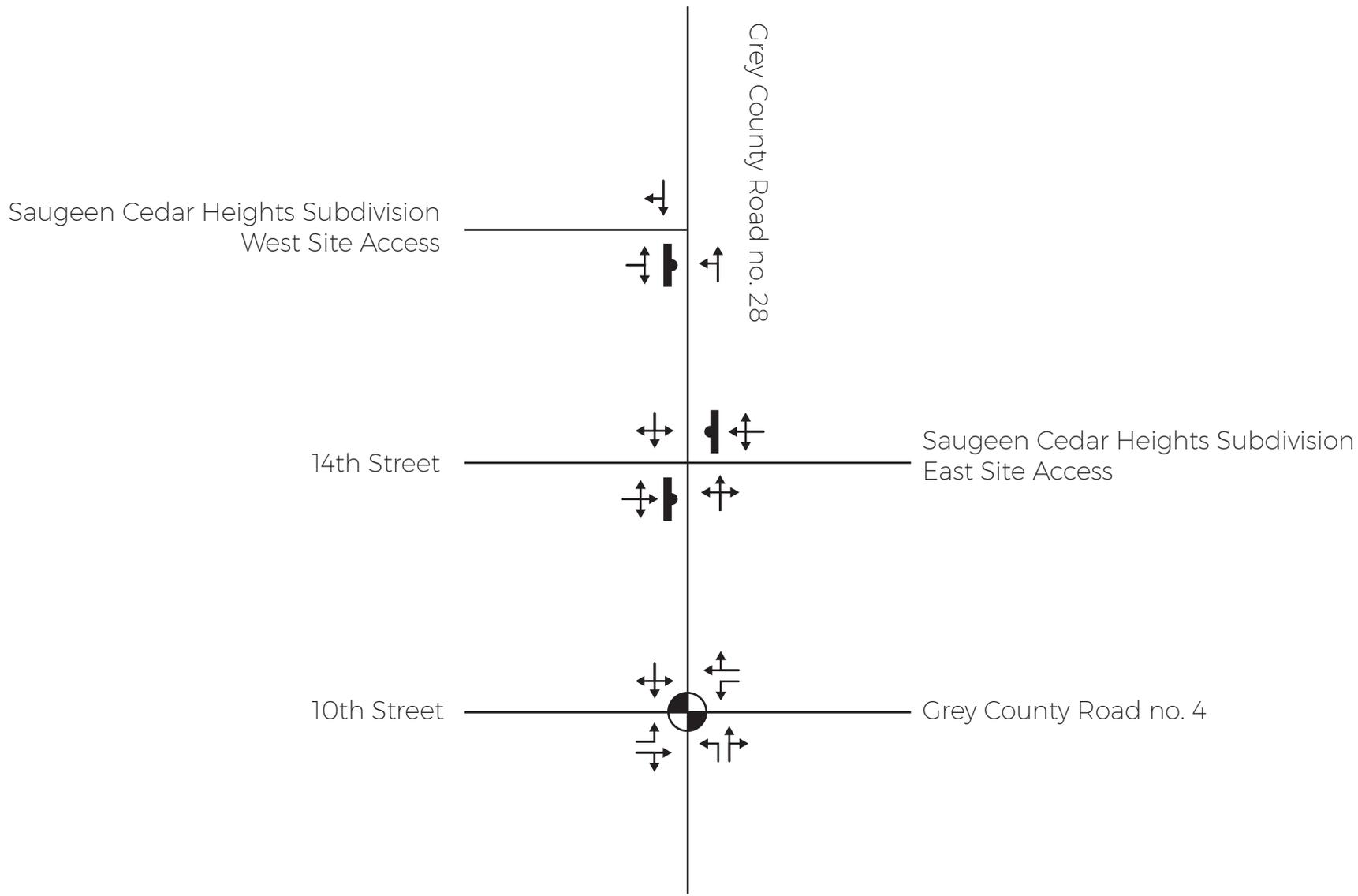
Intersection	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay in Seconds)	Volume/Capacity Ratio	LOS (Delay in Seconds)	Volume/Capacity Ratio
10 th Street/Grey County Road No. 4 and Grey County Road No. 28	B (18)	-	B (18)	-
14 th Street and Grey County Road No. 28	B (12)	WB-LTR (0.09)	B (12)	WB-LTR (0.05)
Saugeen Cedar Heights West Access and Grey County Road No. 28	B (10)	EB-LTR (0.07)	B (11)	EB-LTR (0.06)

- 1 For signalized intersections, the level of service is based on the overall delay of the intersection. Critical v/c ratios are only listed for movements with values over 0.85.
- 2 For two-way stop controlled intersections, the level of service is based on the delay associated with the critical movement.

As seen in Table 5.1, the study intersections are forecast to operate at a level of service 'B' or better, with minimal delays found to impact traffic. Little to no change is experienced over the future background condition.

WALMART DRIVEWAY ACCESS AND GREY COUNTY ROAD NO. 28

It is our understanding that the Town is interested in assuming the existing Walmart driveway as a connection into the Saugeen Cedar Heights Subdivision east. Based on the trips generated by the development and the existing cross-traffic volumes on Grey County Road no. 28, it is WSP's opinion that the roadway will not require modifications to accommodate future traffic volumes. However, the results should be quantitatively verified through a future study.

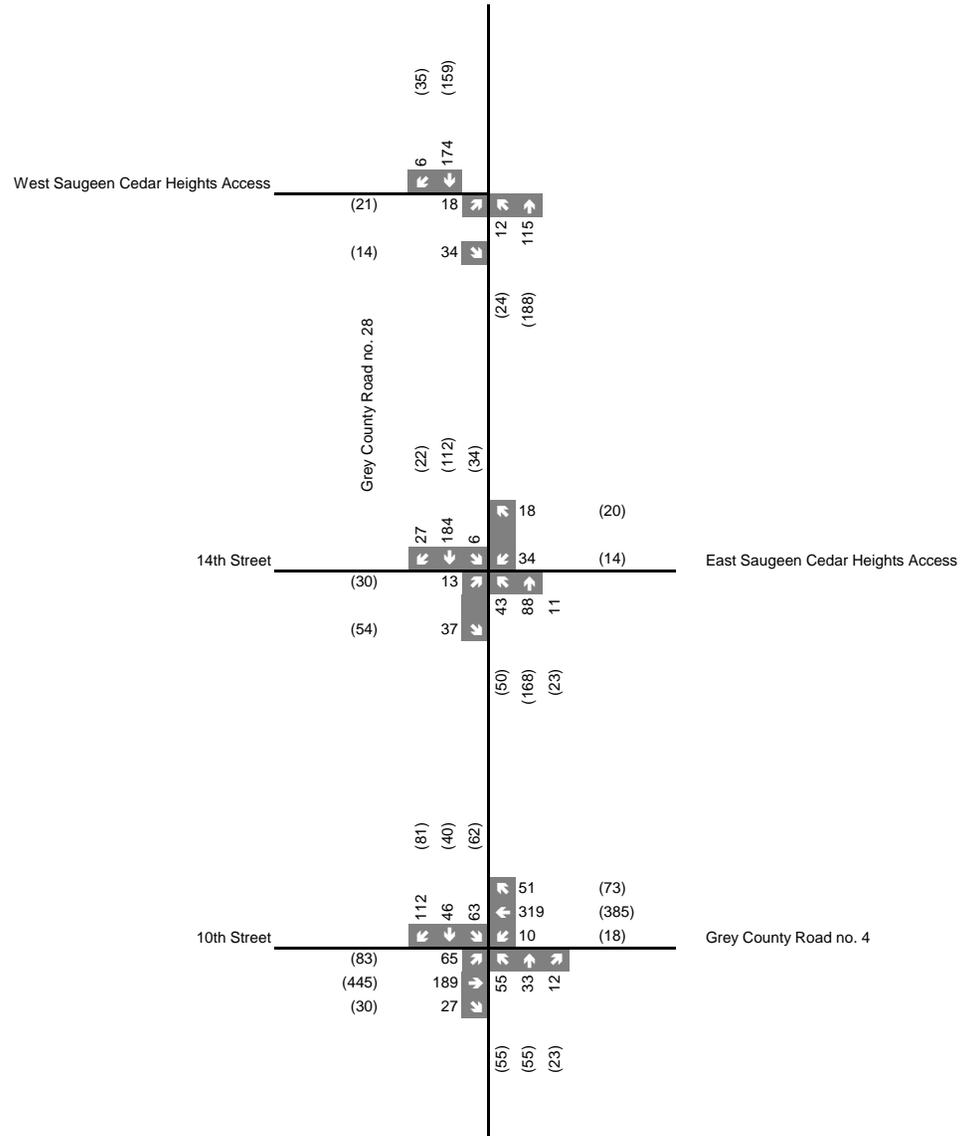


Not to Scale



-  Signalized Intersection
-  Stop-controlled Leg

FIGURE 5.1
Saugeen Cedar Heights Subdivision East
Future Lane Configurations



xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes

FIGURE 5.2
 Total Future Traffic Forecasts



6 CONCLUSIONS AND RECOMMENDATIONS

2501563 Ontario Inc. has retained WSP Canada Inc. to produce a Traffic Impact Study in support of the subject lands located east of Grey County Road no. 28, across from 14th Street, in the town of Hanover, Ontario.

Access for the Saugeen Cedar Heights East subdivision will be through the existing 14th Street and Grey County Road no. 28 intersection. A new full-moves eastern leg at this intersection will connect into the subdivision.

Utilizing the average trip rates outlined in the *Institute of Transportation Engineers, Trip Generation Manual, 9th Edition*, the proposed development is expected to generate 14 inbound auto trips and 45 outbound auto trips during the a.m. peak hour, and 50 inbound auto trips and 28 outbound auto trips during the p.m. peak hour.

The inclusion of these peak hour trips to the existing and future background peak hour traffic volumes does not pose any constraint to the development, and can readily be accommodated within the existing road network.

APPENDIX

A TRAFFIC DATA



Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

To: 9:00:00

Municipality: Hanover
Site #: 1801900001
Intersection: Grey Road 28 & 14th St
TFR File #: 2
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 28 runs N/S

North Leg Total: 215
 North Entering: 141
 North Peds: 0
 Peds Cross: ∇

Cyclists	0	0	0
Trucks	1	22	23
Cars	26	92	118
Totals	27	114	



Cyclists	0
Trucks	22
Cars	52
Totals	74

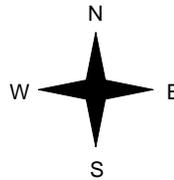
Cyclists	Trucks	Cars	Totals
0	5	65	70



Grey Road 28



14th St



Cyclists	Trucks	Cars	Totals
0	1	12	13
0	4	33	37
0	5	45	



Grey Road 28

Peds Cross: ∇
 West Peds: 0
 West Entering: 50
 West Leg Total: 120

Cars	125
Trucks	26
Cyclists	0
Totals	151



Cars	39	40	79
Trucks	4	21	25
Cyclists	0	0	0
Totals	43	61	

Peds Cross: ∇
 South Peds: 0
 South Entering: 104
 South Leg Total: 255

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 16:00:00

To: 18:00:00

One Hour Peak

From: 16:00:00

To: 17:00:00

Municipality: Hanover
Site #: 1801900001
Intersection: Grey Road 28 & 14th St
TFR File #: 2
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 28 runs N/S

North Leg Total: 237
 North Entering: 97
 North Peds: 0
 Peds Cross: ∇

Cyclists	0	0	0
Trucks	0	5	5
Cars	22	70	92
Totals	22	75	



Cyclists	0
Trucks	3
Cars	137
Totals	140

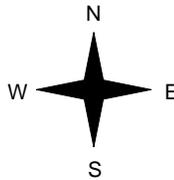
Cyclists	Trucks	Cars	Totals
0	0	72	72



Grey Road 28



14th St



Cyclists	Trucks	Cars	Totals
0	0	30	30
0	0	54	54
0	0	84	



Grey Road 28



Peds Cross: ∇
 West Peds: 0
 West Entering: 84
 West Leg Total: 156

Cars	124
Trucks	5
Cyclists	0
Totals	129



Cars	50	107
Trucks	0	3
Cyclists	0	0
Totals	50	110

Peds Cross: ∇
 South Peds: 0
 South Entering: 160
 South Leg Total: 289

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Hanover
Site #: 1801900001
Intersection: Grey Road 28 & 14th St
TFR File #: 2
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 28 runs N/S

North Leg Total: 828
 North Entering: 405
 North Peds: 0
 Peds Cross: ∇

Cyclists	0	0	0
Trucks	1	41	42
Cars	76	287	363
Totals	77	328	



Cyclists	0
Trucks	42
Cars	381
Totals	423

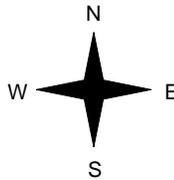
Cyclists	0
Trucks	7
Cars	220
Totals	227



Grey Road 28



14th St



Cyclists	0		
Trucks	1		
Cars	83		
Totals	84		
0	4	158	162
0	5	241	



Grey Road 28

Peds Cross: ∇
 West Peds: 0
 West Entering: 246
 West Leg Total: 473

Cars	445
Trucks	45
Cyclists	0
Totals	490



Cars	144	298	442
Trucks	6	41	47
Cyclists	0	0	0
Totals	150	339	

Peds Cross: ∇
 South Peds: 0
 South Entering: 489
 South Leg Total: 979

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: Grey Road 28 & 14th St

Count Date: 10-Jan-18

Municipality: Hanover

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	70	11	81	0	139	8:00:00	15	43	0	58	0
9:00:00	0	114	27	141	0	245	9:00:00	43	61	0	104	0
16:00:00	0	1	0	1	0	2	16:00:00	0	1	0	1	0
17:00:00	0	75	22	97	0	257	17:00:00	50	110	0	160	0
18:00:00	0	68	17	85	0	249	18:00:00	42	122	0	164	0
Totals:	0	328	77	405	0	892		150	337	0	487	0
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	31	8:00:00	17	0	14	31	0
9:00:00	0	0	0	0	0	50	9:00:00	13	0	37	50	0
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0	84	17:00:00	30	0	54	84	0
18:00:00	0	0	0	0	0	81	18:00:00	24	0	57	81	0
Totals:	0	0	0	0	0	246		84	0	162	246	0
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	7:00	8:00	9:00	16:00		17:00	17:00	18:00	18:00			
Crossing Values:	0	17	13	0		30	30	24	24			

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

To: 9:00:00

Municipality: Hanover
Site #: 1801900002
Intersection: 10th St & Grey Rd 28
TFR File #: 4
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: 10th St runs W/E

North Leg Total: 249
 North Entering: 131
 North Peds: 0
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	12	6	7	25
Cars	57	19	30	106
Totals	69	25	37	



Cyclists	0
Trucks	19
Cars	99
Totals	118

East Leg Total: 580
 East Entering: 354
 East Peds: 0
 Peds Cross: \times

Cyclists	Trucks	Cars	Totals
0	30	393	423

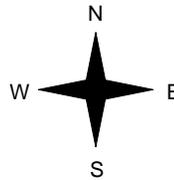


Grey Rd 28

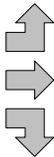
Cars	Trucks	Cyclists	Totals
32	9	0	41
287	16	0	303
10	0	0	10
329	25	0	



10th St



Cyclists	Trucks	Cars	Totals
0	8	45	53
0	19	160	179
0	1	26	27
0	28	231	



Grey Rd 28

10th St



Cars	Trucks	Cyclists	Totals
199	27	0	226

Peds Cross: \times
 West Peds: 0
 West Entering: 259
 West Leg Total: 682

Cars	55
Trucks	7
Cyclists	0
Totals	62



Cars	49	22	9	80
Trucks	2	2	1	5
Cyclists	0	0	0	0
Totals	51	24	10	

Peds Cross: \times
 South Peds: 0
 South Entering: 85
 South Leg Total: 147

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period

From: 16:00:00

To: 18:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Hanover
Site #: 1801900002
Intersection: 10th St & Grey Rd 28
TFR File #: 4
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: 10th St runs W/E

North Leg Total: 284
 North Entering: 138
 North Peds: 0
 Peds Cross: \times

Cyclists	0	0	0	0
Trucks	8	2	5	15
Cars	56	25	42	123
Totals	64	27	47	



Cyclists	0
Trucks	15
Cars	131
Totals	146

East Leg Total: 920
 East Entering: 431
 East Peds: 0
 Peds Cross: \times

Cyclists	Trucks	Cars	Totals
0	24	459	483

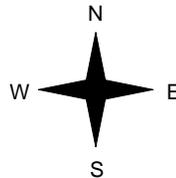


Grey Rd 28

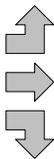
Cars	Trucks	Cyclists	Totals
48	4	0	52
352	14	0	366
13	0	0	13
413	18	0	



10th St



Cyclists	Trucks	Cars	Totals
0	6	51	57
0	19	404	423
0	1	29	30
0	26	484	



10th St



Peds Cross: \times
 West Peds: 0
 West Entering: 510
 West Leg Total: 993

Cars	67
Trucks	3
Cyclists	0
Totals	70



Cars	51	32	18	101
Trucks	2	5	1	8
Cyclists	0	0	0	0
Totals	53	37	19	

Grey Rd 28



Peds Cross: \times
 South Peds: 0
 South Entering: 109
 South Leg Total: 179

Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Hanover
Site #: 1801900002
Intersection: 10th St & Grey Rd 28
TFR File #: 4
Count date: 10-Jan-18

Weather conditions:
Person(s) who counted:

**** Signalized Intersection ****

Major Road: 10th St runs W/E

North Leg Total: 916
 North Entering: 461
 North Peds: 0
 Peds Cross: \bowtie

Cyclists	0	0	0	0
Trucks	31	9	15	55
Cars	194	97	115	406
Totals	225	106	130	



Cyclists 0
 Trucks 64
 Cars 391
 Totals 455

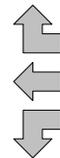
East Leg Total: 2621
 East Entering: 1331
 East Peds: 2
 Peds Cross: \bowtie

Cyclists	Trucks	Cars	Totals
0	83	1455	1538

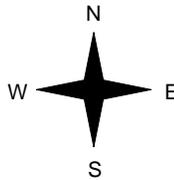


Grey Rd 28

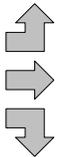
Cars	Trucks	Cyclists	Totals
129	22	0	151
1088	47	0	1135
45	0	0	45
1262	69	0	



10th St



Cyclists	Trucks	Cars	Totals
0	29	165	194
0	63	1040	1103
0	3	118	121
0	95	1323	



10th St



Peds Cross: \bowtie
 West Peds: 0
 West Entering: 1418
 West Leg Total: 2956

Cars	260
Trucks	12
Cyclists	0
Totals	272



Grey Rd 28

Cars	173	97	54	324
Trucks	5	13	3	21
Cyclists	0	0	0	0
Totals	178	110	57	

Peds Cross: \bowtie
 South Peds: 2
 South Entering: 345
 South Leg Total: 617

Comments

Ontario Traffic Inc. Traffic Count Summary

Intersection: 10th St & Grey Rd 28

Count Date: 10-Jan-18

Municipality: Hanover

North Approach Totals						South Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	North/South Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	17	19	46	82	0	143	8:00:00	35	16	10	61	2
9:00:00	37	25	69	131	0	216	9:00:00	51	24	10	85	0
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	46	26	62	134	0	237	17:00:00	46	39	18	103	0
18:00:00	30	36	48	114	0	210	18:00:00	46	31	19	96	0
Totals:	130	106	225	461	0	806		178	110	57	345	2
East Approach Totals						West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	East/West Total Approaches	Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	7	147	30	184	2	380	8:00:00	37	133	26	196	0
9:00:00	10	303	41	354	0	613	9:00:00	53	179	27	259	0
16:00:00	0	1	0	1	0	2	16:00:00	0	1	0	1	0
17:00:00	15	373	40	428	0	932	17:00:00	57	416	31	504	0
18:00:00	13	310	40	363	0	819	18:00:00	47	372	37	456	0
Totals:	45	1134	151	1330	2	2746		194	1101	121	1416	0
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	7:00	8:00	9:00	16:00		17:00	17:00	18:00	18:00			
Crossing Values:	0	73	113	0		488	131	112	432			

20. EPAC300 PROGRAM LOG

Prepared By: Joel Merswolke_	Date: Jan 30 2013
Approved By.....: _____	Date: ___ / ___ / ___
Intersection Name: Hanover Grey rd 28 @ Grey rd 4_	

UTILITIES - ACCESS

Access Code: _____ Codes: Four Digits (0000 - 9999)

PHASE DATA - VEHICLE TIMINGS

Basic Times	Phase:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Minimum Green.....		5	30	___	10	10	15	10	15	___	___	___	___	___	___	___	___
Passage Time		40	50	___	30	40	50	40	50	___	___	___	___	___	___	___	___
Maximum No 1		25	35	___	18	25	35	25	35	___	___	___	___	___	___	___	___
Maximum No 2		30	50	___	18	30	50	30	50	___	___	___	___	___	___	___	___
Yellow Change		3.0	5.0	___	4.0	4.0	4.0	4.0	4.0	___	___	___	___	___	___	___	___
Red Clearance		___	2.0	___	2.0	2.0	2.0	1.0	2.0	___	___	___	___	___	___	___	___

Density Times	Phase:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Seconds/Actuation		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Maximum Initial		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Time B4 Reduction.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Cars B4 Reduction.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Time To Reduce.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Minimum Gap.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___

PHASE DATA - PEDESTRIAN TIMINGS & CONTROL

Pedestrian Times	Phase:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Walk		___	15	___	13	___	7	___	7	___	___	___	___	___	___	___	___
Pedestrian Clearance.....		___	5	___	5	___	8	___	8	___	___	___	___	___	___	___	___

Pedestrian Control	Phase:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Flashing Walk.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Extended Pedestrian Clear		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Act Rest In Walk.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___

Pedestrian Control Entry: "1" = Yes & "0" = No

PHASE DATA - VEHICLE CONTROL

Veh Control	Phase:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Non-Lock Memory.....		1	1	1	1	___	___	___	___	___	___	___	___	___	___	___	___
Dual Entry.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Last Car Passage.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
Conditional Service		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___
No Simultaneous Gap.....		___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___

Vehicle Control Entry: "1" = Yes & "0" = No

APPENDIX

B LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS AT SIGNALIZED INTERSECTIONS⁽¹⁾

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically for a 15-min analysis period. The criteria are given in the table below. Delay may be measured in the field or estimated using software such as Highway Capacity Software. Delay is a complex measure and is dependent upon a number of variables, including quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

Level of Service	Features	Control Delay per vehicle (sec)
A	LOS A describes operations with very low delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favourable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	≤ 10
B	LOS B describes operations with delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 and ≤ 20
C	LOS C describes operations with delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.	> 20 and ≤ 35
D	LOS D describes operations with delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavourable progression, long cycle lengths, of high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35 and ≤ 55
E	LOS E describes operations with delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.	> 55 and ≤ 80
F	LOS F describes operations with delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.	> 80

(1) Highway Capacity Manual 2000

LEVEL OF SERVICE DEFINITIONS AT UNSIGNALIZED INTERSECTIONS⁽¹⁾

The level of service criteria for unsignalized intersections are given in the table below. As used here, total delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position. The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation.

Level of Service	Features	Average Total Delay (sec/veh)
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.	≤ 10
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.	> 10 and ≤ 15
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.	> 15 and ≤ 25
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.	> 25 and ≤ 35
E	Very long traffic delays occur. Operations approach the capacity of the intersection.	> 35 and ≤ 50
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.	> 50

(1) Highway Capacity Manual 2000.

APPENDIX

C EXISTING TRAFFIC OPERATIONS

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖			↖	↖		↖	↖
Traffic Volume (vph)	53	179	27	10	303	41	51	24	10	37	25	69
Future Volume (vph)	53	179	27	10	303	41	51	24	10	37	25	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt		0.981			0.982				0.850		0.929	
Flt Protected	0.950			0.950				0.967			0.986	
Satd. Flow (prot)	1573	1712	0	1825	1748	0	0	1759	1484	0	1474	0
Flt Permitted	0.448			0.619				0.780			0.877	
Satd. Flow (perm)	742	1712	0	1189	1748	0	0	1419	1484	0	1311	0
Right Turn on Red			Yes			Yes		Yes			Yes	
Satd. Flow (RTOR)		17			11				112		75	
Link Speed (kh)		50			50				50		50	
Link Distance (m)		136.5			155.6				87.3		500.7	
Travel Time (s)		9.8			11.2				6.3		36.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	16%	11%	4%	0%	6%	22%	4%	9%	10%	19%	24%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	58	195	29	11	329	45	55	26	11	40	27	75
Shared Lane Traffic (%)												
Lane Group Flow (vph)	58	224	0	11	374	0	0	81	11	0	142	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			8		8	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0	24.0	
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0	24.0	
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%	35.3%	
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	

Existing AM 02/08/2018 Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Recall Mode	Max	Max		Max	Max		None	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)	41.7	39.5		25.4	25.4				11.0	11.0		11.0
Actuated g/C Ratio	0.72	0.68		0.44	0.44				0.19	0.19		0.19
v/c Ratio	0.09	0.19		0.02	0.48				0.30	0.03		0.46
Control Delay	4.0	5.6		11.6	15.5				24.9	0.1		17.3
Queue Delay	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Total Delay	4.0	5.6		11.6	15.5				24.9	0.1		17.3
LOS	A	A		B	B		C	C	A	A		B
Approach Delay		5.3			15.4				22.0			17.3
Approach LOS		A			B				C			B
Queue Length 50th (m)	1.7	8.8		0.7	29.2				8.3	0.0		6.8
Queue Length 95th (m)	5.7	20.5		3.6	57.2				19.1	0.0		21.1
Internal Link Dist (m)		112.5			131.6				63.3			476.7
Turn Bay Length (m)										42.0		
Base Capacity (vph)	668	1176		524	776				450	547		467
Starvation Cap Reductn	0	0		0	0				0	0		0
Spillback Cap Reductn	0	0		0	0				0	0		0
Storage Cap Reductn	0	0		0	0				0	0		0
Reduced v/c Ratio	0.09	0.19		0.02	0.48				0.18	0.02		0.30
Intersection Summary												
Area Type:	Other											
Cycle Length:	68											
Actuated Cycle Length:	57.7											
Natural Cycle:	60											
Control Type:	Semi Act-Uncoord											
Maximum v/c Ratio:	0.48											
Intersection Signal Delay:	13.2						Intersection LOS: B					
Intersection Capacity Utilization:	51.0%						ICU Level of Service A					
Analysis Period (min):	15											
Splits and Phases: 2: Grey Road 28 & 10th Street												

Existing AM 02/08/2018 Baseline

Synchro 10 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	RT			RT	RT	
Traffic Volume (veh/h)	13	37	43	61	114	27
Future Volume (Veh/h)	13	37	43	61	114	27
Sign Control	Stop			Free		Free
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	40	47	66	124	29
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	298	138	153			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	298	138	153			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	98	95	97			
cM capacity (veh/h)	657	886	1380			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	54	113	153			
Volume Left	14	47	0			
Volume Right	40	0	29			
cSH	813	1380	1700			
Volume to Capacity	0.07	0.03	0.09			
Queue Length 95th (m)	1.7	0.8	0.0			
Control Delay (s)	9.7	3.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.7	3.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay	2.8					
Intersection Capacity Utilization	26.6%		ICU Level of Service	A		
Analysis Period (min)	15					

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖			↖	↖		↖	↖
Traffic Volume (vph)	57	423	30	13	366	52	53	37	19	47	27	64
Future Volume (vph)	57	423	30	13	366	52	53	37	19	47	27	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt		0.990			0.981				0.850		0.937	
Flt Protected	0.950			0.950				0.971			0.983	
Satd. Flow (prot)	1644	1812	0	1825	1803	0	0	1726	1541	0	1589	0
Flt Permitted	0.369			0.483				0.786			0.848	
Satd. Flow (perm)	639	1812	0	928	1803	0	0	1397	1541	0	1371	0
Right Turn on Red			Yes			Yes		Yes			Yes	
Satd. Flow (RTOR)		8			12				112		63	
Link Speed (kh)		50			50				50		50	
Link Distance (m)		136.5			155.6				87.3		500.7	
Travel Time (s)		9.8			11.2				6.3		36.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	5%	4%	0%	4%	8%	4%	14%	6%	11%	8%	13%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	62	460	33	14	398	57	58	40	21	51	29	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	62	493	0	14	455	0	0	98	21	0	150	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			8		8	4	
Permitted Phases	2				6			8		8	4	
Detector Phase	5	2			6			8		8	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0	24.0	
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0	24.0	
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%	35.3%	
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	

Existing AM 02/08/2018 Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

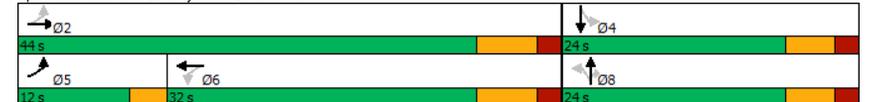
07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0				3.0	3.0		3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Recall Mode	Max	Max		Max	Max		None	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)	41.8	39.5		25.5	25.5				11.3	11.3		11.3
Actuated g/C Ratio	0.72	0.68		0.44	0.44				0.19	0.19		0.19
v/c Ratio	0.10	0.40		0.03	0.57				0.36	0.05		0.47
Control Delay	4.3	7.6		12.1	17.2				26.1	0.3		19.5
Queue Delay	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Total Delay	4.3	7.6		12.1	17.2				26.1	0.3		19.5
LOS	A	A		B	B		C	C	A	A		B
Approach Delay		7.2			17.1				21.5			19.5
Approach LOS		A			B				C			B
Queue Length 50th (m)	1.8	24.8		0.9	37.6				10.2	0.0		9.0
Queue Length 95th (m)	6.1	52.5		4.3	72.9				22.2	0.0		23.9
Internal Link Dist (m)		112.5			131.6				63.3			476.7
Turn Bay Length (m)										42.0		
Base Capacity (vph)	618	1237		407	798				441	563		476
Starvation Cap Reductn	0	0		0	0				0	0		0
Spillback Cap Reductn	0	0		0	0				0	0		0
Storage Cap Reductn	0	0		0	0				0	0		0
Reduced v/c Ratio	0.10	0.40		0.03	0.57				0.22	0.04		0.32

Intersection Summary

Area Type:	Other
Cycle Length:	68
Actuated Cycle Length:	58
Natural Cycle:	60
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.57
Intersection Signal Delay:	13.5
Intersection Capacity Utilization:	59.5%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	B

Splits and Phases: 2: Grey Road 28 & 10th Street



Existing AM 02/08/2018 Baseline

Synchro 10 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	RT			RT	RT	
Traffic Volume (veh/h)	30	54	50	110	75	22
Future Volume (Veh/h)	30	54	50	110	75	22
Sign Control	Stop			Free		Free
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	59	54	120	82	24
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	322	94	106			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	322	94	106			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	94	96			
cM capacity (veh/h)	651	968	1498			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	92	174	106			
Volume Left	33	54	0			
Volume Right	59	0	24			
cSH	825	1498	1700			
Volume to Capacity	0.11	0.04	0.06			
Queue Length 95th (m)	3.0	0.9	0.0			
Control Delay (s)	9.9	2.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.9	2.5	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			26.9%	ICU Level of Service	A	
Analysis Period (min)			15			

APPENDIX

D FUTURE BACKGROUND INTERSECTION OPERATIONS

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street/East Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔			↔		
Traffic Volume (veh/h)	30	0	54	0	0	0	50	168	0	0	112	22	
Future Volume (Veh/h)	30	0	54	0	0	0	50	168	0	0	112	22	
Sign Control	Stop		Stop		Free		Free		Free		Free		
Grade	0%		0%		0%		0%		0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	33	0	59	0	0	0	54	183	0	0	122	24	
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	425	425	134	484	437	183	146						183
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	425	425	134	484	437	183	146						183
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 %	94	100	94	100	100	100	96						100
cM capacity (veh/h)	528	502	920	448	494	859	1448						1392
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	92	0	237	146									
Volume Left	33	0	54	0									
Volume Right	59	0	0	24									
cSH	726	1700	1448	1392									
Volume to Capacity	0.13	0.00	0.04	0.00									
Queue Length 95th (m)	3.4	0.0	0.9	0.0									
Control Delay (s)	10.7	0.0	2.0	0.0									
Lane LOS	B	A	A										
Approach Delay (s)	10.7	0.0	2.0	0.0									
Approach LOS	B	A											
Intersection Summary													
Average Delay			3.1										
Intersection Capacity Utilization			33.8%		ICU Level of Service							A	
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis

3: Grey Road 28 & West Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations	↔			↔	↔		
Traffic Volume (veh/h)	21	14	24	168	125	35	
Future Volume (Veh/h)	21	14	24	168	125	35	
Sign Control	Stop		Free		Free		
Grade	0%		0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	23	15	26	183	136	38	
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	390	155	174				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	390	155	174				
tC, single (s)	6.4	6.2	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	96	98	98				
cM capacity (veh/h)	603	891	1403				
Direction, Lane #	EB 1	NB 1	SB 1				
Volume Total	38	209	174				
Volume Left	23	26	0				
Volume Right	15	0	38				
cSH	691	1403	1700				
Volume to Capacity	0.06	0.02	0.10				
Queue Length 95th (m)	1.4	0.4	0.0				
Control Delay (s)	10.5	1.1	0.0				
Lane LOS	B	A					
Approach Delay (s)	10.5	1.1	0.0				
Approach LOS	B						
Intersection Summary							
Average Delay			1.5				
Intersection Capacity Utilization			32.2%		ICU Level of Service		A
Analysis Period (min)			15				

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	189	27	10	319	47	55	31	12	54	40	94
Future Volume (vph)	60	189	27	10	319	47	55	31	12	54	40	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%			0%			0%		
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt	0.981			0.981			0.850			0.932		
Flt Protected	0.950			0.950				0.969				0.986
Satd. Flow (prot)	1573	1711	0	1825	1744	0	0	1759	1484	0	1477	0
Flt Permitted	0.401			0.613				0.683				0.869
Satd. Flow (perm)	664	1711	0	1178	1744	0	0	1240	1484	0	1301	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	16			12			112			72		
Link Speed (kh)	50			50			50			50		
Link Distance (m)	136.5			155.6			87.3			500.7		
Travel Time (s)	9.8			11.2			6.3			36.1		
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	16%	11%	4%	0%	6%	22%	4%	9%	10%	19%	24%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)	0%			0%			0%			0%		
Adj. Flow (vph)	65	205	29	11	347	51	60	34	13	59	43	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	234	0	11	398	0	0	94	13	0	204	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		6	6		8	8	8	4	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0	24.0	
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0	24.0	
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%	35.3%	
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	

Future Background AM 02/08/2018 Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

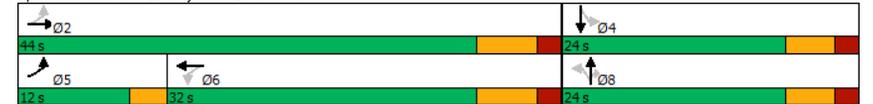
07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	None
Walk Time (s)	7.0			7.0			7.0			7.0		
Flash Dont Walk (s)	11.0			11.0			11.0			11.0		
Pedestrian Calls (#/hr)	0											
Act Effct Green (s)	41.1	37.1		25.1	25.1		12.8	12.8		12.8		12.8
Actuated g/C Ratio	0.65	0.59		0.40	0.40		0.20	0.20		0.20		0.20
v/c Ratio	0.12	0.23		0.02	0.57		0.37	0.03		0.64		0.64
Control Delay	5.2	7.0		13.2	18.8		25.9	0.2		24.2		24.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay	5.2	7.0		13.2	18.8		25.9	0.2		24.2		24.2
LOS	A	A		B	B		C	A		C		C
Approach Delay	6.6			18.7			22.8			24.2		
Approach LOS	A			B			C			C		
Queue Length 50th (m)	2.2	10.3		0.8	33.6		9.8	0.0		14.2		14.2
Queue Length 95th (m)	7.4	25.0		3.9	67.7		21.5	0.0		33.5		33.5
Internal Link Dist (m)	112.5			131.6			63.3			476.7		
Turn Bay Length (m)							42.0					
Base Capacity (vph)	564	1015		469	702		355	505		424		424
Starvation Cap Reductn	0	0		0	0		0	0		0		0
Spillback Cap Reductn	0	0		0	0		0	0		0		0
Storage Cap Reductn	0	0		0	0		0	0		0		0
Reduced v/c Ratio	0.12	0.23		0.02	0.57		0.26	0.03		0.48		0.48

Intersection Summary

Area Type:	Other
Cycle Length:	68
Actuated Cycle Length:	62.9
Natural Cycle:	60
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.64
Intersection Signal Delay:	16.7
Intersection LOS:	B
Intersection Capacity Utilization:	55.5%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 2: Grey Road 28 & 10th Street



Future Background AM 02/08/2018 Baseline

Synchro 10 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street/East Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔			↔		
Traffic Volume (veh/h)	13	0	37	0	0	0	43	88	0	0	184	27	
Future Volume (Veh/h)	13	0	37	0	0	0	43	88	0	0	184	27	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	14	0	40	0	0	0	47	96	0	0	200	29	
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	404	404	214	444	419	96	229						96
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	404	404	214	444	419	96	229						96
tC, single (s)	7.2	6.5	6.3	7.1	6.5	6.2	4.2						4.1
tC, 2 stage (s)													
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.3						2.2
p0 queue free %	97	100	95	100	100	100	96						100
cM capacity (veh/h)	531	516	803	484	506	960	1293						1498
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	54	0	143	229									
Volume Left	14	0	47	0									
Volume Right	40	0	0	29									
cSH	709	1700	1293	1498									
Volume to Capacity	0.08	0.00	0.04	0.00									
Queue Length 95th (m)	1.9	0.0	0.9	0.0									
Control Delay (s)	10.5	0.0	2.8	0.0									
Lane LOS	B	A	A										
Approach Delay (s)	10.5	0.0	2.8	0.0									
Approach LOS	B	A											
Intersection Summary													
Average Delay	2.3												
Intersection Capacity Utilization	31.7%			ICU Level of Service			A						
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

3: Grey Road 28 & West Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	18	34	12	97	168	6
Future Volume (Veh/h)	18	34	12	97	168	6
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	37	13	105	183	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	318	186	190			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318	186	190			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	96	99			
cM capacity (veh/h)	669	856	1384			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	57	118	190			
Volume Left	20	13	0			
Volume Right	37	0	7			
cSH	779	1384	1700			
Volume to Capacity	0.07	0.01	0.11			
Queue Length 95th (m)	1.9	0.2	0.0			
Control Delay (s)	10.0	0.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	10.0	0.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay	1.9					
Intersection Capacity Utilization	25.2%			ICU Level of Service		
Analysis Period (min)	15					

Lanes, Volumes, Timings

2: Grey Road 28 & 10th Street

07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖		↖	↖			↖	↖		↖	↖
Traffic Volume (vph)	75	445	30	18	385	65	55	49	23	57	37	75
Future Volume (vph)	75	445	30	18	385	65	55	49	23	57	37	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%		0%		0%		0%		0%		0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt	0.990				0.978				0.850		0.940	
Flt Protected	0.950			0.950				0.974				0.983
Satd. Flow (prot)	1644	1812	0	1825	1797	0	0	1722	1541	0	1596	0
Flt Permitted	0.313			0.473				0.751				0.843
Satd. Flow (perm)	542	1812	0	909	1797	0	0	1327	1541	0	1369	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)	8				14				112		58	
Link Speed (kh)	50				50				50		50	
Link Distance (m)	136.5				155.6				87.3		500.7	
Travel Time (s)	9.8				11.2				6.3		36.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	5%	4%	0%	4%	8%	4%	14%	6%	11%	8%	13%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)	0%				0%				0%		0%	
Adj. Flow (vph)	82	484	33	20	418	71	60	53	25	62	40	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	82	517	0	20	489	0	0	113	25	0	184	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			8		8		4
Permitted Phases	2				6			8		8		4
Detector Phase	5	2			6			8		8		4
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0		10.0
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0		24.0
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0		24.0
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%		35.3%
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0		18.0
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0		4.0
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0		6.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0		3.0

Lanes, Volumes, Timings

2: Grey Road 28 & 10th Street

07/11/2018

	↖	→	↘	↙	←	↖	↙	↘	↙	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max			None	None	None	None	None
Walk Time (s)	7.0				7.0				7.0		7.0	
Flash Dont Walk (s)	11.0				11.0				11.0		11.0	
Pedestrian Calls (#/hr)	0				0				0		0	
Act Effct Green (s)	41.1	37.1		25.1	25.1			12.4	12.4			12.4
Actuated g/C Ratio	0.66	0.59		0.40	0.40			0.20	0.20			0.20
v/c Ratio	0.16	0.48		0.05	0.67			0.43	0.06			0.58
Control Delay	5.3	9.5		13.4	21.4			27.2	0.3			23.2
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	5.3	9.5		13.4	21.4			27.2	0.3			23.2
LOS	A	A		B	C			C	A			C
Approach Delay	9.0				21.1				22.3		23.2	
Approach LOS	A				C				C		C	
Queue Length 50th (m)	2.7	28.0		1.4	42.7			12.0	0.0			13.4
Queue Length 95th (m)	8.8	62.7		5.8	#88.0			24.9	0.0			30.8
Internal Link Dist (m)	112.5				131.6				63.3		476.7	
Turn Bay Length (m)									42.0			
Base Capacity (vph)	515	1078		364	728			383	524			436
Starvation Cap Reductn	0	0		0	0			0	0			0
Spillback Cap Reductn	0	0		0	0			0	0			0
Storage Cap Reductn	0	0		0	0			0	0			0
Reduced v/c Ratio	0.16	0.48		0.05	0.67			0.30	0.05			0.42

Intersection Summary

Area Type:	Other
Cycle Length:	68
Actuated Cycle Length:	62.5
Natural Cycle:	60
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.67
Intersection Signal Delay:	16.4
Intersection LOS:	B
Intersection Capacity Utilization:	62.4%
ICU Level of Service:	B
Analysis Period (min):	15
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.

Splits and Phases: 2: Grey Road 28 & 10th Street



APPENDIX

E FUTURE TOTAL INTERSECTION OPERATIONS

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	189	27	10	319	51	55	33	12	62	46	110
Future Volume (vph)	65	189	27	10	319	51	55	33	12	62	46	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%			0%			0%		
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt	0.981			0.979			0.850			0.932		
Flt Protected	0.950			0.950				0.970				0.986
Satd. Flow (prot)	1573	1711	0	1825	1738	0	0	1760	1484	0	1477	0
Flt Permitted	0.393			0.613				0.643				0.871
Satd. Flow (perm)	651	1711	0	1178	1738	0	0	1167	1484	0	1304	0
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	16			13			112			74		
Link Speed (kh)	50			50			50			50		
Link Distance (m)	136.5			155.6			87.3			500.7		
Travel Time (s)	9.8			11.2			6.3			36.1		
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	16%	11%	4%	0%	6%	22%	4%	9%	10%	19%	24%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)	0%			0%			0%			0%		
Adj. Flow (vph)	71	205	29	11	347	55	60	36	13	67	50	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	234	0	11	402	0	0	96	13	0	237	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			8		8		4
Permitted Phases	2				6			8		8		4
Detector Phase	5	2			6			8		8		4
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0		10.0
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0		24.0
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0		24.0
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%		35.3%
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0		18.0
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0		4.0
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0		2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0		6.0
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0		3.0

Future Total AM 02/08/2018 Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings
2: Grey Road 28 & 10th Street

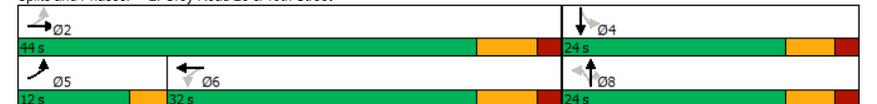
07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	None
Walk Time (s)	7.0			7.0			7.0			7.0		
Flash Dont Walk (s)	11.0			11.0			11.0			11.0		
Pedestrian Calls (#/hr)	0											
Act Effct Green (s)	41.1	37.1		25.1	25.1				13.6	13.6		13.6
Actuated g/C Ratio	0.65	0.58		0.39	0.39				0.21	0.21		0.21
v/c Ratio	0.13	0.23		0.02	0.58				0.39	0.03		0.71
Control Delay	5.6	7.4		13.6	19.6				26.0	0.2		27.8
Queue Delay	0.0	0.0		0.0	0.0				0.0	0.0		0.0
Total Delay	5.6	7.4		13.6	19.6				26.0	0.2		27.8
LOS	A	A		B	B				C	A		C
Approach Delay	6.9			19.4			23.0			27.8		
Approach LOS	A			B			C			C		
Queue Length 50th (m)	2.7	11.2		0.8	35.7				10.1	0.0		18.1
Queue Length 95th (m)	8.0	25.0		3.9	68.5				22.2	0.0		40.2
Internal Link Dist (m)	112.5			131.6			63.3			476.7		
Turn Bay Length (m)							42.0					
Base Capacity (vph)	550	1003		463	691				330	500		422
Starvation Cap Reductn	0	0		0	0				0	0		0
Spillback Cap Reductn	0	0		0	0				0	0		0
Storage Cap Reductn	0	0		0	0				0	0		0
Reduced v/c Ratio	0.13	0.23		0.02	0.58				0.29	0.03		0.56

Intersection Summary

Area Type:	Other
Cycle Length:	68
Actuated Cycle Length:	63.7
Natural Cycle:	60
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.71
Intersection Signal Delay:	18.1
Intersection LOS:	B
Intersection Capacity Utilization:	57.5%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 2: Grey Road 28 & 10th Street



Future Total AM 02/08/2018 Baseline

Synchro 10 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street/East Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔			↔		
Traffic Volume (veh/h)	13	0	37	30	0	16	43	88	10	5	184	27	
Future Volume (Veh/h)	13	0	37	30	0	16	43	88	10	5	184	27	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	14	0	40	33	0	17	47	96	11	5	200	29	
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	437	426	214	460	434	102	229						107
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	437	426	214	460	434	102	229						107
tC, single (s)	7.2	6.5	6.3	7.1	6.5	6.2	4.2						4.1
tC, 2 stage (s)													
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.3						2.2
p0 queue free %	97	100	95	93	100	98	96						100
cM capacity (veh/h)	495	500	803	471	494	954	1293						1484
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	54	50	154	234									
Volume Left	14	33	47	5									
Volume Right	40	17	11	29									
cSH	692	569	1293	1484									
Volume to Capacity	0.08	0.09	0.04	0.00									
Queue Length 95th (m)	2.0	2.3	0.9	0.1									
Control Delay (s)	10.6	11.9	2.6	0.2									
Lane LOS	B	B	A	A									
Approach Delay (s)	10.6	11.9	2.6	0.2									
Approach LOS	B	B											
Intersection Summary													
Average Delay	3.3												
Intersection Capacity Utilization	35.0%			ICU Level of Service	A								
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

3: Grey Road 28 & West Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	18	34	12	113	173	6
Future Volume (Veh/h)	18	34	12	113	173	6
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	37	13	123	188	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	340	192	195			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	340	192	195			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	96	99			
cM capacity (veh/h)	649	850	1378			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	57	136	195			
Volume Left	20	13	0			
Volume Right	37	0	7			
cSH	767	1378	1700			
Volume to Capacity	0.07	0.01	0.11			
Queue Length 95th (m)	1.9	0.2	0.0			
Control Delay (s)	10.1	0.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.1	0.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.8					
Intersection Capacity Utilization	25.9%		ICU Level of Service	A		
Analysis Period (min)	15					

Lanes, Volumes, Timings

2: Grey Road 28 & 10th Street

07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	83	445	30	18	385	73	55	55	23	62	40	81
Future Volume (vph)	83	445	30	18	385	73	55	55	23	62	40	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%			0%			0%		
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		42.0	0.0		0.0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
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												
Frt	0.990			0.976			0.850			0.940		
Flt Protected	0.950			0.950				0.976				0.983
Satd. Flow (prot)	1644	1812	0	1825	1792	0	0	1720	1541	0	1596	0
Flt Permitted	0.304			0.473				0.745				0.840
Satd. Flow (perm)	526	1812	0	909	1792	0	0	1313	1541	0	1364	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)	8			16			112			58		
Link Speed (kh)	50			50			50			50		
Link Distance (m)	136.5			155.6			87.3			500.7		
Travel Time (s)	9.8			11.2			6.3			36.1		
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	5%	4%	0%	4%	8%	4%	14%	6%	11%	8%	13%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)	0%			0%			0%			0%		
Adj. Flow (vph)	90	484	33	20	418	79	60	60	25	67	43	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	517	0	20	497	0	0	120	25	0	198	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		6	6		8	8	8	4	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	9.5	25.0		25.0	25.0		24.0	24.0	24.0	24.0	24.0	
Total Split (s)	12.0	44.0		32.0	32.0		24.0	24.0	24.0	24.0	24.0	
Total Split (%)	17.6%	64.7%		47.1%	47.1%		35.3%	35.3%	35.3%	35.3%	35.3%	
Maximum Green (s)	9.0	37.0		25.0	25.0		18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.0	5.0		5.0	5.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.0	7.0		7.0	7.0		6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	

Future Total PM 02/08/2018

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

2: Grey Road 28 & 10th Street

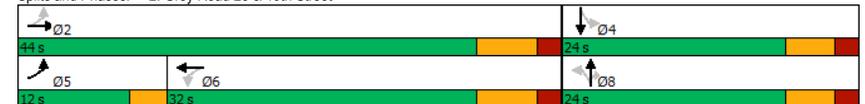
07/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	None
Walk Time (s)	7.0			7.0			7.0			7.0		
Flash Dont Walk (s)	11.0			11.0			11.0			11.0		
Pedestrian Calls (#/hr)	0			0			0			0		
Act Effct Green (s)	41.1	37.1		25.0	25.0		12.7	12.7		12.7		12.7
Actuated g/C Ratio	0.65	0.59		0.40	0.40		0.20	0.20		0.20		0.20
v/c Ratio	0.18	0.48		0.06	0.69		0.45	0.06		0.61		0.61
Control Delay	5.6	9.8		13.6	22.2		27.6	0.3		24.6		24.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay	5.6	9.8		13.6	22.2		27.6	0.3		24.6		24.6
LOS	A	A		B	C		C	A		C		C
Approach Delay	9.1			21.8			22.9			24.6		
Approach LOS	A			C			C			C		
Queue Length 50th (m)	3.1	29.1		1.4	44.6		12.8	0.0		15.1		15.1
Queue Length 95th (m)	9.6	63.3		5.9	#93.1		26.4	0.0		33.5		33.5
Internal Link Dist (m)	112.5			131.6			63.3			476.7		
Turn Bay Length (m)							42.0					
Base Capacity (vph)	504	1072		362	724		376	522		432		432
Starvation Cap Reductn	0	0		0	0		0	0		0		0
Spillback Cap Reductn	0	0		0	0		0	0		0		0
Storage Cap Reductn	0	0		0	0		0	0		0		0
Reduced v/c Ratio	0.18	0.48		0.06	0.69		0.32	0.05		0.46		0.46

Intersection Summary

Area Type: Other
 Cycle Length: 68
 Actuated Cycle Length: 62.8
 Natural Cycle: 60
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 17.1 Intersection LOS: B
 Intersection Capacity Utilization 63.2% ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Grey Road 28 & 10th Street



Future Total PM 02/08/2018

Synchro 10 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street/East Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	30	0	54	14	0	20	50	168	23	34	112	22
Future Volume (Veh/h)	30	0	54	14	0	20	50	168	23	34	112	22
Sign Control	Stop		Stop		Free		Free		Free		Free	
Grade	0%		0%		0%		0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	0	59	15	0	22	54	183	25	37	122	24
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	534	524	134	570	524	196	146			208		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	534	524	134	570	524	196	146			208		
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 %	92	100	94	96	100	97	96			97		
cM capacity (veh/h)	427	429	920	385	429	846	1448			1363		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	92	37	262	183								
Volume Left	33	15	54	37								
Volume Right	59	22	25	24								
cSH	650	569	1448	1363								
Volume to Capacity	0.14	0.07	0.04	0.03								
Queue Length 95th (m)	3.9	1.6	0.9	0.7								
Control Delay (s)	11.4	11.8	1.8	1.7								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.4	11.8	1.8	1.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			30.3%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Grey Road 28 & West Saugeen Cedar Heights Access

07/11/2018



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↔	↔	
Traffic Volume (veh/h)	21	14	24	188	159	35
Future Volume (Veh/h)	21	14	24	188	159	35
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	15	26	204	173	38
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	448	192	211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	448	192	211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	98	98			
cM capacity (veh/h)	558	850	1360			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	230	211			
Volume Left	23	26	0			
Volume Right	15	0	38			
cSH	645	1360	1700			
Volume to Capacity	0.06	0.02	0.12			
Queue Length 95th (m)	1.5	0.5	0.0			
Control Delay (s)	10.9	1.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.9	1.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			35.0%		ICU Level of Service A	
Analysis Period (min)			15			