

2501563 ONTARIO INC.

# SAUGEEN CEDAR HEIGHTS WEST TOWN OF HANOVER

JULY 11, 2018







# SAUGEEN CEDAR HEIGHTS WEST 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 West  
Town of Hanover, Ontario**

WSP Canada Inc. is pleased to submit this traffic impact study for the subject lands located west of Grey County Road no. 28, north of 14<sup>th</sup> 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', enclosed within a rectangular box.

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

Project Manager

Ismet Medic

Designer (EIT)

Jordan Hart-Bishop, EIT

Designer (EIT)

Denny Yip, EIT

## SUBCONSULTANTS

Traffic Counters

Ontario Traffic Inc.





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# 1 INTRODUCTION

2501563 Ontario Inc. has retained WSP Canada Inc. to produce a Traffic Impact Study in support of the subject lands located west of Grey County Road no. 28, north of 14<sup>th</sup> Street, in the town of Hanover, Ontario.

**Figure 1.1** illustrates the site location and context.

---

## 1.1 DEVELOPMENT PROPOSAL

The Saugeen Cedar Heights West subdivision will consist of 91 units (73 single detached homes and 18 semi-detached homes) with an option to develop up to a total of 110 units.

**Figure 1.2** illustrates the proposed site plan.

---

## 1.2 ACCESS

Access for the Saugeen Cedar Heights West subdivision will be through a new full-moves access fronting onto Grey County Road no. 28.

An additional site access will also be available at the south end of the site, connecting into the existing residential subdivision to the south.

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



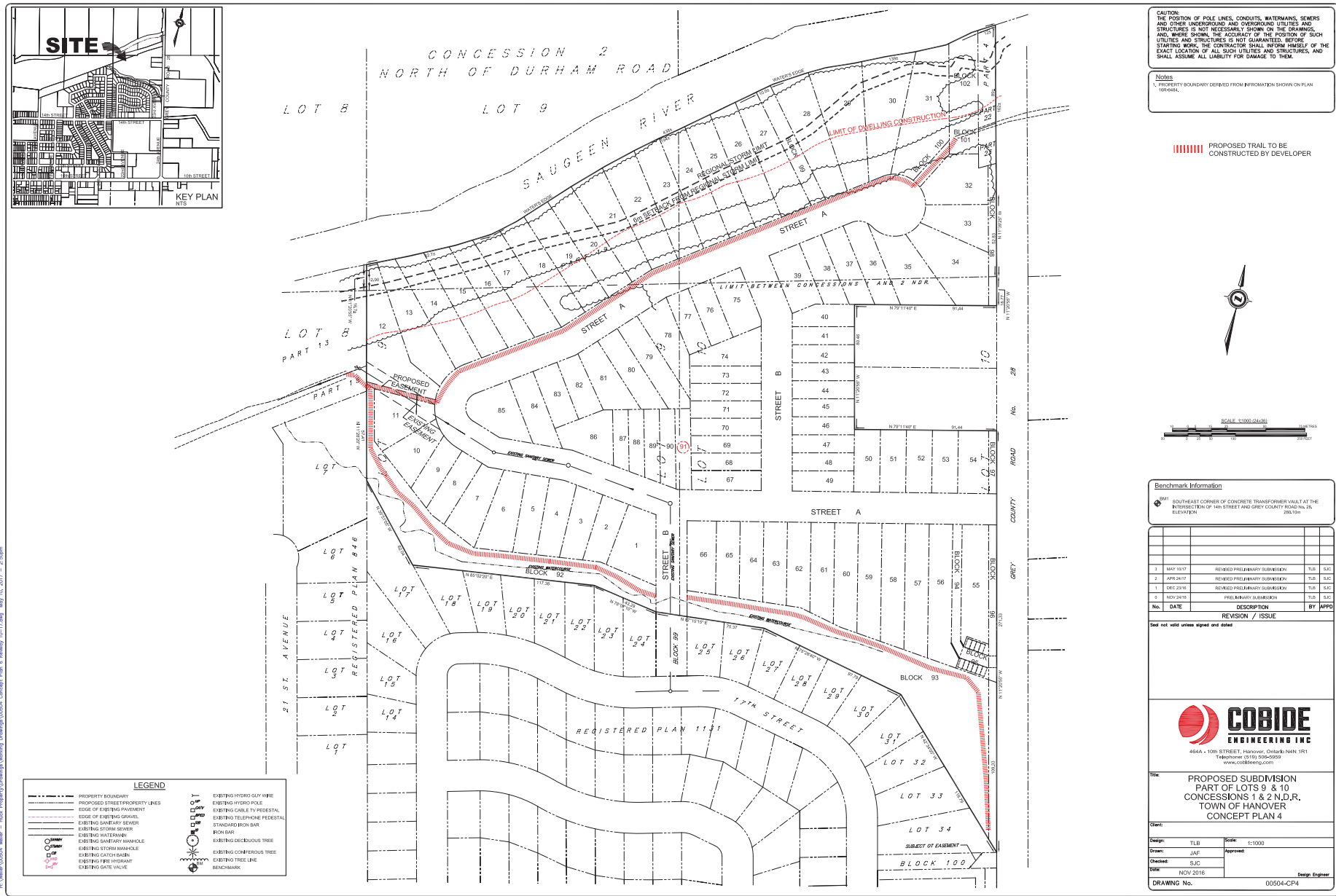
Not to Scale



 Subject Site

**FIGURE 1.1**  
Saugeen Cedar Heights Subdivision West  
Site Location and Context





Not to Scale

## 2 EXISTING TRANSPORTATION CONDITIONS

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### 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 east 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 **10<sup>th</sup> Street**. 10<sup>th</sup> Street is under the jurisdiction of Grey County.

**14<sup>th</sup> Street** is an east-west local road located south 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 <sup>th</sup> Street/Grey County Road no. 4	Signalized
Grey County Road no. 28 and 14 <sup>th</sup> Street	Stop Controlled

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

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

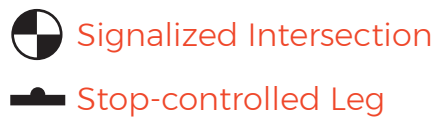
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### 2.3 PUBLIC TRANSIT

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.

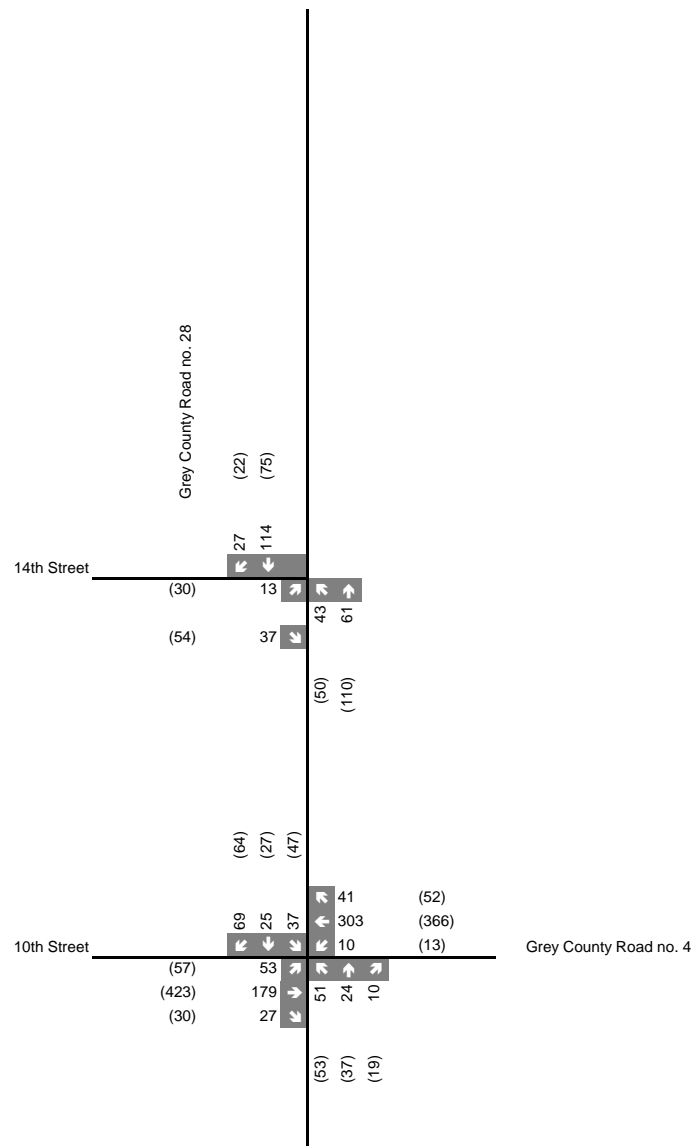


Not to Scale



**FIGURE 2.1**  
Saugeen Cedar Heights Subdivision West  
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 <sup>th</sup> Street/Grey County Road No. 4 and Grey County Road No. 28	B (13)	-	B (14)	-
14 <sup>th</sup> 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.

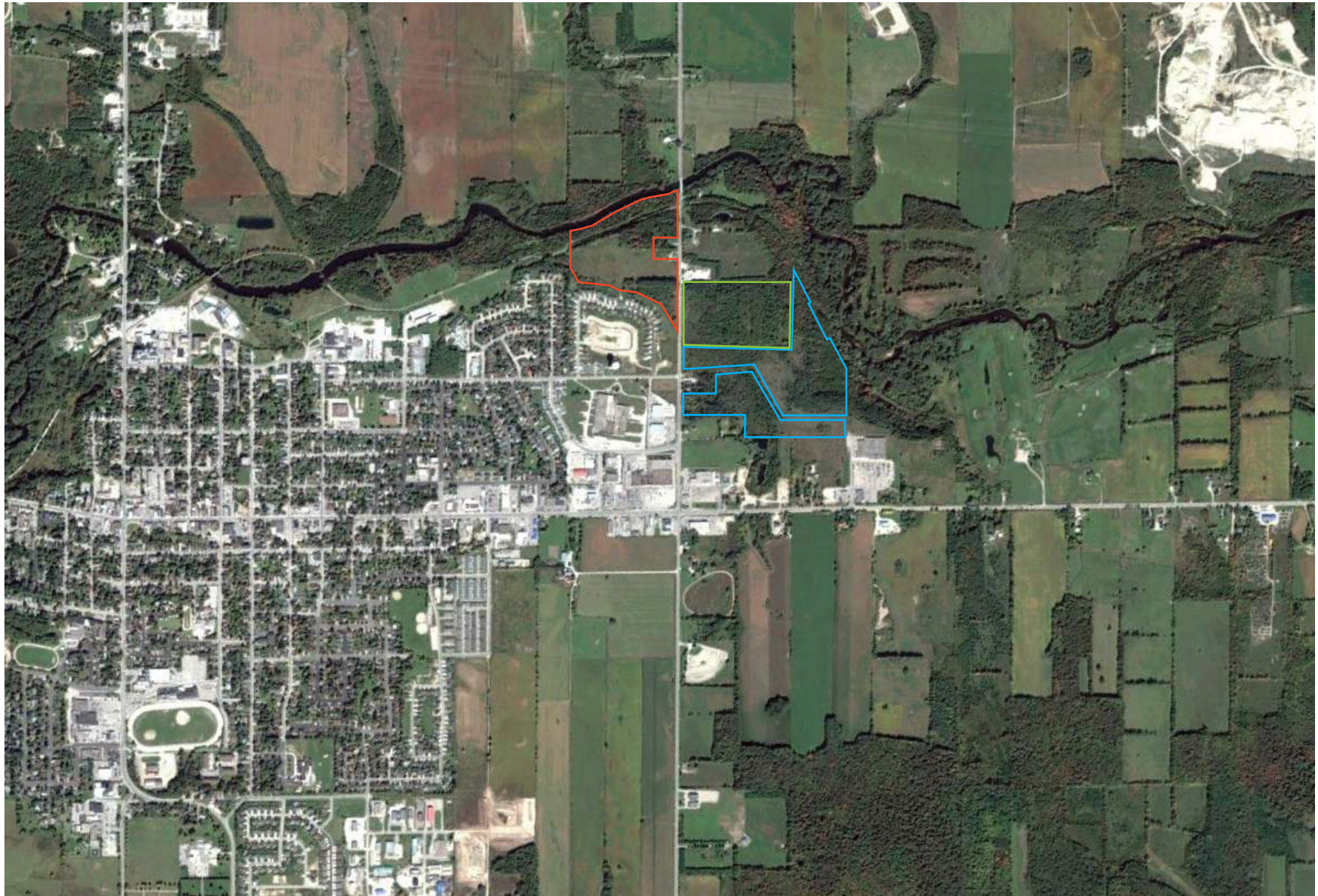
**Table 3.1: Background Developments**

Location	Development Characteristics	Source
Saugeen Cedar Heights East Subdivision	98 total units 50 single family detached dwelling units 28 semi-detached dwelling units 20 townhouse units	WSP Canada Inc. (July 2018) <sup>1</sup>
Kraemer Subdivision	47 total units 29 single family detached dwelling units 18 semi-detached dwelling units	WSP Canada Inc. (October 2015)

<sup>1</sup> 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 East 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 East
- Kraemer Subdivision

**FIGURE 3.1**  
Saugeen Cedar Heights Subdivision West  
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**.

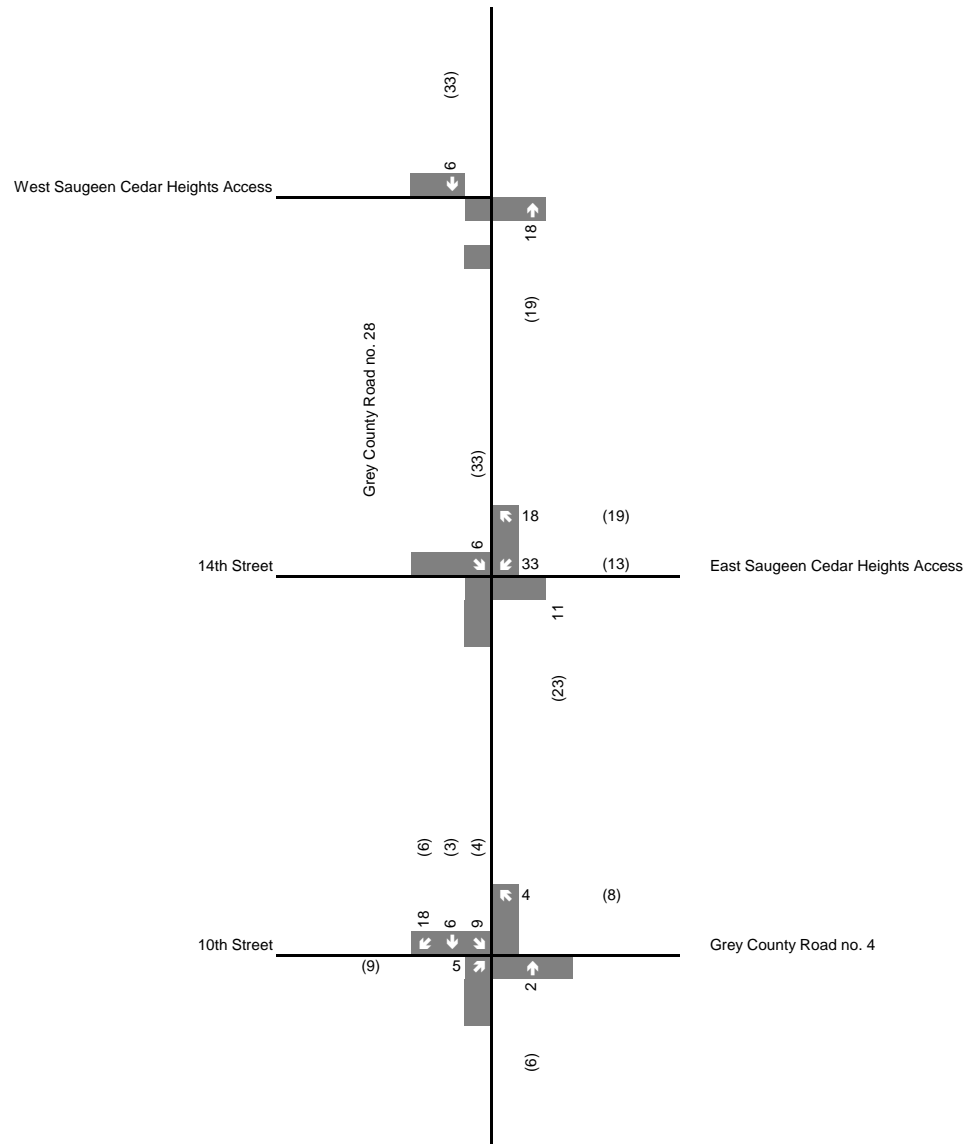
**Table 3.2: Future Background Intersection Operations**

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 <sup>th</sup> Street/Grey County Road No. 4 and Grey County Road No. 28	B (17)	-	B (16)	-
14 <sup>th</sup> Street and Grey County Road No. 28	B (12)	WB-LTR (0.09)	B (11)	WB-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 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.

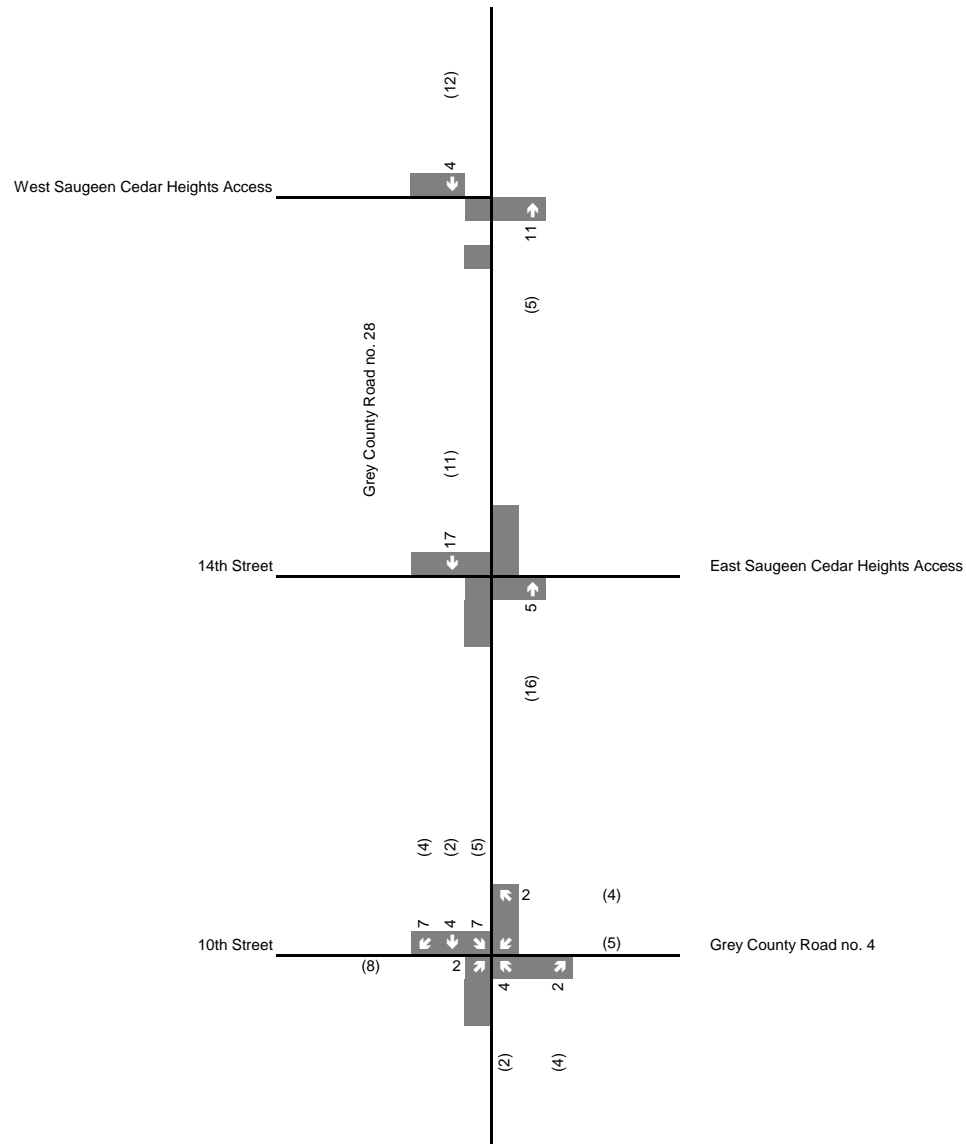




xx A.M. Peak Hour Traffic Volumes  
 (xx) P.M. Peak Hour Traffic Volumes

**FIGURE 3.2**  
 East Saugeen Cedar Heights  
 Background Development Traffic Volumes

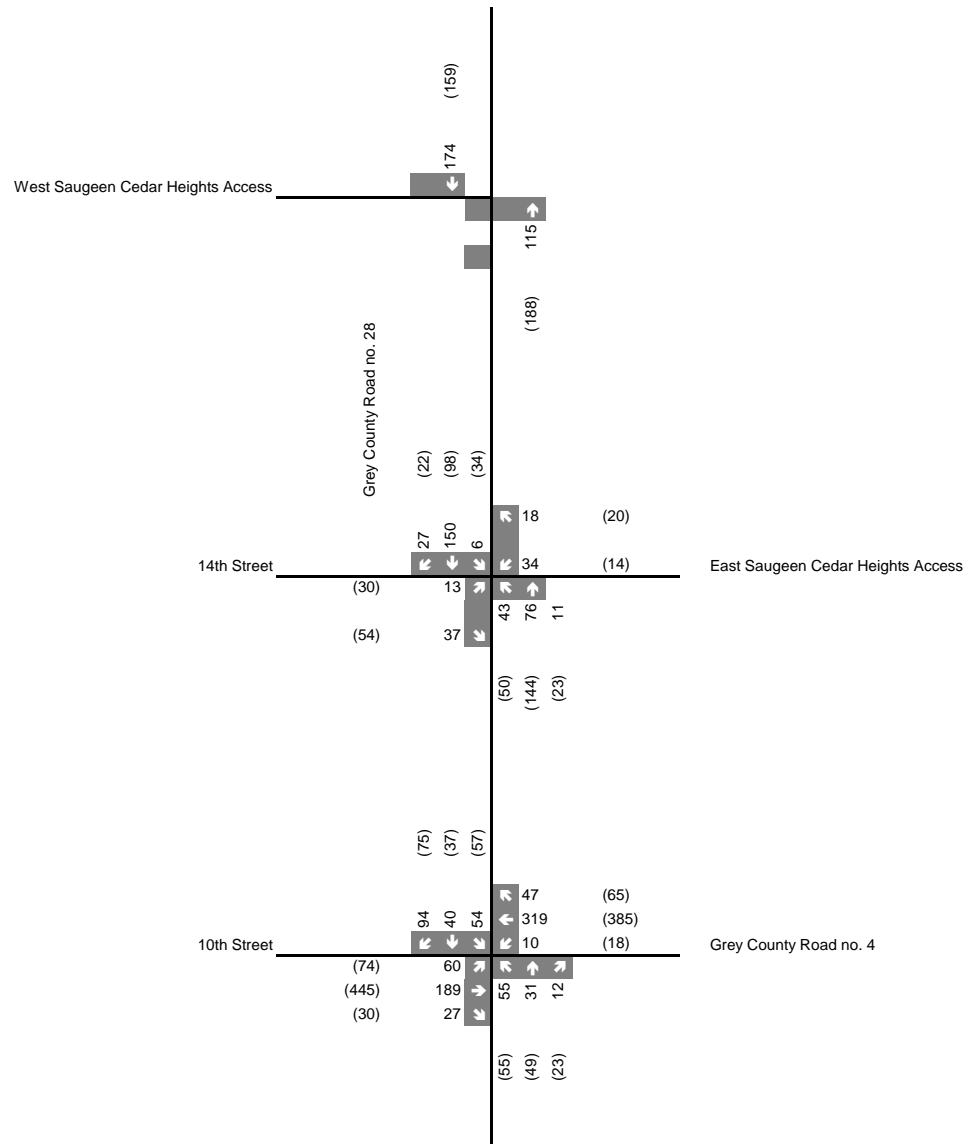




xx A.M. Peak Hour Traffic Volumes  
 (xx) P.M. Peak Hour Traffic Volumes

**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, 9<sup>th</sup> 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 overall vehicle trips generated based on a total development count of 91 units are shown in **Table 4.1**. To maintain a conservative estimate, the land use category 210 was used for both detached and semi-detached housing.

**Table 4.1: Site Generated Vehicular Trips (91 Units)**

Land Use	Basis/Parameter	Vehicle Trips			
		Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
		Inbound	Outbound	Inbound	Outbound
Detached and Semi-Detached Houses (91 Units)	ITE Land Use 210 (Single-Family Detached Housing)	17	51	57	34
	Total Trips	17	51	57	34

As shown in Table 4.1, the proposed development is expected to generate **17 inbound auto trips and 51 outbound auto trips** during the a.m. peak hour, and **57 inbound auto trips and 34 outbound auto trips** during the p.m. peak hour.

It is our understanding that a total of 110 units can be accommodated on the site. We have also estimated the total number of trips on the basis of 110 units as illustrated in **Table 4.2**:

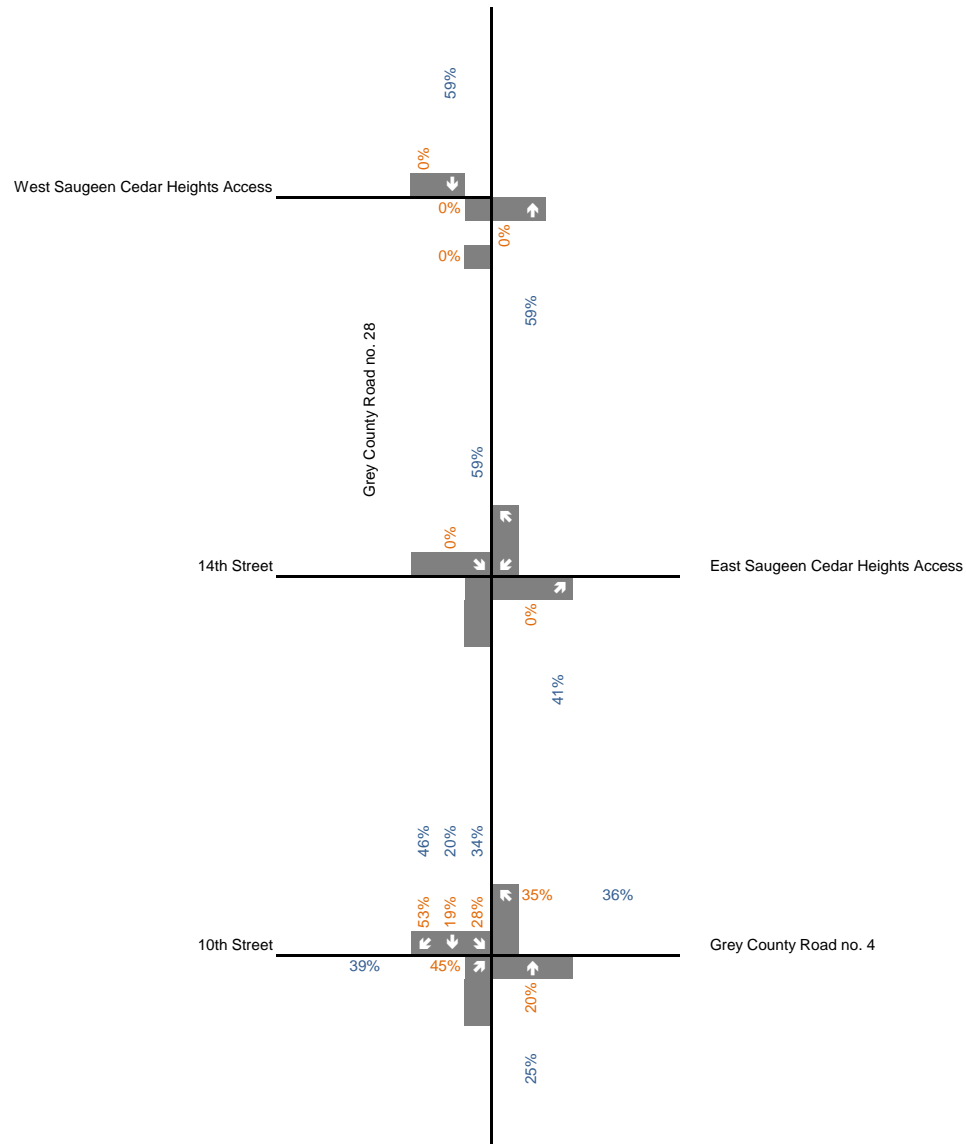
**Table 4.2: Site Generated Vehicular Trips (110 Units)**

Land Use	Basis/Parameter	Vehicle Trips			
		Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
		Inbound	Outbound	Inbound	Outbound
Detached and Semi-Detached Houses (110 Units)	ITE Land Use 210 (Single-Family Detached Housing)	21	62	69	41
	Total Trips	21	62	69	41

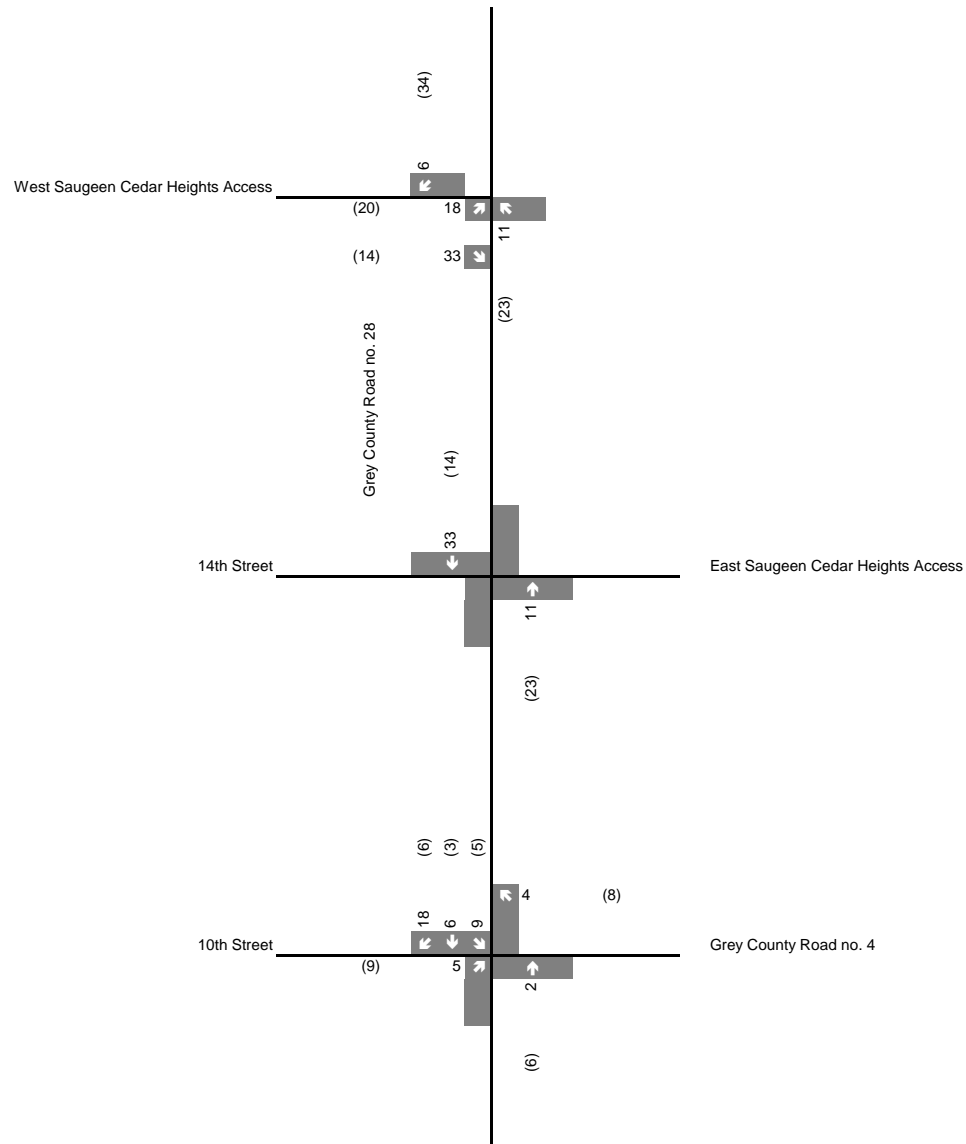
Accordingly, with a unit count of 110, the proposed development is expected to generate **21 inbound auto trips and 62 outbound auto trips** during the a.m. peak hour, and **69 inbound auto trips and 41 outbound auto trips** during the p.m. peak hour.

## 4.2 TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution and assignment for the Saugeen Cedar Heights West 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. **Figure 4.2** and **Figure 4.3** illustrates the resulting traffic assignment to the boundary road network with unit counts of 91 and 110 respectively.



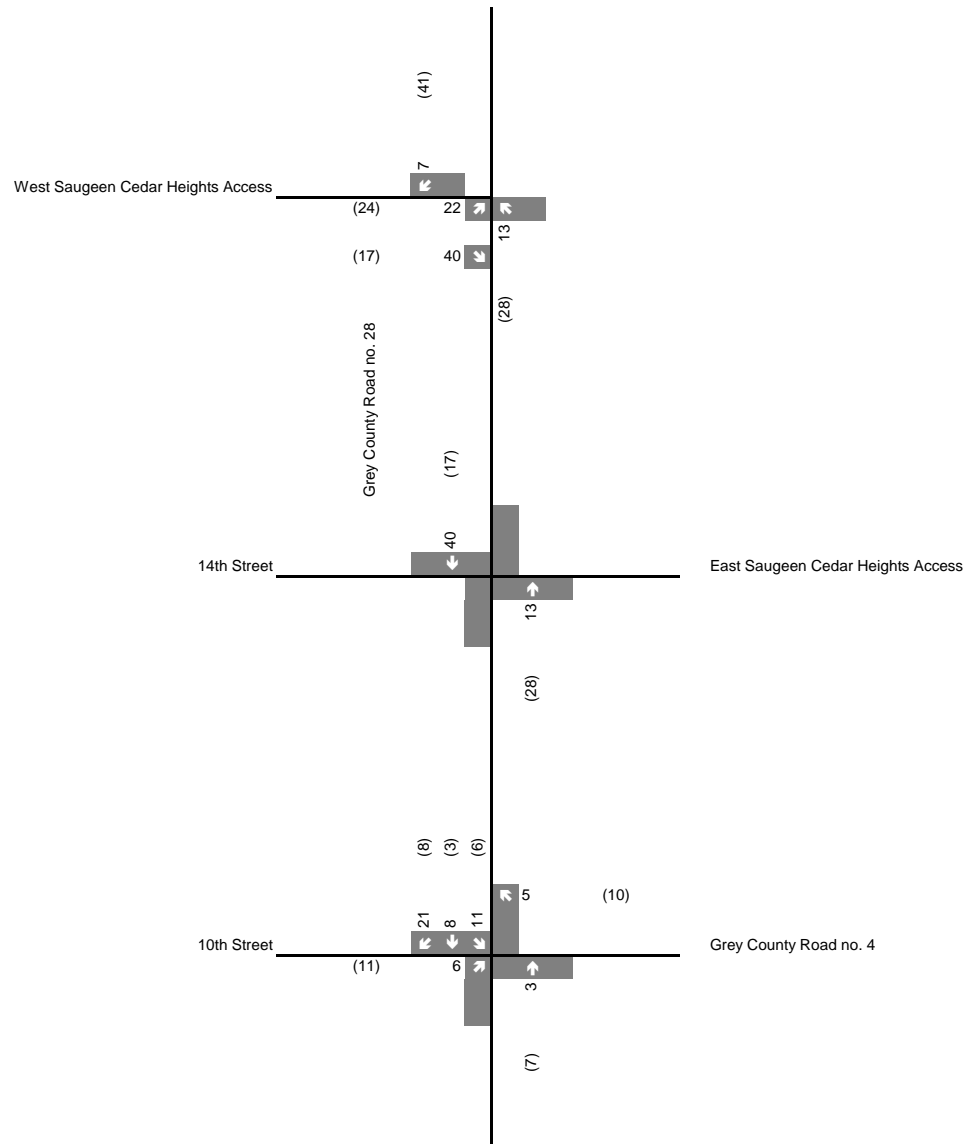
**FIGURE 4.1**  
Site Traffic Trip Distribution



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

**FIGURE 4.2**  
 Site Generated Traffic Volumes  
 91 Unit Development Volume





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

**FIGURE 4.3**  
 Site Generated Traffic Volumes  
 110 Unit Development Volume



# 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 4.2 and Figure 4.3 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** and **Figure 5.3**.

## 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.

### 5.2.1 91 UNIT DEVELOPMENT VOLUME

The resulting levels of service are outlined in **Table 5.1** for the 91 unit development scenario. Detailed Synchro worksheets are available in **Appendix E**.

**Table 5.1: Total Future Intersection Operations (91 Units)**

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 <sup>th</sup> Street/Grey County Road No. 4 and Grey County Road No. 28	B (18)	-	B (17)	-
14 <sup>th</sup> 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.

## 5.2.2 110 UNIT DEVELOPMENT VOLUME

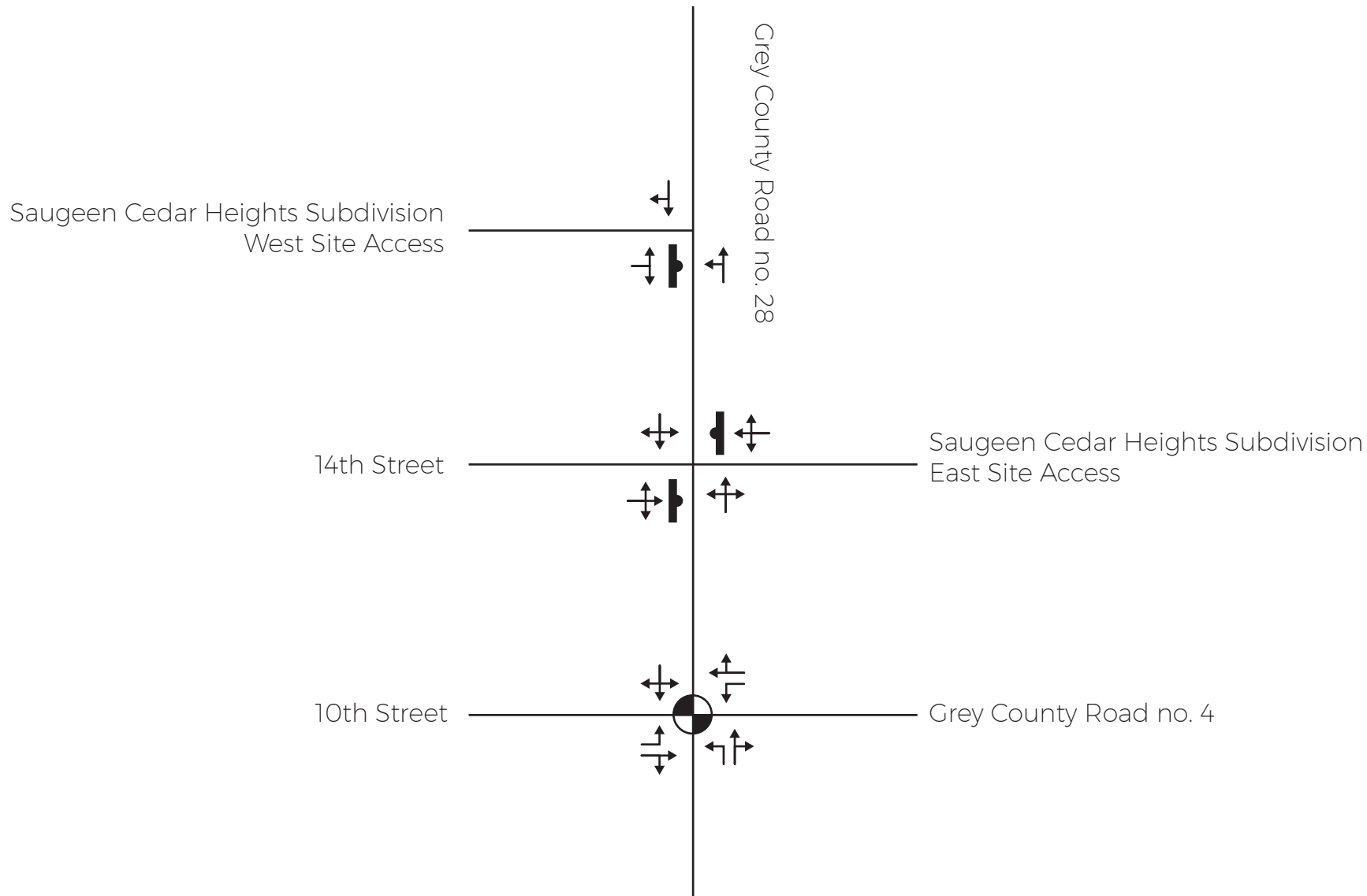
The resulting levels of service are outlined in **Table 5.2** for the 110 unit development scenario. Detailed Synchro worksheets are available in **Appendix 0**.

**Table 5.2: Total Future Intersection Operations (110 Units)**

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 <sup>th</sup> Street/Grey County Road No. 4 and Grey County Road No. 28	B (18)	-	B (17)	-
14 <sup>th</sup> 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 (0.07)

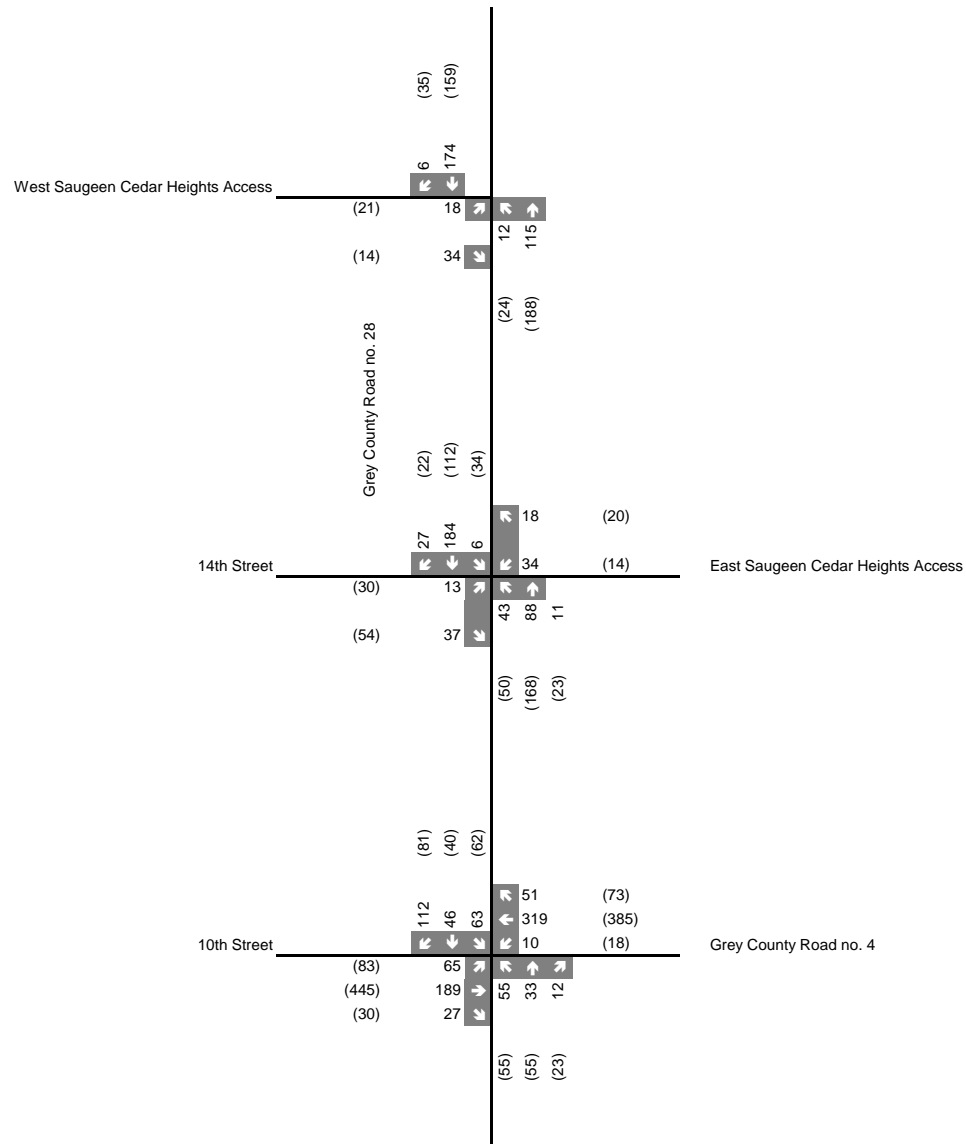
- 1 For signalized intersections, the level of service is based on the overall delay of the intersection. Critical v/c ratios are only listed for movements with values over 0.85.
- 2 For two-way stop controlled intersections, the level of service is based on the delay associated with the critical movement.

As seen in Table 5.2, 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 future background condition. This indicates that the roadway network is readily capable of accommodating a total development volume of 110 units.



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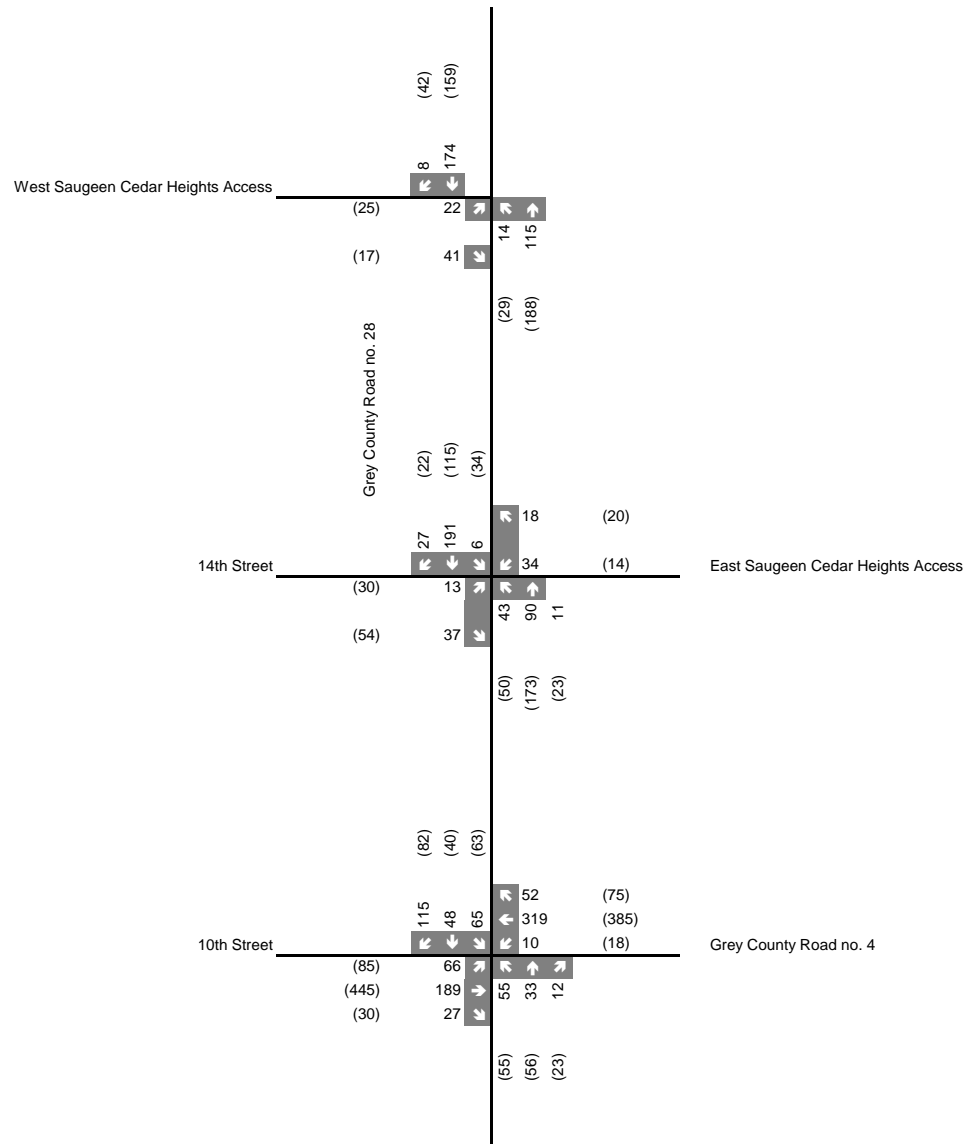




xx A.M. Peak Hour Traffic Volumes  
 (xx) P.M. Peak Hour Traffic Volumes

**FIGURE 5.2**  
 Total Future Traffic Forecasts  
 91 Unit Development Volume





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

**FIGURE 5.3**  
 Total Future Traffic Forecasts  
 110 Unit Development Volume

## 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 west of Grey County Road no. 28, north of 14th Street, in the town of Hanover, Ontario.

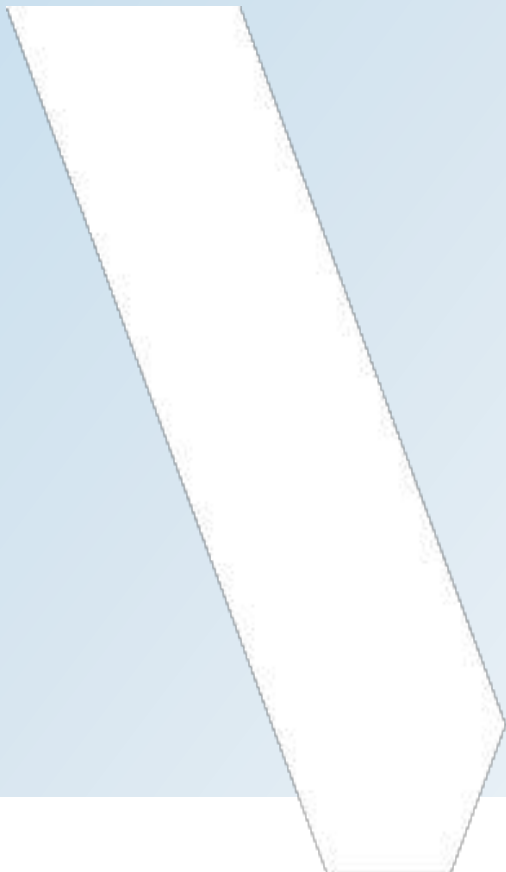
Access for the Saugeen Cedar Heights West subdivision will be through a new access fronting onto Grey County Road no. 28 intersection.

Utilizing the average trip rates outlined in the *Institute of Transportation Engineers, Trip Generation Manual*, 9<sup>th</sup> Edition and based on a unit count of 91, the proposed development is expected to generate 16 inbound auto trips and 48 outbound auto trips during the a.m. peak hour, and 54 inbound auto trips and 31 outbound auto trips during the p.m. peak hour. Accordingly, with a unit count of 110, the proposed development is expected to generate 21 inbound auto trips and 62 outbound auto trips during the a.m. peak hour, and 69 inbound auto trips and 41 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
<b>Totals</b>	<b>27</b>	<b>114</b>	



Cyclists	0
Trucks	22
Cars	52
<b>Totals</b>	<b>74</b>

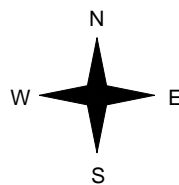
Cyclists	Trucks	Cars	Totals
0	5	65	70



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
<b>Totals</b>	<b>151</b>



Cars	39	40	79
Trucks	4	21	25
Cyclists	0	0	0
<b>Totals</b>	<b>43</b>	<b>61</b>	

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

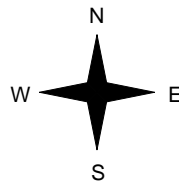



14th St

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	157
Trucks	0	3	3
Cyclists	0	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
Trucks	1	41
Cars	76	287
Totals	77	328

0  
42  
363



Cyclists	0
Trucks	42
Cars	381
Totals	423

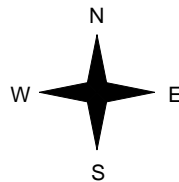
Cyclists	0
Trucks	7
Cars	220
Totals	227



Grey Road 28



14th St




Cyclists	0
Trucks	1
Cars	83
Totals	84

0	4	158
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
Trucks	6	41
Cyclists	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



***Ontario Traffic Inc.***

**Count Date: 10-Jan-18      Site #: 1801900001**

[illegible]

[illegible]

**Count Date: 10-Jan-18      Site #: 1801900001**

[illegible]

***Ontario Traffic Inc.***

**Count Date: 10-Jan-18      Site #: 1801900001**

[illegible]

[illegible]

**Count Date:** 10-Jan-18      **Site #:** 1801900001

[illegible]

# 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:  $\nlessgtr$

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

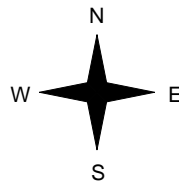
Peds Cross:  $\nlessgtr$

Cyclists	Trucks	Cars	Totals
0	30	393	423



10th St

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



Grey Rd 28

Grey Rd 28

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

10th St



Cars	Trucks	Cyclists	Totals
199	27	0	226

Peds Cross:  $\nlessgtr$

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:  $\nlessgtr$

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:  $\nlessgtr$

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

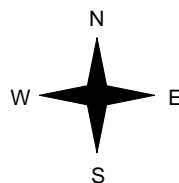
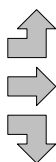
Peds Cross:  $\nlessgtr$

Cyclists	Trucks	Cars	Totals
0	24	459	483



10th St

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



Grey Rd 28

Grey Rd 28

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

10th St



Cars	Trucks	Cyclists	Totals
464	25	0	489

Peds Cross:  $\nlessgtr$

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	

Peds Cross:  $\nlessgtr$

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:  $\nlessgtr$

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:  $\nlessgtr$

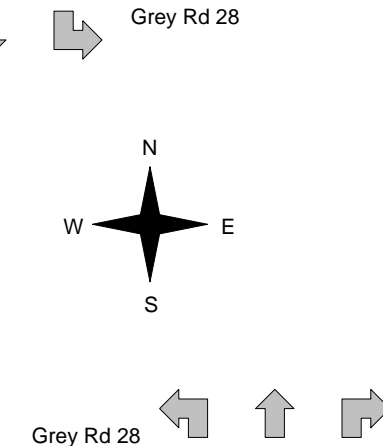
Cyclists	0	83	1455	Totals
				1538

10th St

Cyclists	0	29	165	Totals
				194
				1103
				121
				1323

Peds Cross:  $\nlessgtr$   
 West Peds: 0  
 West Entering: 1418  
 West Leg Total: 2956

Cars	260
Trucks	12
Cyclists	0
Totals	272



Cars	129	1088	45	Totals
Trucks	22	47	0	69
Cyclists	0	0	0	0
Totals	151	1135	45	1290

10th St

Cars	1209	81	0	Totals
Trucks				
Cyclists				
Totals	1290			

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

Peds Cross:  $\nlessgtr$   
 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						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	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

### 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



[illegible]

**Count Date:** 10-Jan-18      **Site #:** 1801900002

[illegible]

[illegible]

**Count Date:** 10-Jan-18      **Site #:** 1801900002

[illegible]

***Ontario Traffic Inc.***

**Count Date: 10-Jan-18      Site #: 1801900002**

[illegible]

[illegible]

**Count Date:** 10-Jan-18      **Site #:** 1801900002

[illegible]

**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 &amp; "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 &amp; "0" = No

# APPENDIX

## B LEVEL OF SERVICE DEFINITIONS



## LEVEL OF SERVICE DEFINITIONS AT SIGNALIZED INTERSECTIONS<sup>(1)</sup>

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.

<b>Level of Service</b>	<b>Features</b>	<b>Control Delay per vehicle (sec)</b>
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.	$\leq 10$
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.	$> 10 \text{ and } \leq 20$
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.	$> 20 \text{ and } \leq 35$
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.	$> 35 \text{ and } \leq 55$
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.	$> 55 \text{ and } \leq 80$
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<sup>(1)</sup>

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.	$\leq 10$
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.	$> 10$ and $\leq 15$
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 $\leq 25$
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 $\leq 35$
E	Very long traffic delays occur. Operations approach the capacity of the intersection.	$> 35$ and $\leq 50$
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.	$> 50$

(1) Highway Capacity Manual 2000.



# APPENDIX










## C EXISTING INTERSECTION OPERATIONS



# HCM Unsignalized Intersection Capacity Analysis

1: Grey Road 28 & 14th Street

07/11/2018

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
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					

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			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	
Frt Protected	0.950			0.950				0.967			0.986	
Satd. Flow (prot)	1573	1712	0	1825	1748	0	0	1759	1484	0	1474	0
Frt 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 (k/h)		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		NA	
Protected Phases	5	2			6			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	
Total Lost Time (s)	3.0	7.0		7.0	7.0			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	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	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
Pedestrian Calls (#/hr)		0		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	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

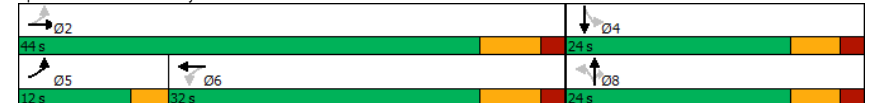
Intersection LOS: B

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						
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 (k/h)		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			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	
Total Lost Time (s)	3.0	7.0		7.0	7.0			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

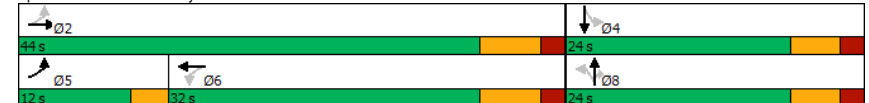
07/11/2018

	←	→	↙	↘	↖	↗	↖	↗	↖	↗	↖	↗
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	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	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
Pedestrian Calls (#/hr)		0		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	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

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



Existing AM 02/08/2018 Baseline

Synchro 10 Report  
Page 2

# APPENDIX

## D FUTURE BACKGROUND 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)	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			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 (k/h)		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			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		
Total Lost Time (s)	3.0	7.0		7.0	7.0			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

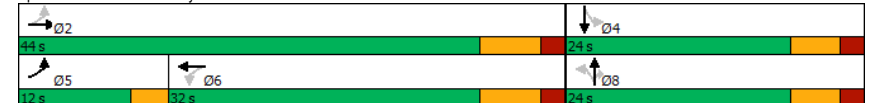
	←	→	↙	↘	←	↙	↘	→	↙	↘	→	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	None	
Walk Time (s)		7.0		7.0	7.0		7.0	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	
Pedestrian Calls (#/hr)		0		0	0		0	0	0	0	0	0	
Act Effct Green (s)	41.1	37.1		25.1	25.1			12.8	12.8		12.8		
Actuated g/C Ratio	0.65	0.59		0.40	0.40			0.20	0.20		0.20		
v/c Ratio	0.12	0.23		0.02	0.57			0.37	0.03		0.64		
Control Delay	5.2	7.0		13.2	18.8			25.9	0.2		24.2		
Queue Delay	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		
LOS	A	A		B	B		C	A			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		
Queue Length 95th (m)	7.4	25.0		3.9	67.7			21.5	0.0		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		
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	0.12	0.23		0.02	0.57			0.26	0.03		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 Capacity Utilization 55.5%  
Analysis Period (min) 15

Intersection LOS: B  
ICU Level of Service B

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	34	0	18	43	76	11	6	150	27
Future Volume (Veh/h)	13	0	37	34	0	18	43	76	11	6	150	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	37	0	20	47	83	12	7	163	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	394	380	178	414	389	89	192				95	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	394	380	178	414	389	89	192				95	
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)	527	530	843	506	524	969	1335				1499	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	54	57	142	199								
Volume Left	14	37	47	7								
Volume Right	40	20	12	29								
cSH	729	608	1335	1499								
Volume to Capacity	0.07	0.09	0.04	0.00								
Queue Length 95th (m)	1.9	2.4	0.9	0.1								
Control Delay (s)	10.3	11.5	2.8	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.3	11.5	2.8	0.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay	3.7											
Intersection Capacity Utilization	33.5%			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)	0	0	0	115	174	0
Future Volume (Veh/h)	0	0	0	115	174	0
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)	0	0	0	125	189	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	314	189	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314	189	189			
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)	679	853	1385			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	125	189			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1385	1700			
Volume to Capacity	0.00	0.00	0.11			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	12.5%			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)	74	445	30	18	385	65	55	49	23	57	37	75
Future Volume (vph)	74	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	
Frt Protected	0.950			0.950				0.974			0.983	
Satd. Flow (prot)	1644	1812	0	1825	1797	0	0	1722	1541	0	1596	0
Frt 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 (k/h)		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)	80	484	33	20	418	71	60	53	25	62	40	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	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			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	
Total Lost Time (s)	3.0	7.0		7.0	7.0			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 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	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
Pedestrian Calls (#/hr)		0		0	0		0	0	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)	2.6	28.0		1.4	42.7			12.0	0.0		13.4	
Queue Length 95th (m)	8.5	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%

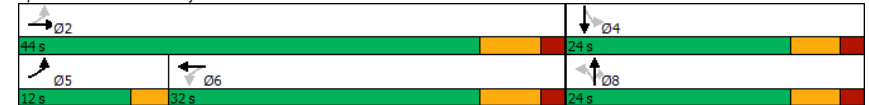
ICU Level of Service B

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



















Future Background 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	144	23	34	98	22
Future Volume (Veh/h)	30	0	54	14	0	20	50	144	23	34	98	22
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)	33	0	59	15	0	22	54	157	25	37	107	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	492	483	119	530	482	170	131				182	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	492	483	119	530	482	170	131				182	
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 %	93	100	94	96	100	97	96				97	
cM capacity (veh/h)	455	453	938	410	453	874	1467				1393	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	92	37	236	168								
Volume Left	33	15	54	37								
Volume Right	59	22	25	24								
cSH	679	600	1467	1393								
Volume to Capacity	0.14	0.06	0.04	0.03								
Queue Length 95th (m)	3.7	1.6	0.9	0.6								
Control Delay (s)	11.1	11.4	2.0	1.9								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.1	11.4	2.0	1.9								
Approach LOS	B	B										
Intersection Summary												
Average Delay				4.2								
Intersection Capacity Utilization				28.7%	ICU Level of Service			A				
Analysis Period (min)				15								

# HCM Unsignalized Intersection Capacity Analysis

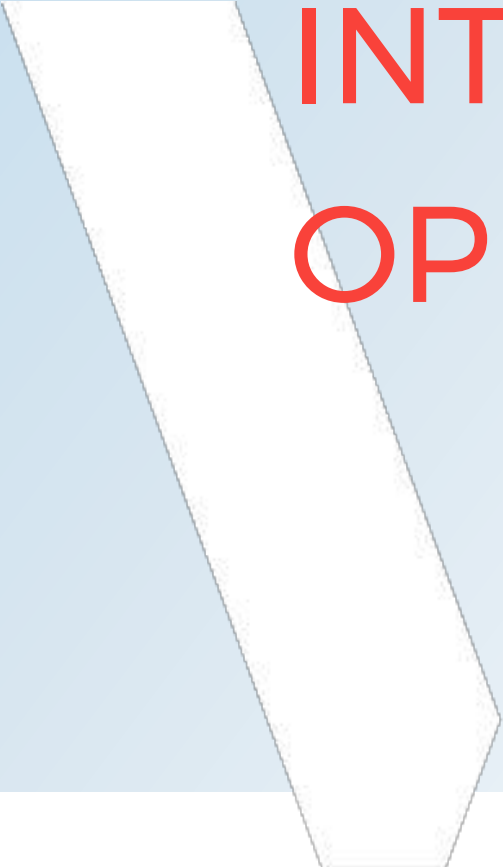
3: Grey Road 28 & West Saugeen Cedar Heights Access

07/11/2018

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	188	159	0
Future Volume (Veh/h)	0	0	0	188	159	0
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)	0	0	0	204	173	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	377	173	173			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	377	173	173			
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)	625	871	1404			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	0	204	173			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1404	1700			
Volume to Capacity	0.00	0.00	0.10			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		13.2%		ICU Level of Service		A
Analysis Period (min)			15			

# APPENDIX

## **E** TOTAL FUTURE 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			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 (k/h)		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			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		
Total Lost Time (s)	3.0	7.0		7.0	7.0			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

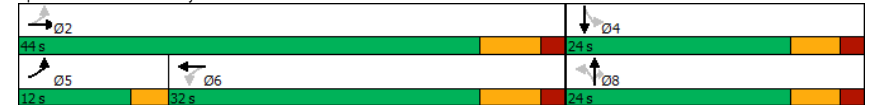
07/11/2018

	↖	→	↗	↙	←	↖	↗	↙	↘	↖	↗	↙	↘
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	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	
Pedestrian Calls (#/hr)		0		0	0		0	0	0	0	0	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		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 Capacity Utilization 57.5%  
Analysis Period (min) 15

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



















Future Total AM 02/08/2018 Baseline

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# 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			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 (k/h)		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			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	
Total Lost Time (s)	3.0	7.0		7.0	7.0			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	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
Pedestrian Calls (#/hr)		0		0	0		0	0	0	0	0	0
Act Effct Green (s)	41.1	37.1		25.0	25.0			12.7	12.7		12.7	
Actuated g/C Ratio	0.65	0.59		0.40	0.40			0.20	0.20		0.20	
v/c Ratio	0.18	0.48		0.06	0.69			0.45	0.06		0.61	
Control Delay	5.6	9.8		13.6	22.2			27.6	0.3		24.6	
Queue Delay	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	
LOS	A	A		B	C			C	A		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	
Queue Length 95th (m)	9.6	63.3		5.9	#93.1			26.4	0.0		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	
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	0.18	0.48		0.06	0.69			0.32	0.05		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

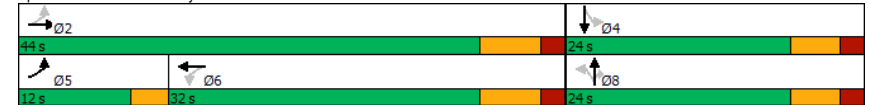
Intersection Capacity Utilization 63.2% ICU Level of Service B

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		
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)	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					

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)	66	189	27	10	319	52	55	33	12	65	48	115	
Future Volume (vph)	66	189	27	10	319	52	55	33	12	65	48	115	
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			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	1737	0	0	1760	1484	0	1477	0	
Flt Permitted	0.389			0.613				0.631			0.870		
Satd. Flow (perm)	644	1711	0	1178	1737	0	0	1145	1484	0	1303	0	
Right Turn on Red		Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		16			14				112		73		
Link Speed (k/h)		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)	72	205	29	11	347	57	60	36	13	71	52	125	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	72	234	0	11	404	0	0	96	13	0	248	0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA		
Protected Phases	5	2			6			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		
Total Lost Time (s)	3.0	7.0		7.0	7.0			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 (110 Units) 02/08/2018 Baseline

Synchro 10 Report  
Page 1

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

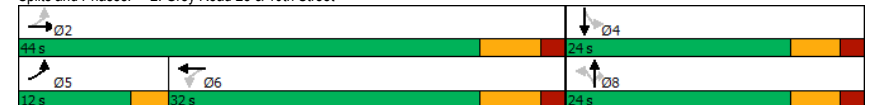
07/11/2018

	←	→	↙	↘	←	↙	↘	→	↙	↘	→	↙	↘
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	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	
Pedestrian Calls (#/hr)		0		0	0		0	0	0	0	0	0	
Act Effct Green (s)	41.1	37.1		25.1	25.1		14.0	14.0		14.0		14.0	
Actuated g/C Ratio	0.64	0.58		0.39	0.39		0.22	0.22		0.22		0.22	
v/c Ratio	0.13	0.23		0.02	0.59		0.39	0.03		0.73		0.73	
Control Delay	5.8	7.5		13.8	19.9		25.9	0.2		29.3		29.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0		0.0	
Total Delay	5.8	7.5		13.8	19.9		25.9	0.2		29.3		29.3	
LOS	A	A		B	B		C	A		C		C	
Approach Delay		7.1			19.8		22.8			29.3			
Approach LOS		A			B		C			C			
Queue Length 50th (m)	2.9	11.6		0.8	36.7		10.1	0.0		19.7			
Queue Length 95th (m)	8.1	25.0		3.9	68.9		22.3	0.0		42.7			
Internal Link Dist (m)		112.5			131.6		63.3			476.7			
Turn Bay Length (m)							42.0						
Base Capacity (vph)	543	996		460	687		322	498		419			
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	0.13	0.23		0.02	0.59		0.30	0.03		0.59		0.59	

Intersection Summary

Area Type: Other  
Cycle Length: 68  
Actuated Cycle Length: 64.1  
Natural Cycle: 60  
Control Type: Semi Act-Uncoord  
Maximum v/c Ratio: 0.73  
Intersection Signal Delay: 18.7  
Intersection Capacity Utilization 58.1%  
Analysis Period (min) 15

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



Future Total AM (110 Units) 02/08/2018 Baseline

















Synchro 10 Report  
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# 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	34	0	18	43	90	11	6	191	27
Future Volume (Veh/h)	13	0	37	34	0	18	43	90	11	6	191	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	37	0	20	47	98	12	7	208	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	454	440	222	474	449	104	237				110	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	454	440	222	474	449	104	237				110	
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	92	100	98	96				100	
cM capacity (veh/h)	480	490	795	460	484	951	1284				1480	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	54	57	157	244								
Volume Left	14	37	47	7								
Volume Right	40	20	12	29								
cSH	679	562	1284	1480								
Volume to Capacity	0.08	0.10	0.04	0.00								
Queue Length 95th (m)	2.0	2.7	0.9	0.1								
Control Delay (s)	10.8	12.1	2.6	0.3								
Lane LOS	B	B	A	A								
Approach Delay (s)	10.8	12.1	2.6	0.3								
Approach LOS	B	B										
Intersection Summary												
Average Delay	3.4											
Intersection Capacity Utilization	36.4%			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)	22	41	14	115	174	8
Future Volume (Veh/h)	22	41	14	115	174	8
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)	24	45	15	125	189	9
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	348	194	198			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348	194	198			
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	95	99			
cM capacity (veh/h)	641	848	1375			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	69	140	198			
Volume Left	24	15	0			
Volume Right	45	0	9			
cSH	763	1375	1700			
Volume to Capacity	0.09	0.01	0.12			
Queue Length 95th (m)	2.3	0.3	0.0			
Control Delay (s)	10.2	0.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.2	0.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization	28.2%		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)	85	445	30	18	385	75	55	56	23	63	40	82
Future Volume (vph)	85	445	30	18	385	75	55	56	23	63	40	82
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				0.975				0.850		0.940	
Flt Protected	0.950			0.950				0.976			0.983	
Satd. Flow (prot)	1644	1812	0	1825	1790	0	0	1720	1541	0	1596	0
Flt Permitted	0.300			0.473				0.744			0.839	
Satd. Flow (perm)	519	1812	0	909	1790	0	0	1311	1541	0	1362	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			16				112			58
Link Speed (k/h)		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)	92	484	33	20	418	82	60	61	25	68	43	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	517	0	20	500	0	0	121	25	0	200	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2			6			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	
Total Lost Time (s)	3.0	7.0		7.0	7.0			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 (110 Units) 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	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
Pedestrian Calls (#/hr)		0		0	0		0	0	0	0	0	0
Act Effct Green (s)	41.1	37.1		25.1	25.1			12.8	12.8			12.8
Actuated g/C Ratio	0.65	0.59		0.40	0.40			0.20	0.20			0.20
v/c Ratio	0.18	0.48		0.06	0.69			0.45	0.06			0.62
Control Delay	5.6	9.8		13.7	22.4			27.6	0.3			24.8
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	5.6	9.8		13.7	22.4			27.6	0.3			24.8
LOS	A	A		B	C			C	A			C
Approach Delay		9.2			22.1			23.0				24.8
Approach LOS		A			C			C				C
Queue Length 50th (m)	3.2	29.2		1.4	45.2			12.9	0.0			15.3
Queue Length 95th (m)	9.7	63.3		5.9	#99.0			26.6	0.0			34.0
Internal Link Dist (m)		112.5			131.6			63.3				476.7
Turn Bay Length (m)									42.0			
Base Capacity (vph)	500	1071		362	722			376	521			432
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	0.18	0.48		0.06	0.69			0.32	0.05			0.46

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: 0.69

Intersection Signal Delay: 17.2

Intersection LOS: B

Intersection Capacity Utilization 63.4%

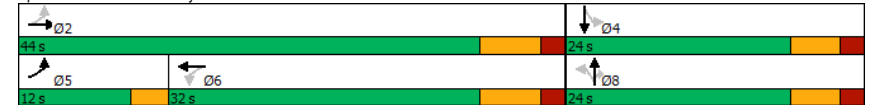
ICU Level of Service B

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



















Future Total PM (110 Units) 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	173	23	34	115	22
Future Volume (Veh/h)	30	0	54	14	0	20	50	173	23	34	115	22
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)	33	0	59	15	0	22	54	188	25	37	125	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	542	532	137	578	532	200	149			213		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	542	532	137	578	532	200	149			213		
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)	421	424	917	380	425	840	1445			1357		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	92	37	267	186								
Volume Left	33	15	54	37								
Volume Right	59	22	25	24								
cSH	645	563	1445	1357								
Volume to Capacity	0.14	0.07	0.04	0.03								
Queue Length 95th (m)	3.9	1.7	0.9	0.7								
Control Delay (s)	11.5	11.8	1.8	1.7								
Lane LOS	B	B	A	A								
Approach Delay (s)	11.5	11.8	1.8	1.7								
Approach LOS	B	B										
Intersection Summary												
Average Delay	3.9											
Intersection Capacity Utilization	30.7%			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)	25	17	29	188	159	42
Future Volume (Veh/h)	25	17	29	188	159	42
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)	27	18	32	204	173	46
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	464	196	219			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	464	196	219			
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	98	98			
cM capacity (veh/h)	543	845	1350			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	45	236	219			
Volume Left	27	32	0			
Volume Right	18	0	46			
cSH	634	1350	1700			
Volume to Capacity	0.07	0.02	0.13			
Queue Length 95th (m)	1.8	0.6	0.0			
Control Delay (s)	11.1	1.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.1	1.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.6					
Intersection Capacity Utilization	35.8%			ICU Level of Service	A	
Analysis Period (min)	15					