158 Ardagh Road
City of Barrie

Traffic Brief for
The Hedbern Development Corp.

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1 Introduction

1.1 Background

The Hedbern Development Corp. [The Developer] is proposing a residential development [subject site], municipally known as 158, 162,166 & 170 Ardagh Road, located north of Ardagh Road, across from Snowshoe Trail, in the City of Barrie [City]. The subject site includes 58 residential townhouse units.

The proposed development will include a single full-movement access driveway [Site Access] onto Ardagh Road, opposite of Snowshoe Trail. The proposed development also provides access via an extension of Bishop Drive. Of the proposed 58 townhouse units, 27 units will have direct driveway access onto the extension of Bishop Drive and 31 units will utilize the Site Access.

The Developer has retained **JD Northcote Engineering Inc.** [JD Engineering] to prepare this traffic brief in support of the proposed residential development.

1.2 Study Area

Figure 1 illustrates the location of the subject site and study area intersections in relation to the surrounding area. The Conceptual Site Plan by IPS Consulting Inc. is attached in **Appendix A**.

The subject site is bound by Ardagh Road to the south and existing residential development to the west, north and east.

Through consultation with the City, the following intersections are included in the Traffic Brief:

- Ardagh Road / Snowshoe Trail & Site Access.

Figure 1 – Proposed Site Location and Study Area

1.3 Study Scope and Objectives

The purpose of this study is to identify the potential impacts to traffic flow at the site access and on the surrounding roadway network. The study analysis includes the following tasks:

- Consult with the City to address any traffic-related issues or concerns they have with the proposed development;
- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed development was not constructed, including the impact of additional proposed developments in the area;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete level-of-service [LOS] analysis of horizon year (with the proposed development) traffic conditions and identify additional operational deficiencies;
- Identify improvement options to address operational deficiencies;
- Calculate lane improvements for the site access driveway based on the Transportation Association of Canada and Ontario Ministry of Transportation guidelines;
- Review the available sight distance at the site access driveway;

- Review and comment on the construction staging plan as it relates to parking of trades people, delivery of construction material, maintenance of adjacent property access, pedestrian movements, City infrastructure, etc.; and
- Document findings and recommendations in a final report.

1.4 Horizon Year and Analysis Periods

The traffic scenario for the City's planning horizon year (2031) was selected for analysis of traffic operations in the study area. The weekday morning [AM] and weekday afternoon [PM] peak hours have been selected as the analysis periods for this study.

2 Information Gathering

2.1 Street and Intersection Characteristics

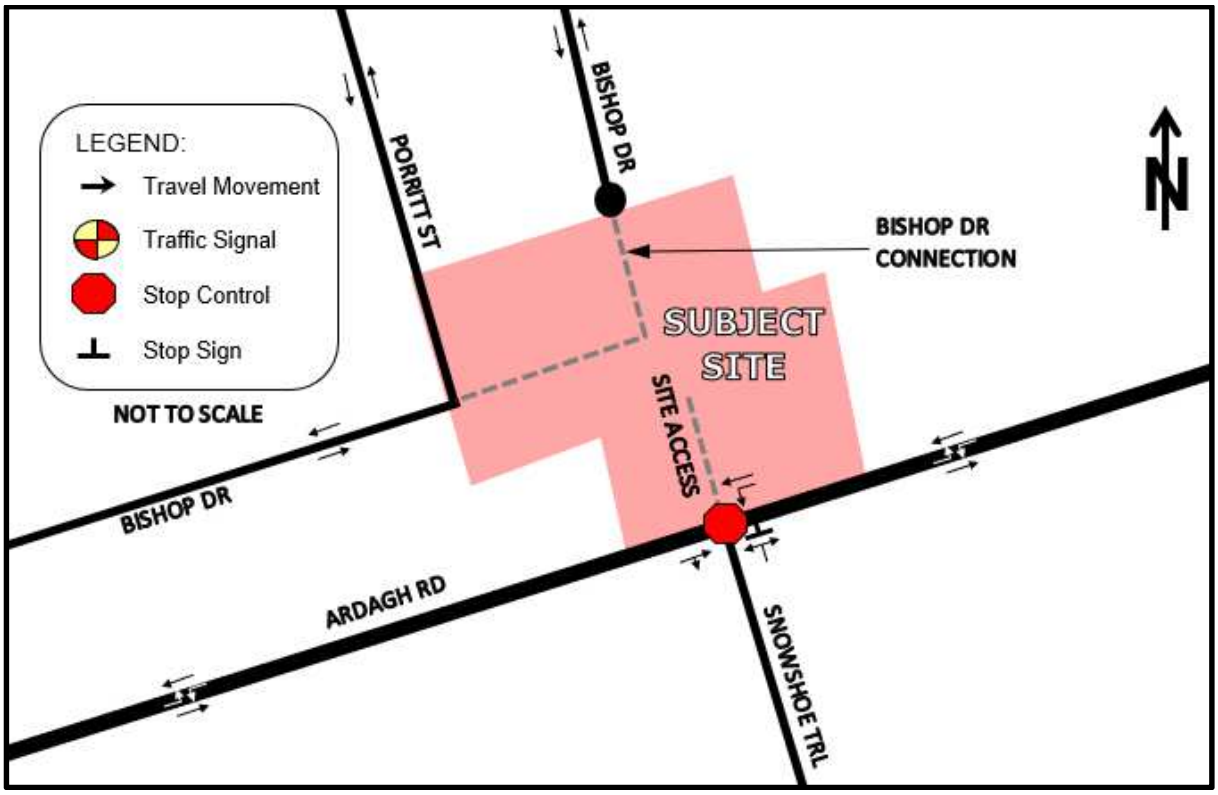
Ardagh Road is a three-lane major arterial road with an urban cross section. Ardagh Road has a bicycle lane and a sidewalk on both sides of the road. Ardagh Road has a posted speed limit of 50km/h and is under the jurisdiction of the City.

Snowshoe Trail is a two-lane local road with an urban cross section. Snowshoe Trail has a sidewalk on the east side of the road. Snowshoe Trail has an assumed (unposted) speed limit of 50km/h and is under the jurisdiction of the City.

Bishop Drive is a two-lane local road with an urban cross section. Bishop Drive has a sidewalk on the north side or east side of the road. Bishop Drive has an assumed (unposted) speed limit of 50km/h and is under the jurisdiction of the City.

The existing intersection spacing and lane configuration within the study area is illustrated in **Figure 2**.

Figure 2 – Existing (2019) Lane Configuration with in Study Area



2.2 Local Transportation Infrastructure Improvements

According to the City of Barrie Multi-Modal Active Transportation Master Plan [MMATMP], the following road improvements were anticipated to be completed prior to 2016, but have not been completed at the time of this study:

- Ardagh Road (within study area)
    - Addition of one lane in both directions

It is noted that the City of Barrie Multi-Modal Active Transportation Master Plan [MMATMP] was completed in January 2014 and at that time Ardagh Road was painted to provide a two-lane cross section. Following the completion of the MMATMP, Ardagh Road was reconfigured to provide a three lane cross-section with painted bike lanes. Since the City's Capital Budget does not identify any road improvements on Ardagh Road, we have assumed that there are no further planned road improvements anticipated on Ardagh Road, for the purpose of the report.

2.3 Transit Access

Barrie Transit provides one bus route within the study area. The No. 7 route provide service between downtown Barrie and the south of City travelling along Ardagh Road within the study area.

The No. 7 route operates between 05:25 – 24:12 on weekdays with service every half hour, between 6:55 – 24:12 on Saturdays with service every half hour and 09:25 – 22:12 on Sundays with service

every hour. The closest bus stop to the subject site for the No. 7 route is located just west of the Ardagh Road / Snowshoe Trail intersection.

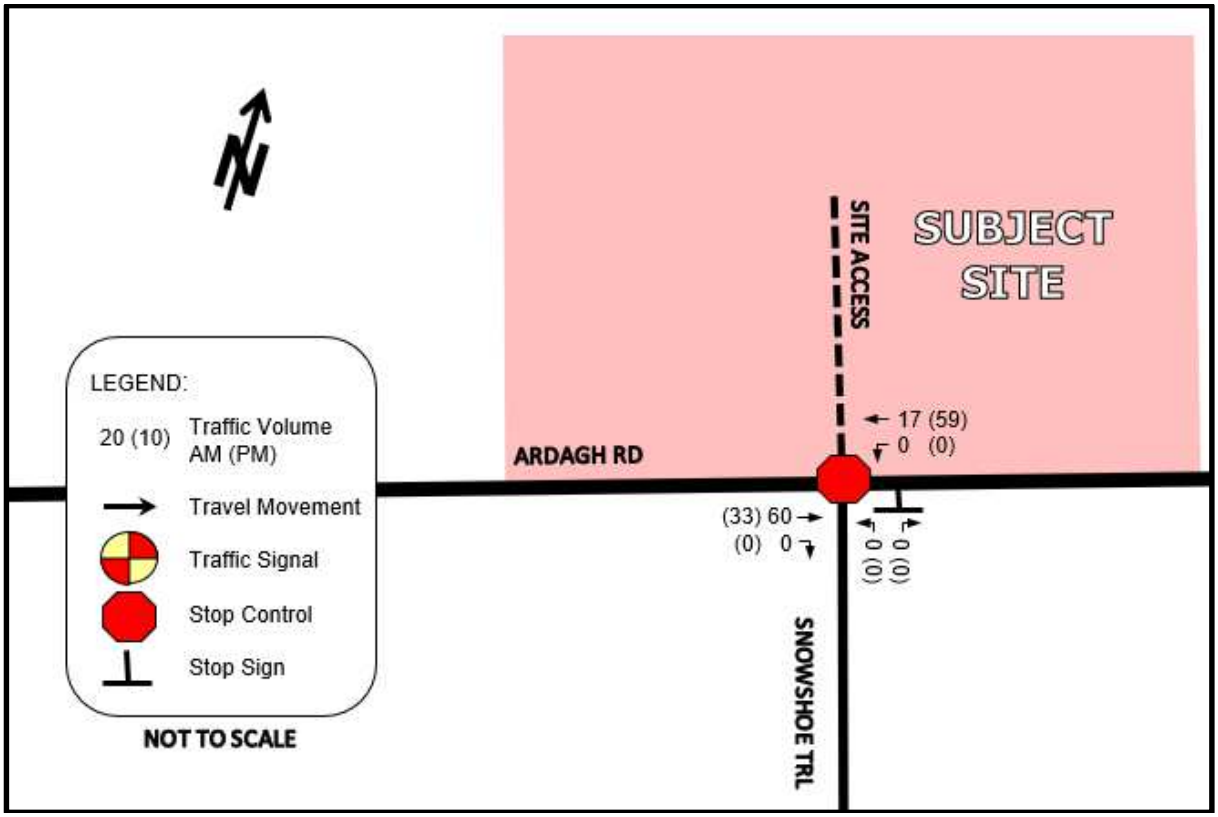
2.4 Other Developments within the Study Area

Based on review of the proposed developments currently in the City's development review process, as identified on the City's website, the Meadows of Bear Creek development is the only site in the study area that will have a notable impact on the local traffic volumes / infrastructure capacity.

The Meadows of Bear Creek development is located north of Ardagh Road between Wright Drive and Mapleton Avenue. This development will include the construction of 78-single detached residential units and a 4.5 hectare medium-density residential block. The specifics of the medium density block are not known at this time; however, it is anticipated that it will include approximately 238 townhouse or walk-up apartment units per the October 2016 traffic impact study completed by JD Engineering [Meadows of Bear Creek TIS]. It has been assumed that this development will be fully occupied prior to the 2031 horizon year.

Traffic generated by the above noted development has been estimated based on the Meadows of Bear Creek TIS (excerpts provided in **Appendix B**). **Figure 3** illustrates the above noted development traffic during within the study area

Figure 3 – Meadows of Bear Creek Traffic Volumes with in Study Area



2.5 Background Traffic Growth

Based on a comparison of the 2011 and 2031 traffic volumes provided in the EMME travel demand model used in the MMATMP, the anticipated background traffic growth on Ardagh Road, in the study area, will be negligible. In order to be conservative, a 2% per annum background traffic growth rate has been applied to the traffic volumes within the study area.

2.6 Traffic Counts

Detailed traffic and pedestrian counts were completed at the Ardagh Road / Snowshoe Trail intersection. **Table 1** summarizes the traffic count data collection information.

Table 1 – Traffic Count Data

Location	Count Date	AM Peak Hour	PM Peak Hour	Completed By
Ardagh Road / Snowshoe Trail	Thursday, February 21st, 2019	07:30 - 08:30	16:15 - 17:15	JD Eng.*

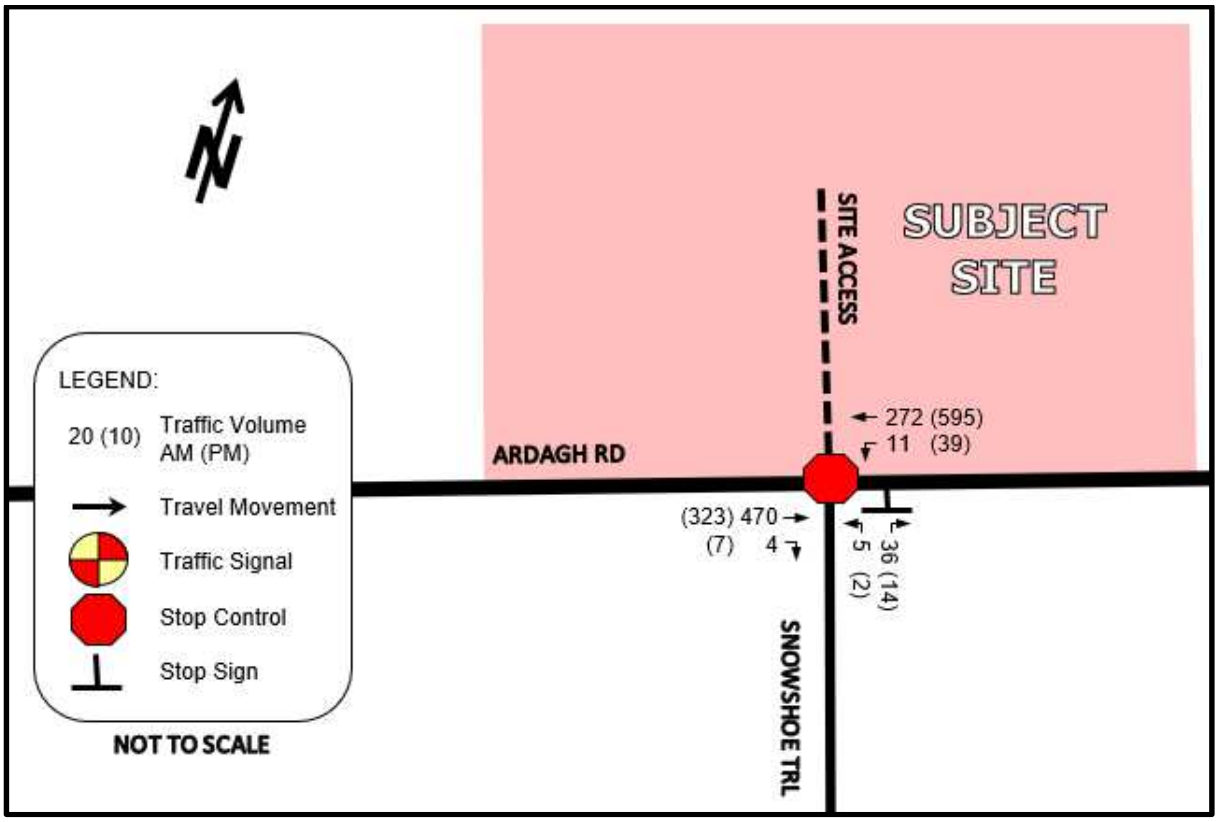
* Traffic counts were completed by Ontario Traffic Inc. on behalf of JD Engineering

Detailed traffic count data can be found in **Appendix C**. The peak hours of traffic generation for the Ardagh Road / Snowshoe Trail intersection generally aligned with the anticipated peak hour of traffic generation by the proposed development.

Heavy vehicle percentages from the traffic count data have also been included in the Synchro analysis.

Figure 4 illustrates the existing (2019) AM and PM peak hour traffic volumes within the study area.

Figure 4 – Existing (2019) Traffic Volumes

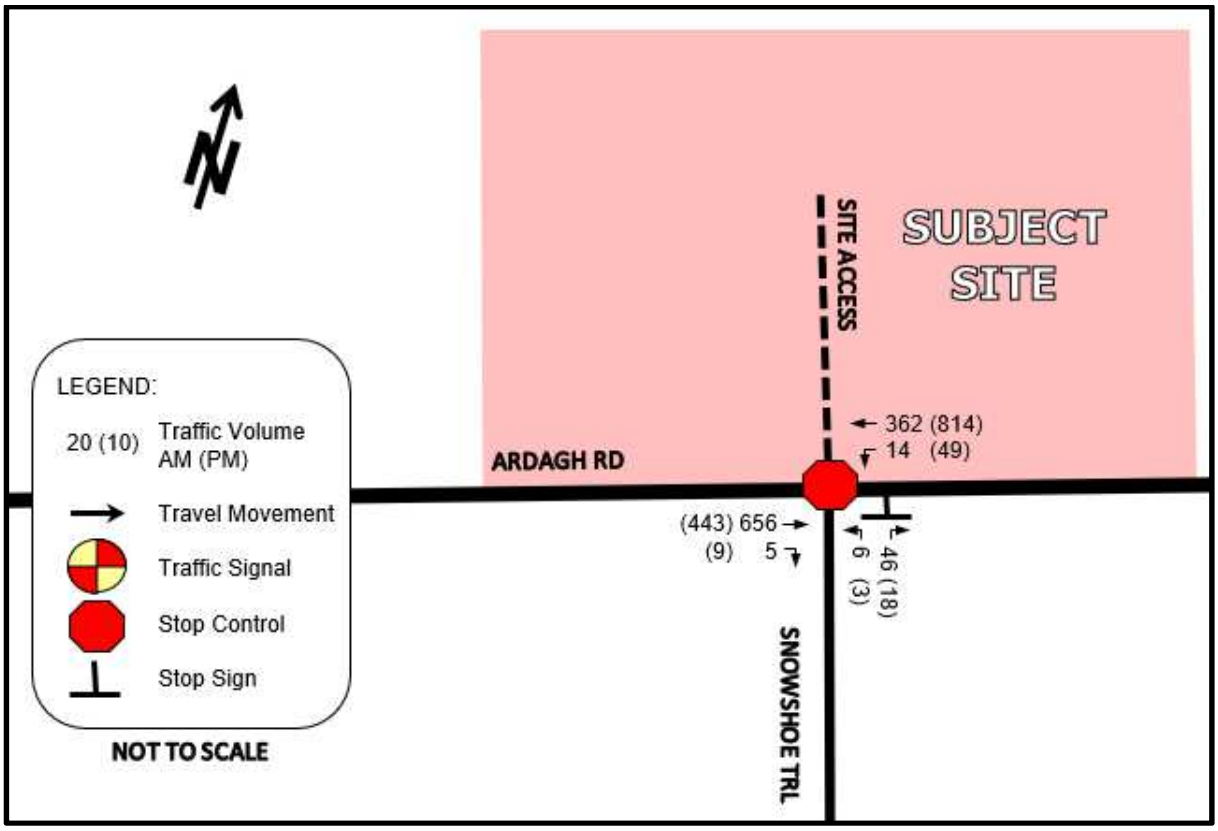


2.7 Horizon Year Traffic Volumes

In addition to the adjacent development traffic volumes outlined in Section 2.4, the background traffic growth rate discussed in Section 2.5 has also been applied to the existing (2019) traffic volumes to estimate the background (2031) horizon year traffic volumes.

Figure 5 illustrates the background (2031) horizon year AM and PM peak hour traffic volumes in the study area.

Figure 5 – Background (2031) Traffic Volumes



3 Proposed Development Traffic Generation and Assignment

3.1 Traffic Generation

The traffic generation for the proposed development has been based on the Institute of Transportation Engineers [ITE] *Trip Generation Manual* (10th Edition) [ITE Trip Generation Manual]. The following ITE land uses have been applied to estimate the traffic from the proposed development:

- ITE land use 220 (Multifamily Housing (Low-Rise)) – General Urban / Suburban Setting

The estimated trip generation of the proposed development is illustrated below in **Table 2**. The AM and PM peak traffic generation for the proposed development is not expected to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 2 – Estimated Traffic Generation of Proposed Development

Land Use	Access Location	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	Site Access	31 units	3	11	14	11	6	17
	Bishop Drive	27 units	3	10	13	9	6	15
TOTAL TRIP GENERATION		58 units	6	21	27	20	12	32

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

3.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. The distribution of residential traffic has been calculated based on the 2016 Transportation Tomorrow Survey [TTS] data for traffic zone 8522, retrieved using the TTS Internet Data Retrieval System [IDRS] (output attached as **Appendix D**). TTS data provides historical origin and destination work trip percentages for specific areas within the City and southern Ontario.

Traffic distribution for the trips generated by the residential component of the proposed development during the AM and PM peak hour is expected to generally follow commuter travel patterns. Our analysis is based on egress traffic during the AM peak hour. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

The distribution of trips is illustrated in **Table 3** using the methodology outlined above.

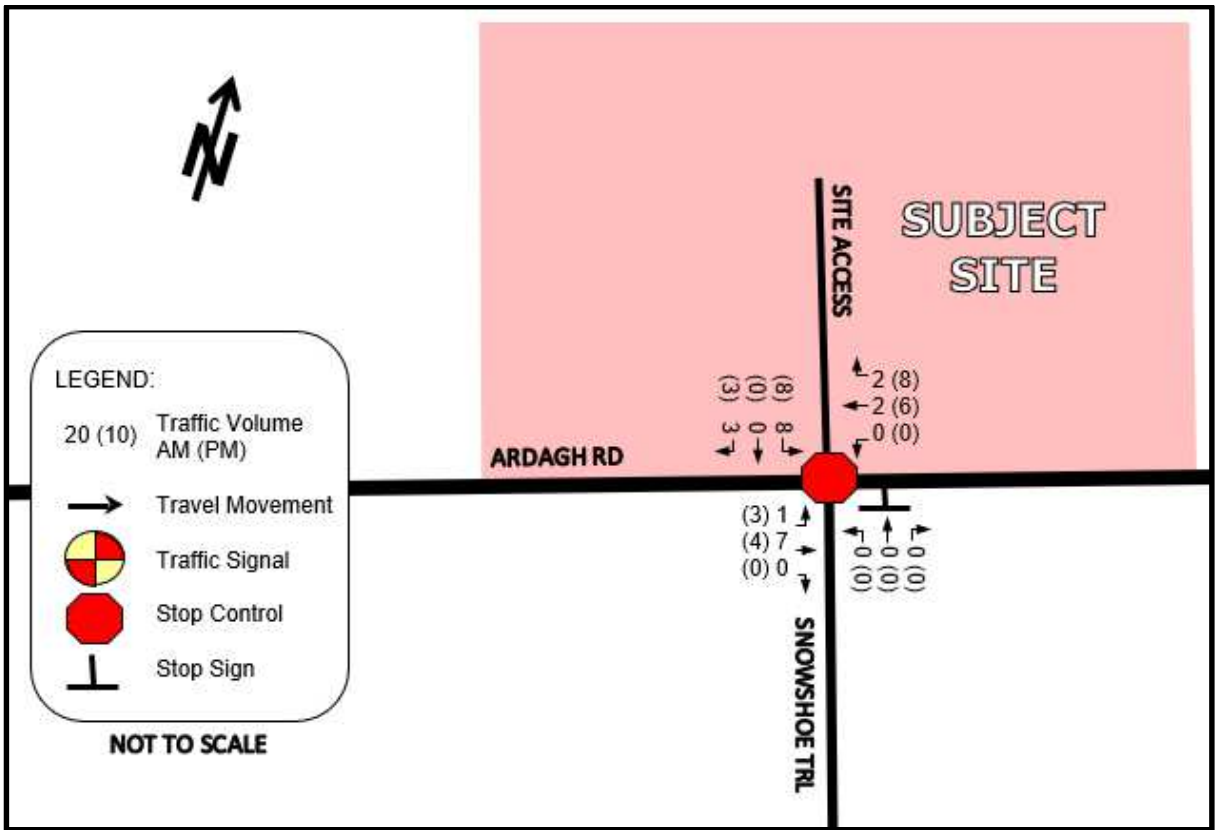
Table 3 – Proposed Development Traffic Distribution

Travel Direction (to / from)	Percentage of Total Traffic Generation	
	Bishop Drive Townhomes	Site Access Townhomes
East via Ardagh Road	70%	70%
West via Ardagh Road	-	30%
Outside Study Area	30%	-
TOTAL	**100%**	**100%**

It is noted that the traffic generated from the townhomes with direct access onto Bishop Drive will only utilize the Ardagh Road / Snowshoe Trail & Site Access intersection if travelling to the east via Ardagh Road.

Using the traffic distributions pattern noted above, the traffic assignment for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figure 6**.

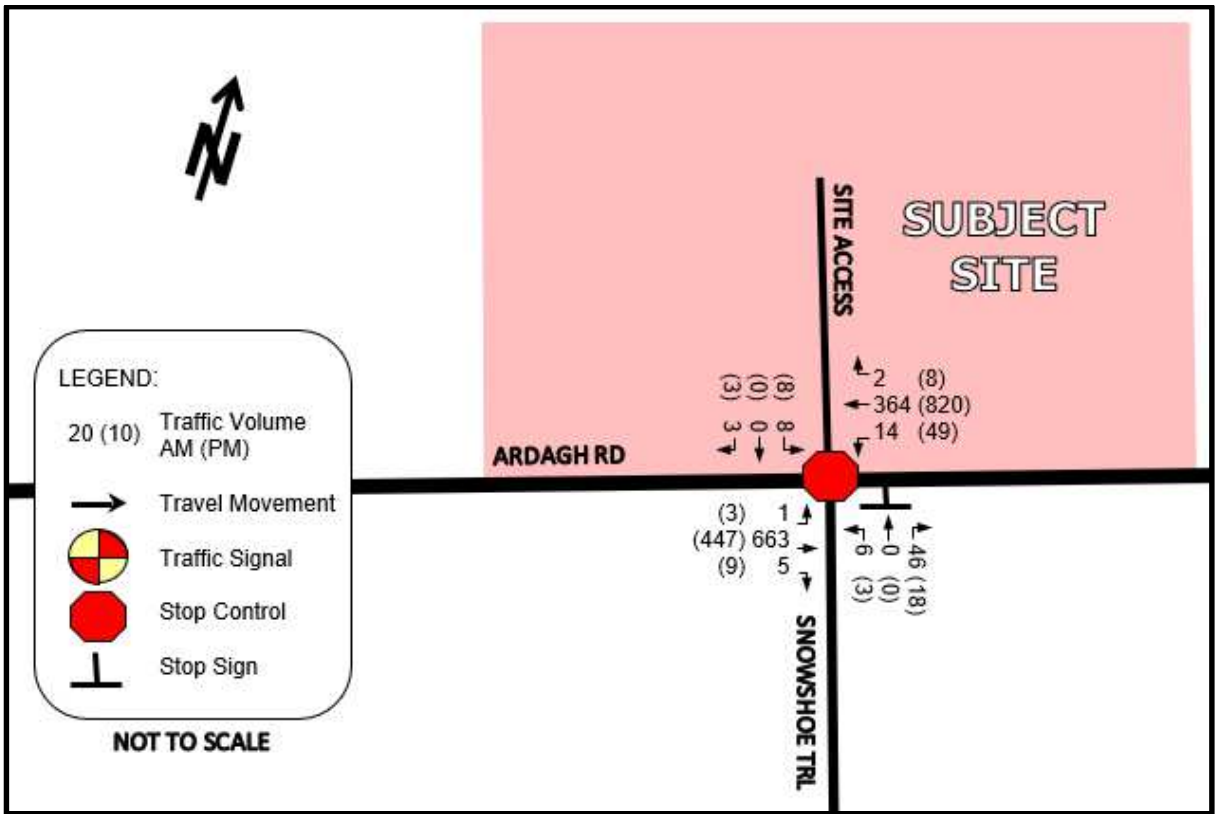
Figure 6 – Subject Site Traffic Assignment



3.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2031) horizon year traffic volumes, the proposed development traffic was added to the background (2031) traffic volumes. The resulting total (2031) horizon year traffic volume for the AM and PM peak hour are illustrated in **Figure 7**.

Figure 7 – Total (2031) Traffic Volumes



4 Intersection Operation with Proposed Development

4.1 Introduction

Traffic operations within the study area were evaluated using the horizon year traffic volumes with the existing road configuration and traffic control. The intersection performance was measured using the traffic analysis software, Synchro 10, a deterministic model that employs Highway Capacity Manual and Intersection Capacity Utilization methodologies for analyzing intersection operations. These procedures are accepted by provincial and municipal agencies throughout North America.

Synchro 10 enables the study area to be graphically defined in terms of streets and intersections, along with their geometric and traffic control characteristics. The user is able to evaluate both signalized and unsignalized intersections in relation to each other, thus not only providing level of service for the individual intersections, but also enabling an assessment of the impact the various intersections in a network have on each other in terms of spacing, traffic congestion, delay, and queuing.

Individual turning movements with a volume-to-capacity [V/C] ratio of 0.85 or greater are considered to be critical movements and have been highlighted in the LOS tables.

The intersection operations were also evaluated in terms of the LOS. LOS is a common measure of the quality of performance at an intersection and is defined in terms of vehicular delay. This delay includes deceleration delay, queue move-up time, stopped delay, and acceleration delay. LOS is expressed on a scale of A through F, where LOS A represents very little delay (i.e. less than 10 seconds per vehicle) and LOS F represents very high delay (i.e. greater than 50 seconds per vehicle for a stop sign controlled intersection and greater than 80 seconds per vehicle for a signalized intersection).

The LOS criteria for signalized and stop sign controlled intersections are shown in **Table 4**. A description of traffic performance characteristics is included for each LOS.

Table 4 – Level of Service Criteria for Intersections

LOS	LOS Description	Control Delay (seconds per vehicle)	
		Signalized Intersections	**Stop Controlled Intersections**
A	Very low delay; most vehicles do not stop (**Excellent**)	less than 10.0	less than 10.0
B	Higher delay; more vehicles stop (**Very Good**)	between 10.0 and 20.0	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping **(Good**)	between 20.0 and 35.0	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (**Satisfactory**)	between 35.0 and 55.0	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of **acceptable** delay	between 55.0 and 80.0	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (**Unacceptable**)	greater than 80.0	greater than 50.0

4.2 Total (2031) Intersection Operation

The results of the LOS analysis under total (2031) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. The existing intersection geometry and traffic control has been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 5 – Total (2031) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour			Weekday PM Peak Hour		
	V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
Ardagh Road / Snowshoe Trail & Site Access	-	1.0	A	-	0.7	B
NB	0.13	14.8	B	0.04	12.6	B
SB	0.03	15.3	C	0.04	18.9	C

The results of the LOS analysis indicate that the Ardagh Road / Snowshoe Trail & Site Access intersection is operating within the typical design limits noted in Section 4.1.

An analysis was completed for right turn movements at the Ardagh Road / Snowshoe Trail & Site Access intersection. Based on the LOS analysis results, no right turn lanes are warranted at the Ardagh Road / Snowshoe Trail & Site Access intersection.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the Ardagh Road / Snowshoe Trail & Site Access intersection (results are provided in **Appendix F**).

No infrastructure improvements are recommended within the study area.

4.3 Site Access

The Site Access will operate efficiently as a full-movement access, with two-way stop control for the northbound and southbound movements. No lane improvements are recommended on Ardagh Road and Snowshoe Trail at the Site Access. A single northbound and two southbound lanes (one right turn lane and one through-left turn lane) at the Site Access driveway will provide the necessary capacity to service the proposed development.

4.4 Sight Distance Review

A review of the available sight distance for the proposed Site Access was completed as part of this analysis.

The sight distance east and west of the Site Access is greater than the minimum stopping sight distance requirements as identified in the Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [TAC Guidelines] for a design speed of 60km/h (85 meters).

Consequently, there are no issues with the sight distance available for the proposed Site Access.

4.5 Construction Parking

Based on our correspondence with the design team for this project, the Developer is committed to the following arrangement for construction parking:

The parking of construction vehicles and vehicles owned by staff and subcontractors employed by the Developer will be formally directed (in writing where possible) to avoid parking on municipal streets surrounding the subject site and avoid parking within private parking lots surrounding the subject site, without consent from the owner of the parking lots.

5 Summary

The Hedbern Development Corp. retained **JD Engineering** to prepare this traffic brief in support of the proposed development in the City of Barrie. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

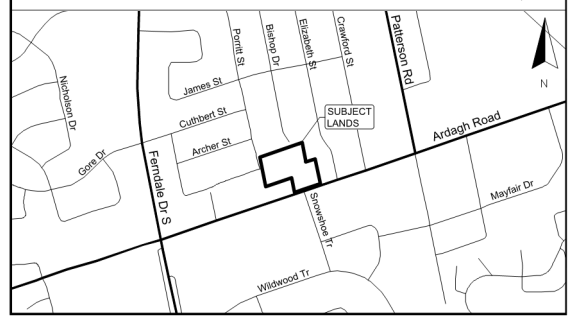
The proposed development includes 58 residential townhouse units. Of the proposed 58 townhouse units, 27 units will have direct driveway access onto Bishop Drive and 31 units will utilize the Site Access.

1. The proposed development is expected to generate a total of 27 AM and 32 PM peak hour trips.
2. Weekday detailed turning movement counts were completed for the Ardagh Road / Snowshoe Trail intersection on Thursday, February 21st, 2019.

3. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed under total (2031) traffic volumes with the proposed development operational at the study area intersections. No geometric lane improvements or traffic signal improvements are recommended within the study area.
5. The Site Access will operate efficiently as a full-movement access, with two-way stop control for the northbound and southbound movements. A single northbound and two southbound lanes (one right turn lane and one through-left turn lane) at the Site Access driveway will provide the necessary capacity to convey the traffic volume generated by the proposed development.
6. The sight distance available for the proposed Site Access meets the minimum stopping sight distance requirements.
7. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Appendix A – Site Plan

KEY MAP — Scale 1:10,000



CONCEPTUAL PLAN

158, 162, 166 & 170 ARDAGH ROAD,
PART OF LOT 5, CONCESSION 14
IN THE
CITY OF BARRIE

Scale 1:3,000

0 5 10 20 30m

LEGEND

- SUBJECT LANDS (Area: 1.63ha / 4.03ac)
- BLOCK/CLUSTER TOWNHOUSE DWELLING
- BACK TO BACK TOWNHOUSE DWELLINGS
- STREET TOWNHOUSE DWELLINGS (Area: 0.91ha / 2.25ac)
- BALCONIES
- * SMALL LOT AREA
- + EXCEEDS LOT COVERAGE (MAX.)

ZONING TABLE - CONDO TOWNHOUSE (31 UNITS)

PROVISION	REQUIRED RM2 ZONE	PROVIDED
Lot Area	720 (min)	7,184.9m² (1.78 ac)
Lot Frontage	21m (min)	102.2m
Setbacks		
Front Yard	7.0m (min)	3.0m
Interior Side Yard	1.8m (min)	1.8m
Exterior Side Yard	3.0m (min)	N.A.
Rear Yard	7.0m (min)	4.5m
Landscaped Open Space	35% (min)	45.0%
Amenity Area	12m² / unit (372.0m²)	1,514.1m²
Lot Coverage	35% (max)	35.0%
Gross Floor Area	60% of lot area (max)	80.0% (based on 2 floors)
Building Height	10.0m (max)	10.0m
Parking	1.5 / unit (47 spaces, with 1 A & 2 B BF spaces)	72 spaces (10 visitor, with 1A & 2B BF spaces
Tandem Parking	not permitted	permitted
Secondary Means of Access	7.0m	4.5m
Density	40.0 u/ha	43.1 u/ha
Landscaped Buffer Area	3.0m	3.0m

ZONING TABLE - STREET TOWNHOUSE (27 UNITS)

PROVISION	REQUIRED RM2 ZONE	PROVIDED
Lot Area (5.3.4.2a)	200.0m² (min)	162.3m²
Lot Frontage (5.3.4.2a)	6.0m (min)	6.0m
Setbacks		
Front Yard (5.3.4.2b)	4.5m (min)	6.0m
Interior Side Yard	1.8m (min)	1.8m
Exterior Side Yard (5.3.3.2a)	3.0m (min)	3.7m
Rear Yard	7.0m (min)	7.0m
Landscape Open Space	35% (min)	39.0%
Dwelling Unit Floor Area (min)	35.0m² / dwelling unit + 10.0m² / bedroom	>35.0m² / dwelling unit + 10.0m² / bedroom
Lot Coverage	45% (max)	49.0%
Gross Floor Area (max)	60%	89% (based on 2 floors)
Building Height	10.0m (max)	10.0m

Source: Parcel fabric by County of Simcoe Interactive Mapping, 2019
Note: This drawing is for discussion purposes only.
The information shown is approximate and subject to change.

CONCEPTUAL PLAN - 58 TOWNHOUSE UNITS

158, 162, 166 & 170 ARDAGH RD - CITY OF BARRIE

RESIDENTIAL	CURRENT OP DESIGNATION
R1(H95) & R3	CURRENT ZONING

SCHEDULE OF REVISIONS

No.	Date	Description	By

IPS
INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
150 DUNLOP STREET EAST, SUITE 201, BARRIE, ONTARIO L4M 1B1
tel: 705 • 812 • 3281 fax: 705 • 812 • 3438 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

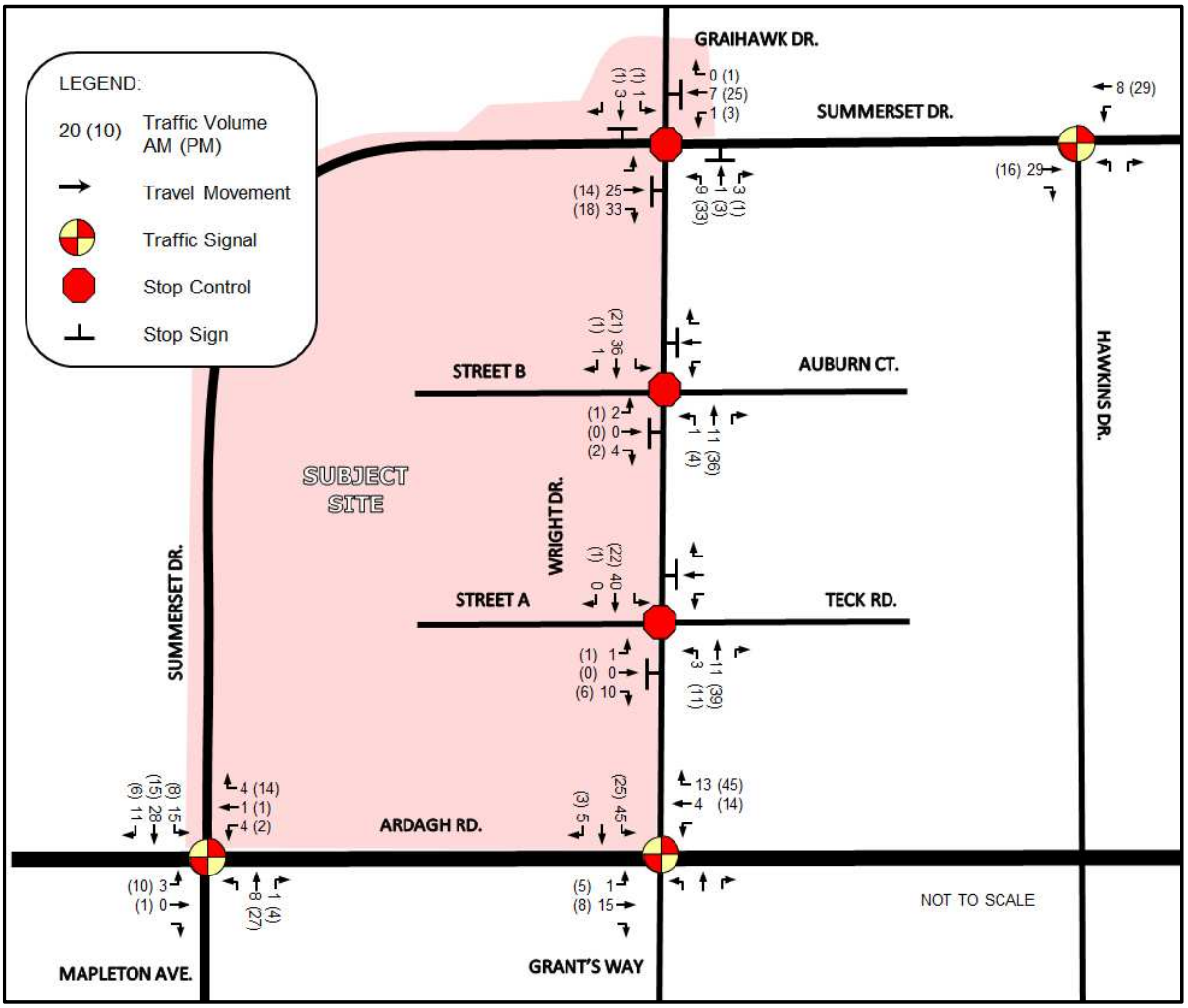
Date:	August 21, 2019	Drawn By:	AS
File:	14-529	Checked By:	GB

Appendix B –
Adjacent Development Excerpts

The proposed development includes 11 units with direct access onto Graihawk Drive. Consequently, we have assumed that 3.5% of the traffic generated by the proposed development will use Graihawk Drive. There are also five units with direct access onto Wright Drive and two units with direct access onto Summerset Drive, east of Wright Drive. For the purpose of our analysis, we have ignored the actual access location for these lots and grouped these lots in with the other lots that will use Street A, Street B and Summerset Drive (west of Wright Drive) to access the existing road network.

The assignment of the traffic generated by the proposed development is provided in **Figure 6**.

Figure 6 – Traffic Assignment for the Proposed Development



4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2026) horizon year traffic volumes, the proposed development traffic was added to the background (2026) traffic volumes and the calculated redistribution of traffic to the Summerset Drive extension was applied. The resulting total (2026) horizon year total traffic volume for the AM and PM peak hour can be found in **Figure 7**.

Appendix C –
Traffic Count Data

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

Municipality: Barrie
Site #: 1904400001
Intersection: Ardagh Rd & Snowshoe Trail
TFR File #: 16
Count date: 21-Feb-19

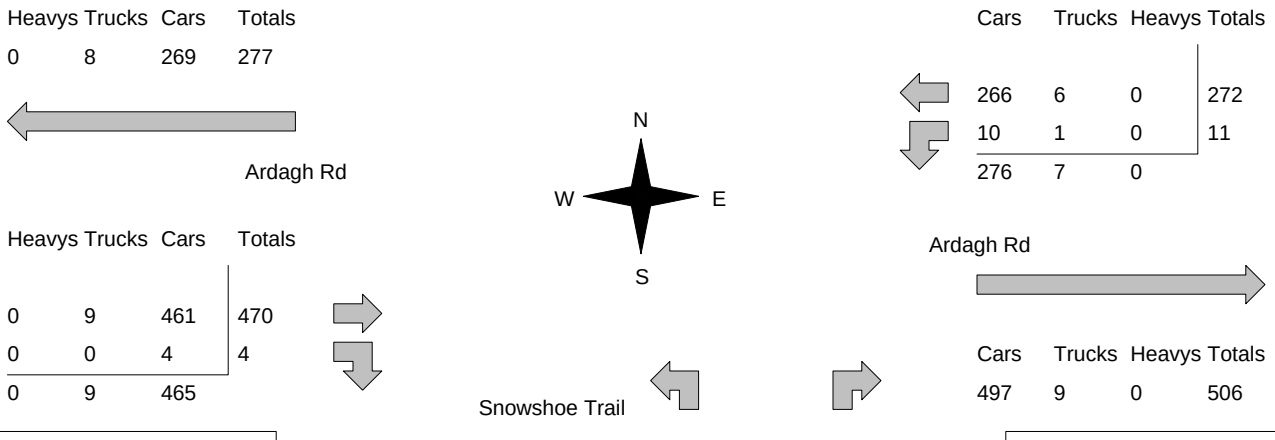
Weather conditions:

Person(s) who counted:

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

Major Road: Ardagh Rd runs W/E

East Leg Total: 789
East Entering: 283
East Peds: 0
Peds Cross:



Peds Cross:
West Peds: 0
West Entering: 474
West Leg Total: 751

Cars 14
Trucks 1
Heavys 0
Totals 15

Cars 3 36 39
Trucks 2 0 2
Heavys 0 0 0
Totals 5 36

Peds Cross:
South Peds: 1
South Entering: 41
South Leg Total: 56

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: Barrie
Site #: 1904400001
Intersection: Ardagh Rd & Snowshoe Trail
TFR File #: 16
Count date: 21-Feb-19

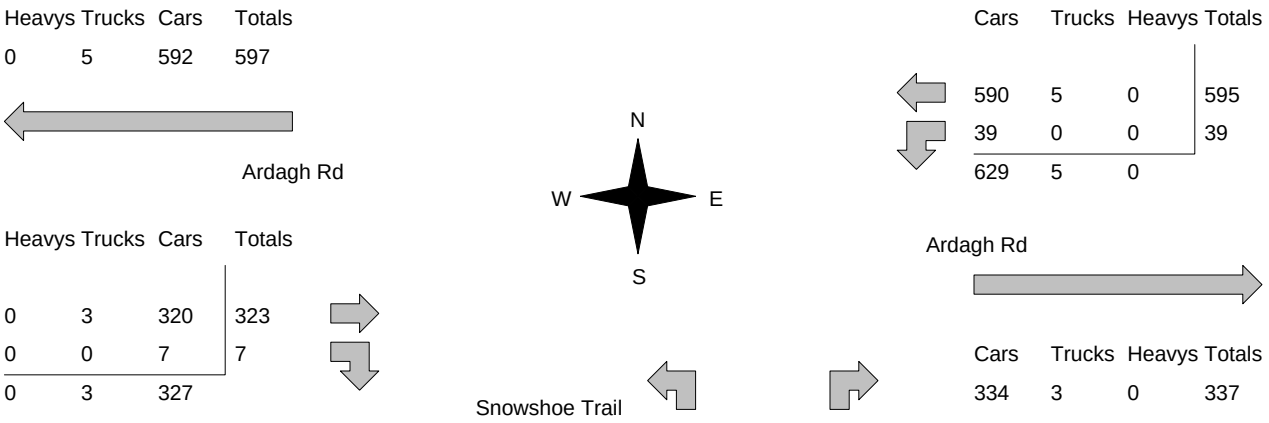
Weather conditions:

Person(s) who counted:

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

Major Road: Ardagh Rd runs W/E

East Leg Total: 971
East Entering: 634
East Peds: 0
Peds Cross:



Peds Cross:
West Peds: 1
West Entering: 330
West Leg Total: 927

Cars 46
Trucks 0
Heavys 0
Totals 46

Cars 2 14 16
Trucks 0 0 0
Heavys 0 0 0
Totals 2 14

Peds Cross:
South Peds: 6
South Entering: 16
South Leg Total: 62

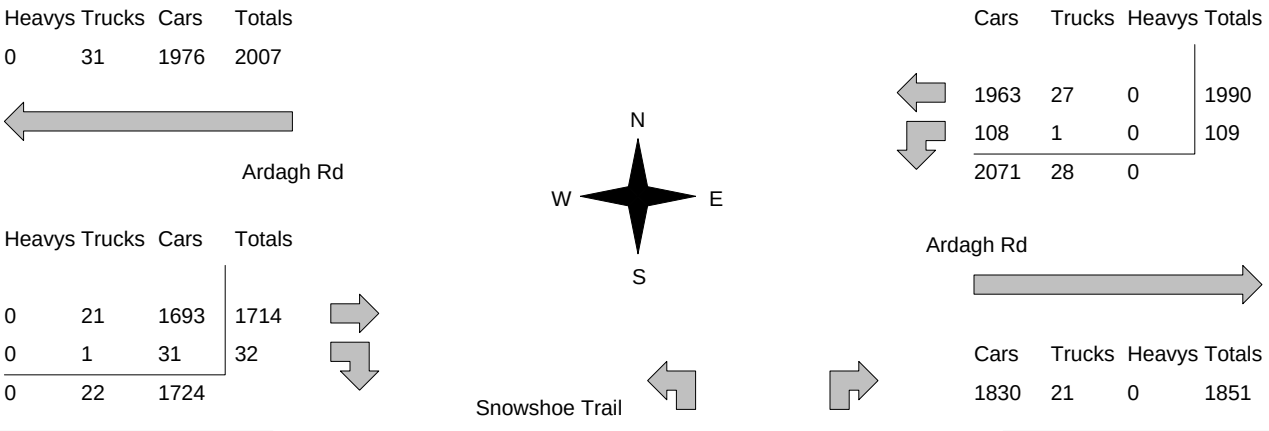
Comments

Ontario Traffic Inc.

Total Count Diagram

Municipality: Barrie	**Weather conditions:**
Site #: 1904400001	
Intersection: Ardagh Rd & Snowshoe Trail	**Person(s) who counted:**
TFR File #: 16	
Count date: 21-Feb-19	
**** Non-Signalized Intersection ****	**Major Road:** Ardagh Rd runs W/E

East Leg Total: 3950
East Entering: 2099
East Peds: 4
Peds Cross: ⧖



Peds Cross:	⧖		Cars	139		Cars	13	137	150	Peds Cross:	⋈
West Peds:	2		Trucks	2		Trucks	4	0	4	South Peds:	17
West Entering:	1746		Heavys	0		Heavys	0	0	0	South Entering:	154
West Leg Total:	3753		Totals	141		Totals	17	137		South Leg Total:	295

Comments

Ontario Traffic Inc.
Traffic Count Summary

Intersection: Ardagh Rd & Snowshoe Trail | **Count Date:** 21-Feb-19 | **Municipality:** Barrie

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	0	0	0	0	0	41
9:00:00	0	0	0	0	0	42
16:00:00	0	0	0	0	0	0
17:00:00	0	0	0	0	0	18
18:00:00	0	0	0	0	0	22
19:00:00	0	0	0	0	0	31
Totals:	0	0	0	0	0	154

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	8	0	33	41	0
9:00:00	3	0	39	42	1
16:00:00	0	0	0	0	0
17:00:00	0	0	18	18	4
18:00:00	4	0	18	22	7
19:00:00	2	0	29	31	5
Totals:	17	0	137	154	17

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	12	230	0	242	0	619
9:00:00	3	223	0	226	2	678
16:00:00	0	3	0	3	0	7
17:00:00	36	593	0	629	2	961
18:00:00	28	531	0	559	0	865
19:00:00	30	410	0	440	0	714
Totals:	109	1990	0	2099	4	3844

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	373	4	377	0
9:00:00	0	447	5	452	0
16:00:00	0	4	0	4	0
17:00:00	0	323	9	332	0
18:00:00	0	297	9	306	2
19:00:00	0	269	5	274	0
Totals:	0	1713	32	1745	2

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	7:00	8:00	9:00	16:00	17:00	18:00	19:00
Crossing Values:	0	0	8	5	0	2	6	2

Ontario Traffic Inc.

Count Date: 21-Feb-19 Site #: 1904400001

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19:00:07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc.

Count Date: 21-Feb-19 Site #: 1904400001

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	29	29	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7:30:00	4	4	74	45	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
7:45:00	7	3	155	81	0	0	1	1	4	3	0	0	0	0	0	0	0	0	0	0
8:00:00	11	4	225	70	0	0	1	0	5	1	0	0	0	0	0	0	0	0	0	0
8:15:00	14	3	278	53	0	0	1	0	7	2	0	0	0	0	0	0	0	0	0	0
8:30:00	14	0	340	62	0	0	1	0	7	0	0	0	0	0	0	0	0	0	0	0
8:45:00	14	0	388	48	0	0	1	0	9	2	0	0	0	0	0	0	0	0	2	2
9:00:00	14	0	441	53	0	0	1	0	12	3	0	0	0	0	0	0	0	0	2	0
9:00:14	14	0	442	1	0	0	1	0	13	1	0	0	0	0	0	0	0	0	2	0
16:00:00	14	0	443	1	0	0	1	0	13	0	0	0	0	0	0	0	0	0	2	0
16:15:00	22	8	581	138	0	0	1	0	15	2	0	0	0	0	0	0	0	0	4	2
16:30:00	30	8	721	140	0	0	1	0	16	1	0	0	0	0	0	0	0	0	4	0
16:45:00	34	4	872	151	0	0	1	0	19	3	0	0	0	0	0	0	0	0	4	0
17:00:00	50	16	1030	158	0	0	1	0	19	0	0	0	0	0	0	0	0	0	4	0
17:15:00	61	11	1171	141	0	0	1	0	20	1	0	0	0	0	0	0	0	0	4	0
17:30:00	67	6	1326	155	0	0	1	0	20	0	0	0	0	0	0	0	0	0	4	0
17:45:00	74	7	1436	110	0	0	1	0	23	3	0	0	0	0	0	0	0	0	4	0
18:00:00	78	4	1557	121	0	0	1	0	23	0	0	0	0	0	0	0	0	0	4	0
18:15:00	88	10	1668	111	0	0	1	0	23	0	0	0	0	0	0	0	0	0	4	0
18:30:00	95	7	1757	89	0	0	1	0	23	0	0	0	0	0	0	0	0	0	4	0
18:45:00	106	11	1862	105	0	0	1	0	25	2	0	0	0	0	0	0	0	0	4	0
19:00:00	108	2	1963	101	0	0	1	0	27	2	0	0	0	0	0	0	0	0	4	0
19:00:07	108	0	1963	0	0	0	1	0	27	0	0	0	0	0	0	0	0	0	4	0

Ontario Traffic Inc.

Count Date: 21-Feb-19 Site #: 1904400001

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Heavys - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	2	2	0	0	16	12	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	4	2	0	0	25	9	3	2	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	5	1	0	0	33	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	5	0	0	0	39	6	3	0	0	0	0	0	0	0	0	0	0	0	1	1
8:30:00	5	0	0	0	52	13	3	0	0	0	0	0	0	0	0	0	0	0	1	0
8:45:00	5	0	0	0	61	9	3	0	0	0	0	0	0	0	0	0	0	0	1	0
9:00:00	7	2	0	0	72	11	4	1	0	0	0	0	0	0	0	0	0	0	1	0
9:00:14	7	0	0	0	72	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0
16:00:00	7	0	0	0	72	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0
16:15:00	7	0	0	0	81	9	4	0	0	0	0	0	0	0	0	0	0	0	1	0
16:30:00	7	0	0	0	83	2	4	0	0	0	0	0	0	0	0	0	0	0	2	1
16:45:00	7	0	0	0	87	4	4	0	0	0	0	0	0	0	0	0	0	0	5	3
17:00:00	7	0	0	0	90	3	4	0	0	0	0	0	0	0	0	0	0	0	5	0
17:15:00	9	2	0	0	95	5	4	0	0	0	0	0	0	0	0	0	0	0	7	2
17:30:00	9	0	0	0	99	4	4	0	0	0	0	0	0	0	0	0	0	0	9	2
17:45:00	9	0	0	0	106	7	4	0	0	0	0	0	0	0	0	0	0	0	10	1
18:00:00	11	2	0	0	108	2	4	0	0	0	0	0	0	0	0	0	0	0	12	2
18:15:00	12	1	0	0	115	7	4	0	0	0	0	0	0	0	0	0	0	0	14	2
18:30:00	12	0	0	0	122	7	4	0	0	0	0	0	0	0	0	0	0	0	16	2
18:45:00	12	0	0	0	132	10	4	0	0	0	0	0	0	0	0	0	0	0	16	0
19:00:00	13	1	0	0	137	5	4	0	0	0	0	0	0	0	0	0	0	0	17	1
19:00:07	13	0	0	0	137	0	4	0	0	0	0	0	0	0	0	0	0	0	17	0

Ontario Traffic Inc.

Count Date: 21-Feb-19 Site #: 1904400001

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	58	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	146	88	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	247	101	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	371	124	4	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	499	128	4	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0
8:30:00	0	0	607	108	5	1	0	0	9	6	0	0	0	0	0	0	0	0	0	0
8:45:00	0	0	700	93	7	2	0	0	11	2	0	0	0	0	0	0	0	0	0	0
9:00:00	0	0	807	107	9	2	0	0	13	2	0	0	0	0	0	0	0	0	0	0
9:00:14	0	0	811	4	9	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
16:00:00	0	0	811	0	9	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
16:15:00	0	0	904	93	12	3	0	0	13	0	1	1	0	0	0	0	0	0	0	0
16:30:00	0	0	977	73	12	0	0	0	13	0	1	0	0	0	0	0	0	0	0	0
16:45:00	0	0	1049	72	13	1	0	0	15	2	1	0	0	0	0	0	0	0	0	0
17:00:00	0	0	1132	83	17	4	0	0	15	0	1	0	0	0	0	0	0	0	0	0
17:15:00	0	0	1224	92	19	2	0	0	16	1	1	0	0	0	0	0	0	0	1	1
17:30:00	0	0	1271	47	22	3	0	0	17	1	1	0	0	0	0	0	0	0	1	0
17:45:00	0	0	1358	87	24	2	0	0	17	0	1	0	0	0	0	0	0	0	1	0
18:00:00	0	0	1426	68	26	2	0	0	18	1	1	0	0	0	0	0	0	0	2	1
18:15:00	0	0	1487	61	28	2	0	0	18	0	1	0	0	0	0	0	0	0	2	0
18:30:00	0	0	1567	80	29	1	0	0	18	0	1	0	0	0	0	0	0	0	2	0
18:45:00	0	0	1635	68	30	1	0	0	20	2	1	0	0	0	0	0	0	0	2	0
19:00:00	0	0	1692	57	31	1	0	0	21	1	1	0	0	0	0	0	0	0	2	0
19:00:07	0	0	1693	1	31	0	0	0	21	0	1	0	0	0	0	0	0	0	2	0

Appendix D –
Transportation Tomorrow Survey Excerpts

datamanagementgroup

Hello John Northcote

Database Index | DMG | TTS | CCP | Contact | Logout

TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

Planning district of desti... × | 2006 GTA zone of hous... × | (Optional) Table Attribute

Group Attributes

Row Grouping | Column Grouping | Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☑	Start time of trip	In	700-900
And			
☑	Trip purpose of destination	In	w,r
And			
☑	2006 GTA zone of household	In	8522

Add | Delete

Output

Output

Comma-delimited table | Column format | Expansion Factor Or | Click to Selec: Load | Load

Execute Query | Select All | Save As

```
Tue Mar 05 2019 00:43:48 GMT-0500 (Eastern Standard Time) - Run Time: 3231ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest
Column: 2006 GTA zone of household - gta06_hhld


Filters:
(Start time of trip - start_time In 700-900
and
Trip purpose of destination - purp_dest In w,r
and
2006 GTA zone of household - gta06_hhld In 8522)

Trip 2016
Table:

,8522
PD 4 of Toronto,31
PD 8 of Toronto,29
PD 9 of Toronto,20
PD 11 of Toronto,76
Newmarket,126
Aurora,84
Markham,50
Vaughan,91
Brampton,8
Mississauga,34
Barrie,2133
Innisfil,239
Bradford-West Gwillimbury,45
New Tecumseth,70
Adjala-Tosorontio,37
Essa,31
Clearview,32
Springwater,108
Haliburton,20
Grey,7
Collingwood,35
Penetanguishene,9
Orillia,190
```

datamanagementgroup

Hello John Northcote

Database Index | DMG | TTS | CCP | Contact | Logout

TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

2006 GTA zone of cestl... × | 2006 GTA zone of hous... × | (Optional) Table Attribute

Group Attributes

Row Grouping | Column Grouping | Table Grouping

Grouping file: Choose File | No file chosen

Filter Selection +

☑	Start time of trip	In	700-900
	And		
☑	Trip purpose of destination	In	w,r
	And		
☑	2006 GTA zone of household	In	8522
	And		
☑	Planning district of destination	In	81,

Add | Delete

Add Delete

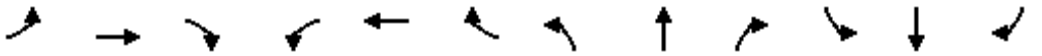
Output

Comma-delimited table Column format Expansion Factor On Click to Select Load Load

Execute Query Select All Save As

```
Tue Mar 05 2019 00:58:26 GMT-0500 (Eastern Standard Time) - Run Time: 2568ms

Cross Tabulation Query Form - Trip - 2016 V1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: 2006 GTA zone of household - gta06_hhld


Filters:
(Start time of trip - start_time In 700-900
and
Trip purpose of destination - purp_dest In w,r
and
2006 GTA zone of household - gta06_hhld In 8522
and
Planning district of destination - pd_dest In 81, )

Trip 2016
Table:

,8522
8501,296
8502,17
8504,96
8508,18
8509,156
8510,139
8513,18
8514,55
8518,42
8520,7
8521,267
8522,163
8523,37
8524,404
8526,61
8527,270
8530,80
```

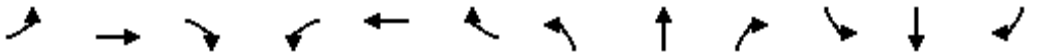
Appendix E –
Synchro Analysis Output –
Total Traffic Volumes



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	663	5	14	364	2	6	0	46	8	0	3
Future Volume (Veh/h)	1	663	5	14	364	2	6	0	46	8	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1	705	5	15	387	2	6	0	49	9	0	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	389			710			1128	1128	708	1174	1130	388
vC1, stage 1 conf vol							710	710		418	418	
vC2, stage 2 conf vol							418	419		756	712	
vCu, unblocked vol	389			710			1128	1128	708	1174	1130	388
tC, single (s)	4.1			4.2			7.5	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.5	5.5		6.1	5.5	
tF (s)	2.2			2.3			3.9	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			98	100	89	97	100	100
cM capacity (veh/h)	1170			858			324	382	438	311	373	660

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1	710	15	389	55	12
Volume Left	1	0	15	0	6	9
Volume Right	0	5	0	2	49	3
cSH	1170	1700	858	1700	422	415
Volume to Capacity	0.00	0.42	0.02	0.23	0.13	0.03
Queue Length 95th (m)	0.0	0.0	0.4	0.0	3.6	0.7
Control Delay (s)	8.1	0.0	9.3	0.0	14.8	15.3
Lane LOS	A		A		B	C
Approach Delay (s)	0.0		0.3		14.8	15.3
Approach LOS					B	C

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	50.5%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	447	9	49	820	8	3	0	18	8	0	3
Future Volume (Veh/h)	3	447	9	49	820	8	3	0	18	8	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	481	10	53	882	9	3	0	19	9	0	3
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												2
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	891			491			1482	1489	486	1498	1490	886
vC1, stage 1 conf vol							492	492		992	992	
vC2, stage 2 conf vol							990	997		506	497	
vCu, unblocked vol	891			491			1482	1489	486	1498	1490	886
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			99	100	97	96	100	99
cM capacity (veh/h)	761			1083			255	275	585	249	273	343

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	3	491	53	891	22	12
Volume Left	3	0	53	0	3	9
Volume Right	0	10	0	9	19	3
cSH	761	1700	1083	1700	498	332
Volume to Capacity	0.00	0.29	0.05	0.52	0.04	0.04
Queue Length 95th (m)	0.1	0.0	1.2	0.0	1.1	0.9
Control Delay (s)	9.8	0.0	8.5	0.0	12.6	18.9
Lane LOS	A		A		B	C
Approach Delay (s)	0.1		0.5		12.6	18.9
Approach LOS					B	C

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	60.3%	ICU Level of Service	B	
Analysis Period (min)	15			

Appendix F –
OTM Signal Justification Sheets

Justification No. 7 - 2031 Total Traffic (Critical Case)

Ardagh Rd / Snowshoe Trail & Site Access

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
		Rest. Flow	Numerical	%			
1. Minimum Vehicluar Volume	A. Vehicle volume, all aproaches (average hour)	720	620	86%	12%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	170	24	14%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	590	82%	7%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	6	8%		NO	NO