

# Hanley Park Transportation Letter





# **Technical Memorandum**

To:	Greg Pinchin – City of Belleville	Date:	2025-10-15
Cc:	Joe Cimer – The Grand Circus Group Inc.		
From:	Robin Marinac – CGH Transportation  Mark Crockford – CGH Transportation	Project Number:	2025-136

#### Re: Hanley Park Belleville – Traffic Letter

#### 1 Introduction

This Traffic Letter has been prepared to serve as a covering letter for the previously submitted Hanley Park North Subdivision Traffic Impact Study (TIS) prepared by D.J. Halpenny & Associated Ltd. in December 2021. The TIS informs the scope of work for this traffic letter and is included in Attachment 1. It is noted that while the TIS was prepared in 2021, the Institute of Transportation Engineer's Multimodal Transportation Impact Analysis for Site Development (2023) indicates that the typical shelf-life of a traffic study is three years and extensions may be evaluated on a case-by-case basis. As the TIS is less than four years old, the surrounding neighborhood adjacent to the development has not undergone substantial changes or growth, the operational analysis results in the TIS indicate the analyzed intersections operate well, and City of Belleville staff have indicated that the study only needs to be updated with new information, a new TIS is not required. As such, this Traffic Letter identifies and documents any new information that may impact the results of the Hanely Park North Subdivision TIS (December 2021).

The Hanley Park residential development located to the east of Haig Road and to the north of Victoria Avenue in the City of Belleville is proposed to consist of a total of 103 residential dwelling units. These residential units will be made up of 74 single-detached units and 29 townhouse units. The subdivision will be constructed in phases and is anticipated to be fully built out by 2029. Access will be provided via Street A to a connection to Tessa Boulevard. The draft plan is included in Attachment 2.

The Hanely Park North Subdivision TIS (December 2021) examined three analysis horizons, including existing (2020), build-out (2029), and build-out plus five years (2034). This Traffic Letter will identify changes to the 2034 future analysis horizon only to in order to reflect the most conservative condition.

## 2 Future Conditions Comparison

#### 2.1 Forecasting

No changes to the proposed development plan have been noted and no changes to the adjacent neighbourhood or roadway network have been identified since the completion of the Hanley Park North Subdivision TIS (December 2021). As such, the site generated trips and the background growth rates used to develop the projected future total traffic volumes shown in the TIS remain valid. The 2034 future total traffic volumes as shown in the TIS are illustrated in Figure 1 below.

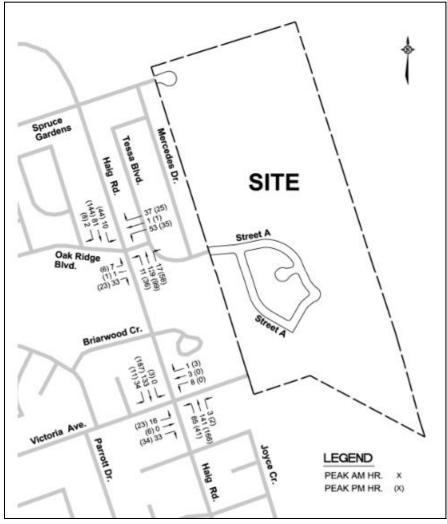


Figure 1: 2034 Future Total Traffic Volumes

Source: Hanley Park North Subdivision Traffic Impact Study, December 2021, D.J. Halpenny & Associated Ltd.

#### 2.2 Other Study Area Developments

A proposed background development which was not considered in the Hanely Park North Subdivision TIS (December 2021) has been identified to the south of the subject site and is expected to impact the TIS Study Area intersections. The background development and traffic associated with it has been summarized below.

#### 2.2.1 621 Dundas Street East

The proposed residential development is located on the southwest corner of the intersection of Haig Road and Dundas Street East. The following information has been taken from the 621 Dundas Street East Traffic Impact Study (December 2024) prepared by GHD. Phase 1 of the development consists of 185 mid-rise units and 72 back-to-back townhouse units and is anticipated to be built out by 2025. Phase 2 of the development consists of 176 stacked townhouse units, 58 2-story townhouse units, and 36 bungalow townhouse units and is anticipated to be built out by 2027. Phase 3 of the development consists of 36 bungalow townhouse units, 7 detached townhouse units, and 29 detached units and is anticipated to be built out by 2029. As such, all phases of the development will be considered in the 2034 analysis horizon. The development is anticipated to generate 342 AM and 388 PM peak hour two-way vehicle trips. The 2029 site generated trips for the 621 Dundas Street East development is shown in Figure 2 below.

Haig Road (24)12 Dundas Street East Dundas Street East 45 (97)(121)25 34 ĸ 7 143 26 91 (58)(15) (73)**LEGEND** XX AM Peak Hour Volumes (XX) PM Peak Hour Volumes Site Access Traffic Signal

Figure 2: 621 Dundas Street East Site Generated Trips (2029)

Source: 621 Dundas Street East Traffic Impact Study, December 2024, GHD.

Background traffic volumes associated with the 621 Dundas Street East development has been assigned to the Study Area intersections based on travel patterns shown in the 2034 future background volumes shown in the Hanley Park North Subdivision TIS (December 2021) as well as engineering judgement. These trips are expected to travel primarily northbound and southbound along Haig Road. Given that no connections to the east of Haig Road would provide access to the broader transportation network, it is assumed that all background traffic would travel to and from the west of the site, and background trips have been assigned only to the northbound left, northbound through, eastbound right, and southbound through movements at the study intersections accordingly. Figure 3 below shows the background volumes assignment.

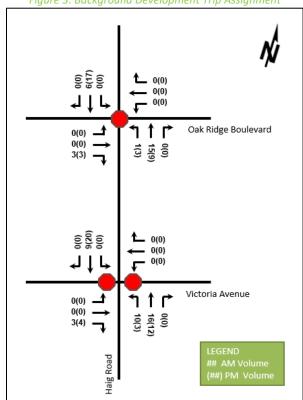


Figure 3: Background Development Trip Assignment

#### 2034 Future Total Traffic

Traffic volumes from the newly identified background development traffic have been combined with the 2034 future total traffic volumes shown in the Hanley Park North Subdivision TIS (December 2021) to determine the updated 2034 future total traffic volumes, shown in Figure 4 below.

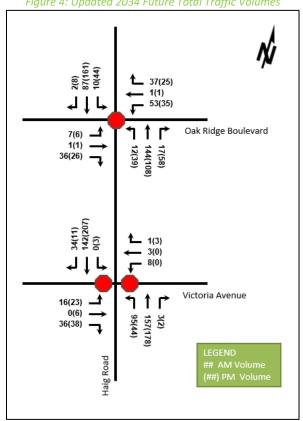


Figure 4: Updated 2034 Future Total Traffic Volumes

## Operational Analysis Comparison

While the differences between the original and updated 2034 future total volumes are minor, Synchro (Version 11) has been used to model the Study Area intersections to reflect the updated volumes.

Level of Service (LOS) have been defined using HCM definition for unsignalized intersections in Table 1 below.

Level of Service	Average Control Delay (Second/Vehicle)
Α	≤10
В	>10 – 15
С	>15 – 25
D	>25 – 35
E	>35 – 50
F	>50

Table 1: LOS Criteria for Unsignalized Intersections

It is noted that a different traffic analysis software was used in the Hanley Park North Subdivision TIS (December 2021) analysis. However, intersection configurations, Peak Hour Factors (PHF) and Heavy Vehicle percentage (HV%) assumptions have been carried forward within this study to ensure consistent analysis results. All other parameters have been modelled using accepted best practices and default parameters where applicable.

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The comparison of the operational analysis is presented in Table 2. Previous intersection analysis worksheets can be found in the Hanley Park North Subdivision TIS (December 2021) in Attachment 1. The updated analysis Synchro worksheets can be found in Attachment 3.

Table 2: 2034 Future Total Operational Analysis Comparison

				ak Hour	γ	PM Peak Hour					
Intersection	Mvmnt	LOS	V/C	Del. (s)	Q (95 <sup>th</sup> )	LOS	v/c	Del. (s)	Q (95 <sup>th</sup> )		
	2021 TIS Analysis										
	EBL/T/R	Α	-	7	<1	Α	-	8	<1		
	WBL/T/R	Α	-	8	<1	Α	-	8	<1		
	NBL/T/R	Α	-	8	1	Α	-	9	1		
Haig Road and Oak Ridge	SBL/T/R	Α	-	8	<1	Α	-	9	1		
Boulevard	Overall	Α	-	8	-	Α	-	9	-		
(Unsignalized)		Updated Analysis									
(Olisigilalizeu)	EBL/T/R	Α	0.06	8	<1	Α	0.05	8	<1		
	WBL/T/R	Α	0.12	8	<1	Α	0.09	8	<1		
	NBL/T/R	Α	0.23	9	1	Α	0.27	9	1		
	SBL/T/R	Α	0.13	8	1	Α	0.29	9	1		
	Overall	Α	-	8	-	Α	-	9	-		
	2021 TIS Analysis										
	EBL/T/R	В	0.08	11	<1	В	0.11	12	<1		
	WBL/T/R	В	0.03	13	<1	Α	0.00	9	0		
	NBL/T/R	Α	0.07	8	<1	Α	0.03	8	<1		
Haig Road and Victoria	SBL/T/R	Α	0.00	8	0	Α	0.00	8	0		
Avenue	Overall	-	-	-	-	-	-	-	-		
(Unsignalized)				Updat	ed Analys	is					
(Onsignanzeu)	EBL/T/R	В	0.09	11	2	В	0.12	12	3		
	WBL/T/R	В	0.03	14	1	Α	0.00	9	<1		
	NBL/T/R	Α	0.08	3	2	Α	0.04	2	1		
	SBL/T/R	Α	0.00	0	0	Α	0.00	<1	0		
	Overall	Α	-	3	-	Α	-	2	-		

It is noted that the 2021 TIS results show low delays and LOS results of B or better at both Study Area intersections.

As shown above, the increase in traffic from the adjacent background development has a minimal impact on the operational analysis of these intersections as they are shown to continue to operate with low delays and LOS results of B or better in the 2034 future total horizon.

#### 4 Conclusions

With the addition of the background development at 621 Dundas Street East, the resulting increase in traffic in the ultimate 2034 analysis horizon will have minimal impact on the operational analysis of the Study Area intersections. As such, this Traffic Letter demonstrates that the conclusions of the Hanley Park North Subdivision TIS (December 2021) remain valid, and the subject development should proceed from a traffic perspective.

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Please call or email if you have any questions.

Yours truly,



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# Attachment 1

Hanley Park North Subdivision Traffic Impact Study

# HANLEY PARK NORTH SUBDIVISION EAST OF HAIG ROAD BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY (REVISED)

December 8, 2021

#### D. J. Halpenny & Associates Ltd.

CONSULTING TRANSPORTATION ENGINEERS
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## HANLEY PARK NORTH SUBDIVISION EAST OF HAIG ROAD BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY (REVISED)

December 8, 2021

Prepared for:

Hanley Park Developments Inc. 1058A Albion Road, Suite 207 Etobicoke, ON M9V 1A7

729 TIS Report\_3.doc

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HANLEY PARK NORTH SUBDIVISION EAST OF HAIG ROAD BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY (REVISED)

#### 1. INTRODUCTION

A Site Plan has been prepared for a development of a 35.16 ha parcel of vacant land at the east end of the City of Belleville in the County of Hastings. The subdivision will be located east of Haig Road and north of Victoria Avenue. The subdivision will consist of 74 single-family homes and 29 townhouses for a total of 103 dwelling units. The subdivision will be constructed in phases which will be dependent on market demands. Completion is expected by 2029. Figure 1.1 shows the location of the subdivision.

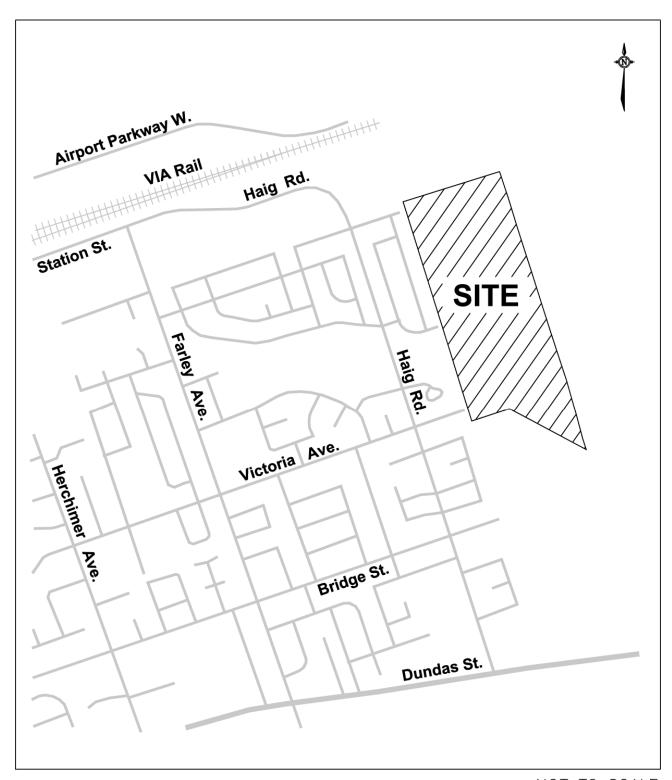
The subdivision will be known as Hanley Park North and will have two access points onto the municipal road network. The first access will be from Street A onto Haig Road by way of the local streets of Tessa Boulevard and Oak Ridge Boulevard which will serve 68 single-family homes and 29 townhouse units. The intersection of Oak Ridge Boulevard and Haig Road is controlled by all-way stop signs. The second access will be from Spruce Gardens onto Haig Road which is an all-way stop-controlled intersection which will serve 6 single-family subdivision homes.

The firm of D. J. Halpenny & Associates Ltd. has been retained by Hanley Park Developments Inc. to prepare a Traffic Impact Study report for the subdivision in support of the Draft Plan of Subdivision Application. The report will examine the impact that the site will have on the operation of the adjacent roads and intersections, and identify modifications to the road network which would be triggered by the subdivision.

#### 1.1 Purpose and Scope of Work

The purpose of the Traffic Impact Study (TIS) will be to examine the major intersections within the study area which would be impacted by the expected trips from the proposed Hanley Park North Subdivision. The study will determine the operation of the accesses to the subdivision following development of the lands, and determine if the proposed accesses are sufficient for the development or if roadway modifications would be required. Following correspondence with staff of the City of Belleville, the study area will consist of the Oak Ridge/Haig intersection which will be the main access point to the subdivision, and the Victoria/Haig intersection which will be the first major intersection south of the site. The Spruce Gardens/Haig intersection will not be examined as the additional 6 future homes will have only a minor impact on the intersections in the area.

FIGURE 1.1 **SITE LOCATION PLAN** 



The analysis will be conducted for the existing 2020 traffic, and traffic at both the completion of the subdivision in the year 2029 and at the year 2034 which represents five years beyond completion. The time period would be for the weekday peak AM and PM hours, which are expected to be the peak traffic periods for the residents of the subdivision and of the background traffic.

#### 2. ADJACENT ROADS AND INTERSECTIONS

#### Roadways

Street A of the subdivision will connect to Haig Road by way of Tessa Boulevard and Oak Ridge Boulevard, which are both two lane urban local streets. Oak Ridge Boulevard is located approximately 390 m north of Victoria Avenue, connecting Haig Road with Tessa Boulevard. Tessa Boulevard connects to Oak Ridge Boulevard and terminates at a cul-de sac at the east end which will be the future access to the proposed subdivision. Both streets will have a pavement width of 8.0 m with a sidewalk along one side of the road. The speed limit is unposted with no parking restrictions along either road.

Haig Road is a north-south two lane collector road with a pavement width of 11.0 m. Haig Road has been extended in 2019 from Oak Ridge Boulevard to connect to Station Street at Farley Avenue. Sidewalks exist along both sides of the road and the speed limit is unposted at 50 km,/h. On-street parking is restricted along the west side of the road from Oak Ridge Boulevard south to Dundas Street. Along the east side parking is restricted between Oak Ridge Boulevard and Briarwood Crescent. Cycling lanes are provided along both sides of the road north from Oak Ridge Boulevard to Farley Avenue. Truck travel is prohibited north of Victoria Avenue to east of Farley Avenue.

Victoria Avenue is an east-west arterial road connecting to Front Street to the west and extends approximately 180 m east of Haig Road. Victoria Avenue is a two lane urban road with sidewalks along both sides of the road. On-street parking is permitted on both sides of the road. The speed limit is unposted at 50 km./h.

#### Intersections

The intersection of Oak Ridge Boulevard and Haig Road is an all-way stop-controlled intersection with Haig Road forming the northbound and southbound approaches, and Oak Ridge Boulevard the eastbound and westbound approaches. The following shows the lane configuration of the intersection:

Northbound Haig Road One shared left/through/right lane (Stop Sign) Southbound Haig Road One shared left/through/right lane (Stop Sign) Eastbound Oak Ridge Blvd. One shared left/through/right lane (Stop Sign) Westbound Oak Ridge Blvd. One shared left/through/right lane (Stop Sign)

## OAK RIDGE/HAIG INTERSECTION - Northbound Haig Rd. Approach



OAK RIDGE/HAIG INTERSECTION - Westbound Oak Ridge Blvd. Approach



The Victoria/Haig Intersection is a two-way stop-controlled intersection with Haig Road forming the north-south approaches and Victoria Avenue the east-west approaches. The following shows the lane configuration of the intersection:

Northbound Haig Road Southbound Haig Road Eastbound Victoria Avenue One shared left/through/right lane
One shared left/through/right lane

Eastbound Victoria Avenue One shared left/through/right lane (Stop Sign) Westbound Victoria Avenue One shared left/through/right lane (Stop Sign)

#### **VICTORIA/HAIG INTERSECTION - Northbound Haig Rd. Approach**

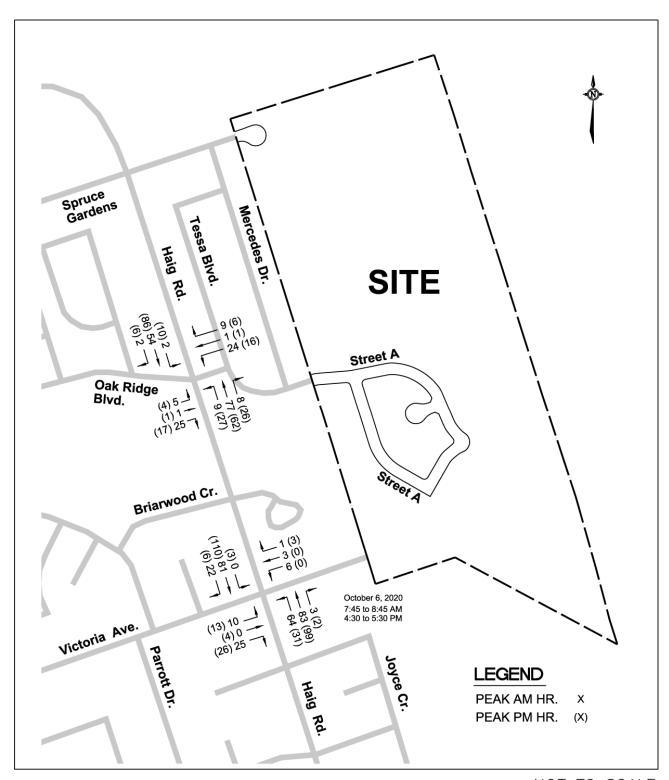


#### VICTORIA/HAIG INTERSECTION - Eastbound Victoria Ave. Approach



Figure 2.1 shows the peak AM hour traffic counts which occurred between 7:45 and 8:45 and peak PM hour traffic between 4:30 and 5:30 which were taken by the consultant on October 6, 2020. The 2020 counts are presented in the Appendix as Exhibit 1 for the Victoria/Haig intersection. The traffic for the Oak Ridge/Haig intersection was determined using a trip generation analysis of the development in the area assuming the completion of the homes along Tessa Boulevard and Mercedes

FIGURE 2.1 2020 PEAK AM AND PM HOUR TRAFFIC



Drive. The traffic volumes were then balanced with the counts taken at the Victoria/Haig intersection on October 6, 2020.

#### Transit

City of Belleville has a public transit system which provides two transit routes in close proximity to the site. Route 1 - Plaza, is a route which provides service downtown to City Hall/Terminal. The route travels southbound along Haig Road between Oak Ridge Boulevard and Victoria Avenue. Access from the subdivision to the bus stops along Haig Road would be from Oak Ridge Boulevard and the pedestrian walkway to Haig Road located 65 m south of Oak Ridge Boulevard. Route 2 - Parkwood Heights, is a route which travels northbound along Haig Road between Dundas Street and Victoria Avenue, providing service to the downtown and City Hall/Terminal.

#### 3. PROPOSED HANLEY PARK NORTH SUBDIVISION

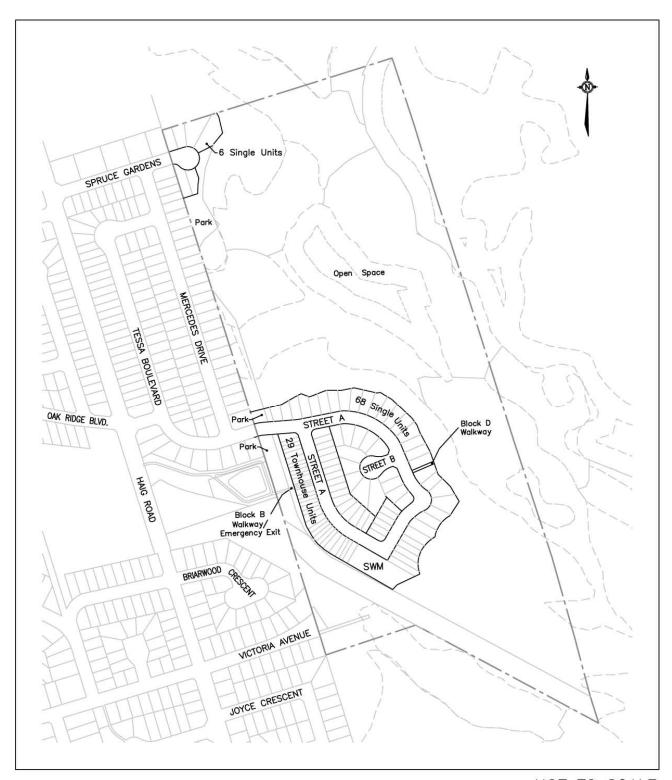
Hanley Park Developments Inc. has proposed the development of the Hanley Park North subdivision at the east limits of the City of Belleville. The subdivision will be located on 35.16 ha of vacant land just east of Haig Road and north of Victoria Avenue. Of the total parcel of land for the subdivision, 8.02 ha will be developable lands located in the south portion of the property, with 27.14 ha on the north portion and south property limit of the site which will be protected from development and retained in a natural state. The lands are current zoned Residential Holding zone (RH-1) and Environmental Control zone (E). The property will require a zoning by-law amendment application to rezone the property to support the proposed residential housing. The existing development surrounding the proposed subdivision consists of residential housing.

The subdivision will provide 103 homes which would consist of 74 single-family homes and 29 townhouse units. The subdivision will have one access point onto Haig Road from Oak Ridge Boulevard which will accommodate 97 dwelling units. Oak Ridge Boulevard connects to Tessa Boulevard which currently terminates at a cul-de-sac planned as a point of access for future development on the subject lands. A second access is provided along Spruce Gardens to Haig Road which will service 6 singlefamily homes. The subdivision will also provide an emergency access onto Haig Road through a recreational walkway along Block B which connects Street A to Haig Road approximately 65 m south of the Oak Ridge/Haig intersection. A second pedestrian walkway is provided along Block D at the east portion of the site which accesses the wetland and environmentally protected portion of the property.

All of the streets within the subdivision will be local streets with a sidewalk along one side of the road. On-street parking will be permitted within the subdivision.

The Hanley Park North subdivision will be constructed according to market demands with completion expected by the year 2029. A conceptual site plan for the subdivision is shown in Figure 3.1.

FIGURE 3.1 CONCEPTUAL SITE PLAN



#### 4. TRAFFIC ANALYSIS

#### 4.1 **Trip Generation**

The trip analysis for the subdivision was determined using the statistical data published in the Institute of Transportation Engineers (ITE) document, Trip Generation, 10<sup>th</sup> Edition. The analysis used the fitted curve equations for the housing, with the ITE Trip Graph for the "Single-Family Detached Housing (210)" provided as Exhibit 2 for the 74 single-family housing units, and the "Multifamily Housing (Low-Rise) (220)" land use provided as Exhibit 3 for the 29 townhouse units. Table 4.1 presents the trip generation rates which were derived from the ITE Trip Graph equations.

**TABLE 4.1** TRIP GENERATION RATES

RESIDENTIAL	ITE LAND USE	TRIP GENERATION RATE					
UNIT TYPE	THE LAND USE	Peak AM Hr.	Peak PM Hr.				
74 Single Homes	Single-Family Detached Housing ITE Land Use Code 210	0.775 T/DU T = 0.71 (X) + 4.80	1.028 T/DU Ln(T) = 0.96 Ln(X) + 0.20				
29 Townhouse Units	Multifamily Housing (Low-Rise) ITE Land Use Code 220	0.507 T/DU Ln(T) = 0.95 Ln(X) - 0.51	0.677 T/DU Ln(T) = 0.89 Ln(X) - 0.02				

Table 4.2 shows the expected number of peak hour site generated trips for the site during the weekday peak AM and PM hour. The trip table has assumed a transit mode share of 5 percent of the trips. The reduction would account for public transit trips between the subdivision and the downtown core and bus terminal.

**TABLE 4.2** PEAK HOUR SITE TRIPS GENERATED

UNIT TYPE	WEEK	DAY PEAK	AM HR.	WEEKDAY PEAK PM HR.				
UNITITE	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT		
74 Single-Family Homes	57	14 (25%)	43 (75%)	76	48 (63%)	28 (37%)		
29 Townhouse Units	15	3 (23%)	12 (77%)	20	13 (63%)	7 (37%)		
5% Transit Reduction	<u>4</u>	<u>1</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>2</u>		
TOTAL Site Trips	68	16	52	91	58	33		

4.2 **Trip Distribution** 

The distribution of expected site generated trips entering and exiting the Hanley Park North subdivision was determined from the examination of the 2020 peak hour traffic counts at the Victoria/Haig intersection which would show the traffic patterns in the area and would account for the extension of Haig Road to Station Street. These volumes would represent the weekday peak AM and PM hour commuter trips to/from the The determination of trips also considered the shortest and most subdivision. convenient routes to employment and retail areas. The site generated trips were distributed onto the adjacent roads to the following proportion:

To/From the North along Haig 55% To/From the South along Haig 45% → To/From the East along Victoria 10% To/From the South along Haig 35%

Figure 4.1 shows the expected weekday peak AM and PM hour site generated trips for the Hanley Park North subdivision using the expected peak hour trips from Table 4.2.

#### 5. TRAFFIC IMPACT

#### 5.1 **Background and Total Traffic Volumes**

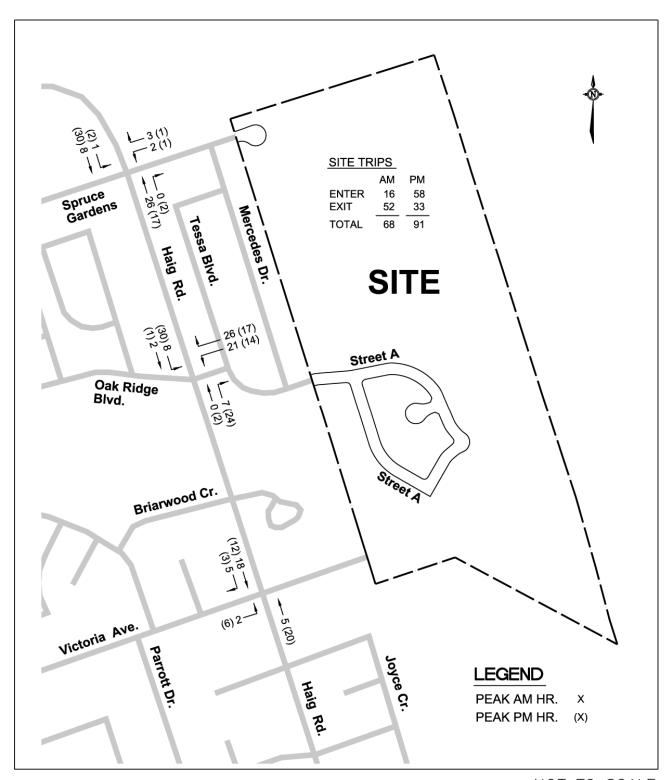
The background traffic would consist of the expected future traffic volumes which would include future development, but would not include the proposed Hanley Park North subdivision. The 2020 traffic counts taken at the intersection of Victoria Avenue and Haig Road were projected to the year 2029 when the total development is expected to be completed and the housing units substantially occupied.

The future background traffic was determined by applying the following two factors which would increase the October 6, 2020 traffic counts to the peak AM and PM hour pre-COVID-19 traffic (normalize to typical peak hour traffic), and the future traffic resulting from development outside the study area (future background traffic). The following are the two factors:

### 1) Typical Peak Hour Traffic (pre-COVID-19)

The October 6, 2020 traffic counts would need to be increased to account for the decreased traffic due to the COVID-19 outbreak which resulted from both the temporary job loss of some of the work force, and allowing some workers to work remotely from home. To convert the 2020 counts to the expected pre-COVID-19 traffic volumes, a conversion factor was applied to the counts. Traffic counts were obtained from the United Counties of Prescott and Russell which were taken along Russell Road 1.5 km. east of the Drouin/Russell intersection which would be influenced by Ottawa federal government employees working remotely. The location is approximately 2.5 km. east of the east city limit of the City of Ottawa. The July 2018 peak hour counts were compared to the September 2020 counts at the east approach to the Drouin/Russell intersection.

FIGURE 4.1
PEAK AM AND PM HOUR SITE GENERATED TRIPS



The counts showed that the 2020 counts were 11 percent lower during the peak AM hour and 15 percent lower during the peak PM hour. The counts are shown below:

Count Date	AM	PM
July 2018	491	524
September 2020	<u>441</u>	<u>457</u>
	-11%	-15%

The study has therefore assumed a 15 percent COVID-19 adjustment factor which was applied to all approaches of the Victoria/Haig and Oak Ridge/Haig intersections which converted the 2020 counts to pre-COVID-19 traffic volumes. The typical 2020 peak AM and PM hour traffic following the application of the pre-COVID-19 factor is shown in Figure 5.1.

#### 2) Future 2029 and 2034 Background Traffic

The second factor represents the increase in traffic due to future development outside the study area. The study has examined the growth in population for the City of Belleville over the five year period between 2011 and 2016 from statistical data obtained from Canada Census. The census has shown the population to increase from 49,454 in 2011 to 50,716 in 2016. This would translate to an annual average compounded increase 0.505 percent. Utilizing the growth statistics discussed above, the study has assumed an annual average compounded growth of 1.0 percent which was applied to the traffic counts at all approaches to the Victoria/Haig and Oak Ridge/Haig intersections. The growth rate translates to the factors below which were applied to the typical traffic (pre-COVID-19) shown in Figure 5.1.

#### 1.0% Annual Increase

$2020 \rightarrow 2029$	1.094
2020 → 2034	1 149

The subdivision is located at the east edge of the urban boundary of the City of Belleville. With the exception of the proposed Hanley Park South subdivision, which is now labeled the Parkville Greens Subdivision and is located between Janlyn Crescent and Bridge Street, the surrounding area is essentially built out with little growth in the next few years. The expected traffic following the development of the Hanley Park South subdivision was determined from the December 6, 2012 Traffic Impact Study Update report which was prepared by this firm. The future subdivision traffic was added to the background traffic.

Figure 5.2 shows the expected 2029 peak AM and PM hour background traffic utilizing the above growth factors (excluding site generated trips) plus the expected trips from the Hanley Park South subdivision. Figure 5.3 shows the 2034 peak hour background traffic.

FIGURE 5.1 2020 PEAK AM AND PM HOUR TRAFFIC COUNTS (Pre-COVID-19)

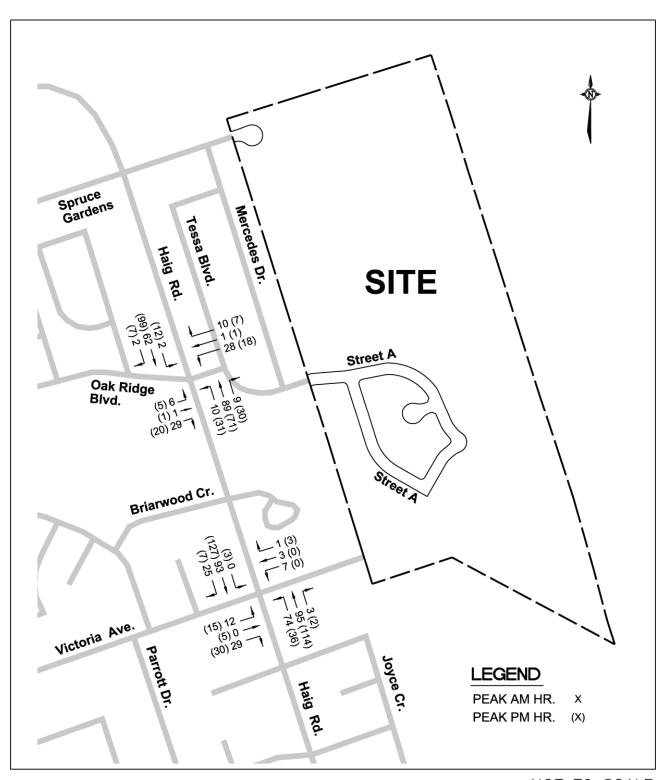


FIGURE 5.2 2029 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

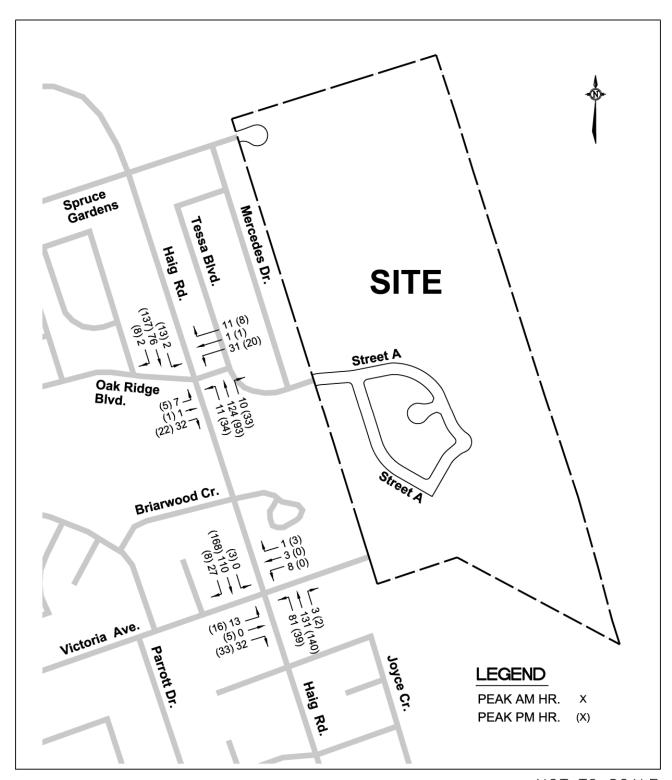
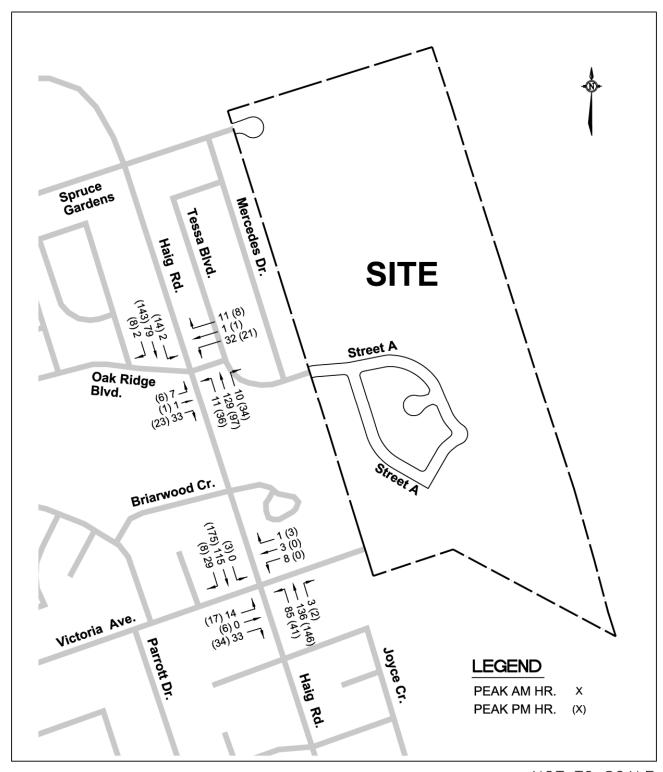


FIGURE 5.3 2034 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



The total traffic volumes are the addition of the future background traffic and the expected site generated trips (Figure 4.1). Figure 5.4 shows the 2029 total volume of traffic and Figure 5.5 the 2034 total traffic.

#### 5.2 Traffic Analysis

The Traffic Impact Study will examine the operation of the subdivision access onto Haig Road at the Oak Ridge/Haig intersection, and at the Victoria/Haig intersection located 390 m south of Oak Ridge Boulevard. The Spruce Gardens/Haig intersection was not examined as part of the study due to the low trips generated by the 6 single-family homes. The time period of the analysis would be the weekday peak AM and PM hour of the adjacent streets which was determined by the traffic counts. The study will examine the operation of the intersections for the traffic counts taken on October 6, 2020 which were adjusted to pre-COVID-19 volumes, at the year 2029 when the total subdivision is expected to be completed, and at the year 2034 which represents five years beyond completion. The analysis will utilize the *Highway Capacity Software, Version 7.9.5,* which uses the capacity analysis procedure as documented in the *Highway Capacity Manual (HCM) 2010 and HCM 6<sup>th</sup> Edition.* 

For unsignalized intersections, the level of service of each lane movement and approach is determined as a function of the delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected control delay at the approach.

LEVEL OF SERVICE	DELAY	
Level of Service A Level of Service B Level of Service C Level of Service D Level of Service E	0-10 sec./vehicle >10-15 sec./vehicle >15-25 sec./vehicle >25-35 sec./vehicle >35-50 sec./vehicle	Little or No Delay Short Traffic Delays Average Traffic Delays Long Traffic Delays Very Long Traffic Delays
Level of Service F	>50 sec./vehicle	Extreme Delays – Demand Exceeds Capacity

The expected length of queue at the critical lane movements for an unsignalized intersection was determined by the calculation of the 95<sup>th</sup> percentile queue at the lane approach as shown on the analysis work sheets provided in the Appendix. The 95<sup>th</sup> percentile queue length is the calculated 95<sup>th</sup> greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95<sup>th</sup> percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicles.

The results of the analysis are discussed in detail in the following sections:

#### Oak Ridge Boulevard/Haig Road Intersection

The Hanley Park North subdivision will have one access onto the surrounding roadway network for the 97 dwelling units. The access will be from Street A which will connect to

FIGURE 5.4 2029 PEAK AM AND PM HOUR TOTAL TRAFFIC

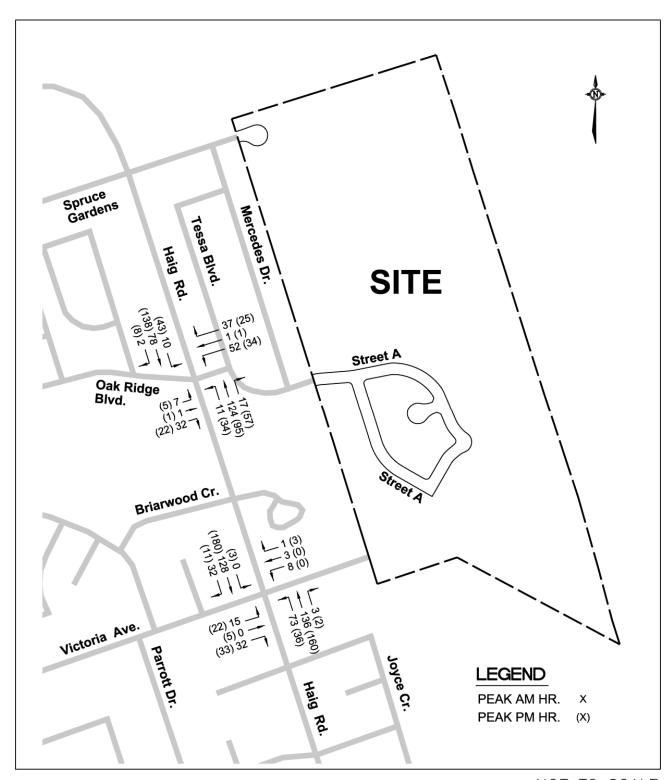
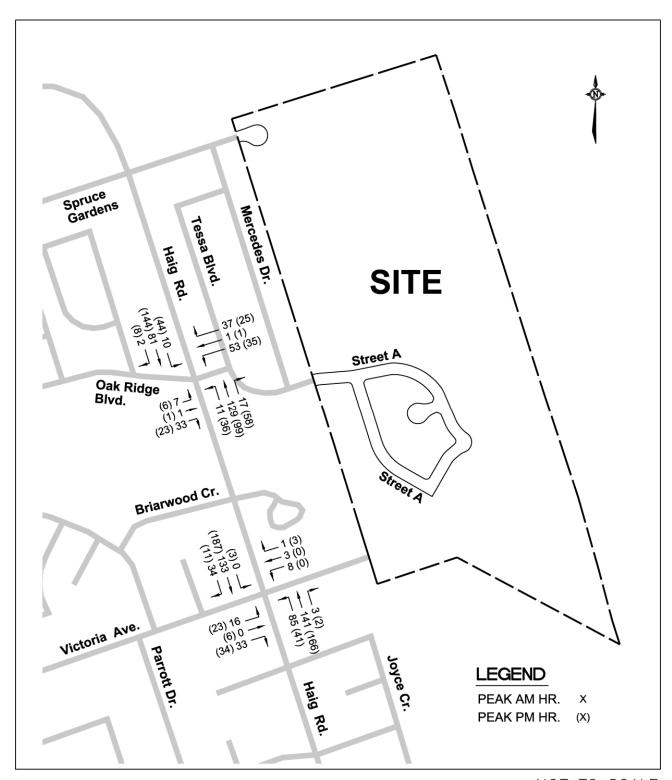


FIGURE 5.5 2034 PEAK AM AND PM HOUR TOTAL TRAFFIC



Tessa Boulevard, then to Haig Road by way of a 50 m section of Oak Ridge Boulevard linking Tessa Boulevard to Haig Road. All site generated traffic for the 97 units would

The Oak Ridge/Haig intersection is an all-way stop-controlled intersection with Haig Road forming the northbound and southbound approaches, and Oak Ridge Boulevard the eastbound and westbound approaches. All approaches will comprise of one lane

access the site from the existing intersection of Oak Ridge Boulevard and Haig Road.

An operational analysis was conducted for the 2020 typical traffic (pre-COVID-19) using the adjusted traffic of Figure 5.1. The analysis determined that all approaches to the intersection currently function at a Level of Service (LOS) "A" during both the peak AM and PM hour time periods. The operation of the all-way stop-controlled intersection is summarized in Table 5.1 with the analysis sheets provided in the Appendix as Exhibit 4 for the peak AM hour and Exhibit 5 for the peak PM hour.

TABLE 5.1
OAK RIDGE/HAIG INTERSECTION – LOS & Delay

having shared left/through/right vehicle movements.

Intersection Approach		<b>AM HOUR</b> 20 (2029) <b>2034</b>	<b>PEAK PM HOUR</b> YEAR 2020 (2029) <b>2034</b>			
	LOS	Delay (sec.)	LOS	Delay (sec.)		
EB Left/Through/Right – Oak Ridge	A (A) <b>A</b>	7.1 (7.4) <b>7.4</b>	A (A) <b>A</b>	7.2 (7.7) <b>7.7</b>		
WB Left/Through/Right – Oak Ridge	A (A) <b>A</b>	7.6 (8.0) <b>8.1</b>	A (A) <b>A</b>	7.7 (8.2) <b>8.2</b>		
NB Left/Through/Right – Haig	A (A) <b>A</b>	7.8 (8.3) <b>8.4</b>	A (A) <b>A</b>	7.9 (8.5) <b>8.6</b>		
SB Left/Through/Right – Haig	A (A) <b>A</b>	7.6 (8.0) <b>8.1</b>	A (A) <b>A</b>	7.9 (8.8) <b>8.9</b>		

Following the completion of the subdivision in 2029, all approaches to the intersection would continue to function at a LOS "A" during both the peak AM and PM hours. A summary of the intersection is presented in Table 5.1 with the analysis sheets provided as Exhibit 6 and Exhibit 7.

The operation of the intersection using the expected 2034 traffic, which represents five years beyond completion of the subdivision, determined that all approaches continued to function at a LOS "A" during the peak AM and PM hours. Table 5.1 summarizes the 2034 operation of the intersection with the analysis sheets provided as Exhibits 8 and 9.

The 95<sup>th</sup> percentile queue at the intersection utilizing the expected 2034 traffic determined that the queue at the westbound Oak Ridge Boulevard approach would be 0.4 vehicles during the peak AM hour. The northbound and southbound Haig Road approaches determined a 95<sup>th</sup> percentile queue of 1.0 vehicle during the peak PM hour.

Following the completion of the Hanley Park North subdivision, the intersection of Oak Ridge Boulevard and Haig Road would operate at an acceptable level of service with no roadway or intersection modifications triggered by the construction of the proposed subdivision.

#### Victoria Avenue and Haig Road Intersection

The intersection of Victoria Avenue and Haig Road is located 390 m south the intersection of Oak Ridge Boulevard and Haig Road. The Victoria/Haig intersection is a two-way stop-controlled intersection with stop signs placed at the eastbound and westbound Victoria Avenue approaches. All approaches to the intersection would be a single lane, each allowing shared left/through/right vehicular movements.

The operational analysis for the typical 2020 traffic (Figure 5.1) determined that during the peak AM hour the northbound and southbound Haig Road approaches and eastbound Victoria Avenue approach functioned at a LOS "A", and the westbound Victoria Avenue approach at a LOS "B". During the peak PM hour the northbound and southbound Haig Road approaches and westbound Victoria Avenue approach functioned at a LOS "A" and eastbound Victoria Avenue approach at a LOS "B". The 2020 operation of the intersection is summarized in Table 5.2 with the analysis sheets provided as Exhibit 10 for the peak AM hour and Exhibit 11 for the peak PM hour.

TABLE 5.2 VICTORIA/HAIG INTERSECTION – LOS & Delay

Intersection Approach		<b>AM HOUR</b> 20 (2029) <b>2034</b>	<b>PEAK PM HOUR</b> YEAR 2020 (2029) <b>2034</b>			
	LOS	Delay (sec.)	LOS	Delay (sec.)		
EB Left/Through/Right – Victoria	A (B) <b>B</b>	9.9 (10.5) <b>10.8</b>	B (B) <b>B</b>	10.2 (11.3) <b>11.5</b>		
WB Left/Through/Right – Victoria	B (B) <b>B</b>	11.8 (12.8) <b>13.3</b>	A (A) <b>A</b>	8.9 (9.1) <b>9.2</b>		
NB Left/Through/Right – Haig	A (A) <b>A</b>	3.6 (3.0) <b>3.3</b>	A (A) <b>A</b>	2.9 (1.6) <b>1.8</b>		
SB Left/Through/Right – Haig	A (A) <b>A</b>	0.0 (0.0) <b>0.0</b>	A (A) <b>A</b>	0.2 (0.1) <b>0.1</b>		

For the expected 2029 traffic following the completion of the subdivision, the Haig Road approaches functioned at a LOS "A" and Victoria Avenue approaches at a LOS "B" during the peak AM hour. During the peak PM hour the northbound and southbound Haig Road approaches and westbound Victoria Avenue approach would function at a LOS "A", and the eastbound Victoria Avenue approach at a LOS "B". The 2029 operation of the intersection is summarized in Table 5.2 with the analysis sheets provided as Exhibit 12 and Exhibit 13.

At the year 2034 the intersection would continue to operate at the same level of service as the 2029 traffic. Table 5.2 summarizes the 2034 operation of the intersection with the analysis sheets provided as Exhibit 14 for the peak AM hour and Exhibit 15 for the peak PM hour.

Utilizing the 2034 traffic volumes, the 95<sup>th</sup> percentile queue at the eastbound Victoria Avenue approach was determined to be 0.4 vehicles during the peak PM hour.

Following the completion of the Hanley Park North subdivision, the intersection of Victoria Avenue and Haig Road would operate at an acceptable level of service with no roadway or intersection modifications triggered by the construction of the proposed subdivision.

#### 5.3 Subdivision Roads and Accesses

The main access to the Hanley Park North subdivision will be from Street A connecting to Tessa Boulevard which currently ends at a cul-de-sac. The photo below shows the point of connection between Street A and Tessa Boulevard.

#### STREET A/TESSA CONNECTION - Eastbound Street A Approach



The photo was taken at the intersection of Tessa Boulevard and Mercedes Drive, looking east to the Street A connection. Roadway modifications due to the development of the subdivision would be the installation of a stop sign at the southbound Mercedes Drive approach to the Mercedes/Tessa intersection.

The main street through the subdivision will be Street A, with a 40 m minor street labeled Street B connecting to Street A. All streets within the subdivision will have a pavement width of 8.0 m.

There is an emergency access onto Haig Road through a recreational walkway along Block B which connects Street A to Haig Road approximately 65 m south of the Oak Ridge/Haig intersection. The emergency access will be 9.0 m in width.

#### 6. FINDINGS AND RECOMMENDATIONS

A site plan has been prepared for a 35.16 ha parcel of land at the east limit of the City of Belleville. The subdivision is called Hanley Park North and will contain 74 single-family homes and 29 townhouse units constructed on 8.02 ha of developable land. The subdivision is divided into two portions:

- a) The north portion will contain 6 single-family homes at the easterly extension of Spruce Gardens. Access to Haig Road will be from Spruce Gardens. The 6 homes will be isolated from the rest of the subdivision.
- b) The south portion will have one access point onto Haig Road from a connection to Tessa Boulevard. The connection to the subdivision will be along Street A onto Tessa Boulevard, then along a 50 m length of Oak Ridge Boulevard to Haig Road. The south portion will contain 68 single-family homes and 29 townhouses.

The Traffic Impact Study report has examined the impact of the subdivision trips at the intersection of Oak Ridge Boulevard and Haig Road, and at the intersection of Victoria Avenue and Haig Road which is located 390 m south of Oak Ridge Boulevard. The analysis was conducted for the 2020 traffic, at the year 2029 which is when completion of the subdivision is expected, and at the year 2034 which represents five years beyond completion. The 2020 traffic counts were adjusted to account for the reduction of traffic due to the COVID-19 outbreak. The operation of the intersections was determined for the weekday peak AM and PM hours. The findings and recommendations of the study are summarized in the following:

- 1. The trip generation analysis determined that the Hanley Park North subdivision would generate 16 vehicles entering and 52 vehicles exiting the site during the weekday peak AM hour for a total of 68 vehicle trips, and 58 vehicles entering and 33 vehicles exiting during the peak PM hour for a total of 91 vehicle trips.
- 2. The 2020 traffic counts were adjusted to account for the decrease in peak hour traffic due to the COVID-19 outbreak. The counts were increase by a factor of 15 percent at all approaches to the intersections examined. The adjustment factor was determined from a comparison of 2018 and 2020 peak hour traffic counts taken along an arterial road at the east limit of the City of Ottawa.
- 3. The connection of Street A to Tessa Boulevard would be at the southeast leg of Tessa Boulevard. The existing cul-de-sac would be removed and replaced by the Street A connection. A stop sign is recommended at the southbound Mercedes Drive approach to the Mercedes/Tessa intersection.

- 4. An operational analysis for the Oak Ridge/Haig intersection determined that the intersection would operate at an acceptable level of service for the expected peak AM and PM hour traffic at the year 2034. There would be no modifications required to the intersection.
- 5. Following the development of the site, the intersection of Victoria/Haig which is located 390 south of Oak Ridge Boulevard, would operate at an acceptable level of service for the expected peak AM and PM hour traffic at the year 2034. There would be no modifications required to the intersection.
- 6. The Site Plan provides an emergency access to/from the subdivision. The emergency access will connect Street A to Haig Road through a recreational walkway along Block B. The walkway is located approximately 65 m south of the Oak Ridge/Haig intersection.

Prepared by:

David J. Halpenny, M. Eng., P. Eng.

David & Walsum



# **APPENDIX**

TRAFFIC COUNTS

ITE TRIP GENERATION DATA SHEETS

OPERATIONAL ANALYSIS WORK SHEETS

EXHIBIT 1
PEAK AM AND PM HOUR TRAFFIC COUNTS (October 6, 2020) – Victoria/Haig

#### **All Vehicles**

Time Period Northbound		So	Southbound		Eastbound		Westbound						
AM	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	Total
07:00 - 07:15	3	12	1	0	12	0	0	0	0	0	0	0	28
07:15 - 07:30	6	12	0	1	13	1	0	0	1	0	0	0	34
07:30 - 07:45	9	20	0	0	12	1	0	0	5	2	0	0	49
07:45 - 08:00	24	20	0	0	17	3	1	0	5	1	1	0	72
08:00 - 08:15	21	18	1	0	27	12	5	0	5	1	1	0	91
08:15 - 08:30	15	22	1	0	25	3	4	0	11	2	1	0	84
08:30 - 08:45	4	23	1	0	12	4	0	0	4	2	0	1	51
08:45 - 09:00	2	21	1	0	24	3	1	0	5	1	0	1	59
PM													
03:30 - 03:45	6	19	1	0	17	3	4	0	5	0	0	1	56
03:45 - 04:00	8	34	1	0	30	5	2	1	11	1	1	0	94
04:00 - 04:15	4	19	0	1	29	9	4	0	8	1	0	0	75
04:15 - 04:30	4	24	1	0	19	2	6	1	6	1	0	0	64
04:30 - 04:45	7	23	0	0	21	2	2	0	4	0	0	1	60
04:45 - 05:00	9	21	1	1	35	1	2	1	8	0	0	0	79
05:00 - 05:15	7	29	1	1	36	3	6	1	6	0	0	0	90
05:15 - 05:30	8	26	0	1	18	0	3	2	8	0	0	2	68

Truck & Bus Traffic

Time Period	Northbound			Southbound			Eastbound			Westbound			
AM	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	Total
07:00 - 07:15	1	0	0	0	0	0	0	0	0	0	0	0	1
07:15 - 07:30	0	0	0	0	1	0	0	0	0	0	0	0	1
07:30 - 07:45	1	0	0	0	0	1	0	0	0	0	0	0	2
07:45 - 08:00	4	1	0	0	1	0	0	0	1	0	0	0	7
08:00 - 08:15	2	0	0	0	1	1	0	0	0	0	0	0	4
08:15 - 08:30	1	1	0	0	1	0	0	0	0	0	0	0	3
08:30 - 08:45	1	1	0	0	1	0	0	0	0	0	0	0	3
08:45 - 09:00	0	1	0	0	1	0	0	0	0	0	0	0	2
PM													
03:30 - 03:45	2	0	0	0	0	0	2	0	0	0	0	0	4
03:45 - 04:00	0	0	0	0	1	0	1	0	1	0	0	0	3
04:00 - 04:15	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 - 04:30	1	0	0	0	1	0	0	0	0	0	0	0	2
04:30 - 04:45	1	0	0	0	0	0	0	0	0	0	0	0	1
04:45 - 05:00	0	0	0	0	1	0	0	0	0	0	0	0	1
05:00 - 05:15	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 - 05:30	0	1	0	0	1	0	0	0	0	0	0	0	2

### **EXHIBIT 2** ITE TRIP GENERATION MANUAL 10<sup>th</sup> Ed. – Single-Family Detached Housing (210)

# Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.

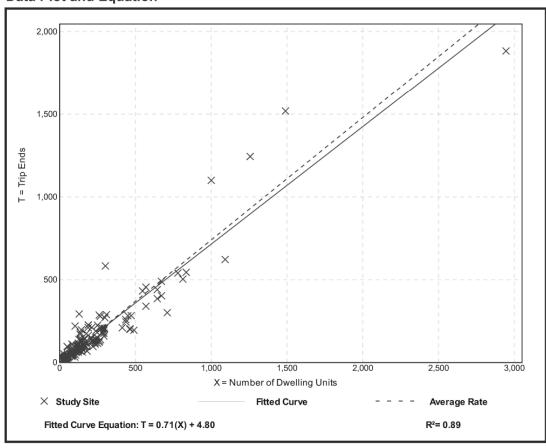
Setting/Location: General Urban/Suburban

Number of Studies: 173 Avg. Num. of Dwelling Units: 219

Directional Distribution: 25% entering, 75% exiting

#### Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27





# **Single-Family Detached Housing**

(210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

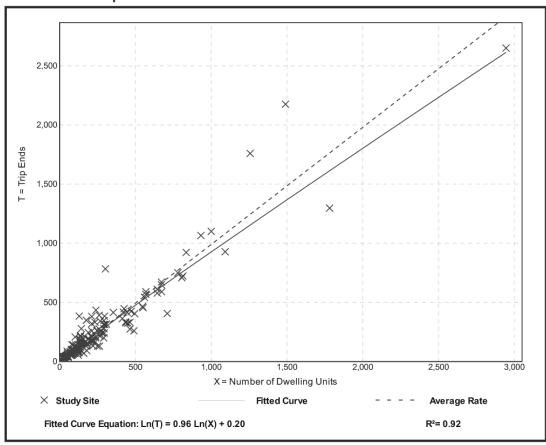
Setting/Location: General Urban/Suburban

Number of Studies: 190 Avg. Num. of Dwelling Units: 242

Directional Distribution: 63% entering, 37% exiting

#### Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31





# **EXHIBIT 3** ITE TRIP GENERATION MANUAL 10<sup>th</sup> Edition – Multifamily Housing (Low-Rise) (220)

# Multifamily Housing (Low-Rise) (220)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.

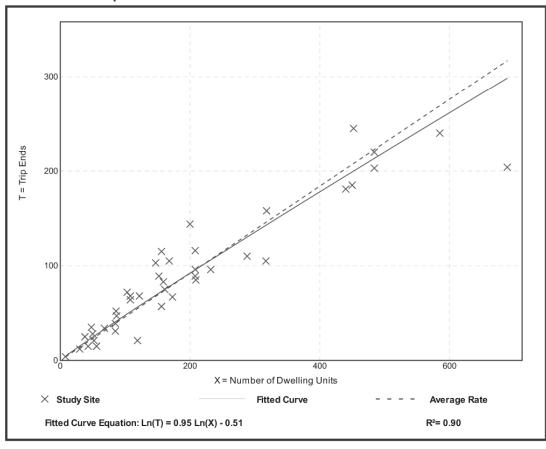
Setting/Location: General Urban/Suburban

Number of Studies: 42 Avg. Num. of Dwelling Units: 199

Directional Distribution: 23% entering, 77% exiting

#### Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12





# Multifamily Housing (Low-Rise) (220)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

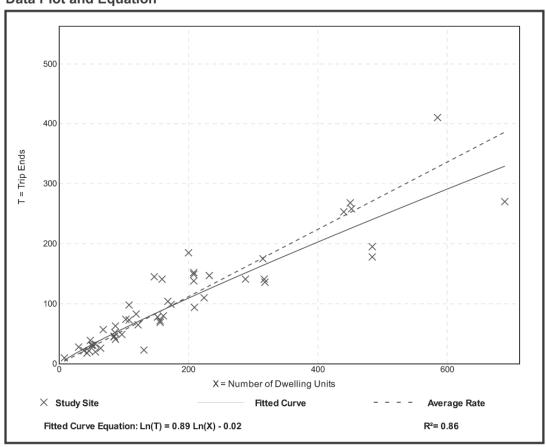
Setting/Location: General Urban/Suburban

Number of Studies: 50 Avg. Num. of Dwelling Units: 187

Directional Distribution: 63% entering, 37% exiting

#### Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16





		HCS7	All-W	ay Sto	ay Stop Control Report											
General Information					Site In	format	ion									
Analyst	Т				Intersec	tion			Oak Rid	ge/Haig						
Agency/Co.					Jurisdict	ion			City of E	Belleville						
Date Performed	11/19/2	020			East/We	st Street			Oak Rid	ge Bouleva	ırd					
Analysis Year	2020				North/S	outh Stree	t		Haig Ro	ad						
Analysis Time Period (hrs)	0.25				Peak Ho	ur Factor		0.92	2							
Time Analyzed	Peak AN	/ Hour Pre	-COVID-19													
Project Description	Hanley	Park North	Subdivisio	n												
Lanes																
			14 + X + 4 C	ነ <b>ተ</b> ቀገ	ታ ፖለ ነ	**************************************										
Vehicle Volume and Adjus	stments															
Approach		Eastbound			Westbound		1	Northboun	d		Southboun	d				
Movement	L	Т	R	L	T	R	L	T	R	L	Т	R				
Volume	6	1	29	28	1	10	10	89	9	2	62	2				
% Thrus in Shared Lane																
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3				
Configuration	LTR			LTR			LTR			LTR						
Flow Rate, v (veh/h)	39			42			117			72						
Percent Heavy Vehicles	1			1			1			1						
Departure Headway and S	ervice Ti	me														
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20						
Initial Degree of Utilization, x	0.035			0.038			0.104			0.064						
Final Departure Headway, hd (s)	3.92			4.36			4.13			4.20						
Final Degree of Utilization, x	0.043			0.051			0.135			0.084						
Move-Up Time, m (s)	2.0			2.0			2.0			2.0						
Service Time, ts (s)	1.92			2.36			2.13			2.20						
Capacity, Delay and Level	of Servic	e														
Flow Rate, v (veh/h)	39			42			117			72						
Capacity	918			827			871			858						
95% Queue Length, Q <sub>95</sub> (veh)	0.1			0.2			0.5			0.3						
Control Delay (s/veh)	7.1			7.6			7.8			7.6						
Level of Service, LOS	А			А			А			А						
Approach Delay (s/veh)		7.1			7.6			7.8			7.6					
Approach LOS		Α			Α			Α			Α					
Intersection Delay, s/veh   LOS			7	.6						A						

# EXHIBIT 5 2020 WEEKDAY PEAK PM HOUR ANALYSIS (Pre-COVID-19) – Oak Ridge/Haig

(apporal intormation					Site In	format	leport								
General Information	Т						ion		Oak Bid	ao/Usia					
Analyst Agency/Co.					Intersec				City of E	ge/Haig Selleville					
Date Performed	11/19/2	120				est Street			_	ge Bouleva	rd				
Analysis Year	2020	J20			-	outh Stree	+		Haig Ro		iu				
Analysis Time Period (hrs)	0.25				_	our Factor			0.92						
Time Analyzed	+	1 Hour Pre-	-COVID-19	ı	Teaking	our ructor			0.52						
Project Description			Subdivisio												
Lanes															
			14 174 1		<del>የ</del> የተነሱ	÷ ÷ ÷									
Vehicle Volume and Adjus	tments														
Approach		Eastbound			Westbound	t	1	Northboun	d	9	outhboun	d			
Movement	L	Т	R	L	Т	R	L	Т	R	L	T	R			
		- 1	20	10	1	7				10	99				
Volume	5	5 1 20		18	1		31	71	30	12	99	7			
% Thrus in Shared Lane	5	1	20	18	1		31	71	30	12	99	7			
	L1	L2	L3	L1	L2	L3	L1	71 L2	30 L3	L1	L2	7 L3			
% Thrus in Shared Lane															
% Thrus in Shared Lane Lane	L1			L1			L1			L1					
% Thrus in Shared Lane Lane Configuration	L1 LTR			L1 LTR			L1 LTR			L1 LTR					
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles	L1 LTR 28	L2		L1 LTR 28			L1 LTR 143			L1 LTR 128					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)	L1 LTR 28	L2		L1 LTR 28			L1 LTR 143			L1 LTR 128					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S	L1 LTR 28 1	L2		L1 LTR 28 1			L1 LTR 143			L1 LTR 128					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)	L1 LTR 28 1 ervice Til	L2		L1 LTR 28 1			L1 LTR 143 1			L1 LTR 128 1					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x	L1 LTR 28 1 ervice Til 3.20 0.025	L2		L1 LTR 28 1 3.20 0.025			L1 LTR 143 1 3.20 0.128			L1 LTR 128 1 3.20 0.114					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11	L2		L1 LTR 28 1 3.20 0.025 4.50			L1 LTR 143 1 3.20 0.128 4.08			L1 LTR 128 1 3.20 0.114 4.17					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032	L2		L1 LTR 28 1 3.20 0.025 4.50 0.035			L1 LTR 143 1 3.20 0.128 4.08 0.163			L1 LTR 128 1 3.20 0.114 4.17 0.149					
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles  Departure Headway and S Initial Departure Headway, hd (s) Initial Degree of Utilization, x Final Departure Headway, hd (s) Final Degree of Utilization, x  Move-Up Time, m (s) Service Time, ts (s)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032 2.0 2.11	L2  me		L1 LTR 28 1 3.20 0.025 4.50 0.035 2.0			L1 LTR 143 1 1 3.20 0.128 4.08 0.163 2.0			L1 LTR 128 1 3.20 0.114 4.17 0.149 2.0					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032 2.0 2.11	L2  me		L1 LTR 28 1 3.20 0.025 4.50 0.035 2.0			L1 LTR 143 1 1 3.20 0.128 4.08 0.163 2.0			L1 LTR 128 1 3.20 0.114 4.17 0.149 2.0					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level	L1 LTR 28 1 ervice Tin 3.20 0.025 4.11 0.032 2.0 2.11 of Service	L2  me		L1 LTR 28 1 3.20 0.025 4.50 0.035 2.0 2.50			L1 LTR 143 1 1 3.20 0.128 4.08 0.163 2.0 2.08			1 LTR 128 1 3.20 0.114 4.17 0.149 2.0 2.17					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032 2.0 2.11 of Servic 28	L2  me		1.1 LTR 28 1 3.20 0.025 4.50 0.035 2.0 2.50			L1 LTR 143 1 1 3.20 0.128 4.08 0.163 2.0 2.08			128 1 3.20 0.114 4.17 0.149 2.0 2.17					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032 2.0 2.11 of Servic 28 877	L2  me		L1 LTR 28 1			L1 LTR 143 1			L1 LTR 128 1					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity  95% Queue Length, Qos (veh)	L1 LTR 28 1 ervice Tin 3.20 0.025 4.11 0.032 2.0 2.11 of Servic 28 877 0.1	L2  me		L1 LTR 28 1 3.20 0.025 4.50 0.035 2.0 2.50 28 799 0.1			L1 LTR 143 1 3.20 0.128 4.08 0.163 2.0 2.08			128 1 3.20 0.114 4.17 0.149 2.0 2.17 128 864 0.5					
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity  95% Queue Length, Q95 (veh)  Control Delay (s/veh)	L1 LTR 28 1 ervice Til 3.20 0.025 4.11 0.032 2.0 2.11 of Servic 28 877 0.1 7.2	L2  me		L1 LTR  28  1  3.20  0.025  4.50  0.035  2.0  2.50  28  799  0.1  7.7			143 1 3.20 0.128 4.08 0.163 2.0 2.08 143 882 0.6 7.9			128 1 3.20 0.114 4.17 0.149 2.0 2.17 128 864 0.5 7.9					

							leport										
General Information					Site In	format	ion										
Analyst					Intersec	tion			Oak Rid	ge/Haig							
Agency/Co.					Jurisdict	tion			City of E	Belleville							
Date Performed	11/19/2	020			East/We	est Street			Oak Rid	ge Bouleva	ırd						
Analysis Year	2029				North/S	outh Stree	t		Haig Ro	ad							
Analysis Time Period (hrs)	0.25				Peak Ho	our Factor			0.92								
Time Analyzed	Peak AN	/ Hour															
Project Description	Hanley I	Park North	Subdivisio	n													
Lanes																	
			4 4 7 4 6	ጉ ቀ ቀ	ቀ የተኮሰ	÷ ÷ + c											
Vehicle Volume and Adjus	tments																
Approach		Eastbound	l		Westbound	d	1	Northboun	d	9	outhboun	d					
Movement	L	Т	R	L	T	R	L	T	R	L	Т	R					
	_			_						-							
Volume	5	1	5 1 32 5			37	11	124	17	10	78	2					
Volume % Thrus in Shared Lane	5	1	32	52	1	37	11	124	17	10	78	2					
	5 L1	1 L2	32 L3	52 L1	1 L2	37 L3	11 L1	124 L2	17 L3	10 L1	78 L2	2 L3					
% Thrus in Shared Lane																	
% Thrus in Shared Lane Lane	L1			L1			L1			L1							
% Thrus in Shared Lane Lane Configuration	L1 LTR			L1 LTR			L1 LTR			L1 LTR							
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h)	L1 LTR 41	L2		L1 LTR 98			L1 LTR 165			L1 LTR 98							
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles	L1 LTR 41	L2		L1 LTR 98			L1 LTR 165			L1 LTR 98							
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles Departure Headway and S	L1 LTR 41 1 ervice Til	L2		L1 LTR 98 1			L1 LTR 165			L1 LTR 98 1							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)	L1 LTR 41 1 ervice Til	L2		L1 LTR 98 1			L1 LTR 165 1			L1 LTR 98 1							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x	L1 LTR 41 1 ervice Til 3.20 0.037	L2		L1 LTR 98 1 3.20			L1 LTR 165 1 3.20 0.147			L1 LTR 98 1							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)	L1 LTR 41 1 <b>ervice Ti</b> 3.20 0.037 4.15	L2		L1 LTR 98 1 3.20 0.087 4.43			L1 LTR 165 1 3.20 0.147 4.29			L1 LTR 98 1 3.20 0.087 4.42							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x	L1 LTR 41 1 ervice Til 3.20 0.037 4.15 0.048	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120			L1 LTR 165 1 3.20 0.147 4.29 0.197			L1 LTR 98 1 3.20 0.087 4.42 0.120							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)	L1 LTR 41 1 ervice Til 3.20 0.037 4.15 0.048 2.0 2.15	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0			1 L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0			L1 LTR 98 1 3.20 0.087 4.42 0.120							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)	L1 LTR 41 1 ervice Til 3.20 0.037 4.15 0.048 2.0 2.15	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0			1 L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0			L1 LTR 98 1 3.20 0.087 4.42 0.120							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level	L1 LTR 41 1 ervice Tin 3.20 0.037 4.15 0.048 2.0 2.15 of Service	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0 2.43			L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0 2.29			L1 LTR 98 1 3.20 0.087 4.42 0.120 2.0							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)	L1 LTR 41 1 ervice Til 3.20 0.037 4.15 0.048 2.0 2.15 of Servic 41	L2		1 L1 LTR 98 1			1 L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0 2.29			L1 LTR 98 1 3.20 0.087 4.42 0.120 2.0 2.42							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity	L1 LTR 41 1  ervice Til 3.20 0.037 4.15 0.048 2.0 2.15  of Servic 41 867	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0 2.43			L1 LTR 165 1			L1 LTR 98 1 3.20 0.087 4.42 0.120 2.0 2.42							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity  95% Queue Length, Q95 (veh)	L1 LTR 41 1 ervice Tin 3.20 0.037 4.15 0.048 2.0 2.15 of Servic 41 867 0.1	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0 2.43			1 L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0 2.29 165 839 0.7			L1 LTR 98 1 3.20 0.087 4.42 0.120 2.0 2.42 98 814 0.4							
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)	L1 LTR 41 1 ervice Til 3.20 0.037 4.15 0.048 2.0 2.15 of Servic 41 867 0.1 7.4	L2		L1 LTR 98 1 3.20 0.087 4.43 0.120 2.0 2.43 98 813 0.4 8.0			1 L1 LTR 165 1 3.20 0.147 4.29 0.197 2.0 2.29 165 839 0.7 8.3			1 L1 LTR 98 1 3.20 0.087 4.42 0.120 2.0 2.42 98 814 0.4 8.0							

# **EXHIBIT 7** 2029 WEEKDAY PEAK PM HOUR ANALYSIS - Oak Ridge/Haig

					y Stop Control Report Site Information											
General Information					Site In	format	ion									
Analyst					Intersec	tion			Oak Rid	ge/Haig						
Agency/Co.					Jurisdict	tion			City of E	Belleville						
Date Performed	11/19/2	020			East/We	est Street			Oak Rid	ge Bouleva	ard					
Analysis Year	2029				North/S	outh Stree	t		Haig Ro	ad						
Analysis Time Period (hrs)	0.25				Peak Ho	our Factor			0.92							
Time Analyzed	Peak PN	1 Hour														
Project Description	Hanley I	Park North	Subdivisio	n												
Lanes																
			14 + 7 + 4	ጉ ቀ ቀ ነ	<del> </del>  * 	÷ ;										
Vehicle Volume and Adjus	tments															
Approach		Eastbound			Westbound	t t	1	Northboun	d	9	Southboun	d ———				
Movement	L	Т	R	L	T	R	L	T	R	L	Т	R				
Volume	5	1 22 34		34	1	25	34	95	57	43	138	8				
Volume % Thrus in Shared Lane	5	1	22	34	1	25	34	95	57	43	138	8				
	5 L1	1 L2	22 L3	34 L1	1 L2	25 L3	34 L1	95 L2	57 L3	43 L1	138 L2	8 L3				
% Thrus in Shared Lane																
% Thrus in Shared Lane Lane	L1			L1			L1			L1						
% Thrus in Shared Lane Lane Configuration	L1 LTR			L1 LTR			L1 LTR			L1 LTR						
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h)	L1 LTR 30	L2		L1 LTR 65			L1 LTR 202			L1 LTR 205						
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles	L1 LTR 30	L2		L1 LTR 65			L1 LTR 202			L1 LTR 205						
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles Departure Headway and S	L1 LTR 30 1	L2		L1 LTR 65			L1 LTR 202 1			L1 LTR 205						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)	L1 LTR 30 1 ervice Til	L2		L1 LTR 65 1			L1 LTR 202 1			L1 LTR 205 1						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x	L1 LTR 30 1 ervice Til 3.20 0.027	L2		L1 LTR 65 1 3.20 0.058			L1 LTR 202 1 3.20 0.180			L1 LTR 205 1 3.20 0.183						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)	L1 LTR 30 1 <b>ervice Ti</b> 3.20 0.027 4.47	L2		L1 LTR 65 1 3.20 0.058 4.72			L1 LTR 202 1 3.20 0.180 4.23			L1 LTR 205 1 3.20 0.183 4.38						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x	L1 LTR 30 1 ervice Til 3.20 0.027 4.47 0.038	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086			L1 LTR 202 1 3.20 0.180 4.23 0.237			L1 LTR 205 1 3.20 0.183 4.38 0.250						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)	L1 LTR 30 1 ervice Til 3.20 0.027 4.47 0.038 2.0 2.47	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0			L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)	L1 LTR 30 1 ervice Til 3.20 0.027 4.47 0.038 2.0 2.47	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0			L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level	L1 LTR 30 1 ervice Tin 3.20 0.027 4.47 0.038 2.0 2.47 of Service	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0 2.72			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0 2.23			L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0						
% Thrus in Shared Lane Lane Configuration Flow Rate, v (veh/h) Percent Heavy Vehicles  Departure Headway and S Initial Departure Headway, hd (s) Initial Departure Headway, hd (s) Final Departure Headway, hd (s) Final Degree of Utilization, x  Move-Up Time, m (s) Service Time, ts (s)  Capacity, Delay and Level Flow Rate, v (veh/h)	L1 LTR 30 1 ervice Til 3.20 0.027 4.47 0.038 2.0 2.47 of Servic	L2		1 L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0 2.72			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0 2.23			1 L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0 2.38						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Degree of Utilization, x  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity	L1 LTR 30 1 20 0.027 4.47 0.038 2.0 2.47 of Service 30 805	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0 2.72			L1 LTR 202 1			L1 LTR 205 1						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity  95% Queue Length, Q <sub>95</sub> (veh)	L1 LTR 30 1 ervice Ti 3.20 0.027 4.47 0.038 2.0 2.47 of Servic 30 805 0.1	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0 2.72 65 762 0.3			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0 2.23 202 852 0.9			1 L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0 2.38 205 822 1.0						
% Thrus in Shared Lane  Lane  Configuration  Flow Rate, v (veh/h)  Percent Heavy Vehicles  Departure Headway and S  Initial Departure Headway, hd (s)  Initial Departure Headway, hd (s)  Final Departure Headway, hd (s)  Final Degree of Utilization, x  Move-Up Time, m (s)  Service Time, ts (s)  Capacity, Delay and Level  Flow Rate, v (veh/h)  Capacity  95% Queue Length, Q95 (veh)  Control Delay (s/veh)	L1 LTR 30 1 ervice Til 3.20 0.027 4.47 0.038 2.0 2.47 of Servic 30 805 0.1 7.7	L2		L1 LTR 65 1 3.20 0.058 4.72 0.086 2.0 2.72 65 762 0.3 8.2			L1 LTR 202 1 3.20 0.180 4.23 0.237 2.0 2.23 202 852 0.9 8.5			1 L1 LTR 205 1 3.20 0.183 4.38 0.250 2.0 2.38 22 1.0 8.8						

# EXHIBIT 8 2034 WEEKDAY PEAK AM HOUR ANALYSIS – Oak Ridge/Haig

Analyst Agency/Co. Date Performed Analysis Year Analysis Time Period (hrs) Time Analyzed	11/10/2				Site In	format	ion									
Agency/Co.  Date Performed  Analysis Year  Analysis Time Period (hrs)	11 (10 (2					TOTTILAL	1011									
Date Performed  Analysis Year  Analysis Time Period (hrs)	11 (10/2				Intersec	tion			Oak Rid	ge/Haig						
Analysis Year Analysis Time Period (hrs)	11/10/0				Jurisdict	ion			City of E	Belleville						
Analysis Time Period (hrs)	11/19/2	020			East/We	st Street			Oak Rid	ge Bouleva	rd					
	2034				North/S	outh Stree	t		Haig Ro	ad						
Time Analyzed	0.25				Peak Ho											
	Peak AN	/I Hour														
Project Description	Hanley I	Park North	Subdivisio	n												
Lanes																
			14 + X + b C	ገላቀነ	ት ፖለትነ	÷ ÷ ÷										
Vehicle Volume and Adjust	ments															
Approach		Eastbound			Westbound	4		Northbound	d	9	outhbound	t				
Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R				
Volume	7	1	33	53	1	37	11	129	17	10	81	2				
% Thrus in Shared Lane																
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3				
Configuration	LTR			LTR			LTR									
Flow Rate, v (veh/h)	45			99			171			101						
Percent Heavy Vehicles	1			1			1			1						
Departure Headway and Se	rvice Ti	me														
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20						
Initial Degree of Utilization, x	0.040			0.088			0.152			0.090						
Final Departure Headway, hd (s)	4.21			4.46			4.31			4.44						
Final Degree of Utilization, x	0.052			0.123			0.204			0.125						
Move-Up Time, m (s)	2.0			2.0			2.0			2.0						
Service Time, ts (s)	2.21			2.46			2.31			2.44						
Capacity, Delay and Level o	f Servic	e														
Flow Rate, v (veh/h)	45			99			171			101						
Capacity	856			807			835			810						
95% Queue Length, Q <sub>95</sub> (veh)	0.2			0.4			0.8			0.4						
Control Delay (s/veh)	7.4			8.1			8.4			8.1						
Level of Service, LOS	А			А			А			А						
Approach Delay (s/veh)		7.4			8.1			8.4			8.1					
Approach LOS		Α			Α			Α			Α					

# **EXHIBIT 9** 2034 WEEKDAY PEAK PM HOUR ANALYSIS - Oak Ridge/Haig

		псэ/	AII-V	ay Sic	ay Stop Control Report										
General Information					Site In	format	ion								
Analyst	Т				Intersec	tion			Oak Rid	ge/Haig					
Agency/Co.					Jurisdict	ion			City of I	Belleville					
Date Performed	11/19/2	020			East/We	st Street			Oak Rid	ge Bouleva	ırd				
Analysis Year	2034				North/S	outh Stree	t		Haig Ro	ad					
Analysis Time Period (hrs)	0.25				Peak Ho	ur Factor									
Time Analyzed	Peak PN	/ Hour													
Project Description	Hanley	Park North	Subdivisio	n											
Lanes															
			14 + X + 4 C	ካ ቀ ቀ ፣	ት ፖለትነ	+									
Vehicle Volume and Adjus	tments														
Approach		Eastbound			Westbound	4	1	Northboun	d	9	outhboun	d			
Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R			
Volume	6	1	23	35	1	25	36	99	58	44	144	8			
% Thrus in Shared Lane															
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3			
Configuration	LTR			LTR			LTR			LTR					
Flow Rate, v (veh/h)	33			66			210			213					
Percent Heavy Vehicles	1			1			1			1					
Departure Headway and S	ervice Ti	me													
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20					
Initial Degree of Utilization, x	0.029			0.059			0.186			0.189					
Final Departure Headway, hd (s)	4.53			4.77			4.25			4.40					
Final Degree of Utilization, x	0.041			0.088			0.248			0.260					
Move-Up Time, m (s)	2.0			2.0			2.0			2.0					
Service Time, ts (s)	2.53			2.77			2.25			2.40					
Capacity, Delay and Level	of Servic	e													
Flow Rate, v (veh/h)	33			66			210			213					
Capacity	795			755			847			818					
95% Queue Length, Q <sub>95</sub> (veh)	0.1			0.3			1.0			1.0					
Control Delay (s/veh)	7.7			8.2			8.6			8.9					
Level of Service, LOS	А			А			А			А					
Approach Delay (s/veh)		7.7			8.2			8.6			8.9				
	_														
Approach LOS		Α			Α			Α			Α				

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# EXHIBIT 10 2020 WEEKDAY PEAK AM HOUR ANALYSIS (Pre-COVID-19) – Victoria/Haig

	Sto	op-Control Report																
General Information							Site	Inforr	natio	n						_		
Analyst							Inters	ection			Victor	ria/Haig						
Agency/Co.							Juriso	liction				of Bellevi	lle					
Date Performed	11/19	9/2020					East/\	West Str	eet		-	ria Aven						
Analysis Year	2020							/South S			Haig Road							
Time Analyzed	Peak	AM Hou	r Pre-CC	VID-19			Peak	Hour Fac	ctor		0.92							
Intersection Orientation	North	n-South					Analy	sis Time	Period (	hrs)	0.25							
Project Description	Hanle	y Park N	Jorth Sul	odivision	1													
Lanes																		
	And the first that th																	
Vehicle Volumes and Adj	ustme	nts																
Approach		Eastb	ound			Westl	bound			North	bound			South	bound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	1	0	0	0	1 0 0			0	1	0		
Configuration			LTR			_	LTR				LTR				LTR			
Volume (veh/h)		12	0	29		7	3	1		74	95	3		0	93	25		
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0				
Proportion Time Blocked																		
Percent Grade (%)			0				0											
Right Turn Channelized				11	of all and													
Median Type   Storage	<u> </u>			Unai	vided													
Critical and Follow-up He	adwa	ys																
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1				
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10				
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2				
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20				
Delay, Queue Length, and	d Leve	l of S	ervice															
Flow Rate, v (veh/h)			45				12			80				0				
Capacity, c (veh/h)			780				543			1439				1497				
v/c Ratio			0.06				0.02			0.06				0.00				
95% Queue Length, Q <sub>95</sub> (veh)			0.2				0.1			0.2				0.0				
Control Delay (s/veh)			9.9				11.8 7.6 7.4											
Level of Service (LOS)			А				В А					A						
Approach Delay (s/veh)		9	.9				1.8			3	.6	0.0						
Approach LOS			Д				В						0.0					

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	-Way	/ Stop-Control Report																
General Information	_						Site	Inforr	natio	n								
Analyst							Inters	ection			Victo	ria/Haig						
Agency/Co.							Juriso	liction			City o	of Bellevi	lle					
Date Performed	11/19	/2020					East/\	West Str	eet		Victo	ria Aven	ue					
Analysis Year	2020						North	/South S	Street		Haig Road							
Time Analyzed	Peak	PM Hou	r Pre-CC	VID-19			Peak	Hour Fac	tor		0.92							
Intersection Orientation	North	-South					Analy	sis Time	Period (	hrs)	0.25							
Project Description	Hanle	y Park N	Iorth Sul	odivision	)													
Lanes																		
M.L.L. W.L.	And And France North-South																	
Vehicle Volumes and Adju	ustme	nts																
Approach			ound	-			oound	-			bound	_			bound	-		
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority		10	11	12 0		7	8	9	10	0	2	3	4U	0	5	6		
Number of Lanes		0	LTR	0		0	LTR	0	0	0	1 LTR	0	0	0	LTR	0		
Configuration  Volume (veh/h)		15	5	30		0	0	3		36	114	2		3	127	7		
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3	114	2		0	127	/		
Proportion Time Blocked		0	0	-		0	-	"		3				0				
Percent Grade (%)			) )				<u> </u>											
Right Turn Channelized																		
Median Type   Storage				Undi	Vided													
Critical and Follow-up He	adwa	ve.		Onai	viaca													
	auwa <sub>.</sub>	_	6.5	6.2		7.1	6.5	6.2		41				41				
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1				
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10				
Base Follow-Up Headway (sec) Follow-Up Headway (sec)		3.50	4.00	3.3		3.50	4.00	3.3		2.23				2.20				
						3.50	4.00	5.50		2.23				2.20				
Delay, Queue Length, and	Leve	l of S	_															
Flow Rate, v (veh/h)			54				3			39				3				
Capacity, c (veh/h)			742				931			1430				1473				
v/c Ratio			0.07				0.00			0.03				0.00				
95% Queue Length, Q <sub>95</sub> (veh)			0.2				0.0			0.1				0.0				
Control Delay (s/veh)			10.2				8.9 7.6							7.4				
Level of Service (LOS)			В				Α			A			A   A					
Approach Delay (s/veh)			0.2				.9			2	2.0 0.2							
Approach LOS			3			/	4											

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### EXHIBIT 12 2029 WEEKDAY PEAK AM HOUR ANALYSIS – Victoria/Haig

		Н	CS7	Two-	-Way	Sto	o-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						_
Analyst							Inters	ection			Victor	ria/Haig				
Agency/Co.							Jurisd	liction				of Bellevi	lle			
Date Performed	11/19	9/2020					East/\	West Str	eet		-	ria Aven				
Analysis Year	2029						North	/South S	Street		Haig	Road				
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fac	ctor		0.92					
Intersection Orientation	North	n-South					Analy	sis Time	Period (	hrs)	0.25					
Project Description	Hanle	y Park N	Jorth Sul	odivision	1											
Lanes																
				7444	ብ ጎ Major	中 十 中 Y r Street: Nor	ተ ተ c	4 + 4 + 4								
Vehicle Volumes and Adj																
Approach		Eastb	ound			Westl	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	_	10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes	-	0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration	-		LTR				LTR				LTR				LTR	
Volume (veh/h)	-	15	0	32		8	3	1		73	136	3		0	128	32
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0		
Proportion Time Blocked	-															
Percent Grade (%)			0				0									
Right Turn Channelized	-			11	of all and											
Median Type   Storage	<u>.                                    </u>			Unai	vided											
Critical and Follow-up He	eadwa	ys														
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)	-	7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10		_
Base Follow-Up Headway (sec)	-	3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		_
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20		
Delay, Queue Length, and	nd Level of Service															
Flow Rate, v (veh/h)	51 13 79										0					
Capacity, c (veh/h)		703 475								1385				1442		
v/c Ratio			0.07				0.03			0.06				0.00		
95% Queue Length, Q <sub>95</sub> (veh)	0.2						0.1			0.2				0.0		
Control Delay (s/veh)		10.5								7.8				7.5		
Level of Service (LOS)			В				В			А				А		
Approach Delay (s/veh)			).5				2.8			3	.0			0	.0	
Approach LOS			В				В									

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		Н	CS7	Two-	-Way	Stop	o-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						
Analyst							Inters	ection			Victo	ria/Haig				
Agency/Co.							Juriso	liction			City o	of Bellevi	lle			
Date Performed	11/19	/2020					East/\	West Str	eet		Victo	ria Aven	ue			
Analysis Year	2029						North	/South S	Street		Haig	Road				
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fac	tor		0.92					
Intersection Orientation	North	-South					Analy	sis Time	Period (	hrs)	0.25					
Project Description	Hanle	y Park N	Iorth Sul	odivision	)											
Lanes																
				3 4 4 4 7 ↑ ↑ ↑ ↑	Major	**************************************	<b>† ት</b> ፫ th-South	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \								
Vehicle Volumes and Adju	ustme	nts														
Approach			ound				oound				bound				bound	
Movement	U	L	T	R	U	L	T	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR			_	LTR	_			LTR				LTR	
Volume (veh/h)		22	5	33		0	0	3		36	160	2		3	180	11
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3				0		
Proportion Time Blocked																
Percent Grade (%)			)				0									
Right Turn Channelized																
Median Type   Storage				Undi	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.23				2.20		
Delay, Queue Length, and	nd Level of Service															
Flow Rate, v (veh/h)			65				3			39				3		
Capacity, c (veh/h)	640						874			1357				1412		
v/c Ratio			0.10				0.00			0.03				0.00		
95% Queue Length, Q <sub>95</sub> (veh)			0.3				0.0			0.1				0.0		
Control Delay (s/veh)			11.3				9.1			7.7				7.6		
Level of Service (LOS)			В				А			А				А		
Approach Delay (s/veh)		11	1.3			9	.1			1	6			0	.1	
Approach LOS		ı	3			,	4									

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### EXHIBIT 14 2034 WEEKDAY PEAK AM HOUR ANALYSIS – Victoria/Haig

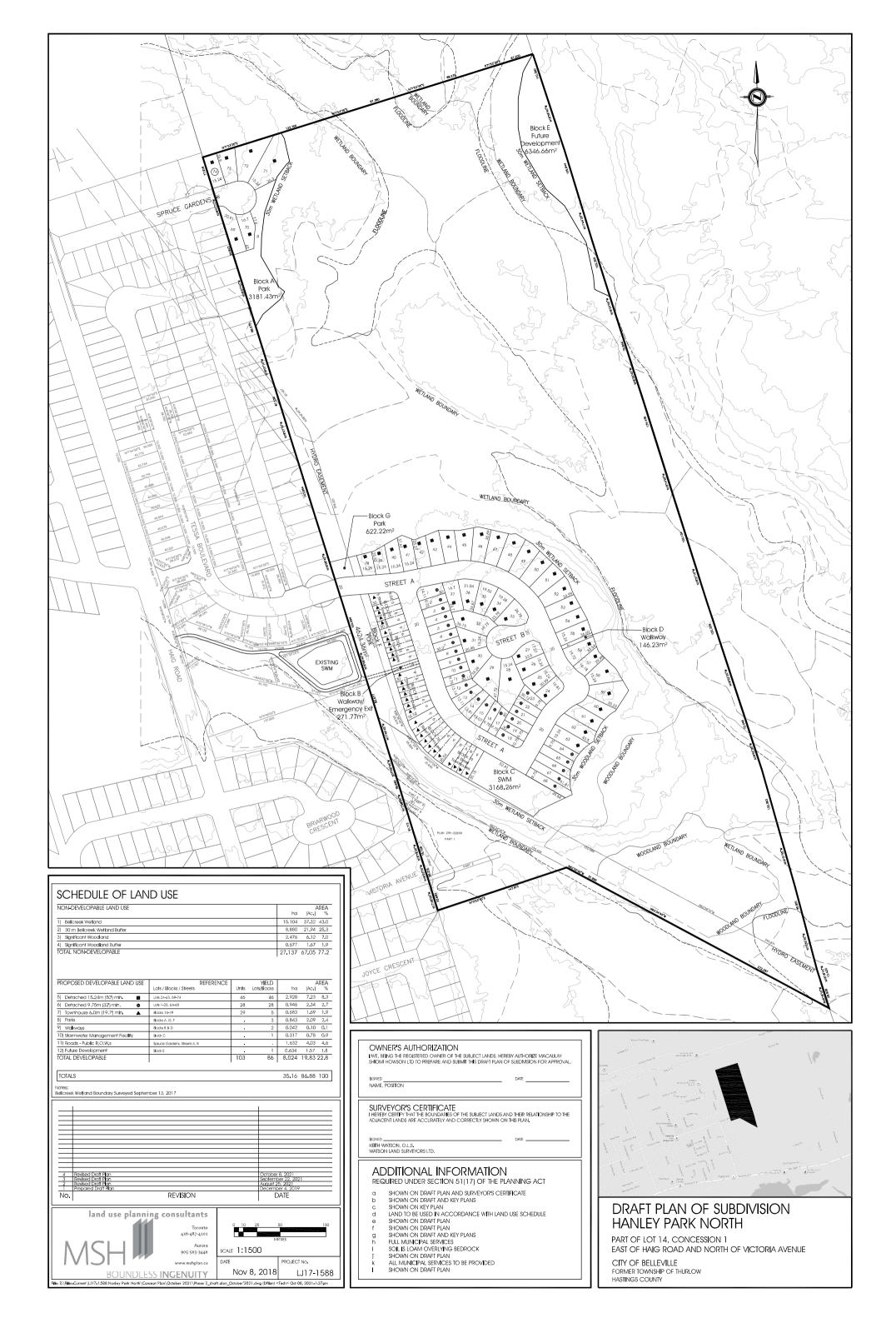
		Н	CS7	Two-	Way	Sto	o-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						
Analyst							Inters	ection			Victo	ria/Haig				
Agency/Co.							Juriso	liction			City o	of Bellevi	lle			
Date Performed	11/19	9/2020					East/\	West Str	eet		Victo	ria Aven	ue			
Analysis Year	2034						North	/South S	Street		Haig	Road				
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fac	ctor		0.92					
Intersection Orientation	North	n-South					Analy	sis Time	Period (	hrs)	0.25					
Project Description	Hanle	y Park N	lorth Sul	odivision	1											
Lanes																
				7 ★ ◆ Y ↑ ► C		**  † **  * Street: Nor		1 4 4 4 t								
Vehicle Volumes and Adju																
Approach	Eastbound						bound			North	bound			South	bound	
Movement	U	L	T	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		16	0	33		8	3	1		85	141	3		0	133	34
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0		
Proportion Time Blocked																
Percent Grade (%)			)				0									
Right Turn Channelized																
Median Type   Storage	L			Undi	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20		
Delay, Queue Length, and	d Level of Service															
Flow Rate, v (veh/h)	53						13			92				0		
Capacity, c (veh/h)	674						446			1376				1436		
v/c Ratio	0.08						0.03			0.07				0.00		
95% Queue Length, Q <sub>95</sub> (veh)	0.3						0.1			0.2				0.0		
Control Delay (s/veh)		10.8					13.3			7.8				7.5		
Level of Service (LOS)			В				В			А				А		
Approach Delay (s/veh)		10	).8			13	3.3			3	.3			0	.0	
Approach LOS			3				В									

### EXHIBIT 15 2034 WEEKDAY PEAK PM HOUR ANALYSIS – Victoria/Haig

		Н	CS7	Two-	-Way	Sto	p-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						
Analyst							Inters	ection			Victo	ria/Haig				
Agency/Co.							Jurisd	liction			City o	of Bellevi	lle			
Date Performed	11/19	9/2020					East/\	West Str	eet		Victo	ria Aven	ue			
Analysis Year	2034						North	n/South :	Street		Haig	Road				
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	North	n-South					Analy	sis Time	Period (	hrs)	0.25					
Project Description	Hanle	y Park N	lorth Sul	odivision	n											
Lanes																
				7 4 4 Y ↑ Y C		** * * Y • Street: Nor		) 4 <del>4 4 1</del>								
Vehicle Volumes and Adj																
Approach	Eastbound						bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		23	6	34		0	0	3		41	166	2		3	187	11
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3				0		
Proportion Time Blocked																
Percent Grade (%)			)				0									
Right Turn Channelized																
Median Type   Storage	•			Undi	vided											
Critical and Follow-up He	aawa	_														
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.23				2.20		
Delay, Queue Length, and	d Level of Service															
Flow Rate, v (veh/h)	68						3			45				3		
Capacity, c (veh/h)	619						866			1349				1405		
v/c Ratio	0.11						0.00			0.03				0.00		
95% Queue Length, Q <sub>95</sub> (veh)	0.4						0.0			0.1				0.0		
Control Delay (s/veh)			11.5				9.2			7.8				7.6		
Level of Service (LOS)			В				А			A				A		
Approach Delay (s/veh)			l.5				.2			1	.8			0	.1	
Approach LOS			3				A									

# Attachment 2

Hanely Park Draft Plan



# Attachment 3

Updated 2034 Future Total Synchro Analysis Worksheets

	۶	<b>→</b>	•	•	+	•	4	<b>†</b>	<b>/</b>	<b>/</b>	<b>↓</b>	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	7	1	36	53	1	37	12	144	17	10	87	2
Future Volume (vph)	7	1	36	53	1	37	12	144	17	10	87	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.890			0.945			0.987			0.997	
Flt Protected		0.992			0.972			0.997			0.995	
Satd. Flow (prot)	0	1642	0	0	1709	0	0	1831	0	0	1845	0
Flt Permitted		0.992			0.972			0.997			0.995	
Satd. Flow (perm)	0	1642	0	0	1709	0	0	1831	0	0	1845	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		142.9			57.4			401.7			338.7	
Travel Time (s)		10.3			4.1			28.9			24.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	8	1	39	58	1	40	13	157	18	11	95	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	0	0	99	0	0	188	0	0	108	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 29.8%			IC	CU Level	of Service	Α					
Analysis Period (min) 15												

	۶	<b>→</b>	•	•	•	•	4	<b>†</b>	<i>&gt;</i>	<b>\</b>	ļ	1
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	7	1	36	53	1	37	12	144	17	10	87	2
Future Volume (vph)	7	1	36	53	1	37	12	144	17	10	87	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	1	39	58	1	40	13	157	18	11	95	2
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	48	99	188	108								
Volume Left (vph)	8	58	13	11								
Volume Right (vph)	39	40	18	2								
Hadj (s)	-0.44	-0.11	-0.03	0.03								
Departure Headway (s)	4.3	4.5	4.3	4.5								
Degree Utilization, x	0.06	0.12	0.23	0.13								
Capacity (veh/h)	771	738	796	761								
Control Delay (s)	7.5	8.2	8.6	8.2								
Approach Delay (s)	7.5	8.2	8.6	8.2								
Approach LOS	Α	Α	Α	Α								
Intersection Summary												
Delay			8.3									
Level of Service			Α									
Intersection Capacity Utilizati	on		29.8%	IC	U Level o	of Service			Α			
Analysis Period (min)			15									

Intersection Delay, s/veh 8.3 Intersection LOS A	Intersection			
Intersection LOS A	Intersection Delay, s/veh	8.3		
	Intersection LOS	Α		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	EDL		EDI	WDL		WDN	NDL		NDI	ODL		SDN
Lane Configurations		4			- 40→			€			- ♣	
Traffic Vol, veh/h	7	1	36	53	1	37	12	144	17	10	87	2
Future Vol, veh/h	7	1	36	53	1	37	12	144	17	10	87	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	8	1	39	58	1	40	13	157	18	11	95	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.5			8.2			8.6			8.2		
HCM LOS	Α			Α			Α			Α		

Lane	NBLn1	EBLn1	WBLn1	SBLn1	
Vol Left, %	7%	16%	58%	10%	
Vol Thru, %	83%	2%	1%	88%	
Vol Right, %	10%	82%	41%	2%	
Sign Control	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	173	44	91	99	
LT Vol	12	7	53	10	
Through Vol	144	1	1	87	
RT Vol	17	36	37	2	
Lane Flow Rate	188	48	99	108	
Geometry Grp	1	1	1	1	
Degree of Util (X)	0.226	0.056	0.124	0.133	
Departure Headway (Hd)	4.324	4.24	4.508	4.461	
Convergence, Y/N	Yes	Yes	Yes	Yes	
Cap	831	845	796	805	
Service Time	2.342	2.264	2.529	2.481	
HCM Lane V/C Ratio	0.226	0.057	0.124	0.134	
HCM Control Delay	8.6	7.5	8.2	8.2	
HCM Lane LOS	Α	Α	Α	Α	
HCM 95th-tile Q	0.9	0.2	0.4	0.5	

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	٠	<b>→</b>	•	•	<b>←</b>	•	4	<b>†</b>	<b>/</b>	<b>/</b>	ţ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	16	0	36	8	3	1	95	157	3	0	142	34
Future Volume (vph)	16	0	36	8	3	1	95	157	3	0	142	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.906			0.990			0.999			0.974	
Flt Protected		0.985			0.967			0.982				
Satd. Flow (prot)	0	1677	0	0	1799	0	0	1810	0	0	1830	0
Flt Permitted		0.985			0.967			0.982				
Satd. Flow (perm)	0	1677	0	0	1799	0	0	1810	0	0	1830	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		323.4			193.0			476.0			401.7	
Travel Time (s)		23.3			13.9			34.3			28.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	0	39	9	3	1	103	171	3	0	154	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	56	0	0	13	0	0	277	0	0	191	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											_
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 36.6%			IC	CU Level o	of Service	Α					
Analysis Period (min) 15												

	۶	<b>→</b>	•	•	<b>←</b>	4	1	<b>†</b>	~	-	<b>+</b>	√
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (veh/h)	16	0	36	8	3	1	95	157	3	0	142	34
Future Volume (Veh/h)	16	0	36	8	3	1	95	157	3	0	142	34
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	0	39	9	3	1	103	171	3	0	154	37
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	554	552	172	590	570	172	191			174		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	554	552	172	590	570	172	191			174		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	96	98	99	100	92			100		
cM capacity (veh/h)	418	411	876	380	402	876	1365			1415		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	56	13	277	191								
Volume Left	17	9	103	0								
Volume Right	39	1	3	37								
cSH	657	403	1365	1415								
Volume to Capacity	0.09	0.03	0.08	0.00								
Queue Length 95th (m)	2.1	0.8	1.9	0.0								
Control Delay (s)	11.0	14.2	3.3	0.0								
Lane LOS	В	В	Α									
Approach Delay (s)	11.0	14.2	3.3	0.0								
Approach LOS	В	В										
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization	n		36.6%	IC	U Level	of Service			Α			
Analysis Period (min)			15									

	۶	<b>→</b>	•	•	+	•	4	<b>†</b>	<b>/</b>	<b>/</b>	<b>↓</b>	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	6	1	26	35	1	25	39	108	58	44	161	8
Future Volume (vph)	6	1	26	35	1	25	39	108	58	44	161	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.895			0.945			0.962			0.995	
Flt Protected		0.990			0.972			0.991			0.990	
Satd. Flow (prot)	0	1648	0	0	1709	0	0	1773	0	0	1832	0
Flt Permitted		0.990			0.972			0.991			0.990	
Satd. Flow (perm)	0	1648	0	0	1709	0	0	1773	0	0	1832	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		142.9			57.4			401.7			338.7	
Travel Time (s)		10.3			4.1			28.9			24.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	7	1	28	38	1	27	42	117	63	48	175	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	36	0	0	66	0	0	222	0	0	232	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 31.3%			IC	CU Level	of Service	Α					
Analysis Period (min) 15												

	٠	<b>→</b>	•	•	<b>←</b>	•	4	<b>†</b>	<b>/</b>	<b>/</b>	ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	6	1	26	35	1	25	39	108	58	44	161	8
Future Volume (vph)	6	1	26	35	1	25	39	108	58	44	161	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	1	28	38	1	27	42	117	63	48	175	9
Direction, Lane#	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	36	66	222	232								
Volume Left (vph)	7	38	42	48								
Volume Right (vph)	28	27	63	9								
Hadj (s)	-0.41	-0.11	-0.12	0.04								
Departure Headway (s)	4.6	4.8	4.3	4.4								
Degree Utilization, x	0.05	0.09	0.26	0.29								
Capacity (veh/h)	697	669	808	782								
Control Delay (s)	7.8	8.3	8.8	9.2								
Approach Delay (s)	7.8	8.3	8.8	9.2								
Approach LOS	Α	Α	Α	Α								
Intersection Summary												
Delay			8.9									
Level of Service			Α									
Intersection Capacity Utiliza	tion		31.3%	IC	U Level o	of Service			Α			
Analysis Period (min)			15									

tersection	
tersection Delay, s/veh	8.8
tersection LOS	Α

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Vol, veh/h	6	1	26	35	1	25	39	108	58	44	161	8
Future Vol, veh/h	6	1	26	35	1	25	39	108	58	44	161	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	7	1	28	38	1	27	42	117	63	48	175	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.8			8.3			8.8			9.2		
HCM LOS	Α			Α			Α			Α		

Lane	NBLn1	EBLn1	WBLn1	SBLn1	
Vol Left, %	19%	18%	57%	21%	
Vol Thru, %	53%	3%	2%	76%	
Vol Right, %	28%	79%	41%	4%	
Sign Control	Stop	Stop	Stop	Stop	
Traffic Vol by Lane	205	33	61	213	
LT Vol	39	6	35	44	
Through Vol	108	1	1	161	
RT Vol	58	26	25	8	
Lane Flow Rate	223	36	66	232	
Geometry Grp	1	1	1	1	
Degree of Util (X)	0.265	0.045	0.089	0.284	
Departure Headway (Hd)	4.277	4.565	4.827	4.411	
Convergence, Y/N	Yes	Yes	Yes	Yes	
Cap	840	783	742	815	
Service Time	2.299	2.602	2.86	2.433	
HCM Lane V/C Ratio	0.265	0.046	0.089	0.285	
HCM Control Delay	8.8	7.8	8.3	9.2	
HCM Lane LOS	А	Α	Α	Α	
HCM 95th-tile Q	1.1	0.1	0.3	1.2	

	۶	<b>→</b>	•	•	<b>←</b>	•	4	<b>†</b>	/	<b>&gt;</b>	ţ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	23	6	38	0	0	3	44	178	2	3	207	11
Future Volume (vph)	23	6	38	0	0	3	44	178	2	3	207	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.924			0.865			0.999			0.993	
Flt Protected		0.983						0.990			0.999	
Satd. Flow (prot)	0	1707	0	0	1625	0	0	1847	0	0	1864	0
Flt Permitted		0.983						0.990			0.999	
Satd. Flow (perm)	0	1707	0	0	1625	0	0	1847	0	0	1864	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		323.4			193.0			476.0			401.7	
Travel Time (s)		23.3			13.9			34.3			28.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Adj. Flow (vph)	25	7	41	0	0	3	48	193	2	3	225	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	73	0	0	3	0	0	243	0	0	240	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											_
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 44.2%			IC	CU Level	of Service	Α					
Analysis Period (min) 15												

	۶	<b>→</b>	•	•	<b>—</b>	4	1	<b>†</b>	<i>&gt;</i>	-	<del> </del>	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (veh/h)	23	6	38	0	0	3	44	178	2	3	207	11
Future Volume (Veh/h)	23	6	38	0	0	3	44	178	2	3	207	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	7	41	0	0	3	48	193	2	3	225	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	530	528	231	572	533	194	237			195		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	530	528	231	572	533	194	237			195		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)			<u> </u>			<u> </u>						
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	98	95	100	100	100	96			100		
cM capacity (veh/h)	448	441	813	396	438	853	1324			1390		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	100		1021			1000		
Volume Total	73	3	243	240								
Volume Left	25	0	48	3								
Volume Right	41	3	2	12								
cSH	598	853	1324	1390								
Volume to Capacity	0.12	0.00	0.04	0.00								
Queue Length 95th (m)	3.2	0.1	0.9	0.0								
Control Delay (s)	11.9	9.2	1.8	0.1								
Lane LOS	В	Α	A	A								
Approach Delay (s)	11.9	9.2	1.8	0.1								
Approach LOS	В	Α										
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization	n		44.2%	IC	CU Level	of Service			Α			
Analysis Period (min)			15									