Bear Creek Village

City of Barrie

Traffic Impact Study for

Wynstar Bear Creek LP

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Executive Summary

This report summarizes the traffic impact study prepared for the proposed residential development located on the north side of Ardagh Road between Pennell Drive and Mapleton Avenue, in the City of Barrie [City]. The report assesses the impact of traffic related to the development on the adjacent roadway and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed development is Phase 2B of the Bear Creek Subdivision and includes the construction of 308 residential units, including 218 townhouse units and a 90-unit apartment building.

The proposed development will include two full-movement access driveways onto Summerset Drive [North Access] and Ardagh Road [South Access].

The scope of this analysis includes a review of the following intersections:

- Wright Drive & Grants Way / Ardagh Road;
- Summerset Drive & Mapleton Avenue / Ardagh Road;
- Wright Drive & Graihawk Drive / Summerset Drive;
- South Access / Ardagh Road; and
- North Access / Summerset Drive.

Conclusions

1. The proposed development is expected to generate a total of 132 AM and 159 PM peak hour trips.
2. Background traffic and pedestrian counts conducted on Thursday October 6th, 2016 were utilized for the existing intersection of Graihawk Drive & Wright Drive / Summerset Drive. Additional background traffic and pedestrian counts were obtained from the City of Barrie for the existing intersection of Mapleton Avenue / Ardagh Road conducted on Wednesday October 22, 2014 and Wright Drive & Grant's Way / Ardagh Road conducted on Tuesday October 17, 2017.
3. An intersection operation analysis was completed at the study area intersections, using the existing and background (2030) traffic volumes, with the adjacent development traffic and without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. No improvements are recommended within the study area.
4. 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.
5. An intersection operation analysis was completed under total (2030) traffic volumes with the proposed development operational at the study area intersections. No improvements are recommended within the study area with respect to intersection operations.
6. The proposed Site Accesses will operate efficiently with one-way stop control for egress movements. A single lane for ingress and egress movements will provide the necessary capacity to convey the traffic volume generated by the proposed development.
7. The proposed parking meets the City's Zoning By-law parking requirements.
8. The sight distance available for the proposed Site Accesses is suitable for the intended use.
9. It is recommended that the community safety zone is extended on Summerset Drive, approximately 250 metres west of Wright Drive. Similarly, it is recommended that the posted 40km/h speed limit zone is extended approximately 200 metres west of Wright Drive.

10. A median island is recommended west of the North Access. A conceptual layout for the recommended median island is provided in the **Appendix H**.
11. The subject sites has very good access to active transportation infrastructure.
12. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

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1 Introduction

1.1 Background

Wynstar Bear Creek LP [The Developer] is proposing a residential development on the north side of Ardagh Road between Wright Drive and Pennell Drive, in the City of Barrie [City]. The development is Phase 2B of the Bear Creek Subdivision, previously approved to include 238 residential units.

The revised development proposal now includes the construction of 308 residential units, including 218 townhouse units and a 90-unit apartment building.

The subject site was previously considered in the *Meadows of Bear Creek Traffic Impact Study* [Meadows TIS] (JD Northcote Engineering Inc., October 17th 2016) as a medium density block. References to the Meadows TIS have be made throughout this study.

The proposed development will include two full-movement access driveways onto Summerset Drive [North Access] and Ardagh Road [South Access].

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

1.2 Study Area

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

The subject site is bound by the extension of Summerset Drive to the north and west, Ardagh Road to the south and the Meadows of Bear Creek development to the east.

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

- Wright Drive & Grants Way / Ardagh Road;
- Summerset Drive & Mapleton Avenue / Ardagh Road;
- Wright Drive & Graihawk Drive / Summerset Drive;
- South Access / Ardagh Road; and
- North Access / Summerset Drive.

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 accesses 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;
- Complete level-of-service [LOS] analysis of horizon year (without the proposed development) traffic conditions and identify operational deficiencies;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete LOS analysis of horizon year (with the proposed development) traffic conditions and identify additional operational deficiencies;
- Identify improvement options to address operational deficiencies;
- Review the proposed parking supply and assess the suitability for the proposed development;
- Review the intersection spacing and available sight distance at the proposed site access driveways;
- Provide a recommendation for any traffic calming measures necessary on Summerset Drive to address potential cut through traffic;
- Review the construction staging plan for the development of the subject site; and
- Document findings and recommendations in a final report.

1.4 Horizon Year and Analysis Periods

Traffic scenarios for the existing year and 10-year post-buildout horizon year (2030) were 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 arterial road with an urban cross-section and sidewalks on both sides of the road in the study area. Ardagh Road has painted bike lanes east of Wright Drive / Grant's Way and buffered bike lanes west of Wright Drive / Grant's Way. The posted speed limit on Ardagh Road is 50km/h in the study area. Ardagh Road is under the jurisdiction of the City.

Mapleton Avenue is a three-lane major collector road with an urban cross-section with a sidewalk on the east side of the street and a paved multi-use trail on the west side of the street in the study area. Mapleton Avenue has a posted speed limit of 50km/h (and a community safety zone) in the study area. Mapleton Avenue is under the jurisdiction of the City.

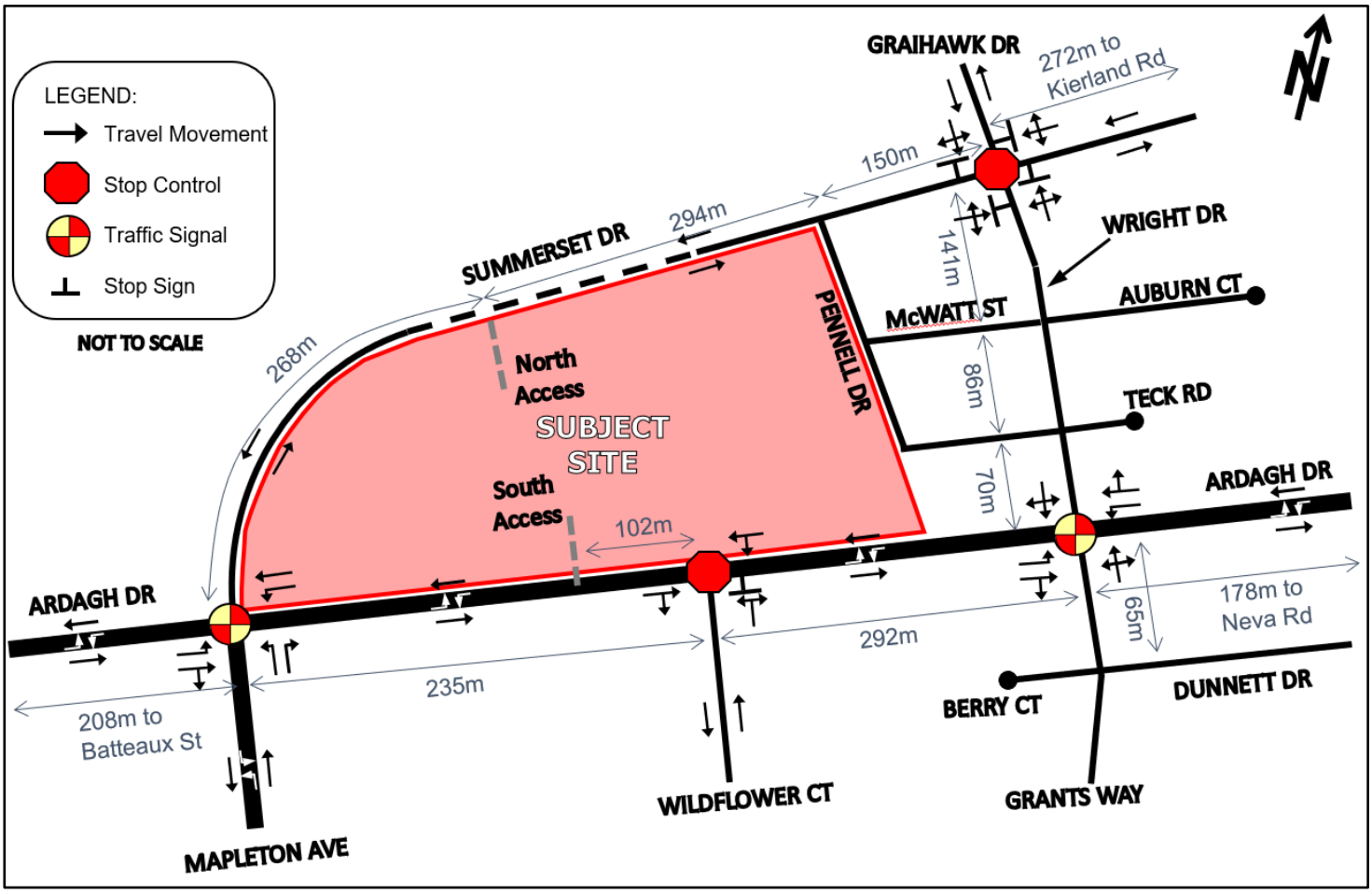
Summerset Drive is a two-lane minor collector road with an urban cross-section and sidewalks on both sides of the road and a posted speed limit of 40km/h (and a community safety zone) in the study area. Summerset Drive is under the jurisdiction of the City.

Wright Drive is a two-lane local road with a posted speed limit of 40km/h (and a community safety zone) from the Teck Road stub to Summerset Drive and a posted speed limit of 50km/h south of the Teck Road stub. Wright Drive has an urban cross-section with a sidewalk on the east side of the road. Wright Drive is under the jurisdiction of the City.

Grant's Way is a two-lane local road with an assumed (unposted) speed limit of 50km/h. Grant's Way has an urban cross-section with a sidewalk on the west side of the road. Grant's Way 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 (2020) Intersection Spacing and Lane Configuration with in Study Area



2.2 Local Transportation Infrastructure Improvements

Based on the City's Transportation Master Plan [TMP] (April 2019), the following road improvements listed as short-term improvements (2019 to 2023):

- Summerset Drive;
  - Construction of the two-lane extension to Ardagh Road; and
  - Provision of buffered bike lanes between Ardagh Road to Nicholson Drive.
- Mapleton Avenue;
  - Provision of buffered bike lanes between Batteaux Street to Marsellus Drive.
- Wright Drive;
  - Provision of a bike lane from Ardagh Road and Summerset Drive.

2.3 Transit Access

The 7A & 7B Grove / Bear Creek bus route travels in both directions along Ardagh Road and Mapleton Avenue in the study area. The 7A & 7B bus route travels between the Downtown Terminal and Park Place with branching access throughout the City from these hubs. This route provides service every half hour in each direction during the regular service hours (Monday to Saturday). Reduced service is available on Sundays.

The closest northbound / southbound bus stops are located at the intersection of Ardagh Road / Wildflower Court.

2.4 Other Developments within the Study Area

As part of the previously completed Meadows TIS, the following developments were noted for consideration:

- 233 Ardagh Road (not developed);
- Teck Road – 9 to 12 residential units (not developed);
- Greenwich Village (developed and occupied);
- Vacant lands north of Summerset Drive, Gore Drive and Kierland Drive (not developed); and
- Agricultural and Environmental Protection lands west of the subject site (not developed).

As indicated, the majority of developments in the study area have yet to be developed, with the exception of the Greenwich Village subdivision.

A subsequent review of the City's Proposed Development webpage was undertaken to determine any further planned developments that may impact local traffic volumes in the study area. The lone development of significance (excluding the Teck Road units) is the 224 Ardagh Road mixed use development. In review of the available *224 Ardagh Road Traffic Brief* (Paradigm Transportation Solution Limited, May 2019), traffic generated by the proposed development will be limited to less than 10 vehicles on Ardagh Road during both peak hours. Given the relatively negligible volumes and proximity to the subject site, the 224 Ardagh Road development volumes have not been explicitly considered.

As previously noted, the subject site is part of the Meadows of Bear Creek development which was previously proposed to include 78 single-family units in addition to the 4.5 hectare medium density block (subject site). For the purpose of this study, the 78 single-family units have been considered as a background development.

2.5 Adjacent Development Traffic Volumes

In general, there is a significant amount of anticipated development planned within the annexed lands at the south end of the City, as well as intensification developments along the City's major corridors. Given their proximity to the subject site, anticipated traffic volumes generated by both the Teck Road residential units and Meadows of Bear Creek single-family units have been explicitly considered.

As in the Meadows TIS, traffic volumes generated by the remainder of the background developments in and around the study area have been estimated using the City's EMME travel demand models (further discusses in the proceeding section).

Traffic generation for Teck Road and Meadows of Bear Creek single-family units have been calculated based on the data provided in 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 adjacent developments:

- ITE land use 210 (Single-Family Detached Housing) – General Urban / Suburban Setting

Given the strong statistical relationship, the fitted curve equation has been utilized. **Table 1** summarizes the utilized ITE equation and estimated peak hour generated trips.

Table 1 – Estimated Traffic Generation – Background Developments

Land Use / Development	Trip Basis / Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Single-Family Detached ITE Land Use: 210	equation	T = 0.71 X + 4.80			Ln(T) = 0.96 Ln(X) + 0.2		
	distribution	25%	75%	100%	63%	37%	100%
Teck Road	12	3	10	13	8	5	13
Meadows of Bear Creek	78	15	45	60	50	30	80
Total		18	55	73	58	35	93

Using the traffic distribution pattern noted in Section 2.4.2, the Teck Road and Meadows of Bear Creek traffic assignment was calculated for the AM and PM peak hour and is illustrated in **Figure 3** and **Figure 4.**

2.6 Background Traffic Growth

As previously mentioned, the impact of development growth within and external to the study area has been inherently considered by utilizing the City's EMME models for future traffic projections (which considers development traffic volumes throughout the City). **Table 2** summaries the average annual traffic growth on each street in the study area based on the EMME data and the assumed/applied growth rates for analyses in this report.

Table 2 – Average Annual Traffic Growth Rate (EMME Data)

Road	Average Annual Traffic Growth Rate (EMME Data)	Average Annual Traffic Growth Rate Applied in Analysis Modeling
Ardagh Road	1.61%	2.0%
Mapleton Avenue	0.41%	2.0%
Summerset Drive	2.52%	3.0%
Wright Drive	N/A	3.0%
Graihawk Drive	N/A	0%
Grants Way	0%	0%

As indicated, inflated growth rates have been utilized for all roadways to ensure a conservative approach. Recognizing that Grants Way is a fully-developed local roadway, no background growth rate has been applied. Similarly, no traffic growth is expected on Graihawk Drive other than traffic generated trips associated with the Meadows of Bear Creek development, which have been considered separately.

2.7 Traffic Counts

Detailed turning movement traffic and pedestrian counts were obtained from the City at the following intersections:

- Ardagh Road / Mapleton Avenue; and
- Ardagh Road / Wright Drive / Grants Way.

Additional detailed turning movement traffic and pedestrian counts were completed by JD Engineering at the intersection of Summerset Drive / Graihawk Drive / Wright Drive. **Table 3** summarizes the traffic count data collection information.

Table 3 – Traffic Count Data

Intersection (N-S Street / E-W Street)	**Count Date**	**AM Peak Hour**	**PM Peak Hour**	**Source**
Mapleton Avenue / Ardagh Road	Wednesday October 22, 2014	08:00 – 09:00	16:30 – 17:30	City
Wright Drive & Grant's Way / Ardagh Road	Tuesday October 17, 2017	07:30 – 08:30	16:15 – 17:15	City
Graihawk Drive & Wright Drive / Summerset Drive	Thursday October 6, 2016	08:00 – 09:00	14:45 – 15:45	JD Eng.

Detailed traffic count data can be found in **Appendix B**. The peak hours of traffic generation for the study area intersections varied slightly as a result of the traffic generated by the schools on Summerset Drive. Although the AM and PM peak periods at all study area intersections do not exactly align (specifically the PM peak hour at Graihawk Drive / Wright Drive / Summerset Drive), for the purpose of this report the peak hours have been assumed

Typically, with above traffic counts being somewhat dated, new counts would be commissioned at these intersections to reflect existing traffic conditions. However, with the timing of the study coinciding with the COVID-19 pandemic, any retrieved data would not reflect typical roadway operations. As such, alternative measures were taken to update the noted counts to reflect 2020 conditions.

2.8 Existing Traffic Volumes

The 2020 existing AM and PM peak hour traffic volumes through the study area have been established based on the obtained and conducted traffic counts, adjusted to reflect the annual background growth rates noted in Section 2.6.

Further consideration has been given to build-out that has occurred within the Meadows of Bear Creek and Teck Road background developments. At the time of this report, a site visit confirmed that approximately 27 of the 78 units within the Meadows of Bear Creek development have been built and occupied. Construction of the Teck Road units have has not started.

In review of the developed 2020 scenario, a significant discrepancy in midblock traffic volumes on Ardagh Road was realized between Wright Drive and Mapleton Avenue (upwards of 150 and 250 trips during the AM and PM peak hours, respectively). While some traffic generators of significance exist between the two intersections, namely the St. Joan of Arc parking lot access and commercial plaza at Mapleton Avenue / Ardagh Road, a traffic volume of this magnitude is unlikely.

As such, volumes through the intersections have been balanced to within 50 vehicles of the higher of the two midblock counts (west leg of Ardagh Rd / Wright Drive intersection). The PM peak hour was chosen to establish the balancing percentage increase of 40%, given that afternoon peak hour is expected to see lower imbalances. With the AM peak hour capturing the morning school cycle, higher imbalances are expected to occur.

The existing (2020) AM and PM peak hour traffic volumes are illustrated in **Figure 5**.

2.9 Horizon Year Traffic Volumes

The background (2030) horizon year traffic volumes without the proposed development were estimated using the background traffic growth discussed in Section 2.6 and in addition to the full build-out adjacent development traffic volumes (outlined in Section 2.4). Volume balancing between the intersections on Ardagh Road was also included in the traffic projections for 2030.

Further consideration has been given to the extension of Summerset Drive from Wright Drive to Ardagh Road, which is expected to occur prior to the 2030 horizon year. The construction of the Summerset Drive extension will create an alternative connection to Ardagh Road that motorists may choose to use. Based on our review of the existing and planned development in the study area in context with the existing traffic volumes observed at the study area intersections, the following redistribution is expected;

- 40% of westbound left turns at Wright Drive will be redistributed to Summerset Drive; and
- 40% of southbound right turn at Wright Drive will be redistributed to Summerset Drive

The distribution of the diverted traffic beyond the Summerset Drive / Mapleton Avenue / Ardagh Road intersection is assumed to follow the local traffic distribution pattern identified in Section 4.2. **Figure 6** illustrates the noted redistribution.

The background (2030) horizon year traffic volumes are illustrated in **Figure 7**.

3 Intersection Operation without Proposed Development

3.1 Introduction

Existing and background horizon operational conditions were established to determine how the street network within the study area is currently functioning without the proposed development. This provides a base case scenario to compare with future development scenarios. Traffic operations within the study area were evaluated using the existing and future background traffic volumes with the existing road configuration and traffic control. The intersection performance was measured using the traffic analysis software, Synchro 9, 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 9 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

3.2 Existing Intersection Operation

The results of the LOS analysis under existing (2020) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix C**.

Table 5 – Background (2023) 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 / Mapleton Avenue (signalized)	0.26	13.7	B	0.43	12.2	B
EB	0.27	9.9	A	0.38	12.0	B
WBL	0.19	3.5	A	0.42	4.6	A
WB	0.14	3.4	A	0.20	3.7	A
NBL	0.24	29.0	C	0.28	29.1	C
NBR	0.16	28.5	C	0.14	28.3	C
Ardagh Road / Wright Drive & Grants Way (signalized)	0.49	9.4	A	0.37	8.3	A
EBL	0.19	4.5	A	0.15	3.8	A
EBTR	0.51	6.4	A	0.30	4.4	A
WBL	0.02	3.3	A	0.02	3.1	A
WBTR	0.44	5.8	A	0.38	4.9	A
NB	0.23	27.2	C	0.14	27.4	C
SB	0.40	28.5	C	0.33	28.7	C
Summerset Drive / Wright Drive & Graihawk Drive (unsignalized)	-	10.4	B	-	8.8	A
NB	0.47	10.6	B	0.31	8.7	A
EB	0.01	7.9	A	0.01	7.3	A
WB	0.32	10.5	B	0.25	9.3	A
SB	0.06	8.4	A	0.05	8.0	A

The results of the LOS analysis indicate that all the intersections in the study area are operating at a good LOS or better for all turning movements.

No additional improvements are recommended within the study area.

3.3 Background (2030) Intersection Operation

The results of the LOS analysis under background (2030) traffic volumes during the AM and PM peak hour can be found below in **Table 6**. Existing intersection geometry and traffic control have been utilized for this scenario, with the addition of the Summerset Drive extension. A shared left/through/right turn lane has been assumed at the new north leg of the Ardagh Road / Mapleton Avenue & Summerset Drive extension intersection, in order to be conservative. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 6 – Background (2030) 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 / Mapleton Avenue & Summerset Drive extension (signalized)	0.32	16.1	B	0.52	15.7	B
EBL	0.04	12.0	B	0.06	13.0	B
EBTR	0.35	15.0	B	0.48	17.8	B
WBL	0.26	6.4	A	0.58	9.2	A
WBTR	0.18	6.2	A	0.26	6.7	A
NBL	0.15	25.5	C	0.18	25.7	C
NBR	0.25	26.3	C	0.24	26.2	C
SB	0.10	24.2	C	0.12	24.6	C
Ardagh Road / Wright Drive & Grants Way (signalized)	0.64	12.5	B	0.47	8.9	A
EBL	0.23	6.4	A	0.16	4.3	A
EBTR	0.65	10.2	B	0.37	5.2	A
WBL	0.02	4.5	A	0.02	3.3	A
WBTR	0.58	9.1	A	0.48	6.2	A
NB	0.16	25.2	C	0.12	26.8	C
SB	0.62	31.7	C	0.42	29.1	C
Summerset Drive / Wright Drive & Graihawk Drive (unsignalized)	-	14.2	B	-	10.0	A
NB	0.64	15.7	C	0.37	10.0	A
EB	0.13	9.7	A	0.14	8.8	A
WB	0.47	13.6	B	0.35	10.7	B
SB	0.08	9.3	A	0.06	8.5	A

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.1.

No additional improvements are recommended within the study area.

4 Proposed Development

4.1 Traffic Generation

The traffic generation for the subject site has been based on the ITE Trip Generation Manual. The following ITE land use has been applied to estimate the traffic from the proposed development:

- ITE land use 220 (Multifamily Housing (Low-Rise)); and
- ITE land use 221 (Multifamily Housing (Mid-Rise)).

The AM and PM peak hour traffic generation for the adjacent developments do not 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. For trip rates showing a strong statistical relationship, fitted curve equations have been utilized. **Table 7** summarizes the utilized trips generation rates and equations.

Table 7 – ITE Traffic Generation Rates & Equations

Land Use	Trip Basis	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	equation (units)	Ln(T) = 0.95 Ln(X) - 0.51			Ln(T) = 0.89 Ln(X) - 0.02		
	distribution	23%	77%	100%	63%	37%	100%
Multifamily Housing (Mid-Rise) ITE Land Use: 221	rate (units)	0.06	0.27	0.36	0.27	0.17	0.44

The estimated trip generation of the proposed development is illustrated below in **Table 8**.

Table 8 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	218 units	23	77	100	75	44	119
Multifamily Housing (Mid-Rise) ITE Land Use: 221	90 units	8	24	32	24	16	40
Total	**308 units**	**31**	**101**	**132**	**99**	**60**	**159**

No transportation modal split has been applied to the above-noted traffic generation calculation.

4.2 Traffic Assignment

For the purposes of this study, it has been assumed that all residential 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 distribution of generated 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 E**). TTS data provides historical origin and destination trip percentages for specific areas within the Town and the Greater Toronto and Hamilton Area [GTHA].

Traffic distribution for the trips generated by all the development are 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 9** using the methodology outlined above.

Table 9 – Proposed Development Traffic Distribution

Travel Direction (to / from)	Percent of Total Traffic Generation
North via Summerset Drive	18%
South via Mapleton Avenue	25%
East via Ardagh Road	43%
West via Ardagh Road	14%
TOTAL	**100%**

The distribution of traffic entering each access location is based on the site's internal configuration, in conjunction with the external traffic distribution.

The site traffic assignment for buildout of the proposed developments for the AM and PM peak hour is illustrated in **Figure 8**.

4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2030) horizon year traffic volumes, the proposed development traffic was added to the background (2030) traffic volumes. The resulting total (2030) horizon year traffic volume for the AM and PM peak hour are illustrated in **Figure 9**.

5 Future Operations

5.1 Total (2030) Intersection Operation

The results of the LOS analysis under total (2030) traffic volumes during the AM and PM peak hour can be found below in **Table 10**. Existing intersection geometry and traffic control have been utilized for this scenario, with the addition of the Summerset Drive extension. A shared left/through/right turn lane has been assumed at the new north leg of the Ardagh Road / Mapleton Avenue & Summerset Drive extension, in order to be conservative. Stop control has been assumed at the Site Access egress movements. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 10 – Total (2030) 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 / Mapleton Avenue & Summerset Drive extension (signalized)	0.33	16.3	B	0.55	16.2	B
EBL	0.04	12.2	B	0.08	13.3	B
EBTR	0.35	15.3	B	0.49	18.1	B
WBL	0.28	6.5	A	0.60	9.7	A
WBTR	0.19	6.2	A	0.26	6.7	A
NBL	0.16	25.6	C	0.19	25.8	C
NBR	0.27	26.4	C	0.29	26.5	C
SB	0.14	24.8	C	0.14	24.8	C
Ardagh Road / Wright Drive & Grants Way (signalized)	0.69	13.1	B	0.50	8.9	A
EBL	0.23	6.5	A	0.18	4.5	A
EBTR	0.70	11.4	B	0.39	5.3	A
WBL	0.03	4.6	A	0.02	3.4	A
WBTR	0.60	9.3	A	0.52	6.6	A
NB	0.16	25.2	C	0.12	26.8	C
SB	0.62	31.7	C	0.42	29.1	C
Summerset Drive / Wright Drive & Graihawk Drive (unsignalized)	-	14.7	A	-	10.4	B
NB	0.66	16.6	C	0.38	10.3	B
EB	0.18	10.1	B	0.17	9.1	A
WB	0.50	14.2	B	0.39	11.2	B
SB	0.08	9.5	A	0.06	8.6	A
Summerset Drive / North Access (unsignalized)	-	2.5	A	-	1.9	A
EBTR	0.03	0.0	-	0.05	0.0	-
WBTL	0.00	0.8	A	0.01	1.8	A
NB	0.04	9.1	A	0.03	9.2	A
Ardagh Road / South Access (unsignalized)	-	0.8	A	-	0.6	A
EBL	0.01	8.8	A	0.03	9.2	A
WBTR	0.36	0.0	-	0.40	0.0	-
SB	0.16	15.1	C	0.10	15.6	B

The results of the LOS analysis indicate that all intersections are operating within the typical design limits noted in Section 3.1.

No additional improvements are recommended within the study area.

5.2 Site Accesses

The North and South Site Accesses will operate efficiently as a full-movement driveway, with one-way stop control for the egress movements. Single ingress and egress lane will provide the necessary capacity to service the proposed development.

As illustrated in Figure 2, the spacing between the proposed North Access and the closest intersections (Ardagh Road/Pennell Drive) is in excess of the suggested minimum corner clearance

requirements as identified in the Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [TAC Guidelines] – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 55 metres for signalized and 25 metres for unsignalized conditions on a collector road.

As illustrated in Figure 2, the spacing between the proposed South Access and the closest intersections (Summerset Drive/Wildflower Court) is also in excess of the TAC Guidelines - Figure 8.8.2 – 70 metres for signalized and 35 metres for unsignalized conditions on an arterial road.

5.3 Sight Distance Review

A review of the available sight distances for the proposed North and South Accesses was completed as part of this analysis.

The sight distance east and west of the South Access is greater than both the minimum sight stopping and intersection sight distance requirements as identified in the TAC Guidelines for a design speed of 60km/h (85 and 130 meters, respectively).

In review of the site plan, the sight lines east and west of the proposed North Access are expected to exceed both the minimum sight stopping and intersection sight distance requirements as identified in the TAC Guidelines for a design speed of 60km/h (85 meters and 130 metres, respectively).

As such, there are no issues with the sight distances available for the proposed Site Accesses.

5.4 Active Transportation Review

As previously mentioned, Ardagh Road (which borders the subject site to the south) has sidewalks on both sides of the road in the addition to painted bike lanes east of Wright Drive / Grant's Way and buffered bike lanes west of Wright Drive / Grant's Way. As per the City's *Active Transportation Strategy* (April 2019), Summerset Drive (bordering the subject site to the north) is proposed to include buffered bike lanes from Ardagh Road to Nicholson Drive where an in-boulevard pathway exists.

Mapleton Avenue currently has a sidewalk on the east side of the street and a paved multi-use trail on the west side of the street. The City's Active Transportation Strategy further proposes buffered bike lanes on Mapleton Avenue from Batteaux Street to Marsellus Drive.

The proposed development is located adjacent to the Ardagh Bluffs, which provides 17 kms of recreational trails within 518 acres, south of Ardagh Road.

As illustrated in **Appendix A**, the proposed development will offer internal sidewalks adjacent all buildings, providing connection to the site's internal amenity areas and the existing and proposed pedestrian sidewalks located Ardagh Road and Summerset Drive. The townhouses adjacent Ardagh Road will provide direct walkout connection to the pedestrian infrastructure on Ardagh Road.

The subject site has good access to active transportation infrastructure.

5.5 Parking

As per the City of Barrie Comprehensive Zoning By-law 080-13, a residential building containing more than 3 dwelling units must provide 1.5 parking spaces per unit. In considering the City's parking standards, the parking requirement for the proposed development is 462 parking spaces.

As per the site plan, the proposed development will provide 610 spaces, satisfying the City's Zoning By-law requirement.

5.6 Traffic Calming

With the extension of Summerset Drive, an opportunity for cut-through traffic will occur for motorists seeking a travel route between Ferndale Drive and Ardagh Road. Although Summerset Drive is a minor collector road, the purpose of this road is not to provide an alternative route between two arterial roads.

The City has implemented speed cushions throughout the city as a form of temporary traffic calming. Currently, there are two sets of speed cushions along Summerset Drive between Wright Drive and Hawkins Drive, which will help to slow traffic over a longer length, while simultaneously discouraging cut-through traffic.

Although the existing all-way stop control at the Summerset Drive / Wright Drive / Graihawk Drive intersection was not recommended for traffic calming purposes, the all-way stop does interrupting the flow of traffic on Summerset Drive, which will have a traffic calming effect.

It is recommended that the community safety zone is extended on Summerset Drive, approximately 250 metres west of Wright Drive. Similarly, it is recommended that the posted 40km/h speed limit zone is extended approximately 200 metres west of Wright Drive.

A median island is recommended west of the North Access. A conceptual layout for the recommended median island is provided in the **Appendix G**.

No other permanent traffic calming infrastructure is recommended on Summerset Drive within the subject site; however, continued monitoring of the traffic along this route is recommended and additional traffic calming techniques may be considered / implemented, once the actual traffic distribution and operation is observed.

5.7 Construction Staging

A review of the construction staging plan was reviewed as it relates to parking of trades people, delivery of construction material, maintenance of adjacent property access, pedestrian movements, City infrastructure, etc.

It is recommended that the parking of construction vehicles, vehicles owned by staff and subcontractors be formally directed (in writing where possible) to avoid parking on municipal streets. Recognizing that the proposed development will be constructed on vacant land, trades parking can be accommodated on-site.

Access to the site will occur via the Summerset Drive extension to/from Ardagh Road, acting as a construction-only entrance. Secondary access will be available via Summerset Drive to the north, through the existing Meadows of Bear Creek subdivision. Both accesses will accommodate small scale deliveries/trades vehicles as well as larger construction vehicles and construction materials.

The expected construction staging plan is not expected to impede or prevent access to the neighboring subdivisions.

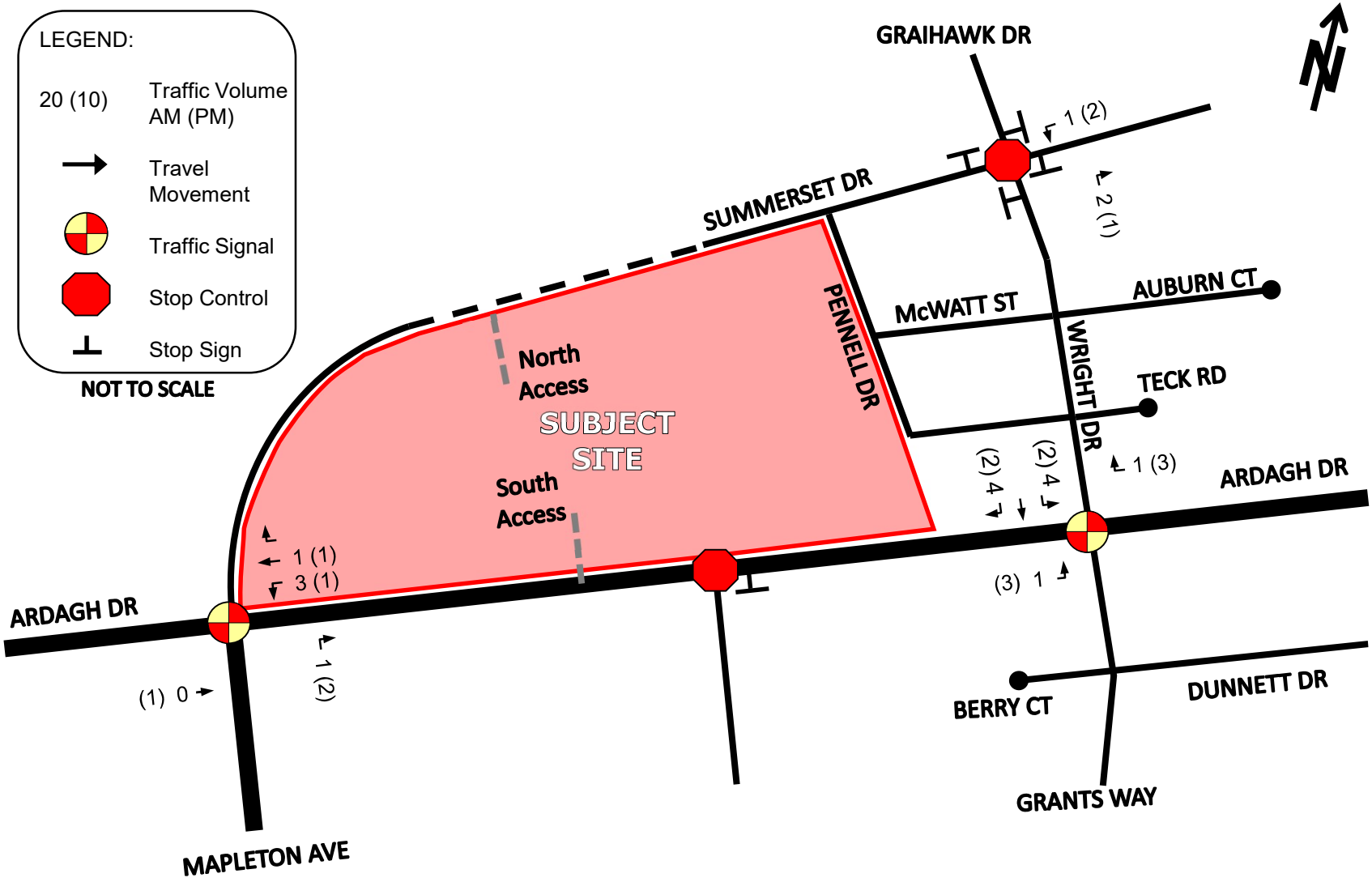
Pedestrian movements on Ardagh Road and Summerset Drive will remain largely unaffected by the construction of the proposed development. No long-term sidewalk closures are expected.

6 Summary

Wynstar Bear Creek LP retained **JD Engineering** to prepare this traffic impact study in support of the proposed residential development in the City of Wasaga. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

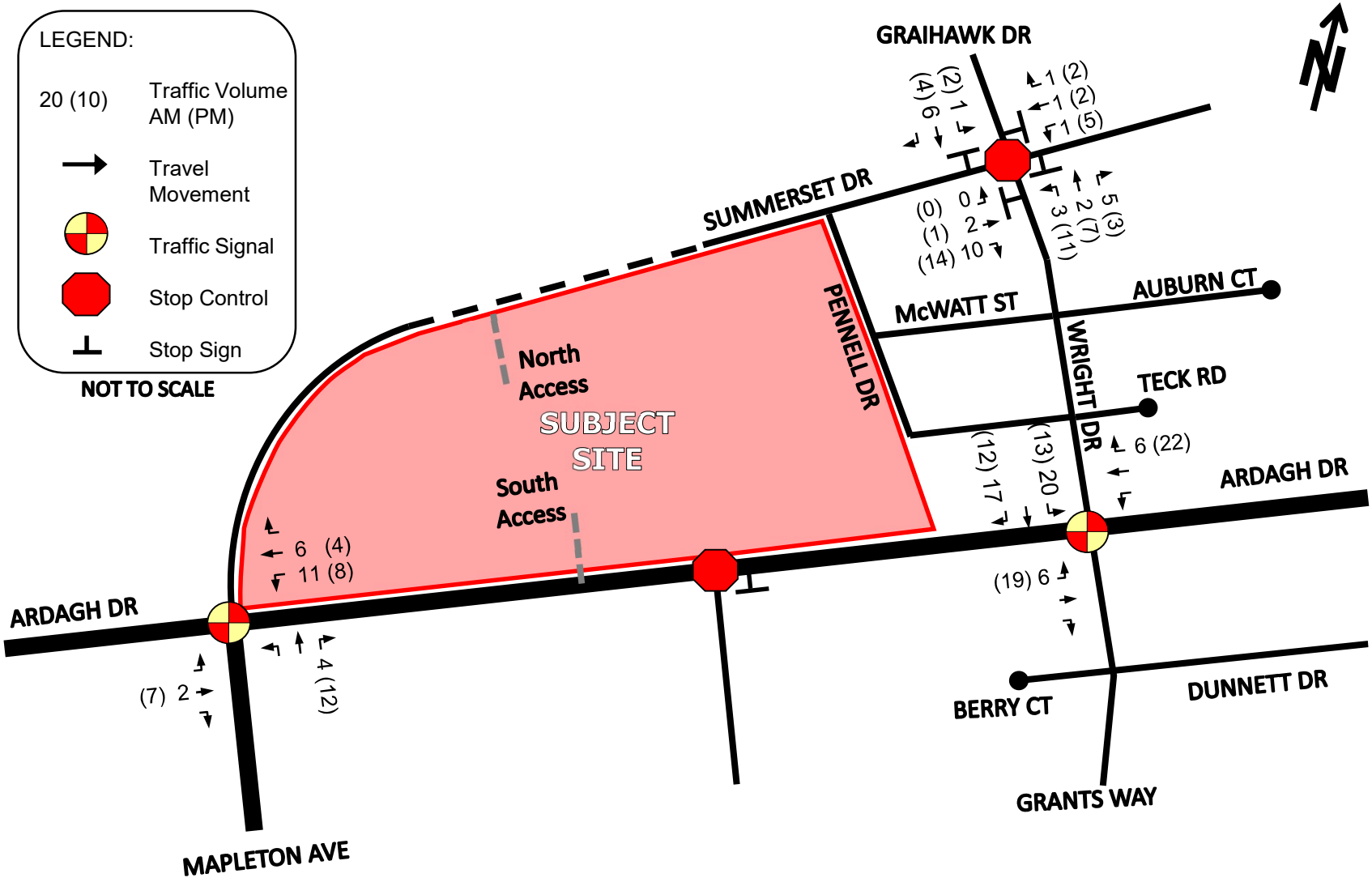
1. The proposed development is expected to generate a total of 132 AM and 159 PM peak hour trips.
2. Background traffic and pedestrian counts conducted on Thursday October 6th, 2016 were utilized for the existing intersection of Graihawk Drive & Wright Drive / Summerset Drive. Additional background traffic and pedestrian counts were obtained from the City of Barrie for the existing intersection of Mapleton Avenue / Ardagh Road conducted on Wednesday October 22, 2014 and Wright Drive & Grant's Way / Ardagh Road conducted on Tuesday October 17, 2017.
3. An intersection operation analysis was completed at the study area intersections, using the existing and background (2030) traffic volumes, with the adjacent development traffic and without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. No improvements are recommended within the study area.
4. 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.
5. An intersection operation analysis was completed under total (2030) traffic volumes with the proposed development operational at the study area intersections. No improvements are recommended within the study area with respect to intersection operations.
6. The proposed Site Accesses will operate efficiently with one-way stop control for egress movements. A single lane for ingress and egress movements will provide the necessary capacity to convey the traffic volume generated by the proposed development.
7. The proposed parking meets the City's Zoning By-law parking requirements.
8. The sight distance available for the proposed Site Accesses is suitable for the intended use.
9. It is recommended that the community safety zone is extended on Summerset Drive, approximately 250 metres west of Wright Drive. Similarly, it is recommended that the posted
10. A median island is recommended west of the North Access. A conceptual layout for the recommended median island is provided in the **Appendix H**.
11. The subject sites has very good access to active transportation infrastructure.
12. The Turning Movement Analysis completed demonstrates that the proposed site layout can accommodate the typical traffic movements.
13. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Figure 3: Adjacent Development Peak Hour Traffic Volumes – Teck Road



ENGINEERING

Figure 4: Adjacent Development Peak Hour Traffic Volumes – Meadows of Bear Creek



ENGINEERING

Figure 5: Existing (2020) Traffic Volumes

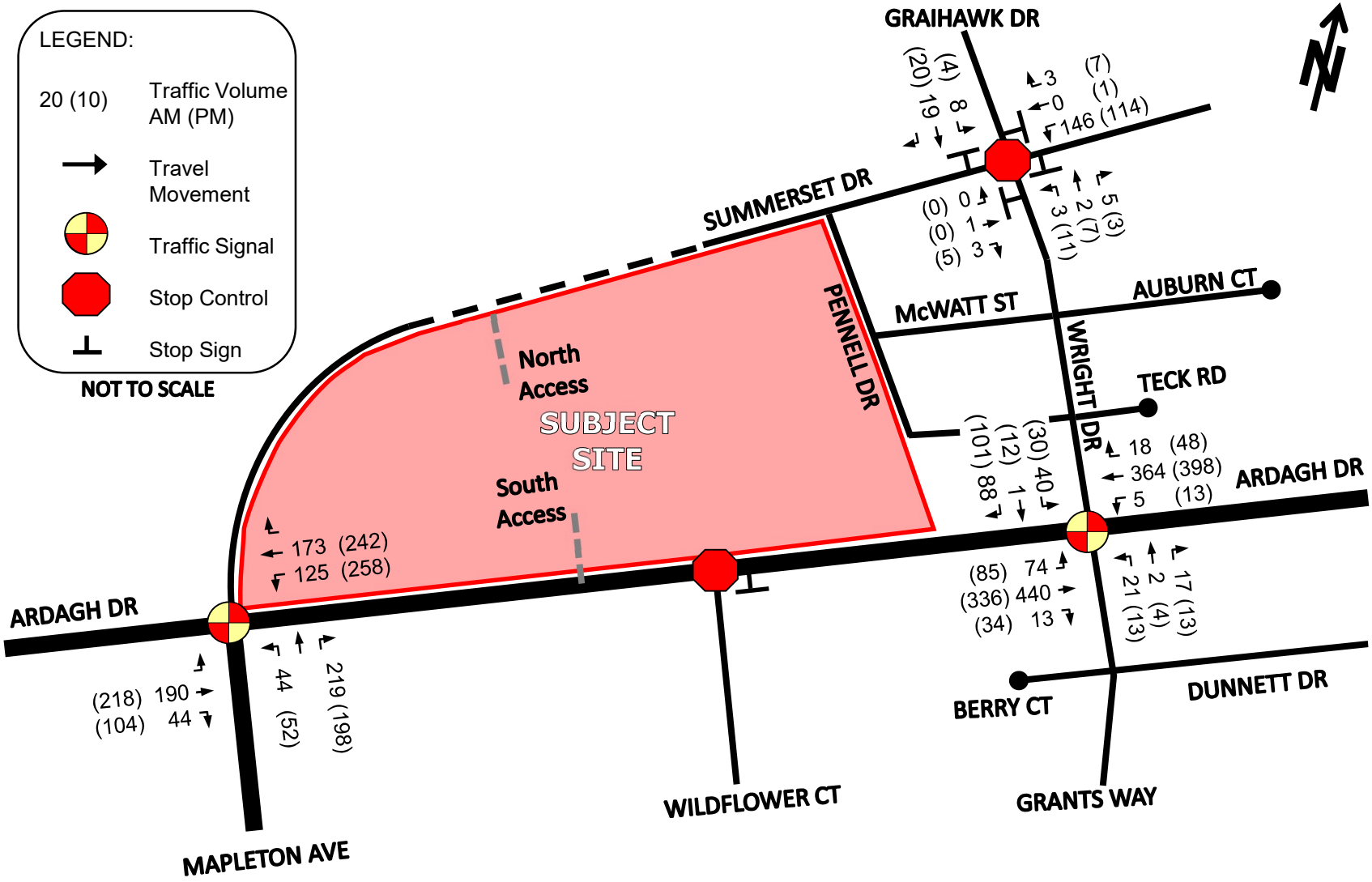


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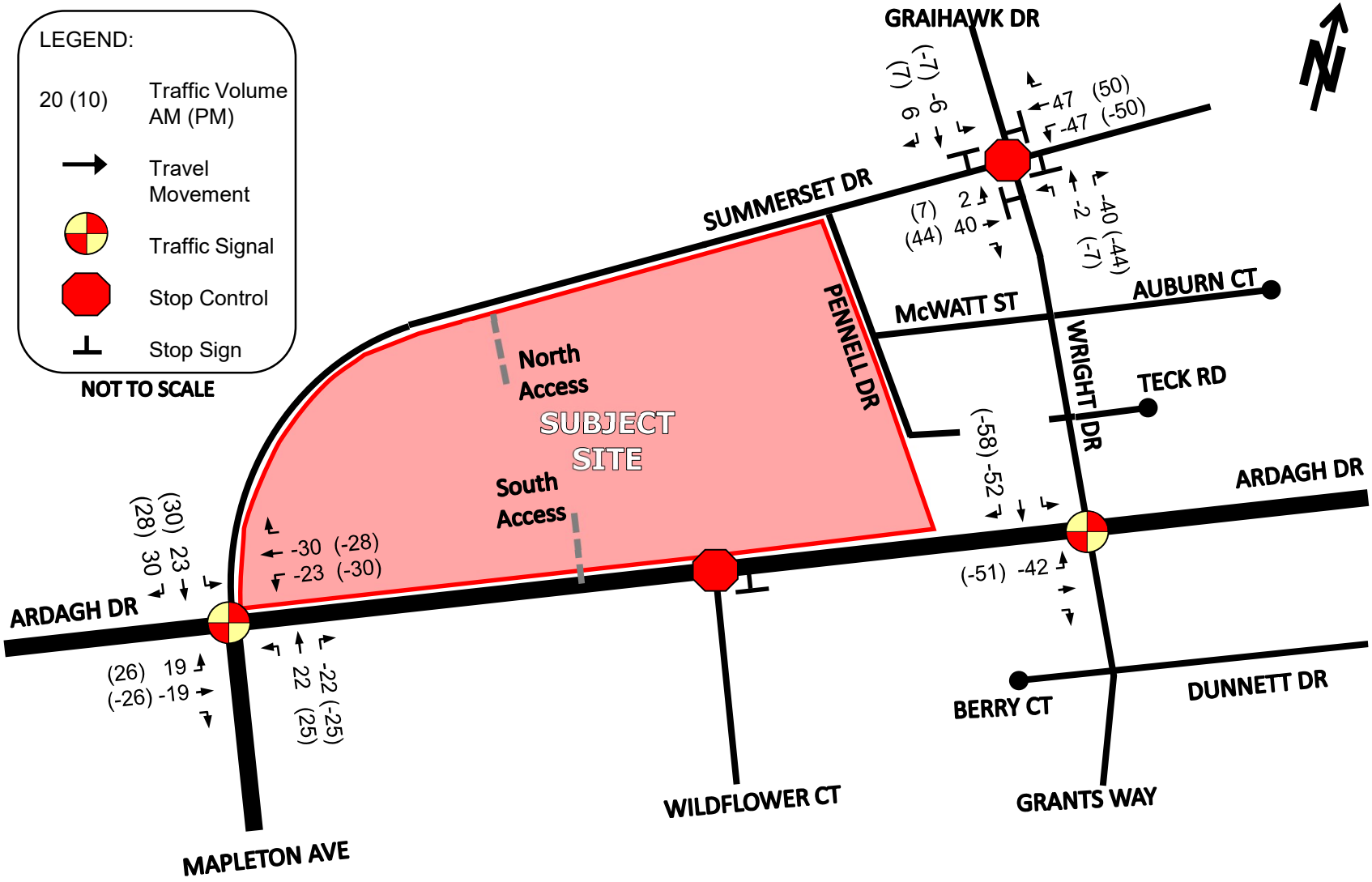
Figure 6: Summerset Drive Extension Traffic Redistribution



ENGINEERING

Figure 7: Background (2030) Traffic Volumes

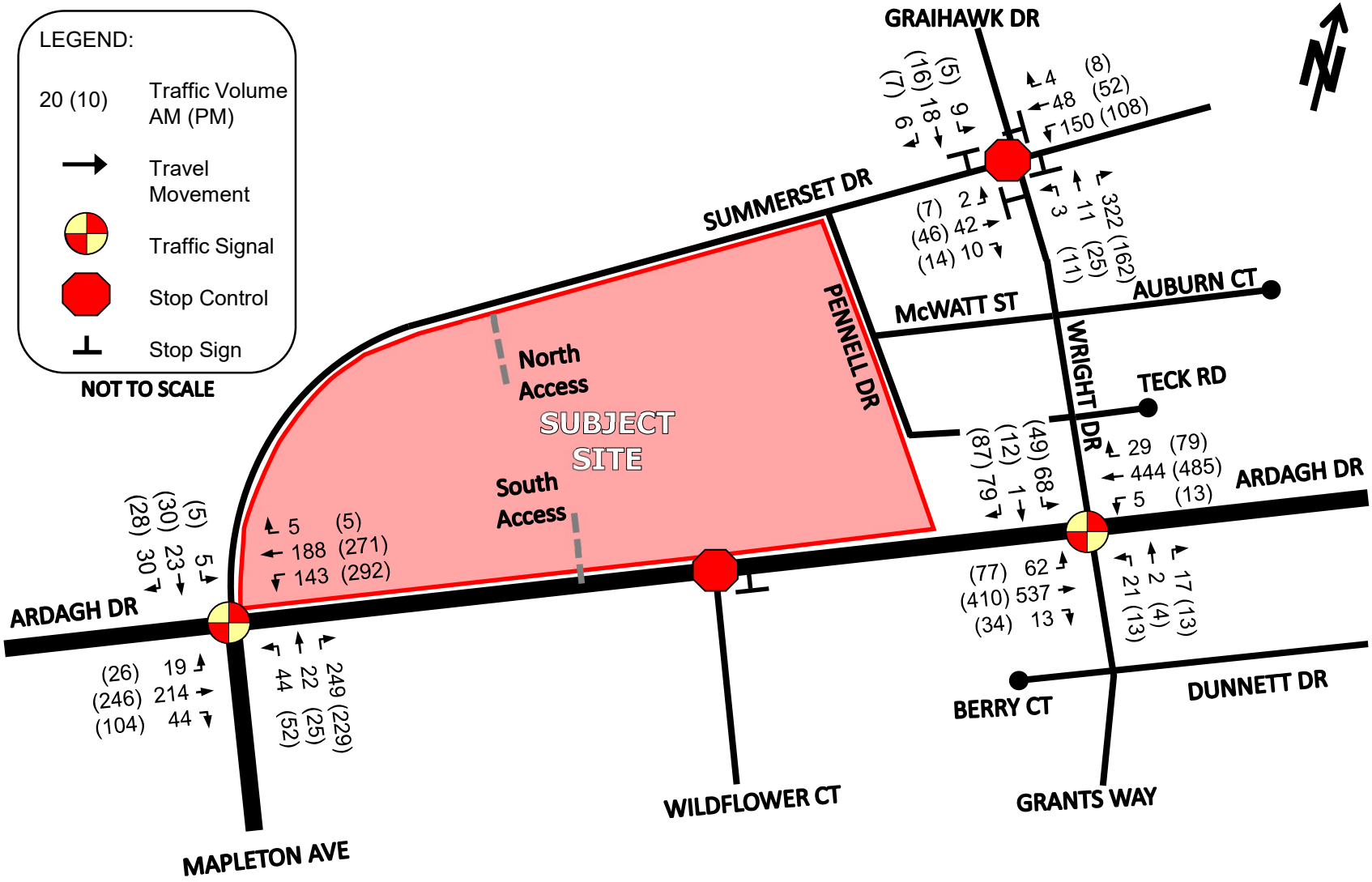


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Figure 8: Site Traffic Assignment

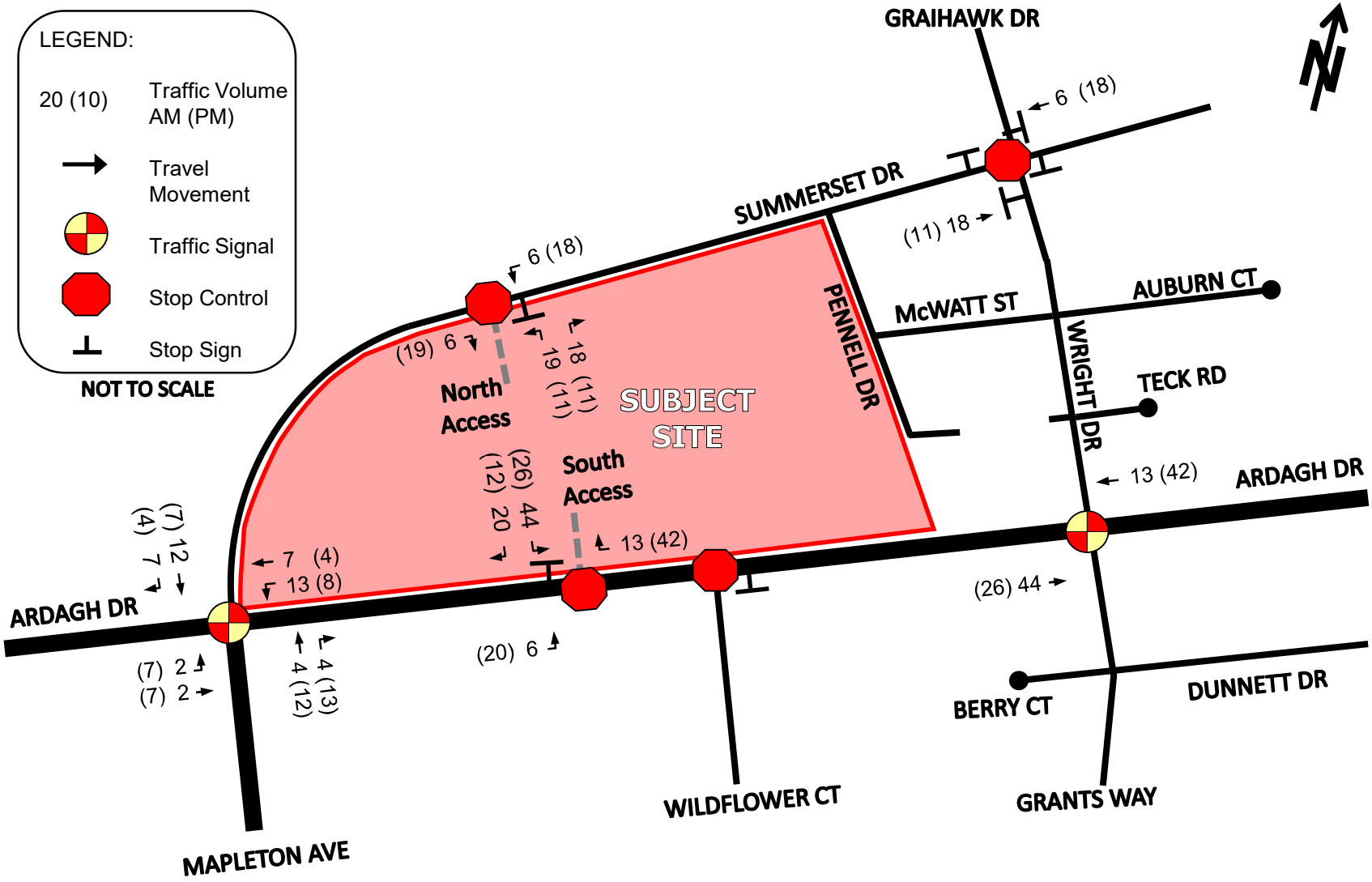

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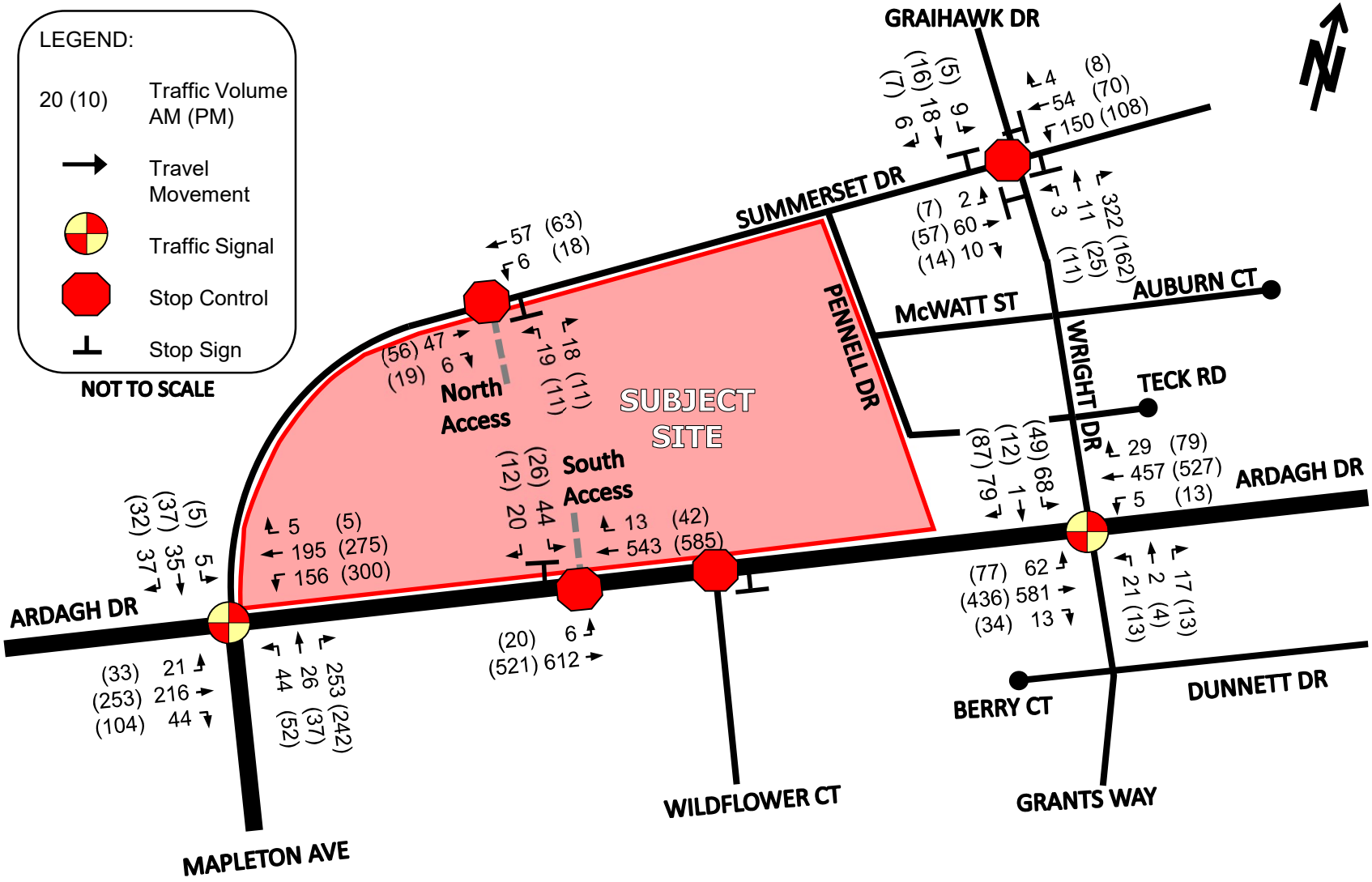
Figure 9: Total (2030) Traffic Volumes



ENGINEERING

Appendix A – Site Plan

ZONING TABLE - RA1-2		
Provision	**Required**	**Block 1 (Apartment Bldg.)**
Lot Area (min.)	1,100.0m²	4,236.0m²
Lot Frontage (min.)	24.0m	73.5m (Summerset Dr.)
Front Yard (min.)	7.0m	6.8m
Int. Side Yard (min.)	5.0m	8.,6m
Ext. Side Yard (min.)	3.0m	3.5m (Ardagh Rd.)
Rear Yard (min.)	7.0m	1.6m
Landscaped Open Space (min.)	35%	21%
Dwelling Unit Floor Area (min.)	35.0m² / unit + 10.0m² / bedroom	> 35.0m² / unit + 10.0m² / bedroom
Lot Coverage (max.)	35%	42%
Gross Floor Area (max.)	100%	230%
Height of Main Bldg. (max.)	15.0m	20.0m
Required Parking	135 spaces incl. 2 Type 'A' and 3 Type 'B' B.F. spaces (1.5 space / unit)	135 spaces incl 2 Type 'A' and 3 Type 'B' B.F. spaces

ENVIRONMENTAL PROTECTION

SUMMERSET DRIVE

ARDAGH ROAD

Existing Regional Floodline

Erosion/ Hazard Limit

STORMWATER MANAGEMENT
0.466 ha

AMENITY AREA
3,554 m² (38,255 ft²)

ROOF-TOP AMENITY AREA

APARTMENT BUILDING
90 UNITS
1,791.7 m² (19,285.7 ft²)
2 LEVEL UNDERGROUND PARKING (100 SPOTS w 3 BF)

BACK TO BACK TOWNHOUSES (4 STOREY) 10 UNITS 560.3m² (6,031.0ft²)

BACK TO BACK TOWNHOUSES (3 STOREY) 12 UNITS 670.2m² (7,215.1ft²)

BACK TO BACK TOWNHOUSES (3 STOREY) 16 UNITS 891.3m² (9,594.4ft²)

BACK TO BACK TOWNHOUSES (4 STOREY) 14 UNITS 781.9m² (8,416.9ft²)

BACK TO BACK TOWNHOUSES (4 STOREY) 12 UNITS 681.4m² (7,335.1ft²)

BACK TO BACK TOWNHOUSES (4 STOREY) 10 UNITS 426.2m² (4,587.8ft²)

OPEN SPACE
1,139 m² (12,260 ft²)

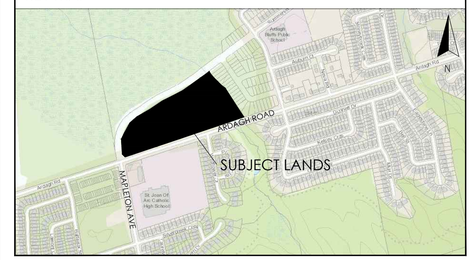
WROUGHT IRON DECORATIVE FENCE

LANDS OWNED BY OTHERS
EXISTING COMMERCIAL

LANDS OWNED BY OTHERS
EXISTING SCHOOL

Source: City of Barrie Interactive Mapping, 2017
Note: Information shown is approximate and subject to change.

KEY MAP



CONCEPTUAL SITE PLAN

PART LOT 2, CONCESSION 14

IN THE
CITY OF BARRIE
COUNTY OF SIMCOE
2017

0 50m

LEGEND

- SUBJECT LANDS — *4.49 ha (11.1 ac)*
- 40 UNITS — BACK-TO-BACK TOWNHOMES - TYPE 'A' (4 STOREY) — *(132.6m²) 1,427.2ft² GFA per unit) Rooftop Amenity Area 8.3m²/per unit*
- 20 UNITS — BACK-TO-BACK TOWNHOMES - TYPE 'B' (4 STOREY) — *(123.6m²) 1,330.4ft² GFA per unit) Rooftop Amenity Area 8.6m²/per unit*
- 158 UNITS — BACK-TO-BACK TOWNHOMES - TYPE 'C' (3 STOREY) — *(129.0 m²) 1,388.5 ft² GFA per unit) Rooftop Amenity Area 11.2m²/per unit*
- 90 UNITS — APARTMENT BUILDING - 6 STOREY — *(1,791.7m² / 19,285.7ft² Building Footprint)*
- AMENITY AREA
  - *APARTMENT BLOCK*
    - *ROOFTOP AMENITY AREA FOR APARTMENT BUILDING: 608.7m² / 6,552.4ft²*
  - *TOWNHOUSE BLOCK*
    - *REQUIRED: 3,696m² (Consolidated)/ PROVIDED: 3,554 m² (Consolidated)*
    - *ROOFTOP AMENITY AREA FOR BACK-TO-BACK TOWNHOMES: 2,306.9m2 / 24,830.1ft²*
- STORMWATER MANAGEMENT — *0.466 ha (1.15 ac)*
- SIDEWALK — *0.312 ha (0.77 ac)*
- WATER SERVICES
- STORM SERVICES
- SANITARY SERVICES

PARKING REQUIREMENTS
Apartment - 135 required/ 135 provided (5 BF; 2 TYPE 'A' & 3 TYPE 'B')
Townhomes - 327 required/ 488 provided (3 BF; 1 TYPE 'A' & 2 TYPE 'B')

ZONING TABLE - RM2 - SP		
Provision	**Required**	**Block 2 (Back-to-Back TH)**
Lot Area (min.)	720.0m²	40,696.0m²
Lot Frontage (min.)	21.0m	288.2m (Ardagh Rd.)
Front Yard (min.)	7.0m	3.8m
Int. Side Yard (min.)	1.8m	1.6m
Ext. Side Yard (min.)	3.0m	5.0m (Summerset Dr.)
Rear Yard (min.)	7.0m	N.A.
Landscaped Open Space (min.)	35%	43%
Dwelling Unit Floor Area (min.)	35.0m² / unit + 10.0m² / bedroom	> 35.0m² / unit + 10.0m² / bedroom
Lot Coverage (max.)	35%	33%
Gross Floor Area (max.)	60%	70%
Height of Main Bldg. (max.)	10.0m	15.0m
Amenity Area (min.)	2,616.0m² (consolidated)	3,554.0m² (consolidated) + min. 8.3m² rooftop amenity / unit
Required Parking	327 spaces incl. 5 Type 'A' and 6 Type 'B' B.F. spaces (1.5 space / unit)	218 / unit + 52 Visitor incl. 1 Type 'A' and 2 Type 'B' (1.23 spaces / unit) + 218 garage spaces
Permitted Uses	Section 5.2.1 Table 5.2	Back-to-Back T.H.
Density	53 units / ha	55 units / ha

CONCEPTUAL SITE PLAN - 308 UNITS

BEAR CREEK VILLAGE

RESIDENTIAL	CURRENT OP DESIGNATION
RM2	CURRENT ZONE

SCHEDULE OF REVISIONS

No.	Date	Description	By
1	Dec. 17, 2020	Adjust max. height of buildings;	A.S.
5	Jan. 18, 2021	Create 2 separate blocks	A.S.

IPS INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
647 WELHAM RD., UNIT 9, BARRIE, ONTARIO L4N 0B7
tel: 705 • 812 • 3281 fax: 705 • 812 • 3434 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

Date: November 21, 2019	Drawn By: A.S.
File: 17-732	Checked: G.B.

Appendix B –
Traffic Count Data

Trans-Plan Transportation Inc.

Site ID Code:
Intersection Location: Ardagh Road and Wright Drive
Municipality: Barrie, Ontario
Count Date: Tuesday October 17 2017
Weather and Temperature: Clear, 20C
Surveyor: TP

AM	NORTH APPROACH											EAST APPROACH											SOUTH APPROACH											WEST APPROACH											Grand Total
	CAR			TRUCKS			CYCLISTS			Peds	Total	CAR			TRUCKS			CYCLISTS			Peds	Total	CAR			TRUCKS			CYCLISTS			Peds	Total	CAR			TRUCKS			CYCLISTS			Peds	Total	
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			
7:00	7	0	9	0	0	0	0	0	0	0	16	0	33	2	0	4	0	0	0	0	0	39	4	1	5	0	0	0	0	0	0	1	11	8	38	1	0	0	0	0	0	0	0	47	113
7:15	9	0	12	0	0	1	0	0	0	1	23	1	53	3	1	3	0	0	0	0	0	61	4	0	4	1	0	0	0	0	0	5	14	15	50	0	1	6	1	0	0	0	2	75	173
7:30	7	1	22	0	0	3	0	0	0	0	33	0	117	3	0	10	0	0	4	0	0	134	5	0	2	1	0	0	0	0	0	8	16	10	78	0	1	3	0	0	1	0	5	98	281
7:45	6	0	24	0	0	1	0	0	0	1	32	1	107	4	0	2	0	0	2	0	0	116	8	1	6	0	0	0	0	0	0	3	18	21	146	6	0	11	0	0	0	0	1	185	351
8:00	8	0	12	0	0	0	0	0	0	2	22	2	38	5	0	7	0	0	0	0	0	52	2	1	5	0	0	0	0	0	0	2	10	18	117	6	0	3	0	0	0	0	0	144	228
8:15	3	0	9	0	0	0	0	0	0	2	14	0	34	3	1	4	1	0	0	0	0	43	3	2	1	1	0	1	0	0	0	0	8	21	79	1	0	5	0	0	0	0	0	106	171
8:30	3	1	11	0	0	0	0	0	0	0	15	0	29	14	0	7	0	0	0	0	0	50	4	4	6	1	0	0	0	0	0	3	18	20	58	2	1	6	1	0	0	0	1	89	172
8:45	7	3	15	0	0	0	0	0	0	4	29	1	48	9	0	6	0	0	0	0	0	64	2	5	3	0	0	0	0	0	0	3	13	31	57	1	1	6	0	0	2	0	3	101	207
MD																																													
11:00	6	0	8	0	0	0	0	0	0	2	16	1	36	6	0	2	0	0	0	0	0	45	1	0	1	0	0	0	0	0	0	1	3	11	32	5	0	5	0	0	0	0	0	53	117
11:15	2	0	5	0	0	0	0	0	0	2	9	3	33	3	0	3	0	0	0	0	0	42	1	0	2	0	0	0	0	0	0	1	4	6	34	2	0	3	0	0	0	0	0	45	100
11:30	5	1	7	0	0	0	0	0	0	1	14	1	51	6	0	3	0	0	0	0	0	61	4	2	0	0	0	0	0	0	0	2	8	6	41	1	0	3	0	0	0	0	0	51	134
11:45	1	0	6	0	0	0	0	0	0	1	8	2	36	4	0	3	0	0	0	0	0	45	3	0	0	0	0	0	0	0	0	0	3	10	53	1	0	4	0	0	0	0	1	69	125
12:00	0	1	13	0	0	0	0	0	0	0	14	5	42	3	0	2	0	0	0	0	0	52	4	1	2	0	0	0	0	0	0	0	7	12	44	3	0	2	0	0	1	0	0	62	135
12:15	1	2	8	0	0	0	0	0	0	0	11	1	29	3	0	4	1	0	0	0	0	38	2	0	2	0	0	0	0	0	0	2	6	10	55	3	0	4	0	1	0	0	1	74	129
12:30	3	0	8	0	0	0	0	0	0	0	11	4	44	2	0	4	0	0	0	0	0	54	2	0	2	0	1	0	0	0	0	2	7	10	38	2	0	3	1	0	0	0	1	55	127
12:45	1	1	16	0	0	0	0	0	0	0	18	1	42	4	0	2	0	0	0	0	0	49	3	0	3	0	0	0	0	0	0	2	8	5	45	3	0	4	0	0	0	0	1	58	133
13:00	2	0	3	0	0	1	0	0	0	2	8	3	37	6	0	1	0	0	0	0	0	47	3	1	1	0	0	0	0	0	0	0	5	2	44	0	0	4	0	0	1	0	2	53	113
13:15	6	1	4	0	0	0	0	0	0	4	15	3	47	6	1	1	0	0	0	0	0	58	3	1	4	1	0	0	0	0	0	0	9	6	53	3	0	5	0	0	0	0	0	67	149
13:30	1	1	8	0	0	0	0	0	1	0	11	1	41	1	0	2	0	0	0	0	0	45	1	1	4	0	0	0	0	0	0	0	6	6	36	3	0	1	0	0	0	0	0	46	108
13:45	1	0	6	0	0	2	0	0	1	1	11	1	67	1	0	6	0	0	0	0	0	75	2	1	1	0	0	0	0	0	0	4	8	8	35	1	0	3	0	0	0	0	0	47	141
PM																																													
15:00	6	0	10	0	0	0	0	0	0	1	17	1	62	12	0	4	0	0	0	0	0	79	1	2	0	0	0	0	0	0	0	1	4	25	72	4	0	1	0	0	2	0	0	104	204
15:15	5	1	14	0	0	0	0	0	0	0	20	2	72	16	0	2	0	0	0	0	0	92	2	5	3	0	0	0	0	0	0	1	11	35	64	2	1	2	0	0	0	0	0	104	227
15:30	4	1	22	0	0	1	0	0	0	6	34	1	55	16	0	3	3	0	4	0	0	82	1	7	3	0	0	0	0	0	0	3	14	42	71	5	0	2	0	0	0	0	6	126	256
15:45	11	8	46	1	0	5	0	0	0	16	87	4	100	8	0	5	0	0	8	0	0	125	4	1	4	0	0	0	0	0	0	19	28	11	55	6	0	3	1	0	0	0	8	84	324
16:00	5	4	9	0	1	1	1	0	0	0	21	4	72	7	0	5	0	0	0	0	0	88	5	4	6	0	0	0	0	0	0	1	16	12	68	6	0	5	0	0	0	0	0	91	216
16:15	6	0	15	0	0	1	0	0	0	2	24	4	83	8	0	0	1	0	0	0	0	96	3	0	4	0	0	0	0	0	0	4	11	18	46	5	0	5	1	0	0	0	7	82	213
16:30	5	1	13	0	0	0	0	0	1	0	20	1	91	8	0	5	0	0	0	0	0	105	1	2	3	0	0	0	0	0	0	0	6	20	87	6	0	3	0	0	0	0	2	118	249
16:45	5	4	30	0	0	0	0	0	0	1	40	3	94	11	0	1	0	0	0	0	0	109	7	1	3	0	0	0	0	0	0	6	17	13	74	11	0	3	0	0	2	0	0	103	269
17:00	7	4	26	0	0	2	0	0	0	0	39	1	99	9	0	4	0	0	0	0	0	113	3	0	5	0	0	0	0	0	0	13	21	24	71	12	0	4	0	1	2	0	1	115	288
17:15	6	3	17	0	0	0	0	0	0	3	29	8	80	9	0	0	0	0	1	0	0	98	2	1	1	0	0	0	0	0	1	0	5	14	70	5	0	1	0	0	0	0	1	91	223
17:30	5	0	27	0	0	0	0	0	0	4	36	3	74	6	0	1	0	1	1	0	0	86	1	2	7	0	0	0	0	1	0	2	13	14	54	5	0	0	0	0	2	0	2	77	212
17:45	8	2	12	0	0	0	0	0	0	5	27	3	75	9	0	0	0	0	0	0	0	87	5	0	2	0	0	0	0	0	0	1	8	11	65	5	0	1	0	0	0	0	2	84	206

TRANS-PLAN
transportation engineering

Turning Movement Count Diagram

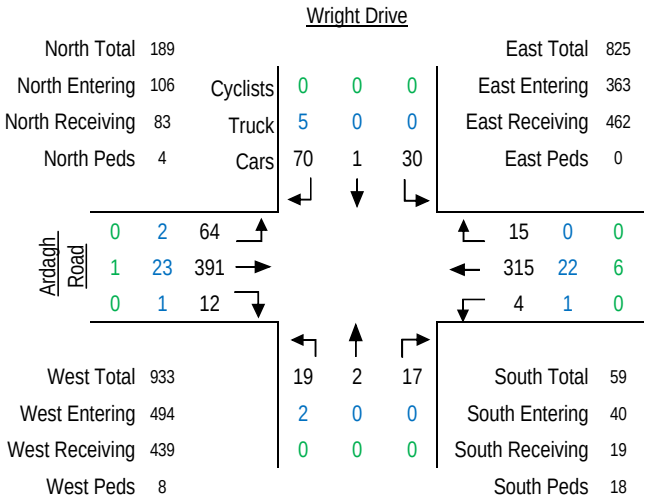
Intersection: Ardagh Road and Wright Drive

Intersection ID:

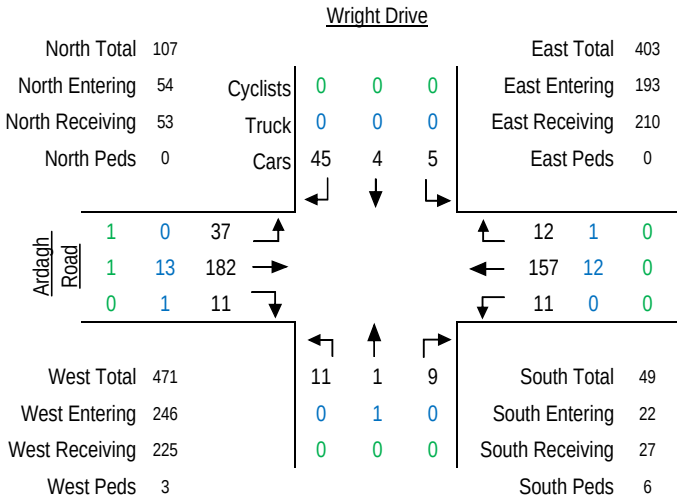
Municipality: Barrie, Ontario

Date: Tuesday October 17 2017

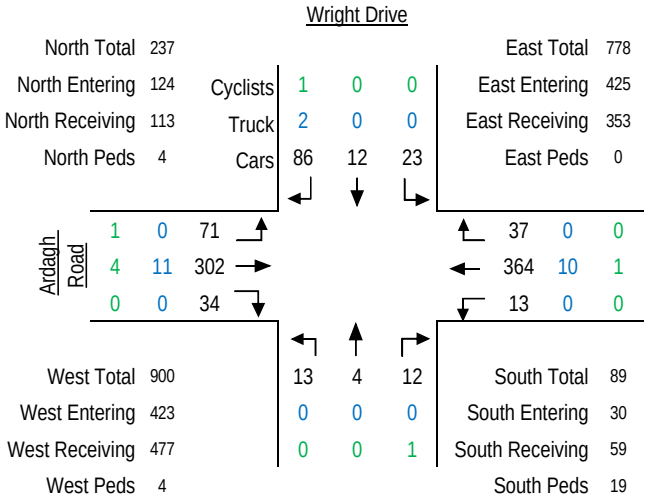
AM Peak Hour: 7:15 to 8:15



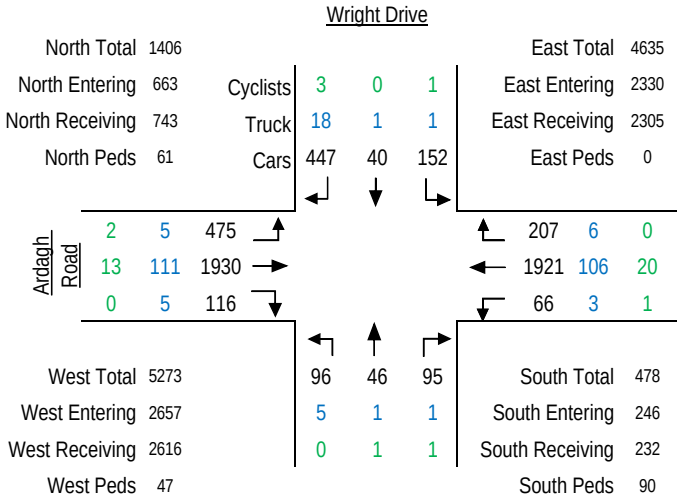
MD Peak Hour: 12:00 to 13:00



PM Peak Hour: 16:30 to 17:30



Total 8-Hour Count



TABULAR SUMMARY OF VEHICLE COUNTS

Observer: D. NORTHCOTE Date: OCT 6/2016 Day: THURSDAY City: BARRIE

R=Right Turn
S=Straight
L=Left Turn

Intersection of: GRAHAM Ave AND SUMMERSET

PED
GRAHAM
SUMMERSET

Time Begins AM	from North				from South				TOTAL North/South	from East				from West				TOTAL East/West	TOTAL ALL	
	R	S	L	TOTAL	R	S	L	TOTAL		R	S	L	TOTAL	R	S	L	TOTAL			
7:00		2	0	2	4	0		4	6	0		14	14					14	20	
7:15		5	0	5	8	2		10	15	0		15/1	15/1					15/1	30/1	SB
4 7:30		7	1	8	17/1	2		19/1	27/1	0		18/2	18/2					18/2	45/3	SB
7:45		8	2	10	30/1	1		31/1	41/1	0		28	28					28	69/1	SB
2 8:00		8	1	9	67	3		70	79	0		35	35					35	114	
1 1 8:15		2	2	4	17	4		21	25	0		18/1	18/1	T				18/1	43/1	T
2 10 8:30		6	3	9	58/1	2		60/1	69/1 T	2		19/2	21/2	SB				21/2	90/3	2SB T
5 15 8:45		1	1/1	2/1	89/3	2		91/3	93/4 SB	1		54/1	55/1					55/1	148/5	SB
3 1 9:00		1	6	7	19/1	1		20/1	27/1	0		15/2	15/2					15/2	42/3	SB

TABULAR SUMMARY OF VEHICLE COUNTS

Observer: D. NORTHCOTE Date: OCT 6/2016 Day: THURSDAY City: BARRIE

R=Right Turn
S=Straight
L=Left Turn

Intersection of: GRAHAWK AND SUMMERSET

GRAHAWK / SUMMERSET

Time Begins AM/PM	from North R	S	L	TOTAL	from South R	S	L	TOTAL	TOTAL North/South	from East R	S	L	TOTAL	from West R	S	L	TOTAL	TOTAL East/West	TOTAL ALL	
11:00		1	0	1	6	1		7	8	0		9	9					9	17	
11:15		0	0	0	5	1		6	6	1		7	8					8	14	
11:30		1	1	2	5	1		6	8	0		6	6					6	14	
11:45		1	0	1	7	2		9	10	2		4	6					6	16	
12:00		2/1	0	2/1	10/1	2		12/1	14/2	3		4	7					7	21/2	T
12:15		2	1	3	10	3		13	16	2		7/1	9/1					9/1	15/1	T
12:30		0	3	3	6	2		8	11	0		16/1	16/1					16/1	27/1	T
12:45		0	0	0	10	2		12	12	0		5	5					5	17	
1:00		1	0	1	3	5		8	9	1/1		7	8/1					8/1	17/1	T

TABULAR SUMMARY OF VEHICLE COUNTS

Observer: D. NORTHCOTE Date: OCT 6/2016 Day: THURSDAY City: BARRIE

R=Right Turn
S=Straight
L=Left Turn

Intersection of: GRAHAWK AND SUMMERSET

RED

GRAHAWK / SUMMERSET

	Time Begins PM	from North R	S	L	TOTAL	from South R	S	L	TOTAL	TOTAL North/South	from East R	S	L	TOTAL	from West R	S	L	TOTAL	TOTAL East/West	TOTAL ALL	
2	2:45		2	1	3	19½	4		23½	26½	1		12½	13½					13½	39¼	SB
13	3:00		2	1	3	38¼	8		46¼	49¼	3		8	11					11	60¼	SB
7 27	3:15		13	1/1	14/1	42½	8		50/2	64/3	2		46/6	48/6					48/6	112/9	SSB 17
2	3:30		2	0	2	24/3	5		29/3	31/3	0		26	26					26	57/3	3T
1	3:45		1	0	1	21	6		27	28	1		13	14					14	42	
3	4:00		5	0	5	21/1	4		25/1	30/1	1		13/1	14/1					14/1	44½	SB T
6 4	4:15		2	2	4	22/1	3		25/1	29/1	2		10	12					12	41/1	SB
3 7	4:30		5	2	7	15	10		25	32	1		15	16					16	48	
2	4:45		3	1	4	18	7		25	29	0		28	28					28	57	
	5:00		1	1	2	14	9		23	25	3		31	34					34	59	
5 2	5:15		6	2	8	12/1	7		19/1	27/1	0		15	15					15	42/1	T
	5:30		2	0	2	17	0		17	19	2		12	14					14	33	
	5:45		4	1	5	12	3		15	20	1		14	15					15	35	
	—																				

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis
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Tel: 1-416-910-0171
Fax: 1-888-711-3125

Accu-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: Barrie
Site #: 1402300089
Intersection: Summerset Dr & Hawkins Dr
TFR File #: 1
Count date: 23-Oct-14

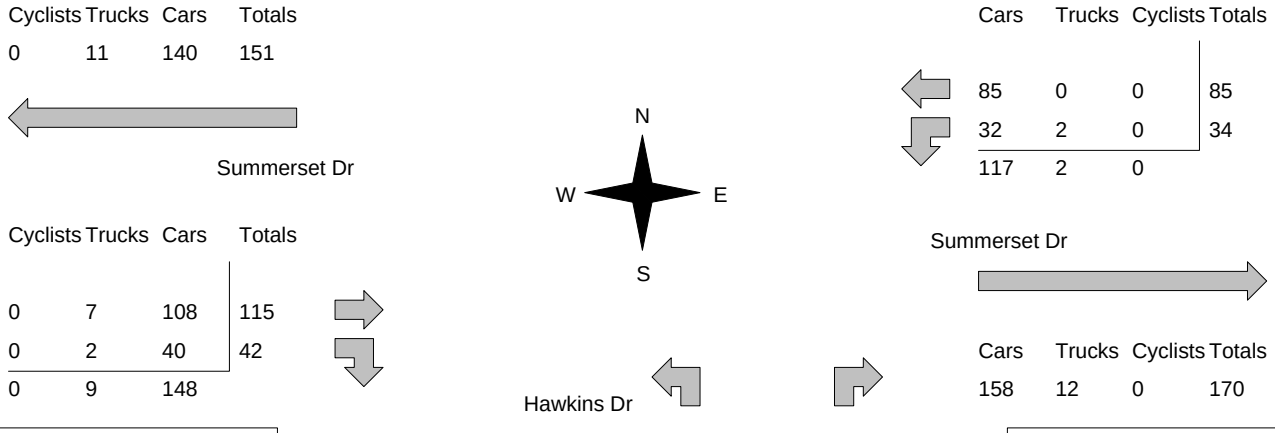
Weather conditions:

Person(s) who counted:

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

Major Road: Summerset Dr runs W/E

East Leg Total: 289
East Entering: 119
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 7
West Entering: 157
West Leg Total: 308

Cars 72
Trucks 4
Cyclists 0
Totals 76

Cars 55 50 105
Trucks 11 5 16
Cyclists 0 0 0
Totals 66 55

Peds Cross: ⋈
South Peds: 39
South Entering: 121
South Leg Total: 197

Comments

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Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:00:00
To: 16:00:00

Municipality: Barrie
Site #: 1402300089
Intersection: Summerset Dr & Hawkins Dr
TFR File #: 1
Count date: 23-Oct-14

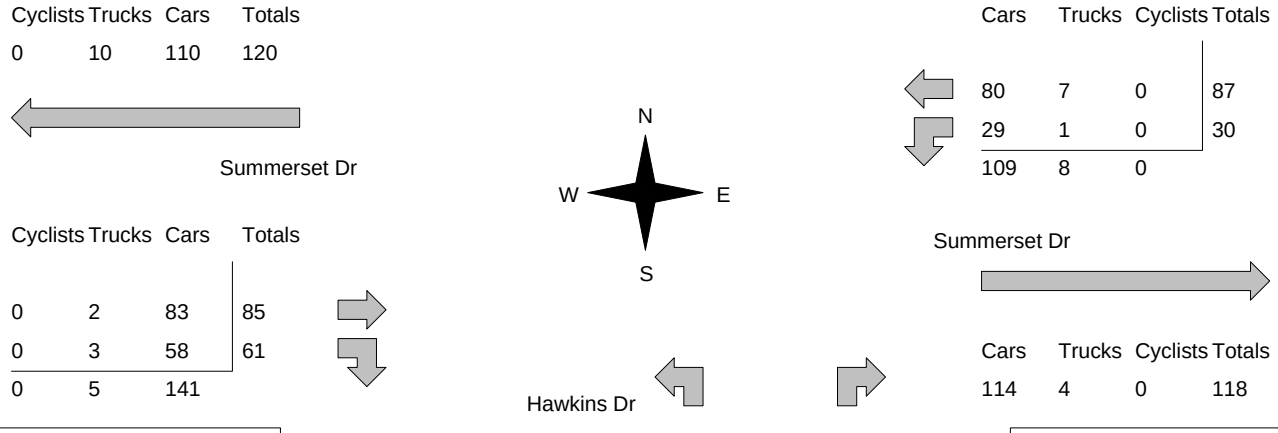
Weather conditions:

Person(s) who counted:

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

Major Road: Summerset Dr runs W/E

East Leg Total: 235
East Entering: 117
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 24
West Entering: 146
West Leg Total: 266

Cars 87
Trucks 4
Cyclists 0
Totals 91

Cars 30 31 61
Trucks 3 2 5
Cyclists 0 0 0
Totals 33 33

Peds Cross: ⋈
South Peds: 77
South Entering: 66
South Leg Total: 157

Comments

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Accu-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: Barrie
Site #: 1402300090
Intersection: Ardagh Rd & Mapleton Ave
TFR File #: 1
Count date: 22-Oct-14

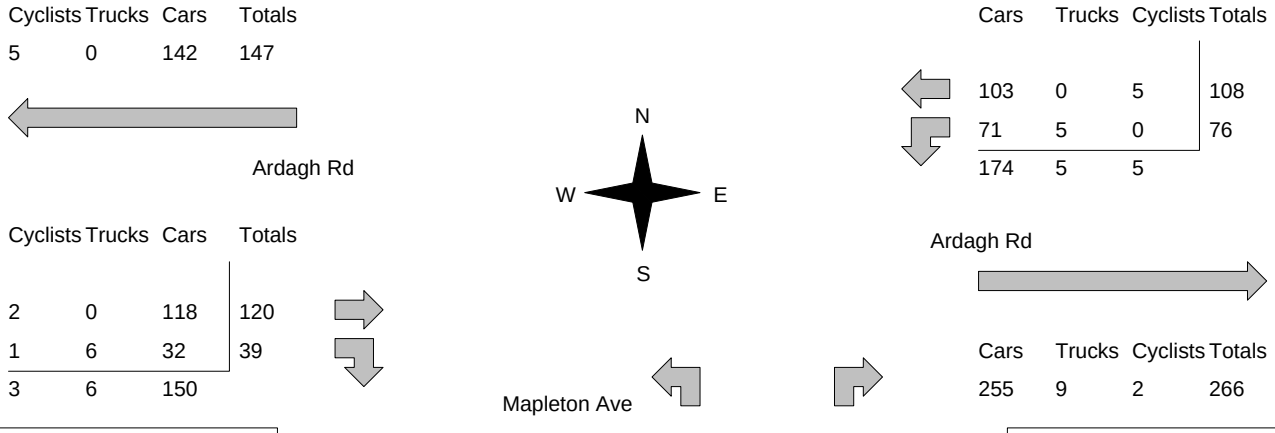
Weather conditions:

Person(s) who counted:

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

Major Road: Ardagh Rd runs W/E

East Leg Total: 450
East Entering: 184
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 159
West Leg Total: 306

Cars 103
Trucks 11
Cyclists 1
Totals 115

Cars 39 137 176
Trucks 0 9 9
Cyclists 0 0 0
Totals 39 146

Peds Cross: ⋈
South Peds: 2
South Entering: 185
South Leg Total: 300

Comments

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Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Barrie
Site #: 1402300090
Intersection: Ardagh Rd & Mapleton Ave
TFR File #: 1
Count date: 22-Oct-14

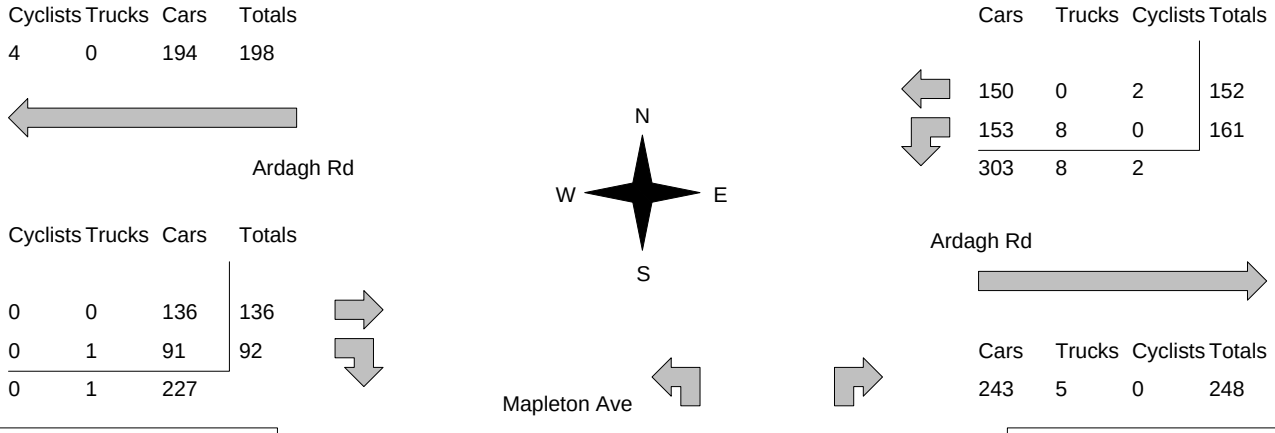
Weather conditions:

Person(s) who counted:

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

Major Road: Ardagh Rd runs W/E

East Leg Total: 561
East Entering: 313
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 228
West Leg Total: 426

Cars 244
Trucks 9
Cyclists 0
Totals 253

Cars 44 107 151
Trucks 0 5 5
Cyclists 2 0 2
Totals 46 112

Peds Cross: ⋈
South Peds: 2
South Entering: 158
South Leg Total: 411

Comments

Appendix C –
Synchro Analysis Output –
Existing Traffic Volumes

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	190	44	125	173	44	219
Future Volume (vph)	190	44	125	173	44	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1782		1704	1883	1789	1541
Flt Permitted	1.00		0.51	1.00	0.95	1.00
Satd. Flow (perm)	1782		921	1883	1789	1541
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	213	49	140	194	49	246
RTOR Reduction (vph)	8	0	0	0	0	218
Lane Group Flow (vph)	254	0	140	194	49	28
Confl. Peds. (#/hr)		2	2			
Heavy Vehicles (%)	2%	16%	7%	2%	2%	6%
Turn Type	NA		pm+pt	NA	Perm	Perm
Protected Phases	4		3	8		
Permitted Phases			8		2	2
Actuated Green, G (s)	36.8		50.1	50.1	7.9	7.9
Effective Green, g (s)	36.8		50.1	50.1	7.9	7.9
Actuated g/C Ratio	0.53		0.72	0.72	0.11	0.11
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	936		740	1347	201	173
v/s Ratio Prot	c0.14		c0.02	0.10		
v/s Ratio Perm			0.12		c0.03	0.02
v/c Ratio	0.27		0.19	0.14	0.24	0.16
Uniform Delay, d1	9.2		3.4	3.2	28.3	28.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7		0.1	0.2	0.6	0.4
Delay (s)	9.9		3.5	3.4	29.0	28.5
Level of Service	A		A	A	C	C
Approach Delay (s)	9.9			3.4	28.6	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	440	13	5	364	18	21	2	17	40	1	88
Future Volume (vph)	74	440	13	5	364	18	21	2	17	40	1	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			0.99			1.00	
Frt	1.00	1.00		1.00	0.99			0.94			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1784	1870		1769	1808			1688			1617	
Flt Permitted	0.42	1.00		0.36	1.00			0.70			0.87	
Satd. Flow (perm)	798	1870		674	1808			1206			1435	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	107	638	19	7	528	26	30	3	25	58	1	128
RTOR Reduction (vph)	0	1	0	0	2	0	0	22	0	0	111	0
Lane Group Flow (vph)	107	656	0	7	552	0	0	36	0	0	76	0
Confl. Peds. (#/hr)	4		18	18		4	8					8
Heavy Vehicles (%)	2%	2%	7%	2%	5%	13%	3%	30%	2%	5%	14%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	47.0	47.0		47.0	47.0			8.9			8.9	
Effective Green, g (s)	47.0	47.0		47.0	47.0			8.9			8.9	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.13			0.13	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	552	1294		466	1251			158			188	
v/s Ratio Prot		c0.35			0.31							
v/s Ratio Perm	0.13			0.01				0.03			c0.05	
v/c Ratio	0.19	0.51		0.02	0.44			0.23			0.40	
Uniform Delay, d1	3.7	5.0		3.3	4.6			26.4			27.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	1.4		0.1	1.1			0.7			1.4	
Delay (s)	4.5	6.4		3.3	5.8			27.2			28.5	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		6.1			5.7			27.2			28.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	67.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	0	1	3	0	146	0	3	0	1	12	266
Future Vol, veh/h	0	0	1	3	0	146	0	3	0	1	12	266
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	2	5	0	221	0	5	0	2	18	403
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.9	10.5	10.6
HCM LOS	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	98%	30%
Vol Thru, %	4%	25%	0%	70%
Vol Right, %	95%	75%	2%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	279	4	149	27
LT Vol	1	0	146	8
Through Vol	12	1	0	19
RT Vol	266	3	3	0
Lane Flow Rate	423	6	226	41
Geometry Grp	1	1	1	1
Degree of Util (X)	0.473	0.008	0.319	0.057
Departure Headway (Hd)	4.032	4.774	5.092	5.048
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	896	743	702	707
Service Time	2.054	2.846	3.149	3.096
HCM Lane V/C Ratio	0.472	0.008	0.322	0.058
HCM Control Delay	10.6	7.9	10.5	8.4
HCM Lane LOS	B	A	B	A
HCM 95th-tile Q	2.6	0	1.4	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	218	104	258	242	52	198
Future Volume (vph)	218	104	258	242	52	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frpb, ped/bikes	0.99		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1787		1737	1883	1789	1570
Flt Permitted	1.00		0.43	1.00	0.95	1.00
Satd. Flow (perm)	1787		790	1883	1789	1570
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	242	116	287	269	58	220
RTOR Reduction (vph)	16	0	0	0	0	195
Lane Group Flow (vph)	342	0	287	269	58	25
Confl. Peds. (#/hr)		2	2			
Heavy Vehicles (%)	2%	2%	5%	2%	2%	4%
Turn Type	NA		pm+pt	NA	Perm	Perm
Protected Phases	4		3	8		
Permitted Phases			8		2	2
Actuated Green, G (s)	35.1		50.0	50.0	8.0	8.0
Effective Green, g (s)	35.1		50.0	50.0	8.0	8.0
Actuated g/C Ratio	0.50		0.71	0.71	0.11	0.11
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	896		684	1345	204	179
v/s Ratio Prot	0.19		c0.05	0.14		
v/s Ratio Perm			c0.25		c0.03	0.02
v/c Ratio	0.38		0.42	0.20	0.28	0.14
Uniform Delay, d1	10.8		4.2	3.3	28.4	27.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2		0.4	0.3	0.8	0.4
Delay (s)	12.0		4.6	3.7	29.1	28.3
Level of Service	B		A	A	C	C
Approach Delay (s)	12.0			4.1	28.5	
Approach LOS	B			A	C	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	336	34	13	398	48	13	4	13	30	12	101
Future Volume (vph)	85	336	34	13	398	48	13	4	13	30	12	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.94			0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1765	1843		1719	1802			1495			1601	
Flt Permitted	0.48	1.00		0.53	1.00			0.78			0.92	
Satd. Flow (perm)	884	1843		954	1802			1185			1487	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	91	361	37	14	428	52	14	4	14	32	13	109
RTOR Reduction (vph)	0	3	0	0	4	0	0	12	0	0	96	0
Lane Group Flow (vph)	91	395	0	14	476	0	0	20	0	0	58	0
Confl. Peds. (#/hr)	4		19	19		4	4					4
Heavy Vehicles (%)	3%	2%	5%	4%	4%	9%	13%	36%	18%	9%	16%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	48.1	48.1		48.1	48.1			8.1			8.1	
Effective Green, g (s)	48.1	48.1		48.1	48.1			8.1			8.1	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.12			0.12	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	623	1299		672	1270			140			176	
v/s Ratio Prot		0.21			c0.26							
v/s Ratio Perm	0.10			0.01				0.02			c0.04	
v/c Ratio	0.15	0.30		0.02	0.38			0.14			0.33	
Uniform Delay, d1	3.3	3.8		3.0	4.0			26.9			27.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.5	0.6		0.1	0.8			0.5			1.1	
Delay (s)	3.8	4.4		3.1	4.9			27.4			28.7	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.3			4.8			27.4			28.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	5	0	114	1	7	0	4	27	152
Future Vol, veh/h	0	0	0	5	0	114	1	7	0	4	27	152
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	8	0	173	2	11	0	6	41	230
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.3	9.3	8.7
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	0%	93%	17%
Vol Thru, %	15%	0%	1%	83%
Vol Right, %	83%	100%	6%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	183	5	122	24
LT Vol	4	0	114	4
Through Vol	27	0	1	20
RT Vol	152	5	7	0
Lane Flow Rate	277	8	185	36
Geometry Grp	1	1	1	1
Degree of Util (X)	0.305	0.009	0.244	0.048
Departure Headway (Hd)	3.962	4.221	4.751	4.725
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	909	846	756	759
Service Time	1.977	2.255	2.778	2.75
HCM Lane V/C Ratio	0.305	0.009	0.245	0.047
HCM Control Delay	8.7	7.3	9.3	8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.3	0	1	0.2

Appendix D –
Synchro Analysis Output –
Background Traffic Volumes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	214	44	143	188	5	44	22	249	5	23	30
Future Volume (vph)	19	214	44	143	188	5	44	22	249	5	23	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.86			0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1789	1786		1704	1876		1789	1568			1745	
Flt Permitted	0.62	1.00		0.47	1.00		0.81	1.00			0.97	
Satd. Flow (perm)	1172	1786		840	1876		1528	1568			1692	
Peak-hour factor, PHF	0.92	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	21	240	49	161	211	6	49	25	280	6	26	34
RTOR Reduction (vph)	0	8	0	0	1	0	0	221	0	0	26	0
Lane Group Flow (vph)	21	281	0	161	216	0	49	84	0	0	40	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	2%	2%	16%	7%	2%	2%	2%	2%	6%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	35.7	35.7		50.0	50.0		16.5	16.5			18.0	
Effective Green, g (s)	35.7	35.7		50.0	50.0		16.5	16.5			18.0	
Actuated g/C Ratio	0.45	0.45		0.64	0.64		0.21	0.21			0.23	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	532	812		626	1194		321	329			387	
v/s Ratio Prot		c0.16		c0.03	0.12			c0.05				
v/s Ratio Perm	0.02			0.14			0.03				0.02	
v/c Ratio	0.04	0.35		0.26	0.18		0.15	0.25			0.10	
Uniform Delay, d1	11.9	13.9		6.2	5.8		25.3	25.9			23.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	1.2		0.2	0.3		0.2	0.4			0.5	
Delay (s)	12.0	15.0		6.4	6.2		25.5	26.3			24.4	
Level of Service	B	B		A	A		C	C			C	
Approach Delay (s)		14.8			6.3			26.2			24.4	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	537	13	5	444	29	21	2	17	68	1	79
Future Volume (vph)	62	537	13	5	444	29	21	2	17	68	1	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			0.99			1.00	
Frt	1.00	1.00		1.00	0.99			0.94			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1785	1872		1776	1801			1688			1644	
Flt Permitted	0.32	1.00		0.26	1.00			0.75			0.82	
Satd. Flow (perm)	609	1872		481	1801			1293			1385	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	90	778	19	7	643	42	30	3	25	99	1	114
RTOR Reduction (vph)	0	1	0	0	2	0	0	21	0	0	60	0
Lane Group Flow (vph)	90	796	0	7	683	0	0	37	0	0	154	0
Confl. Peds. (#/hr)	4		18	18		4	8					8
Heavy Vehicles (%)	2%	2%	7%	2%	5%	13%	3%	30%	2%	5%	14%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	46.8	46.8		46.8	46.8			12.9			12.9	
Effective Green, g (s)	46.8	46.8		46.8	46.8			12.9			12.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.18			0.18	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	397	1221		313	1175			232			249	
v/s Ratio Prot		c0.43			0.38							
v/s Ratio Perm	0.15			0.01				0.03			c0.11	
v/c Ratio	0.23	0.65		0.02	0.58			0.16			0.62	
Uniform Delay, d1	5.1	7.5		4.4	7.0			24.8			27.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.3	2.7		0.1	2.1			0.3			4.5	
Delay (s)	6.4	10.2		4.5	9.1			25.2			31.7	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		9.9			9.0			25.2			31.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	71.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	14.2
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	2	42	10	0	150	48	4	0	3	11	322
Future Vol, veh/h	0	2	42	10	0	150	48	4	0	3	11	322
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	64	15	0	227	73	6	0	5	17	488
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.7	13.6	15.7
HCM LOS	A	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	1%	4%	74%	24%
Vol Thru, %	3%	78%	24%	58%
Vol Right, %	96%	19%	2%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	336	54	202	33
LT Vol	3	2	150	8
Through Vol	11	42	48	19
RT Vol	322	10	4	6
Lane Flow Rate	509	82	306	50
Geometry Grp	1	1	1	1
Degree of Util (X)	0.649	0.13	0.474	0.079
Departure Headway (Hd)	4.587	5.737	5.581	5.71
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	794	623	646	626
Service Time	2.587	3.789	3.62	3.764
HCM Lane V/C Ratio	0.641	0.132	0.474	0.08
HCM Control Delay	15.7	9.7	13.6	9.3
HCM Lane LOS	C	A	B	A
HCM 95th-tile Q	4.9	0.4	2.5	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	246	104	292	271	5	52	25	229	5	30	28
Future Volume (vph)	26	246	104	292	271	5	52	25	229	5	30	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.86			0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1789	1786		1737	1878		1789	1601			1763	
Flt Permitted	0.57	1.00		0.37	1.00		0.80	1.00			0.97	
Satd. Flow (perm)	1080	1786		678	1878		1507	1601			1715	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	29	273	116	324	301	6	58	28	254	6	33	31
RTOR Reduction (vph)	0	16	0	0	1	0	0	201	0	0	24	0
Lane Group Flow (vph)	29	373	0	324	306	0	58	81	0	0	46	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	2%	2%	2%	5%	2%	2%	2%	2%	4%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.3	34.3		50.0	50.0		16.5	16.5			18.0	
Effective Green, g (s)	34.3	34.3		50.0	50.0		16.5	16.5			18.0	
Actuated g/C Ratio	0.44	0.44		0.64	0.64		0.21	0.21			0.23	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	471	780		562	1196		316	336			393	
v/s Ratio Prot		0.21		c0.07	0.16			c0.05				
v/s Ratio Perm	0.03			c0.30			0.04				0.03	
v/c Ratio	0.06	0.48		0.58	0.26		0.18	0.24			0.12	
Uniform Delay, d1	12.8	15.7		7.8	6.2		25.5	25.8			24.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	2.1		1.4	0.5		0.3	0.4			0.6	
Delay (s)	13.0	17.8		9.2	6.7		25.7	26.2			24.6	
Level of Service	B	B		A	A		C	C			C	
Approach Delay (s)		17.5			8.0			26.1			24.6	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	410	34	13	485	79	13	4	13	49	12	87
Future Volume (vph)	77	410	34	13	485	79	13	4	13	49	12	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.94			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1767	1849		1723	1789			1495			1614	
Flt Permitted	0.39	1.00		0.47	1.00			0.79			0.88	
Satd. Flow (perm)	729	1849		859	1789			1211			1439	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	83	441	37	14	522	85	14	4	14	53	13	94
RTOR Reduction (vph)	0	2	0	0	5	0	0	12	0	0	80	0
Lane Group Flow (vph)	83	476	0	14	602	0	0	20	0	0	80	0
Confl. Peds. (#/hr)	4		19	19		4	4					4
Heavy Vehicles (%)	3%	2%	5%	4%	4%	9%	13%	36%	18%	9%	16%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	48.0	48.0		48.0	48.0			9.1			9.1	
Effective Green, g (s)	48.0	48.0		48.0	48.0			9.1			9.1	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.13			0.13	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	506	1284		596	1242			159			189	
v/s Ratio Prot		0.26			c0.34							
v/s Ratio Perm	0.11			0.02				0.02			c0.06	
v/c Ratio	0.16	0.37		0.02	0.48			0.12			0.42	
Uniform Delay, d1	3.6	4.3		3.3	4.9			26.5			27.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	0.8		0.1	1.4			0.4			1.5	
Delay (s)	4.3	5.2		3.3	6.2			26.8			29.1	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		5.0			6.1			26.8			29.1	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	10
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	7	46	14	0	108	52	8	0	11	25	162
Future Vol, veh/h	0	7	46	14	0	108	52	8	0	11	25	162
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	70	21	0	164	79	12	0	17	38	245
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.8	10.7	10
HCM LOS	A	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	10%	64%	18%
Vol Thru, %	13%	69%	31%	57%
Vol Right, %	82%	21%	5%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	198	67	168	28
LT Vol	11	7	108	5
Through Vol	25	46	52	16
RT Vol	162	14	8	7
Lane Flow Rate	300	102	255	42
Geometry Grp	1	1	1	1
Degree of Util (X)	0.366	0.139	0.349	0.06
Departure Headway (Hd)	4.389	4.933	4.932	5.065
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	816	720	723	701
Service Time	2.439	3.011	2.999	3.141
HCM Lane V/C Ratio	0.368	0.142	0.353	0.06
HCM Control Delay	10	8.8	10.7	8.5
HCM Lane LOS	A	A	B	A
HCM 95th-tile Q	1.7	0.5	1.6	0.2

Appendix E –
Transportation Tomorrow Survey – Excerpt

2006 GTA Zone of Origin: 8522

Outside Barrie		Distribution				Total
Planning District of Destination		N	S	E	W	
PD 1 of Toronto	35			32	4	35
PD 4 of Toronto	48			43	5	48
PD 8 of Toronto	29			26	3	29
PD 9 of Toronto	64			58	6	64
PD 10 of Toronto	7			6	1	7
PD 11 of Toronto	76			68	8	76
PD 16 of Toronto	57			51	6	57
Newmarket	140			126	14	140
Aurora	80			72	8	80
Markham	86			77	9	86
King	33			30	3	33
Vaughan	142			128	14	142
Brampton	8			7	1	8
Mississauga	69			62	7	69
Barrie	6082					0
Innisfil	203			102	102	203
Bradford-West Gwillimbury	165			149	17	165
New Tecumseth	103			10	93	103
Adjala-Tosorontio	37				37	37
Essa	65				65	65
Clearview	32				32	32
Springwater	108			54	54	108
Muskoka	11			11		11
Grey	7			7		7
Collingwood	75				75	75
Penetanguishene	9			5	5	9
Ramara	20			20		20
Orillia	226			226		226
	1935		0	0	1369	566	1935

Within Barrie		Distribution				Total
2006 GTA zone of Destination		N	S	E	W	
8501	615		308		308		615
8502	51		26		26		51
8504	120		60		60		120
8506	29		15		15		29
8508	107		54		54		107
8509	324		162		162		324
8510	173		87		87		173
8513	18		9		9		18
8514	89		45		45		89
8516	16		8		8		16
8518	170		68		51	51	170
8520	33		13		10	10	33
8521	324		162		162		324
8522	1835		459	459	459	459	1835
8523	967			967			967
8524	650			325	325		650
8526	69				69		69
8527	384			192	192		384
8529	50			25	25		50
8530	59			30	30		59
	6083		1473	1997	2093	520	6083
Totals	8018		1473	1997	3463	1085	8018
Distribution %			18%	25%	43%	14%	100%

```
Thu Jun 04 2020 12:59:40 GMT-0400 (Eastern Daylight Time) - Run Time: 2506ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: Planning district of destination - pd_dest


Filters:
(2006 GTA zone of origin - gta06_orig In 8522
and
Start time of trip - start_time In 600-900)

Trip 2016
ROW : gta06_orig
COLUMN : pd_dest
  gta06_orig     pd_dest      total
        8522           1         35
        8522           4         48
        8522           8         29
        8522           9         64
        8522          10          7
        8522          11         76
        8522          16         57
        8522          27        140
        8522          28         80
        8522          31         86
        8522          32         33
        8522          33        142
        8522          35          8
        8522          36         69
        8522          81       6082
        8522          82        203
        8522          83        165
        8522          84        103
        8522          85         37
        8522          86         65
        8522          87         32
        8522          88        108
        8522         117         11
        8522         120          7
        8522         127         75
        8522         130          9
        8522         135         20
        8522         136        226
```

```
Thu Jun 04 2020 13:20:18 GMT-0400 (Eastern Daylight Time) - Run Time: 2680ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest


Filters:
(2006 GTA zone of origin - gta06_orig In 8522
and
Start time of trip - start_time In 600-900
and
Planning district of destination - pd_dest In 81, )

Trip 2016
ROW : gta06_orig
COLUMN : gta06_dest
  gta06_orig  gta06_dest      total
        8522        8501        615
        8522        8502         51
        8522        8504        120
        8522        8506         29
        8522        8508        107
        8522        8509        324
        8522        8510        173
        8522        8513         18
        8522        8514         89
        8522        8516         16
        8522        8518        170
        8522        8520         33
        8522        8521        324
        8522        8522       1835
        8522        8523        967
        8522        8524        650
        8522        8526         69
        8522        8527        384
        8522        8529         50
        8522        8530         59
```

Appendix F –
Synchro Analysis Output –
Total Traffic Volumes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	216	44	156	195	5	44	26	253	5	35	37
Future Volume (vph)	21	216	44	156	195	5	44	26	253	5	35	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.86			0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1789	1787		1704	1876		1789	1571			1755	
Flt Permitted	0.62	1.00		0.46	1.00		0.75	1.00			0.97	
Satd. Flow (perm)	1164	1787		832	1876		1418	1571			1713	
Peak-hour factor, PHF	0.92	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	23	243	49	175	219	6	49	29	284	6	39	42
RTOR Reduction (vph)	0	8	0	0	1	0	0	224	0	0	32	0
Lane Group Flow (vph)	23	284	0	175	224	0	49	89	0	0	55	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	2%	2%	16%	7%	2%	2%	2%	2%	6%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	35.4	35.4		50.0	50.0		16.5	16.5			18.0	
Effective Green, g (s)	35.4	35.4		50.0	50.0		16.5	16.5			18.0	
Actuated g/C Ratio	0.45	0.45		0.64	0.64		0.21	0.21			0.23	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	524	805		625	1194		298	330			392	
v/s Ratio Prot		c0.16		c0.03	0.12			c0.06				
v/s Ratio Perm	0.02			0.15			0.03				0.03	
v/c Ratio	0.04	0.35		0.28	0.19		0.16	0.27			0.14	
Uniform Delay, d1	12.1	14.1		6.3	5.9		25.4	26.0			24.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	1.2		0.2	0.3		0.3	0.4			0.7	
Delay (s)	12.2	15.3		6.5	6.2		25.6	26.4			24.8	
Level of Service	B	B		A	A		C	C			C	
Approach Delay (s)		15.1			6.4			26.3			24.8	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	581	13	5	457	29	21	2	17	68	1	79
Future Volume (vph)	62	581	13	5	457	29	21	2	17	68	1	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			0.99			1.00	
Frt	1.00	1.00		1.00	0.99			0.94			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1785	1873		1779	1802			1688			1644	
Flt Permitted	0.31	1.00		0.22	1.00			0.75			0.82	
Satd. Flow (perm)	587	1873		412	1802			1293			1385	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	90	842	19	7	662	42	30	3	25	99	1	114
RTOR Reduction (vph)	0	1	0	0	2	0	0	21	0	0	60	0
Lane Group Flow (vph)	90	860	0	7	702	0	0	37	0	0	154	0
Confl. Peds. (#/hr)	4		18	18		4	8					8
Heavy Vehicles (%)	2%	2%	7%	2%	5%	13%	3%	30%	2%	5%	14%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	46.8	46.8		46.8	46.8			12.9			12.9	
Effective Green, g (s)	46.8	46.8		46.8	46.8			12.9			12.9	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.18			0.18	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	383	1222		268	1176			232			249	
v/s Ratio Prot		c0.46			0.39							
v/s Ratio Perm	0.15			0.02				0.03			c0.11	
v/c Ratio	0.23	0.70		0.03	0.60			0.16			0.62	
Uniform Delay, d1	5.1	8.0		4.4	7.1			24.8			27.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.4	3.4		0.2	2.2			0.3			4.5	
Delay (s)	6.5	11.4		4.6	9.3			25.2			31.7	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		11.0			9.3			25.2			31.7	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	71.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	2	60	10	0	150	54	4	0	3	11	322
Future Vol, veh/h	0	2	60	10	0	150	54	4	0	3	11	322
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	91	15	0	227	82	6	0	5	17	488
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

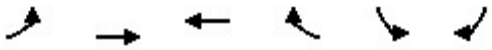
Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	10.1	14.2	16.6
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	1%	3%	72%	27%
Vol Thru, %	3%	83%	26%	55%
Vol Right, %	96%	14%	2%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	336	72	208	33
LT Vol	3	2	150	9
Through Vol	11	60	54	18
RT Vol	322	10	4	6
Lane Flow Rate	509	109	315	50
Geometry Grp	1	1	1	1
Degree of Util (X)	0.666	0.176	0.496	0.082
Departure Headway (Hd)	4.71	5.82	5.662	5.874
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	774	613	637	607
Service Time	2.71	3.885	3.711	3.942
HCM Lane V/C Ratio	0.658	0.178	0.495	0.082
HCM Control Delay	16.6	10.1	14.2	9.5
HCM Lane LOS	C	B	B	A
HCM 95th-tile Q	5.2	0.6	2.8	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	47	6	6	57	19	18
Future Volume (Veh/h)	47	6	6	57	19	18
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	7	7	62	21	20
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			58		130	54
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			58		130	54
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	98
cM capacity (veh/h)			1546		860	1012

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	58	69	41
Volume Left	0	7	21
Volume Right	7	0	20
cSH	1700	1546	928
Volume to Capacity	0.03	0.00	0.04
Queue Length 95th (m)	0.0	0.1	1.1
Control Delay (s)	0.0	0.8	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	0.8	9.1
Approach LOS			A

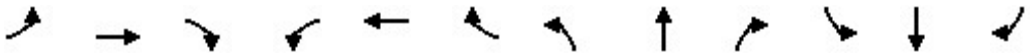
Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization		18.0%	ICU Level of Service
Analysis Period (min)		15	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	612	543	13	44	20
Future Volume (Veh/h)	6	612	543	13	44	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	665	590	14	48	22
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (m)		394	240			
pX, platoon unblocked	0.87				0.87	0.87
vC, conflicting volume	604				1276	597
vC1, stage 1 conf vol					597	
vC2, stage 2 conf vol					679	
vCu, unblocked vol	469				1242	461
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	99				88	96
cM capacity (veh/h)	950				395	522

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	7	665	604	70
Volume Left	7	0	0	48
Volume Right	0	0	14	22
cSH	950	1700	1700	428
Volume to Capacity	0.01	0.39	0.36	0.16
Queue Length 95th (m)	0.2	0.0	0.0	4.4
Control Delay (s)	8.8	0.0	0.0	15.1
Lane LOS	A			C
Approach Delay (s)	0.1		0.0	15.1
Approach LOS				C

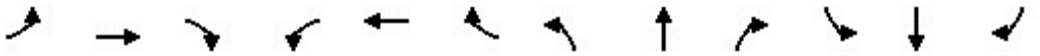
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	253	104	300	275	5	52	37	242	5	37	32
Future Volume (vph)	33	253	104	300	275	5	52	37	242	5	37	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.87			0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1789	1788		1737	1878		1789	1611			1767	
Flt Permitted	0.57	1.00		0.36	1.00		0.76	1.00			0.97	
Satd. Flow (perm)	1075	1788		664	1878		1438	1611			1723	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	281	116	333	306	6	58	41	269	6	41	36
RTOR Reduction (vph)	0	16	0	0	1	0	0	212	0	0	28	0
Lane Group Flow (vph)	37	381	0	333	311	0	58	98	0	0	55	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	2%	2%	2%	5%	2%	2%	2%	2%	4%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	34.2	34.2		50.0	50.0		16.5	16.5			18.0	
Effective Green, g (s)	34.2	34.2		50.0	50.0		16.5	16.5			18.0	
Actuated g/C Ratio	0.44	0.44		0.64	0.64		0.21	0.21			0.23	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	468	778		556	1196		302	338			395	
v/s Ratio Prot		0.21		c0.07	0.17			c0.06				
v/s Ratio Perm	0.03			c0.31			0.04				0.03	
v/c Ratio	0.08	0.49		0.60	0.26		0.19	0.29			0.14	
Uniform Delay, d1	12.9	15.9		7.9	6.2		25.5	26.1			24.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	2.2		1.7	0.5		0.3	0.5			0.7	
Delay (s)	13.3	18.1		9.7	6.7		25.8	26.5			24.8	
Level of Service	B	B		A	A		C	C			C	
Approach Delay (s)		17.7			8.2			26.4			24.8	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

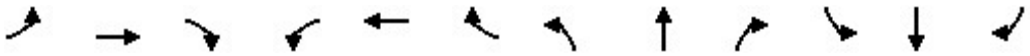
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	436	34	13	527	79	13	4	13	49	12	87
Future Volume (vph)	77	436	34	13	527	79	13	4	13	49	12	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.98	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.94			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1767	1851		1725	1793			1495			1614	
Flt Permitted	0.37	1.00		0.46	1.00			0.79			0.88	
Satd. Flow (perm)	679	1851		826	1793			1211			1439	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	83	469	37	14	567	85	14	4	14	53	13	94
RTOR Reduction (vph)	0	2	0	0	5	0	0	12	0	0	80	0
Lane Group Flow (vph)	83	504	0	14	647	0	0	20	0	0	80	0
Confl. Peds. (#/hr)	4		19	19		4	4					4
Heavy Vehicles (%)	3%	2%	5%	4%	4%	9%	13%	36%	18%	9%	16%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	48.0	48.0		48.0	48.0			9.1			9.1	
Effective Green, g (s)	48.0	48.0		48.0	48.0			9.1			9.1	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.13			0.13	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	471	1285		573	1245			159			189	
v/s Ratio Prot		0.27			c0.36							
v/s Ratio Perm	0.12			0.02				0.02			c0.06	
v/c Ratio	0.18	0.39		0.02	0.52			0.12			0.42	
Uniform Delay, d1	3.7	4.4		3.3	5.0			26.5			27.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	0.9		0.1	1.6			0.4			1.5	
Delay (s)	4.5	5.3		3.4	6.6			26.8			29.1	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		5.2			6.5			26.8			29.1	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	57	14	108	70	8	11	25	162	5	16	7
Future Volume (vph)	7	57	14	108	70	8	11	25	162	5	16	7
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	11	86	21	164	106	12	17	38	245	8	24	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	118	282	300	43
Volume Left (vph)	11	164	17	8
Volume Right (vph)	21	12	245	11
Hadj (s)	-0.05	0.12	-0.44	-0.08
Departure Headway (s)	5.1	5.0	4.5	5.3
Degree Utilization, x	0.17	0.39	0.38	0.06
Capacity (veh/h)	643	675	742	603
Control Delay (s)	9.1	11.3	10.3	8.6
Approach Delay (s)	9.1	11.3	10.3	8.6
Approach LOS	A	B	B	A

Intersection Summary				
Delay	10.4			
Level of Service	B			
Intersection Capacity Utilization	36.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	7	57	14	0	108	70	8	0	11	25	162
Future Vol, veh/h	0	7	57	14	0	108	70	8	0	11	25	162
Peak Hour Factor	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	86	21	0	164	106	12	0	17	38	245
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.1	11.2	10.3
HCM LOS	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	9%	58%	18%
Vol Thru, %	13%	73%	38%	57%
Vol Right, %	82%	18%	4%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	198	78	186	28
LT Vol	11	7	108	5
Through Vol	25	57	70	16
RT Vol	162	14	8	7
Lane Flow Rate	300	118	282	42
Geometry Grp	1	1	1	1
Degree of Util (X)	0.375	0.164	0.388	0.061
Departure Headway (Hd)	4.498	4.999	4.96	5.192
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	795	709	719	682
Service Time	2.557	3.088	3.036	3.282
HCM Lane V/C Ratio	0.377	0.166	0.392	0.062
HCM Control Delay	10.3	9.1	11.2	8.6
HCM Lane LOS	B	A	B	A
HCM 95th-tile Q	1.8	0.6	1.8	0.2

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

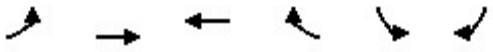
Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	5	16	7
Future Vol, veh/h	0	5	16	7
Peak Hour Factor	0.92	0.66	0.66	0.66
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	8	24	11
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	8.6
HCM LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	56	19	18	63	11	11
Future Volume (Veh/h)	56	19	18	63	11	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	21	20	68	12	12
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			82		180	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			82		180	72
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
cM capacity (veh/h)			1515		799	991

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	82	88	24
Volume Left	0	20	12
Volume Right	21	0	12
cSH	1700	1515	885
Volume to Capacity	0.05	0.01	0.03
Queue Length 95th (m)	0.0	0.3	0.6
Control Delay (s)	0.0	1.8	9.2
Lane LOS		A	A
Approach Delay (s)	0.0	1.8	9.2
Approach LOS			A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		



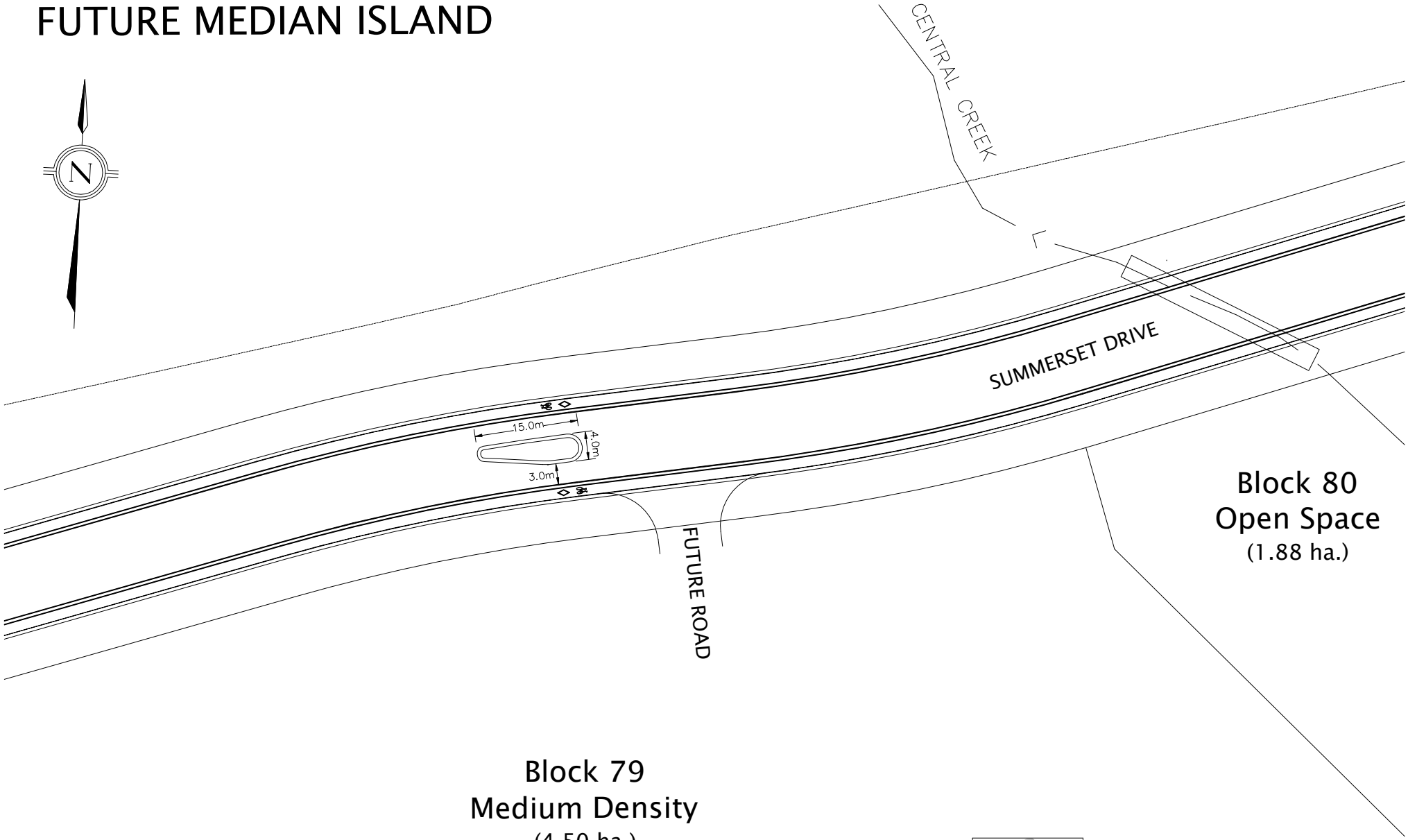
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	521	585	42	26	12
Future Volume (Veh/h)	20	521	585	42	26	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	566	636	46	28	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	TWLTL			
Median storage veh)		2	2			
Upstream signal (m)		394	240			
pX, platoon unblocked	0.86				0.86	0.86
vC, conflicting volume	682				1269	659
vC1, stage 1 conf vol					659	
vC2, stage 2 conf vol					610	
vCu, unblocked vol	544				1230	517
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				93	97
cM capacity (veh/h)	877				392	478

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	566	682	41
Volume Left	22	0	0	28
Volume Right	0	0	46	13
cSH	877	1700	1700	415
Volume to Capacity	0.03	0.33	0.40	0.10
Queue Length 95th (m)	0.6	0.0	0.0	2.5
Control Delay (s)	9.2	0.0	0.0	14.6
Lane LOS	A			B
Approach Delay (s)	0.3		0.0	14.6
Approach LOS				B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix G – Traffic Calming

CONCEPTUAL LAYOUT
FUTURE MEDIAN ISLAND



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