

560 Lockhart Road

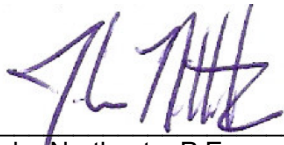
City of Barrie

Traffic Impact Study for Lockhart Innisfil Investments I Ltd.

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Executive Summary

This report summarizes the traffic impact study for the proposed residential development located on the north side of Lockhart Road, midblock between Finsbury Street and Yonge Street, in the City of Barrie [City] within the Hewitt Secondary Plan Area [HSPA]. 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 includes 190 single detached units and future lots / blocks (eight residential units). It is anticipated that the subject site will be built-out and occupied by 2027.

The proposed development will access Ball Gate to the west and Madelaine Drive to the north via Fenchurch Manor, which is planned to extend through the adjacent properties to the west and north. The proposed development will access Lockhart Road via Ball Gate and will access Mapleview Drive East via Madelaine Drive. Ball Gate is a proposed local road north of Fenchurch Manor and a major collector road south of Fenchurch Manor.

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

- Ball Gate / Lockhart Road.

Conclusions

1. The proposed development is expected to generate a total of 95 AM and 133 PM peak hour external trips.
2. Background traffic and pedestrian counts were obtained from the City at the Yonge Street / Lockhart intersection, completed on Thursday, September 28th, 2017 and Wednesday, October 21st 2020.
3. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed under total (2027) traffic volumes with the proposed development operational at the study area intersections. The following interim lane improvements are recommended on Lockhart Road ahead of the planned road reconstruction by opening day of Lockhart Development P2 (2025).

Ball Gate / Lockhart Road

- Eastbound left turn lane with a 30 metre storage length and an 85 metre taper length.
 - Westbound right turn lane with a 60 metre taper length.
5. Planned road improvements at the study area intersections include the 2031 road reconstruction of Lockhart Road from a two-lane to a four-lane cross-section with a multi-use trail on the north side of the road.
 6. An intersection operation analysis was completed under total (2031 & 2037) traffic volumes with the proposed development operational at the study area intersections.
 7. It is recommended that the City monitor the traffic volumes at the Ball Gate / Lockhart Road intersection closer to the 2031 horizon year to confirm whether traffic signals are required to accommodate the southbound left turn movements.
 8. The proposed Ball Gate intersection will operate efficiently as a full-movement access, with one-way stop control for southbound movements. Ball Gate will include buffered bicycle lanes

between Fenchurch Manor and Lockhart Road and sidewalk on both sides of the road. A single ingress and two egress lanes (right turn and left turn lane with a 40 metre storage length and a 55 metre taper) at the Ball Gate intersection will provide the necessary capacity to service the proposed development.

9. The sight distance available for the proposed Ball Gate intersection meets the minimum stopping sight distance and decision sight distance requirements.
10. 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

Lockhart Innisfil Investments I Ltd. [Client] is proposing to develop a residential development located on the north side of Lockhart Road, midblock between Finsbury Street and Yonge Street, in the City of Barrie [City].

The proposed development includes 190 single detached units and future lots / blocks (eight residential units). It is anticipated that the subject site will be built-out and occupied by 2027.

The proposed development will access Ball Gate to the west and Madelaine Drive to the north via Fenchurch Manor, which is planned to extend through the adjacent properties to the west and north. The proposed development will access Lockhart Road via Ball Gate and will access Mapleview Drive East via Madelaine Drive. Ball Gate is a proposed local road north of Fenchurch Manor and a major collector road south of Fenchurch Manor. Ball Gate will provide a transportation link for various subdivisions within the Hewitt Secondary Plan Area [HSPA] to Lockhart Road; details are further discussed in Section 2.4.

The proposed development is located within the HSPA. The HSPA includes 2,290 hectares of annexed lands previously under the jurisdiction of the Town of Innisfil per the Barrie-Innisfil Boundary Adjustment Act (dated 2009). Details regarding the HSPA are further discussed in Section 2.4.

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

1.2 Study Area

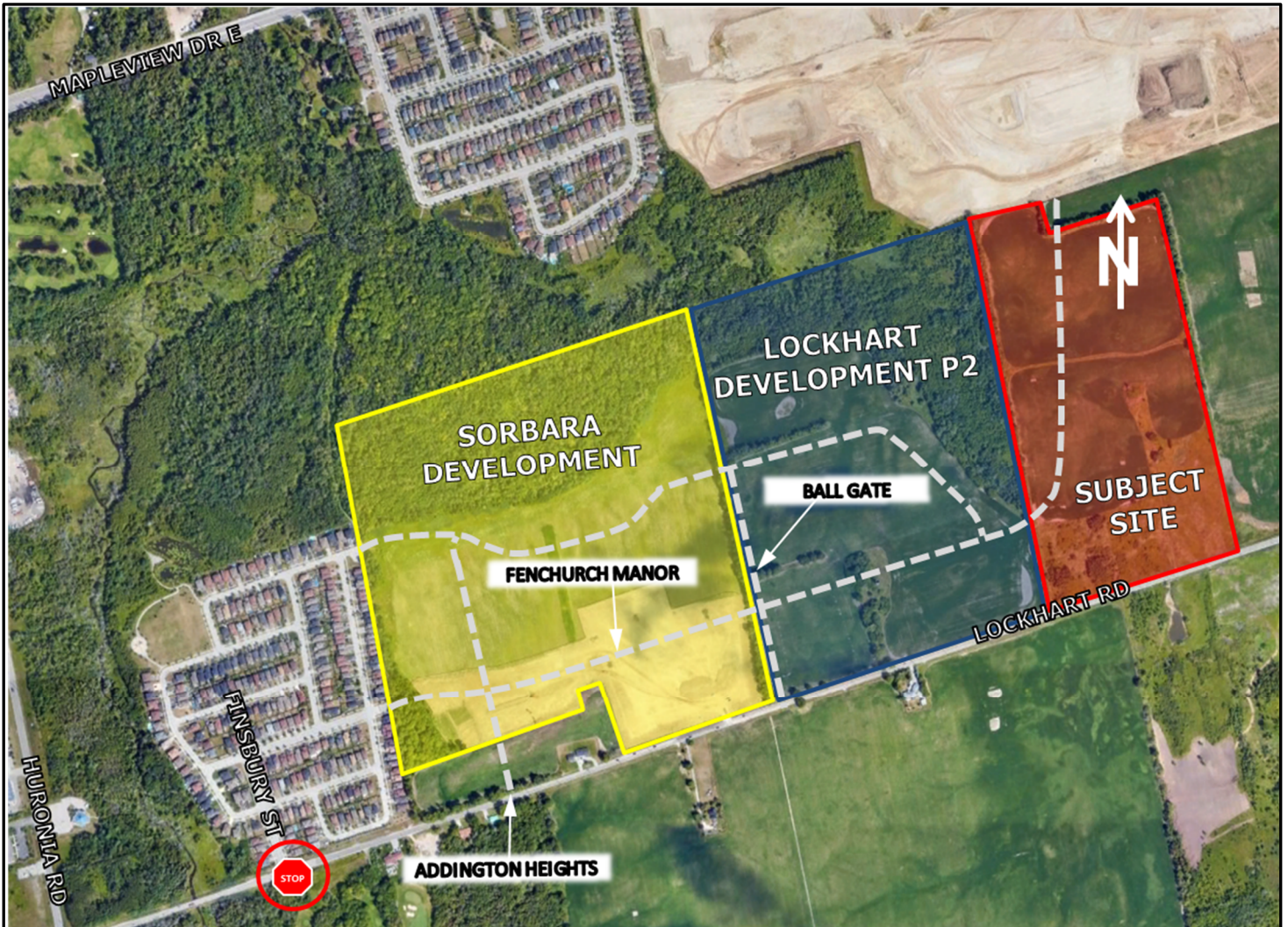
Figure 1 illustrates the location of the subject site and study area intersections in relation to the surrounding area. The Site Plan by Jones Consulting Group Ltd. is attached in **Appendix A**.

The subject site is bound by Lockhart Road to the south and existing farmland to be developed as a part of the HSPA to the north, east and west.

Based on our experience with similar studies, the following intersections will be analysed as part of the study:

- Ball Gate / Lockhart Road.

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;
- 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;
- Provide an assessment of the impact of the additional traffic on the local road network;
- Identify improvement options to address operational deficiencies;
- Calculate lane improvements for the site access driveway based on the Transportation Association of Canada [TAC] and Ontario Ministry of Transportation guidelines;
- Complete a review of the proposed intersection spacing;
- Identify proposed connections for active transportation;
- Complete a sight distance review for the future Ball Gate intersection; and
- Document findings and recommendations in a final report.

1.4 Horizon Year and Analysis Periods

Traffic operations for the build out year (2027), planning horizon year (2031) and 10-year post-buildout horizon (2037) were selected for analysis of traffic operations in the study area. The weekday morning [AM] and weekday afternoon [PM] peak hours have been selected as the analysis periods for this study.

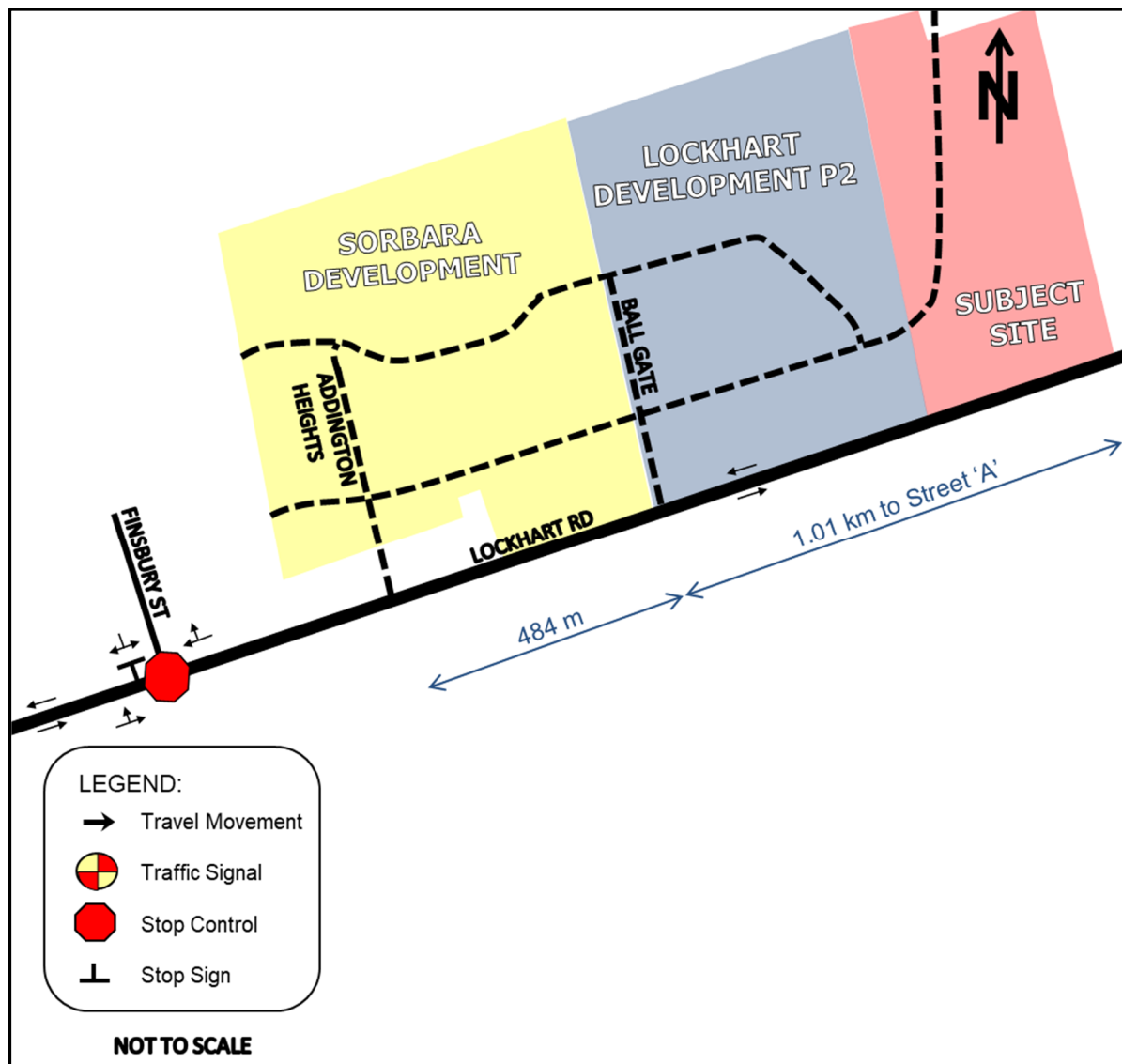
2 Information Gathering

2.1 Street and Intersection Characteristics

Lockhart Road is a two-lane arterial road with a rural cross section, no sidewalk and gravel shoulders within the study area. Lockhart Road has a posted speed limit of 60km/h and is under the jurisdiction of the City, in the study area.

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

Figure 2 – Existing (2021) Lane Configuration within Study Area



2.2 Local Transportation Infrastructure Improvements

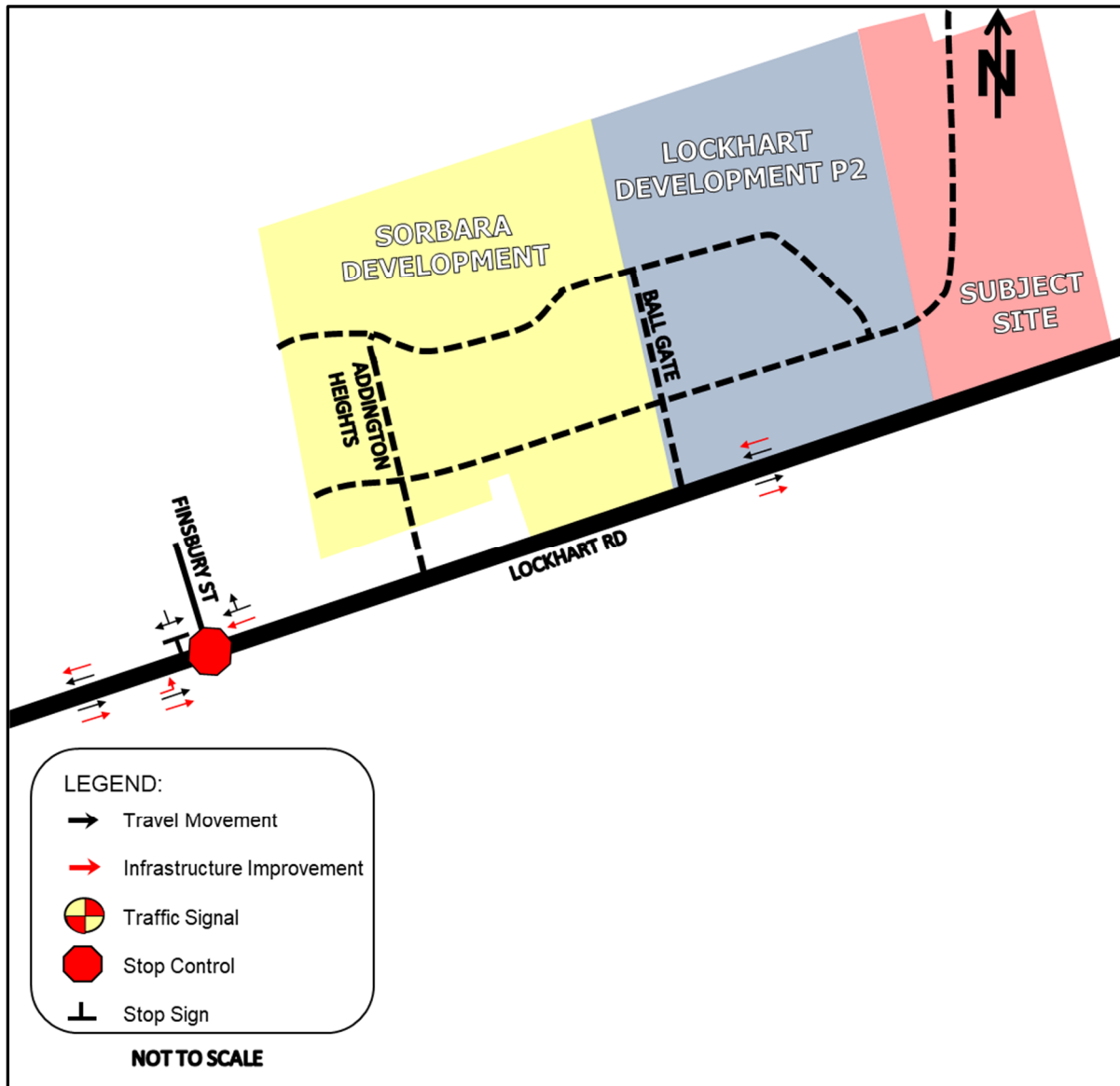
A review of Environmental Assessment Studies, the City's Transportation Master Plan [City TMP] (April 2019), the City's Capital Plan (2021) and the Town of Innisfil's Transportation Master Plan [Innisfil TMP] (dated May 2018) was completed to assess future road improvements. A review of the Master Transportation Study completed by LEA Consulting Ltd. for the Hewitt Secondary Plan (dated February 2019) [Hewitt MTS] was also completed to identify the future road improvements in the study area. The following infrastructure improvements are anticipated to be completed by 2031:

- Lockhart Road – Road Reconstruction
 - o Widen roadway to include an extra lane in both directions¹;
 - o Urban cross-section on the north side of the road with a multi-use trail.

The ultimate (2031) lane configuration within the study area can be seen in **Figure 3**.

¹ The City TMP recommended a five-lane cross-section on Lockhart Road with a cycle track and sidewalk on both sides of the road, however, based on our correspondence with the City, the four-lane cross-section is still the preferred option.

Figure 3 – Future Lane Configuration within Study Area



2.3 Transit Access

There is no municipal transit available near the subject site. The City is planning an adjustment and expansion of transit service in the study area, associated with the development of the Hewitt Secondary Plan Area. The future service (which is subject to change), will provide two routes along Lockhart Road within the study area; route No. 2 and No. 4.

2.4 Other Developments within the Study Area

The HSPA will include approximately 2,290 hectares of annexed lands, previously under jurisdiction of the Town of Innisfil. There is a significant amount of anticipated development planned within HSPA with the development of major residential communities, with low, medium and high density residential, and neighbourhood commercial uses. The development will also include schools, parks, recreational centres, open spaces and environmentally protected areas.

The future traffic projections provided in the Hewitt MTS includes the traffic generated by all the planned development in the HSPA. The development plan for the HSPA is attached in **Appendix B**.

The Hewitt MTS included detailed turning movement traffic projections at critical locations in the study area; however, the Hewitt MTS did not include detailed turning movement projections at all midblock intersections. Consequently, some site specific traffic generation and distribution estimates were completed as part of our analysis. Sections 2.4.1 to 2.4.9 outline the methodology used to refine the distribution of the future traffic in the study area. The development locations are illustrated in **Figure 4**.

Figure 4 – Adjacent Development Location



2.4.1 Distribution of Local Traffic in the Study Area

As noted in Section 1.1, Ball Gate will provide a transportation link for various subdivisions within the HSPA to Lockhart Road.

Addington Heights is a proposed local road within the future Van Der Haden property. Based on the location of Addington Heights and connections within the HSPA to the existing residential subdivision [EX RES Development] west of the HSPA, it is anticipated that some traffic from the EX RES Development will utilize Addington Heights and Ball Gate. The EX RES Development consists of 272 residential units. The EX RES Development traffic redistribution will occur when the internal connection to Ball Gate is constructed. For the purpose of this analysis, we have assumed this will occur in 2027.

There are three notable developments in the HSPA that would impact traffic operations at the Ball Gate / Lockhart Road intersection. Descriptions of the three developments are provided below.

The Lockhart Innisfil Investments II Limited property is located north of Lockhart Road, just west of the proposed development [Lockhart Development P2]. The Lockhart Development P2 is anticipated to consist of 194 single detached units, 200 townhouse units and one future lot / blocks (residential unit). Lockhart Development P2 is anticipated to have a single full-movement access within the site via Ball Gate. Ball Gate is a proposed local road north of Fenchurch Manor and a major collector road south of Fenchurch Manor. JD Engineering completed a traffic impact study for the Lockhart Development P2 (dated September 2021) [Lockhart Development P2 TIS]. It is anticipated the Lockhart Development P2 will be built-out by 2025.

The Mattamy Homes Canada is developing a property located north of Lockhart Road east of the proposed development [Mattamy Development]. The Mattamy Development is anticipated to consist of 348 single detached units, 254 townhouse units and partial lots (28 units). Mattamy Development will have a single full-movement access roadway onto Lockhart Road [Street 'A'] and internal connections to the proposed development and surrounding HSPA. JD Engineering completed a traffic study for the Mattamy Development (dated July 2021) [Mattamy Development TIS]. It is anticipated the Mattamy Development will be built-out by 2024.

The Barrie Lockhart Road GP property is located west of the Lockhart Development P2 north of Lockhart Road [Sorbara Development] and is anticipated to consist of 257 single detached units, 138 townhouse units, 186 mixed-use units, 13 future lot / blocks and an elementary school block. The Sorbara Development will have access to Lockhart Road via Addington Heights and via internal connections to Ball Gate. JD Engineering completed a traffic impact study for the Sorbara Development (dated March 2020) [Sorbara TIS]. It is anticipated the Sorbara Development will be built-out by the 2031 horizon year.

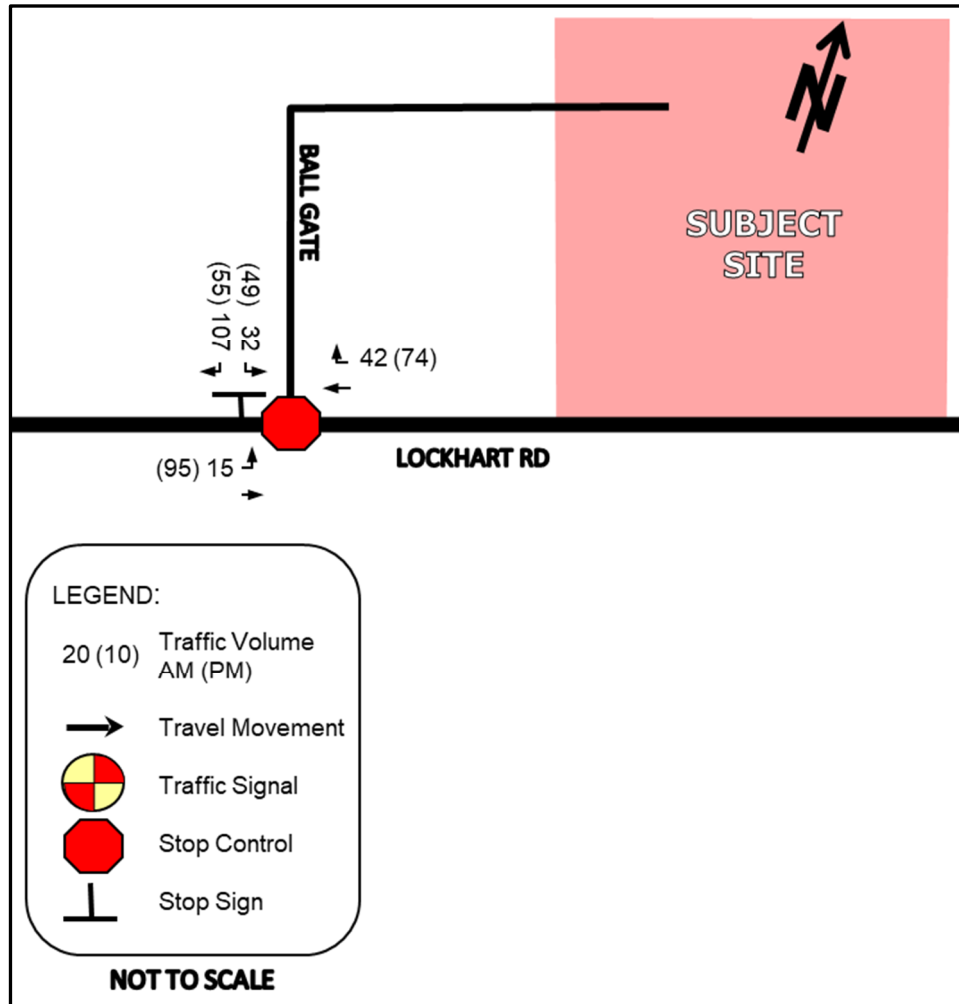
The Van Der Hayden property is located between the Sorbara development and Lockhart Road [VDH Development] and is anticipated to consist of 53 residential units. The VDH Development will connect internally to various streets within the Sorbara Development and will also have direct access to Lockhart Road via Addington Heights. The exact schedule for build-out and occupancy of the VDH Development has not been finalized; consequently, for the purposes of this report we have assumed the VDH Development will be fully built-out and occupied by the 2031 horizon year.

2.4.2 Lockhart Development P2

Traffic generated by the Lockhart Development P2 has been estimated based on the Lockhart Development P2 TIS (excerpts provided in **Appendix C**). As noted in Section 2.4.1, Lockhart Development P2 is anticipated to be constructed and occupied by 2025.

Figure 5 illustrates the traffic assignment for the Lockhart Development P2 for the 2027² horizon year, in the AM and PM peak hour.

Figure 5 – Lockhart Development P2 Traffic Assignment (2027)



² It is assumed the road network in the HSPA is anticipated to be fully constructed by the 2027 horizon year.

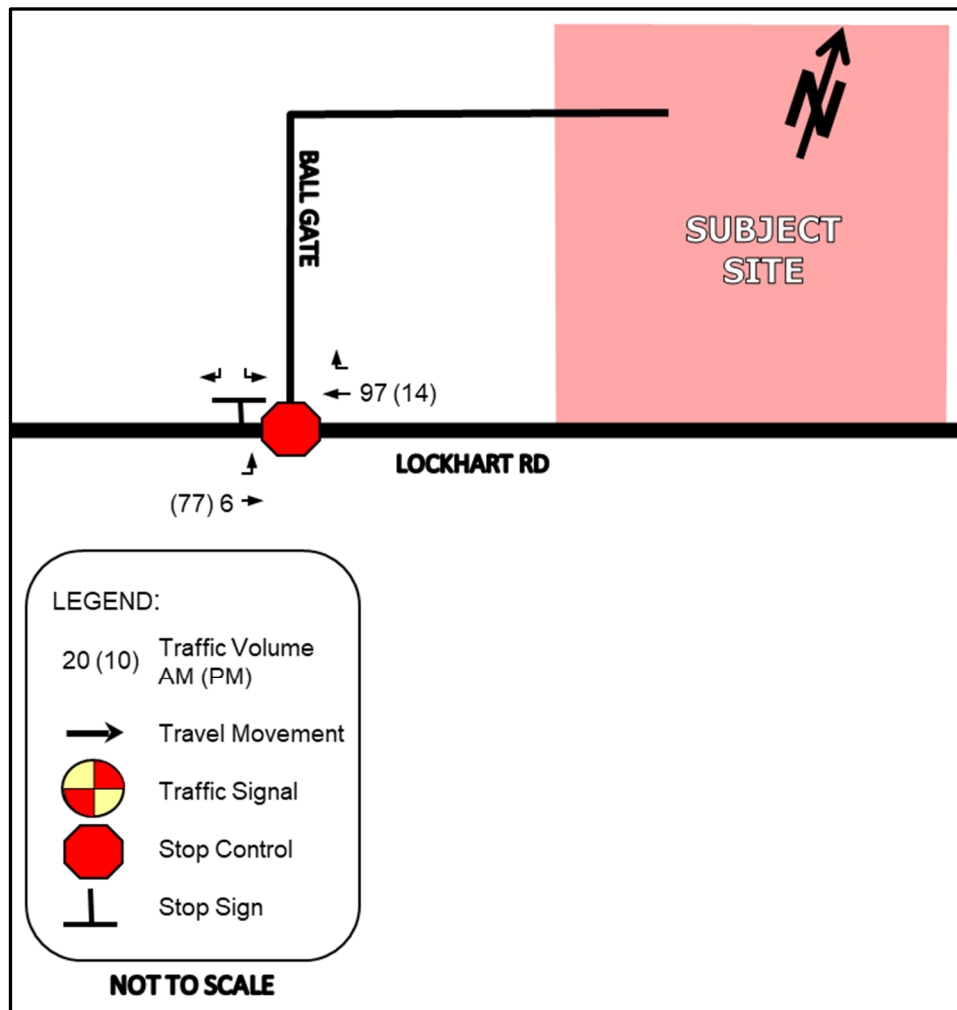
2.4.3 Mattamy Development

The traffic generated by the Mattamy Development has been estimated based on the Mattamy Development TIS (excerpts provided in **Appendix C**).

The Mattamy Development TIS assumed the Mattamy Development would primarily utilize Street 'A' and internal road network in the HSPA to access the external road network and no trips assigned at Ball Gate.

Figures 6 illustrates the traffic assignment for the Mattamy Development for the 2027² horizon year, in the AM and PM peak hour.

Figure 6 – Mattamy Development Traffic Assignment (2027)



2.4.4 Traffic Generation for the Sorbara Development, EX RES Development and VDH Development

The traffic generation calculation for the Sorbara Development, EX RES Development and VDH Development have been estimated based on the traffic generation rates provided in the Hewitt MTS illustrated in **Table 1**. This methodology was utilized as the traffic generation calculations in the Hewitt MTS takes into account the extensive development taking place in the entire HSPA and utilizes proxy counts from a suitable location within the City.

Table 1 – Hewitt MTS Traffic Generation Rates

Land Use	AM Peak Hour			PM Peak Hour*		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	0.14	0.34	0.48	0.415	0.255	0.67

*It is noted that the in and out trip generation rates in the Hewitt MTS for the PM Peak Hour (0.41 and 0.25 respectively) do not add up to the total trip generation rate (0.67). Consequently, we have made a slight adjustment as illustrated in the table above.

2.4.5 Traffic Distribution for the EX RES Development and VDH Development

The traffic distribution for the EX RES Development and VDH Development have been estimated based on the Hewitt MTS. Our analysis is based on the ingress and egress traffic during the AM and PM peak hours at the Street 19 / Lockhart Road intersection for the 2031 site traffic volumes illustrated in Appendix H in the Hewitt MTS (excerpts provided in **Appendix D**). **Table 2** illustrates the calculation of the distribution of ingress and egress trips for the above noted developments using the methodology outlined above.

Table 2 – Hewitt MTS Development Traffic Distribution within Study Area

Travel Direction (to / from)	Percentage of Total Traffic Generation			
	AM Peak Hour		PM Peak Hour	
	Ingress	Egress	Ingress	Egress
West via Lockhart Road	73%	77%	44%	53%
East via Lockhart Road	27%	23%	56%	47%
TOTAL	100%	100%	100%	100%

The distribution of traffic to each access driveway for the above noted developments has been based on the internal connections to the surrounding developments and road network.

2.4.6 Sorbara Development

Traffic generated by the Sorbara Development has been estimated based on the Sorbara TIS (excerpts provided in **Appendix C**).

The Sorbara Development analyzed the 2023 (Phase 1 build-out) and 2031 (full build-out) horizon years. To estimate the traffic generated in the 2027 horizon year for the Sorbara Development we have assumed a linear increase in occupancy for the residential units. Based on this assumption it is estimated 388 residential units will be built-out by 2027.

Using the methodology noted in Section 2.4.3, the traffic generation for the Sorbara Development is estimated in **Table 3**.

Table 3 – Estimated Traffic Generation for the Sorbara Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	388 units	54	132	186	161	99	260

The traffic distribution for the Sorbara Development will follow the same distribution applied for the development in the Sorbara TIS.

Figures 7 and 8 illustrates the traffic assignment for the Sorbara Development for the 2027 and 2031 / 2037 horizon years respectively, in the AM and PM peak hour. It is noted that that the traffic volumes are higher in the 2031 / 2037 horizon year at the Lockhart Road / Ball Gate intersection as Addington Heights will not be constructed until 2031.

Figure 7 – Sorbara Development Traffic Assignment (2027)

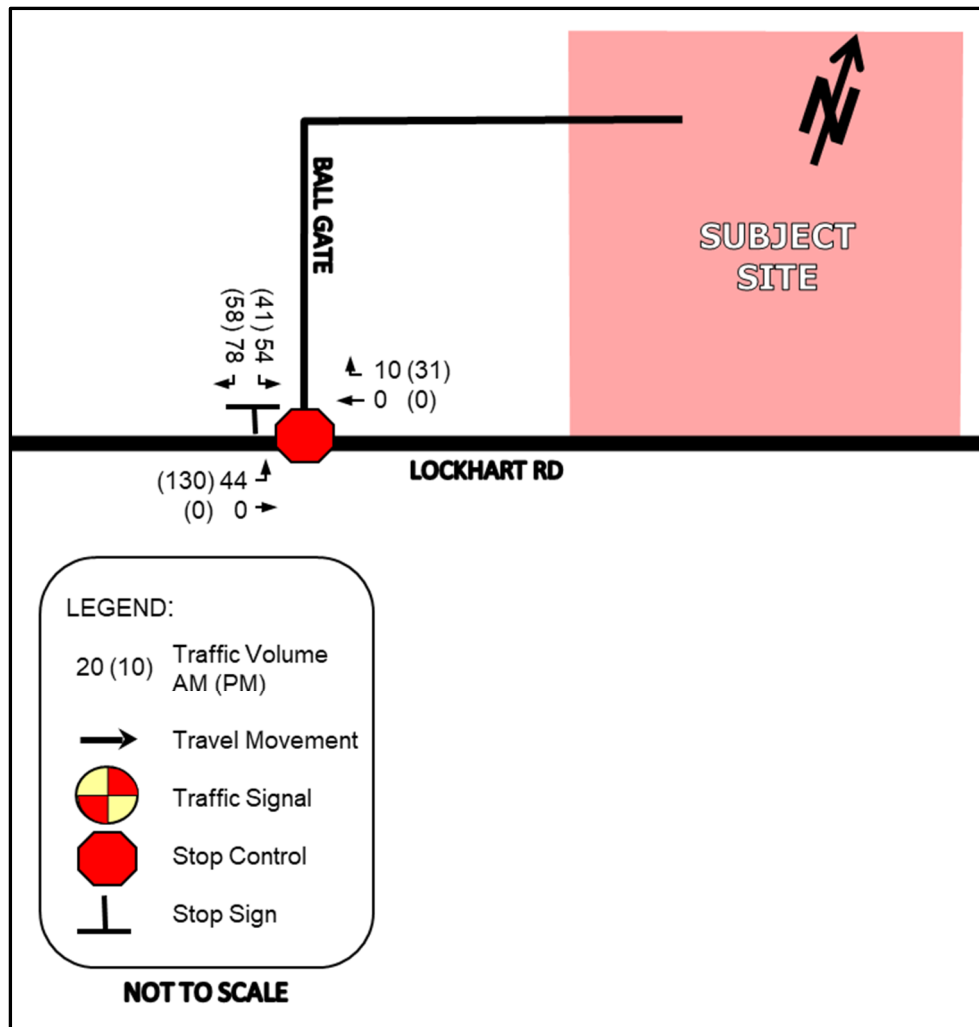
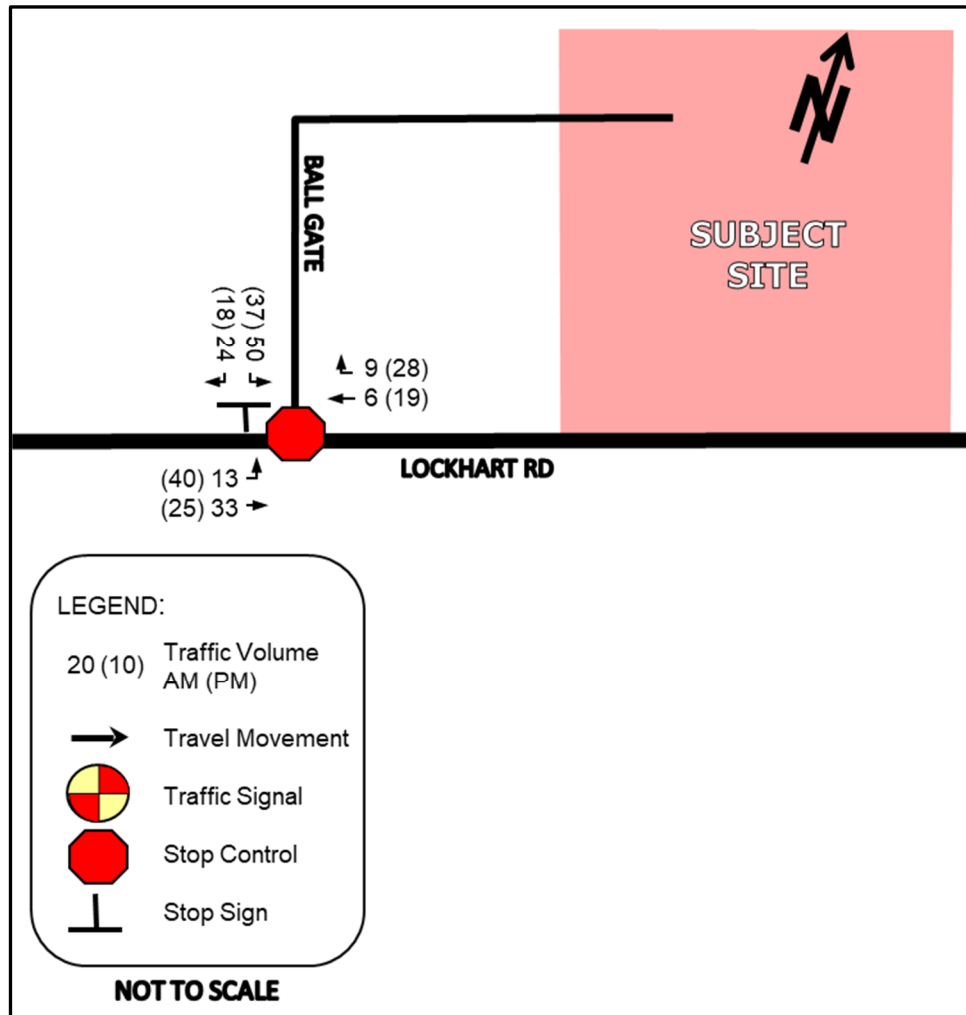


Figure 8 – Sorbara Development Traffic Assignment (2031 / 2037)



2.4.7 EX RES Development Traffic Redistribution

Using the methodology noted in Section 2.4.3, the trip generation for the EX RES Development is estimated in **Table 4**.

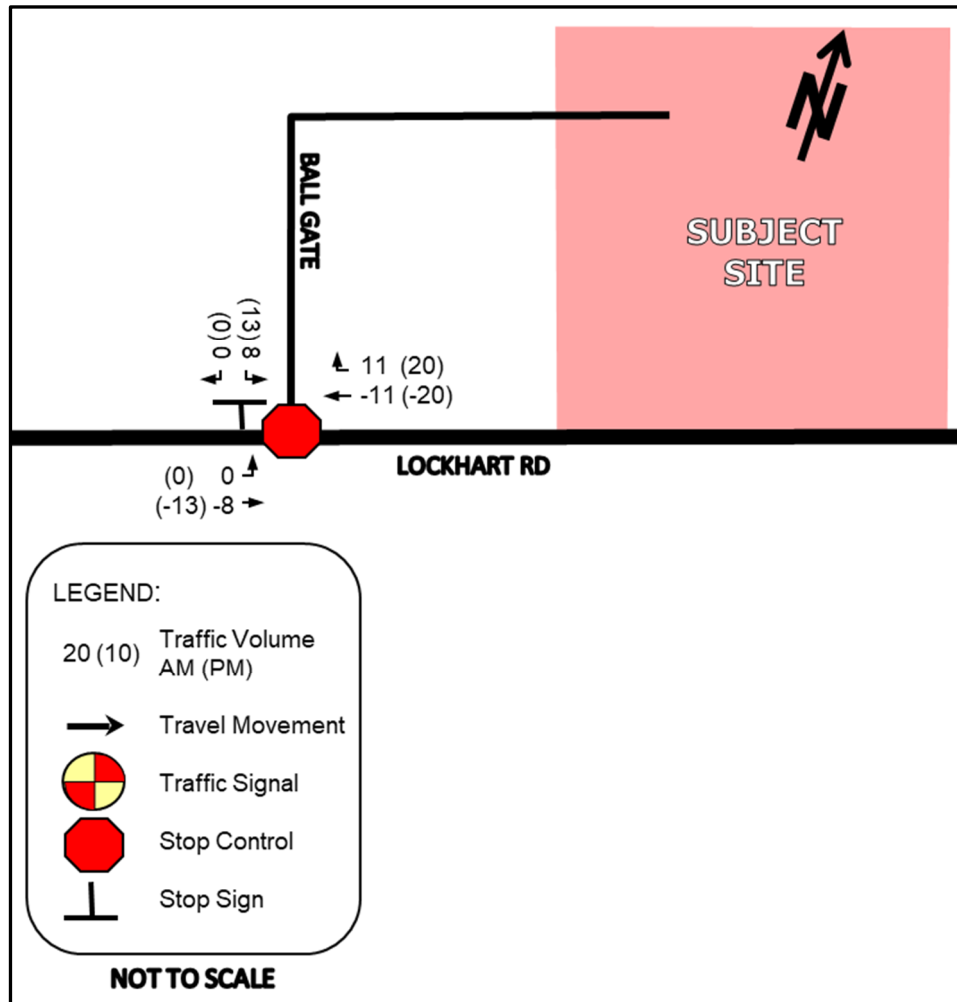
Table 4 – Estimated Traffic Generation for the EX RES Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	272 units	39	92	131	113	69	182

The redistribution of traffic from the EX RES Development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.4. Only traffic to/from the east will be redistributed as a result of the internal connection to Ball Gate.

Figure 9 illustrates the traffic redistribution in the 2027 horizon year for the EX RES Development within the study area, in the AM and PM peak hour. Traffic redistribution to Ball Gate will only occur in the 2027 horizon year as Addington Gate will be constructed by the 2031 horizon year. Once Addington Gate is constructed, the traffic redistribution from the EX RES Development will primarily be to and from Addington Gate with negligible traffic redistribution to Ball Gate.

Figure 9 – EX RES Development Traffic Redistribution (2027)



2.4.8 VDH Development

Using the methodology noted in Section 2.4.3, the trip generation for the VDH Development is estimated in **Table 5**.

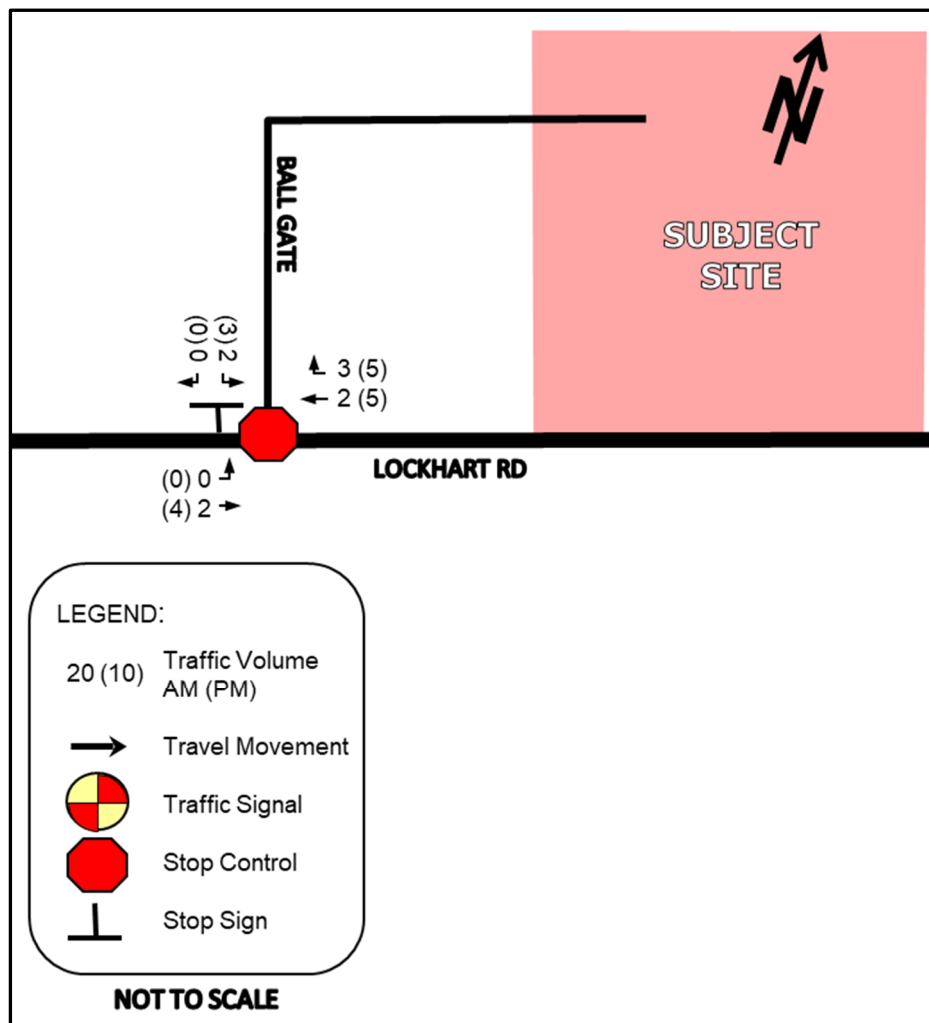
Table 5 – Estimated Traffic Generation for the VDH Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	53 units	7	18	25	22	14	36

The traffic assignment for the VDH Development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.4.

Figure 10 illustrates the traffic assignment for the VDH Development within the study area, in the AM and PM peak hour.

Figure 10 – VDH Development Traffic Assignment (2031 / 2037)



2.4.9 Study Area Adjacent Development Traffic Volumes

Figures 11 and 12 illustrates the traffic redistribution/assignment for all the above noted adjacent developments in the 2027 and 2031 / 2037 horizon year within the study area.

Figure 11 – Total Adjacent Development Traffic (2027)

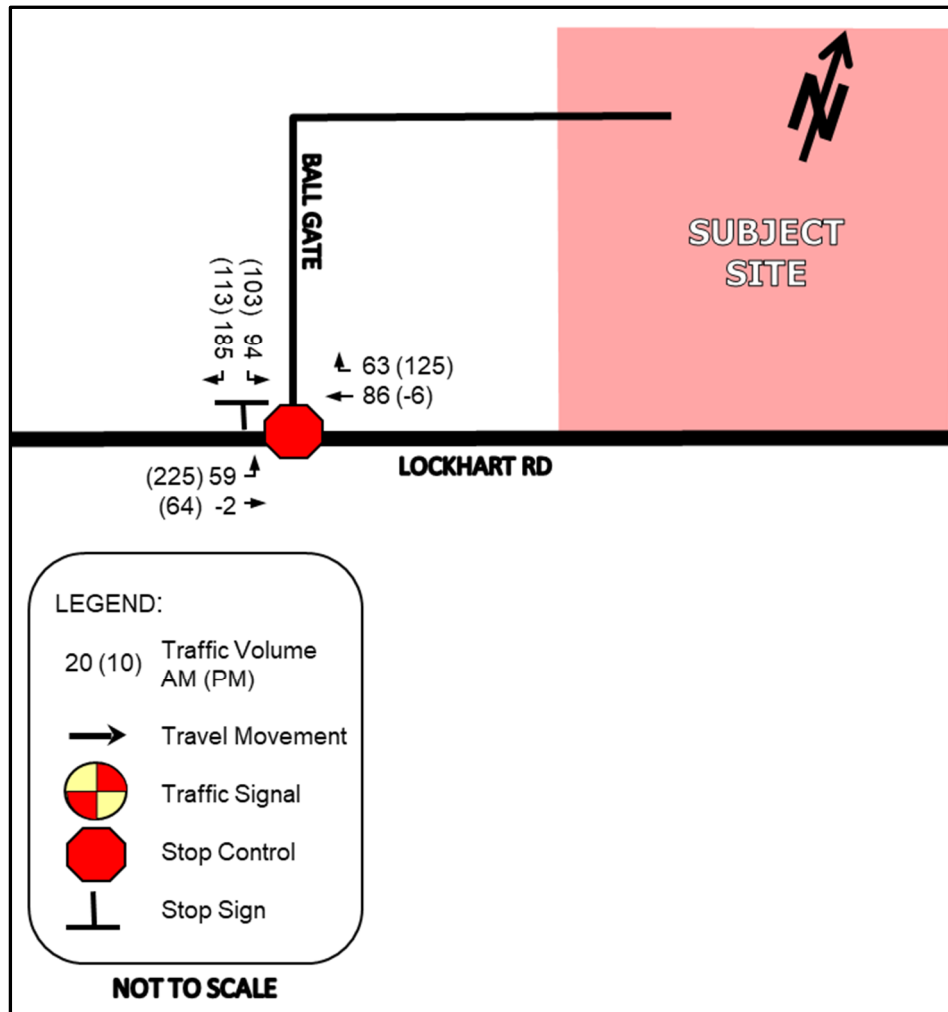
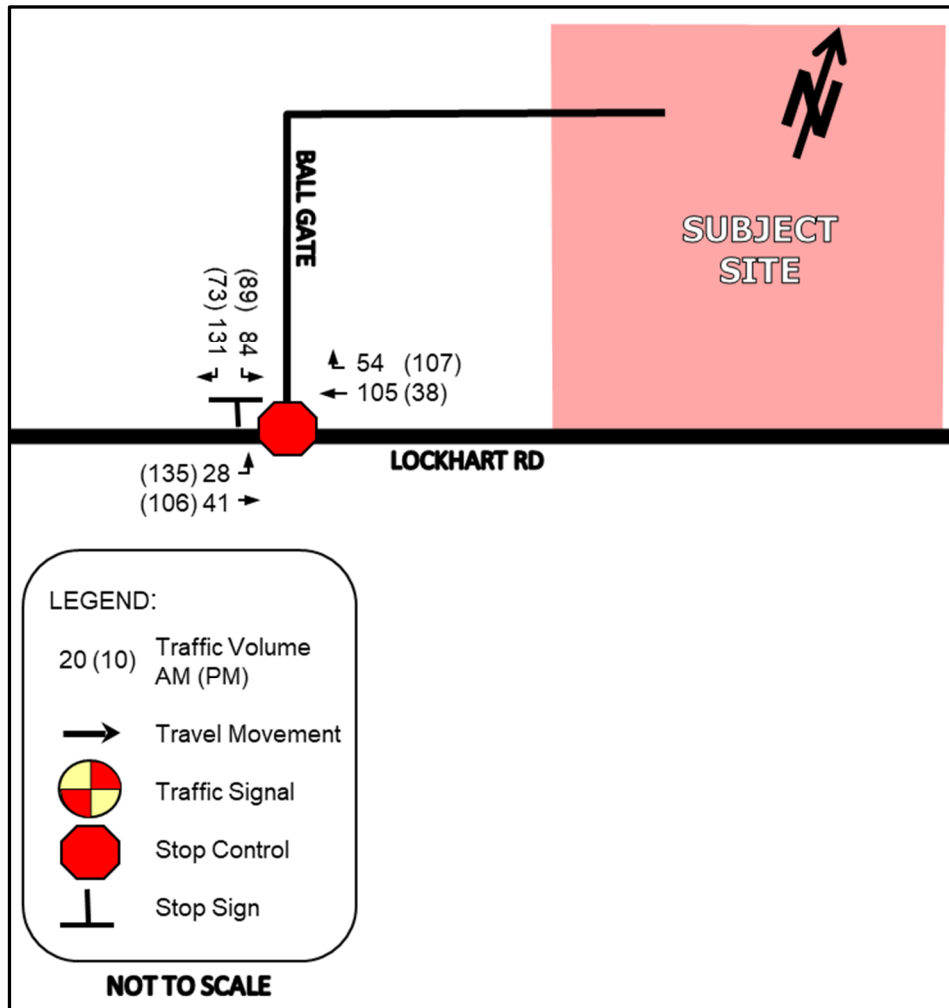


Figure 12 – Total Adjacent Development Traffic (2031 / 2037)



2.5 Background Traffic Growth

As noted in Section 2.4, there is a significant amount of anticipated development planned within the annexed lands at the south end of the City, as well as intensification developments along the City's major corridors.

In order to be conservative, a background traffic growth rate of 2.0% per year has been selected for Lockhart Road above and beyond the planned adjacent developments within the study area prior to 2031.

Beyond 2031, to analyse the traffic in the 2037 horizon year we have applied a different background traffic growth rate illustrated in **Table 6** estimated using the City TMP Emme traffic projections for 2031 and 2041.

Table 6 – Background Traffic Growth Rate in the Study Area (2031 - 2041)

Street	Background Traffic Growth Rate Applied	
	AM Peak Hour	PM Peak Hour
Lockhart Road	2.9%	2.6%

2.6 Traffic Counts

Detailed turning movements traffic and pedestrian counts were retrieved from the City for the intersection of Yonge Street / Lockhart Road.

Table 7 summarizes the traffic count data collection information.

Table 7 - Traffic Count Data

Intersection (N-S Street / E-W Street)	Count Date	AM Peak Hour	PM Peak Hour	Source
Yonge Street / Lockhart Road	Thursday, September 28 th 2017	07:30 – 08:30	16:30 – 17:30	City
	Wednesday, October 21 st 2020	07:45 – 08:45	16:00 – 17:00	City

Detailed traffic count data can be found in **Appendix E**. 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.

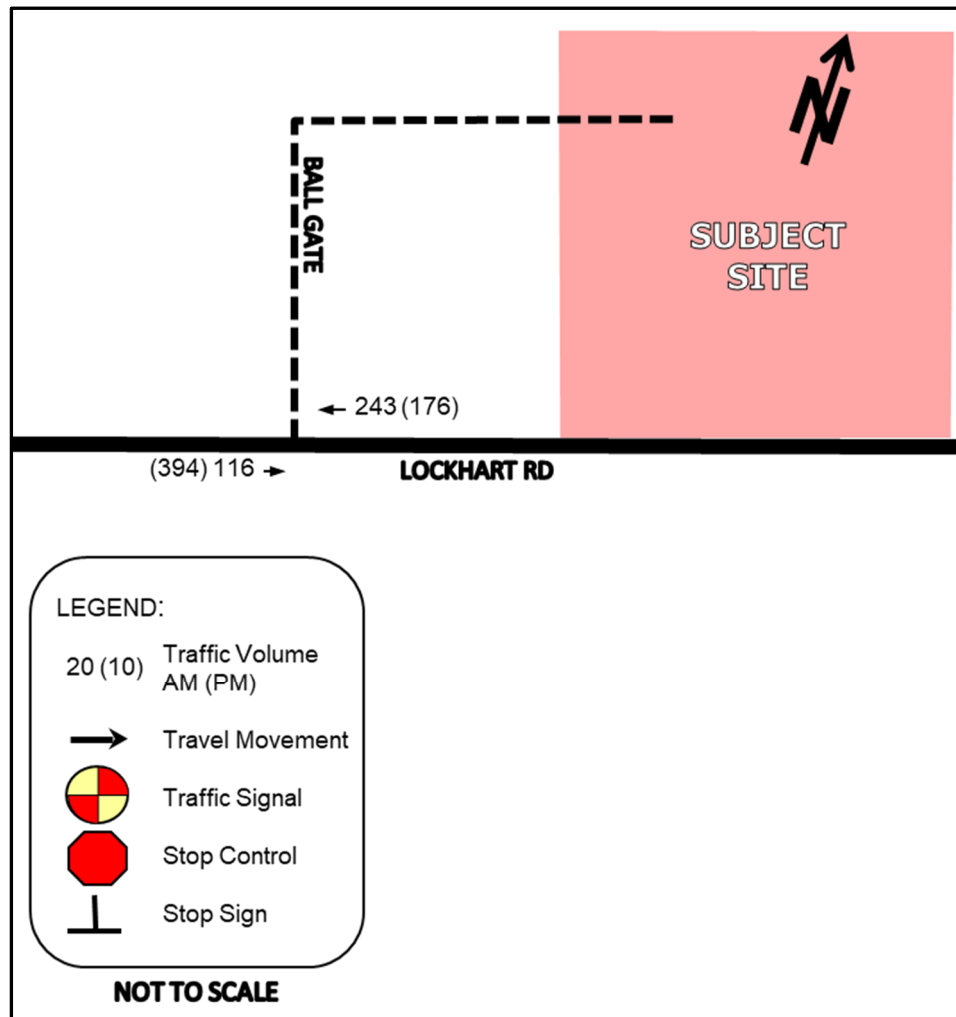
As a result of the physical distancing requirements associated with the COVID-19 pandemic, the traffic counts completed in 2020 in Table 5 reflect lower than expected traffic under normal conditions. Based on a comparison of the 2020 (Post-COVID) and 2017 (Pre-COVID) traffic counts³ at the west leg of the Yonge Street / Lockhart Road intersection, a 36% and 61% decrease in traffic volumes was observed in the AM and PM peak hour respectively. Consequently, we have increased the traffic on Lockhart Road by 36% and 61% in the AM and PM peak hour respectively.

³ The traffic counts were factored up to the 2021 horizon year using the background traffic growth rate noted in Section 2.5 to accurately compare two counts.

To determine the equivalent existing (2021) traffic volumes, the background traffic growth rate noted in Section 2.5 was applied to the traffic count data.

Figure 13 illustrates the existing (2021) AM and PM peak hour traffic volumes in the study area.

Figure 13 – Existing (2021) Traffic Volumes



3 Proposed Development Traffic Generation and Assignment

3.1 Traffic Generation

The traffic generation calculation for the proposed development has been estimated based on the traffic generation rates provided in the Hewitt MTS as illustrated in Table 1 in Section 2.4.3. The estimated trip generation of the proposed development is illustrated below in **Table 8**.

Table 8 – Estimated Traffic Generation for the Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	198 units	28	67	95	82	51	133

3.2 Traffic Assignment

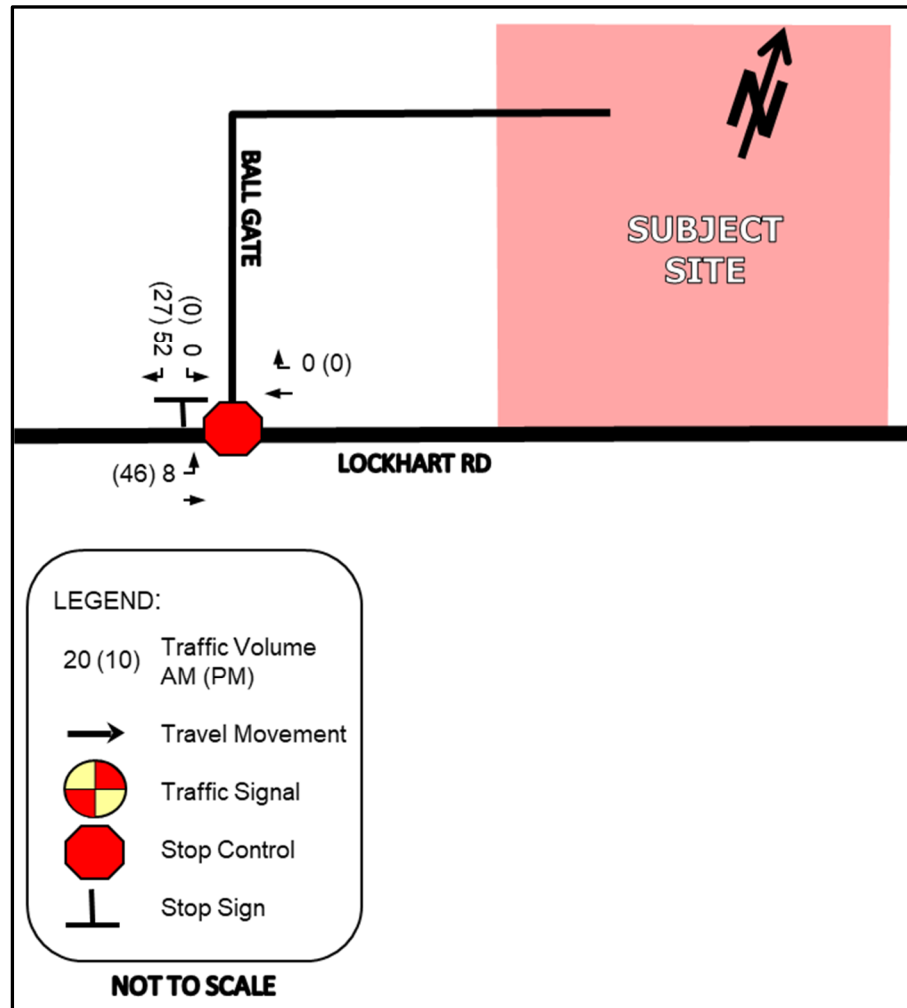
For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The traffic assignment for the proposed development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.5.

It is assumed the traffic assigned east on Lockhart Road for the proposed development would travel via the internal roadway network in the HSPA based on a review of the site plan (provided in Appendix A) and the HSPA Development Plan (provided in Appendix B).

Using the traffic distribution pattern noted above, **Figure 14** illustrates the traffic assignment for the proposed development in the AM and PM peak hour for the build-out (2027) horizon year.

Figure 14 – Proposed Development Traffic Assignment (2027)



3.3 Total Horizon Year Traffic Volumes with the Proposed Development

Two different methodologies have been applied in order to estimate the traffic volumes for the total (2027) and total (2031 & 2037) horizon years. The total 2027 traffic volumes are based on the 2020 traffic counts and the total 2031 & 2037 traffic volumes are based on the City's future Emme and Aimsum micro simulation models provided in Appendix E in the City TMP (2019) [Emme Model]. The future traffic projections from the City's Emme Model provide a better estimate of the long-term traffic growth and distribution patterns in the study area, as they account for the impact of the planned infrastructure improvements and future development in and around the City.

3.3.1 Total 2027 Traffic Volumes

The total (2027) AM and PM peak hour traffic volumes at the Ball Gate / Lockhart Road intersection was estimated by applying the background traffic growth rates (discussed in Section 2.5) to the existing (2021) traffic volumes, then adding the total adjacent development traffic assignment (Figure 11) and the proposed development traffic (Figure 14). This methodology better represents the traffic volumes for the total (2027) analysis period, as the HSPA will be in the early stages of development and most of the planned infrastructure improvements in the City (which will impact local traffic distribution) will not be complete for this horizon year.

3.3.2 Total 2031 Traffic Volumes

The total (2031) AM and PM peak hour traffic volumes at the Ball Gate / Lockhart Road intersection was estimated based on the City's Emme Model. The City's Emme Model included traffic projections for midblock traffic for the 2031 and 2041 horizon years in the AM and PM peak hour, which includes the full build-out of the HSPA⁴. The eastbound and westbound 2031 midblock traffic volumes on the east leg of the Ball Gate / Lockhart Road intersection in the City's Emme Model were used at the Lock Ball Gate / Lockhart Road intersection⁵. The left-turn and right-turn traffic volumes at the Ball Gate / Lockhart Road intersection was obtained from the adjacent development traffic volumes (Figure 11) and the proposed development traffic volumes (Figure 14). A further adjustment was made to the Lockhart Road through traffic volumes to incorporate the left-turn and right-turn traffic volumes at the Ball Gate / Lockhart Road intersection.

3.3.3 Total 2037 Traffic Volumes

The total (2037) AM and PM peak hour traffic volumes at the Ball Gate / Lockhart Road intersection was estimated applying the same methodology as the total (2031) traffic volumes (in Section 3.3.2) and also applying the background traffic growth rates noted in Table 7 in Section 2.5 to the 2031 traffic volumes.

Figures 15, 16 and 17 illustrate the resulting total (2027, 2031 & 2037) horizon year traffic volumes respectively, for the AM and PM peak hours.

⁴ It is noted, for the purposes of comparison and to identify the critical case, the traffic projections for the 2031 horizon year in the City's Emme Model and with the Hewitt MTS were reviewed. The traffic projections in the Hewitt MTS were adjusted to factor the HSPA site traffic volumes based on the updated unit count (15,215 units) compared to the unit count used in the Hewitt MTS (13,512 units). Based on our review, the critical traffic scenario is observed in the City's Emme Model.

⁵ To be conservative, the higher midblock traffic volumes were selected comparing the east and west leg traffic on Lockhart Road at the intersection.

Figure 15 – Total (2027) Traffic Volumes

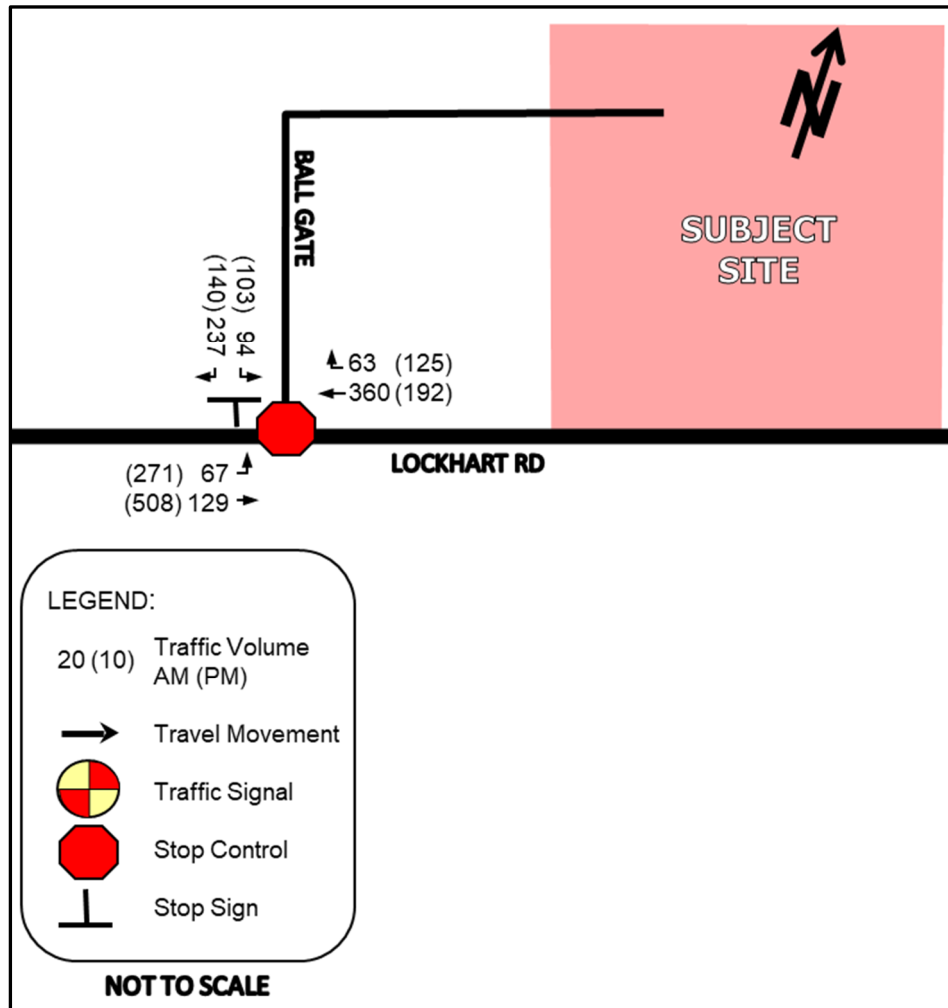


Figure 16 – Total (2031) Traffic Volumes

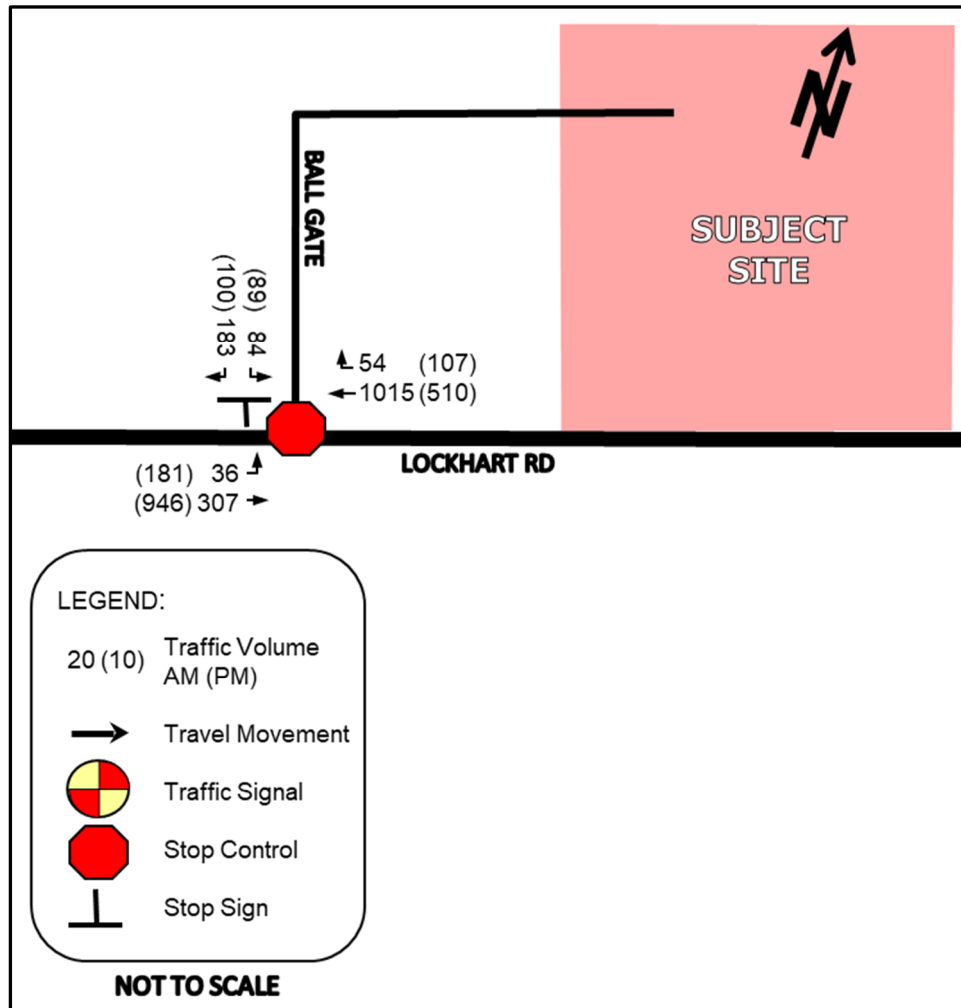
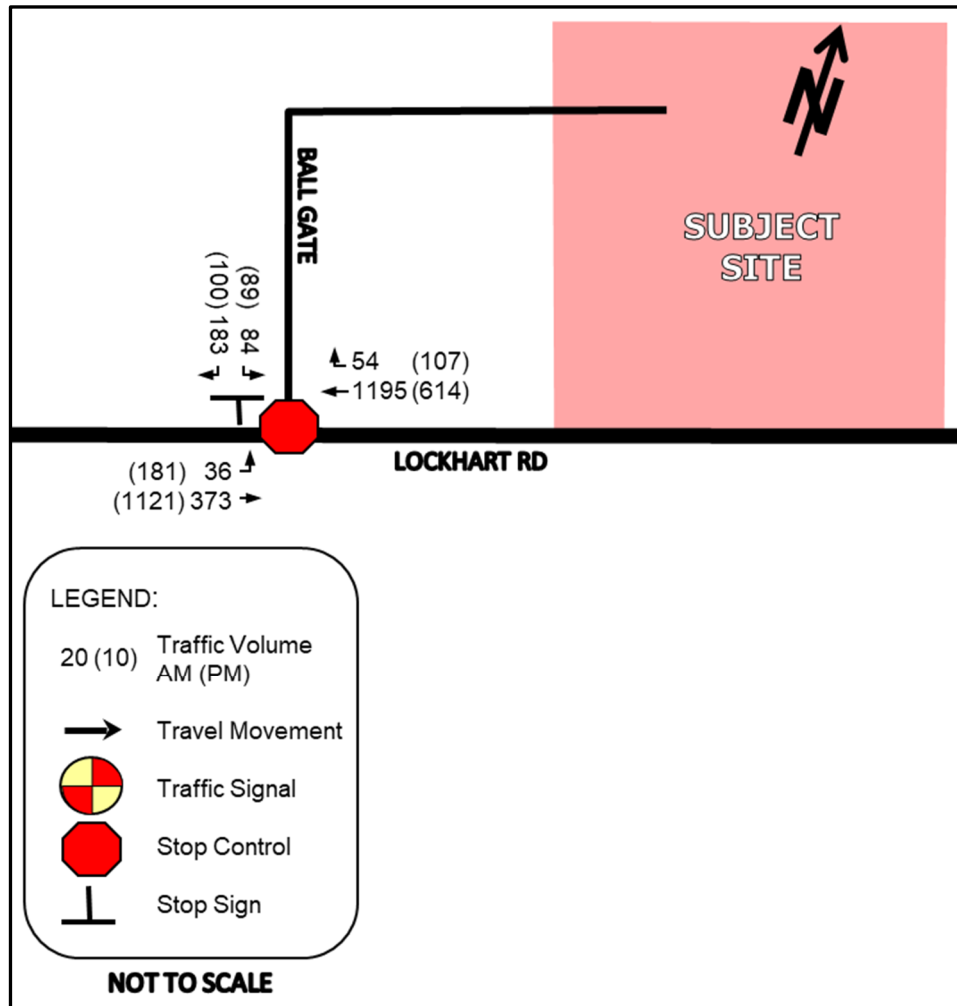


Figure 17 – Total (2037) Traffic Volumes



4 Intersection Operation with Proposed Development

4.1 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 11 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.

The design limits outlined in the City's TIS Guidelines are highlighted in this report. At signalized intersections overall intersection operation exceeding LOS D and intersection and individual turning movements with a volume-to-capacity [V/C] ratio of 0.85 or greater are considered to be critical. At unsignalized intersections individual turning movements operating at LOS E or greater are considered to be critical movements. Values approaching these thresholds 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 9**. A description of traffic performance characteristics is included for each LOS.

Table 9 – Level of Service Criteria for Intersections

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

4.2 Total (2027) Intersection Operation

The results of the LOS analysis under total (2027) traffic volumes during the AM and PM peak hours can be found below in **Table 10**. The existing local infrastructure on Lockhart Road has been utilized in this scenario with the proposed configuration and traffic control at the proposed side streets.

The Lockhart Development P2 TIS recommended the configuration for the north leg of the Ball Gate / Lockhart Road intersection include a right turn lane and an auxiliary left turn lane, with a 40 metre storage length and a 55 metre taper length by opening day of Lockhart Development P2 (2025).

The Lockhart Development P2 TIS also recommended the following interim improvements ahead of the planned Lockhart Road reconstruction by opening day of Lockhart Development P2 (2025), with the following configuration:

Ball Gate / Lockhart Road

- Eastbound left turn lane with a 30 metre storage length and an 85 metre taper length.
- Westbound right turn taper with a 60 metre taper length.

Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 10 – Total (2027) 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	Storage				Model	Storage
Ball Gate / Lockhart Road (unsignalized)	-	6.1	A	-	-	-	15.8	B	-	-
SBL	0.27	18.2	C	9	40	0.98	150.8	F	49	40
SBR	0.41	14.6	B	16	-	0.20	10.9	B	6	-

The results of the LOS analysis indicate that the southbound left movement at the Ball Gate / Lockhart Road intersection is operating outside the typical design limits noted in Section 3.1; however, the v/c ratio under the theoretical capacity (1.0) and as noted below there are no issues with the anticipated queue. Consequently, no further improvements are recommended at the intersection.

The anticipated queue for the southbound left turn movement at the Ball Gate / Lockhart Road intersection will marginally extend past the proposed left turn storage length; however, the excess queue can be accommodated by the proposed taper length.

There are no other issues regarding the anticipated queuing for movements at the Ball Gate / Lockhart Road intersection.

A review of the need for additional auxiliary right turn lanes was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, the construction of a full right turn lanes is not recommended ahead of the planned Lockhart Road reconstruction.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the Ball Gate / Lockhart Road intersection (results are provided in **Appendix H**).

No additional improvements are required for the total (2027) scenario.

4.3 Total (2031) Intersection Operation

The results of the LOS analysis under total (2031) traffic volumes during the AM and PM peak hours can be found below in **Table 11**. The planned infrastructure improvements noted in Section 2.2 have been utilized in this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 11 – Total (2031) 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	Storage				Model	Storage
Ball Gate / Lockhart Road (unsignalized)	-	6.6	A	-	-	-	12.4	B	-	-
EBTL	0.07	3.6	A	2	-	0.22	5.4	A	7	-
EBT	0.13	0.0	A	0	-	0.40	0.0	A	0	-
WBT	0.43	0.0	A	0	-	0.22	0.0	A	0	-
WBTR	0.25	0.0	A	0	-	0.18	0.0	A	0	-
SBL	0.72	84.5	F	31	40	1.13	225.0	F	52	40
SBR	0.44	18.8	C	17	-	0.16	11.5	B	5	-

The results of the LOS analysis indicate that the control delay for the southbound left turn movement for the Ball Gate / Lockhart Road intersection the typical design limits noted in Section 3.1, during the

2031 horizon year. Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the Ball Gate / Lockhart Road intersection (results are provided in **Appendix G**). It is recommended that the City monitor the traffic volumes at this intersection closer to the 2031 horizon year to determine if traffic signals are required to accommodate the southbound left turn movements.

It is recommended that underground provisions for traffic signals at Ball Gate are included as part of the planned infrastructure improvements on Lockhart Road.

The results of the LOS analysis with traffic signals at the Ball Gate / Lockhart Road intersection can be found in **Table 12**. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 12 – Total (2031) 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	Storage				Model	Storage
Ball Gate / Lockhart Road (signalized)	0.52	14.3	B	-	-	0.66	16.3	B	-	-
EBTL	0.31	10.5	B	21	-	0.86	19.2	B	103	-
WBTR	0.73	15.2	B	71	-	0.32	8.5	A	31	-
SBL	0.15	14.8	B	20	40	0.21	25.1	C	32	40
SBR	0.23	15.7	B	25	-	0.07	23.1	C	14	-

The results of the LOS analysis indicate that the eastbound movement is operating marginally outside the typical design limits noted in Section 3.1; however, the is only marginally over capacity and based on our review of the SimTraffic model, there are no issues with the anticipated queue. Consequently, no further improvements are recommended at the intersection.

No additional improvements are required for the total (2031) scenario.

4.4 Total (2037) Intersection Operation

The results of the LOS analysis under total (2037) traffic volumes during the AM and PM peak hours can be found below in **Table 13**. The infrastructure improvements noted in Section 2.2 and 4.3 have been utilized in this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 13 – Total (2037) 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	Storage				Model	Storage
Ball Gate / Lockhart Road (signalized)	0.59	14.6	B	-	-	0.76	19.3	B	-	-
EBTL	0.33	9.7	A	24	-	0.92	23.9	C	149	-
WBTR	0.76	15.2	B	88	-	0.35	7.4	A	37	-
SBL	0.17	18.5	B	24	40	0.25	33.7	C	37	40
SBR	0.31	20.3	C	36	-	0.07	31.3	C	16	-

The results of the LOS analysis indicate that the eastbound movement is operating marginally outside the typical design limits noted in Section 3.1; however, the individual movement is only marginally over capacity and based on our review of the SimTraffic model, there are no issues with the anticipated queue. Consequently, no further improvements are recommended at the intersection.

No additional improvements are required for the total (2037) scenario.

4.5 Site Access

Ball Gate will operate efficiently as a full-movement access, with one-way stop control for southbound movements. A single ingress and two egress lanes (right turn and left turn lane with a 40 metre storage length and a 55 metre taper) at the Ball Gate driveway will provide the necessary capacity to service the proposed development. Signalization of the Ball Gate / Lockhart Road intersection may be required in the future to address the southbound control delay.

The proposed spacing between Ball Gate and the future Addington Heights roadway (420 metres – measured edge to edge of roadway) and between Ball Gate and the future local road to the east (800 metres – measured edge to edge of roadway) are greater than the desired spacing between adjacent intersections on an arterial road (400 metres) identified in Section 9.4.2.1 of the TAC Guidelines.

There are no issues with the proposed location of the Ball Gate roadway.

4.6 Sight Distance Review

A review of the available sight distance for the proposed Ball Gate intersection was completed as part of this analysis.

The sight distance east and west of Ball Gate intersection are both greater than the minimum stopping sight distance and decision sight distance requirements as identified in the TAC Guidelines for a design speed of 80km/h (130 metres & 155 metres respectively).

Consequently, there are no issues with the sight distance available for the proposed Ball Gate intersection.

4.7 Active Transportation Review

There is currently no dedicated cycling infrastructure, trail network or sidewalk network adjacent to the proposed development. Cyclists and pedestrians from the subject site would be required to share the existing road network with all other users.

As noted in Section 2.2, a cycle track is planned along Lockhart Road in the study area which will connect to the existing and proposed major active transportation pathways on Lockhart Road, Huronia Road, Yonge Street and the future cycling network within the HSPA.

As noted in Section 2.2, a sidewalk is also planned on both sides of Lockhart Road in the study area which will connect to the proposed sidewalk network on Lockhart Road, Huronia Road, Yonge Street and the future sidewalk network within the HSPA.

Ball Gate will have buffered bicycle lanes between Fenchurch Manor and Lockhart Road and sidewalk on both sides of the road along the entire length. Fenchurch Manor includes bicycle lanes and sidewalk along both sides of the road. Fenchurch Manor will ultimately connect into Madelaine Drive, north of the subject site, which also includes dedicated on-street cycling infrastructure and separated pedestrian infrastructure.

There is an existing trail connecting Thicketwood Avenue (in the EX RES Development) with Stunden Lane / Patrick Drive, which links into the existing branching sidewalk network within the City. The proposed sidewalk network within the subject site will connect into the existing sidewalk network within the EX RES Development, via the proposed sidewalk network in the Sorbara Development.

4.8 Construction Parking

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

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

5 Summary

Lockhart Innisfil Investments Ltd. retained **JD Engineering** to prepare this traffic impact study in support of the proposed residential development located on the north side of Lockhart Road, midblock Finsbury Street and Yonge Street, in the City of Barrie [City] within the Hewitt Secondary Plan Area [HSPA]. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

The proposed development is anticipated to consist of 190 single detached units and future lots / blocks (eight residential units).

1. The proposed development is expected to generate a total of 95 AM and 133 PM peak hour external trips.
2. Background traffic and pedestrian counts were obtained from the City at the Yonge Street / Lockhart intersection, completed on Thursday, September 28th, 2017 and Wednesday, October 21st 2020.
3. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed under total (2027) traffic volumes with the proposed development operational at the study area intersections. The following interim lane improvements are recommended on Lockhart Road ahead of the planned road reconstruction by opening day of Lockhart Development P2 (2025).

Ball Gate / Lockhart Road

- Eastbound left turn lane with a 30 metre storage length and an 85 metre taper length.
 - Westbound right turn lane with a 60 metre taper length.
5. Planned road improvements at the study area intersections include the 2031 road reconstruction of Lockhart Road from a two-lane to a four-lane cross-section with a multi-use trail on the north side of the road.
 6. An intersection operation analysis was completed under total (2031 & 2037) traffic volumes with the proposed development operational at the study area intersections.
 7. It is recommended that the City monitor the traffic volumes at the Ball Gate / Lockhart Road intersection closer to the 2031 horizon year to determine if traffic signals are required to accommodate the southbound left turn movements.
 8. The proposed Ball Gate intersection will operate efficiently as a full-movement access, with one-way stop control for southbound movements. Ball Gate will include buffered bicycle lanes between Fenchurch Manor and Lockhart Road and sidewalk on both sides of the road. A single ingress and two egress lanes (right turn and left turn lane with a 40 metre storage length

and a 55 metre taper) at the Ball Gate intersection will provide the necessary capacity to service the proposed development.

9. The sight distance available for the proposed Ball Gate intersection meets the minimum stopping sight distance and decision sight distance requirements.
10. 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

Appendix B – Hewitt Secondary Plan Area Development Plan



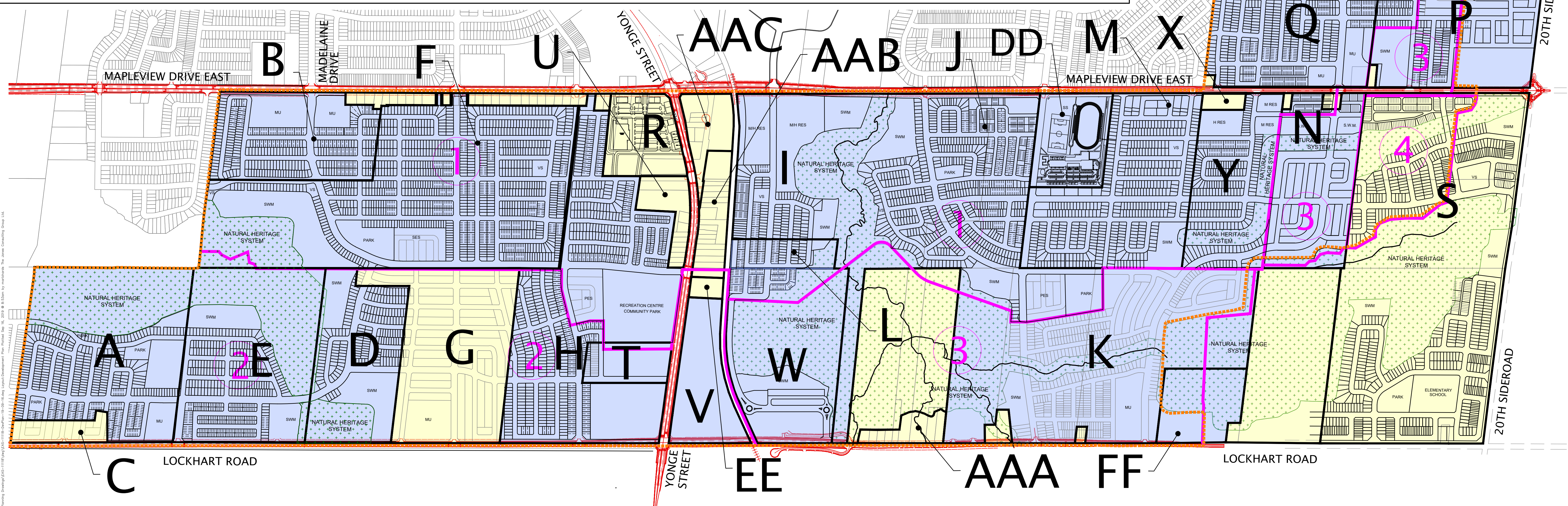
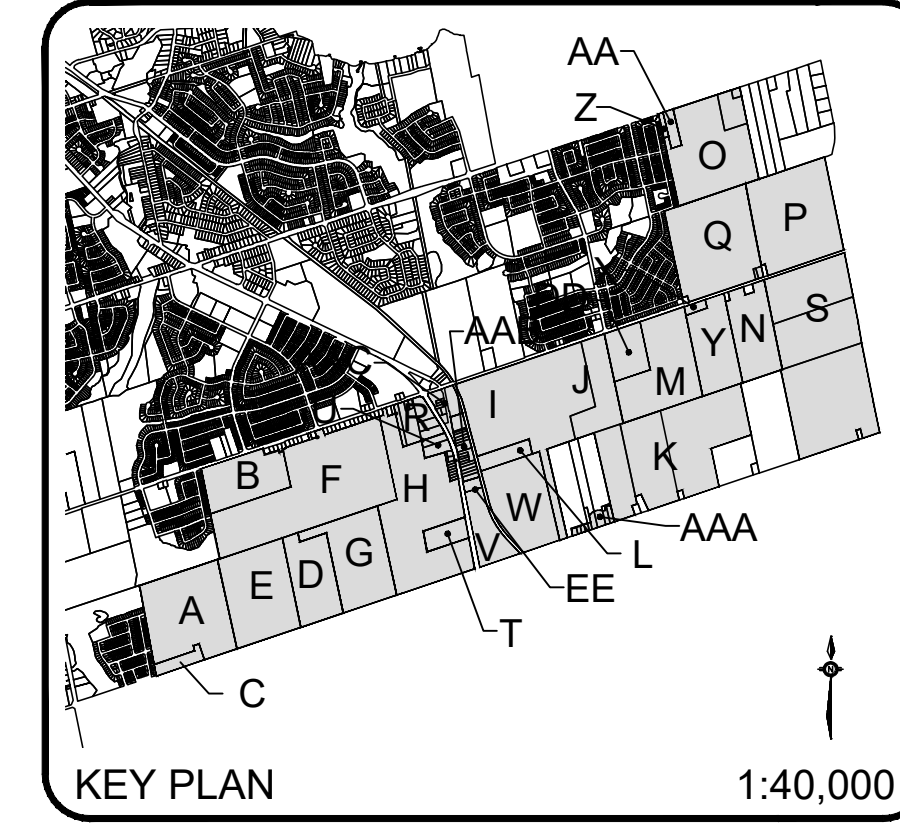
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Checked By: RD
Project No.: EAS-11118
Drawn By: m.c.r.
Drawing Name:
EAS-11118-DevPlan-19-09-16.dwg

Participating Landowner Unit Counts/Estimates (To Year 2031)										STATUS					2019			2020			2021			2022			2023			2024			
Phase	Map ID	Land Owner	Total Area (ha.)	Developable Area within Phase 1 CDR Sec Plan	Total Area within 2031 Boundary (ha.)	Total Developable (ha.)	Developable Area within 2031 Boundary (2031) ha.	Phase 1 Units	Phase 2 Units	Phase 3 Units	Phase 4 Units	Total Units	Conformity Appl. Submitted	Conformity Approval	DP/SP & ZBIA Appl. Submitted	DP/SP & ZBIA Approved	Final Approval	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	
2	A	Barrie Lockhart Road GP Inc.	36.72	0.00	36.72	23.47	23.47	0	594	0	0	594						0	0	0	0	0	0	408	136	136	0	136	136	0	0	0	
1	AA	Maple Developments Inc.	2.04	2.04	2.04	2.04	2.04	43	0	0	0	43	Y	Y	Y	Y		0	0	0	43	0	0	0	43	0	0	0	0	0	0	0	
1	B	BMP Holdings 2 Inc.	19.45	19.45	19.45	19.45	19.45	847	0	0	0	847						0	0	0	131	65	65	0	66	66	130	65	65	0	0	0	
2	D	Lockhart Infill Investments Limited	19.73	0.00	19.73	15.44	15.44	0	194	0	0	194						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	E	Lockhart Infill Investments Limited II	32.19	0.00	32.19	19.65	19.65	0	420	0	0	420						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	F	Lockmaple Infill Investments Limited	65.49	58.47	65.49	58.47	58.47	1073	0	0	0	1073	Y	Y	Y	Y		0	0	0	396	0	0	0	150	0	0	150	150	141	96	150	0
3	FF	John and Alida Esses	8.16	0	1.99	2.67	1.99	0	0	199	0	199						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1 & 2	H	Rainbow Land Development Inc.	50.15	25.67	50.15	50.15	50.15	356	365	0	0	761	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)		0	0	0	200	75	65	0	125	300	196	75	100	0	75	75	
1 & 3	L, L, K	Clidwell Construction Inc.	134.58	63.94	129.38	97.25	97.25	1515	0	640	0	2155	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)		276	276	0	108	108	132	323	232	452	260	214	187	0	46	170	
1	L	2303757 Ontario Inc. (Campbell)	4.33	4.33	4.33	3.56	3.56	85	0	0	0	85	Y	Y	Y	Y		0	0	0	0	0	0	85	0	0	0	40	0	0	0	45	
1	M	1091949 Ontario Inc. (Boutin)	30.25	30.25	30.25	30.25	30.25	570	0	0	0	570	Y	Y	Y	Y		0	0	0	267	180	65	0	147	180	303	125	125	0	54	125	
1 & 3	N	Finger Lakes Estates Inc.	19.42	11.31	17.25	13.98	13.98	45	0	415	0	460	Y	Y	Y	Y		0	0	0	89	0	0	89	89	0	0	0	0	0	0	0	
1 & 3	O, P	1597229 Ontario Ltd.	80.16	42.62	60.76	71.11	52.76	786	0	244	0	1030	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)	Y (Ph. 1)		0	0	0	170	70	70	260	125	125	0	125	125	172	125	125	
1	Q	979 Mapleview Inc.	41.54	40.67	41.54	41.49	41.49	828	0	33	0	861	Y	Y	Y	Y		0	0	0	144	130	70	114	130	300	200	140	88	0	140	100	
2	T	Crown (Barrie) Developments Inc.	4.95	0.8	4.76	4.77	4.77	0	700	0	0	690	Y	Y	Y	Y		0	0	0	360	360	0	0	360	360	90	90	180	90	90	90	
2	V	ASA Development Inc.	10.14	0	10.14	10.14	10.14	1246	0	0	0	1246	Y	Y	Y	Y		0	0	0	0	0	0	0	0	0	200	0	0	100	200	100	
1 & 3	W	Ballymore Building (Barrie) Corp.	26.41	2.25	26.41	10.25	10.25	87	0	382	0	469	Y	Y	Y	Y		0	0	0	0	0	0	0	0	0	0	0	0	0	87	0	
1	Y	Mapleview South (Infill) Ltd.	15.03	15.03	15.03	15.19	15.19	206	0	0	0	206	Y	Y	Y	Y		0	0	0	99	0	0	60	60	60	60	60	60	100	60	60	
1	Z	961 Big Bay Ltd.	0.65	0.65	0.65	0.65	0.65	16	0	0	0	16	Y	Y	Y	Y		0	0	0	0	0	0	16	16	0	0	0	0	0	0	0	
			605.20	307.46	572.76	491.98	472.96	6797	3519	1913	0	12159						276	276	0	1558	578	467	1655	1580	1212	1569	1399	1501	503	1203	1426	853

Non-Participating Landowner Unit Counts/Estimates (To Year 2031)										STATUS					2019			2020			2021			2022			2023			2024		
Phase	Map ID	Land Owner	Total Area (ha.)	Developable Area within Phase 1 CDR Sec Plan	Total Area within 2031 Boundary (ha.)	Total Developable (ha.)	Developable Area within 2031 Boundary (2031) ha.	Phase 1 Units	Phase 2 Units	Phase 3 Units	Phase 4 Units	Total Units	Conformity Appl. Submitted	Conformity Approval	DP/SP & BIA Appl. Submitted	DP/SP & BIA Approved	Final Approval	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations	Registration	Permits	Occupancies / Energizations
3	AAA	Individual Lockhart Landowners	2.67	0.00	2.67	2.67	2.67	0	0	80	0	80						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 & 2	AAB	Individual Yonge Street Landowners	5.07	4.72	5.07	5.07	5.07	566	42	0	0	608						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2031+	AAC	St. Paul's Landowners	4.46	4.46	4.46	4.46	4.46	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	DD	SCDRB	9.60	9.60	9.60	9.60	9.60	0	0	0	0	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	EE	Barbara Johnston	0.95	0.95	0.95	0.95	0.95	0	95	0	0	95						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	C	Van Der Heyden	3.37	0.00	3.37	3.37	3.37	0	53	0	0	53						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	G	Myrtle Service Irving	27.95	0.00	27.95	27.95	27.95	0	648	0	0	648						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	R	Soddy's	8.18	8.18	8.18	8.18	8.18	981	0	0	0	981						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	S	DR Development	80.28	0	37.43	37.43	37.43	0	0	0	0	368						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	U	Ed Esses and Others	3.77	3.77	3.77	3.77	3.77	452	0	0	0	452						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	X	H. Rosner	1.01	1.01	1.01	1.01	1.01	100	0	0	0	100						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			136.28	12.96	83.23	96.93	97.74	1553	761	0	0	2302																				

- Subject Lands
- City of Barrie Settlement Area Boundary (2031)
- Natural Heritage System including Buffer
- Participating Landowners
- Non-Participating Landowners
- Adjusted based on Draft Plan Approvals
- SWM – Stormwater Management Pond
- VS – Village Square
- PARK – Parkland
- SES – Separate Elementary School
- PES – Public Elementary School
- SS – Secondary School
- MU – Mixed Use Block
- M/H RES – Medium/High Density Residential

Hewitt's Secondary Plan Overall Development Plan



Appendix C – Adjacent Development Reports

Lockhart Development P2 TIS

460 Lockhart Road

City of Barrie

Traffic Impact Study for Lockhart Innisfil Investments II Ltd.

Type of Document:
Final Report

Project Number:
JDE – 1302

Date Submitted:
September 9th, 2021



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



ENGINEERING

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Barrie, ON
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Executive Summary

This report summarizes the traffic impact study for the proposed residential development located on the north side of Lockhart Road, midblock between Finsbury Street and Yonge Street, in the City of Barrie [City] within the Hewitt Secondary Plan Area [HSPA]. 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 includes 194 single detached units, 200 townhouse units and one future lot / block (residential unit). It is anticipated that the subject site will be built-out and occupied by 2025.

The proposed development includes a single full-movement access within the site via Ball Gate. Ball Gate is a proposed local road north of Fenchurch Manor and a major collector road south of Fenchurch Manor.

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

- Ball Gate / Lockhart Road.

Conclusions

1. The proposed development is expected to generate a total of 190 AM and 265 PM peak hour external trips.
2. Background traffic and pedestrian counts were obtained from the City at the Yonge Street / Lockhart intersection, completed on Thursday, September 28th, 2017 and Wednesday, October 21st 2020.
3. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed under total (2025) traffic volumes with the proposed development operational at the study area intersections. The following interim lane improvements are recommended on Lockhart Road ahead of the planned road reconstruction in 2026.

Ball Gate / Lockhart Road

- Eastbound left turn lane with a 30 metre storage length and an 85 metre taper length.
 - Westbound right turn lane with a 60 metre taper length.
5. Planned road improvements at the study area intersections include the 2031 road reconstruction of Lockhart Road from a two-lane to a four-lane cross-section with a multi-use trail on the north side of the road.
 6. An intersection operation analysis was completed under total (2031 & 2035) traffic volumes with the proposed development operational at the study area intersections.
 7. It is recommended that the City monitor the traffic volumes at the Ball Gate / Lockhart Road intersection closer to the 2031 horizon year to confirm whether traffic signals are required to accommodate the southbound left turn movements.
 8. The proposed Ball Gate intersection will operate efficiently as a full-movement access, with one-way stop control for southbound movements. Ball Gate will include buffered bicycle lanes between Fenchurch Manor and Lockhart Road and sidewalk on both sides of the road. A single ingress and two egress lanes (right turn and left turn lane with a 40 metre storage length

and a 55 metre taper) at the Ball Gate intersection will provide the necessary capacity to service the proposed development.

9. The sight distance available for the proposed Ball Gate intersection meets the minimum stopping sight distance and decision sight distance requirements.
10. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

3 Proposed Development Traffic Generation and Assignment

3.1 Traffic Generation

The traffic generation calculation for the proposed development has been estimated based on the traffic generation rates provided in the Hewitt MTS as illustrated in Table 1 in Section 2.4.3. The estimated trip generation of the proposed development is illustrated below in **Table 8**.

Table 8 – Estimated Traffic Generation for the Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	395 units*	55	135	190	164	101	265

* To be conservative, the analysis in the report is based on a previous version of the site plan for the proposed development which had a slightly higher unit count and proposed 408 residential units (194 single detached units, 202 townhouse units and one future lot / blocks (residential unit)). The traffic generation for the previous version of the site plan is illustrated in Table A in **Appendix I**.

3.2 Traffic Assignment

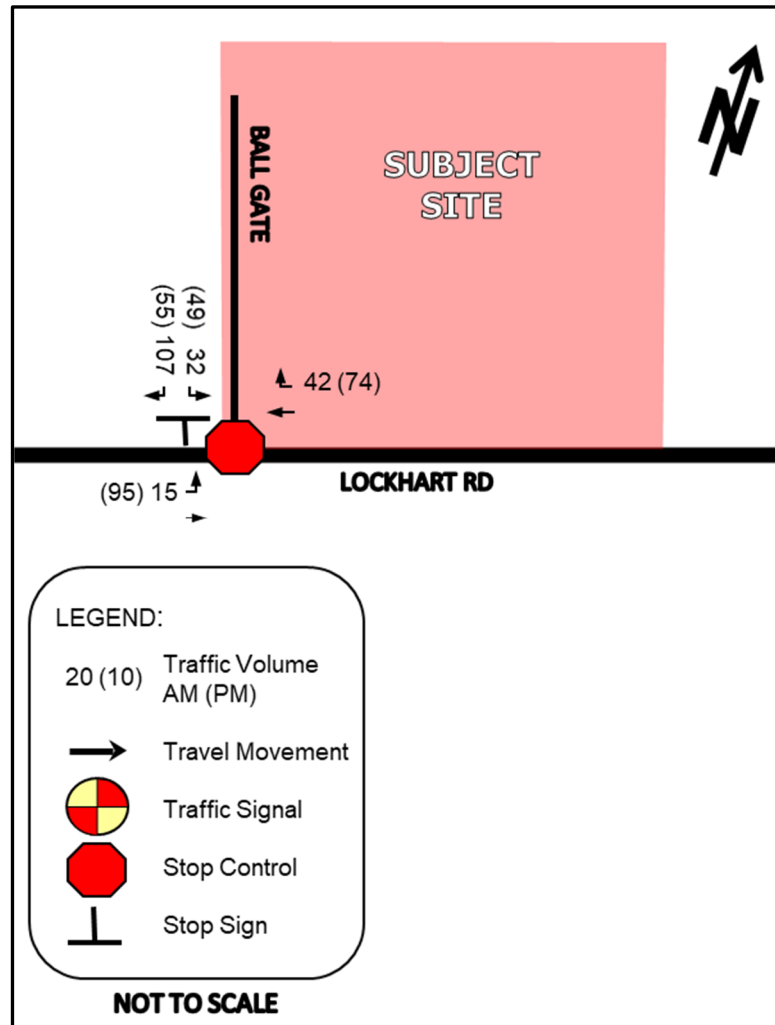
For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The traffic assignment for the proposed development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.4.

Using the traffic distribution pattern noted above, **Figure 14** illustrates the traffic assignment for the proposed development in the AM and PM peak hour for the build-out (2025) horizon year.

Figure 15 the traffic assignment for the proposed development in the AM and PM peak hour for the full build-out (2025) horizon year.

Figure 15 – Proposed Development Traffic Assignment (2025)



Mattamy Development TIS

620 Lockhart Road

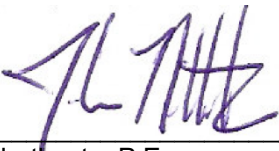
City of Barrie

Traffic Impact Study for Mattamy Homes Canada

Type of Document:
Final Report

Project Number:
JDE – 1302

Date Submitted:
July 28th, 2021



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



ENGINEERING

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3 Proposed Development Traffic Generation and Assignment

3.1 Traffic Generation

The traffic generation calculation for the proposed development has been estimated based on the traffic generation rates provided in the Hewitt MTS as illustrated in Table 1 in Section 2.4.4. The estimated trip generation of the proposed development is illustrated below in **Table 7**.

Table 7 – Estimated Traffic Generation for the Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential	629 units	88	214	302	261	161	422

3.2 Traffic Assignment

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

The traffic assignment for the proposed development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.5.

It is anticipated the internal road network in the HSPA will not be fully built-out by the 2024 horizon year; consequently, we have assumed all proposed development traffic will use the Street 'A' access in the build-out (2024) horizon year. For the post 2031 / 2034 horizon year it is anticipated the internal road network in the HSPA will be fully built-out; consequently, we have assumed a reduction in traffic at the Street 'A' access⁴ as it is anticipated most of the traffic would use the internal connections north of the proposed development in the HSPA.

Using the traffic distribution pattern noted above, **Figure 11** and **12** illustrates the traffic assignment for the proposed development in the AM and PM peak hour for the 2024 and 2031 / 2034 horizon years respectively.

⁴ The percentage of traffic using the Street 'A' access was calculated based on the 2031 site traffic volumes illustrated in Appendix H in the Hewitt MTS.

Figure 11 – Proposed Development Traffic Assignment (2024)

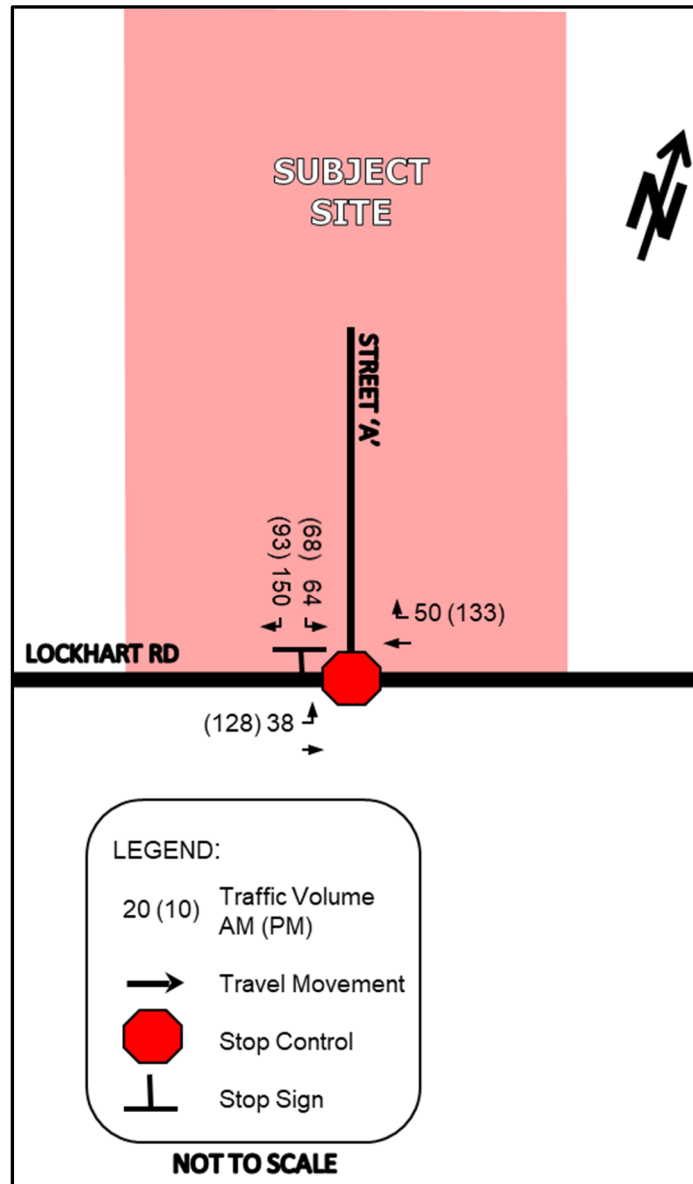
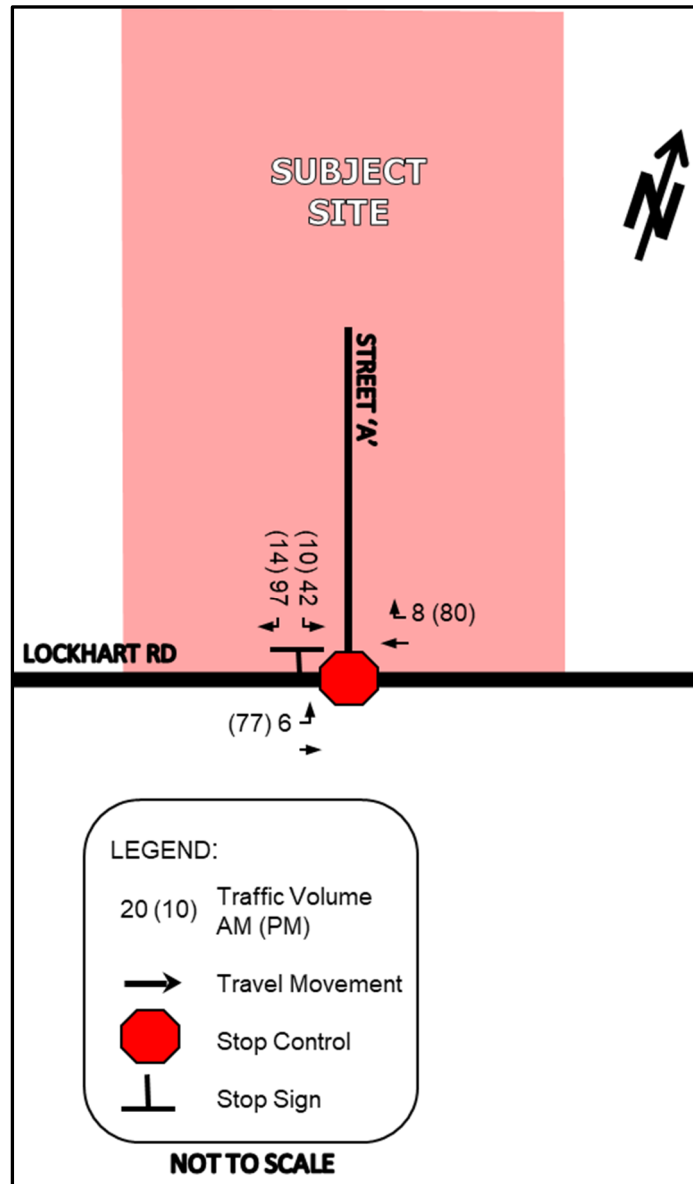


Figure 12 – Proposed Development Traffic Assignment (2031 / 2034)



Sorbara Development TIS

Barrie Lockhart Road (Sorbara)

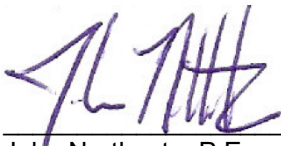
City of Barrie

Traffic Brief for Barrie Lockhart Road GP

Type of Document:
Final Report

Project Number:
JDE – 1302

Date Submitted:
March 5th, 2020



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Table 8 – Estimated Traffic Generation for the Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Residential (Phase 1)	181 units	25	62	87	75	46	121
Residential (Ultimate Development)	594 units	83	202	285	247	151	398

No traffic generation calculations have been completed for the commercial component of the mixed-use blocks and from the elementary school block as these components of the proposed development will primarily service the local residents and traffic to these blocks are anticipated to primarily utilize the internal road network.

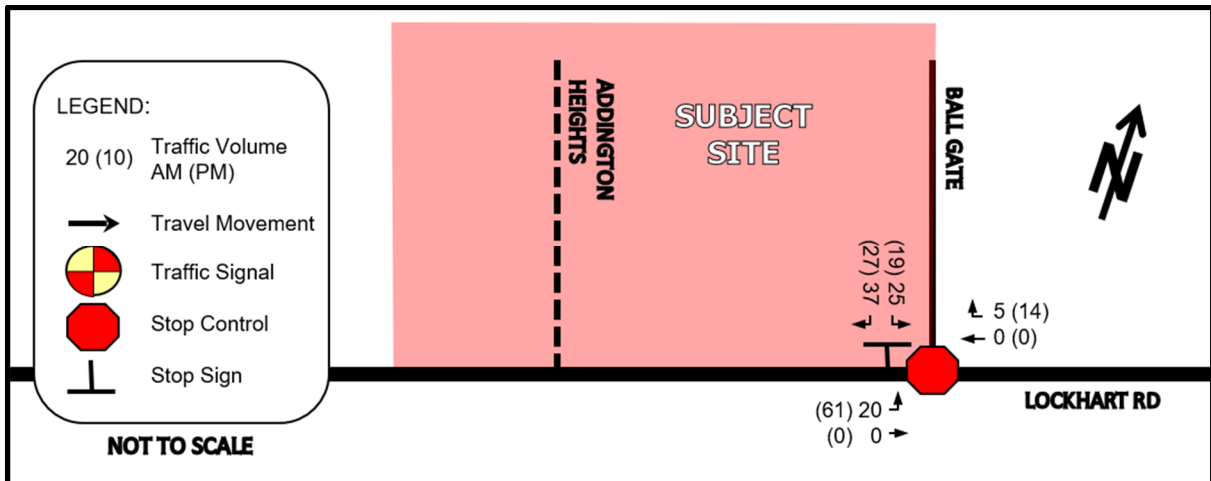
3.2 Traffic Assignment

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

The traffic assignment for the proposed development within the study area has been based on the traffic distribution noted in Table 2 in Section 2.4.3.

Using the traffic distribution pattern noted above, **Figures 12 and 13** illustrate the traffic assignment for the proposed development in the AM and PM peak hour for the Phase 1 development (2023) and ultimate development (2031) horizon years respectively.

Figure 12 – Proposed Development Traffic Assignment (2023)



Appendix D – Hewitt MTS Excerpts



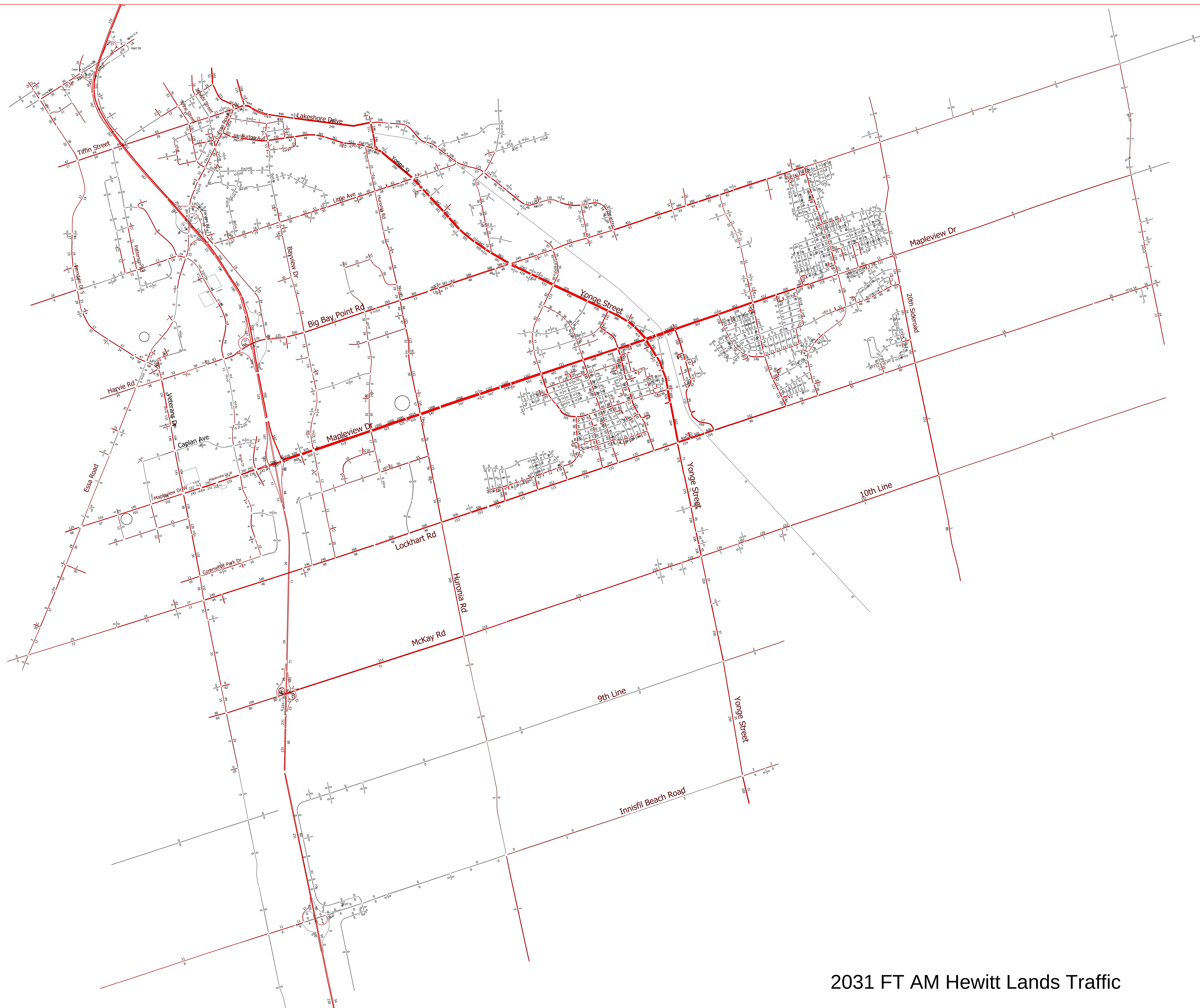
Draft Plan of Subdivisions, Hewitt Landowners
Group (HLG)

UPDATED MASTER TRANSPORTATION STUDY

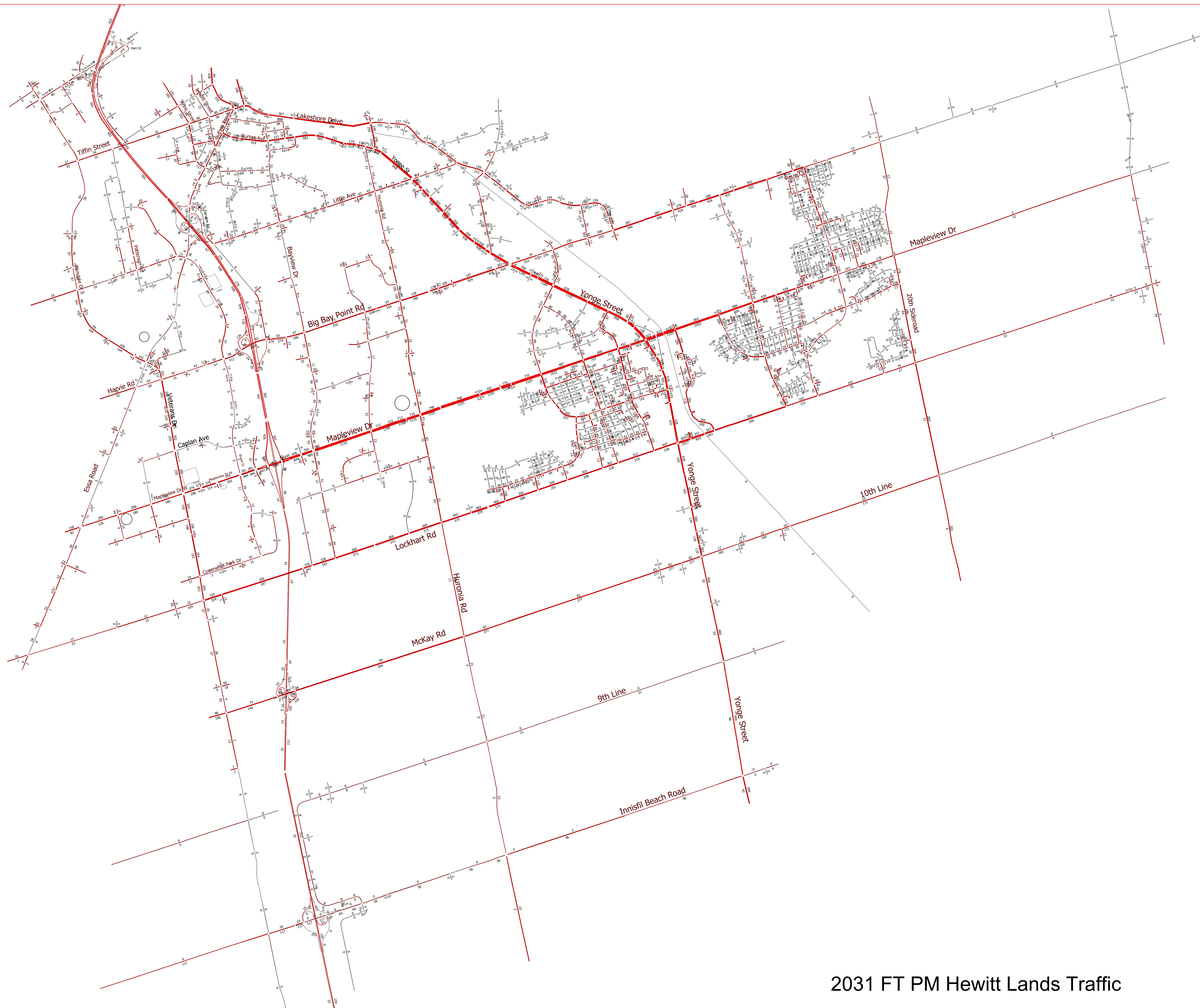
February 2019
17092

APPENDIX H

Ultimate 2031 Future Total Site Traffic Assignment Volumes



2031 FT AM Hewitt Lands Traffic



2031 FT PM Hewitt Lands Traffic

Appendix E – Traffic Count Data

Trans-Plan Transportation Inc.

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

Yonge Street and Lockhart Road
Barrie, Ontario
Thursday September 28, 2017
Clear, 15C
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														
7:00	2	109	6	0	2	0	0	0	0	0	119	12	20	8	0	1	0	0	0	0	0	41	14	33	8	1	1	0	0	1	0	0	58	2	3	9	1	0	1	0	0	0	16	234	
7:15	5	94	19	1	3	1	0	0	0	0	123	15	23	6	0	0	0	0	0	0	0	44	12	58	6	0	3	0	0	0	0	0	79	1	1	8	1	2	0	0	0	0	13	259	
7:30	3	138	16	0	4	3	0	0	0	0	164	10	36	8	1	0	2	0	0	0	0	57	17	80	5	1	1	1	0	0	0	0	105	3	6	5	1	1	0	0	0	0	16	342	
7:45	8	121	22	0	7	1	0	0	0	0	159	8	21	8	1	0	0	0	0	0	0	38	19	72	9	1	4	1	0	0	0	0	106	4	12	5	0	0	0	0	0	0	21	324	
8:00	4	111	17	0	2	1	0	0	0	0	135	6	31	12	0	0	0	0	0	0	0	49	17	69	2	0	2	0	0	0	0	0	90	4	7	10	1	1	0	0	0	0	23	297	
8:15	4	101	9	0	2	0	0	0	0	0	116	11	22	11	0	0	1	0	0	0	0	45	15	75	3	0	7	2	0	0	0	0	102	5	9	7	1	0	0	0	0	0	22	285	
8:30	4	117	10	0	2	3	0	0	0	0	136	9	22	10	0	0	0	0	0	0	0	41	19	84	2	1	3	0	0	0	0	0	109	10	8	13	0	1	1	0	0	0	33	319	
8:45	6	112	9	0	5	0	0	0	0	0	132	8	23	3	0	0	0	0	0	0	0	34	13	69	7	3	5	0	0	0	0	0	97	4	11	12	1	0	1	0	0	0	29	292	
MD																																													
11:00	6	77	3	0	3	0	0	0	0	0	89	6	10	8	1	0	4	0	0	0	0	29	8	74	5	0	5	0	0	0	0	0	92	3	14	8	0	1	1	0	0	0	0	27	237
11:15	4	82	5	0	2	0	0	0	0	0	93	7	11	11	0	1	0	0	0	0	0	30	9	75	9	1	8	0	0	0	0	0	102	6	18	16	0	0	1	1	0	0	0	42	267
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11:45	7	51	3	0	3	0	0	0	0	0	64	15	9	7	0	0	0	0	0	0	0	31	4	66	8	0	3	1	0	0	0	0	82	3	14	17	0	0	0	0	0	0	0	34	211
12:00	2	70	4	0	2	0	0	0	0	0	78	9	17	8	0	1	1	0	0	0	0	36	11	60	11	0	2	0	0	0	0	0	84	6	17	12	0	0	0	0	0	0	0	35	233
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13:15	9	87	6	0	2	0	0	0	0	0	104	15	15	10	0	0	2	0	0	0	0	42	4	61	16	0	2	1	0	0	0	0	84	2	18	15	0	0	0	0	0	0	0	35	265
13:30	7	67	6	0	1	0	0	0	0	0	81	6	13	9	1	0	1	0	0	0	0	30	9	78	8	0	3	0	0	0	0	0	98	6	17	9	0	0	0	0	0	0	0	32	241
13:45	10	77	5	0	2	0	0	0	0	0	94	8	10	12	0	1	0	0	0	0	0	31	10	82	8	2	3	0	0	0	0	0	105	2	15	14	1	1	2	0	0	0	0	35	265
PM																																													
15:00	5	108	5	0	3	0	0	0	0	0	121	5	7	3	0	0	1	0	0	0	0	16	14	96	11	3	4	0	0	0	0	0	128	8	21	15	1	0	0	0	0	0	0	45	310
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17:30	11	114	10	0	3	0	0	0	0	0	138	7	12	4	0	0	1	0	0	0	0	24	11	151	9	0	1	1	0	0	0	0	173	28	33	25	0	0	1	0	0	0	0	87	422
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Turning Movement Count Diagram

Intersection: Yonge Street and Lockhart Road

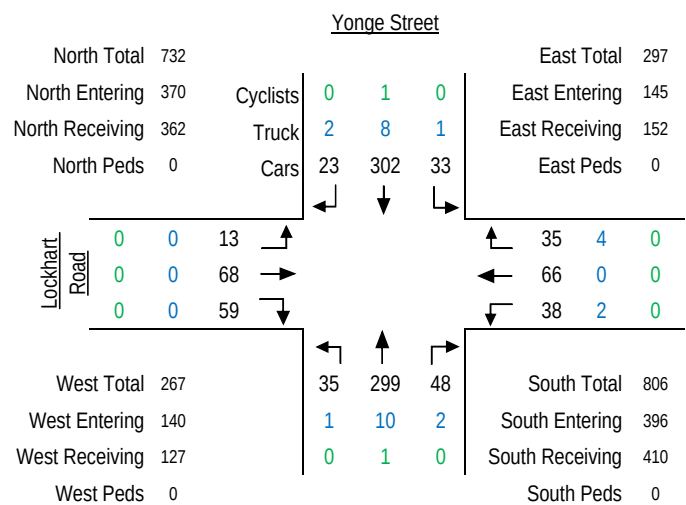
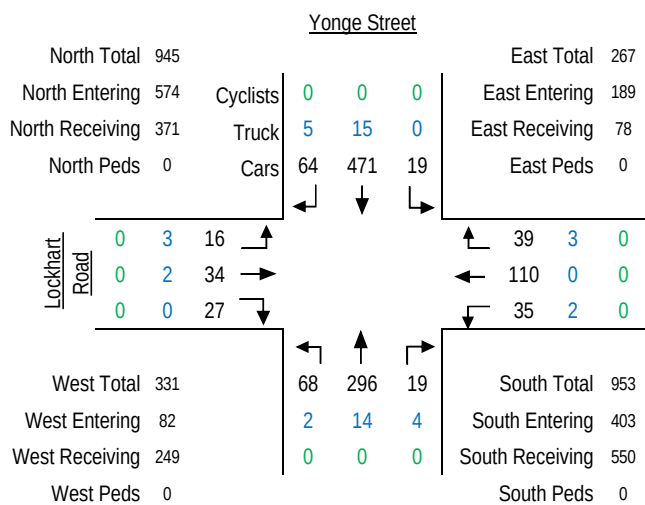
Municipality: Barrie, Ontario

Intersection ID:

Date: Thursday September 28, 2017

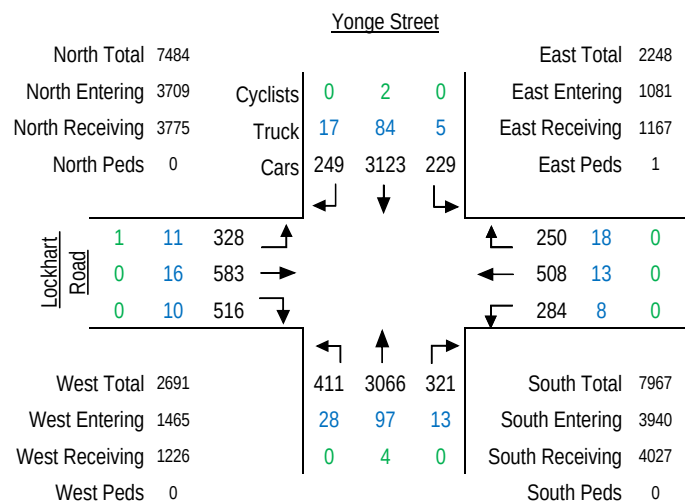
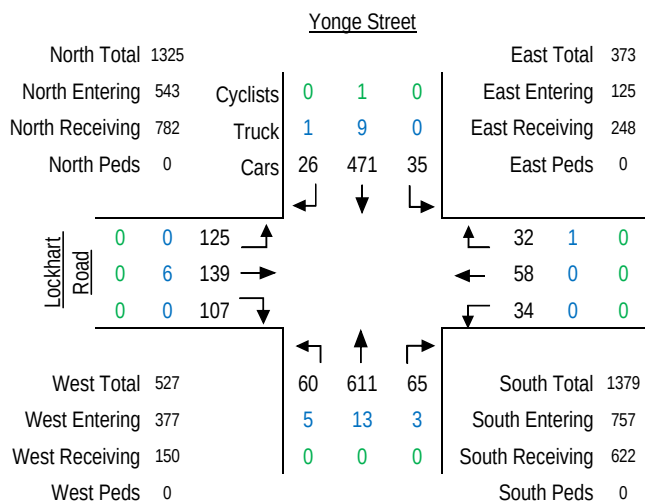
AM Peak Hour: 7:30 to 8:30

MD Peak Hour: 12:30 to 13:30



PM Peak Hour: 16:30 to 17:30

Total 8-Hour Count



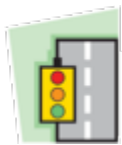


Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

Project #20-013 - City of Barrie

Intersection Count Report

Intersection:	Yonge St & Lockhart Rd
Municipality:	Barrie
Count Date:	Oct 21, 2020
Site Code:	2001300114
Count Categories:	Cars, Trucks, Bicycles, Pedestrians
Count Period:	07:00-09:00, 11:00-14:00, 15:00-18:00
Weather:	Clear

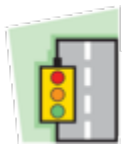


Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Map

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020





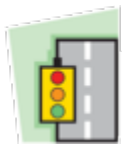
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

Yonge St - Traffic Summary

Hour	North Approach Totals						South Approach Totals					
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	17	304	49	0	370	0	52	188	12	0	252	0
08:00 - 09:00	21	344	26	0	391	0	48	249	17	0	314	0
BREAK												
11:00 - 12:00	35	256	17	0	308	0	31	304	28	0	363	0
12:00 - 13:00	24	319	19	0	362	0	41	317	33	0	391	0
13:00 - 14:00	27	326	19	0	372	0	49	334	39	0	422	0
BREAK												
15:00 - 16:00	36	329	30	0	395	0	32	369	41	0	442	0
16:00 - 17:00	33	411	27	0	471	0	48	487	47	0	582	0
17:00 - 18:00	38	314	26	0	378	0	44	423	47	0	514	0
GRAND TOTAL	231	2603	213	0	3047	0	345	2671	264	0	3280	0



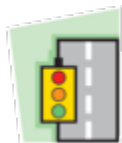
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

Lockhart Rd - Traffic Summary

Hour	East Approach Totals						West Approach Totals					
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	22	84	32	0	138	0	12	20	27	0	59	0
08:00 - 09:00	22	86	35	0	143	0	16	25	37	0	78	0
BREAK												
11:00 - 12:00	22	47	34	0	103	0	10	46	50	0	106	0
12:00 - 13:00	27	44	22	0	93	1	10	45	31	0	86	0
13:00 - 14:00	31	55	32	0	118	0	22	50	60	0	132	0
BREAK												
15:00 - 16:00	21	43	28	0	92	0	29	80	59	0	168	0
16:00 - 17:00	20	32	30	0	82	0	54	100	85	0	239	0
17:00 - 18:00	17	29	19	0	65	0	60	117	77	0	254	0
GRAND TOTAL	182	420	232	0	834	1	213	483	426	0	1122	0



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

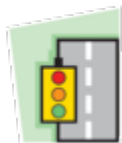
Intersection: Yonge St & Lockhart Rd

Municipality: Barrie

Count Date: Oct 21, 2020

North Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	2	66	11	0	79	0	3	1	0	4	0	0	0	0	0	0
07:15	4	63	14	0	81	0	7	1	0	8	0	0	0	0	0	0
07:30	1	59	8	0	68	3	18	1	0	22	0	0	0	0	0	0
07:45	6	70	11	0	87	1	18	2	0	21	0	0	0	0	0	0
08:00	2	75	2	0	79	1	20	1	0	22	0	0	0	0	0	0
08:15	2	66	8	0	76	1	24	1	0	26	0	0	0	0	0	0
08:30	2	60	5	0	67	1	18	1	0	20	0	0	0	0	0	0
08:45	10	62	7	0	79	2	19	1	0	22	0	0	0	0	0	0
SUBTOTAL	29	521	66	0	616	9	127	9	0	145	0	0	0	0	0	0



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

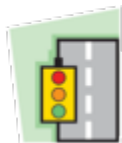
Intersection: Yonge St & Lockhart Rd

Municipality: Barrie

Count Date: Oct 21, 2020

North Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:00	5	65	3	0	73	2	12	0	0	14	0	0	0	0	0	0
11:15	10	43	4	0	57	1	10	1	0	12	0	0	0	0	0	0
11:30	8	44	2	0	54	1	17	0	0	18	0	0	0	0	0	0
11:45	6	52	4	0	62	2	13	3	0	18	0	0	0	0	0	0
12:00	6	59	1	0	66	0	11	2	0	13	0	0	0	0	0	0
12:15	5	75	4	0	84	1	22	2	0	25	0	0	0	0	0	0
12:30	5	67	3	0	75	2	5	3	0	10	0	0	0	0	0	0
12:45	4	69	3	0	76	1	11	1	0	13	0	0	0	0	0	0
13:00	3	58	0	0	61	3	13	0	0	16	0	0	0	0	0	0
13:15	8	89	6	0	103	2	20	3	0	25	0	0	0	0	0	0
13:30	3	61	5	0	69	2	8	1	0	11	0	0	0	0	0	0
13:45	5	63	4	0	72	1	14	0	0	15	0	0	0	0	0	0
SUBTOTAL	68	745	39	0	852	18	156	16	0	190	0	0	0	0	0	0



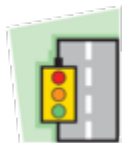
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

North Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	6	69	4	0	79	1	15	0	0	16	0	0	0	0	0	0
15:15	7	64	7	0	78	1	14	3	0	18	0	0	0	0	0	0
15:30	5	67	5	0	77	1	19	2	0	22	0	0	0	0	0	0
15:45	14	58	6	0	78	1	23	3	0	27	0	0	0	0	0	0
16:00	3	80	4	0	87	0	29	0	0	29	0	0	0	0	0	0
16:15	8	87	8	0	103	0	23	1	0	24	0	0	0	0	0	0
16:30	8	66	5	0	79	5	14	3	0	22	0	0	0	0	0	0
16:45	8	93	6	0	107	1	19	0	0	20	0	0	0	0	0	0
17:00	8	70	6	0	84	2	17	0	0	19	0	0	0	0	0	0
17:15	14	69	3	0	86	3	15	2	0	20	0	0	0	0	0	0
17:30	4	65	5	0	74	2	2	4	0	8	0	0	0	0	0	0
17:45	5	71	5	0	81	0	5	1	0	6	0	0	0	0	0	0
SUBTOTAL	90	859	64	0	1013	17	195	19	0	231	0	0	0	0	0	0
GRAND TOTAL	187	2125	169	0	2481	44	478	44	0	566	0	0	0	0	0	0



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

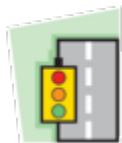
Intersection: Yonge St & Lockhart Rd

Municipality: Barrie

Count Date: Oct 21, 2020

South Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	10	32	2	0	44	0	1	1	0	2	0	0	0	0	0	0
07:15	6	39	3	0	48	1	5	1	0	7	0	0	0	0	0	0
07:30	19	43	3	0	65	2	8	0	0	10	0	0	0	0	0	0
07:45	13	49	0	0	62	1	11	2	0	14	0	0	0	0	0	0
08:00	11	39	3	0	53	3	6	1	0	10	0	0	0	0	0	0
08:15	9	62	1	0	72	4	11	0	0	15	0	0	0	0	0	0
08:30	8	56	3	0	67	3	12	2	0	17	0	0	0	0	0	0
08:45	9	55	5	0	69	1	8	2	0	11	0	0	0	0	0	0
SUBTOTAL	85	375	20	0	480	15	62	9	0	86	0	0	0	0	0	0



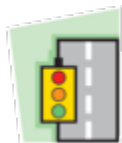
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

South Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:00	11	60	4	0	75	1	12	1	0	14	0	0	0	0	0	0
11:15	6	57	7	0	70	2	8	1	0	11	0	0	0	0	0	0
11:30	2	70	6	0	78	3	25	1	0	29	0	0	0	0	0	0
11:45	4	53	7	0	64	2	19	1	0	22	0	0	0	0	0	0
12:00	7	56	9	0	72	2	19	0	0	21	0	0	0	0	0	0
12:15	10	53	5	0	68	1	10	1	0	12	0	1	0	0	1	0
12:30	7	83	6	0	96	2	23	0	0	25	0	0	0	0	0	0
12:45	8	59	12	0	79	4	13	0	0	17	0	0	0	0	0	0
13:00	5	64	10	0	79	2	17	5	0	24	0	0	0	0	0	0
13:15	16	89	5	0	110	1	14	1	0	16	0	0	0	0	0	0
13:30	9	62	4	0	75	3	23	3	0	29	0	0	0	0	0	0
13:45	11	47	7	0	65	2	18	4	0	24	0	0	0	0	0	0
SUBTOTAL	96	753	82	0	931	25	201	18	0	244	0	1	0	0	1	0



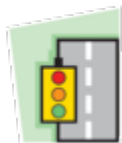
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

South Approach - Yonge St

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	4	67	11	0	82	1	13	2	0	16	0	0	0	0	0	0
15:15	5	82	7	0	94	3	21	1	0	25	0	0	0	0	0	0
15:30	12	81	10	0	103	1	17	5	0	23	0	0	0	0	0	0
15:45	4	66	5	0	75	2	22	0	0	24	0	0	0	0	0	0
16:00	5	99	10	0	114	3	18	1	0	22	0	0	0	0	0	0
16:15	13	104	11	0	128	4	19	4	0	27	0	0	0	0	0	0
16:30	9	108	6	0	123	5	20	4	0	29	0	0	0	0	0	0
16:45	6	103	9	0	118	3	16	2	0	21	0	0	0	0	0	0
17:00	11	74	8	0	93	1	22	6	0	29	0	0	0	0	0	0
17:15	11	89	8	0	108	3	16	1	0	20	0	0	0	0	0	0
17:30	5	87	13	0	105	1	17	1	0	19	0	0	0	0	0	0
17:45	10	100	9	0	119	2	18	1	0	21	0	0	0	0	0	0
SUBTOTAL	95	1060	107	0	1262	29	219	28	0	276	0	0	0	0	0	0
GRAND TOTAL	276	2188	209	0	2673	69	482	55	0	606	0	1	0	0	1	0



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

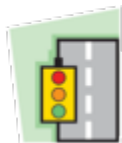
Intersection: Yonge St & Lockhart Rd

Municipality: Barrie

Count Date: Oct 21, 2020

East Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	9	15	7	0	31	1	2	0	0	3	0	0	0	0	0	0
07:15	7	13	3	0	23	0	5	2	0	7	0	0	0	0	0	0
07:30	3	17	10	0	30	0	3	2	0	5	0	0	0	0	0	0
07:45	2	23	5	0	30	0	6	3	0	9	0	0	0	0	0	0
08:00	5	13	6	0	24	0	3	1	0	4	0	0	0	0	0	0
08:15	3	18	9	0	30	0	3	0	0	3	0	0	0	0	0	0
08:30	2	19	7	0	28	0	7	2	0	9	0	0	0	0	0	0
08:45	11	19	9	0	39	1	4	1	0	6	0	0	0	0	0	0
SUBTOTAL	42	137	56	0	235	2	33	11	0	46	0	0	0	0	0	0



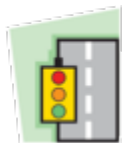
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

East Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:00	9	8	5	0	22	0	3	0	0	3	0	0	0	0	0	0
11:15	4	10	8	0	22	0	1	0	0	1	0	0	0	0	0	0
11:30	6	12	6	0	24	0	3	5	0	8	0	0	0	0	0	0
11:45	3	7	10	0	20	0	3	0	0	3	0	0	0	0	0	0
12:00	6	7	3	0	16	0	3	4	0	7	0	0	0	0	0	0
12:15	8	7	6	0	21	0	1	1	0	2	0	0	0	0	0	1
12:30	8	11	4	0	23	0	2	0	0	2	0	0	0	0	0	0
12:45	4	11	3	0	18	1	2	1	0	4	0	0	0	0	0	0
13:00	7	13	8	0	28	0	1	1	0	2	0	0	0	0	0	0
13:15	8	12	6	0	26	0	1	2	0	3	0	0	0	0	0	0
13:30	6	9	5	0	20	0	3	0	0	3	0	0	0	0	0	0
13:45	8	11	6	0	25	2	5	4	0	11	0	0	0	0	0	0
SUBTOTAL	77	118	70	0	265	3	28	18	0	49	0	0	0	0	0	1



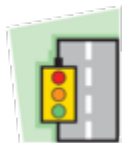
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

East Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	9	7	7	0	23	0	3	1	0	4	0	0	0	0	0	0
15:15	6	8	7	0	21	0	1	2	0	3	0	0	0	0	0	0
15:30	1	11	6	0	18	0	3	0	0	3	0	0	0	0	0	0
15:45	5	7	4	0	16	0	3	1	0	4	0	0	0	0	0	0
16:00	4	3	7	0	14	0	0	1	0	1	0	0	0	0	0	0
16:15	5	9	6	0	20	1	1	0	0	2	0	0	0	0	0	0
16:30	4	6	5	0	15	0	3	2	0	5	0	0	0	0	0	0
16:45	6	6	7	0	19	0	4	2	0	6	0	0	0	0	0	0
17:00	6	5	3	0	14	0	1	0	0	1	0	0	0	0	0	0
17:15	4	5	5	0	14	2	3	1	0	6	0	0	0	0	0	0
17:30	1	5	2	0	8	0	3	2	0	5	0	0	0	0	0	0
17:45	4	6	5	0	15	0	1	1	0	2	0	0	0	0	0	0
SUBTOTAL	55	78	64	0	197	3	26	13	0	42	0	0	0	0	0	0
GRAND TOTAL	174	333	190	0	697	8	87	42	0	137	0	0	0	0	0	1



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

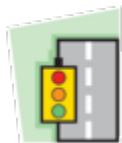
Intersection: Yonge St & Lockhart Rd

Municipality: Barrie

Count Date: Oct 21, 2020

West Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	2	2	7	0	11	0	0	0	0	0	0	0	0	0	0	0
07:15	1	4	5	0	10	1	1	0	0	2	0	0	0	0	0	0
07:30	2	2	2	0	6	2	4	0	0	6	0	0	0	0	0	0
07:45	3	4	12	0	19	1	3	1	0	5	0	0	0	0	0	0
08:00	3	8	3	0	14	0	2	2	0	4	0	0	0	0	0	0
08:15	0	2	8	0	10	3	3	3	0	9	0	0	0	0	0	0
08:30	4	3	12	0	19	0	1	2	0	3	0	0	0	0	0	0
08:45	4	4	6	0	14	2	2	1	0	5	0	0	0	0	0	0
SUBTOTAL	19	29	55	0	103	9	16	9	0	34	0	0	0	0	0	0



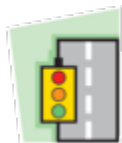
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

West Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:00	2	13	12	0	27	0	4	2	0	6	0	0	0	0	0	0
11:15	1	3	9	0	13	0	2	4	0	6	0	0	0	0	0	0
11:30	1	10	11	0	22	1	2	2	0	5	0	0	0	0	0	0
11:45	3	8	8	0	19	2	4	2	0	8	0	0	0	0	0	0
12:00	1	7	3	0	11	2	1	2	0	5	0	0	0	0	0	0
12:15	4	12	13	0	29	0	1	2	0	3	0	0	0	0	0	0
12:30	0	9	4	0	13	0	2	1	0	3	0	0	0	0	0	0
12:45	3	10	5	0	18	0	3	1	0	4	0	0	0	0	0	0
13:00	3	12	10	0	25	1	5	2	0	8	0	0	0	0	0	0
13:15	1	6	11	0	18	1	3	3	0	7	0	0	0	0	0	0
13:30	4	12	17	0	33	2	1	1	0	4	0	0	0	0	0	0
13:45	7	10	13	0	30	3	1	3	0	7	0	0	0	0	0	0
SUBTOTAL	30	112	116	0	258	12	29	25	0	66	0	0	0	0	0	0



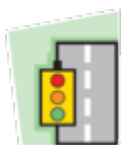
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Yonge St & Lockhart Rd
Municipality: Barrie
Count Date: Oct 21, 2020

West Approach - Lockhart Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	7	17	7	0	31	2	4	3	0	9	0	0	0	0	0	0
15:15	4	15	13	0	32	1	3	4	0	8	0	0	0	0	0	0
15:30	5	16	13	0	34	1	6	3	0	10	0	0	0	0	0	0
15:45	8	10	12	0	30	1	9	4	0	14	0	0	0	0	0	0
16:00	8	28	19	0	55	4	5	3	0	12	0	0	0	0	0	0
16:15	14	22	16	0	52	4	8	2	0	14	0	0	0	0	0	0
16:30	15	15	20	0	50	2	2	5	0	9	0	0	0	0	0	0
16:45	7	16	16	0	39	0	4	4	0	8	0	0	0	0	0	0
17:00	17	31	19	0	67	3	6	5	0	14	0	0	0	0	0	0
17:15	13	32	19	0	64	2	7	3	0	12	0	0	0	0	0	0
17:30	15	13	13	0	41	3	2	4	0	9	0	0	0	0	0	0
17:45	7	24	10	0	41	0	2	4	0	6	0	0	0	0	0	0
SUBTOTAL	120	239	177	0	536	23	58	44	0	125	0	0	0	0	0	0
GRAND TOTAL	169	380	348	0	897	44	103	78	0	225	0	0	0	0	0	0



Ontario Traffic Inc.

TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 09:00:00

One Hour Peak

From: 07:45:00
To: 08:45:00

Intersection: Yonge St & Lockhart Rd
Site ID: 2001300114
Count Date: Oct 21, 2020

Weather conditions:

**** Signalized Intersection ****

Major Road: Yonge St runs N/S

North Approach

	Out	In	Total
	309	243	552
	89	50	139
	0	0	0
Totals	398	293	691

Yonge St

	0	0	0	0
	5	80	4	0
	26	271	12	0
Totals	31	351	16	0

East Approach

	Out	In	Total
	112	36	148
	25	18	43
	0	0	0
Totals	137	54	191

Lockhart Rd

				Totals
	0	0	0	0
	0	4	10	14
	0	9	17	26
	0	8	35	43

Peds: 0



Peds: 0

Peds: 0

Peds: 0

Lockhart Rd

Totals			
	0	0	0
	33	27	6
	92	73	19
	12	12	0

West Approach

	Out	In	Total
	62	140	202
	21	35	56
	0	0	0
Totals	83	175	258

Totals				
	52	246	12	0
	41	206	7	0
	11	40	5	0
	0	0	0	0

Yonge St

South Approach

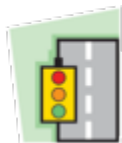
	Out	In	Total
	254	318	572
	56	88	144
	0	0	0
Totals	310	406	716

- Cars

- Trucks

- Bicycles

Comments



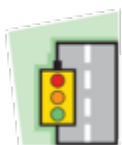
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Yonge St & Lockhart Rd
Count Date: Oct 21, 2020
Period: 07:00 - 09:00

Peak Hour Data (07:45 - 08:45)

Start Time	North Approach Yonge St						South Approach Yonge St						East Approach Lockhart Rd						West Approach Lockhart Rd						Total Vehicles
	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	
07:45	7	88	13	0	0	108	14	60	2	0	0	76	2	29	8	0	0	39	4	7	13	0	0	24	247
08:00	3	95	3	0	0	101	14	45	4	0	0	63	5	16	7	0	0	28	3	10	5	0	0	18	210
08:15	3	90	9	0	0	102	13	73	1	0	0	87	3	21	9	0	0	33	3	5	11	0	0	19	241
08:30	3	78	6	0	0	87	11	68	5	0	0	84	2	26	9	0	0	37	4	4	14	0	0	22	230
Grand Total	16	351	31	0	0	398	52	246	12	0	0	310	12	92	33	0	0	137	14	26	43	0	0	83	928
Approach %	4	88.2	7.8	0		-	16.8	79.4	3.9	0		-	8.8	67.2	24.1	0		-	16.9	31.3	51.8	0		-	
Totals %	1.7	37.8	3.3	0		42.9	5.6	26.5	1.3	0		33.4	1.3	9.9	3.6	0		14.8	1.5	2.8	4.6	0		8.9	
PHF	0.57	0.92	0.6	0		0.92	0.93	0.84	0.6	0		0.89	0.6	0.79	0.92	0		0.88	0.88	0.65	0.77	0		0.86	0.94
Cars	12	271	26	0		309	41	206	7	0		254	12	73	27	0		112	10	17	35	0		62	737
% Cars	75	77.2	83.9	0		77.6	78.8	83.7	58.3	0		81.9	100	79.3	81.8	0		81.8	71.4	65.4	81.4	0		74.7	79.4
Trucks	4	80	5	0		89	11	40	5	0		56	0	19	6	0		25	4	9	8	0		21	191
% Trucks	25	22.8	16.1	0		22.4	21.2	16.3	41.7	0		18.1	0	20.7	18.2	0		18.2	28.6	34.6	18.6	0		25.3	20.6
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	



Ontario Traffic Inc.

TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Diagram

Specified Period

From: 11:00:00
To: 14:00:00

One Hour Peak

From: 13:00:00
To: 14:00:00

Intersection: Yonge St & Lockhart Rd
Site ID: 2001300114
Count Date: Oct 21, 2020

Weather conditions:

**** Signalized Intersection ****

Major Road: Yonge St runs N/S

North Approach

	Out	In	Total
	305	302	607
	67	86	153
	0	0	0
Totals	372	388	760

Yonge St

	0	0	0	0
	4	55	8	0
	15	271	19	0
Totals	19	326	27	0

East Approach

	Out	In	Total
	99	85	184
	19	31	50
	0	0	0
Totals	118	116	234

Lockhart Rd

				Totals
	0	0	0	0
	0	7	15	22
	0	10	40	50
	0	9	51	60

Peds: 0



Peds: 0

Peds: 0

Peds: 0

Lockhart Rd

Totals			
	0	0	0
	32	25	7
	55	45	10
	31	29	2

West Approach

	Out	In	Total
	106	101	207
	26	22	48
	0	0	0
Totals	132	123	255

Totals				
	49	334	39	0
	41	262	26	0
	8	72	13	0
	0	0	0	0

Yonge St

South Approach

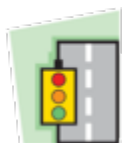
	Out	In	Total
	329	351	680
	93	66	159
	0	0	0
Totals	422	417	839

- Cars

- Trucks

- Bicycles

Comments



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Peak Hour Summary

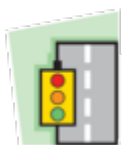
Intersection: Yonge St & Lockhart Rd

Count Date: Oct 21, 2020

Period: 11:00 - 14:00

Peak Hour Data (13:00 - 14:00)

Start Time	North Approach Yonge St						South Approach Yonge St						East Approach Lockhart Rd						West Approach Lockhart Rd						Total Vehicles
	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	←	↑	→	↺	Peds	Total	
13:00	6	71	0	0	0	77	7	81	15	0	0	103	7	14	9	0	0	30	4	17	12	0	0	33	243
13:15	10	109	9	0	0	128	17	103	6	0	0	126	8	13	8	0	0	29	2	9	14	0	0	25	308
13:30	5	69	6	0	0	80	12	85	7	0	0	104	6	12	5	0	0	23	6	13	18	0	0	37	244
13:45	6	77	4	0	0	87	13	65	11	0	0	89	10	16	10	0	0	36	10	11	16	0	0	37	249
Grand Total	27	326	19	0	0	372	49	334	39	0	0	422	31	55	32	0	0	118	22	50	60	0	0	132	1044
Approach %	7.3	87.6	5.1	0		-	11.6	79.1	9.2	0		-	26.3	46.6	27.1	0		-	16.7	37.9	45.5	0		-	
Totals %	2.6	31.2	1.8	0		35.6	4.7	32	3.7	0		40.4	3	5.3	3.1	0		11.3	2.1	4.8	5.7	0		12.6	
PHF	0.68	0.75	0.53	0		0.73	0.72	0.81	0.65	0		0.84	0.78	0.86	0.8	0		0.82	0.55	0.74	0.83	0		0.89	0.85
Cars	19	271	15	0		305	41	262	26	0		329	29	45	25	0		99	15	40	51	0		106	839
% Cars	70.4	83.1	78.9	0		82	83.7	78.4	66.7	0		78	93.5	81.8	78.1	0		83.9	68.2	80	85	0		80.3	80.4
Trucks	8	55	4	0		67	8	72	13	0		93	2	10	7	0		19	7	10	9	0		26	205
% Trucks	29.6	16.9	21.1	0		18	16.3	21.6	33.3	0		22	6.5	18.2	21.9	0		16.1	31.8	20	15	0		19.7	19.6
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	



Ontario Traffic Inc.

TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 16:00:00
To: 17:00:00

Intersection: Yonge St & Lockhart Rd
Site ID: 2001300114
Count Date: Oct 21, 2020

Weather conditions:

**** Signalized Intersection ****

Major Road: Yonge St runs N/S

North Approach

	Out	In	Total
	376	483	859
	95	88	183
	0	0	0
Totals	471	571	1042

Yonge St

	0	0	0	0
	4	85	6	0
	23	326	27	0
Totals	27	411	33	0

East Approach

	Out	In	Total
	68	144	212
	14	36	50
	0	0	0
Totals	82	180	262

Lockhart Rd

				Totals
	0	0	0	0
	0	10	44	54
	0	19	81	100
	0	14	71	85

Peds: 0



Peds: 0

Peds: 0

Peds: 0

Lockhart Rd

Totals			
	0	0	0
	30	25	5
	32	24	8
	20	19	1

West Approach

	Out	In	Total
	196	80	276
	43	27	70
	0	0	0
Totals	239	107	346

Totals				
	48	487	47	0
	33	414	36	0
	15	73	11	0
	0	0	0	0

Yonge St

South Approach

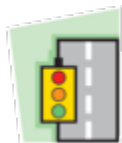
	Out	In	Total
	483	416	899
	99	100	199
	0	0	0
Totals	582	516	1098

- Cars

- Trucks

- Bicycles

Comments



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Yonge St & Lockhart Rd
Count Date: Oct 21, 2020
Period: 15:00 - 18:00

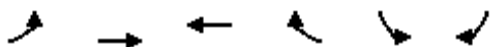
Peak Hour Data (16:00 - 17:00)

Start Time	North Approach Yonge St						South Approach Yonge St						East Approach Lockhart Rd						West Approach Lockhart Rd						Total Vehicles
	←	↑	→	↩	Peds	Total	←	↑	→	↩	Peds	Total	←	↑	→	↩	Peds	Total	←	↑	→	↩	Peds	Total	
16:00	3	109	4	0	0	116	8	117	11	0	0	136	4	3	8	0	0	15	12	33	22	0	0	67	334
16:15	8	110	9	0	0	127	17	123	15	0	0	155	6	10	6	0	0	22	18	30	18	0	0	66	370
16:30	13	80	8	0	0	101	14	128	10	0	0	152	4	9	7	0	0	20	17	17	25	0	0	59	332
16:45	9	112	6	0	0	127	9	119	11	0	0	139	6	10	9	0	0	25	7	20	20	0	0	47	338
Grand Total	33	411	27	0	0	471	48	487	47	0	0	582	20	32	30	0	0	82	54	100	85	0	0	239	1374
Approach %	7	87.3	5.7	0		-	8.2	83.7	8.1	0		-	24.4	39	36.6	0		-	22.6	41.8	35.6	0		-	
Totals %	2.4	29.9	2	0		34.3	3.5	35.4	3.4	0		42.4	1.5	2.3	2.2	0		6	3.9	7.3	6.2	0		17.4	
PHF	0.63	0.92	0.75	0		0.93	0.71	0.95	0.78	0		0.94	0.83	0.8	0.83	0		0.82	0.75	0.76	0.85	0		0.89	0.93
Cars	27	326	23	0		376	33	414	36	0		483	19	24	25	0		68	44	81	71	0		196	1123
% Cars	81.8	79.3	85.2	0		79.8	68.8	85	76.6	0		83	95	75	83.3	0		82.9	81.5	81	83.5	0		82	81.7
Trucks	6	85	4	0		95	15	73	11	0		99	1	8	5	0		14	10	19	14	0		43	251
% Trucks	18.2	20.7	14.8	0		20.2	31.3	15	23.4	0		17	5	25	16.7	0		17.1	18.5	19	16.5	0		18	18.3
Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
% Bicycles	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Appendix F – Synchro Analysis Output – Total Traffic Volumes

560 Lockhart Road
1: Lockhart Rd & Ball Gate

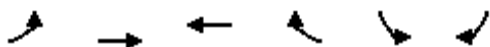
HCM Unsignalized Intersection Capacity Analysis
Total (2027) AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	67	129	360	63	94	237
Future Volume (Veh/h)	67	129	360	63	94	237
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	140	391	68	102	258
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	459				711	425
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	459				711	425
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				73	59
cM capacity (veh/h)	1102				373	629
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	49	164	459	102	258	
Volume Left	49	24	0	102	0	
Volume Right	0	0	68	0	258	
cSH	1102	1102	1700	373	629	
Volume to Capacity	0.07	0.07	0.27	0.27	0.41	
Queue Length 95th (m)	1.6	1.6	0.0	8.3	15.2	
Control Delay (s)	8.5	1.8	0.0	18.2	14.6	
Lane LOS	A	A		C	B	
Approach Delay (s)	3.3		0.0	15.7		
Approach LOS				C		
Intersection Summary						
Average Delay			6.1			
Intersection Capacity Utilization			44.8%	ICU Level of Service		A
Analysis Period (min)			15			

560 Lockhart Road
1: Lockhart Rd & Ball Gate

HCM Unsignalized Intersection Capacity Analysis
Total (2027) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	271	508	192	125	103	140
Future Volume (Veh/h)	271	508	192	125	103	140
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	295	552	209	136	112	152
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	345				1419	277
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	345				1419	277
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	76				2	80
cM capacity (veh/h)	1214				114	762
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	197	650	345	112	152	
Volume Left	197	98	0	112	0	
Volume Right	0	0	136	0	152	
cSH	1214	1214	1700	114	762	
Volume to Capacity	0.24	0.24	0.20	0.98	0.20	
Queue Length 95th (m)	7.3	7.3	0.0	48.3	5.6	
Control Delay (s)	8.9	4.1	0.0	150.8	10.9	
Lane LOS	A	A		F	B	
Approach Delay (s)	5.2		0.0	70.3		
Approach LOS				F		
Intersection Summary						
Average Delay			15.8			
Intersection Capacity Utilization			60.2%		ICU Level of Service	B
Analysis Period (min)			15			

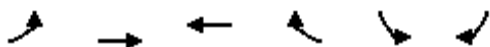
560 Lockhart Road
1: Lockhart Rd & Ball Gate

HCM Unsignalized Intersection Capacity Analysis
Total (2031) AM Peak Hour

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		 	 			
Traffic Volume (veh/h)	36	307	1015	54	84	183
Future Volume (Veh/h)	36	307	1015	54	84	183
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	334	1103	59	91	199
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1162				1378	581
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1162				1378	581
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				28	56
cM capacity (veh/h)	597				127	457
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	150	223	735	427	91	199
Volume Left	39	0	0	0	91	0
Volume Right	0	0	0	59	0	199
cSH	597	1700	1700	1700	127	457
Volume to Capacity	0.07	0.13	0.43	0.25	0.72	0.44
Queue Length 95th (m)	1.6	0.0	0.0	0.0	30.5	16.5
Control Delay (s)	3.6	0.0	0.0	0.0	84.5	18.8
Lane LOS	A				F	C
Approach Delay (s)	1.4		0.0		39.4	
Approach LOS					E	
Intersection Summary						
Average Delay			6.6			
Intersection Capacity Utilization			47.9%		ICU Level of Service	A
Analysis Period (min)			15			

560 Lockhart Road
1: Lockhart Rd & Ball Gate

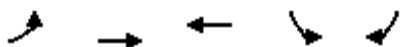
HCM Unsignalized Intersection Capacity Analysis
Total (2031) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Traffic Volume (veh/h)	181	946	510	107	89	100
Future Volume (Veh/h)	181	946	510	107	89	100
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	197	1028	554	116	97	109
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	670				1520	335
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	670				1520	335
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				0	84
cM capacity (veh/h)	916				86	661
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	540	685	369	301	97	109
Volume Left	197	0	0	0	97	0
Volume Right	0	0	0	116	0	109
cSH	916	1700	1700	1700	86	661
Volume to Capacity	0.22	0.40	0.22	0.18	1.13	0.16
Queue Length 95th (m)	6.2	0.0	0.0	0.0	51.4	4.5
Control Delay (s)	5.4	0.0	0.0	0.0	225.0	11.5
Lane LOS	A				F	B
Approach Delay (s)	2.4		0.0		112.0	
Approach LOS					F	
Intersection Summary						
Average Delay			12.4			
Intersection Capacity Utilization			63.8%		ICU Level of Service	B
Analysis Period (min)			15			

560 Lockhart Road
1: Lockhart Rd & Ball Gate

Queues
Total (2031) AM Peak Hour with Signalization



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑
Traffic Volume (vph)	36	307	1015	84	183
Future Volume (vph)	36	307	1015	84	183
Lane Group Flow (vph)	0	373	1162	91	199
Turn Type	Perm	NA	NA	Prot	Perm
Protected Phases		4	8	6	
Permitted Phases	4				6
Detector Phase	4	4	8	6	6
Switch Phase					
Minimum Initial (s)	20.0	20.0	20.0	14.0	14.0
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0
Total Split (s)	63.0	63.0	63.0	27.0	27.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	Max	Max
v/c Ratio		0.31	0.73	0.15	0.32
Control Delay		10.7	16.2	17.5	10.4
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		10.7	16.2	17.5	10.4
Queue Length 50th (m)		13.0	52.4	7.1	7.0
Queue Length 95th (m)		20.3	70.9	19.4	24.5
Internal Link Dist (m)		419.5	318.1	201.2	
Turn Bay Length (m)				40.0	
Base Capacity (vph)		2381	3093	608	616
Starvation Cap Reductn		0	0	0	0
Spillback Cap Reductn		0	0	0	0
Storage Cap Reductn		0	0	0	0
Reduced v/c Ratio		0.16	0.38	0.15	0.32

Intersection Summary

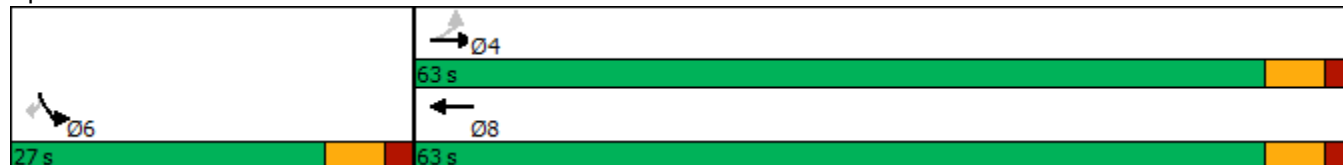
Cycle Length: 90

Actuated Cycle Length: 62.4

Natural Cycle: 60

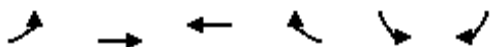
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Lockhart Rd & Ball Gate



560 Lockhart Road
1: Lockhart Rd & Ball Gate

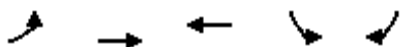
HCM Signalized Intersection Capacity Analysis
Total (2031) AM Peak Hour with Signalization



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔		↔	↔
Traffic Volume (vph)	36	307	1015	54	84	183
Future Volume (vph)	36	307	1015	54	84	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	0.99		1.00	0.85
Flt Protected		0.99	1.00		0.95	1.00
Satd. Flow (prot)		3410	3393		1789	1601
Flt Permitted		0.76	1.00		0.95	1.00
Satd. Flow (perm)		2611	3393		1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	334	1103	59	91	199
RTOR Reduction (vph)	0	0	6	0	0	72
Lane Group Flow (vph)	0	373	1156	0	91	127
Heavy Vehicles (%)	2%	7%	7%	2%	2%	2%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		29.0	29.0		21.2	21.2
Effective Green, g (s)		29.0	29.0		21.2	21.2
Actuated g/C Ratio		0.47	0.47		0.34	0.34
Clearance Time (s)		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1217	1581		609	545
v/s Ratio Prot			c0.34		0.05	
v/s Ratio Perm		0.14				c0.08
v/c Ratio		0.31	0.73		0.15	0.23
Uniform Delay, d1		10.3	13.4		14.2	14.7
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.1	1.8		0.5	1.0
Delay (s)		10.5	15.2		14.8	15.7
Level of Service		B	B		B	B
Approach Delay (s)		10.5	15.2		15.4	
Approach LOS		B	B		B	
Intersection Summary						
HCM 2000 Control Delay			14.3		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.52			
Actuated Cycle Length (s)			62.2		Sum of lost time (s)	12.0
Intersection Capacity Utilization			58.3%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

560 Lockhart Road
1: Lockhart Rd & Ball Gate

Queues
Total (2031) PM Peak Hour with Signalization



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑
Traffic Volume (vph)	181	946	510	89	100
Future Volume (vph)	181	946	510	89	100
Lane Group Flow (vph)	0	1225	670	97	109
Turn Type	Perm	NA	NA	Prot	Perm
Protected Phases		4	8	6	
Permitted Phases	4				6
Detector Phase	4	4	8	6	6
Switch Phase					
Minimum Initial (s)	20.0	20.0	20.0	14.0	14.0
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0
Total Split (s)	93.0	93.0	93.0	27.0	27.0
Total Split (%)	77.5%	77.5%	77.5%	22.5%	22.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	Max	Max
v/c Ratio		0.86	0.33	0.21	0.22
Control Delay		20.6	7.8	30.3	8.1
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		20.6	7.8	30.3	8.1
Queue Length 50th (m)		75.2	22.6	11.9	0.0
Queue Length 95th (m)		102.7	30.4	31.2	13.7
Internal Link Dist (m)		419.5	318.1	201.2	
Turn Bay Length (m)				40.0	
Base Capacity (vph)		2303	3222	462	494
Starvation Cap Reductn		0	0	0	0
Spillback Cap Reductn		0	0	0	0
Storage Cap Reductn		0	0	0	0
Reduced v/c Ratio		0.53	0.21	0.21	0.22

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 83.3

Natural Cycle: 75

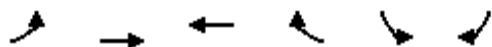
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Lockhart Rd & Ball Gate



560 Lockhart Road
1: Lockhart Rd & Ball Gate

HCM Signalized Intersection Capacity Analysis
Total (2031) PM Peak Hour with Signalization



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↔	↔↔		↔	↔
Traffic Volume (vph)	181	946	510	107	89	100
Future Volume (vph)	181	946	510	107	89	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		0.99	1.00		0.95	1.00
Satd. Flow (prot)		3410	3350		1789	1601
Flt Permitted		0.70	1.00		0.95	1.00
Satd. Flow (perm)		2396	3350		1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	1028	554	116	97	109
RTOR Reduction (vph)	0	0	21	0	0	81
Lane Group Flow (vph)	0	1225	649	0	97	28
Heavy Vehicles (%)	2%	7%	7%	2%	2%	2%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		49.5	49.5		21.5	21.5
Effective Green, g (s)		49.5	49.5		21.5	21.5
Actuated g/C Ratio		0.60	0.60		0.26	0.26
Clearance Time (s)		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1428	1997		463	414
v/s Ratio Prot			0.19		c0.05	
v/s Ratio Perm		c0.51				0.02
v/c Ratio		0.86	0.32		0.21	0.07
Uniform Delay, d1		13.8	8.4		24.1	23.2
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		5.3	0.1		1.0	0.3
Delay (s)		19.2	8.5		25.1	23.5
Level of Service		B	A		C	C
Approach Delay (s)		19.2	8.5		24.3	
Approach LOS		B	A		C	
Intersection Summary						
HCM 2000 Control Delay			16.3		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.66			
Actuated Cycle Length (s)			83.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			75.6%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

460 Lockhart Road
1: Lockhart Rd & Ball Gate

Queues
Total (2037) AM Peak Hour



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑
Traffic Volume (vph)	36	373	1195	84	183
Future Volume (vph)	36	373	1195	84	183
Lane Group Flow (vph)	0	444	1358	91	199
Turn Type	Perm	NA	NA	Prot	Perm
Protected Phases		4	8	6	
Permitted Phases	4				6
Detector Phase	4	4	8	6	6
Switch Phase					
Minimum Initial (s)	20.0	20.0	20.0	14.0	14.0
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0
Total Split (s)	63.0	63.0	63.0	27.0	27.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	Max	Max
v/c Ratio		0.33	0.76	0.17	0.37
Control Delay		9.9	16.0	22.2	16.8
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		9.9	16.0	22.2	16.8
Queue Length 50th (m)		16.1	67.4	8.5	12.3
Queue Length 95th (m)		23.7	88.0	23.4	35.7
Internal Link Dist (m)		419.5	318.1	201.2	
Turn Bay Length (m)				40.0	
Base Capacity (vph)		2111	2801	543	536
Starvation Cap Reductn		0	0	0	0
Spillback Cap Reductn		0	0	0	0
Storage Cap Reductn		0	0	0	0
Reduced v/c Ratio		0.21	0.48	0.17	0.37

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 70.2

Natural Cycle: 60

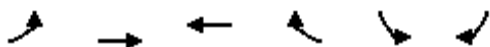
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Lockhart Rd & Ball Gate



460 Lockhart Road
1: Lockhart Rd & Ball Gate

HCM Signalized Intersection Capacity Analysis
Total (2037) AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Traffic Volume (vph)	36	373	1195	54	84	183
Future Volume (vph)	36	373	1195	54	84	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	0.99		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3410	3396		1789	1601
Flt Permitted		0.75	1.00		0.95	1.00
Satd. Flow (perm)		2558	3396		1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	405	1299	59	91	199
RTOR Reduction (vph)	0	0	5	0	0	49
Lane Group Flow (vph)	0	444	1353	0	91	150
Heavy Vehicles (%)	2%	7%	7%	2%	2%	2%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		36.6	36.6		21.3	21.3
Effective Green, g (s)		36.6	36.6		21.3	21.3
Actuated g/C Ratio		0.52	0.52		0.30	0.30
Clearance Time (s)		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1339	1778		545	487
v/s Ratio Prot			c0.40		0.05	
v/s Ratio Perm		0.17				c0.09
v/c Ratio		0.33	0.76		0.17	0.31
Uniform Delay, d1		9.6	13.2		17.8	18.6
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.1	2.0		0.7	1.6
Delay (s)		9.7	15.2		18.5	20.3
Level of Service		A	B		B	C
Approach Delay (s)		9.7	15.2		19.7	
Approach LOS		A	B		B	
Intersection Summary						
HCM 2000 Control Delay			14.6		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			69.9		Sum of lost time (s)	12.0
Intersection Capacity Utilization			59.8%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

460 Lockhart Road
1: Lockhart Rd & Ball Gate

Queues
Total (2037) PM Peak Hour



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑
Traffic Volume (vph)	181	1121	614	89	100
Future Volume (vph)	181	1121	614	89	100
Lane Group Flow (vph)	0	1415	783	97	109
Turn Type	Perm	NA	NA	Prot	Perm
Protected Phases		4	8	6	
Permitted Phases	4				6
Detector Phase	4	4	8	6	6
Switch Phase					
Minimum Initial (s)	20.0	20.0	20.0	14.0	14.0
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0
Total Split (s)	93.0	93.0	93.0	27.0	27.0
Total Split (%)	77.5%	77.5%	77.5%	22.5%	22.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	Max	Max
v/c Ratio		0.92	0.35	0.26	0.26
Control Delay		24.2	6.9	40.5	9.8
Queue Delay		0.0	0.0	0.0	0.0
Total Delay		24.2	6.9	40.5	9.8
Queue Length 50th (m)		109.0	28.5	16.2	0.0
Queue Length 95th (m)		148.1	36.4	36.2	15.2
Internal Link Dist (m)		419.5	318.1	201.2	
Turn Bay Length (m)				40.0	
Base Capacity (vph)		1990	2887	379	426
Starvation Cap Reductn		0	0	0	0
Spillback Cap Reductn		0	0	0	0
Storage Cap Reductn		0	0	0	0
Reduced v/c Ratio		0.71	0.27	0.26	0.26

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 101.4

Natural Cycle: 90

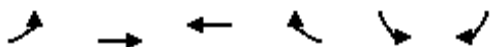
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Lockhart Rd & Ball Gate



460 Lockhart Road
1: Lockhart Rd & Ball Gate

HCM Signalized Intersection Capacity Analysis
Total (2037) PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑
Traffic Volume (vph)	181	1121	614	107	89	100
Future Volume (vph)	181	1121	614	107	89	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	6.0
Lane Util. Factor		0.95	0.95		1.00	1.00
Frt		1.00	0.98		1.00	0.85
Flt Protected		0.99	1.00		0.95	1.00
Satd. Flow (prot)		3410	3359		1789	1601
Flt Permitted		0.68	1.00		0.95	1.00
Satd. Flow (perm)		2321	3359		1789	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	1218	667	116	97	109
RTOR Reduction (vph)	0	0	14	0	0	86
Lane Group Flow (vph)	0	1415	769	0	97	23
Heavy Vehicles (%)	2%	7%	7%	2%	2%	2%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)		67.6	67.6		21.5	21.5
Effective Green, g (s)		67.6	67.6		21.5	21.5
Actuated g/C Ratio		0.67	0.67		0.21	0.21
Clearance Time (s)		6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1551	2245		380	340
v/s Ratio Prot			0.23		c0.05	
v/s Ratio Perm		c0.61				0.01
v/c Ratio		0.91	0.34		0.26	0.07
Uniform Delay, d1		14.2	7.2		33.1	31.8
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		8.5	0.1		1.6	0.4
Delay (s)		22.7	7.3		34.8	32.2
Level of Service		C	A		C	C
Approach Delay (s)		22.7	7.3		33.4	
Approach LOS		C	A		C	
Intersection Summary						
HCM 2000 Control Delay		18.6		HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio		0.75				
Actuated Cycle Length (s)		101.1		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		83.3%		ICU Level of Service	E	
Analysis Period (min)		15				
c Critical Lane Group						

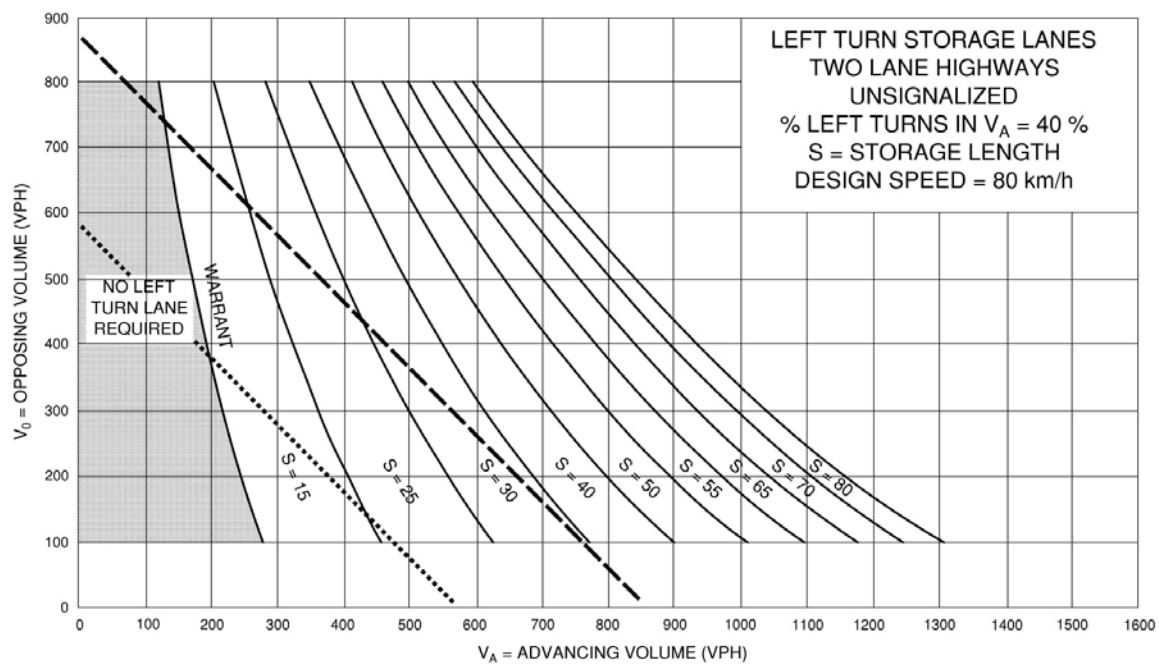
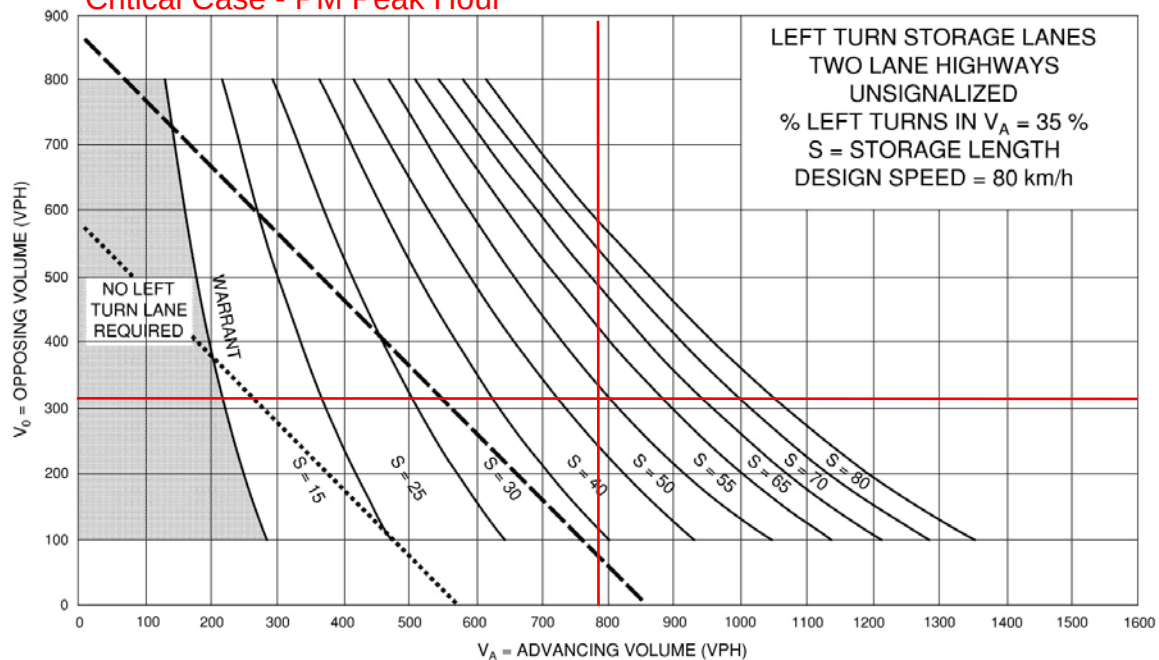
Appendix G – MTO Left Turn Warrant Analysis

Ball Gate / Lockhart Road

2027 Total - Eastbound

Exhibit 9A-17

Critical Case - PM Peak Hour



Appendix H – OTM Signal Justification Sheets

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

Lockhart Road / Ball Gate

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	176	24%	16%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	114	45%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	749	104%	38%	NO	YES
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	43	58%		NO	NO