

Previn Court

City of Barrie

Traffic Impact Study for Previn Court Homes

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Executive Summary

This report summarizes the traffic impact study for the proposed mixed-use development municipally known as 180 & 190 Ferndale Drive North, located on the west side of Ferndale Drive North, north of Dunlop Street West, in the 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 will consist of 300 residential units and approximately 62,796 sq.ft. of commercial space.

Access to the development will be provided via one full-movement access onto Ferndale Drive North [North Residential Access], one right-in right-out access driveway onto Ferndale Drive North [South Commercial Access] and three access driveways onto the proposed extension of Sproule Drive. The proposed extension of Sproule Drive will intersect with Ferndale Drive North directly across from the existing driveway to the City's Operations Centre [City Operations Driveway]. Access driveways onto the Sproule Drive extension will provide access to the residential lands to the north and future commercial land to the south of Sproule Drive.

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

- Ferndale Drive North / Edgehill Drive;
- Ferndale Drive North / Sproule Drive Extension & City Operations Driveway;
- Miller Drive / Sproule Drive; and
- Pringle Drive / Edgehill Drive.

Conclusions

1. The proposed development is expected to generate 293 AM and 406 PM new peak hour trips in the study area.
2. Background traffic and pedestrian counts were obtained from the City at the existing intersections of Ferndale Drive North / Edgehill Drive and Miller Drive / Sproule Drive, completed on Tuesday October 13th, 2017 and Thursday, March 2nd 2017 respectively. Background traffic and pedestrian counts were obtained at the existing intersection of Ferndale Drive North / City Operations Driveway and Pringle Drive / Edgehill Drive, completed on Wednesday, September 19th 2018.
3. An intersection operational analysis was completed at the study area intersections, using the existing (2018) and background (2028) traffic volumes, 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.
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 intersection.
5. An intersection operation analysis was completed under total (2028) traffic volumes with the proposed development operational at the study area intersections.
6. The following infrastructure improvements are recommended for the 2028 horizon year:

Ferndale Drive North / Edgehill Drive

- Modify pavement markings to extend the westbound left turn auxiliary lane to provide a storage length of 85 metres and a taper length of 30 metres.
- Signal Timing Plan optimization.

Ferndale Drive North / Sproule Drive Extension & City Operations Driveway

- Construction of a single eastbound through / right turn lane and an eastbound left turn auxiliary lane with a transition to a two-way left-turn lane, 50 metres west of Ferndale Drive North; terminating 15 metres west of the main site access driveway for the commercial block, with a 50 metre taper length;
 - Replace the northbound traffic signal heads in order to provide a protected northbound left turn movement;
 - Signal Timing Plan optimization;
 - The City should consider monitoring queuing at this location once the Sproule Drive extension is constructed to determine if the extension of the northbound left turn auxiliary lane is required; and
 - The Sproule Drive extension (through the subject site) to include an urban cross-section with painted bike lanes and a sidewalk on both sides of the road.
7. The proposed Sproule Drive extension onto Ferndale Drive North will operate efficiently with signalized control.
 8. The sight distance available for the Sproule Drive extension meets the minimum stopping sight distance requirements.
 9. 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

Previn Court Homes [the Developer] is proposing a mixed-use development within the site municipally known as 180 & 190 Ferndale Drive North, located on the west side of Ferndale Drive North, north of Dunlop Street West, in the in the City of Barrie [City]. The proposed development will consist of 300 residential units and approximately 62,796 sq.ft. of commercial space.

Access to the development will be provided via one full-movement access onto Ferndale Drive North [North Residential Access], one right-in right-out [RIRO] access driveway onto Ferndale Drive North [South Commercial Access] and three access driveways onto the proposed extension of Sproule Drive. The proposed extension of Sproule Drive will intersect with Ferndale Drive North directly across from the existing driveway to the City's Operations Centre [City Operations Driveway]. Access driveways onto the Sproule Drive extension will provide access to the residential lands to the north and future commercial land to the south of Sproule Drive.

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

1.2 Study Area

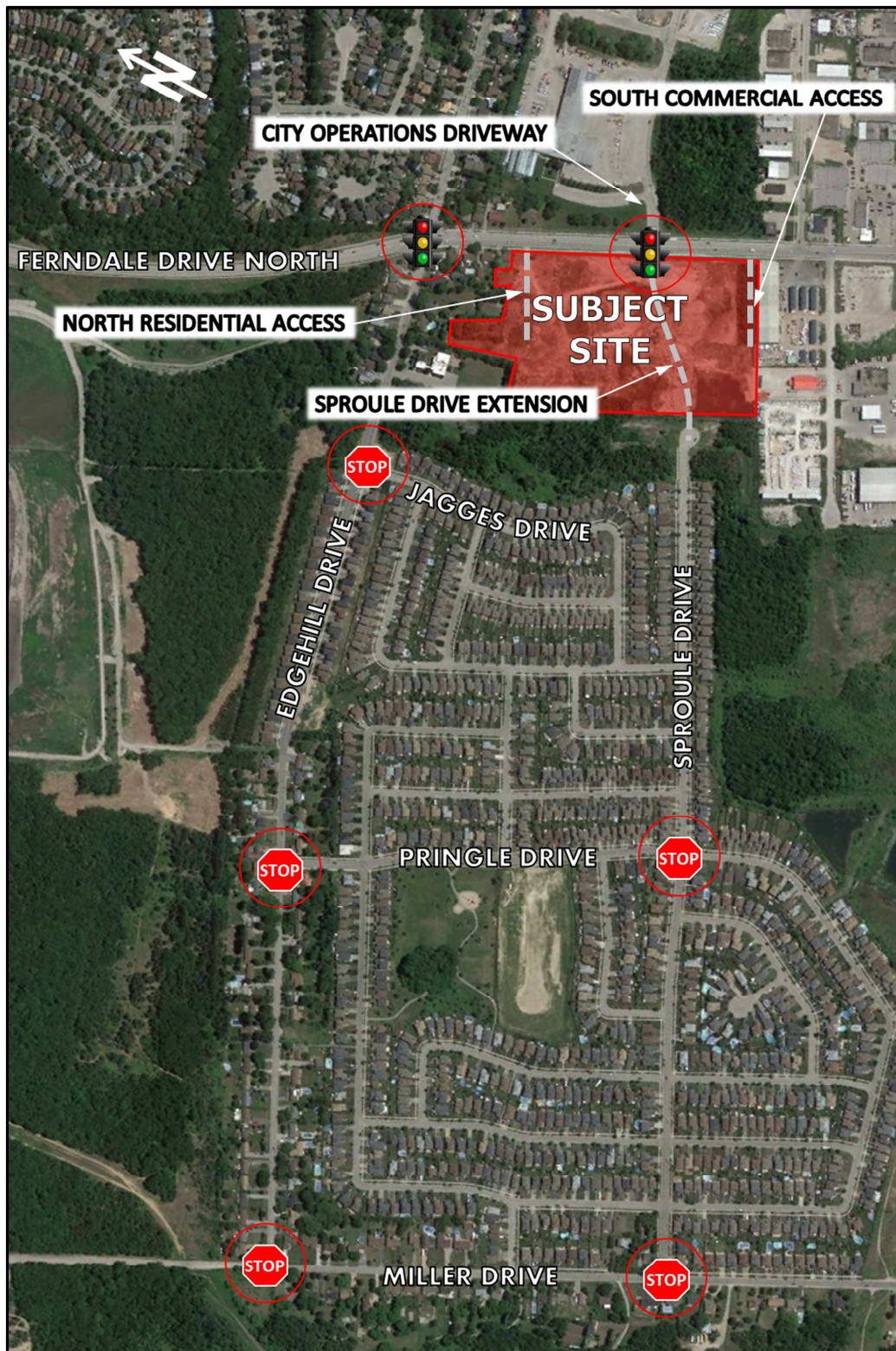
Figure 1 illustrates the location of the subject site and study area intersections, in relation to the surrounding area. The site plan provided by the Innovative Planning Solutions is included in **Appendix A**.

The subject site is bound by Ferndale Drive North to the east, existing residential lands to the north and west and the Simcoe Building Centre and Ferndale Banquet Hall to the south.

Through consultation with the City, the following intersections will be analysed as part of the study:

- Ferndale Drive North / Edgehill Drive;
- Ferndale Drive North / Sproule Drive Extension & City Operations Driveway;
- Miller Drive / Sproule Drive;
- Pringle Drive / Edgehill Drive;
- Ferndale Drive North / North Residential Access; and
- Ferndale Drive North / South Commercial Access.

Figure 1 – Proposed Site Location and Study Area



1.3 Study Scope and Objectives

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

- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed development was not constructed, including the impact of additional proposed developments in the area;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete level-of-service [LOS] analysis of horizon year (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;
- Complete an active transportation review for the proposed development; and
- Document findings and recommendations in a final report.

1.4 Horizon Year and Analysis Periods

Traffic scenarios for the existing year (2018) and ten year horizon year (2028) were selected for analysis of traffic operations in the study area. The weekday morning [AM] and afternoon [PM] peak hours have been selected as the analysis periods for this study.

2 Information Gathering

2.1 Street and Intersection Characteristics

Ferndale Drive North is a four-lane arterial road with an urban cross-section, sidewalks and painted sharrows on both sides of the road, within the study area. Ferndale Drive North has a posted speed limit of 50km/h and is under jurisdiction of the City.

Edgehill Drive is a two-lane minor collector road with an urban cross-section within the study area. Edgehill Drive has a sidewalk on both sides east of Ferndale Drive, within the study area. West of Ferndale Drive, Edgehill Drive has a sidewalk on both sides of the road for approximately 300 metres west of Jagges Drive. Edgehill Drive has a posted speed limit of 50km/h in the study area and is under jurisdiction of the City.

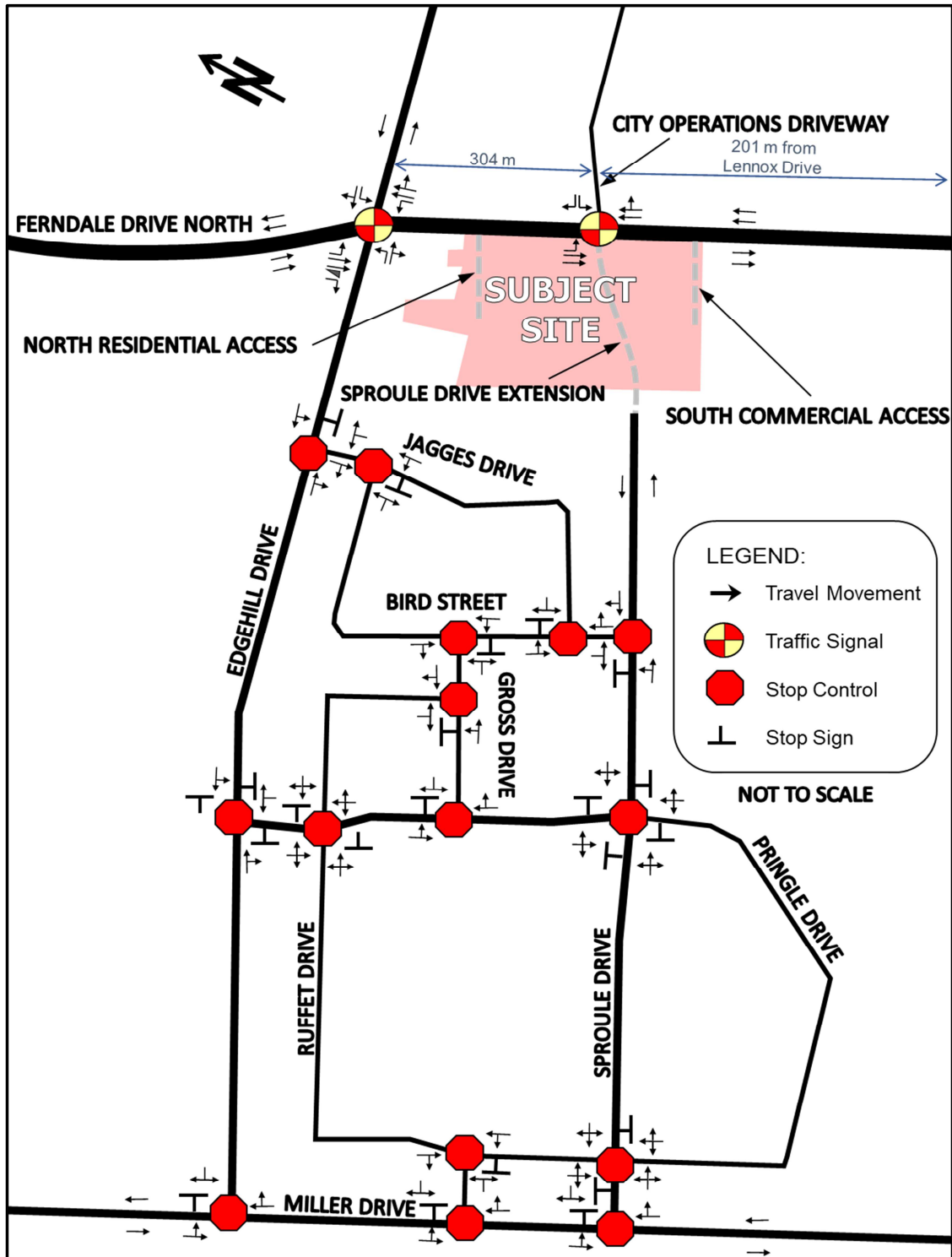
Sproule Drive is a two-lane minor collector road with an urban cross-section and a sidewalk on both sides of the road. Sproule Drive has an unposted (assumed) speed limit of 50km/h and is under jurisdiction of the City.

Miller Drive is a two-lane minor collector road with an urban cross-section. Miller Drive has a sidewalk on the east side of the road, south of Ruffet Drive within the study area. Miller Drive has a posted speed limit of 50km/h in the study area and is under jurisdiction of the City.

Pringle Drive is a two-lane minor collector road with an urban cross-section and a sidewalk on both sides of the road, within the study area. Pringle Drive has an unposted (assumed) speed limit of 50km/h and is under jurisdiction of the City.

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

Figure 2 - Existing (2018) Intersection Spacing and Lane Configuration within Study Area



2.2 Local Transportation Infrastructure Improvements

Based on the Multi-Modal Active Transportation Master Plan (January 2014) [MMATMP] and City's Capital Budget (January 2018) the following infrastructure improvement was identified to be completed in the 2024 horizon year:

- Right-of-Way [ROW] Extension – Edgehill Drive (east of Miller Drive) & Miller Drive (south of Edgehill Drive)
 - o Construction of sidewalks along both sides of the road with bicycle lanes.

Based on the City's MMATMP, the following infrastructure improvement was identified to be completed by the 2024 horizon year:

- Sproule Drive will be extended to Ferndale Drive North with a sidewalk on both sides of the road [Sproule Drive extension]. For the purpose of this report we have assumed the Sproule Drive extension will be constructed as part of the proposed development.

2.3 Transit Access

Barrie Transit provides bus service within the study area. The No. 2A-2B (Dunlop-Park Place) route provides bus service along Dunlop Street west, south of the Subject Site, from the Downtown Terminal to the south end of the City. The No. 5A-5B (Blake-Edgehill) route provides bus service along Edgehill Drive and Pringle Drive, providing connections from the study area to the Downtown Terminal and the east end of the City.

The No. 2A & 2B bus routes operate from 06:00 – 22:30 and 06:00 – 22:00 respectively on weekdays with daytime service every 30 minutes, from 07:00 – 22:30 and 07:00 – 22:00 respectively on Saturdays with daytime service every 30 minutes and from 09:30 – 22:30 and 09:30 – 22:30 respectively on Sundays with daytime service every hour. The closest northbound and southbound bus stop is located on Ferndale Drive North at the southeast and southwest corners of the Ferndale Drive North / Dunlop Street West intersection, respectively.

The No. 5A & 5B bus routes operate from 05:45 – 21:00 and 05:45 – 21:30 respectively on weekdays with daytime service every 30 minutes, from 07:00 – 21:00 and 07:00 – 21:30 respectively on Saturdays with daytime service every 30 minutes and from 09:00 – 21:00 and 09:00 – 21:30 respectively on Sundays with daytime service every hour. The closest eastbound and westbound bus stop is located on Edgehill Drive at the southwest and northeast corners of the Ferndale Drive North / Edgehill Drive, respectively.

Based on Figures ES-1 and 2-3 of the MMATMP, transit service will extend onto the Sproule Drive extension once constructed.

2.4 Other Developments within Study Area

Based on discussions with the City and a review of the City's website there are a number of developments that will impact the traffic in the study area.

Hedbern Development Corp. is proposing the development of 12 residential units located on the north side of Edgehill Drive, between Ferndale Drive North and Jagges Drive, on a site municipally known as 298 & 302 Edgehill Drive [Edgehill Development]. It is assumed that full build-out of the Edgehill Development will occur prior to 2028.

Hedbern Development Corp. is also proposing to develop a 3.00 hectare site located on the west side of Miller Drive north of Dunlop Street South on a site municipally known as 20/30/40 Miller Drive [Miller Development]. The Miller Development will include the development of 185 residential units and a 283 square metre (3,049 sq.ft.) commercial building. JD Engineering prepared a traffic impact study [TIS] for the Miller Development (dated November 2015) [Miller Development TIS]. Based on correspondence with the City, It is assumed that full build-out of the Miller Development will occur prior to 2028.

Park City Inc. is proposing a residential development located on the west side of Miller Drive, between Edgehill Drive and Ruffet Drive, on a site municipally known as 152 & 156 Miller Drive [Park City Development]. The Park City Development will include the development of 71 townhouse and 4 semi-detached units. JD Engineering prepared a traffic brief for the Park City Development (dated April 2018) [Park City Development Traffic Brief]. It is assumed that full build-out of the Park City Development will occur prior to 2028.

2.4.1 Traffic Generation for Edgehill Development

The traffic generated by the Edgehill Development has been estimated 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 use has been applied to estimate the traffic from the Edgehill Development:

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

The AM and PM peak hour traffic generation for the Edgehill Development 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.

The estimated trip generation from the Edgehill Development is illustrated below in **Table 1**.

Table 1 – Estimated Traffic Generation of the Edgehill Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	12 units	2	5	7	6	3	9

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

2.4.2 Traffic Assignment for Edgehill Development

The distribution of traffic for the Edgehill Development is assumed to follow the trip distribution calculated for the proposed development as illustrated in **Table 8** in Section 4.2.

Figure 3 illustrates the traffic assignment during the AM and PM peak hour for the Edgehill Development.

2.4.3 Traffic Assignment for Miller Development

The traffic assignment for the Miller Development has been estimated based on the Miller Development TIS (excerpts provided in **Appendix B**).

Figure 4 illustrates the traffic assignment during the AM and PM peak hour for the Miller Development.

2.4.4 Traffic Assignment for Park City Development

The traffic assignment for the Park City Development has been estimated based on the Park City Development Traffic Brief (excerpts provided in **Appendix B**).

Figure 5 illustrates the traffic assignment during the AM and PM peak hour for the Park City Development.

2.4.5 Total Adjacent Development Traffic within the Study Area

Figure 6 illustrates the traffic assignment during the AM and PM peak hour for all the adjacent developments within the study area.

Figure 3 – Edgehill Development Traffic Assignment

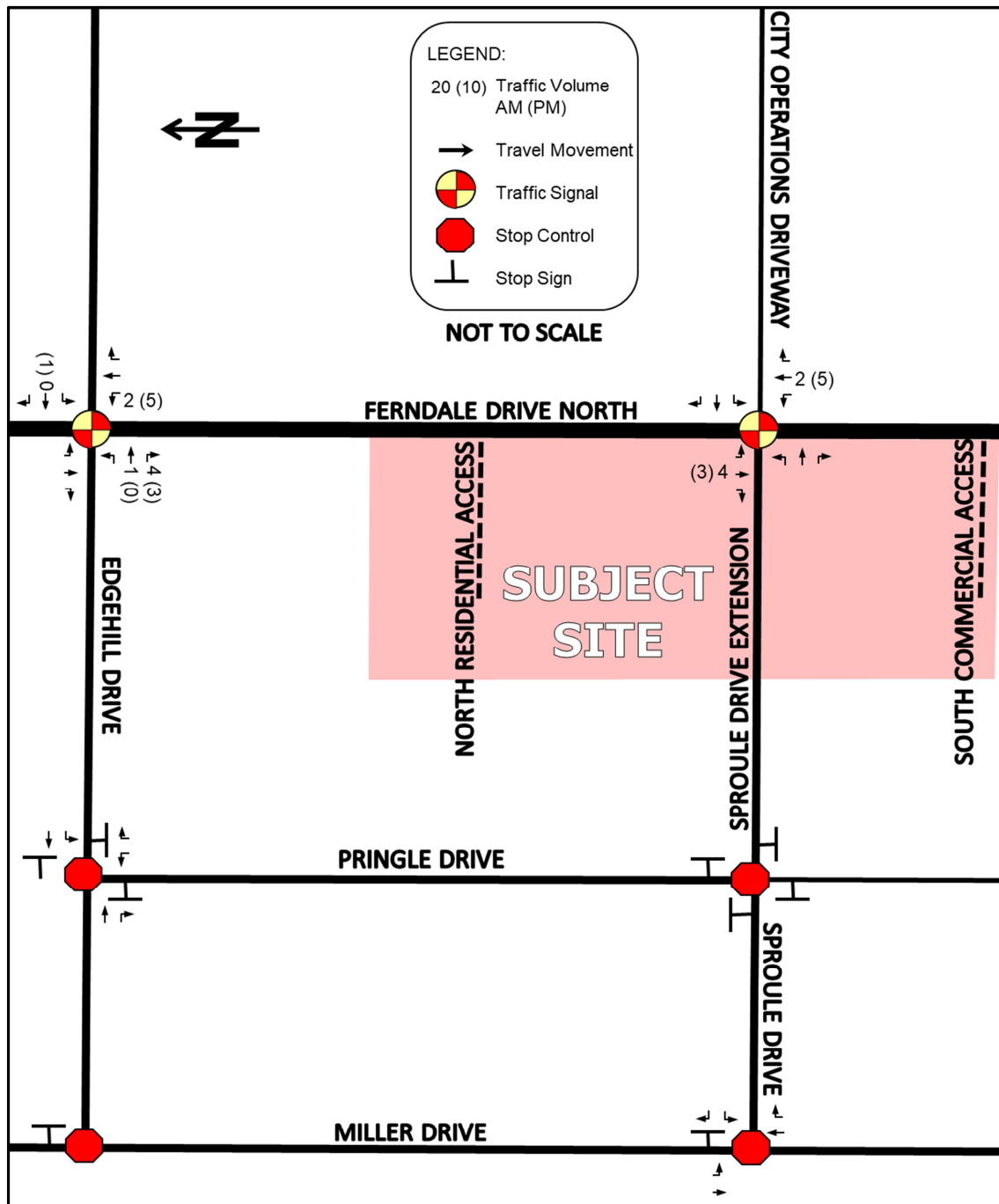


Figure 4 – Miller Development Traffic Assignment

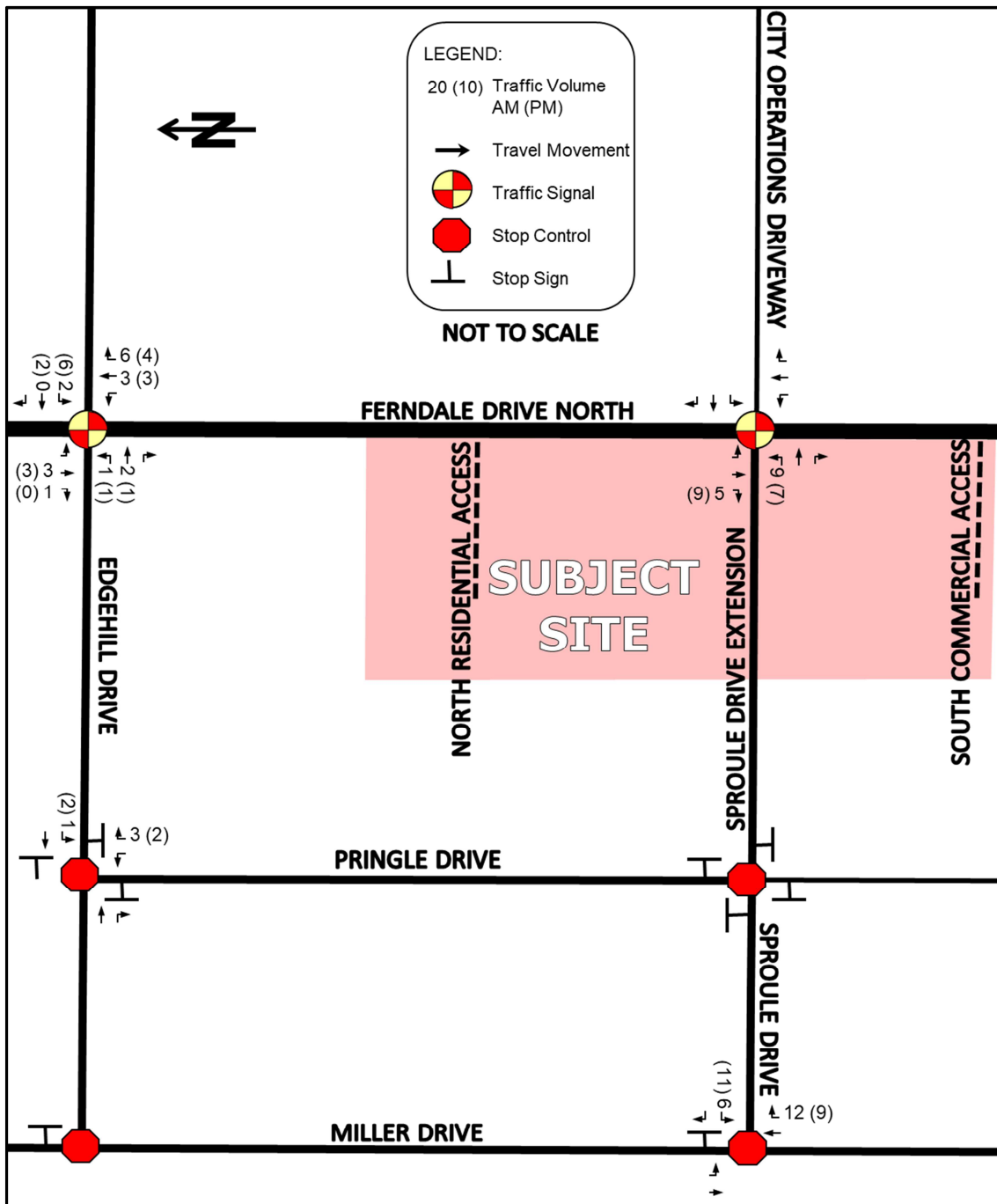


Figure 5 – Park City Development Traffic Assignment

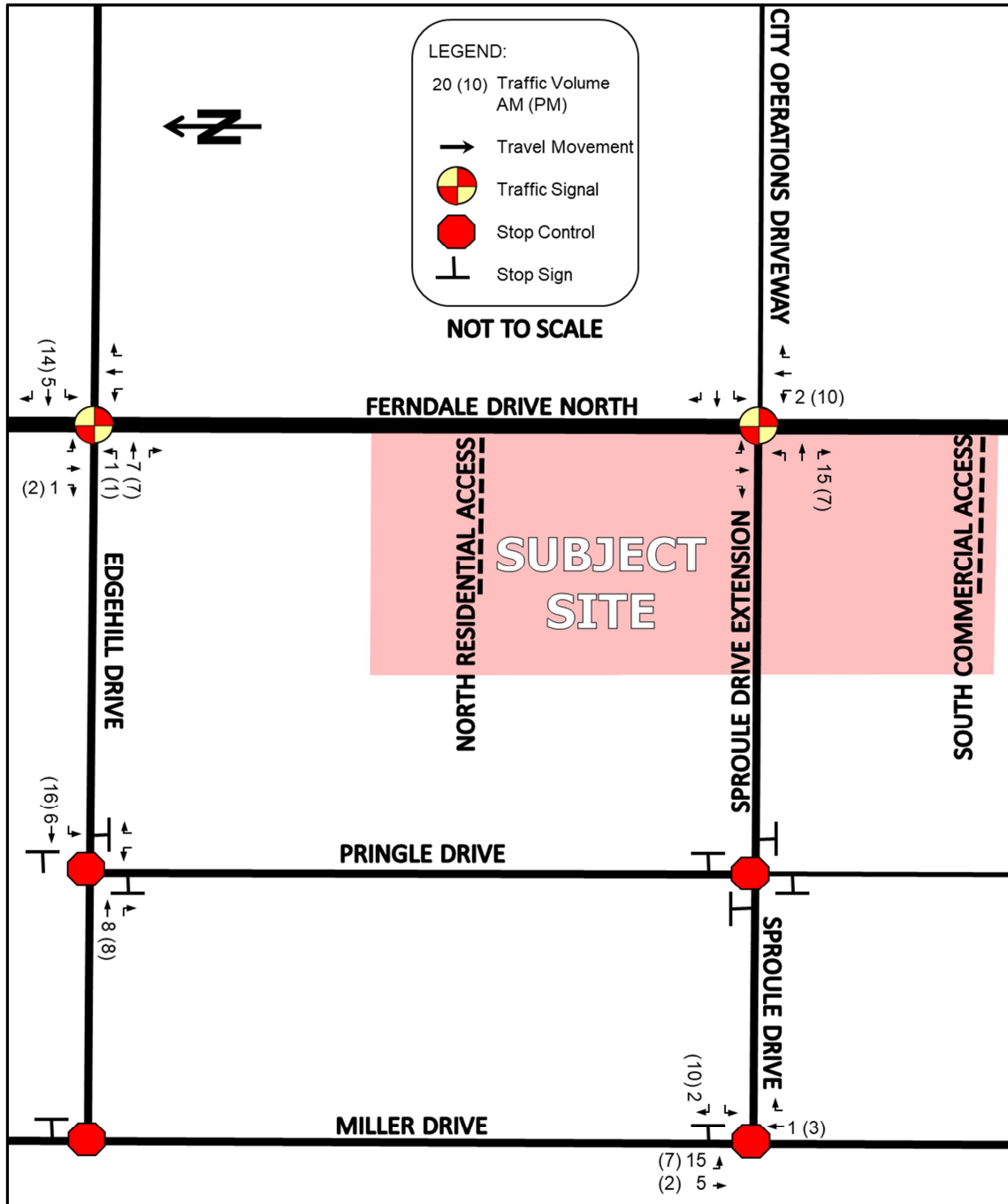
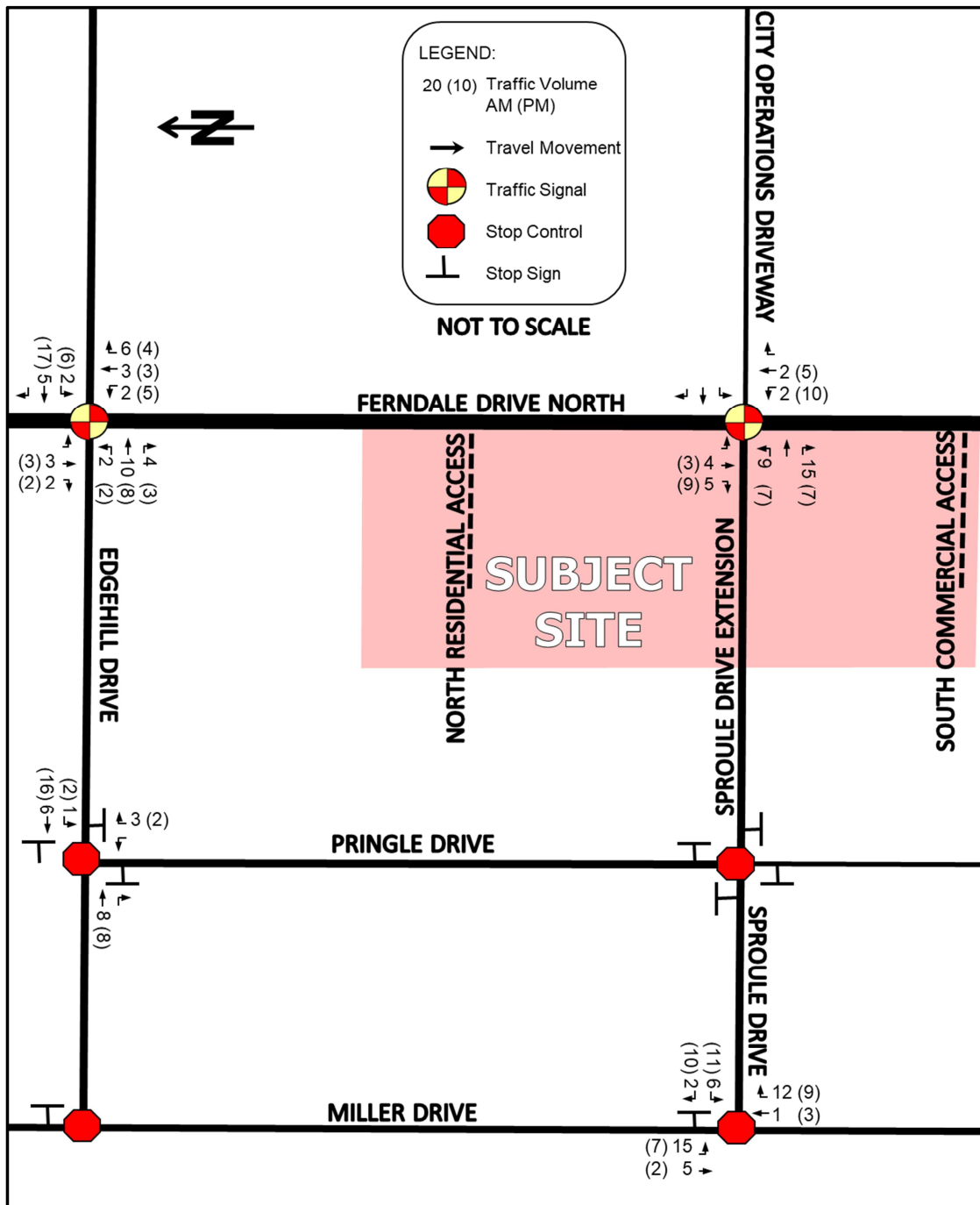


Figure 6 – Total Adjacent Developments' Traffic Assignment



2.5 Background Traffic Growth

A 2.5% and 2.4% per annum background traffic growth rate has been assumed on Ferndale Drive North and Edgehill Drive respectively based on a comparison between 2011 and 2031 Emme traffic volume projections from the MMATMP.

Miller Drive, Sproule Drive and Pringle Drive within the study area are anticipated to have a reduction of traffic when comparing the 2011 and 2031 EMME traffic volume projections from the MMATMP; however, in order to be conservative we have assumed a 1.0% per annum background traffic growth rate within the study area for Miller Drive, Sproule Drive and Pringle Drive

2.6 Traffic Counts

Detailed turning movements traffic and pedestrian counts were obtained from the City for the intersections of Ferndale Drive North / Edgehill Drive and Miller Drive / Sproule Drive. Detailed turning movements traffic and pedestrian counts were commissioned by JD Engineering for the intersections of Ferndale Drive North / City Operations Driveway and Pringle Drive / Edgehill Drive.

Table 2 summarizes the traffic count data collection information.

Table 2 - Traffic Count Data

Intersection (N-S Street / E-W Street)	Count Date	AM Peak Hour	PM Peak Hour	Source
Ferndale Drive North / Edgehill Drive	Tuesday, June 13 th 2017	08:00 – 09:00	16:30 – 17:30	City
Ferndale Drive North / City Operations Driveway	Wednesday, September 19 th 2018	07:15 – 08:15	16:15 – 17:15	JD Eng.*
Miller Drive / Sproule Drive	Thursday, March 2 nd 2017	07:30 – 08:30	16:30 – 17:30	City
Pringle Drive / Edgehill Drive	Wednesday, September 19 th 2018	07:15 – 08:15	16:30 – 17:30	JD Eng.*

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

Detailed traffic count data can be found in **Appendix C**. The peak hours of traffic generation for the study area intersections generally aligned with the anticipated peak hour of traffic generation by the proposed development.

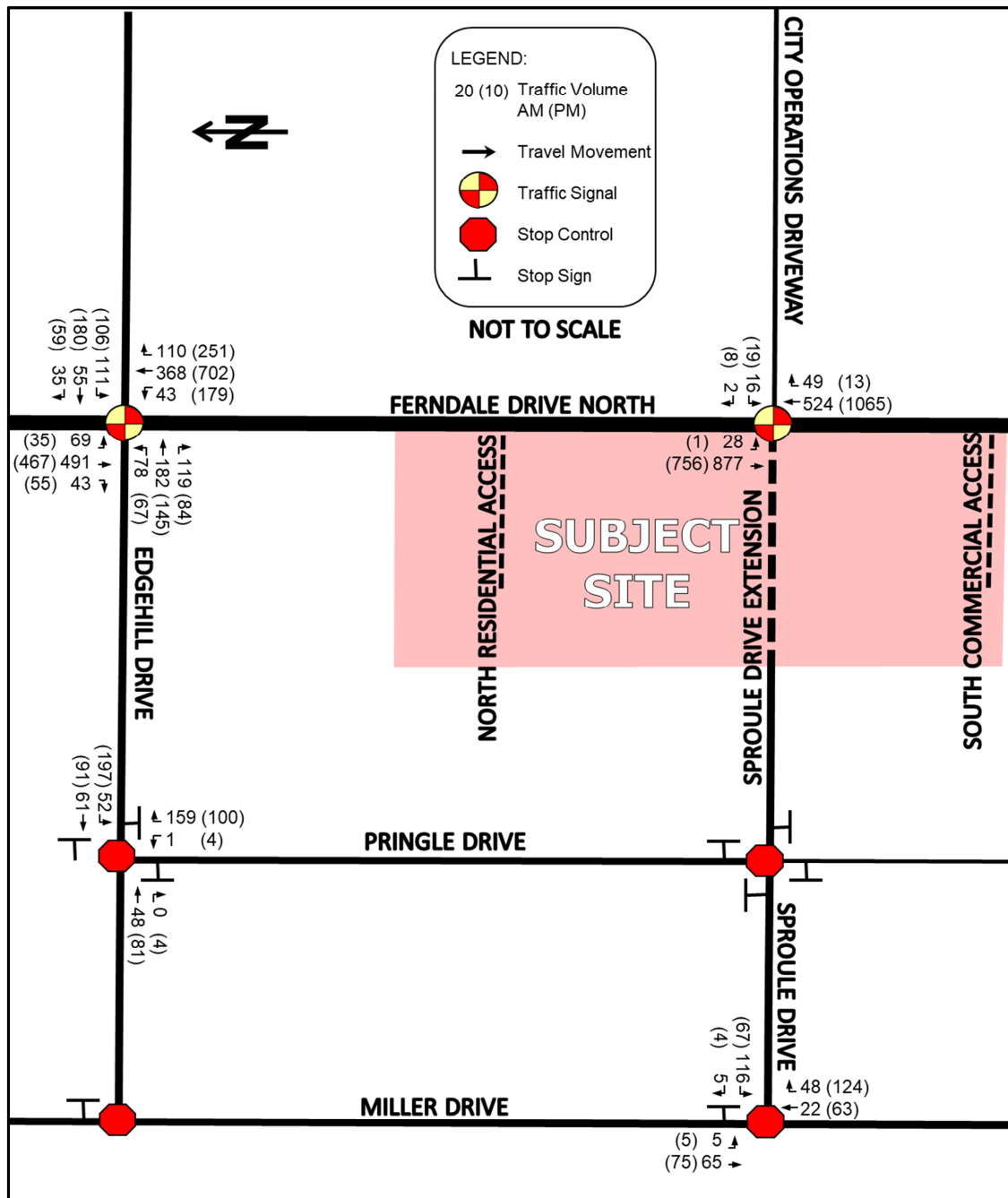
Heavy vehicle percentages and pedestrian crossings from the traffic count data have also been included in the Synchro analysis.

To determine the equivalent existing (2018) traffic volumes, the background growth rates noted in Section 2.5 were applied to the traffic count data.

Traffic volumes at the Ferndale Drive North / Edgehill Drive have been adjusted (increased) to match the ingress southbound traffic volumes at the adjacent Ferndale Drive North / City Operations Driveway intersection.

Figure 7 illustrates the existing (2018) AM and PM peak hour traffic volumes in the study area.

Figure 7 – Existing (2018) Traffic Volumes



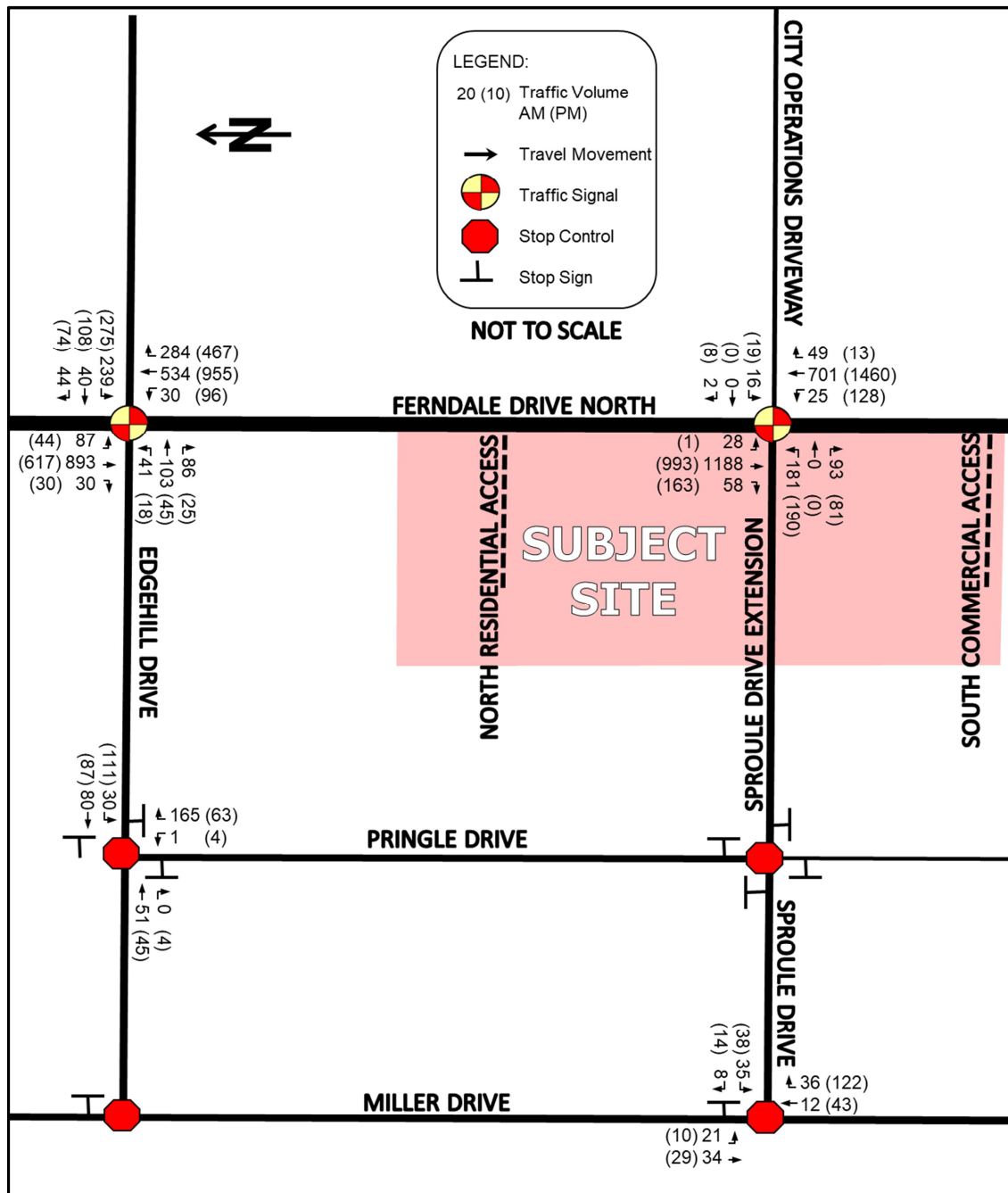
2.7 Horizon Year Traffic Volumes

The Sproule Drive extension, as noted in Section 2.2, will have a notable impact on the distribution of the local traffic volumes when it is completed. For the purpose of our analysis, the impact of the redistribution of traffic volumes due to the Sproule Drive extension has been estimated using the Emme transportation model output from the City's MMATMP.

The Emme travel demand model provides 2011, 2026 and 2031 traffic volume projections. The Sproule Drive extension was not assumed to be complete for in the 2011 and 2026 Emme traffic volume projections, but was assumed to be complete in the 2031 Emme traffic volume projections. Based on a comparison between 2011 and 2026 Emme traffic volume projections, we have calculated the equivalent 2031 traffic volume projections, without the Sproule Drive extension. Based on a comparison of the 2031 Emme traffic volume projections with the Sproule Drive extension and the calculated equivalent 2031 traffic volume projections without the Sproule Drive extension, we have calculated a ratio, at each midblock location within the study area, that represents the anticipated redistribution of traffic as a result of the Sproule Drive extension. These ratios have been applied to the existing (2018) traffic volumes to calculate theoretical baseline (2018) traffic volumes that include the impact of the Sproule Drive extension. The background (2028) traffic volumes were estimated for the AM and PM peak hour by applying the background traffic growth rates discussed in Section 2.5 to the theoretical baseline (2018) traffic volumes, in addition to the adjacent development traffic volumes (outlined in Section 2.4).

Figure 8 illustrates the background (2028) AM and PM peak hour traffic volumes in the study area.

Figure 8 - Background (2028) Traffic Volumes



3 Intersection Operation without Proposed Development

3.1 Intersection Capacity Analysis Criteria

Intersection performance was measured using the traffic analysis software, Synchro 10, a deterministic model that employs Highway Capacity Manual and Intersection Capacity Utilization methodologies for analysing intersection operations. These procedures are accepted by provincial and municipal agencies throughout North America.

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

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

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

The LOS criteria for signalized and stop sign controlled intersections are shown in **Table 3**. A description of traffic performance characteristics is included for each LOS.

Table 3 – 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 (2018) Intersection Operation

The results of the LOS analysis under existing (2018) traffic volumes during the AM and PM peak hours can be found below in **Table 4**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 4 - Existing (2018) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Ferndale Drive North / Edgehill Drive (signalized)	0.61	17.2	B	-	-	0.58	14.0	B	-	-
EBL	0.25	18.0	B	16	15.0	0.32	19.9	B	15	15.0
EBTR	0.69	24.4	C	-	-	0.52	21.2	C	-	-
WBL	0.88	56.3	E	43	33.0	0.47	21.3	C	22	33.0
WBTR	0.15	17.3	B	-	-	0.58	22.4	C	-	-
NBL	0.17	13.0	B	12	30	0.45	14.1	B	43	30
NBTR	0.36	13.6	B	-	-	0.60	13.5	B	-	-
SBL	0.16	7.3	A	11	71.0	0.13	6.7	A	6	71.0
SBT	0.39	9.1	A	-	-	0.24	6.4	A	-	-
SBR	0.03	6.9	A	5	8.0	0.04	5.5	A	5	8.0
Ferndale Drive North / Sproule Drive Extension & City Operations Driveway (signalized)	0.33	3.0	A	-	-	0.40	3.7	A	-	-
WBL	0.24	47.9	D	10	27.0	0.29	50.1	D	11	27.0
WBR	0.00	45.7	D	-	-	0.01	47.3	D	-	-
NB	0.23	3.3	A	-	-	0.41	3.7	A	-	-
SBL	0.05	1.4	A	3	29.0	0.00	1.6	A	1	29.0
SBTR	0.31	2.0	A	-	-	0.27	1.8	A	-	-
Miller Drive / Sproule Drive (unsignalized)	-	5.0	A	-	-	-	2.2	A	-	-
WB	0.19	10.4	B	-	-	0.10	10.3	B	-	-
Pringle Drive / Edgehill Drive (unsignalized)	-	7.8	A	-	-	-	9.3	A	-	-
EB	0.06	7.7	A	-	-	0.12	8.1	A	-	-
WB	0.15	8.2	A	-	-	0.39	10.2	B	-	-
NB	0.18	7.6	A	-	-	0.14	7.9	A	-	-

The V/C ratio for the westbound left turn movement at the Ferndale Drive North / Edgehill Drive intersection is operating outside the typical design limits noted in Section 3.1 during the AM peak hour; however, improvements are not recommended as the V/C ratio for the westbound left turn movement is only marginally outside the design limits.

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

The anticipated 95th percentile queue length for the eastbound left turn, westbound left turn and northbound left turn movements at the Ferndale Drive North / Edgehill Drive intersection marginally extend beyond the available storage length; however, no improvements are recommended as the additional queue can be accommodated by the available taper length.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

An analysis was completed for left turn movements at the unsignalized intersections, based on the criteria outlined in Exhibit 9A of the MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads (dated June 2017) [MTO DS]. Based on the above-noted criteria, a left turn lane is not warranted at any of the study area intersections (results are provided in **Appendix H**).

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized intersections (results are provided in **Appendix I**).

No infrastructure improvements are recommended within the study area.

3.3 Background (2028) Intersection Operation

The results of the LOS analysis under background (2028) traffic volumes during the AM and PM peak hours can be found below in **Table 5**. The infrastructure improvements required as a result of the Sproule Drive extension at the Ferndale Drive North / Sproule Drive extension & City Operations Driveway intersection discussed in Section 5.3 have been utilized in this scenario. The signal timing plans at the signalized intersections have been optimized in this scenario. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 5 - Background (2028) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Ferndale Drive North / Edgehill Drive (signalized)	0.67	18.5	B	-	-	0.77	21.6	C	-	-
EBL	0.12	22.2	C	13	15.0	0.11	29.0	C	11	15.0
EBTR	0.35	24.1	C	-	-	0.16	29.3	C	-	-
WBL	0.83	44.3	D	64	33.0	0.81	49.0	D	75	33.0
WBTR	0.12	22.1	C	-	-	0.43	32.1	C	-	-
NBL	0.13	14.1	B	11	30	0.30	14.1	B	33	30
NBTR	0.57	18.1	B	-	-	0.78	21.3	C	-	-
SBL	0.29	9.8	A	17	71.0	0.28	14.1	B	10	71.0
SBT	0.50	11.5	B	-	-	0.31	9.0	A	-	-
SBR	0.02	7.7	A	5	8.0	0.03	7.2	A	6	8.0
Ferndale Drive North / Sproule Drive Extension & City Operations Driveway (signalized)	0.62	15.8	B	-	-	0.69	16.7	B	-	-
EBL	0.74	48.3	D	61	100.0	0.76	54.1	D	61	100.0
EBTR	0.06	33.1	C	-	-	0.05	36.6	D	-	-
WBL	0.07	33.2	C	9	27.0	0.08	36.9	D	10	27.0
WBTR	0.00	32.7	C	-	-	0.01	36.2	D	-	-
NBL	0.12	8.4	A	5	29.0	0.35	8.6	A	15	29.0
NBTR	0.38	10.3	B	-	-	0.68	12.9	B	-	-
SBL	0.07	6.4	A	6	29.0	0.01	10.0	B	1	29.0
SBTR	0.61	13.2	B	-	-	0.58	14.9	B	-	-
Miller Drive / Sproule Drive (unsignalized)	-	4.1	A	-	-	-	1.8	A	-	-
WB	0.06	9.6	A	-	-	0.05	9.6	A	-	-
Pringle Drive / Edgehill Drive (unsignalized)	-	7.8	A	-	-	-	9.1	A	-	-
EB	0.07	7.7	A	-	-	0.16	8.3	A	-	-
WB	0.15	8.2	A	-	-	0.36	9.9	A	-	-
NB	0.19	7.6	A	-	-	0.15	8.0	A	-	-

The result of the analysis indicates that all intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn movement at the Ferndale Drive North / Edgehill Drive intersection will exceed the available storage length. The existing width of asphalt can accommodate the extension of the westbound left turn storage lane. Consequently, it is recommended that the City adjusting the pavement markings at this location to extend the westbound left turn auxiliary lane to provide a storage length of 75 metres and a taper length of 30 metres.

The anticipated 95th percentile queue length for the northbound left turn movement at the Ferndale Drive North / Edgehill Drive intersection marginally extends beyond the available storage length; however, no improvements are recommended as the additional queue can be accommodated within the existing taper length.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

An analysis was completed for left turn movements at the unsignalized intersections, based on the criteria outlined in Exhibit 9A of the MTO DS. Based on the above-noted criteria, a left turn lane is not warranted at any of the study area intersections (results are provided in **Appendix H**).

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized intersections (results are provided in **Appendix I**).

No infrastructure improvements are recommended within the study area for this scenario.

4 Proposed Development Traffic Generation and Assignment

4.1 Traffic Generation

The traffic generation for the subject site has been based on the ITE *Trip Generation* data. The following ITE land uses have been applied to estimate the traffic from the proposed development (ITE trip generation sheets are provided in **Appendix K**):

- ITE land use #221 (Multifamily Housing (Mid-Rise)) – General Urban/Suburban
- ITE land use #820 (Shopping Centre) – General Urban/Suburban

The estimated trip generation for the proposed development is illustrated below in **Table 6**. The AM and PM peak traffic generation for the residential component of the proposed development is not expected to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

For the shopping centre ITE land use, the fitted curve equation for the peak hour of adjacent street traffic has been used in our calculation for the PM peak hour. The fitted curve equation for the AM peak hour of adjacent street traffic has a low R^2 value; consequently, we have applied the average rate in our calculation for the AM peak hour. For the purposes of this analysis, the more conservative AM peak hour of generator rate has been used in our calculation for the AM peak hour.

Table 6 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Multifamily Housing (Mid-Rise)) ITE Land Use: 221	300 units	28	80	108	81	51	132
Shopping Centre ITE Land Use: 820	62,796 sq.ft.	102	87	189	185	201	386
TOTAL TRIP GENERATION		130	167	297	266	252	518
INTERNAL CAPTURE*		-2	-2	-4	-56	-56	-112
NET GENERATION		128	165	293	210	196	406
PASS-BY TRIPS (ITE Land Use: 820)**		0	0	0	-57	-57	-114
TOTAL PRIMARY TRIPS		128	165	293	153	139	292

* The internal capture rate has been calculated using the methodology outlined in the ITE Trip Generation Handbook, 3rd Edition.

** Commercial pass-by trips for the AM and PM peak hour are 0% and 34% respectively, according to the ITE data for ITE land use 820.

In order to be conservative, no transportation modal split reduction 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 traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. Beyond the local area the distribution of traffic from the residential component of the proposed development have been estimated based on the 2016 TTS data for traffic zone 8520 (excerpt attached as **Appendix G**). TTS data provides historical origin and destination work trip percentages for specific areas within southern Ontario.

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

The estimated distribution of trips generated by the proposed development is illustrated in **7**, which was calculated using the methodology outlined above.

Table 7 – Residential Component of Proposed Development Traffic Distribution

Travel Direction (to/from)	Percentage of Total Traffic Generation
South via Ferndale Drive North	86%
North via Ferndale Drive North	1%
East via Edgehill Drive	11%
South via Miller Drive	2%
Total	100%

The distribution of traffic for the commercial component of the proposed development is assumed to follow the distribution of the existing traffic volumes within the study area.

Table 8 illustrates the calculation of the distribution of ingress and egress traffic for the commercial development.

Table 8 – Commercial Component of Proposed Development Traffic Distribution

Scenario	Ingress Traffic Direction						Egress Traffic Direction					
	Eastbound via Edgehill Drive	Southbound via Ferndale Drive North	Westbound via Edgehill Drive	Northbound via Miller Drive	Northbound via Ferndale Drive North	Southbound via Miller Drive	Westbound via Edgehill Drive	Northbound via Ferndale Drive North	Eastbound via Edgehill Drive	Southbound via Miller Drive	Southbound via Ferndale Drive North	Northbound via Miller Drive
AM Peak Hour	2%	45%	14%	2%	35%	2%	3%	24%	18%	3%	51%	1%
PM Peak Hour	3%	23%	14%	7%	52%	1%	4%	36%	19%	1%	38%	2%

Using the above-noted traffic distribution patterns, the residential, commercial primary and commercial pass-by site traffic assignment for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figure 9, 10 and 11** respectively.

Figure 9 – Residential Site Traffic Assignment

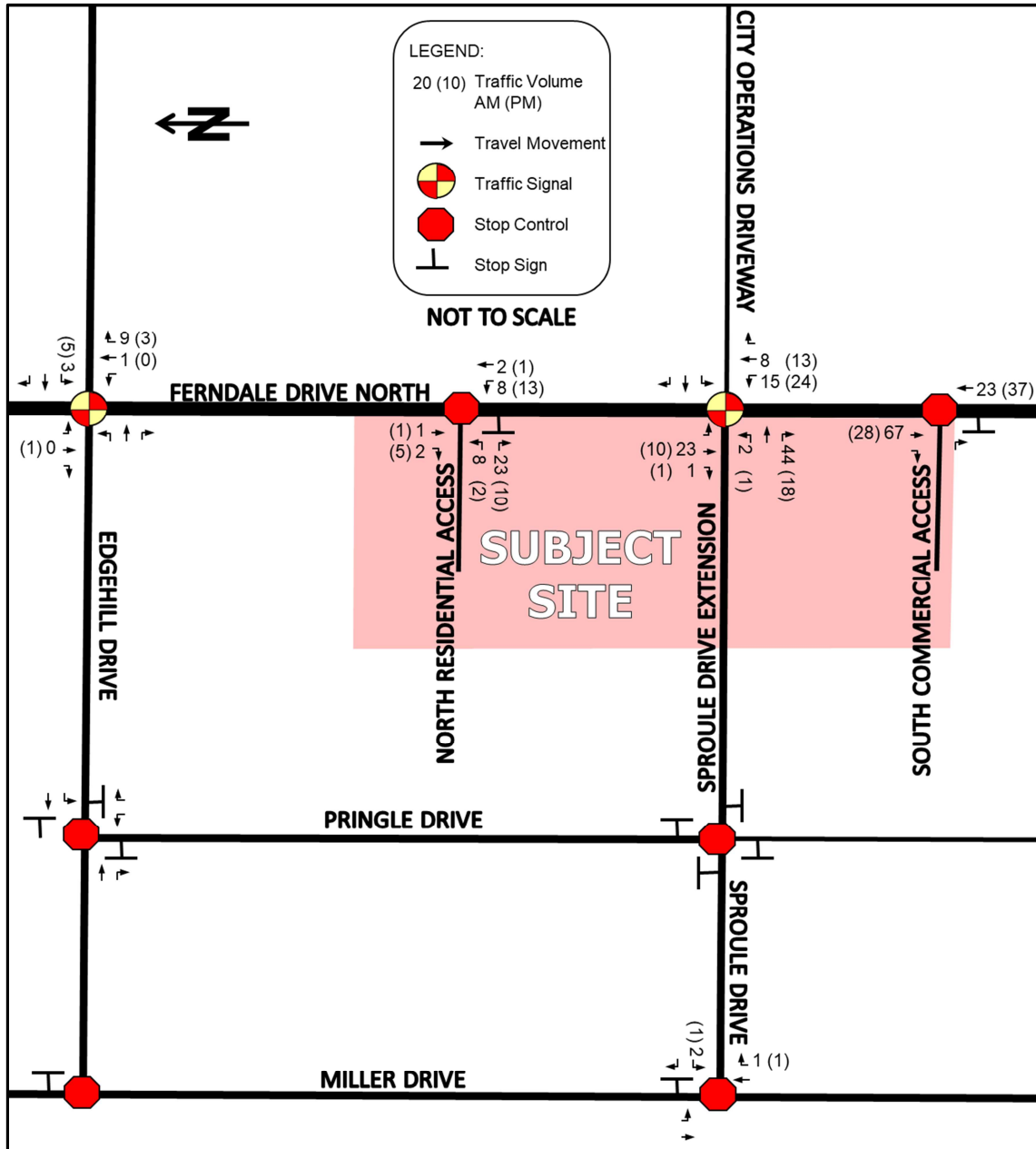


Figure 10 – Commercial Primary Site Traffic Assignment

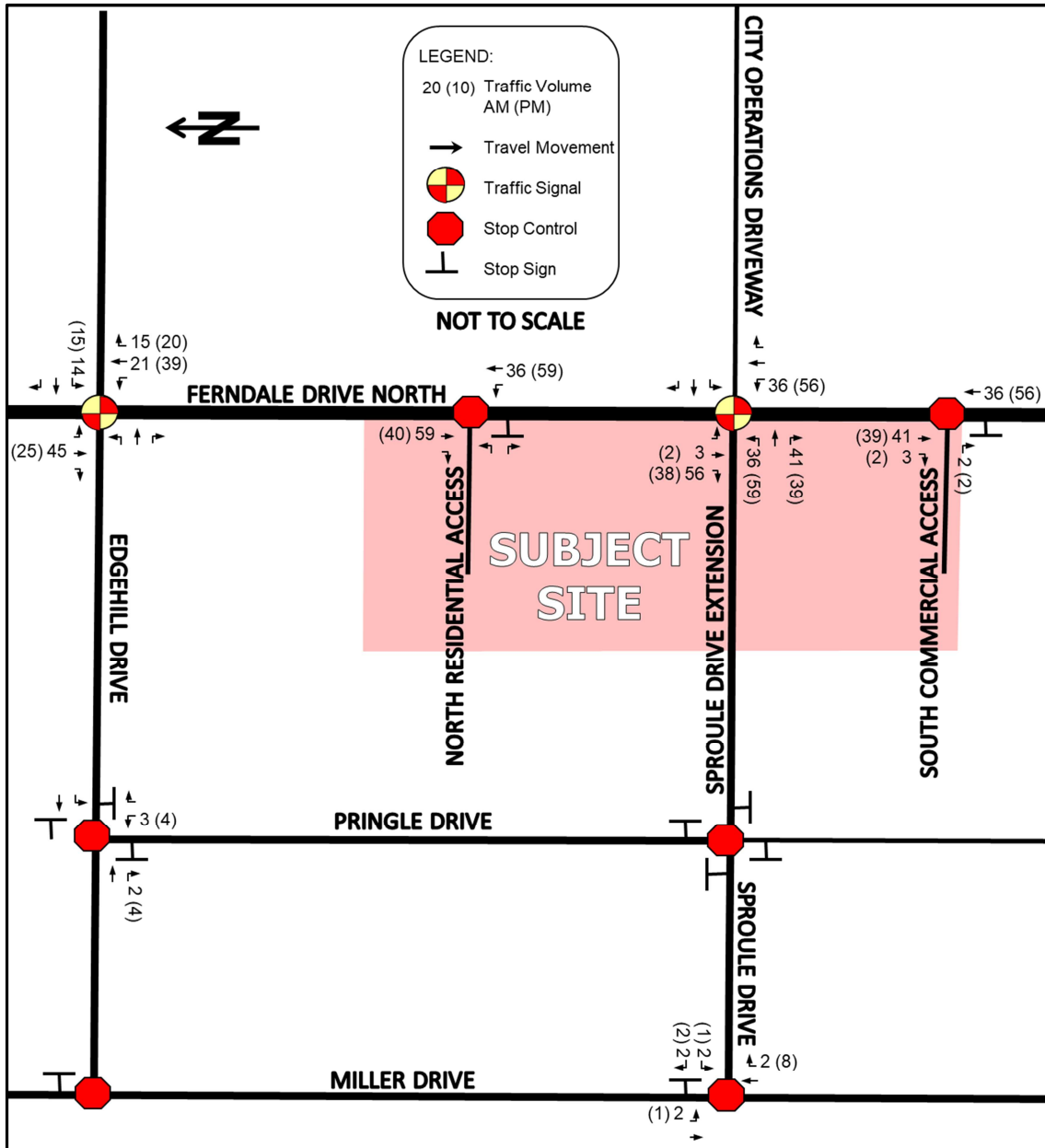
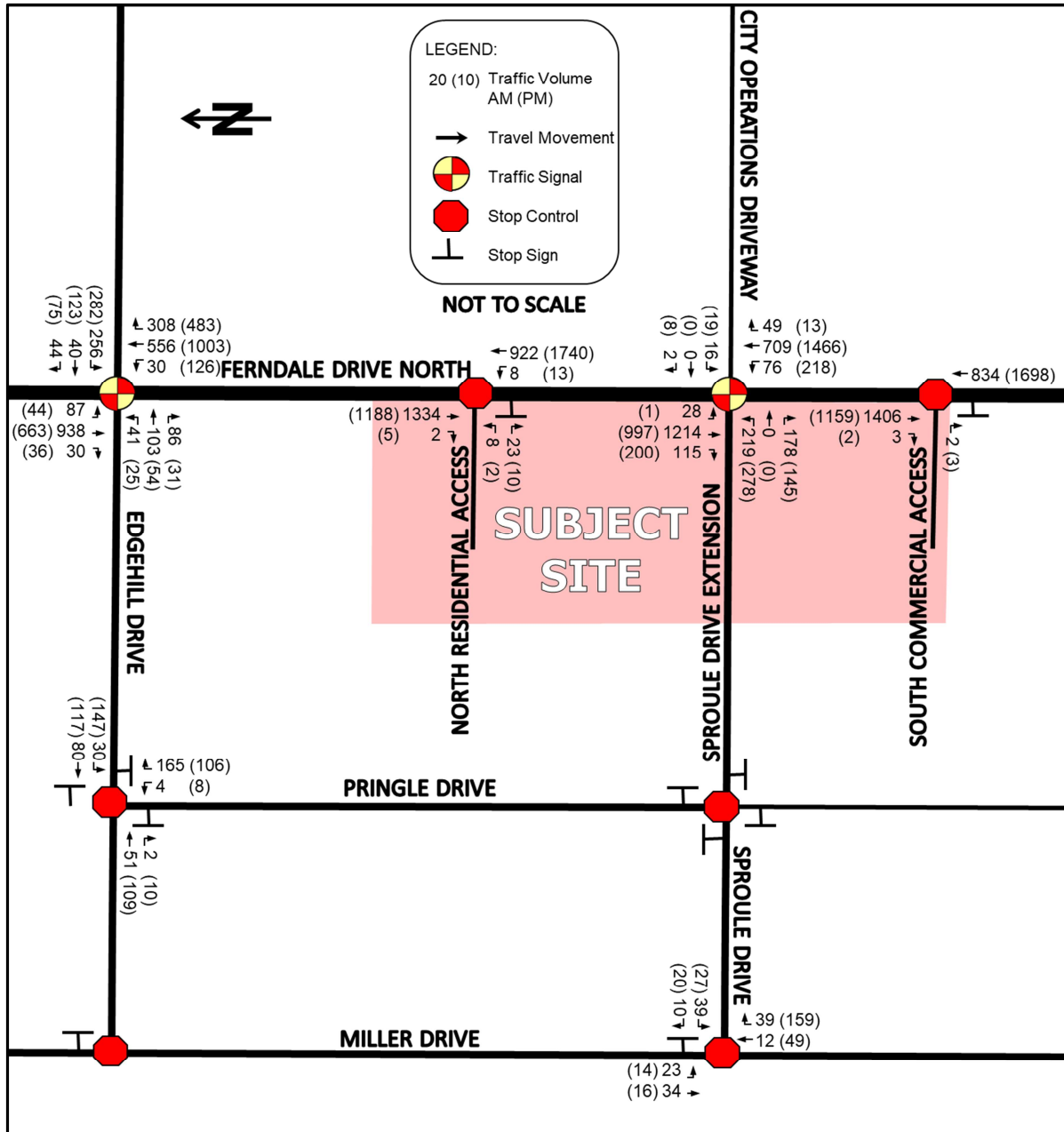


Figure 12 – Total (2028) Traffic Volumes



5 Intersection Operation with Proposed Development

5.1 Total (2028) Intersection Operation

The results of the LOS analysis under total (2028) traffic volumes during the AM and PM peak hours can be found below in **Table 9**. The infrastructure improvements identified in Section 3.3 have been utilized in this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 9 - Total (2028) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Ferndale Drive North / Edgehill Drive (signalized)	0.70	19.6	B	-	-	0.82	23.9	C	-	-
EBL	0.12	21.8	C	12	15.0	0.10	28.3	C	11	15.0
EBTR	0.35	23.7	C	-	-	0.14	28.6	C	-	-
WBL	0.84	45.5	D	69	33.0	0.84	52.1	D	84	33.0
WBTR	0.12	21.7	C	-	-	0.39	31.1	C	-	-
NBL	0.14	15.0	B	13	30	0.33	15.8	B	36	30.0
NBTR	0.61	19.7	B	-	-	0.83	24.8	C	-	-
SBL	0.32	10.9	B	18	71.0	0.32	16.8	B	10	71.0
SBT	0.53	12.7	B	-	-	0.33	10.1	B	-	-
SBR	0.02	8.3	A	5	8.0	0.03	7.9	A	6	8.0
Ferndale Drive North / Sproule Drive Extension & City Operations Driveway (signalized)	0.70	20.2	C	-	-	0.81	26.3	C	-	-
EBL	0.77	50.8	D	76	100.0	0.85	62.5	E	97	100.0
EBTR	0.14	33.9	C	-	-	0.10	35.9	D	-	-
WBL	0.08	33.5	C	9	27.0	0.07	35.5	D	10	27.0
WBTR	0.00	32.8	C	-	-	0.01	34.9	D	-	-
NBL	0.39	13.2	B	14	29.0	0.76	31.3	C	72	29.0
NBTR	0.39	12.1	B	-	-	0.72	18.7	B	-	-
SBL	0.07	8.5	A	7	29.0	0.01	15.8	B	1	29.0
SBTR	0.71	18.5	B	-	-	0.70	25.0	C	-	-
Miller Drive / Sproule Drive (unsignalized)	-	4.3	A	-	-	-	2.0	A	-	-
WB	0.08	9.7	A	-	-	0.06	9.7	A	-	-
Pringle Drive / Edgehill Drive (unsignalized)	-	7.8	A	-	-	-	9.1	A	-	-
EB	0.07	7.7	A	-	-	0.16	8.3	A	-	-
WB	0.15	8.2	A	-	-	0.36	10.0	A	-	-
NB	0.19	7.6	A	-	-	0.15	8.1	A	-	-
Ferndale Drive North / North Residential Access (unsignalized)	-	0.3	A	-	-	-	0.2	C	-	-
EB	0.10	17.2	C	-	-	0.04	18.0	C	-	-
Ferndale Drive North / South Commercial Access (unsignalized)	-	0.0	A	-	-	-	0.0	A	-	-
EB	0.00	9.7	A	-	-	0.00	9.5	A	-	-

The result of the analysis indicates that the eastbound left movement at the Ferndale Drive North / Sproule Drive extension & City Operations Driveway intersection is operating at the typical design limits noted in Section 3.1 during the PM peak hour; however, no improvements are recommended as the future traffic assumptions applied in this report are expected to be a conservative estimate.

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

The anticipated 95th percentile queue length for the westbound left turn movement at the Ferndale Drive North / Edgehill Drive intersection will exceed the available storage length. The existing width of asphalt can accommodate the extension of the westbound left turn storage lane. Consequently, it is recommended that the City consider adjusting the pavement markings at this location to extend the westbound left turn auxiliary lane to provide a storage length of 85 metres.

The anticipated 95th percentile queue length for the northbound left turn movement at the Ferndale Drive North / Edgehill Drive intersection marginally extends beyond the available storage length; however, no improvements are recommended as the additional queue can be accommodated within the existing taper length.

The anticipated 95th percentile queue length for the northbound left turn movements at the Ferndale Drive North / Sproule Drive extension & City Operations Driveway intersection extends beyond the available storage length. It is noted that the existing storage length can accommodate the 50th percentile queue length (22 metres) during the PM peak hour and the 95th percentile queue length for the AM peak hour. An additional review of the queuing was completed using the SimTraffic software. The 95th percentile queue length using this methodology was calculated to be 62 metres, which can be accommodated within the existing taper length. Since the northbound left turn queue is only expected to exceed the storage length for a short period during the PM peak hour, reconstruction of Ferndale Drive North to provide additional storage length is not currently recommended. It is recommended that the City monitor queuing at this location once the Sproule Drive extension is constructed to confirm the recommendations provided in this report. In the event that the northbound left turn queuing is resulting in operational issues, it is recommended that the City consider constructing a southbound right turn auxiliary lane on Ferndale Drive North at Sproule Drive. Based on our review, a southbound right turn lane would be the most economical strategy to improve capacity at the intersection and decrease the northbound left turn queue.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

An analysis was completed for left turn movements at the unsignalized intersections, based on the criteria outlined in Exhibit 9A of the MTO DS. Based on the above-noted criteria, a left turn lane is warranted in the northbound direction at the Ferndale Drive North / North Residential Access intersection (results are provided in **Appendix H**); however, based on the low volume of left turn movements and the low volume to capacity / excellent LOS for northbound thru movements on Ferndale Drive North at the North Residential Access, a northbound left turn is not recommended. The left northbound lane would act as a de facto left turn lane and the right northbound lane (curb lane) will provide the opportunity for northbound vehicles to pass a queuing vehicle waiting to make a left turn at this location, when required.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized intersections (results are provided in **Appendix I**).

No infrastructure improvements are recommended within the study area.

5.2 Sight Distance Review

A review of the available sight distance for the proposed North Residential Access, Sproule Drive extension and South Commercial Access was completed as part of this analysis.

The sight distance north and south on Ferndale Drive North, at the North Residential Access, Sproule Drive extension and South Commercial Access is significantly greater than the minimum stopping sight distance requirements as identified in the Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [TAC Guidelines] for a design speed of 60km/h (85 metres). Consequently, there are no issues with the sight distance available for the proposed North Residential Access, Sproule Drive extension and South Commercial Access.

5.3 Site Access

The North Residential Access will operate as a full-movement access, with one-way stop control for eastbound movement. A single eastbound and westbound lane at the North Residential Access will provide the necessary capacity to service the proposed development.

The South Commercial Access will operate as a RIRO access, with one-way stop control for eastbound movement. A single eastbound and westbound lane at the North Commercial Access will provide the necessary capacity to service the proposed development.

The proposed spacing between the North Residential Access and Edgehill Drive (measured edge of driveway to edge of road) is in excess of 120 metres, the proposed spacing between the North Residential Access and the City Operations Driveway (measured edge to edge of driveway) is in excess of 165 metres and the proposed spacing between the City Operations Driveway and the South Commercial Access (measured edge to edge of driveway) is in excess of 121 metres. The proposed driveway spacing, for all cases noted above, is in excess of the suggested minimum corner clearance requirements for a driveway 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) – 70 metres for signalized condition.

The proposed spacing between the South Commercial Access and Lennox Drive (measured edge of driveway to edge of road) is in excess of 50 metres. The proposed driveway spacing is in excess of the suggested minimum corner clearance requirements for a driveway as identified in the TAC Guidelines – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – 35 metres for unsignalized condition.

5.4 Sproule Drive Extension

The intersection of Ferndale Drive North / Sproule Drive Extension & City Operations Driveway would operate efficiently as a signalized intersection. It is recommended that the northbound traffic signal heads are replaced in order to provide a protected northbound left turn movement at this intersection.

Based on the anticipated number of eastbound left turn movements and the existing configuration of the Ferndale Drive North / City Operations Driveway intersection, it is recommended that the lane configuration for the Sproule Drive extension onto Ferndale Drive North include a single through / right lane and an auxiliary eastbound left turn lane. It is recommended that the eastbound left turn lane transition into a two-way left-turn lane [TWLTL] 50 metres west of Ferndale Drive North. It is recommended that the TWLTL terminate 15 metres west of the main site access driveway for the commercial block and taper back to a two-lane cross-section over a 50 metre length.

5.5 Active Transportation Review

There are painted sharrows on both sides of Ferndale Drive North. Additionally, according to the City's MMATMP, additional cycling infrastructure is planned for the study area that will provide better connectivity for the surrounding community. The planned ROW Extension of Edgehill Drive and Miller Drive outlined in Section 2.2, will include the construction of a sidewalk and bicycle lanes along both sides of the road.

The proposed development will include an internal sidewalk network which will connect onto the Sproule Drive extension. The construction of the Sproule Drive extension will include the construction of sidewalks along both sides of the road which will connect onto Ferndale Drive North. There are currently actuated pedestrian crossing signals and cross-walk pavement markings across all four sides of the Ferndale Drive North / Sproule Drive Extension & City Ops Centre Driveway intersection.

Sproule Drive is a minor collector road. It is recommended that the Sproule Drive extension include a two-lane urban cross-section with painted bike lanes and a sidewalk on both sides of the road, per the City standard for a minor collector road. It is recommended that the City review the existing road cross-section for Sproule Drive, west of the subject site, to determine if a retrofit bike facility is feasible.

It is recommended that the City continue to prioritize active transportation along these corridors, in order to provide the necessary transportation network capacity to accommodate the anticipated future transportation demands in the study area.

5.6 Parking Review

The proposed parking supply for the subject site meets the parking requirements specified in the City Zoning By-law 2009-141. Accessible parking for the subject site is provided according to the City Zoning By-law 2009-141. The proposed parking breakdown is provided in **Table 10**.

Table 10 - Zoning By-law Parking Requirements

Category	Zoning By-Law Section	Parking Standard	Parking	
			Required	Provided
Residential Parking	4.6.1	1.5 spaces per dwelling unit	450 spaces	456 spaces
Commercial Parking	4.6.1	1 space per 30 sq.m. of gross leasable floor area	195 spaces	212 spaces
Accessible Parking	4.6.4	1 space plus 3% of required parking	20 spaces	21 spaces

5.7 Construction Parking

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

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

6 Summary

Previn Court Homes retained **JD Engineering** to prepare this traffic impact study in support of the proposed mixed-use development municipally known as 180 & 190 Ferndale Drive North in the in the City of Barrie. The site plan provided by the Developer is included in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

The proposed development will consist of 300 residential units and approximately 62,796 sq.ft. of commercial space.

1. The proposed development is expected to generate 293 AM and 406 PM new peak hour trips in the study area.
2. Background traffic and pedestrian counts were obtained from the City at the existing intersections of Ferndale Drive North / Edgehill Drive and Miller Drive / Sproule Drive, completed on Tuesday October 13th, 2017 and Thursday, March 2nd 2017 respectively. Background traffic and pedestrian counts were obtained at the existing intersection of Ferndale Drive North / City Operations Driveway and Pringle Drive / Edgehill Drive, completed on Wednesday, September 19th 2018.
3. An intersection operational analysis was completed at the study area intersections, using the existing (2018) and background (2028) traffic volumes, 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.
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 intersection.
5. An intersection operation analysis was completed under total (2028) traffic volumes with the proposed development operational at the study area intersections.
6. The following infrastructure improvements are recommended for the 2028 horizon year:

Ferndale Drive North / Edgehill Drive

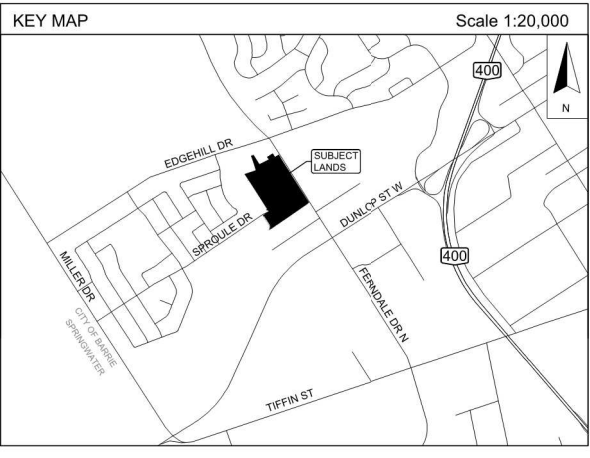
- Modify pavement markings to extend the westbound left turn auxiliary lane to provide a storage length of 85 metres and a taper length of 30 metres.
- Signal Timing Plan optimization.

Ferndale Drive North / Sproule Drive Extension & City Operations Driveway

- Construction of a single eastbound through / right turn lane and an eastbound left turn auxiliary lane with a transition to a two-way left-turn lane, 50 metres west of Ferndale Drive North; terminating 15 metres west of the main site access driveway for the commercial block, with a 50 metre taper length;
- Replace the northbound traffic signal heads in order to provide a protected northbound left turn movement;
- Signal Timing Plan optimization;
- The City should consider monitoring queuing at this location once the Sproule Drive extension is constructed to determine if the extension of the northbound left turn auxiliary lane is required; and
- The Sproule Drive extension (through the subject site) to include an urban cross-section with painted bike lanes and a sidewalk on both sides of the road.

7. The proposed Sproule Drive extension onto Ferndale Drive North will operate efficiently with signalized control.
8. The sight distance available for the Sproule Drive extension meets the minimum stopping sight distance requirements.
9. In summary the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Appendix A – Site Plan



LEGEND

- SUBJECT LANDS
Area: ±7.973ha (19.70ac)
- RESIDENTIAL APARTMENT BUILDINGS
60 Units / Building
- COMMERCIAL RETAIL UNITS
- NEIGHBOURHOOD PARK
- LANDSCAPED OPEN SPACE
- SWM BLOCK

	APARTMENT RESIDENTIAL (RA1-2 ZONE)		GENERAL COMMERCIAL (C5-SP 514 ZONE)	
	REQUIRED	PROPOSED	REQUIRED	PROPOSED
Lot Area	1,100m²	36,858.6m²	450m²	20,356.91m²
Lot Frontage	24m	118.3m	15.0m	122.9m
Setbacks				
Front Yard	7.0m	7.0m	6.0m	6.0m
Side Yard	5.0m	6.0m	3.0m	6.9m
Ex. Side Yard	3.0m	7.0m	5.0m	5.0m
Rear Yard	7.0m	7.0m	7.0m	7.4m
Landscaped Open Space	35%	38.5%	n/a	-
Dwelling Unit Floor Area	35m²	35m²	n/a	-
Lot Coverage	35%	14.7%	50%	28.7%
GFA % of Lot	100%	73.3%	n/a	-
Height	15m	15m	14m	<14m
Parking	450 (incl. 15 barrier free)	456	195	212

CONCEPT PLAN
300 Units

FERNDALE DRIVE NORTH & SPROULE DRIVE
PART OF LOT 23, CONCESSION 7
IN THE
CITY OF BARRIE, ON

0 25 50 75m

IPS INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
150 DUNLOP STREET EAST, SUITE 201, BARRIE, ONTARIO L4M 1B1
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Source: Concept plan prepared by McKnight Charron Limited Architects, October 2018.

Date: October 30, 2018	File: 17-682
Scale: 1:600	Reviewed By: GB

Appendix B – Adjacent Development Reports

Miller Development TIS

20/30/40 Miller Drive Development

City of Barrie

Traffic Impact Study for The Hedbern Development Corp.

Type of Document:
Final Report

Project Number:
JDE – 1534

Date Submitted:
November 26th, 2015



John Northcote, P.Eng.
Professional License #:



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Figure 7 – Residential Traffic Assignment for Proposed Development

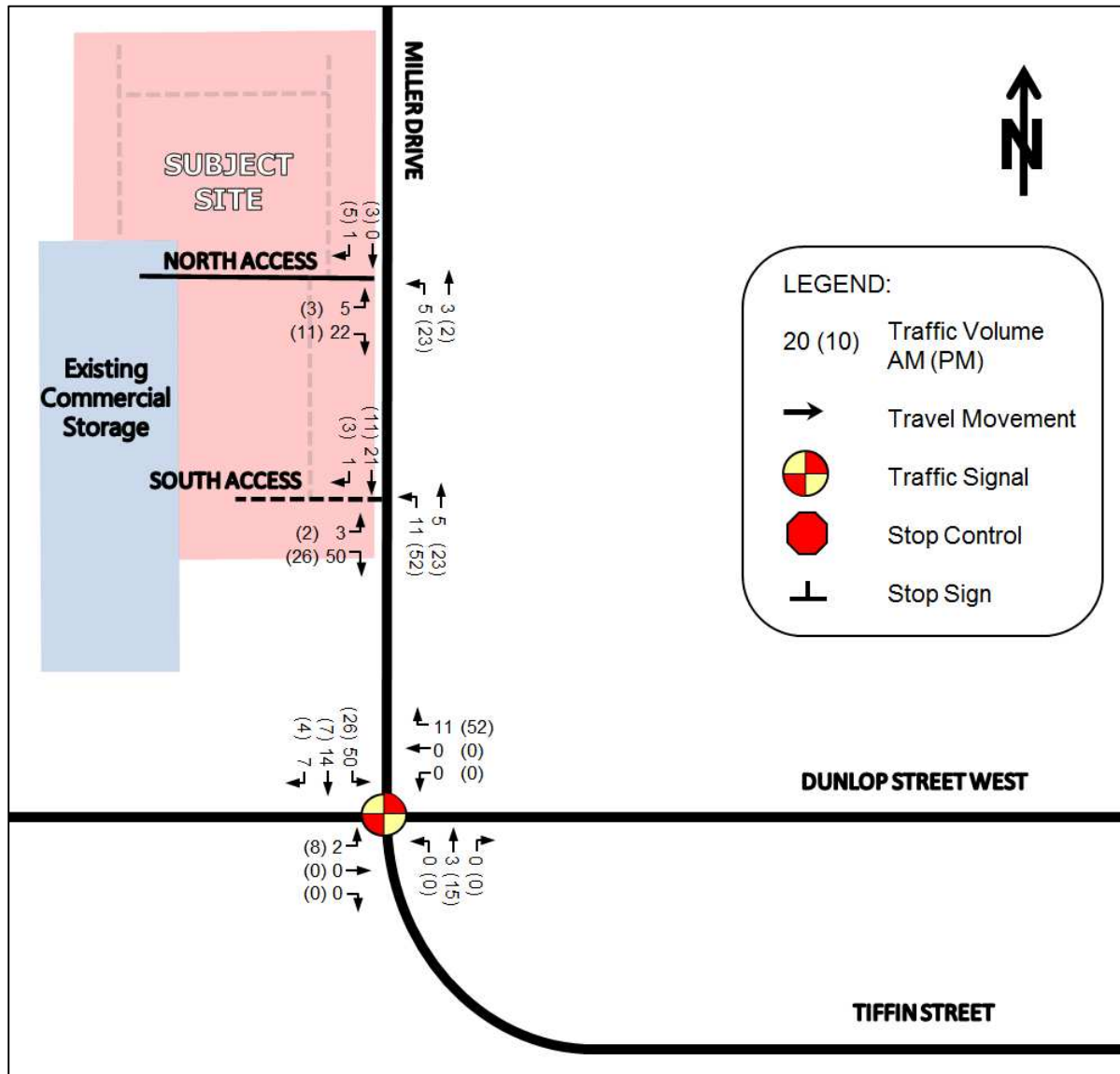
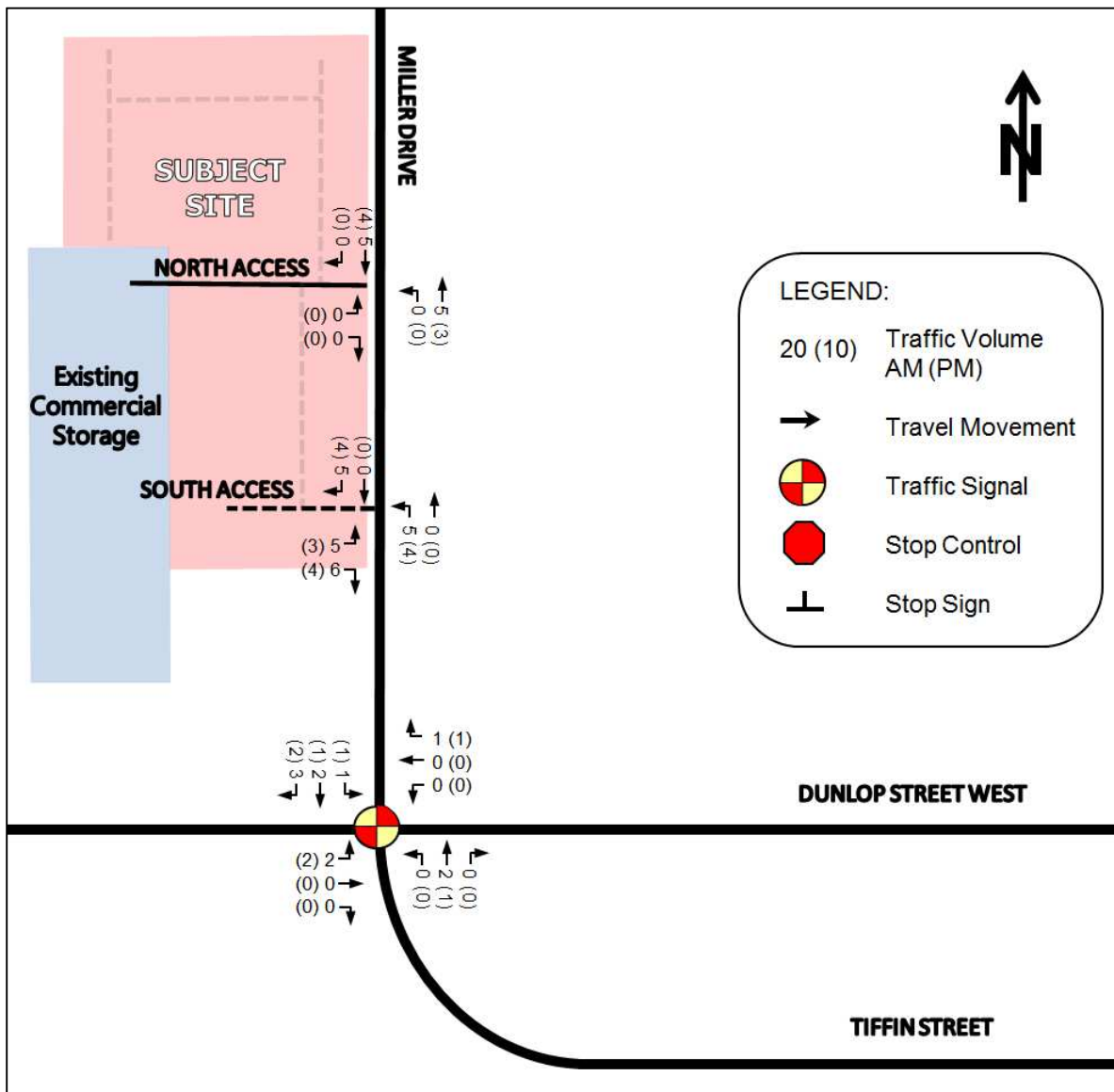


Figure 8 – Commercial Traffic Assignment for Proposed Development



4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2025) horizon year traffic volumes, the proposed residential and commercial development traffic was added to the projected (2025) traffic volumes. The resulting total (2025) horizon year total traffic volume for the AM and PM peak hour can be found in **Figure 9**.

Park City Traffic Brief

152 Miller Drive Development

City of Barrie

Traffic Impact Study for Park City Inc.

Type of Document:
Final Report

Project Number:
JDE – 18027

Date Submitted:
April 20th, 2018

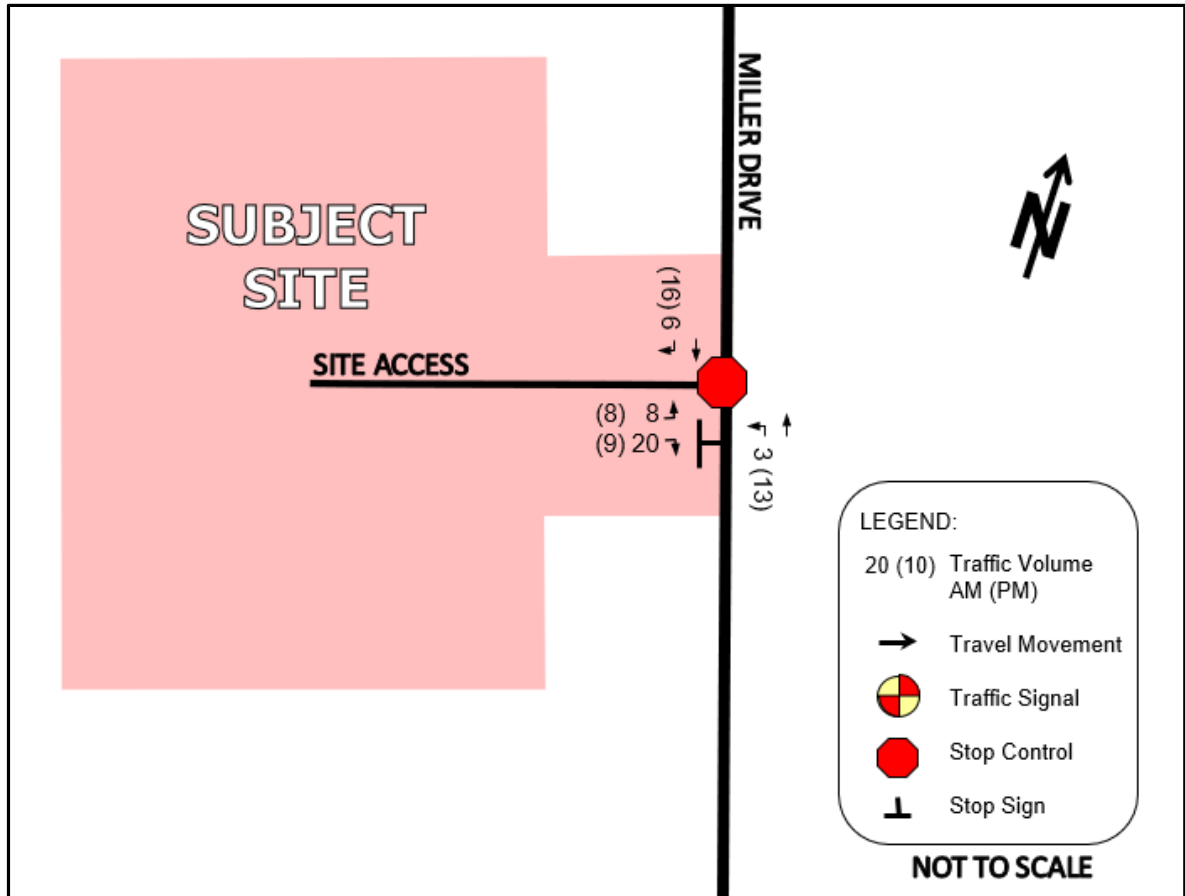


John Northcote, P.Eng.
Professional License #: 100124071



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86 Cumberland Street
Barrie, ON
(705) 725-4035
www.JDEngineering.ca

Figure 4 – Traffic Assignment for Proposed Development



Appendix C – Traffic Count Data

Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:00:00 To: 9:00:00	One Hour Peak From: 7:15:00 To: 8:15:00
Municipality: Barrie Site #: 1812000001 Intersection: Ferndale Dr N & City of Barrie Ops TFR File #: 1 Count date: 19-Sep-18	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **	Major Road: Ferndale Dr N runs N/S	

North Leg Total: 1431 North Entering: 905 North Peds: 1 Peds Cross:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">0</td> <td style="text-align: right;">23</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">23</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">0</td> <td style="text-align: right;">1</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">0</td> <td style="text-align: right;">853</td> <td style="text-align: right;">28</td> <td style="border-left: 1px solid black; text-align: right;">881</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">0</td> <td style="text-align: right;">877</td> <td style="text-align: right;">28</td> <td style="border-left: 1px solid black; text-align: right;">881</td> </tr> </table>	Heavys	0	23	0	23	Trucks	0	1	0	1	Cars	0	853	28	881	Totals	0	877	28	881	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">40</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">7</td> </tr> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">479</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">526</td> </tr> </table>	Heavys	40	Trucks	7	Cars	479	Totals	526	East Leg Total: 95 East Entering: 18 East Peds: 4 Peds Cross:
Heavys	0	23	0	23																											
Trucks	0	1	0	1																											
Cars	0	853	28	881																											
Totals	0	877	28	881																											
Heavys	40																														
Trucks	7																														
Cars	479																														
Totals	526																														

Heavys	Trucks	Cars	Totals
0	0	0	0

City of Barrie Ops Centre driveway

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	0	0
0	0	0	0

Ferndale Dr N

N
S
E
W

Ferndale Dr N

Cars	Trucks	Heavys	Totals
2	0	0	2
0	0	0	0
15	0	1	16
17	0	1	18

City of Barrie Ops Centre driveway

Cars	Trucks	Heavys	Totals
74	0	3	77

Peds Cross: West Peds: 0 West Entering: 0 West Leg Total: 0	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">868</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">24</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">893</td> </tr> </table>	Cars	868	Trucks	1	Heavys	24	Totals	893	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Cars</td> <td style="text-align: right;">0</td> <td style="text-align: right;">477</td> <td style="text-align: right;">46</td> <td style="border-left: 1px solid black; text-align: right;">523</td> </tr> <tr> <td style="text-align: right;">Trucks</td> <td style="text-align: right;">0</td> <td style="text-align: right;">7</td> <td style="text-align: right;">0</td> <td style="border-left: 1px solid black; text-align: right;">7</td> </tr> <tr> <td style="text-align: right;">Heavys</td> <td style="text-align: right;">0</td> <td style="text-align: right;">40</td> <td style="text-align: right;">3</td> <td style="border-left: 1px solid black; text-align: right;">43</td> </tr> <tr> <td style="text-align: right;">Totals</td> <td style="text-align: right;">0</td> <td style="text-align: right;">524</td> <td style="text-align: right;">49</td> <td style="border-left: 1px solid black; text-align: right;">573</td> </tr> </table>	Cars	0	477	46	523	Trucks	0	7	0	7	Heavys	0	40	3	43	Totals	0	524	49	573	Peds Cross: South Peds: 0 South Entering: 573 South Leg Total: 1466
Cars	868																														
Trucks	1																														
Heavys	24																														
Totals	893																														
Cars	0	477	46	523																											
Trucks	0	7	0	7																											
Heavys	0	40	3	43																											
Totals	0	524	49	573																											

Comments

Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 16:00:00 To: 19:00:00	One Hour Peak From: 16:15:00 To: 17:15:00
Municipality: Barrie Site #: 1812000001 Intersection: Ferndale Dr N & City of Barrie Ops TFR File #: 1 Count date: 19-Sep-18	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **	Major Road: Ferndale Dr N runs N/S	

North Leg Total: 1830 North Entering: 757 North Peds: 0 Peds Cross:	<table style="margin: auto;"> <tr><td>Heavys</td><td>0</td><td>20</td><td>0</td><td>20</td></tr> <tr><td>Trucks</td><td>0</td><td>4</td><td>0</td><td>4</td></tr> <tr><td>Cars</td><td>0</td><td>732</td><td>1</td><td>733</td></tr> <tr><td>Totals</td><td>0</td><td>756</td><td>1</td><td></td></tr> </table>	Heavys	0	20	0	20	Trucks	0	4	0	4	Cars	0	732	1	733	Totals	0	756	1		<table style="margin: auto;"> <tr><td>Heavys</td><td>10</td></tr> <tr><td>Trucks</td><td>6</td></tr> <tr><td>Cars</td><td>1057</td></tr> <tr><td>Totals</td><td>1073</td></tr> </table>	Heavys	10	Trucks	6	Cars	1057	Totals	1073	East Leg Total: 41 East Entering: 27 East Peds: 1 Peds Cross:
Heavys	0	20	0	20																											
Trucks	0	4	0	4																											
Cars	0	732	1	733																											
Totals	0	756	1																												
Heavys	10																														
Trucks	6																														
Cars	1057																														
Totals	1073																														

Heavys	Trucks	Cars	Totals
0	0	0	0

City of Barrie Ops Centre driveway

Heavys	Trucks	Cars	Totals
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Ferndale Dr N

W N E S

Ferndale Dr N

Cars	Trucks	Heavys	Totals
8	0	0	8
0	0	0	0
18	0	1	19
26	0	1	

City of Barrie Ops Centre driveway

Cars	Trucks	Heavys	Totals
12	1	1	14

Peds Cross: West Peds: 0 West Entering: 0 West Leg Total: 0	<table style="margin: auto;"> <tr><td>Cars</td><td>750</td></tr> <tr><td>Trucks</td><td>4</td></tr> <tr><td>Heavys</td><td>21</td></tr> <tr><td>Totals</td><td>775</td></tr> </table>	Cars	750	Trucks	4	Heavys	21	Totals	775	<table style="margin: auto;"> <tr><td>Cars</td><td>0</td><td>1049</td><td>11</td><td>1060</td></tr> <tr><td>Trucks</td><td>0</td><td>6</td><td>1</td><td>7</td></tr> <tr><td>Heavys</td><td>0</td><td>10</td><td>1</td><td>11</td></tr> <tr><td>Totals</td><td>0</td><td>1065</td><td>13</td><td></td></tr> </table>	Cars	0	1049	11	1060	Trucks	0	6	1	7	Heavys	0	10	1	11	Totals	0	1065	13		Peds Cross: South Peds: 0 South Entering: 1078 South Leg Total: 1853
Cars	750																														
Trucks	4																														
Heavys	21																														
Totals	775																														
Cars	0	1049	11	1060																											
Trucks	0	6	1	7																											
Heavys	0	10	1	11																											
Totals	0	1065	13																												

Comments

Accu-Traffic Inc.

Total Count Diagram

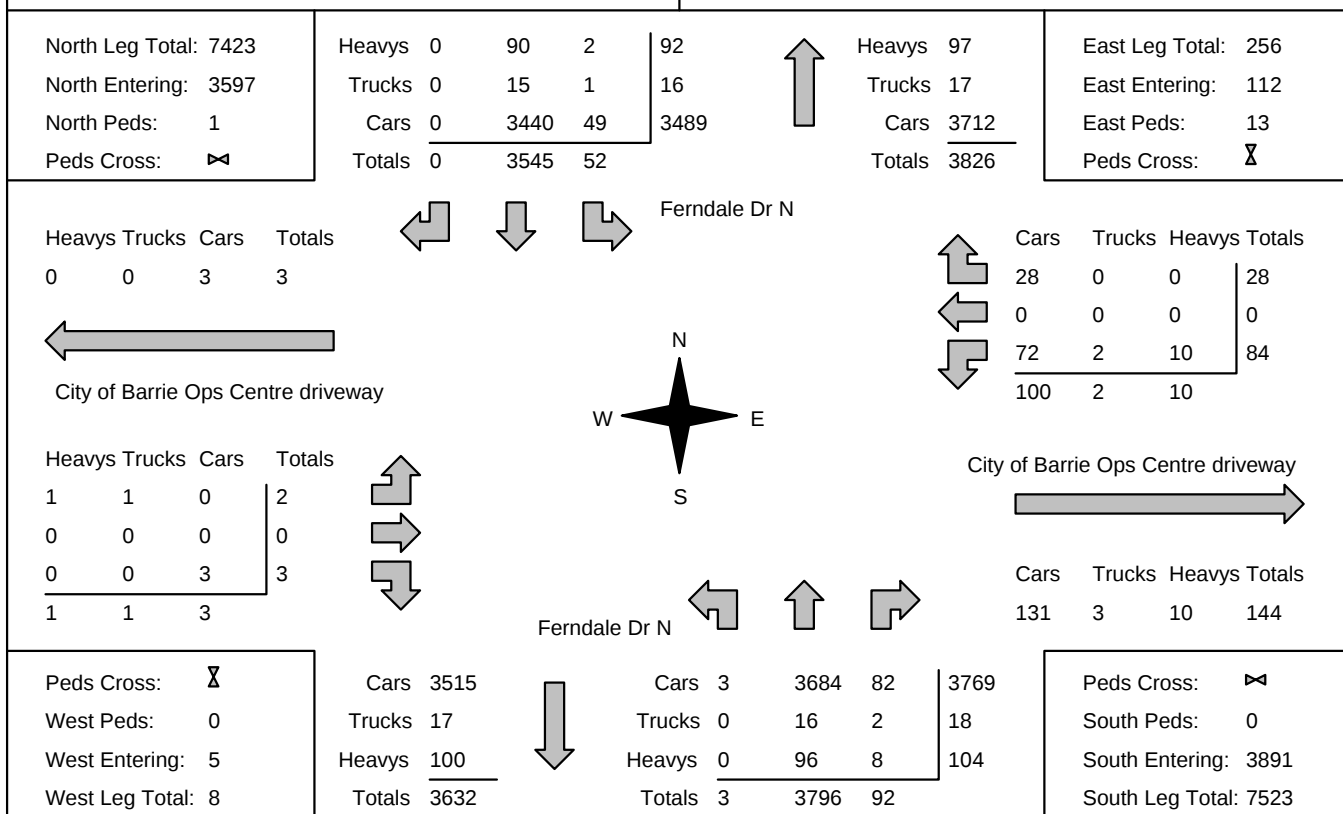
Municipality: Barrie
Site #: 1812000001
Intersection: Ferndale Dr N & City of Barrie Ops
TFR File #: 1
Count date: 19-Sep-18

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: Ferndale Dr N runs N/S



Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Ferndale Dr N & City of Barrie Ops						Count Date: 19-Sep-18		Municipality: Barrie				
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	40	864	0	904	0	1403	8:00:00	0	449	50	499	0
9:00:00	7	730	0	737	1	1325	9:00:00	1	566	21	588	0
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	4	718	0	722	0	1752	17:00:00	0	1016	14	1030	0
18:00:00	0	659	0	659	0	1683	18:00:00	0	1021	3	1024	0
19:00:00	1	574	0	575	0	1325	19:00:00	2	744	4	750	0
</												

[illegible]

[illegible]

[illegible]

[illegible]

Accu-Traffic Inc.

Morning Peak Diagram		Specified Period From: 7:00:00 To: 9:00:00	One Hour Peak From: 7:15:00 To: 8:15:00																																																																		
Municipality: Barrie Site #: 1812000002 Intersection: Edgehill Dr & Pringle Dr TFR File #: 1 Count date: 19-Sep-18		Weather conditions: Person counted: Person prepared: Person checked:																																																																			
** Non-Signalized Intersection **		Major Road: Edgehill Dr runs W/E																																																																			
East Leg Total: 320 East Entering: 113 East Peds: 0 Peds Cross: 8																																																																					
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>6</td> <td>0</td> <td>56</td> <td>62</td> </tr> </table> Edgehill Dr </td> <td style="width: 10%; text-align: center; vertical-align: middle;"> N W E S </td> <td style="width: 30%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>55</td> <td>0</td> <td>6</td> <td>61</td> </tr> <tr> <td>48</td> <td>1</td> <td>3</td> <td>52</td> </tr> <tr> <td style="border-top: 1px solid black;">103</td> <td style="border-top: 1px solid black;">1</td> <td style="border-top: 1px solid black;">9</td> <td></td> </tr> </table> Edgehill Dr </td> <td style="width: 30%; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>4</td> <td>0</td> <td>44</td> <td>48</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td style="border-top: 1px solid black;">4</td> <td style="border-top: 1px solid black;">0</td> <td style="border-top: 1px solid black;">44</td> <td></td> </tr> </table> Pringle Dr </td> </tr> <tr> <td style="padding: 10px; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Peds Cross: 8 West Peds: 0 West Entering: 48 West Leg Total: 110 </td> <td style="width: 50%;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Cars 48 Trucks 1 Heavys 3 Totals 52 </td> <td style="width: 50%;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Cars 1 Trucks 0 Heavys 0 Totals 1 </td> <td style="width: 50%;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">156</td> <td style="width: 50%;">157</td> </tr> <tr> <td style="width: 50%;">0</td> <td style="width: 50%;">0</td> </tr> <tr> <td style="width: 50%;">3</td> <td style="width: 50%;">3</td> </tr> <tr> <td style="width: 50%;">159</td> <td style="width: 50%;">157</td> </tr> </table> </td> </tr> </table> </td> </tr> </table> </td> <td style="padding: 10px; vertical-align: top;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Peds Cross: 2 South Peds: 2 South Entering: 160 South Leg Total: 212 </td> <td style="width: 50%;"></td> </tr> </table> </td> </tr> </table> </td> </tr> <tr> <td colspan="4" style="height: 150px; vertical-align: top; padding: 10px;"> Comments </td> </tr> </table>				<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>6</td> <td>0</td> <td>56</td> <td>62</td> </tr> </table> Edgehill Dr	Heavys	Trucks	Cars	Totals	6	0	56	62	N W E S	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>55</td> <td>0</td> <td>6</td> <td>61</td> </tr> <tr> <td>48</td> <td>1</td> <td>3</td> <td>52</td> </tr> <tr> <td style="border-top: 1px solid black;">103</td> <td style="border-top: 1px solid black;">1</td> <td style="border-top: 1px solid black;">9</td> <td></td> </tr> </table> Edgehill Dr	Cars	Trucks	Heavys	Totals	55	0	6	61	48	1	3	52	103	1	9		<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Heavys</th> <th style="text-align: left;">Trucks</th> <th style="text-align: left;">Cars</th> <th style="text-align: left;">Totals</th> </tr> <tr> <td>4</td> <td>0</td> <td>44</td> <td>48</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td style="border-top: 1px solid black;">4</td> <td style="border-top: 1px solid black;">0</td> <td style="border-top: 1px solid black;">44</td> <td></td> </tr> </table> Pringle Dr	Heavys	Trucks	Cars	Totals	4	0	44	48	0	0	0	0	4	0	44		<table style="width: 100%; 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Heavys	Trucks	Cars	Totals																																																																		
6	0	56	62																																																																		
Cars	Trucks	Heavys	Totals																																																																		
55	0	6	61																																																																		
48	1	3	52																																																																		
103	1	9																																																																			
Heavys	Trucks	Cars	Totals																																																																		
4	0	44	48																																																																		
0	0	0	0																																																																		
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Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 16:00:00 To: 19:00:00	One Hour Peak From: 16:30:00 To: 17:30:00																																																
Municipality: Barrie Site #: 1812000002 Intersection: Edgehill Dr & Pringle Dr TFR File #: 1 Count date: 19-Sep-18	Weather conditions: Person counted: Person prepared: Person checked:																																																	
** Non-Signalized Intersection **	Major Road: Edgehill Dr runs W/E																																																	
East Leg Total: 469 East Entering: 288 East Peds: 0 Peds Cross: 8																																																		
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Heavys	Trucks	Cars	Totals																																															
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Cars	Trucks	Heavys	Totals																																															
179	0	2	181																																															
Peds Cross: 8 West Peds: 0 West Entering: 85 West Leg Total: 180	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>Cars</td> <td>201</td> </tr> <tr> <td>Trucks</td> <td>0</td> </tr> <tr> <td>Heavys</td> <td>0</td> </tr> <tr> <td>Totals</td> <td>201</td> </tr> </table>	Cars	201	Trucks	0	Heavys	0	Totals	201	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>Cars</td> <td>4</td> <td>98</td> <td>102</td> </tr> <tr> <td>Trucks</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Heavys</td> <td>0</td> <td>2</td> <td>2</td> </tr> <tr> <td>Totals</td> <td>4</td> <td>100</td> <td></td> </tr> </table>	Cars	4	98	102	Trucks	0	0	0	Heavys	0	2	2	Totals	4	100																									
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Accu-Traffic Inc.

Total Count Diagram

Municipality: Barrie
Site #: 1812000002
Intersection: Edgehill Dr & Pringle Dr
TFR File #: 1
Count date: 19-Sep-18

Weather conditions:

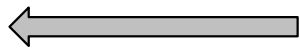
Person counted:
Person prepared:
Person checked:

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

Major Road: Edgehill Dr runs W/E

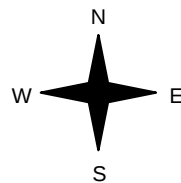
East Leg Total: 1772
East Entering: 881
East Peds: 1
Peds Cross: 8

Heavys	Trucks	Cars	Totals
20	0	282	302



Edgehill Dr

Heavys	Trucks	Cars	Totals
7	0	251	258
1	0	8	9
8	0	259	



Pringle Dr

Cars	Trucks	Heavys	Totals
275	0	20	295
576	1	9	586
851	1	29	



Edgehill Dr

Cars	Trucks	Heavys	Totals
864	0	27	891



Peds Cross: 8
West Peds: 0
West Entering: 267
West Leg Total: 569

Cars	584
Trucks	1
Heavys	10
Totals	595



Cars	7	613	620
Trucks	0	0	0
Heavys	0	20	20
Totals	7	633	

Peds Cross: 13
South Peds: 13
South Entering: 640
South Leg Total: 1235

Comments

Accu-Traffic Inc.

Traffic Count Summary

Intersection: Edgehill Dr & Pringle Dr					Count Date: 19-Sep-18		Municipality: Barrie					
North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	142	8:00:00	1	0	141	142	2
9:00:00	0	0	0	0	0	165	9:00:00	1	0	164	165	5
16:00:00	0	0	0	0	0	0	16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0	101	17:00:00	2	0	99	101	4
18:00:00	0	0	0	0	0	104	18:00:00	2	0	102	104	1
19:00:00	0	0	0	0	0	128	19:00:00	1	0	127	128	1

[illegible]

[illegible]

[illegible]

[illegible]

Trans-Plan Transportation Inc.

Site ID Code:
Intersection Location:
Municipality:
Count Date:
Weather and Temperature:
Surveyor:

Ferndale Drive and Edgehill Drive
Barrie, Ontario
Tuesday, June 13 2017
Clear 23 Degrees
TP

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds													
	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														
7:15	4	98	4	0	2	0	0	0	0	1	109	27	6	3	1	0	0	0	0	0	0	37	12	39	8	0	4	0	0	0	0	1	64	4	15	27	0	1	0	0	0	0	47	257	
7:30	5	132	4	0	2	0	0	0	0	0	143	24	9	2	1	3	0	0	0	0	0	39	10	69	8	2	4	1	0	0	0	0	94	6	23	32	0	1	0	0	0	0	62	338	
7:45	9	149	6	1	3	1	0	0	0	0	169	28	21	6	1	3	0	0	0	0	0	59	9	62	18	0	10	0	0	0	0	1	100	7	32	43	1	1	1	0	0	0	85	413	
8:00	7	144	8	0	2	0	0	0	0	0	161	39	16	6	1	2	0	0	0	0	0	64	4	58	24	0	5	1	0	0	0	1	93	14	39	32	0	0	0	0	0	0	85	403	
8:15	17	103	9	0	7	3	0	0	0	0	139	30	11	11	0	2	0	0	0	0	0	54	10	79	34	0	6	0	0	0	0	0	129	12	47	34	0	1	0	0	0	0	94	416	
8:30	13	132	8	0	8	1	0	0	0	0	162	29	12	4	0	2	0	0	0	0	0	47	8	86	23	1	4	0	0	0	0	5	127	10	40	26	0	1	0	0	0	0	77	413	
8:45	13	107	6	0	2	1	0	0	0	0	129	25	8	8	0	1	0	0	0	0	0	42	8	86	22	1	5	1	0	0	0	3	126	20	43	24	3	8	0	0	0	0	98	395	
9:00	23	108	13	1	12	1	0	0	0	0	158	23	17	11	1	1	0	0	0	0	0	53	14	88	26	0	5	1	0	0	0	1	135	31	38	32	0	0	0	0	0	0	101	447	
MD																																													
11:15	6	70	1	0	5	0	0	0	0	0	82	6	7	4	0	0	0	0	0	0	17	15	45	17	0	7	0	0	0	0	0	84	11	11	14	0	1	0	0	0	0	37	220		
11:30	0	70	8	1	3	1	0	0	0	0	83	17	13	9	0	1	1	0	0	0	0	41	8	66	31	1	9	0	0	0	0	0	115	6	13	9	0	0	0	0	0	0	28	267	
11:45	7	92	8	1	10	0	0	0	0	0	118	17	21	9	2	0	0	0	0	0	0	49	11	59	29	0	4	1	0	0	0	1	104	4	14	15	1	1	1	0	0	0	36	307	
12:00	15	91	10	1	5	0	0	0	0	0	122	22	14	13	0	1	0	0	0	0	0	50	18	74	25	0	6	2	0	0	0	0	125	9	15	17	0	0	0	0	0	0	41	338	
12:15	12	87	10	0	6	0	0	0	0	0	115	18	20	7	1	0	1	0	0	0	0	47	13	86	24	0	4	0	0	0	0	0	127	10	21	11	0	1	0	0	0	0	43	332	
12:30	9	93	13	0	3	1	0	0	0	0	119	20	23	9	0	1	0	0	0	0	0	53	16	81	20	0	5	0	0	0	0	0	122	9	16	17	0	1	0	0	0	0	43	337	
12:45	9	89	13	1	4	0	0	0	0	0	116	19	22	8	2	0	1	0	0	0	0	52	14	83	25	0	4	0	0	0	0	1	126	7	22	20	0	1	0	0	0	0	50	344	
13:00	14	89	8	0	8	0	0	0	0	0	119	22	17	5	0	1	0	0	0	0	0	45	20	81	29	0	4	0	0	0	0	0	134	4	25	14	0	0	0	0	0	0	43	341	
13:15	11	75	8	0	4	0	0	0	0	0	98	28	21	13	0	2	0	0	0	0	0	64	18	74	27	0	5	0	0	0	0	0	124	9	23	18	0	1	0	0	0	0	51	337	
13:30	7	83	7	1	5	0	0	0	0	0	103	17	21	5	1	1	0	0	0	0	0	45	12	84	24	0	5	1	0	0	0	0	126	9	23	8	0	0	0	0	0	0	40	314	
13:45	6	76	7	0	9	1	0	0	0	0	99	13	17	7	0	0	2	0	0	0	0	39	13	60	14	0	4	0	0	0	0	0	91	12	25	13	0	1	1	0	0	0	52	281	
14:00	5	101	13	0	6	0	0	0	0	0	125	19	17	10	0	1	1	0	0	0	0	48	27	71	28	0	8	0	0	0	0	1	134	7	20	16	0	0	0	0	0	0	43	350	
PM																																													
15:15	5	37	5	0	2	0	0	0	0	0	49	17	16	7	0	0	0	1	0	0	0	41	16	62	23	0	2	0	0	0	0	0	103	6	17	6	0	0	0	0	0	0	29	222	
15:30	9	96	24	0	5	3	0	0	0	0	137	32	41	6	0	1	0	0	0	0	0	80	30	136	39	1	5	0	0	0	0	0	211	8	20	10	0	0	0	0	0	0	38	466	
15:45	9	117	14	0	7	0	0	0	0	0	147	30	39	12	1	5	0	0	0	0	1	88	27	106	44	0	5	0	0	0	0	0	182	15	34	29	2	1	1	0	0	0	82	499	
16:00	9	82	10	0	7	0	0	0	0	1	109	22	40	7	0	1	0	0	0	0	0	70	24	140	44	0	4	0	0	0	0	1	213	15	36	13	0	1	0	0	0	0	65	457	
16:15	8	90	18	0	8	0	0	0	0	1	125	16	34	15	0	2	0	0	0	0	0	67	26	159	52	0	4	0	0	0	0	6	247	16	30	18	1	1	3	0	0	0	69	508	
16:30	7	89	16	1	4	0	0	0	0	0	117	21	35	13	0	1	0	0	0	0	0	70	38	149	49	0	2	0	0	0	0	0	238	15	41	16	1	1	0	0	0	0	74	499	
16:45	16	121	12	0	8	0	0	0	0	0	157	26	40	20	0	0	0	0	0	0	1	87	39	168	61	0	2	0	0	0	0	4	274	13	37	17	1	1	0	0	0	0	69	587	
17:00	6	114	10	0	6	0	0	0	0	0	136	31	40	13	0	1	0	0	0	0	2	87	38	148	51	0	3	0	0	0	0	7	247	22	43	18	1	0	0	0	0	0	84	554	
17:15	6	107	17	0	4	0	0	0	0	0	134	24	48	15	0	0	1	0	0	0	0	88	46	166	60	0	3	0	0	0	0	1	276	13	26	26	0	1	0	0	0	0	1	67	565
17:30	6	94	15	0	2	0	0	0	0	0	117	23	46	9	0	1	0	0	0	0	0	79	52	193	73	0	2	0	0	0	0	2	322	15	34	21	0	0	0	0	0	0	70	588	
17:45	5	82	14	0	2	0	0	0	0	0	103	28	47	8	0	0	0	0	0	0	0	83	55	166	46	0	1	0	0	0	0	0	268	20	40	18	0	1	0	0	0	0	79	533	
18:00	13	79	9	0	4	0	0	0	0	2	107	20	40	6	0	1	0	0	0	0	0	67	49	133	54	0	0	0	0	0	0	1	237	16	35	27	0	0	0	0	0	0	1	79	490



Turning Movement Count Diagram

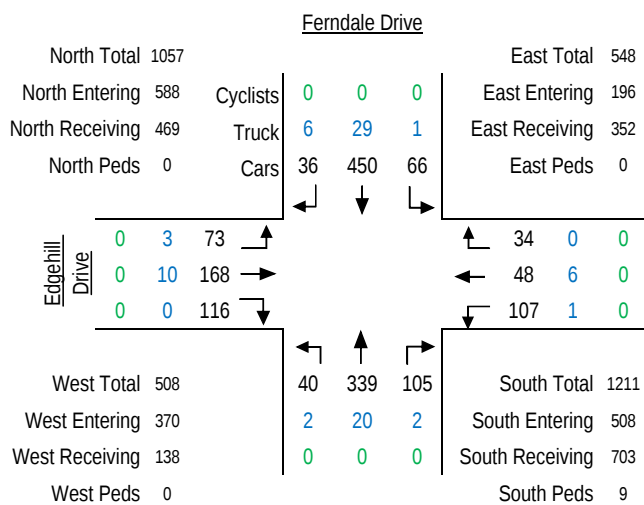
Intersection: Ferndale Drive and Edgehill Drive

Municipality: Barrie, Ontario

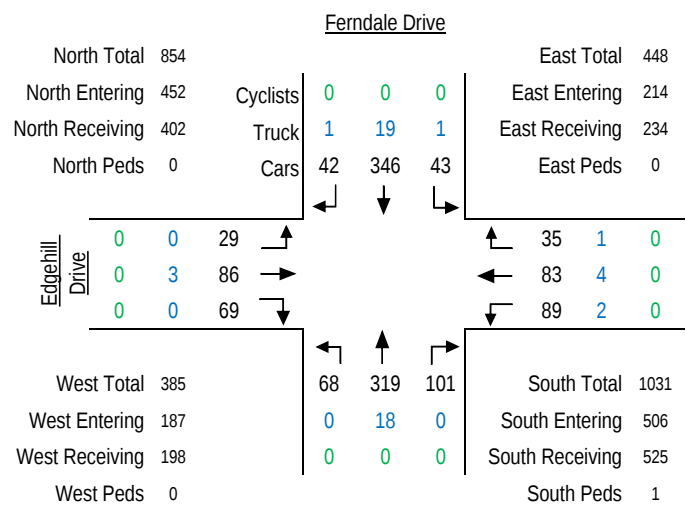
Intersection ID:

Date: Tuesday, June 13 2017

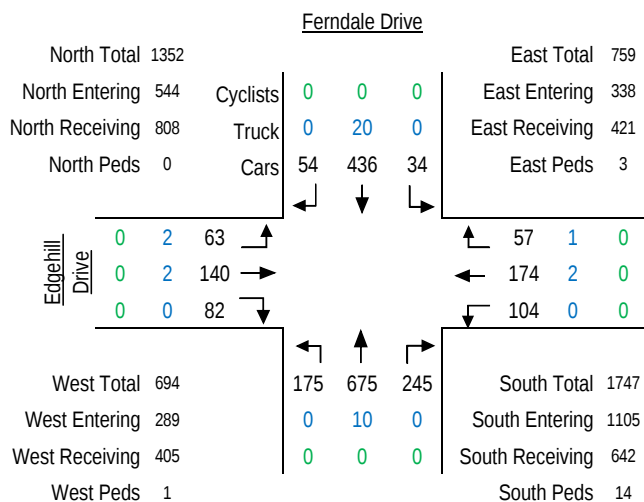
AM Peak Hour: 8:00 to 9:00



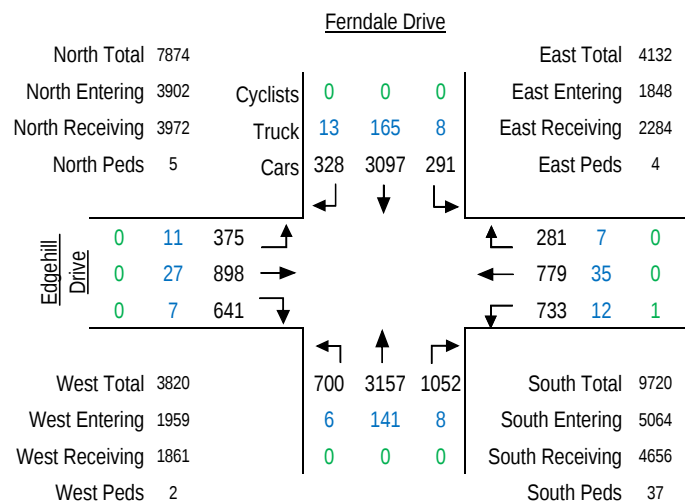
MD Peak Hour: 12:15 to 13:15



PM Peak Hour: 16:30 to 17:30



Total 8-Hour Count



AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds													
	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														
7:15	0	11	0	0	2	0	0	0	0	0	13	21	0	0	0	0	0	0	0	0	0	21	0	3	6	0	0	2	0	0	0	0	11	0	0	0	0	0	0	0	0	0	45		
7:30	0	12	0	1	1	0	0	0	0	0	14	24	0	1	1	0	0	0	0	0	0	26	0	2	7	0	2	1	0	0	0	0	12	0	0	0	0	0	0	0	0	52			
7:45	0	24	0	0	0	0	0	0	0	0	24	37	0	1	6	0	0	0	0	0	0	44	0	4	8	0	0	1	0	0	0	0	13	0	0	0	0	0	0	0	0	81			
8:00	0	10	0	2	0	0	0	0	0	0	12	26	0	0	1	0	0	0	0	0	0	27	0	3	12	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	54			
8:15	0	11	0	0	0	0	0	0	0	0	11	20	0	1	1	0	1	0	0	0	0	23	0	8	10	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	52				
8:30	0	17	0	3	2	0	0	0	0	0	22	23	0	1	1	0	1	0	0	0	0	26	0	6	11	0	1	6	0	0	0	24	0	0	0	0	0	0	0	0	72				
8:45	0	10	0	0	0	0	0	0	0	0	10	26	0	0	1	0	0	0	0	0	0	27	0	5	8	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	50				
9:00	0	6	0	1	0	0	0	0	0	0	7	16	0	1	0	0	0	0	0	0	0	17	0	4	5	0	0	1	0	0	0	10	0	0	0	0	0	0	0	0	34				
MD																																													
11:15	0	12	0	0	0	0	0	0	0	0	12	15	0	0	1	0	0	0	0	0	0	16	0	7	8	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	43				
11:30	0	10	0	2	1	0	0	0	0	0	13	12	0	1	0	0	0	0	0	0	0	13	0	9	8	0	1	0	0	0	0	18	0	0	0	0	0	0	0	0	44				
11:45	0	7	0	0	0	0	0	0	0	0	7	19	0	0	0	0	0	0	0	0	0	19	0	11	8	0	4	0	0	0	0	23	0	0	0	0	0	0	0	0	49				
12:00	0	10	0	1	2	0	0	0	0	0	13	8	0	0	2	0	0	0	0	0	0	10	0	9	7	0	3	0	0	0	0	19	0	0	0	0	0	0	0	0	42				
12:15	0	12	0	0	1	0	0	0	0	0	13	5	0	0	0	0	0	0	0	0	0	5	0	8	6	0	3	0	0	0	0	17	0	0	0	0	0	0	0	0	35				
12:30	0	11	0	2	0	0	0	0	0	0	13	11	0	3	0	0	0	0	0	0	0	14	0	5	10	0	2	0	0	0	0	17	0	0	0	0	0	0	0	0	44				
12:45	0	12	0	0	1	0	0	0	0	0	13	12	0	0	0	0	0	0	0	0	0	12	0	16	16	0	0	1	0	0	0	33	0	0	0	0	0	0	0	0	58				
13:00	0	19	0	0	0	0	0	0	0	0	19	9	0	0	0	0	0	0	0	0	0	9	0	6	15	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	49				
13:15	0	10	0	1	2	0	0	0	0	0	13	16	0	0	2	0	1	0	0	0	0	19	0	7	13	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	52				
13:30	0	11	0	1	0	0	0	0	0	0	12	14	0	0	0	0	0	0	0	0	0	14	0	7	10	0	0	1	0	0	0	18	0	0	0	0	0	0	0	0	44				
13:45	0	3	0	0	0	0	0	0	0	0	3	11	0	0	0	0	0	0	0	0	0	11	0	12	8	0	1	1	0	0	0	22	0	0	0	0	0	0	0	0	36				
14:00	0	2	0	1	0	0	0	0	0	0	3	10	0	0	0	0	0	0	0	0	0	10	0	11	13	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	37				
PM																																													
15:15	0	14	0	1	0	0	0	0	0	0	15	14	0	0	0	0	0	0	0	0	0	14	0	7	16	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	52				
15:30	0	14	0	0	0	0	0	0	0	0	14	6	0	1	0	0	0	0	0	0	0	7	0	14	21	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	56				
15:45	0	10	0	2	0	0	0	0	0	0	12	22	0	0	5	0	0	0	0	0	0	27	0	17	22	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	78				
16:00	0	15	0	1	1	0	0	0	0	0	17	17	0	2	2	0	0	0	0	0	0	21	0	18	24	0	0	1	0	0	0	43	0	0	0	0	0	0	0	0	81				
16:15	0	11	0	0	0	0	0	0	0	0	11	10	0	0	1	0	0	0	0	0	0	11	0	14	22	0	1	3	0	0	0	40	0	0	0	0	0	0	0	0	62				
16:30	2	14	0	0	1	0	0	0	0	0	17	13	0	0	0	0	0	0	0	0	0	13	0	12	32	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	74				
16:45	2	18	0	1	0	0	0	0	0	0	21	7	0	1	0	0	0	0	0	0	0	8	0	7	35	0	0	0	0	0	0	42	0	0	0	0	0	0	0	0	71				
17:00	1	17	0	0	0	0	0	0	0	0	18	20	0	2	0	0	0	0	0	0	2	22	0	20	34	0	0	0	0	0	0	54	0	0	0	0	0	0	0	0	94				
17:15	0	14	0	1	0	0	0	0	0	0	15	17	0	1	0	0	0	0	0	0	1	18	0	16	28	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	77				
17:30	0	25	0	0	0	0	0	0	0	0	25	22	0	0	0	0	0	0	0	0	4	22	0	19	26	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	92				
17:45	0	9	0	1	1	0	0	0	0	0	11	18	0	0	0	0	0	0	0	0	0	18	0	16	20	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0	65				
18:00	2	9	0	1	0	0	0	0	0	0	12	10	0	0	0	0	0	0	0	0	0	10	0	12	19	0	1	0	0	0	0	32	0	0	0	0	0	0	0	0	54				



Turning Movement Count Diagram

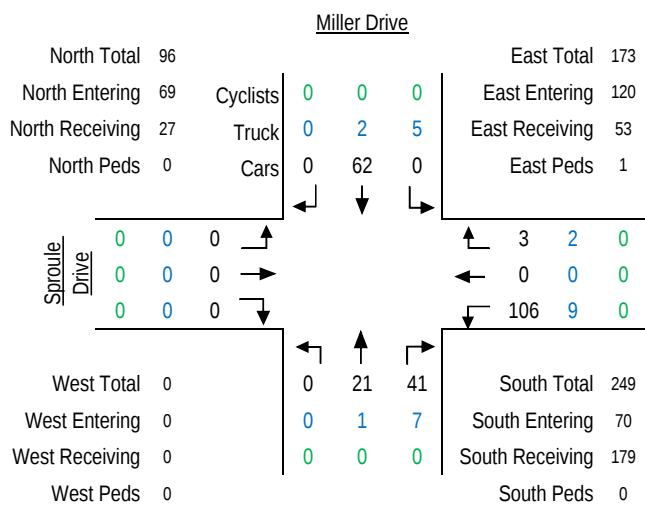
Intersection: Miller Drive and Sproule Drive

Municipality: Barrie, Ontario

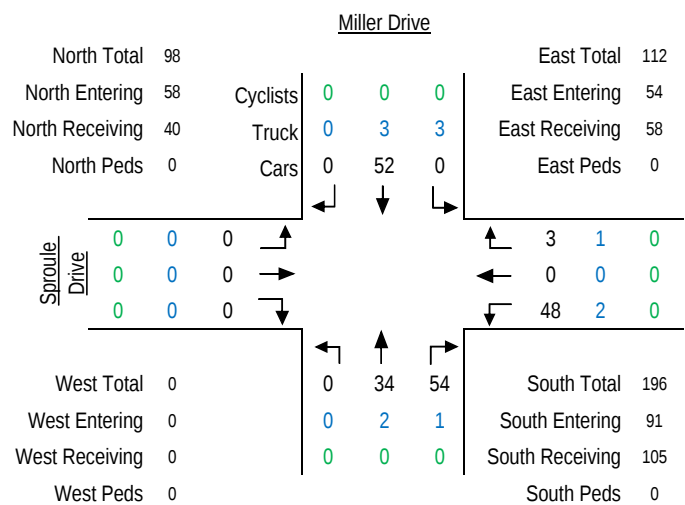
Intersection ID:

Date: Thursday, March 2, 2017

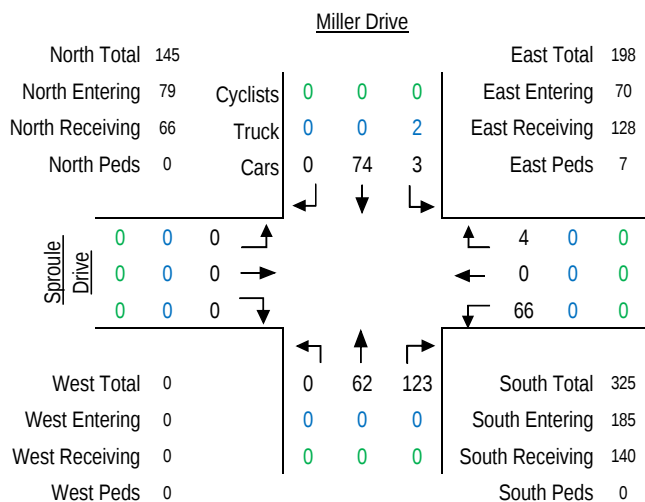
AM Peak Hour: 7:30 to 8:30



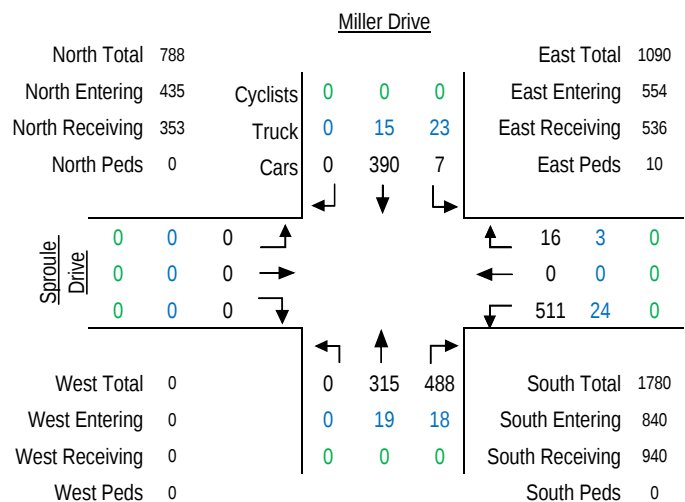
MD Peak Hour: 12:15 to 13:15



PM Peak Hour: 16:30 to 17:30



Total 8-Hour Count



Appendix D – Synchro Analysis Output – Existing Traffic Volumes

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Existing (2018) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	78	182	149	55	43	368	69	661	43
Future Volume (vph)	78	182	149	55	43	368	69	661	43
Lane Group Flow (vph)	84	368	160	97	46	514	74	711	46
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	30.0	30.0	30.0	30.0	26.0	26.0	11.0	37.0	37.0
Total Split (%)	44.8%	44.8%	44.8%	44.8%	38.8%	38.8%	16.4%	55.2%	55.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.24	0.70	0.86	0.20	0.16	0.37	0.14	0.41	0.06
Control Delay	17.8	22.8	59.1	11.4	18.2	14.3	8.6	10.6	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	22.8	59.1	11.4	18.2	14.3	8.6	10.6	3.5
Queue Length 50th (m)	7.0	28.3	16.4	4.8	3.5	19.9	3.4	22.9	0.0
Queue Length 95th (m)	16.0	52.0	#43.0	13.5	12.0	37.2	10.4	42.8	4.4
Internal Link Dist (m)		387.5		303.1		499.5		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	504	725	270	689	283	1390	522	1751	751
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.51	0.59	0.14	0.16	0.37	0.14	0.41	0.06

Intersection Summary

Cycle Length: 67

Actuated Cycle Length: 60.1

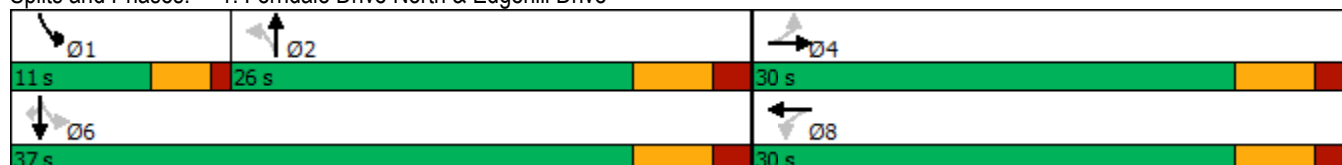
Natural Cycle: 65

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive



Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis
Existing (2018) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	182	160	149	55	35	43	368	110	69	661	43
Future Volume (vph)	78	182	160	149	55	35	43	368	110	69	661	43
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		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.94		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1716	1693		1767	1658		1700	3255		1763	3368	1401
Flt Permitted	0.69	1.00		0.36	1.00		0.38	1.00		0.39	1.00	1.00
Satd. Flow (perm)	1254	1693		673	1658		682	3255		725	3368	1401
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)	84	196	172	160	59	38	46	396	118	74	711	46
RTOR Reduction (vph)	0	53	0	0	28	0	0	35	0	0	0	21
Lane Group Flow (vph)	84	315	0	160	69	0	46	479	0	74	711	25
Confl. Peds. (#/hr)									9	9		
Heavy Vehicles (%)	4%	6%	0%	1%	11%	0%	5%	6%	2%	1%	6%	14%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	16.7	16.7		16.7	16.7		25.0	25.0		33.0	33.0	33.0
Effective Green, g (s)	16.7	16.7		16.7	16.7		25.0	25.0		33.0	33.0	33.0
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.41	0.41		0.53	0.53	0.53
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	339	458		182	448		276	1318		455	1801	749
v/s Ratio Prot		0.19			0.04			0.15		0.01	c0.21	
v/s Ratio Perm	0.07			c0.24			0.07			0.08		0.02
v/c Ratio	0.25	0.69		0.88	0.15		0.17	0.36		0.16	0.39	0.03
Uniform Delay, d1	17.6	20.2		21.5	17.1		11.7	12.8		7.1	8.5	6.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	4.3		34.8	0.2		1.3	0.8		0.2	0.7	0.1
Delay (s)	18.0	24.4		56.3	17.3		13.0	13.6		7.3	9.1	6.9
Level of Service	B	C		E	B		B	B		A	A	A
Approach Delay (s)		23.2			41.6			13.5			8.8	
Approach LOS		C			D			B			A	
Intersection Summary												
HCM 2000 Control Delay			17.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			61.7			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			86.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
2: City Ops. Driveway & Ferndale Drive North

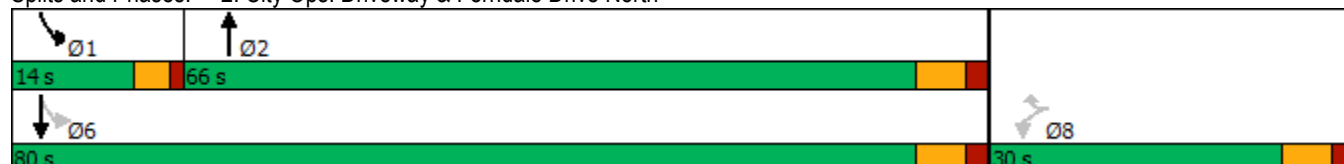
Queues
Existing (2018) AM Peak Hour

	↖	↗	↑	↘	↓
Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↖	↗	↑↑	↘	↓↓
Traffic Volume (vph)	16	2	524	28	877
Future Volume (vph)	16	2	524	28	877
Lane Group Flow (vph)	17	2	616	30	943
Turn Type	Perm	Perm	NA	pm+pt	NA
Protected Phases			2	1	6
Permitted Phases	8	8		6	
Detector Phase	8	8	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	66.0	11.0	66.0
Total Split (s)	30.0	30.0	66.0	14.0	80.0
Total Split (%)	27.3%	27.3%	60.0%	12.7%	72.7%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	4.0	6.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	
Recall Mode	None	None	Max	None	Max
v/c Ratio	0.09	0.01	0.20	0.04	0.29
Control Delay	39.0	28.5	3.6	1.7	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	28.5	3.6	1.7	2.0
Queue Length 50th (m)	2.4	0.0	0.0	0.3	0.0
Queue Length 95th (m)	9.2	2.0	29.4	2.4	29.3
Internal Link Dist (m)	271.9		361.0		499.5
Turn Bay Length (m)	27.0			29.0	
Base Capacity (vph)	463	410	3007	776	3242
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.04	0.00	0.20	0.04	0.29

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 92.8
Natural Cycle: 105
Control Type: Semi Act-Uncoord

Splits and Phases: 2: City Ops. Driveway & Ferndale Drive North



Previn Court
2: City Ops. Driveway & Ferndale Drive North

HCM Signalized Intersection Capacity Analysis

Existing (2018) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	16	2	524	49	28	877
Future Volume (vph)	16	2	524	49	28	877
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		4.0	6.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1785	1576	3485		1784	3570
Flt Permitted	0.95	1.00	1.00		0.40	1.00
Satd. Flow (perm)	1785	1576	3485		747	3570
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	17	2	563	53	30	943
RTOR Reduction (vph)	0	2	3	0	0	0
Lane Group Flow (vph)	17	0	613	0	30	943
Confl. Peds. (#/hr)		1		5	5	
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%
Turn Type	Perm	Perm	NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8			6	
Actuated Green, G (s)	3.9	3.9	76.4		83.1	83.1
Effective Green, g (s)	3.9	3.9	76.4		83.1	83.1
Actuated g/C Ratio	0.04	0.04	0.77		0.84	0.84
Clearance Time (s)	6.0	6.0	6.0		4.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	70	62	2689		655	2996
v/s Ratio Prot			0.18		0.00	c0.26
v/s Ratio Perm	c0.01	0.00			0.04	
v/c Ratio	0.24	0.00	0.23		0.05	0.31
Uniform Delay, d1	46.1	45.7	3.1		1.4	1.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.8	0.0	0.2		0.0	0.3
Delay (s)	47.9	45.7	3.3		1.4	2.0
Level of Service	D	D	A		A	A
Approach Delay (s)	47.7		3.3			2.0
Approach LOS	D		A			A
Intersection Summary						
HCM 2000 Control Delay			3.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.33			
Actuated Cycle Length (s)			99.0		Sum of lost time (s)	16.0
Intersection Capacity Utilization			68.6%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis

Existing (2018) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	116	5	22	48	5	65
Future Volume (Veh/h)	116	5	22	48	5	65
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	145	6	28	60	6	81
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	159	66			96	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	159	66			96	
tC, single (s)	6.5	6.6			5.1	
tC, 2 stage (s)						
tF (s)	3.6	3.7			3.1	
p0 queue free %	82	99			99	
cM capacity (veh/h)	808	895			1049	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	151	88	87			
Volume Left	145	0	6			
Volume Right	6	60	0			
cSH	811	1700	1049			
Volume to Capacity	0.19	0.05	0.01			
Queue Length 95th (m)	5.2	0.0	0.1			
Control Delay (s)	10.4	0.0	0.6			
Lane LOS	B		A			
Approach Delay (s)	10.4	0.0	0.6			
Approach LOS	B					
Intersection Summary						
Average Delay		5.0				
Intersection Capacity Utilization		20.9%		ICU Level of Service		A
Analysis Period (min)		15				

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis
Existing (2018) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	48	0	52	61	1	159
Future Volume (vph)	48	0	52	61	1	159
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	53	0	58	68	1	177
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	53	126	178			
Volume Left (vph)	0	58	1			
Volume Right (vph)	0	0	177			
Hadj (s)	0.00	0.11	-0.60			
Departure Headway (s)	4.4	4.4	3.7			
Degree Utilization, x	0.06	0.15	0.18			
Capacity (veh/h)	779	772	923			
Control Delay (s)	7.7	8.2	7.6			
Approach Delay (s)	7.7	8.2	7.6			
Approach LOS	A	A	A			
Intersection Summary						
Delay			7.8			
Level of Service			A			
Intersection Capacity Utilization			29.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Existing (2018) PM Peak Hour

									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	67	145	106	180	179	702	35	467	55
Future Volume (vph)	67	145	106	180	179	702	35	467	55
Lane Group Flow (vph)	69	236	109	247	185	983	36	481	57
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	30.0	30.0	30.0	30.0	26.0	26.0	11.0	37.0	37.0
Total Split (%)	44.8%	44.8%	44.8%	44.8%	38.8%	38.8%	16.4%	55.2%	55.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.30	0.54	0.45	0.58	0.43	0.59	0.09	0.25	0.06
Control Delay	21.3	19.6	24.8	22.5	18.2	14.5	6.3	7.4	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.3	19.6	24.8	22.5	18.2	14.5	6.3	7.4	3.3
Queue Length 50th (m)	5.8	16.4	9.5	19.6	8.9	24.8	1.3	11.2	0.3
Queue Length 95th (m)	14.6	33.0	21.2	37.3	#42.4	#81.8	5.1	23.1	4.8
Internal Link Dist (m)		387.5		303.1		499.5		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	429	778	454	784	431	1667	391	1908	890
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.30	0.24	0.32	0.43	0.59	0.09	0.25	0.06

Intersection Summary

Cycle Length: 67

Actuated Cycle Length: 55.9

Natural Cycle: 65

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive

		
Ø1	Ø2	Ø4
11 s	26 s	30 s
		
Ø6		Ø8
37 s		30 s

Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis

Existing (2018) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	145	84	106	180	59	179	702	251	35	467	55
Future Volume (vph)	67	145	84	106	180	59	179	702	251	35	467	55
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		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.94		1.00	0.96		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1733	1745		1763	1787		1784	3381		1785	3433	1563
Flt Permitted	0.55	1.00		0.57	1.00		0.48	1.00		0.19	1.00	1.00
Satd. Flow (perm)	998	1745		1059	1787		896	3381		359	3433	1563
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	69	149	87	109	186	61	185	724	259	36	481	57
RTOR Reduction (vph)	0	38	0	0	21	0	0	41	0	0	0	21
Lane Group Flow (vph)	69	198	0	109	226	0	185	942	0	36	481	36
Confl. Peds. (#/hr)			18	18			1		4	4		1
Heavy Vehicles (%)	3%	1%	0%	0%	1%	2%	0%	1%	0%	0%	4%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	12.8	12.8		12.8	12.8		26.9	26.9		33.5	33.5	33.5
Effective Green, g (s)	12.8	12.8		12.8	12.8		26.9	26.9		33.5	33.5	33.5
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.46	0.46		0.57	0.57	0.57
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	219	383		232	392		413	1560		269	1972	898
v/s Ratio Prot		0.11			c0.13			c0.28		0.01	c0.14	
v/s Ratio Perm	0.07			0.10			0.21			0.07		0.02
v/c Ratio	0.32	0.52		0.47	0.58		0.45	0.60		0.13	0.24	0.04
Uniform Delay, d1	19.1	20.0		19.8	20.3		10.7	11.7		6.4	6.1	5.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.8	1.2		1.5	2.1		3.5	1.7		0.2	0.3	0.1
Delay (s)	19.9	21.2		21.3	22.4		14.1	13.5		6.7	6.4	5.5
Level of Service	B	C		C	C		B	B		A	A	A
Approach Delay (s)		20.9			22.0			13.6			6.3	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay			14.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			58.3			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			81.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
2: City Ops. Driveway & Ferndale Drive North

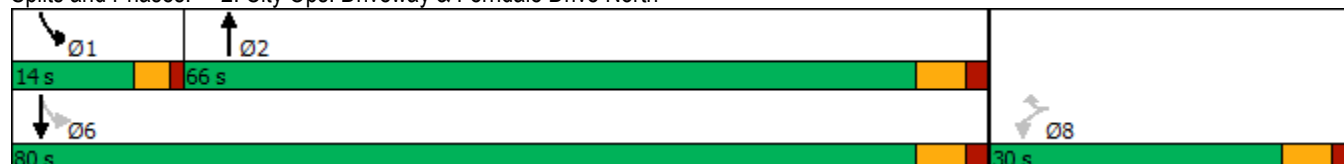
Queues
Existing (2018) PM Peak Hour

	↖	↗	↑	↘	↓
Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations	↖	↗	↕	↘	↕
Traffic Volume (vph)	19	8	1065	1	756
Future Volume (vph)	19	8	1065	1	756
Lane Group Flow (vph)	20	8	1135	1	796
Turn Type	Perm	Perm	NA	pm+pt	NA
Protected Phases			2	1	6
Permitted Phases	8	8		6	
Detector Phase	8	8	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	66.0	11.0	66.0
Total Split (s)	30.0	30.0	66.0	14.0	80.0
Total Split (%)	27.3%	27.3%	60.0%	12.7%	72.7%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	4.0	6.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	
Recall Mode	None	None	Max	None	Max
v/c Ratio	0.11	0.05	0.36	0.00	0.25
Control Delay	40.4	22.5	3.5	2.0	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.4	22.5	3.5	2.0	1.8
Queue Length 50th (m)	3.4	0.0	0.0	0.0	0.0
Queue Length 95th (m)	10.3	4.1	63.8	0.3	23.8
Internal Link Dist (m)	271.9		361.0		499.5
Turn Bay Length (m)	27.0			29.0	
Base Capacity (vph)	448	407	3120	519	3211
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.04	0.02	0.36	0.00	0.25

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 95.4
Natural Cycle: 105
Control Type: Semi Act-Uncoord

Splits and Phases: 2: City Ops. Driveway & Ferndale Drive North



Previn Court
2: City Ops. Driveway & Ferndale Drive North

HCM Signalized Intersection Capacity Analysis

Existing (2018) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	19	8	1065	13	1	756
Future Volume (vph)	19	8	1065	13	1	756
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		4.0	6.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
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	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1785	1597	3524		1785	3535
Flt Permitted	0.95	1.00	1.00		0.23	1.00
Satd. Flow (perm)	1785	1597	3524		423	3535
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	20	8	1121	14	1	796
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	20	0	1135	0	1	796
Confl. Peds. (#/hr)				1	1	
Heavy Vehicles (%)	0%	0%	1%	8%	0%	1%
Turn Type	Perm	Perm	NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8	8			6	
Actuated Green, G (s)	4.0	4.0	80.9		86.3	86.3
Effective Green, g (s)	4.0	4.0	80.9		86.3	86.3
Actuated g/C Ratio	0.04	0.04	0.79		0.84	0.84
Clearance Time (s)	6.0	6.0	6.0		4.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	69	62	2786		375	2982
v/s Ratio Prot			c0.32		0.00	c0.23
v/s Ratio Perm	c0.01	0.00			0.00	
v/c Ratio	0.29	0.01	0.41		0.00	0.27
Uniform Delay, d1	47.8	47.2	3.3		1.6	1.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.3	0.0	0.4		0.0	0.2
Delay (s)	50.1	47.3	3.7		1.6	1.8
Level of Service	D	D	A		A	A
Approach Delay (s)	49.3		3.7			1.8
Approach LOS	D		A			A
Intersection Summary						
HCM 2000 Control Delay			3.6		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.40			
Actuated Cycle Length (s)			102.3		Sum of lost time (s)	16.0
Intersection Capacity Utilization			68.3%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis

Existing (2018) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	67	4	63	124	3	75
Future Volume (Veh/h)	67	4	63	124	3	75
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	75	4	71	139	3	84
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	238	148			218	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	238	148			218	
tC, single (s)	6.4	6.2			4.5	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.6	
p0 queue free %	90	100			100	
cM capacity (veh/h)	747	898			1148	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	79	210	87			
Volume Left	75	0	3			
Volume Right	4	139	0			
cSH	754	1700	1148			
Volume to Capacity	0.10	0.12	0.00			
Queue Length 95th (m)	2.7	0.0	0.1			
Control Delay (s)	10.3	0.0	0.3			
Lane LOS	B		A			
Approach Delay (s)	10.3	0.0	0.3			
Approach LOS	B					
Intersection Summary						
Average Delay		2.2				
Intersection Capacity Utilization		22.5%		ICU Level of Service		A
Analysis Period (min)		15				

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis
Existing (2018) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	81	4	197	91	4	100
Future Volume (vph)	81	4	197	91	4	100
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	90	4	219	101	4	111
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	94	320	115			
Volume Left (vph)	0	219	4			
Volume Right (vph)	4	0	111			
Hadj (s)	-0.03	0.14	-0.57			
Departure Headway (s)	4.5	4.4	4.3			
Degree Utilization, x	0.12	0.39	0.14			
Capacity (veh/h)	768	791	773			
Control Delay (s)	8.1	10.2	7.9			
Approach Delay (s)	8.1	10.2	7.9			
Approach LOS	A	B	A			
Intersection Summary						
Delay			9.3			
Level of Service			A			
Intersection Capacity Utilization			35.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix E – Synchro Analysis Output – Background Traffic Volumes

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Background (2028) AM Peak Hour

									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	41	103	239	40	30	534	87	893	30
Future Volume (vph)	41	103	239	40	30	534	87	893	30
Lane Group Flow (vph)	44	203	257	90	32	879	94	960	32
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	60.0	60.0	60.0	60.0	41.0	41.0	11.0	52.0	52.0
Total Split (%)	53.6%	53.6%	53.6%	53.6%	36.6%	36.6%	9.8%	46.4%	46.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.12	0.39	0.82	0.18	0.13	0.58	0.26	0.50	0.04
Control Delay	21.1	19.3	48.2	12.1	19.0	18.5	11.1	13.2	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	19.3	48.2	12.1	19.0	18.5	11.1	13.2	4.9
Queue Length 50th (m)	5.0	18.9	36.9	4.9	2.9	47.5	5.7	43.2	0.2
Queue Length 95th (m)	12.1	35.0	63.4	14.3	10.7	85.0	16.3	81.0	4.8
Internal Link Dist (m)		387.5		303.1		499.5		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	840	1142	729	1110	246	1518	357	1908	806
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.18	0.35	0.08	0.13	0.58	0.26	0.50	0.04

Intersection Summary

Cycle Length: 112
Actuated Cycle Length: 81.9
Natural Cycle: 65
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive

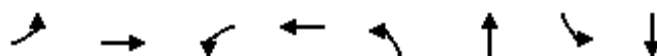
		
Ø1	Ø2	Ø4
11 s	41 s	60 s
		
Ø6		Ø8
52 s		60 s

Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis

Background (2028) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	103	86	239	40	44	30	534	284	87	893	30
Future Volume (vph)	41	103	86	239	40	44	30	534	284	87	893	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		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.92		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1716	1696		1767	1645		1700	3192		1766	3368	1401
Flt Permitted	0.70	1.00		0.59	1.00		0.30	1.00		0.22	1.00	1.00
Satd. Flow (perm)	1262	1696		1096	1645		534	3192		406	3368	1401
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)	44	111	92	257	43	47	32	574	305	94	960	32
RTOR Reduction (vph)	0	34	0	0	34	0	0	49	0	0	0	12
Lane Group Flow (vph)	44	169	0	257	56	0	32	830	0	94	960	20
Confl. Peds. (#/hr)									9	9		
Heavy Vehicles (%)	4%	6%	0%	1%	11%	0%	5%	6%	2%	1%	6%	14%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	23.4	23.4		23.4	23.4		37.8	37.8		47.3	47.3	47.3
Effective Green, g (s)	23.4	23.4		23.4	23.4		37.8	37.8		47.3	47.3	47.3
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.46	0.46		0.57	0.57	0.57
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	357	479		310	465		244	1458		322	1926	801
v/s Ratio Prot		0.10			0.03			c0.26		0.02	c0.29	
v/s Ratio Perm	0.03			c0.23			0.06			0.15		0.01
v/c Ratio	0.12	0.35		0.83	0.12		0.13	0.57		0.29	0.50	0.02
Uniform Delay, d1	22.0	23.6		27.8	22.0		13.0	16.5		9.3	10.6	7.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		16.5	0.1		1.1	1.6		0.5	0.9	0.1
Delay (s)	22.2	24.1		44.3	22.1		14.1	18.1		9.8	11.5	7.7
Level of Service	C	C		D	C		B	B		A	B	A
Approach Delay (s)		23.7			38.5			18.0			11.3	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			18.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			82.7			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			85.3%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	181	0	16	0	25	701	28	1188
Future Volume (vph)	181	0	16	0	25	701	28	1188
Lane Group Flow (vph)	195	100	17	2	27	807	30	1339
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	4.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	26.0	26.0	10.0	66.0	11.0	66.0
Total Split (s)	57.0	57.0	57.0	57.0	15.0	66.0	15.0	66.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	10.9%	47.8%	10.9%	47.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None	Max
v/c Ratio	0.73	0.22	0.07	0.00	0.10	0.37	0.06	0.61
Control Delay	53.8	1.1	33.4	0.0	6.4	11.3	5.9	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.8	1.1	33.4	0.0	6.4	11.3	5.9	14.4
Queue Length 50th (m)	36.9	0.0	2.8	0.0	1.4	42.0	1.5	84.2
Queue Length 95th (m)	60.3	0.0	8.5	0.0	4.8	65.8	5.1	130.8
Internal Link Dist (m)		467.5		271.9		361.0		499.5
Turn Bay Length (m)	90.0		27.0		29.0		29.0	
Base Capacity (vph)	734	914	686	953	354	2173	547	2213
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.11	0.02	0.00	0.08	0.37	0.05	0.61

Intersection Summary

Cycle Length: 138

Actuated Cycle Length: 97.9

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Splits and Phases: 2: Sproule Drive Extension/City Ops. Driveway & Ferndale Drive North

Ø1	Ø2	Ø4
15 s	66 s	57 s
Ø5	Ø6	Ø8
15 s	66 s	57 s

Previn Court

HCM Signalized Intersection Capacity Analysis

2: Sproule Drive Extension/City Ops. Driveway & Ferndale Drive North Background (2028) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	181	0	93	16	0	2	25	701	49	28	1188	58
Future Volume (vph)	181	0	93	16	0	2	25	701	49	28	1188	58
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		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		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	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1747	1566		1785	1576		1750	3496		1784	3542	
Flt Permitted	0.76	1.00		0.69	1.00		0.14	1.00		0.31	1.00	
Satd. Flow (perm)	1391	1566		1301	1576		263	3496		584	3542	
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)	195	0	100	17	0	2	27	754	53	30	1277	62
RTOR Reduction (vph)	0	81	0	0	2	0	0	3	0	0	2	0
Lane Group Flow (vph)	195	19	0	17	0	0	27	804	0	30	1337	0
Confl. Peds. (#/hr)	1					1			5	5		
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	1%	0%	0%	0%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.9	18.9		18.9	18.9		64.2	60.7		65.0	61.1	
Effective Green, g (s)	18.9	18.9		18.9	18.9		64.2	60.7		65.0	61.1	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.65	0.61		0.65	0.61	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	264	297		247	299		222	2132		428	2175	
v/s Ratio Prot		0.01			0.00		c0.00	0.23		0.00	c0.38	
v/s Ratio Perm	c0.14			0.01			0.07			0.04		
v/c Ratio	0.74	0.06		0.07	0.00		0.12	0.38		0.07	0.61	
Uniform Delay, d1	38.0	33.0		33.1	32.7		8.2	9.8		6.3	11.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.3	0.1		0.1	0.0		0.2	0.5		0.1	1.3	
Delay (s)	48.3	33.1		33.2	32.7		8.4	10.3		6.4	13.2	
Level of Service	D	C		C	C		A	B		A	B	
Approach Delay (s)		43.1			33.1			10.3			13.1	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			15.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			99.5				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			76.7%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis
Background (2028) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	8	12	36	21	34
Future Volume (Veh/h)	35	8	12	36	21	34
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	44	10	15	45	26	43
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	140	46			68	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140	46			68	
tC, single (s)	6.5	6.6			5.1	
tC, 2 stage (s)						
tF (s)	3.6	3.7			3.1	
p0 queue free %	95	99			98	
cM capacity (veh/h)	813	920			1079	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	54	60	69			
Volume Left	44	0	26			
Volume Right	10	45	0			
cSH	831	1700	1079			
Volume to Capacity	0.06	0.04	0.02			
Queue Length 95th (m)	1.6	0.0	0.6			
Control Delay (s)	9.6	0.0	3.3			
Lane LOS	A		A			
Approach Delay (s)	9.6	0.0	3.3			
Approach LOS	A					
Intersection Summary						
Average Delay		4.1				
Intersection Capacity Utilization		19.6%		ICU Level of Service	A	
Analysis Period (min)		15				

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis
Background (2028) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	51	0	30	80	1	165
Future Volume (vph)	51	0	30	80	1	165
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	57	0	33	89	1	183
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	57	122	184			
Volume Left (vph)	0	33	1			
Volume Right (vph)	0	0	183			
Hadj (s)	0.00	0.06	-0.60			
Departure Headway (s)	4.4	4.4	3.7			
Degree Utilization, x	0.07	0.15	0.19			
Capacity (veh/h)	767	776	924			
Control Delay (s)	7.7	8.2	7.6			
Approach Delay (s)	7.7	8.2	7.6			
Approach LOS	A	A	A			
Intersection Summary						
Delay			7.8			
Level of Service			A			
Intersection Capacity Utilization			29.5%	ICU Level of Service	A	
Analysis Period (min)			15			

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Background (2028) PM Peak Hour

									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	25	56	254	131	118	964	44	637	36
Future Volume (vph)	25	56	254	131	118	964	44	637	36
Lane Group Flow (vph)	26	90	262	212	122	1466	45	657	37
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	47.0	47.0	47.0	47.0	54.0	54.0	11.0	65.0	65.0
Total Split (%)	42.0%	42.0%	42.0%	42.0%	48.2%	48.2%	9.8%	58.0%	58.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.10	0.19	0.79	0.44	0.29	0.78	0.21	0.31	0.04
Control Delay	26.5	19.7	50.3	27.8	18.5	22.9	11.1	10.5	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.5	19.7	50.3	27.8	18.5	22.9	11.1	10.5	5.0
Queue Length 50th (m)	3.7	8.8	45.3	28.2	12.8	112.0	2.8	27.5	0.5
Queue Length 95th (m)	9.9	19.8	72.7	47.2	32.7	#203.1	9.3	52.6	5.5
Internal Link Dist (m)		387.5		303.1		499.5		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	414	759	544	765	414	1878	213	2109	970
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.12	0.48	0.28	0.29	0.78	0.21	0.31	0.04

Intersection Summary

Cycle Length: 112

Actuated Cycle Length: 96.7

Natural Cycle: 75

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive

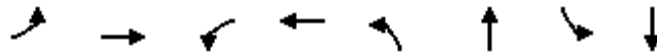
		
Ø1	Ø2	Ø4
11 s	54 s	47 s
		
Ø6		Ø8
65 s		47 s

Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis

Background (2028) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	56	31	254	131	75	118	964	458	44	637	36
Future Volume (vph)	25	56	31	254	131	75	118	964	458	44	637	36
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		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.97	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.95		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1733	1742		1738	1753		1783	3345		1785	3433	1561
Flt Permitted	0.53	1.00		0.70	1.00		0.40	1.00		0.08	1.00	1.00
Satd. Flow (perm)	970	1742		1278	1753		755	3345		149	3433	1561
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	26	58	32	262	135	77	122	994	472	45	657	37
RTOR Reduction (vph)	0	21	0	0	22	0	0	40	0	0	0	11
Lane Group Flow (vph)	26	69	0	262	190	0	122	1426	0	45	657	26
Confl. Peds. (#/hr)			18	18			1		3	3		1
Heavy Vehicles (%)	3%	1%	0%	0%	1%	2%	0%	1%	0%	0%	4%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	25.2	25.2		25.2	25.2		53.2	53.2		61.2	61.2	61.2
Effective Green, g (s)	25.2	25.2		25.2	25.2		53.2	53.2		61.2	61.2	61.2
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.54	0.54		0.62	0.62	0.62
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	248	446		327	448		408	1808		159	2135	970
v/s Ratio Prot		0.04			0.11			c0.43		0.01	c0.19	
v/s Ratio Perm	0.03			c0.20			0.16			0.16		0.02
v/c Ratio	0.10	0.16		0.80	0.43		0.30	0.79		0.28	0.31	0.03
Uniform Delay, d1	28.0	28.4		34.3	30.6		12.4	18.1		13.2	8.7	7.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2		13.2	0.7		1.9	3.6		1.0	0.4	0.1
Delay (s)	28.2	28.5		47.4	31.2		14.3	21.7		14.2	9.1	7.2
Level of Service	C	C		D	C		B	C		B	A	A
Approach Delay (s)		28.4			40.2			21.1			9.3	
Approach LOS		C			D			C			A	
Intersection Summary												
HCM 2000 Control Delay			21.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			98.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			81.4%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	179	0	19	0	109	1482	1	999
Future Volume (vph)	179	0	19	0	109	1482	1	999
Lane Group Flow (vph)	188	79	20	8	115	1574	1	1198
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	4.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	26.0	26.0	10.0	66.0	11.0	66.0
Total Split (s)	55.0	55.0	55.0	55.0	17.0	66.0	17.0	66.0
Total Split (%)	39.9%	39.9%	39.9%	39.9%	12.3%	47.8%	12.3%	47.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None	Max
v/c Ratio	0.73	0.17	0.08	0.02	0.35	0.66	0.00	0.60
Control Delay	56.9	0.7	35.2	0.1	8.3	13.2	6.0	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.9	0.7	35.2	0.1	8.3	13.2	6.0	16.7
Queue Length 50th (m)	36.1	0.0	3.4	0.0	6.1	79.7	0.1	75.9
Queue Length 95th (m)	61.0	0.0	9.8	0.0	14.8	174.0	0.6	122.4
Internal Link Dist (m)		467.5		271.9		361.0		499.5
Turn Bay Length (m)	90.0		27.0		29.0		29.0	
Base Capacity (vph)	653	859	625	859	393	2396	350	2009
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.09	0.03	0.01	0.29	0.66	0.00	0.60

Intersection Summary

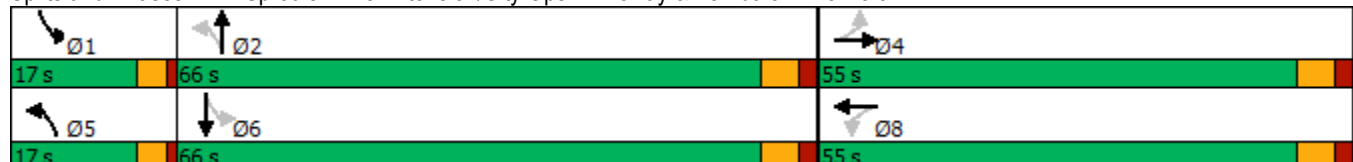
Cycle Length: 138

Actuated Cycle Length: 104.4

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Splits and Phases: 2: Sproule Drive Extension/City Ops. Driveway & Ferndale Drive North



Previn Court

HCM Signalized Intersection Capacity Analysis

2: Sproule Drive Extension/City Ops. Driveway & Ferndale Drive North Background (2028) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	179	0	75	19	0	8	109	1482	13	1	999	139
Future Volume (vph)	179	0	75	19	0	8	109	1482	13	1	999	139
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		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1566		1785	1597		1750	3527		1785	3466	
Flt Permitted	0.75	1.00		0.71	1.00		0.16	1.00		0.12	1.00	
Satd. Flow (perm)	1386	1566		1326	1597		294	3527		217	3466	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	188	0	79	20	0	8	115	1560	14	1	1052	146
RTOR Reduction (vph)	0	65	0	0	7	0	0	0	0	0	6	0
Lane Group Flow (vph)	188	14	0	20	1	0	115	1574	0	1	1192	0
Confl. Peds. (#/hr)									1	1		
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	1%	8%	0%	1%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.4	19.4		19.4	19.4		76.2	70.9		64.9	63.6	
Effective Green, g (s)	19.4	19.4		19.4	19.4		76.2	70.9		64.9	63.6	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.71	0.66		0.60	0.59	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	282		239	287		324	2324		149	2048	
v/s Ratio Prot		0.01			0.00		c0.03	c0.45		0.00	0.34	
v/s Ratio Perm	c0.14			0.02			0.22			0.00		
v/c Ratio	0.76	0.05		0.08	0.01		0.35	0.68		0.01	0.58	
Uniform Delay, d1	41.8	36.5		36.7	36.2		7.9	11.3		10.0	13.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.2	0.1		0.2	0.0		0.7	1.6		0.0	1.2	
Delay (s)	54.1	36.6		36.9	36.2		8.6	12.9		10.0	14.9	
Level of Service	D	D		D	D		A	B		B	B	
Approach Delay (s)		48.9			36.7			12.6			14.9	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			16.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			107.6				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			86.0%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis
Background (2028) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	14	53	146	13	16
Future Volume (Veh/h)	25	14	53	146	13	16
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	28	16	60	164	15	18
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	198	150			232	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	198	150			232	
tC, single (s)	6.4	6.2			4.5	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.6	
p0 queue free %	96	98			99	
cM capacity (veh/h)	780	896			1134	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	44	224	33			
Volume Left	28	0	15			
Volume Right	16	164	0			
cSH	818	1700	1134			
Volume to Capacity	0.05	0.13	0.01			
Queue Length 95th (m)	1.3	0.0	0.3			
Control Delay (s)	9.6	0.0	3.8			
Lane LOS	A		A			
Approach Delay (s)	9.6	0.0	3.8			
Approach LOS	A					
Intersection Summary						
Average Delay		1.8				
Intersection Capacity Utilization		22.6%		ICU Level of Service	A	
Analysis Period (min)		15				

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis
Background (2028) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	111	4	147	117	4	106
Future Volume (vph)	111	4	147	117	4	106
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	123	4	163	130	4	118
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	127	293	122			
Volume Left (vph)	0	163	4			
Volume Right (vph)	4	0	118			
Hadj (s)	-0.02	0.11	-0.57			
Departure Headway (s)	4.5	4.4	4.3			
Degree Utilization, x	0.16	0.36	0.15			
Capacity (veh/h)	770	784	771			
Control Delay (s)	8.3	9.9	8.0			
Approach Delay (s)	8.3	9.9	8.0			
Approach LOS	A	A	A			
Intersection Summary						
Delay			9.1			
Level of Service			A			
Intersection Capacity Utilization			34.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix F – Synchro Analysis Output – Total Traffic Volumes

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Total (2028) AM Peak Hour

									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	41	103	256	40	30	556	87	938	30
Future Volume (vph)	41	103	256	40	30	556	87	938	30
Lane Group Flow (vph)	44	203	275	90	32	929	94	1009	32
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	60.0	60.0	60.0	60.0	41.0	41.0	11.0	52.0	52.0
Total Split (%)	53.6%	53.6%	53.6%	53.6%	36.6%	36.6%	9.8%	46.4%	46.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.12	0.38	0.84	0.17	0.14	0.62	0.29	0.54	0.04
Control Delay	20.6	19.6	48.6	11.7	20.3	20.1	12.3	14.6	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	19.6	48.6	11.7	20.3	20.1	12.3	14.6	5.3
Queue Length 50th (m)	5.0	19.8	40.3	4.9	3.0	53.4	6.0	49.0	0.2
Queue Length 95th (m)	11.9	35.9	68.4	14.2	11.2	95.5	17.2	91.8	5.0
Internal Link Dist (m)		387.5		303.1		267.3		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	823	1118	717	1089	230	1489	328	1870	791
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.18	0.38	0.08	0.14	0.62	0.29	0.54	0.04

Intersection Summary

Cycle Length: 112
Actuated Cycle Length: 83.6
Natural Cycle: 65
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive

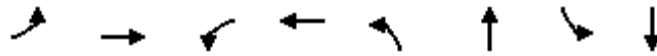
		
Ø1	Ø2	Ø4
11 s	41 s	60 s
		
Ø6		Ø8
52 s		60 s

Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis

Total (2028) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	103	86	256	40	44	30	556	308	87	938	30
Future Volume (vph)	41	103	86	256	40	44	30	556	308	87	938	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		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.92		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1716	1696		1767	1645		1700	3180		1766	3368	1401
Flt Permitted	0.70	1.00		0.59	1.00		0.28	1.00		0.19	1.00	1.00
Satd. Flow (perm)	1262	1696		1101	1645		508	3180		362	3368	1401
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)	44	111	92	275	43	47	32	598	331	94	1009	32
RTOR Reduction (vph)	0	28	0	0	33	0	0	54	0	0	0	13
Lane Group Flow (vph)	44	175	0	275	57	0	32	875	0	94	1009	19
Confl. Peds. (#/hr)									12	12		
Heavy Vehicles (%)	4%	6%	0%	1%	11%	0%	5%	6%	2%	1%	6%	14%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	25.0	25.0		25.0	25.0		37.8	37.8		47.3	47.3	47.3
Effective Green, g (s)	25.0	25.0		25.0	25.0		37.8	37.8		47.3	47.3	47.3
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.45	0.45		0.56	0.56	0.56
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	374	502		326	487		227	1425		294	1889	786
v/s Ratio Prot		0.10			0.03			c0.28		0.02	c0.30	
v/s Ratio Perm	0.03			c0.25			0.06			0.16		0.01
v/c Ratio	0.12	0.35		0.84	0.12		0.14	0.61		0.32	0.53	0.02
Uniform Delay, d1	21.6	23.3		27.8	21.6		13.7	17.7		10.2	11.6	8.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4		17.7	0.1		1.3	2.0		0.6	1.1	0.1
Delay (s)	21.8	23.7		45.5	21.7		15.0	19.7		10.9	12.7	8.3
Level of Service	C	C		D	C		B	B		B	B	A
Approach Delay (s)		23.3			39.6			19.5			12.4	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			19.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			84.3			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			87.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	219	0	16	0	76	709	28	1214
Future Volume (vph)	219	0	16	0	76	709	28	1214
Lane Group Flow (vph)	235	191	17	2	82	815	30	1429
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	4.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	26.0	26.0	10.0	66.0	11.0	66.0
Total Split (s)	57.0	57.0	57.0	57.0	15.0	66.0	15.0	66.0
Total Split (%)	41.3%	41.3%	41.3%	41.3%	10.9%	47.8%	10.9%	47.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None	Max
v/c Ratio	0.76	0.39	0.08	0.00	0.34	0.39	0.07	0.71
Control Delay	55.1	7.9	33.2	0.0	10.9	13.2	7.5	20.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.1	7.9	33.2	0.0	10.9	13.2	7.5	20.7
Queue Length 50th (m)	46.1	1.2	2.8	0.0	4.9	46.8	1.7	107.1
Queue Length 95th (m)	75.1	18.2	8.8	0.0	13.2	76.3	6.1	177.8
Internal Link Dist (m)		467.5		271.9		104.3		208.1
Turn Bay Length (m)	100.0		27.0		29.0		29.0	
Base Capacity (vph)	679	858	486	900	292	2113	522	2024
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.22	0.03	0.00	0.28	0.39	0.06	0.71

Intersection Summary

Cycle Length: 138

Actuated Cycle Length: 105.8

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Splits and Phases: 2: Ferndale Drive North & Sproule Drive Extension/City Ops. Driveway

Ø1	Ø2	Ø4
15 s	66 s	57 s
Ø5	Ø6	Ø8
15 s	66 s	57 s

Previn Court

HCM Signalized Intersection Capacity Analysis

2: Ferndale Drive North & Sproule Drive Extension/City Ops. Driveway

Total (2028) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	219	0	178	16	0	2	76	709	49	28	1214	115
Future Volume (vph)	219	0	178	16	0	2	76	709	49	28	1214	115
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		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		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	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1747	1566		1785	1575		1750	3497		1784	3517	
Flt Permitted	0.76	1.00		0.53	1.00		0.10	1.00		0.31	1.00	
Satd. Flow (perm)	1391	1566		997	1575		187	3497		590	3517	
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)	235	0	191	17	0	2	82	762	53	30	1305	124
RTOR Reduction (vph)	0	144	0	0	2	0	0	3	0	0	4	0
Lane Group Flow (vph)	235	47	0	17	0	0	82	812	0	30	1425	0
Confl. Peds. (#/hr)	1					1			5	5		
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	1%	0%	0%	0%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	23.6	23.6		23.6	23.6		70.1	63.9		65.7	61.7	
Effective Green, g (s)	23.6	23.6		23.6	23.6		70.1	63.9		65.7	61.7	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.65	0.59		0.61	0.57	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	305	343		218	345		212	2078		405	2018	
v/s Ratio Prot		0.03			0.00		c0.02	0.23		0.00	c0.41	
v/s Ratio Perm	c0.17			0.02			0.23			0.04		
v/c Ratio	0.77	0.14		0.08	0.00		0.39	0.39		0.07	0.71	
Uniform Delay, d1	39.4	33.8		33.3	32.7		12.0	11.5		8.4	16.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.4	0.2		0.2	0.0		1.2	0.6		0.1	2.1	
Delay (s)	50.8	33.9		33.5	32.8		13.2	12.1		8.5	18.5	
Level of Service	D	C		C	C		B	B		A	B	
Approach Delay (s)		43.2			33.4			12.2			18.3	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay			20.2				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			107.5				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			88.0%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis

Total (2028) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	39	10	12	39	23	34
Future Volume (Veh/h)	39	10	12	39	23	34
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	49	13	15	49	29	43
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	148	48			72	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	148	48			72	
tC, single (s)	6.5	6.6			5.1	
tC, 2 stage (s)						
tF (s)	3.6	3.7			3.1	
p0 queue free %	94	99			97	
cM capacity (veh/h)	802	918			1075	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	62	64	72			
Volume Left	49	0	29			
Volume Right	13	49	0			
cSH	824	1700	1075			
Volume to Capacity	0.08	0.04	0.03			
Queue Length 95th (m)	1.9	0.0	0.6			
Control Delay (s)	9.7	0.0	3.5			
Lane LOS	A		A			
Approach Delay (s)	9.7	0.0	3.5			
Approach LOS	A					
Intersection Summary						
Average Delay		4.3				
Intersection Capacity Utilization		19.7%		ICU Level of Service		A
Analysis Period (min)		15				

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis

Total (2028) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	51	2	30	80	4	165
Future Volume (vph)	51	2	30	80	4	165
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	57	2	33	89	4	183
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	59	122	187			
Volume Left (vph)	0	33	4			
Volume Right (vph)	2	0	183			
Hadj (s)	-0.02	0.06	-0.58			
Departure Headway (s)	4.4	4.4	3.7			
Degree Utilization, x	0.07	0.15	0.19			
Capacity (veh/h)	769	774	920			
Control Delay (s)	7.7	8.2	7.6			
Approach Delay (s)	7.7	8.2	7.6			
Approach LOS	A	A	A			
Intersection Summary						
Delay			7.8			
Level of Service			A			
Intersection Capacity Utilization			29.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Previn Court
5: Ferndale Drive North & North Residential Access

HCM Unsignalized Intersection Capacity Analysis

Total (2028) AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	23	8	922	1334	2
Future Volume (Veh/h)	8	23	8	922	1334	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	25	9	1002	1450	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				232	291	
pX, platoon unblocked	0.88	0.82	0.82			
vC, conflicting volume	1970	726	1452			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1267	233	1117			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	96	98			
cM capacity (veh/h)	141	637	520			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	34	343	668	967	485	
Volume Left	9	9	0	0	0	
Volume Right	25	0	0	0	2	
cSH	329	520	1700	1700	1700	
Volume to Capacity	0.10	0.02	0.39	0.57	0.29	
Queue Length 95th (m)	2.6	0.4	0.0	0.0	0.0	
Control Delay (s)	17.2	0.6	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	17.2	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			46.9%	ICU Level of Service		A
Analysis Period (min)			15			

Previn Court
6: South Commercial Access & Ferndale Drive North

HCM Unsignalized Intersection Capacity Analysis

Total (2028) AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	2	0	834	1406	3
Future Volume (Veh/h)	0	2	0	834	1406	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	907	1528	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					128	
pX, platoon unblocked	0.71	0.71	0.71			
vC, conflicting volume	1983	766	1531			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1563	0	924			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	73	767	520			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	2	454	454	1019	512	
Volume Left	0	0	0	0	0	
Volume Right	2	0	0	0	3	
cSH	767	1700	1700	1700	1700	
Volume to Capacity	0.00	0.27	0.27	0.60	0.30	
Queue Length 95th (m)	0.1	0.0	0.0	0.0	0.0	
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	9.7	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			49.0%	ICU Level of Service		A
Analysis Period (min)			15			

Previn Court
1: Ferndale Drive North & Edgehill Drive

Queues
Total (2028) PM Peak Hour

									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	25	54	282	123	126	1003	44	663	36
Future Volume (vph)	25	54	282	123	126	1003	44	663	36
Lane Group Flow (vph)	26	88	291	204	130	1532	45	684	37
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA	Perm
Protected Phases		4		8		2	1	6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	1	6	6
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	20.0	20.0	7.0	27.0	27.0
Minimum Split (s)	24.0	24.0	24.0	24.0	26.0	26.0	11.0	33.0	33.0
Total Split (s)	45.0	45.0	45.0	45.0	56.0	56.0	11.0	67.0	67.0
Total Split (%)	40.2%	40.2%	40.2%	40.2%	50.0%	50.0%	9.8%	59.8%	59.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag					Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes		
Recall Mode	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.09	0.18	0.83	0.41	0.33	0.82	0.23	0.33	0.04
Control Delay	26.7	19.6	54.3	27.0	19.9	25.7	12.2	11.5	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	19.6	54.3	27.0	19.9	25.7	12.2	11.5	5.1
Queue Length 50th (m)	3.8	8.8	53.3	27.5	15.3	134.1	3.2	33.0	0.6
Queue Length 95th (m)	10.2	19.9	84.0	46.3	35.2	#218.7	9.3	55.1	5.5
Internal Link Dist (m)		387.5		303.1		233.4		189.4	
Turn Bay Length (m)	15.0		33.0		30.0		71.0		8.0
Base Capacity (vph)	387	689	494	695	400	1860	195	2079	956
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.13	0.59	0.29	0.33	0.82	0.23	0.33	0.04

Intersection Summary

Cycle Length: 112

Actuated Cycle Length: 101.3

Natural Cycle: 90

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Ferndale Drive North & Edgehill Drive

		
Ø1	Ø2	Ø4
11 s	56 s	45 s
		
Ø6		Ø8
67 s		45 s

Previn Court
1: Ferndale Drive North & Edgehill Drive

HCM Signalized Intersection Capacity Analysis

Total (2028) PM Peak Hour

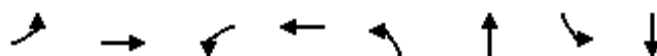
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	54	31	282	123	75	126	1003	483	44	663	36
Future Volume (vph)	25	54	31	282	123	75	126	1003	483	44	663	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00		1.00	0.99		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		0.97	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.94		1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1733	1738		1736	1748		1783	3343		1785	3433	1561
Flt Permitted	0.55	1.00		0.70	1.00		0.39	1.00		0.07	1.00	1.00
Satd. Flow (perm)	1001	1738		1279	1748		735	3343		127	3433	1561
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	26	56	32	291	127	77	130	1034	498	45	684	37
RTOR Reduction (vph)	0	20	0	0	22	0	0	44	0	0	0	11
Lane Group Flow (vph)	26	68	0	291	182	0	130	1488	0	45	684	26
Confl. Peds. (#/hr)			18	18			1		3	3		1
Heavy Vehicles (%)	3%	1%	0%	0%	1%	2%	0%	1%	0%	0%	4%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	27.9	27.9		27.9	27.9		55.1	55.1		63.1	63.1	63.1
Effective Green, g (s)	27.9	27.9		27.9	27.9		55.1	55.1		63.1	63.1	63.1
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.53	0.53		0.61	0.61	0.61
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	271	470		346	473		393	1788		142	2103	956
v/s Ratio Prot		0.04			0.10			c0.45		0.01	c0.20	
v/s Ratio Perm	0.03			c0.23			0.18			0.18		0.02
v/c Ratio	0.10	0.14		0.84	0.39		0.33	0.83		0.32	0.33	0.03
Uniform Delay, d1	28.1	28.5		35.5	30.6		13.5	20.1		15.5	9.7	7.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1		16.6	0.5		2.2	4.7		1.3	0.4	0.1
Delay (s)	28.3	28.6		52.1	31.1		15.8	24.8		16.8	10.1	7.9
Level of Service	C	C		D	C		B	C		B	B	A
Approach Delay (s)		28.5			43.4			24.1			10.4	
Approach LOS		C			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			23.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			103.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			84.7%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court

2: Ferndale Drive North & Sproule Drive Extension/City Ops. Driveway

Queues

Total (2028) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	278	0	19	0	218	1466	1	997
Future Volume (vph)	278	0	19	0	218	1466	1	997
Lane Group Flow (vph)	293	153	20	8	229	1557	1	1260
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	4.0	60.0	7.0	60.0
Minimum Split (s)	26.0	26.0	26.0	26.0	10.0	66.0	11.0	66.0
Total Split (s)	55.0	55.0	55.0	55.0	17.0	66.0	17.0	66.0
Total Split (%)	39.9%	39.9%	39.9%	39.9%	12.3%	47.8%	12.3%	47.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	1.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	4.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None	Max
v/c Ratio	0.83	0.27	0.07	0.01	0.75	0.70	0.00	0.72
Control Delay	62.1	1.4	32.7	0.0	33.0	19.5	10.0	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.1	1.4	32.7	0.0	33.0	19.5	10.0	27.3
Queue Length 50th (m)	65.1	0.0	3.6	0.0	22.0	111.4	0.1	114.9
Queue Length 95th (m)	96.9	0.7	9.6	0.0	#72.0	224.6	0.9	175.1
Internal Link Dist (m)		467.5		271.9		120.4		242.2
Turn Bay Length (m)	100.0		27.0		29.0		29.0	
Base Capacity (vph)	568	777	465	774	306	2218	298	1740
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.20	0.04	0.01	0.75	0.70	0.00	0.72

Intersection Summary

Cycle Length: 138

Actuated Cycle Length: 120

Natural Cycle: 105

Control Type: Semi Act-Uncoord

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

Queue shown is maximum after two cycles.

Splits and Phases: 2: Ferndale Drive North & Sproule Drive Extension/City Ops. Driveway

Ø1	Ø2	Ø4
17 s	66 s	55 s
Ø5	Ø6	Ø8
17 s	66 s	55 s

Previn Court

HCM Signalized Intersection Capacity Analysis

2: Ferndale Drive North & Sproule Drive Extension/City Ops. Driveway

Total (2028) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	278	0	145	19	0	8	218	1466	13	1	997	200
Future Volume (vph)	278	0	145	19	0	8	218	1466	13	1	997	200
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		4.0	6.0		4.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1566		1785	1597		1750	3527		1785	3440	
Flt Permitted	0.75	1.00		0.60	1.00		0.11	1.00		0.11	1.00	
Satd. Flow (perm)	1386	1566		1134	1597		210	3527		200	3440	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	0	153	20	0	8	229	1543	14	1	1049	211
RTOR Reduction (vph)	0	115	0	0	6	0	0	0	0	0	11	0
Lane Group Flow (vph)	293	38	0	20	2	0	229	1557	0	1	1249	0
Confl. Peds. (#/hr)									1	1		
Heavy Vehicles (%)	2%	0%	2%	0%	0%	0%	2%	1%	8%	0%	1%	2%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	30.5	30.5		30.5	30.5		80.7	75.4		64.9	63.6	
Effective Green, g (s)	30.5	30.5		30.5	30.5		80.7	75.4		64.9	63.6	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.66	0.61		0.53	0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	343	387		280	395		301	2158		122	1775	
v/s Ratio Prot		0.02			0.00		c0.08	0.44		0.00	0.36	
v/s Ratio Perm	c0.21			0.02			c0.42			0.00		
v/c Ratio	0.85	0.10		0.07	0.01		0.76	0.72		0.01	0.70	
Uniform Delay, d1	44.2	35.7		35.5	34.9		20.5	16.6		15.8	22.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.3	0.1		0.1	0.0		10.8	2.1		0.0	2.4	
Delay (s)	62.5	35.9		35.6	34.9		31.3	18.7		15.8	25.0	
Level of Service	E	D		D	C		C	B		B	C	
Approach Delay (s)		53.4			35.4			20.3			25.0	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			26.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			123.2				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			97.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Previn Court
3: Sproule Drive & Miller Drive

HCM Unsignalized Intersection Capacity Analysis

Total (2028) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	27	20	49	159	14	16
Future Volume (Veh/h)	27	20	49	159	14	16
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	30	22	55	179	16	18
Pedestrians	8					
Lane Width (m)	3.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	202	152			242	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202	152			242	
tC, single (s)	6.4	6.2			4.5	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.6	
p0 queue free %	96	98			99	
cM capacity (veh/h)	774	893			1124	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	52	234	34			
Volume Left	30	0	16			
Volume Right	22	179	0			
cSH	820	1700	1124			
Volume to Capacity	0.06	0.14	0.01			
Queue Length 95th (m)	1.5	0.0	0.3			
Control Delay (s)	9.7	0.0	3.9			
Lane LOS	A		A			
Approach Delay (s)	9.7	0.0	3.9			
Approach LOS	A					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			23.3%	ICU Level of Service		A
Analysis Period (min)			15			

Previn Court
4: Pringle Drive & Edgehill Drive

HCM Unsignalized Intersection Capacity Analysis

Total (2028) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	109	10	147	117	8	106
Future Volume (vph)	109	10	147	117	8	106
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	121	11	163	130	9	118
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	132	293	127			
Volume Left (vph)	0	163	9			
Volume Right (vph)	11	0	118			
Hadj (s)	-0.05	0.11	-0.54			
Departure Headway (s)	4.5	4.5	4.3			
Degree Utilization, x	0.16	0.36	0.15			
Capacity (veh/h)	772	780	763			
Control Delay (s)	8.3	10.0	8.1			
Approach Delay (s)	8.3	10.0	8.1			
Approach LOS	A	A	A			
Intersection Summary						
Delay			9.1			
Level of Service			A			
Intersection Capacity Utilization			34.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Previn Court
5: Ferndale Drive North & North Residential Access

HCM Unsignalized Intersection Capacity Analysis

Total (2028) PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	10	13	1740	1188	5
Future Volume (Veh/h)	2	10	13	1740	1188	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	11	14	1891	1291	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				266	257	
pX, platoon unblocked	0.71	0.92	0.92			
vC, conflicting volume	2267	648	1296			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1461	448	1151			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	98	98			
cM capacity (veh/h)	84	520	566			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	13	644	1261	861	435	
Volume Left	2	14	0	0	0	
Volume Right	11	0	0	0	5	
cSH	289	566	1700	1700	1700	
Volume to Capacity	0.04	0.02	0.74	0.51	0.26	
Queue Length 95th (m)	1.1	0.6	0.0	0.0	0.0	
Control Delay (s)	18.0	0.7	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	18.0	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			67.2%	ICU Level of Service		C
Analysis Period (min)			15			

Previn Court
6: South Commercial Access & Ferndale Drive North

HCM Unsignalized Intersection Capacity Analysis

Total (2028) PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3	0	1698	1159	2
Future Volume (Veh/h)	0	3	0	1698	1159	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	3	0	1846	1260	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					144	
pX, platoon unblocked	0.73	0.73	0.73			
vC, conflicting volume	2184	631	1262			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1889	0	634			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	45	797	694			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	3	923	923	840	422	
Volume Left	0	0	0	0	0	
Volume Right	3	0	0	0	2	
cSH	797	1700	1700	1700	1700	
Volume to Capacity	0.00	0.54	0.54	0.49	0.25	
Queue Length 95th (m)	0.1	0.0	0.0	0.0	0.0	
Control Delay (s)	9.5	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	9.5	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			50.3%	ICU Level of Service		A
Analysis Period (min)			15			

Summary of All Intervals

Run Number	1	2	3	4	5	2028	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:07	8:07	8:07	8:07	8:07	8:07	8:07
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4280	4205	4206	3983	4269	4117	4176
Vehs Exited	4269	4193	4213	3990	4241	4120	4172
Starting Vehs	121	127	159	128	112	140	125
Ending Vehs	132	139	152	121	140	137	134
Travel Distance (km)	4240	4116	4121	3946	4200	4094	4119
Travel Time (hr)	139.1	128.2	128.6	122.0	132.2	127.3	129.6
Total Delay (hr)	49.9	41.6	42.0	39.1	43.8	41.0	42.9
Total Stops	4589	4071	4112	3807	4163	3997	4123
Fuel Used (l)	374.6	359.3	360.7	342.5	365.7	354.2	359.5

Interval #0 Information Seeding

Start Time	6:57
End Time	7:07
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:07
End Time	8:07
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	2028	Avg
Vehs Entered	4280	4205	4206	3983	4269	4117	4176
Vehs Exited	4269	4193	4213	3990	4241	4120	4172
Starting Vehs	121	127	159	128	112	140	125
Ending Vehs	132	139	152	121	140	137	134
Travel Distance (km)	4240	4116	4121	3946	4200	4094	4119
Travel Time (hr)	139.1	128.2	128.6	122.0	132.2	127.3	129.6
Total Delay (hr)	49.9	41.6	42.0	39.1	43.8	41.0	42.9
Total Stops	4589	4071	4112	3807	4163	3997	4123
Fuel Used (l)	374.6	359.3	360.7	342.5	365.7	354.2	359.5

Previn Court
Queuing and Blocking Report

Queuing and Blocking Report
Total (2028) PM Peak Hour

Intersection: 2: Sproule Drive Extension/City Ops. Driveway & Ferndale Drive North

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (m)	105.9	60.7	15.4	9.3	85.6	108.7	107.2	1.2	112.2	118.2
Average Queue (m)	52.9	14.3	4.1	1.8	30.3	55.2	56.7	0.1	58.1	65.5
95th Queue (m)	84.7	36.2	12.0	7.0	61.5	94.0	95.8	1.3	97.4	104.9
Link Distance (m)				284.0		128.6	128.6		255.0	255.0
Upstream Blk Time (%)						0	0			
Queuing Penalty (veh)						0	1			
Storage Bay Dist (m)	100.0		27.0		29.0			29.0		
Storage Blk Time (%)	1	0			9	15			22	
Queuing Penalty (veh)	1	0			68	34			0	

Appendix G – Transportation Tomorrow Survey Excerpt

Thu Oct 04 2018 15:27:09 GMT-0400 (Eastern Daylight Time) - Run Time: 1553ms Cross Tabulation Query Form - Trip - 2016 v1.1 Row: 2006 GTA zone of household - gta06_hhld Column: Planning district of destination - pd_dest Filters: (2006 GTA zone of household - gta06_hhld In 8520); and (Start time of trip - start_time In 700 - 900); and Trip purpose of destination - purp_dest In W Trip 2016 ROW : gta06_hhld COLUMN : pd_dest	Thu Oct 04 2018 15:30:06 GMT-0400 (Eastern Daylight Time) - Run Time: 2250ms Cross Tabulation Query Form - Trip - 2016 v1.1 Row: 2006 GTA zone of household - gta06_hhld Column: 2006 GTA zone of destination - gta06_dest Filters: (2006 GTA zone of household - gta06_hhld In 8520); and (Start time of trip - start_time In 700 - 900); and Trip purpose of destination - purp_dest In W (Planning district of destination - pd_dest In 81) ROW : gta06_hhld COLUMN : gta06_dest
---	--

TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

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

Group Attributes

Row Grouping Column Grouping Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☐ 2006 GTA zone of household In 8520

And

☐ Start time of trip In 700 - 900

And

☐ Trip purpose of destination In W

Add Delete

Output

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

Execute Query Select All Save As

Wed Nov 14 2018 15:36:22 GMT-0500 (Eastern Standard Time) - Run Time: 2144ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of household - gta06_hhld

Column: Planning district of destination - pd_dest

Filters:

2006 GTA zone of household - gta06_hhld In 8520

and

Start time of trip - start_time In 700 - 900

and

Trip purpose of destination - purp_dest In W

Trip 2016

ROW : gta06_hhld

COLUMN : pd_dest

gta06_hhld	pd_dest	total
8520	9	9
8520	28	206
8520	30	60
8520	32	37
8520	33	41
8520	36	21
8520	81	341
8520	86	7

TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

2006 GTA zone of hous... X 2006 GTA zone of desti... X (Optional) Table Attribute

Group Attributes

Row Grouping Column Grouping Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☐ 2006 GTA zone of household In 8520

And

☐ Start time of trip In 700 - 900

And

☐ Trip purpose of destination In W

And

☐ Planning district of destination In 81

Add Delete

Output

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

Execute Query Select All Save As

Wed Nov 14 2016 15:37:36 GMT-0500 (Eastern Standard Time) - Run Time: 2074ms

Cross Tabulation Query Form - Trip - 2016 v1.1

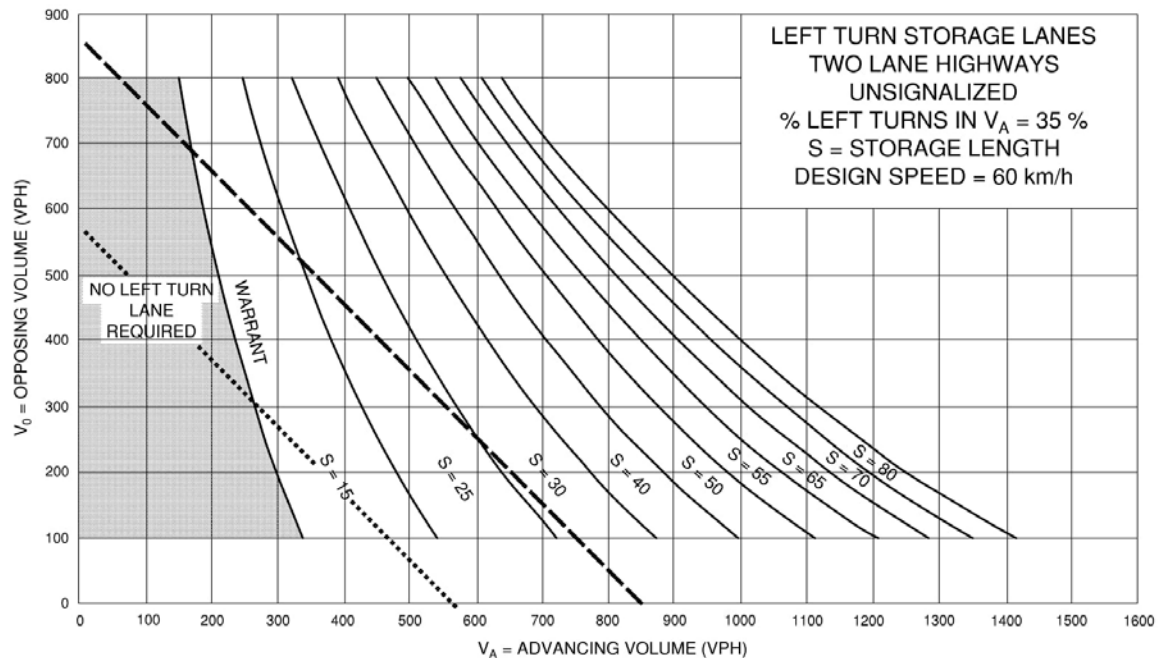
Row: 2006 GTA zone of household - gta06_hhld
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of household - gta06_hhld In 8520
and
Start time of trip - start_time In 700 - 900
and
Trip purpose of destination - purp_dest In W
and
Planning district of destination - pd_dest In 81

Trip 2016

ROW : gta06_hhld	COLUMN : gta06_dest	
gta06_hhld	gta06_dest	total
8520	8502	8
8520	8508	50
8520	8509	90
8520	8510	26
8520	8516	20
8520	8521	25
8520	8524	84
8520	8527	39

Appendix H – MTO Left Turn Analysis

Exhibit 9A-9

--- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

..... TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

Miller Drive / Sproule Drive

Total 2028 - Southbound - Critical Case
PM Peak Hour

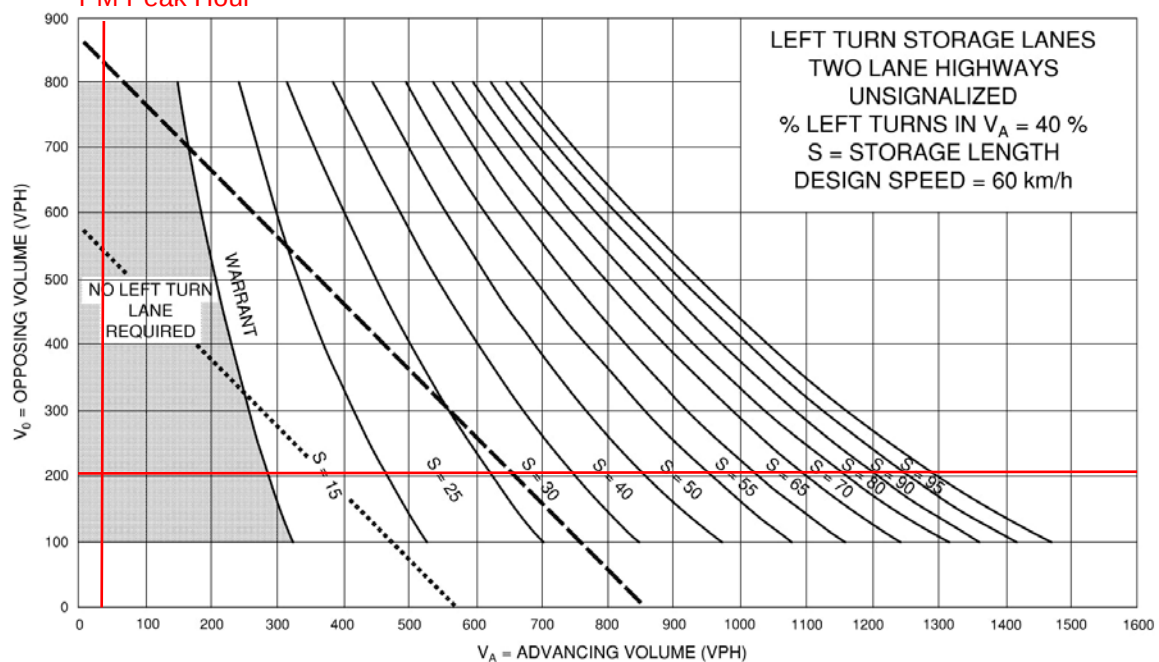
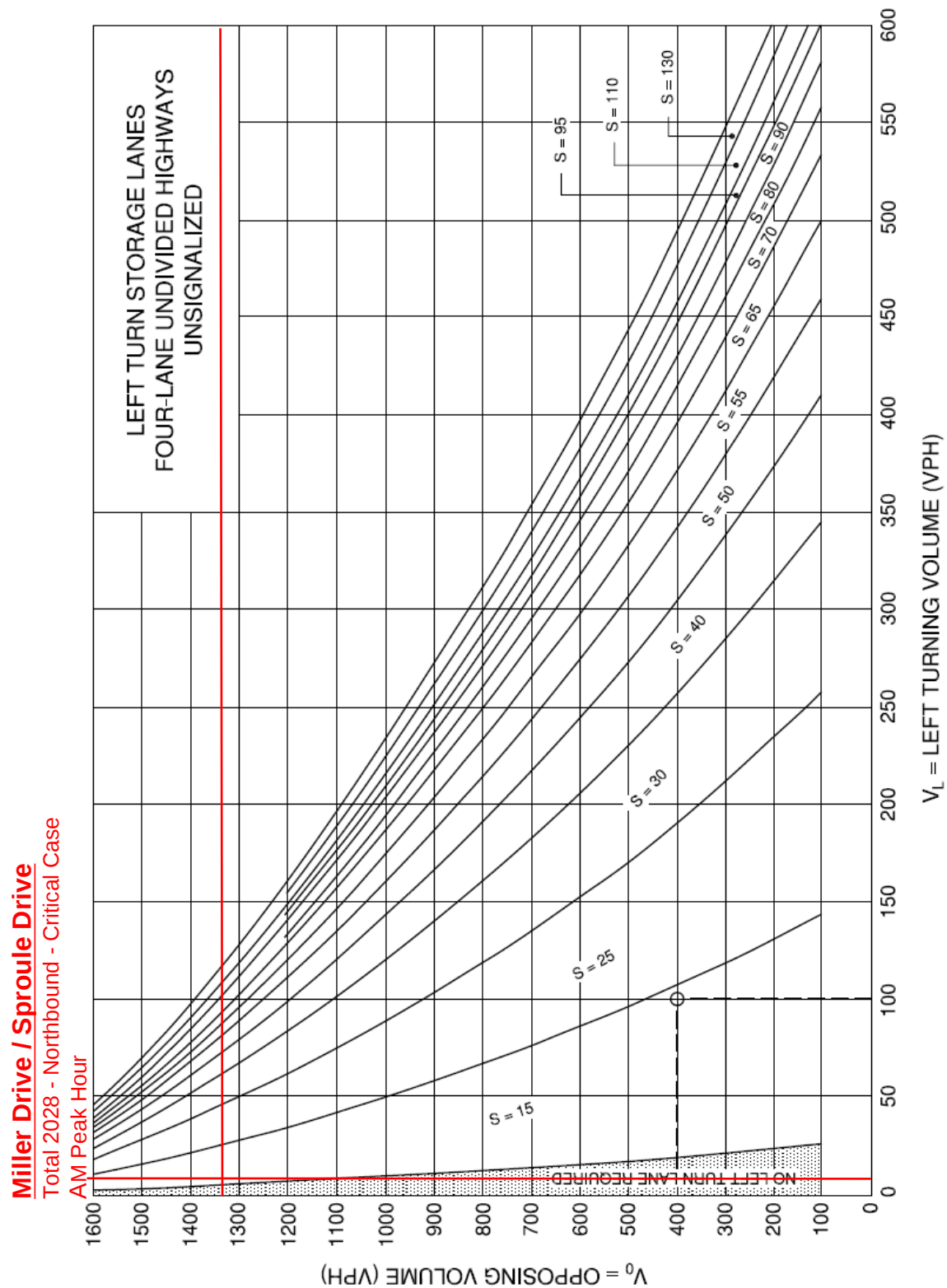


Exhibit 9A-30

Appendix I – OTM Signal Justification Sheets

Justification No. 7 - 2028 Total Traffic (Critical Case)

Pringle Drive / Edgehill Drive

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	720	207	29%	23%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	71	28%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	133	19%	3%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	3	4%		NO	NO

Justification No. 7 - 2028 Total Traffic (Critical Case)

Miller Drive / Sproule Drive

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	720	110	15%	8%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	24	9%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	37	5%	4%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	17	22%		NO	NO

Justification No. 7 - 2028 Total Traffic (Critical Case)

Ferndale Drive North / North Residential Access

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	900	1314	146%	3%	NO	YES
	B. Vehicle volume, along minor streets (average hour)	255	11	4%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	900	1301	145%	1%	NO	YES
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	170	3	1%		NO	NO

Justification No. 7 - 2028 Total Traffic (Critical Case)

Ferndale Drive North / South Commercial Access

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	900	1277	142%	0%	NO	YES
	B. Vehicle volume, along minor streets (average hour)	255	1	0%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	900	1274	142%	0%	NO	YES
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	170	0	0%		NO	NO

Appendix K – ITE Trip Generation Sheets

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Previn Court	Organization:	JD Engineering		
Project Location:	180 & 190 Ferndale Drive North	Performed By:	Allister Aresta		
Scenario Description:	AM Street Peak Hour	Date:	November 14th, 2018		
Analysis Year:	2028	Checked By:	John Northcote		
Analysis Period:	AM Street Peak Hour	Date:	November 14th, 2018		

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				189	102	87
Restaurant				0		
Cinema/Entertainment				0		
Residential				108	28	80
Hotel				0		
All Other Land Uses ²				0		
				297	130	167

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant						
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	297	130	167
Internal Capture Percentage	1%	2%	1%
External Vehicle-Trips ⁵	293	128	165
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	1%	1%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	4%	1%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Previn Court
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	102	102	1.00	87	87
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	28	28	1.00	80	80
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	25		11	0	12	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	1	16	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		33	0	0	0	0
Retail	0		0	0	1	0
Restaurant	0	8		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	17	0	0		0
Hotel	0	4	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	101	102	101	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	27	28	27	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	1	86	87	86	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	79	80	79	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Previn Court	Organization:	JD Engineering		
Project Location:	180 & 190 Ferndale Drive North	Performed By:	Allister Aresta		
Scenario Description:	PM Street Peak Hour	Date:	November 14th, 2018		
Analysis Year:	2028	Checked By:	John Northcote		
Analysis Period:	PM Street Peak Hour	Date:	November 14th, 2018		

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data <i>(For Information Only)</i>			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				386	185	201
Restaurant				0		
Cinema/Entertainment				0		
Residential				132	81	51
Hotel				0		
All Other Land Uses ²				0		
				518	266	252

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant						
Cinema/Entertainment						
Residential	1.00	0%	0%	1.00	0%	0%
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	37	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	19	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	518	266	252
Internal Capture Percentage	22%	21%	22%
External Vehicle-Trips ⁵	406	210	196
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	46%	37%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ Person-Trips
[*] Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Previn Court
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	185	185	1.00	201	201
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	81	81	1.00	51	51
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		58	8	52	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	21	11	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		15	0	0	3	0
Retail	0		0	0	37	0
Restaurant	0	93		0	13	0
Cinema/Entertainment	0	7	0		3	0
Residential	0	19	0	0		0
Hotel	0	4	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	19	166	185	166	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	37	44	81	44	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	37	164	201	164	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	19	32	51	32	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.