COMMERCIAL CENTRE DEVELOPMENT
3020 HAWTHORNE ROAD
OTTAWA, ONTARIO

TRANSPORTATION BRIEF REPORT

Prepared for:

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3020 HAWTHORNE ROAD
OTTAWA, ONTARIO

TRANSPORTATION BRIEF REPORT

1. BACKGROUND

Controlex Corporation is developing property at 3020 Hawthorne Road which is located on the west side of the intersection of Hawthorne Road and Russell Road. The Commercial Centre Development is an industrial park which originally proposed six free standing buildings with an access road which formed the eastbound approach to the Hawthorne/Russell intersection. A Transportation Impact Study (TIS) report dated March 2, 2012 was prepared which evaluated the expected number of site generated trips and the impact the development would have on the Hawthorne/Russell intersection. An Addendum was prepared dated January 2016 which presented a revised Site Plan. The revised Site Plan updated the gross floor area of the existing and proposed buildings. The Addendum determined that the total gross floor area of the development increased by 342.3 m^2 resulting in no changes in the level of service of the Hawthorne/Russell intersection. The location of the site is shown in Figure 1.1.

A Site Plan has been prepared which proposes the addition of Building 100 and 550 along with some revisions to the buildings which have yet to be constructed. Figure 1.2 shows the Revised Site Plan which this Transportation Brief will examine. To date Buildings 200, 300/400 and 700 have been constructed with Buildings 100, 500, 550 and 600 still to be completed. The Site Plan shows Building 100 with a gross floor area of 1,954 m^2 and Building 550 with an area of 702 m^2. Building 100 was included in the January 2016 Addendum. The total development is expected to be completed by 2019.

A Screening Form has been completed by this firm which determined that the additional development to the Commercial Centre Development (Building 100 and Building 550) would not trigger the requirement for a Transportation Impact Assessment (TIA) report as determined in the City of Ottawa's *Transportation Impact Assessment Guidelines (2017)*. The Form is provided in the Appendix as Exhibit 1. City staff has requested that a Transportation Brief be prepared which would determine the total traffic generated by the development, and the impact the traffic would have on the signalized intersection of Hawthorne Road and Russell Road.

1.1 Scope of Work

The Transportation Brief will utilize the most recent Site Plan for the development and will address the operation of the Hawthorne/Russell intersection which is the limit of the

FIGURE 1.1
SITE LOCATION PLAN

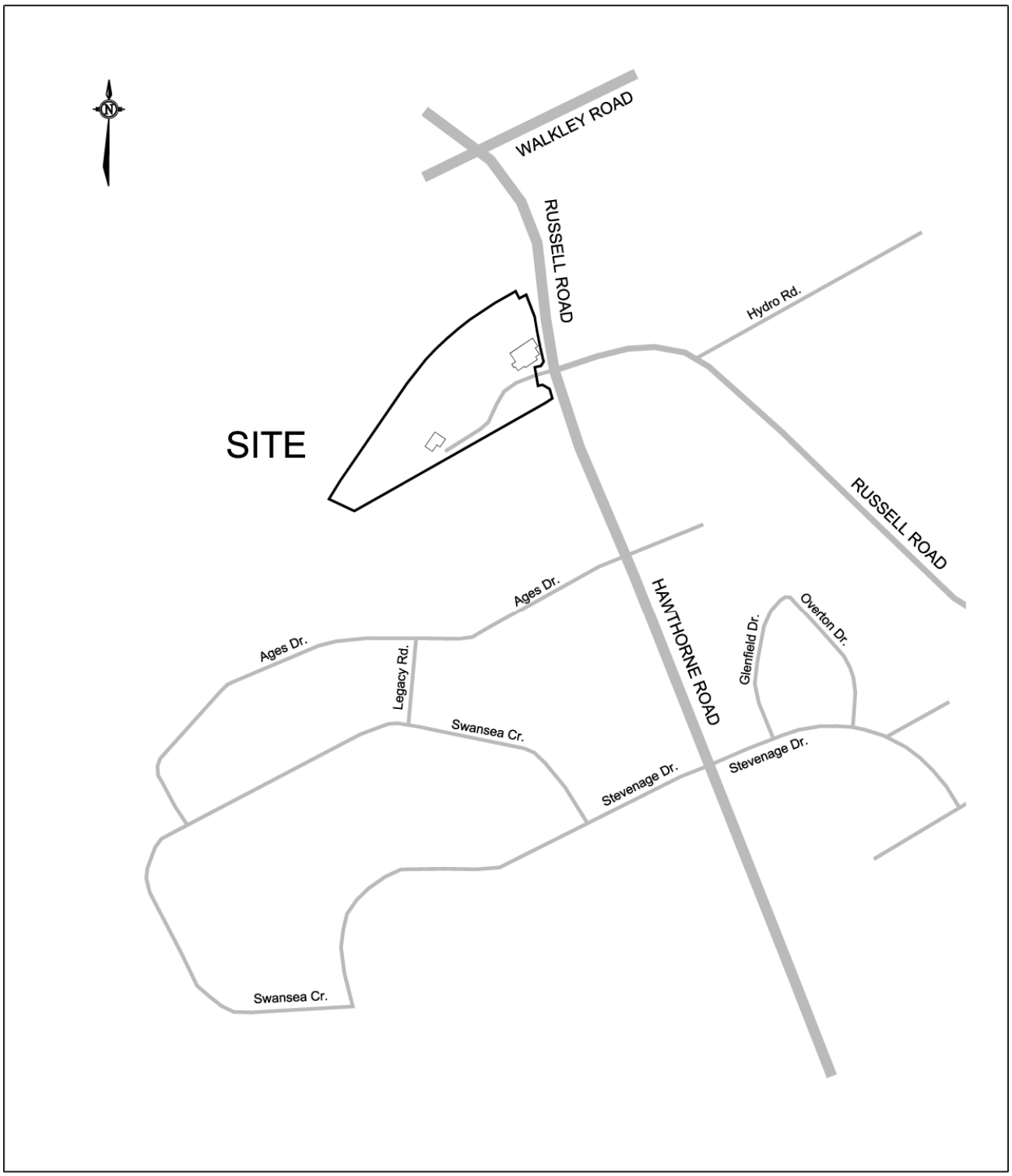

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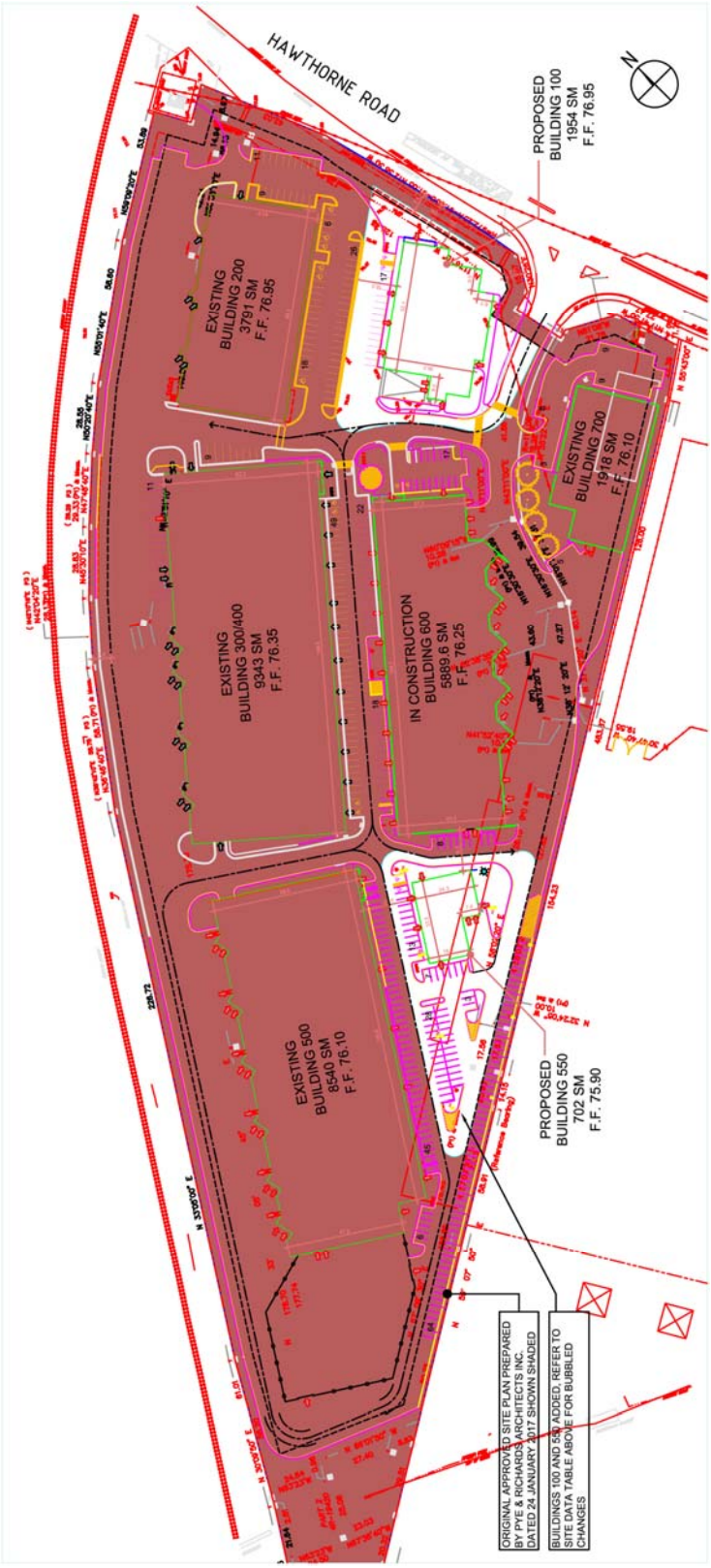
FIGURE 1.2
CONCEPTUAL SITE PLAN



study area. The analysis will use the most recent traffic counts available which were obtained from the City of Ottawa and were taken on July 20, 2015 at the Hawthorne/Russell intersection. The analysis will be completed for the existing traffic counts taken in 2015 which would include the existing development of Buildings 200, 300/400 and 700. The Transportation Brief would also examine the Hawthorne/Russell intersection for the expected 2024 traffic (5 years beyond completion) which would assume full development and occupancy of the development. The time period would be the weekday peak AM and PM hours of the adjacent roads.

2. ADJACENT ROADS AND INTERSECTIONS

2.1 Existing Roadway Geometry and Intersections

The Commercial Centre Development site would be located along a private access which intersects Hawthorne Road at the Hawthorne/Russell intersection. Hawthorne Road is a north-south road which is designated as an arterial road in the City of Ottawa *Transportation Master Plan* (TMP). The roadway is named Hawthorne Road south of the Hawthorne/Russell intersection, and Russell Road north of the intersection. Hawthorne Road in the vicinity of the site is a four lane road with centre medians placed at the Hawthorne/Russell intersection approaches and a shared north-south centre left turn lane at midblock south of the intersection. The posted speed limit along the road is 70 km./h. A sidewalk is located along the west side of the road south of the Hawthorne/Russell intersection. Cycling lanes are provided along both sides of the road.

The east approach to the Hawthorne/Russell intersection is Russell Road. Russell Road at this location is an east-west arterial road. The road is a two lane rural road with gravel shoulders. The posted speed limit along the road is 60 km./h. There are no pedestrian sidewalks or cycling lanes along the road.

The site is at the west side of the Hawthorne/Russell intersection. The intersection is controlled by traffic signals with Hawthorne Road forming the northbound approach, Russell Road the southbound approach, a private access road to the development the eastbound approach, and Russell Road the westbound approach. The intersection has the following lane configuration:

Northbound Hawthorne Approach -	One left turn lane
	One through lane
	One shared through/right lane (Channelized)
Southbound Russell Approach -	One left turn lane
	One through lane
	One shared through/right lane (Channelized)
Eastbound Development Access -	One left turn lane
	One shared through/right lane (Channelized)
Westbound Russell Approach -	One left turn lane
	One through lane
	One right turn lane (Channelized)

Figure 2.1 shows the peak AM and PM hour existing traffic counts obtained from the City of Ottawa and taken on July 20, 2015. The counts are shown in detail in Exhibit 2.

3. COMMERCIAL CENTRE DEVELOPMENT

3.1 Proposed Development

The development is located on an 88,504.31 m^2 parcel of land. The land currently has a "Light Industrial (IL)" zoning which will support the proposed development. Development surrounding the lands is mainly industrial and/or commercial uses.

The Commercial Centre Development will contain seven free standing buildings. Three of the buildings have already been constructed and are substantially occupied. Of the four remaining buildings, three have been accounted for in the original 2012 TIS and 2016 Addendum. Building 550 is an additional building proposed in the current Site Plan.

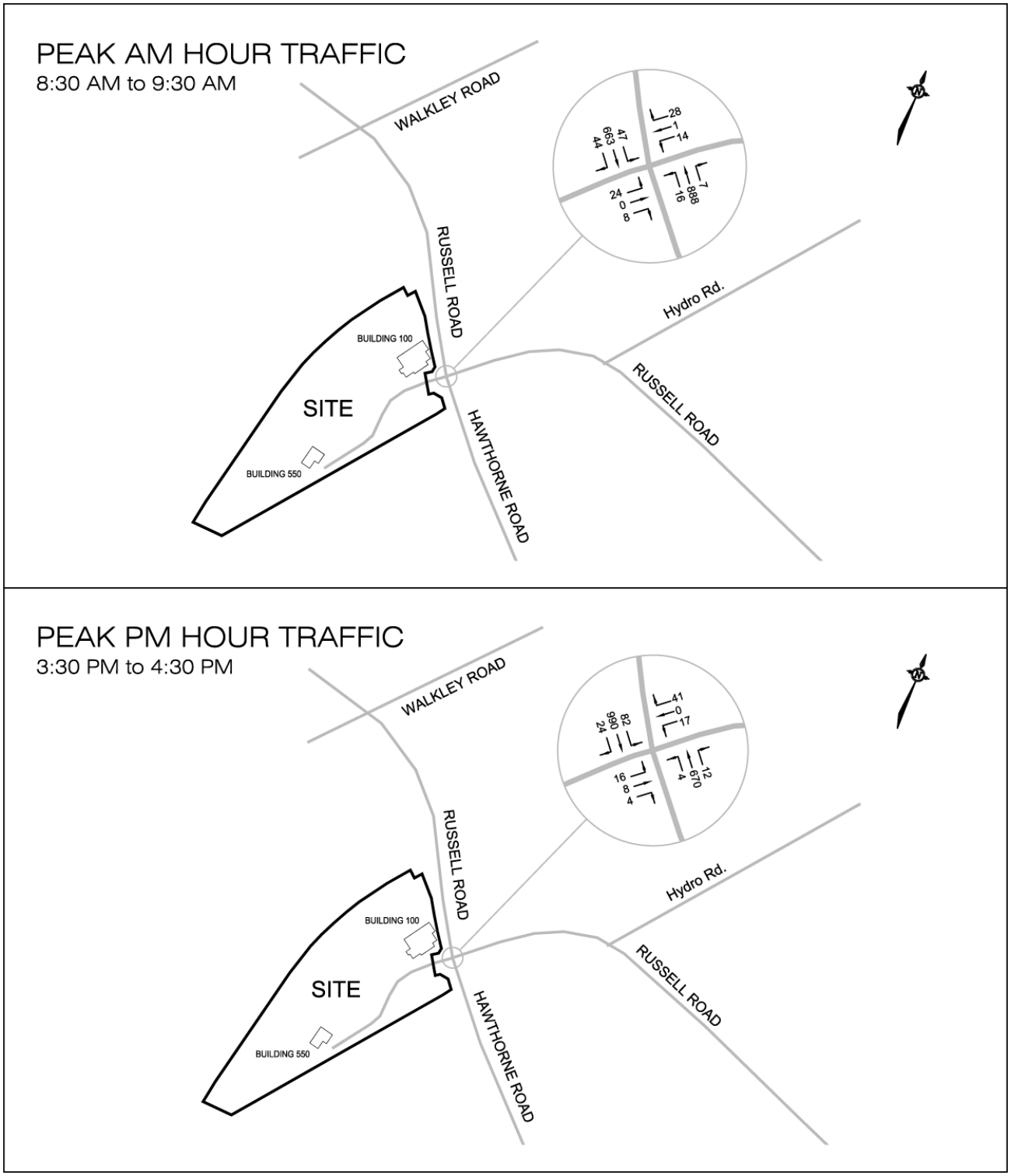
The property has one access point onto Hawthorne Road which forms the eastbound approach to the Hawthorne/Russell intersection. The access was constructed under Phase 1 when Buildings 200, 300/400 and 700 were constructed. Table 3.1 provides a site inventory of the buildings and the gross floor area of each building.

TABLE 3.1
SITE INVENTORY

BUILDING NUMBER	GROSS FLOOR AREA		STATUS
Building 100	1,954.0 m^2	21,033 ft^2	Proposed
Building 200	3,791.0 m^2	40,806 ft^2	Completed
Building 300/400	9,343.0 m^2	100,567 ft^2	Completed
Building 500	8,540.0 m^2	91,924 ft^2	Approved but not constructed
Building 550	702.0 m^2	7,556 ft^2	Approved but not constructed
Building 600	5,889.6 m^2	63,395 ft^2	Under Construction
Building 700	1,918.0 m^2	20,645 ft^2	Completed
TOTAL	**32,137.6 m^2**	**345,926 ft^2**	

Transit service of provided by OC Transpo Route 47 along Hawthorne Road which is scheduled for peak periods only. The study has taken a conservative approach by not utilizing any trip reduction factors for transit use or shared trips within the development.

FIGURE 2.1
2015 PEAK AM AND PM HOUR TRAFFIC COUNTS – July 20, 2015



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3.2 Trip Generation

The trip generation analysis has utilized the statistical data presented in the Institute of Transportation Engineers document, *Trip Generation Manual 10th Edition*. The analysis has used the same land use category as the March 2012 TIS report and January 2016 Addendum. The analysis utilized the Average Trip Rate for an "Industrial Park" – Land Use 130. The trip generation rates are shown in Table 3.2, with the ITE 130 trip rate data presented as Exhibit 3.

TABLE 3.2
TRIP GENERATION RATES

BUILDING USE	ITE LAND USE	TRIP GENERATION RATE	
		Peak AM Hr.	Peak PM Hr.
Commercial/Industrial	Industrial Park – ITE 130	0.40 T/1000 ft^2	0.40 T/1000 ft^2

The analysis has utilized the gross floor area of each building (Figure 3.1) and the trip generation rates of Table 3.2 to determine the number of site trips which are shown in Table 3.3.

TABLE 3.3
PEAK HOUR SITE GENERATED TRIPS

PEAK HOUR TRIPS / BUILDING	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Building 200	16	13	3	16	3	13
Building 300/400	40	33	7	40	9	31
Building 700	9	7	2	9	2	7
Subtotal - Prior to 2015	65	53	12	65	14	51
Building 100	8	7	1	8	2	6
Building 500	37	30	7	37	7	30
Building 550	3	2	1	3	1	2
Building 600	25	20	5	25	5	20
Subtotal - 2015 to 2019	73	59	14	73	15	58
Total Site Trips	138	**112**	**26**	138	**29**	**109**

3.2.1 Trip Distribution

The distribution of site generated trips for the proposed Commercial Centre Development was determined by examining the existing peak hour traffic pattern entering and exiting the site access road from the July 20, 2015 traffic counts. The distribution of traffic at the Hawthorne/Russell intersection would show the preferred travel route of drivers travelling to/from the 3020 Hawthorne Road industrial park. The trip distribution which will be utilized in the study for both the weekday peak AM hour and PM hour is as follows:

To/From the north along Hawthorne Road	60%
To/From the south along Hawthorne Road	40%

The site generated trips used in the study analysis assumed that all trips from Buildings 200, 300/400 and 700 are included in the 2015 traffic counts and would be considered the background traffic in the analysis since the buildings were fully constructed and occupied by 2015.

The expected trips generated by the site would be the trips from development which would be constructed after 2015 and would include Buildings 100, 500, 550 and 600. The expected total site generated peak AM and PM hour trips is shown in Figure 3.1.

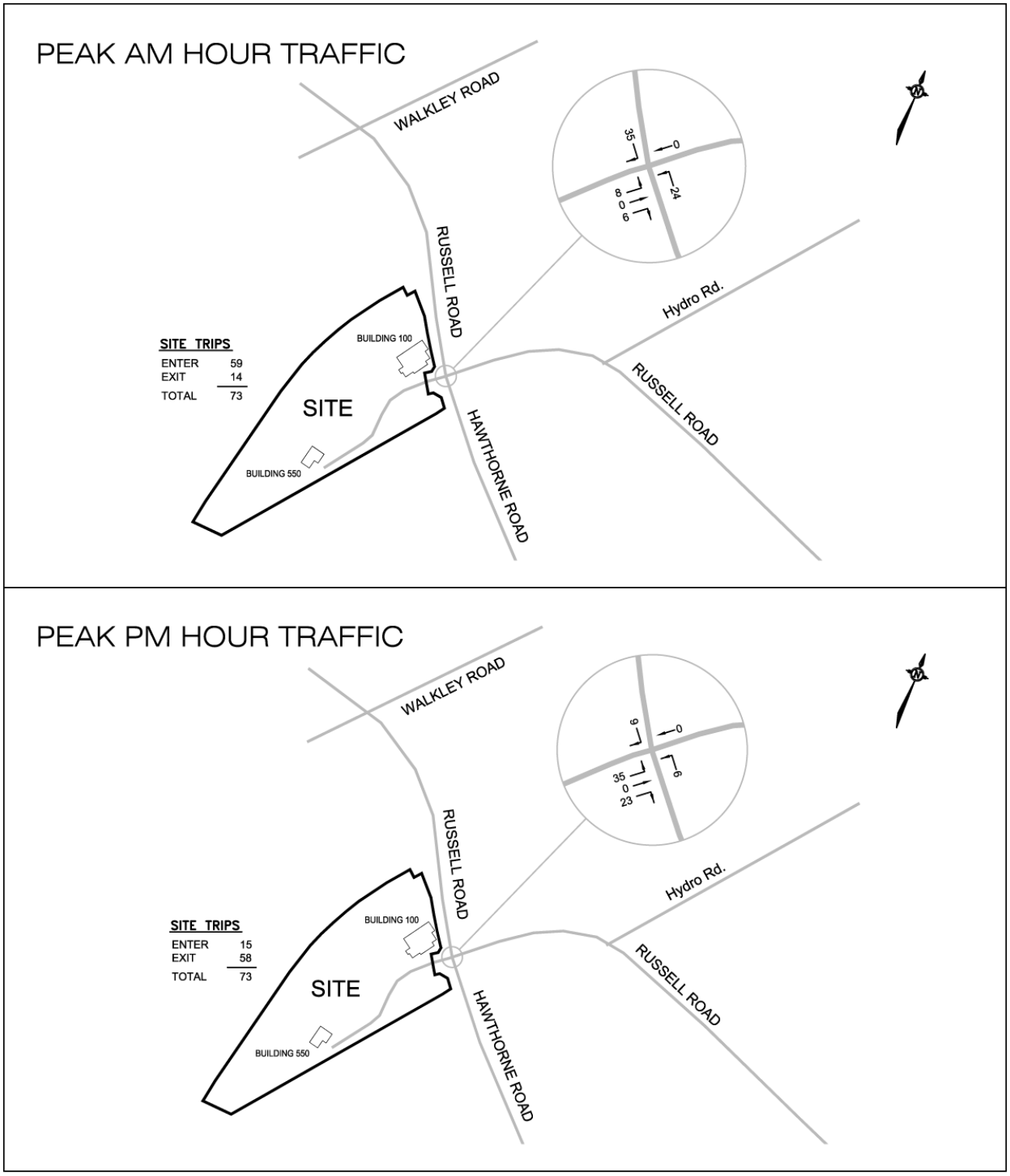
4. TRANSPORTATION IMPACT

The Transportation Brief will examine the operation of the industrial park access to Hawthorne Road which will form the eastbound approach to the Hawthorne/Russell intersection. The analysis will determine the level of service during the peak AM and PM hours for the 2015 traffic counts, and at full development of the site at the year 2024. The analysis of the Hawthorne/Russell intersection will use the *Highway Capacity Software, Version 7.6,* which utilizes the intersection capacity analysis procedure as documented in the *Highway Capacity Manual 2010 and 6th Edition*.

For a signalized intersection, the operation or level of service of an intersection is determined from the volume to capacity ratio (v/c) for each lane movement as documented by the City of Ottawa in the *Transportation Impact Assessment Guidelines (2017)*. The following relates the level of service with the volume to capacity ratio at each lane movement.

LEVEL OF SERVICE	VOLUME TO CAPACITY RATIO
Level of Service A	0 to 0.60
Level of Service B	0.61 to 0.70
Level of Service C	0.71 to 0.80
Level of Service D	0.81 to 0.90
Level of Service E	0.91 to 1.00
Level of Service F	> 1.00

FIGURE 3.1
WEEKDAY PEAK AM AND PM HOUR SITE GENERATED TRIPS



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4.1 Background Traffic Volumes

The growth in background traffic was determined by examination of historical traffic counts. The 2010 and 2015 traffic counts taken by the City of Ottawa at the south approach of the Russell/Hawthorne intersection were compared to the 2017 counts at the north approach to the Ages/Hawthorne intersection. The counts determined that the traffic along Hawthorne Road decreased over the seven year period from 2010 to 2017, and were approximately the same when comparing the 2015 to the 2017 traffic counts.

Following the examination of historical traffic volumes along Hawthorne Road, the study has increased the through movements at the north and south approaches and all lane movements turning to/from the Russell Road east approach by an annual compounded rate of 2.0 percent. This increase would account for development outside the study area which would not include Buildings 100, 500, 550 and 600 which were not constructed at the time the 2015 traffic counts were taken. The expected site trips from the competed TIS report for the development at 3009 Hawthorne Road which is currently under construction were also included as background traffic.

The increase in background traffic was applied to the 2015 traffic counts (Figure 2.1). The annual increase would translate to the following growth factor:

Existing Counts		Analysis Year		Growth Factor
2015	→	2024	=	1.195

Figure 4.1 shows the expected 2024 background traffic volumes at the Hawthorne/Russell intersection.

4.2 Total Traffic Volumes

The expected peak AM and PM hour 2024 total traffic volumes were determined by the addition of the site generated trips (Figure 3.1), and the background traffic in the year 2024 (Figure 4.1). The results are the expected total 2024 traffic volumes which are shown in Figure 4.2.

4.3 Traffic Analysis

The traffic analysis will be completed for the intersection of Hawthorne Road and Russell Road where the development access forms the existing eastbound approach to the intersection. The analysis will be completed using the most recent 2015 traffic counts for the intersection which will include trips from three of the seven buildings proposed for the site. The analysis will determine the total number of expected site generated trips at the completion of the development (seven buildings), and the impact at the Hawthorne/Russell intersection using the expected traffic at the year 2024 which will include the trips from the total development of the site. The analysis will be conducted for the traffic during the peak AM and PM hours of the adjacent streets.

FIGURE 4.1
YEAR 2024 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

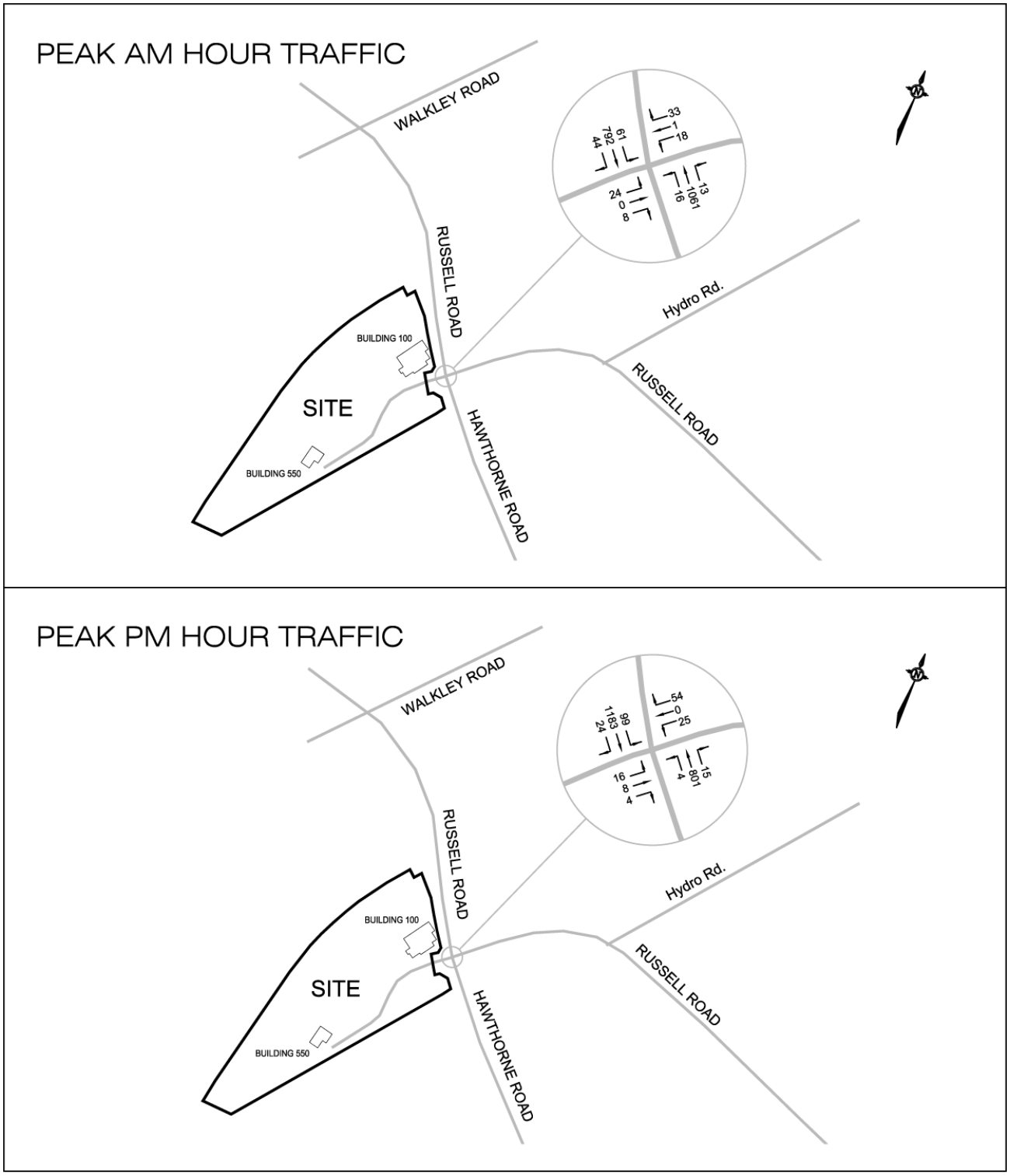
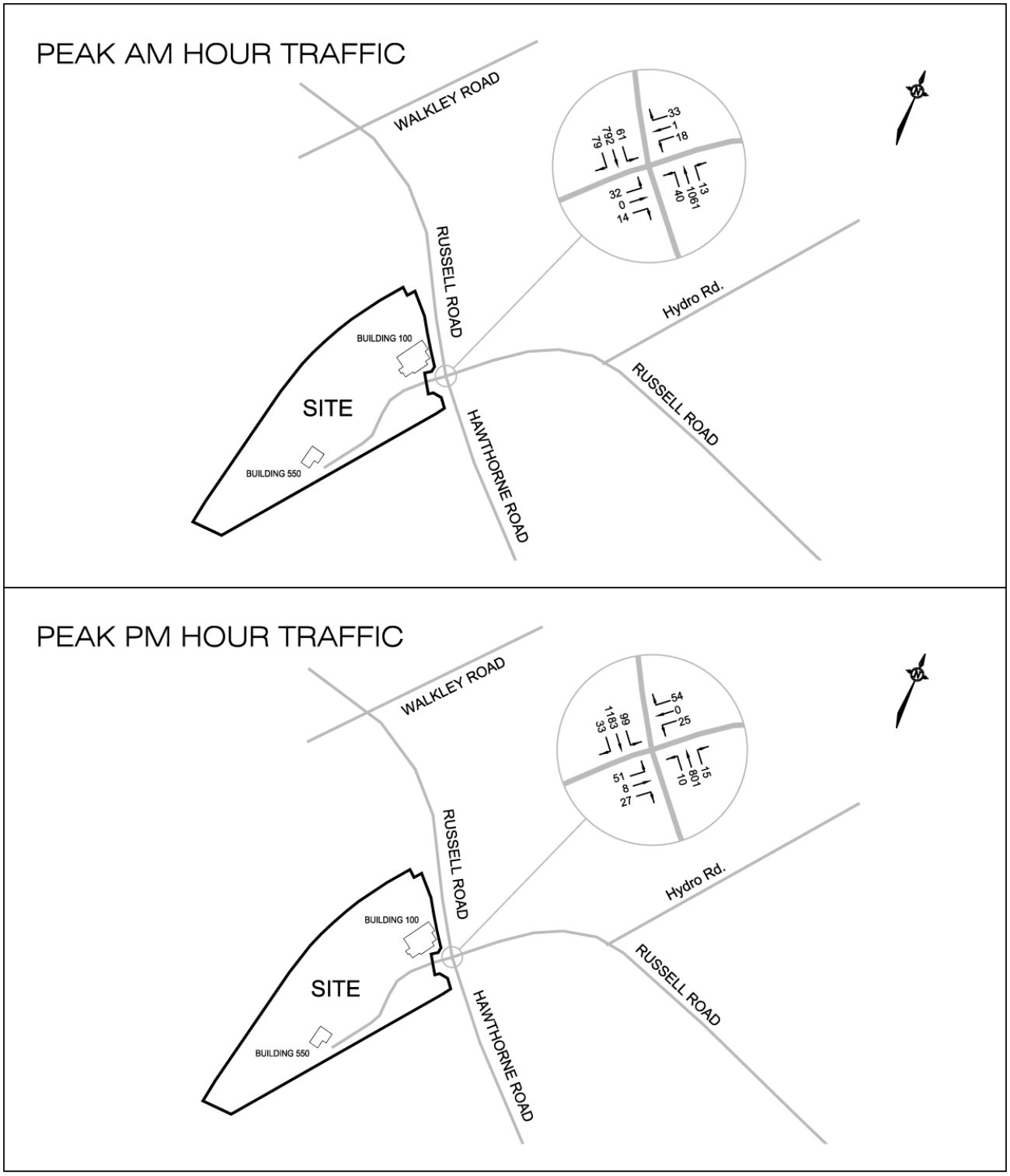


FIGURE 4.2
YEAR 2024 PEAK AM AND PM HOUR TOTAL TRAFFIC



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The 2015 analysis used the 2015 traffic counts which are the most recent counts obtained from the City of Ottawa along with the traffic signal timing plan. The analysis included the trips from Buildings 200, 300/400 and 700 which were constructed and occupied at the time. The traffic analysis determined that all of the approaches to the intersection would function at a Level of Service (LoS) "A" during both the peak AM and PM hours. The existing intersection geometry provides sufficient left turn lane storage at all approaches for the 2015 traffic using the traffic signal cycle from the timing plan. The analysis of the intersection is summarized in Table 4.1 with the analysis sheets provided in the Appendix as Exhibit 4 for the 2015 peak AM hour and Exhibit 5 for the peak PM hour.

TABLE 4.1
HAWTHORNE/RUSSELL INTERSECTION – LoS & Volume to Capacity Ratio (v/c)

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR 2015 (2024)		WEEKDAY PEAK PM HOUR YEAR 2015 (2024)	
	LoS	v/c	LoS	v/c
EB Left – Site Access	A (A)	0.114 (0.146)	A (A)	0.061 (0.180)
EB Through – Site Access	A (A)	0.000 (0.000)	A (A)	0.040 (0.036)
WB Left – Russell	A (A)	0.060 (0.074)	A (A)	0.080 (0.111)
WB Through – Russell	A (A)	0.006 (0.005)	A (A)	0.000 (0.000)
WB Right – Russell	A (A)	0.215 (0.239)	A (A)	0.268 (0.319)
NB Left – Hawthorne	A (A)	0.030 (0.086)	A (A)	0.010 (0.033)
NB Through – Hawthorne	A (A)	0.392 (0.473)	A (A)	0.299 (0.363)
SB Left – Hawthorne	A (A)	0.122 (0.191)	A (A)	0.170 (0.239)
SB Through – Hawthorne	A (A)	0.306 (0.372)	A (A)	0.457 (0.555)

The analysis for the expected 2024 traffic at the Hawthorne/Russell intersection included an increase in background traffic due to development outside the study area. The trips were from the total development and included Buildings 100, 200, 300/400, 500, 550, 600 and 700, with the 2015 traffic counts accounting for the trips from Buildings 200, 300/400 and 700 which were already constructed. The traffic analysis for the Hawthorne/Russell intersection determined that the intersection would continue to operate at a LoS "A", with the existing lane geometry providing sufficient storage for the peak hour left turn movements at all intersection approaches. The analysis of the intersection is summarized in Table 4.1 with the analysis sheets provided as Exhibit 6 for the 2024 peak AM hour and Exhibit 7 for the peak PM hour.

5. FINDINGS AND RECOMMENDATIONS

The Commercial Centre Development is located west of the Hawthorne/Russell intersection with the existing site access forming the eastbound approach to the intersection. A TIS report was completed in 2012 along with an Addendum in 2016 which addressed the development and revisions to the buildings. This Transportation Brief will be addressing the Site Plan Application for the construction of Building 100 and Building 550 which proposes an additional 302.5 m^2 of gross floor area when compared to the January 2016 Addendum. The following are the findings of the traffic analysis:

1. A TIA Screening Form was prepared for the construction of Buildings 100 and 550. The Screening Form did not trigger the requirement for the preparation of a Transportation Impact Assessment (TIA) report. The Transportation Brief was prepared as requested by City of Ottawa staff and has addressed their concerns.

2. A trip generation analysis was conducted utilizing the average trip rates published in the Institute of Transportation Engineers document (ITE), *Trip Generation Manual, 10th Edition*. The analysis used the same ITE Land Use 130 for an Industrial Park which was used in the original TIS report prepared by WSP Canada Inc. dated March 2, 2012 and the January 2016 TIS Addendum. For the total development which includes trips from Buildings 100, 200, 300/400, 500, 550, 600 and 700, the analysis determined the following expected peak hour trips which are detailed in Table 3.2:

Peak AM Hour		Peak PM Hour	
Trips entering	Trips Exiting	Trips Entering	Trips Exiting
112	26	29	109

3. The operational analysis of the Hawthorne/Russell intersection was completed for both the existing 2015 traffic counts and the expected 2024 traffic which would include the complete development of the site. Total development includes all seven commercial buildings. The operational analysis determined that the intersection would function at an acceptable level of service at the year 2015 and 2024 as shown in Table 4.1. There would be no requirement for upgrading the existing intersection due to the development of the 3020 Hawthorne Road site.

Prepared by:

David J. Halpenny

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

APPENDIX

SCREENING FORM

TRAFFIC COUNTS

TRIP GENERATION DATA GRAPHS

TRAFFIC ANALYSIS SHEETS

EXHIBIT 1
SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	**3020 Hawthorne Road, Ottawa**
Description of Location	Building 100 and Building 550
Land Use Classification	"IL" Zoning – Light Industrial Zone
Development Size (units)	
Development Size (m^2)	Two building with a gross floor area of 2,656 m^2
Number of Accesses and Locations	Will use the existing site access onto Hawthorne Road which forms the west approach to the Hawthorne/Russell intersection.
Phase of Development	Single phase
Buildout Year	2019

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Industrial	5,000 m^2

	Yes	No
1,954 m^2 (Building 100) + 702 m^2 (Building 550) = 2,656 m^2 **2,656 m^2 < 5,000 m^2**		X

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		X
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		X

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		X
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		X
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		X
Is the proposed driveway within auxiliary lanes of an intersection?		X
Does the proposed driveway make use of an existing median break that serves an existing site?		X
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		X
Does the development include a drive-thru facility?		X

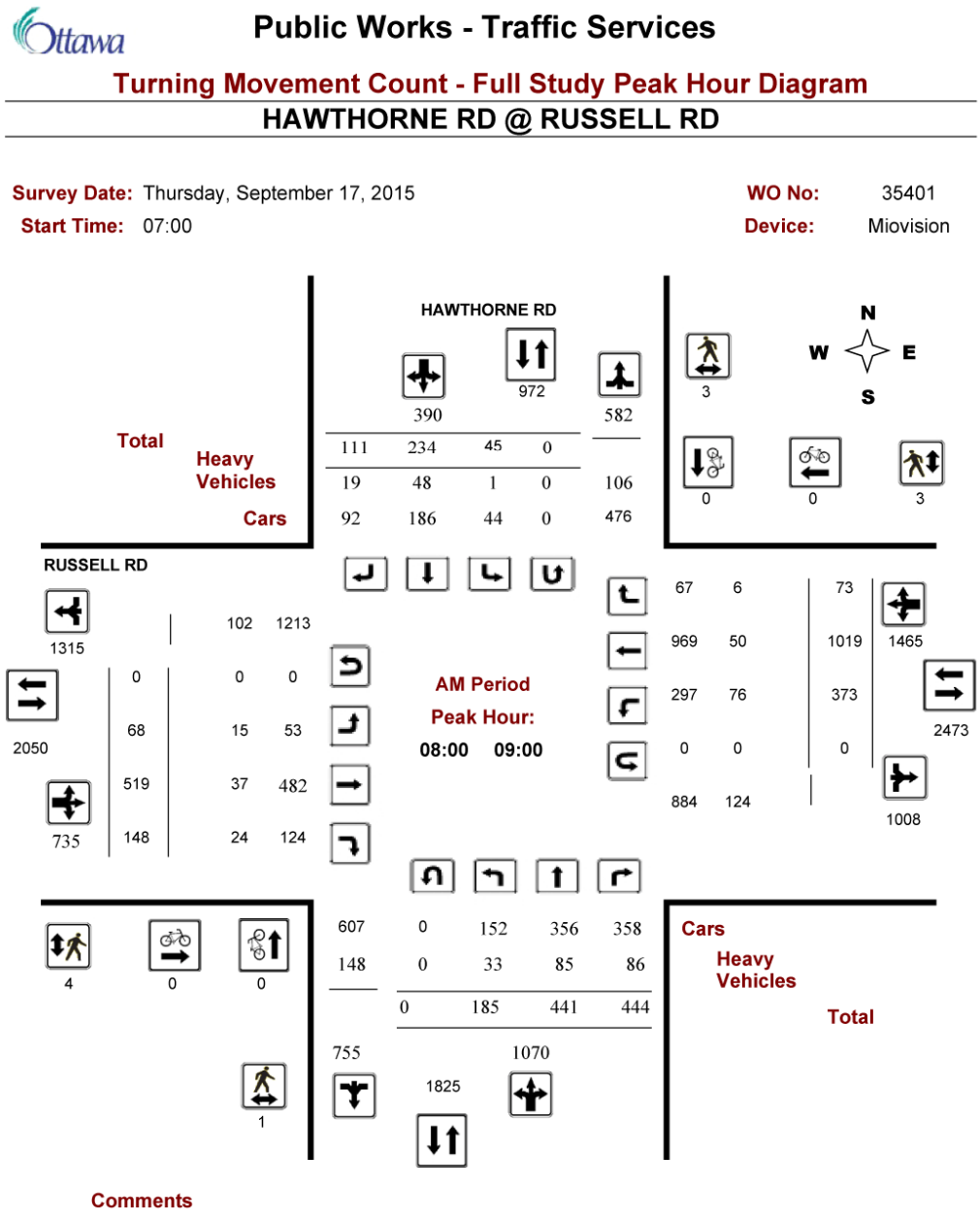
If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?		X
Does the development satisfy the Location Trigger?		X
Does the development satisfy the Safety Trigger?		X

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

EXHIBIT 2
HAWTHORNE ROAD AND RUSSELL ROADTRAFFIC COUNTS – July 20, 2015



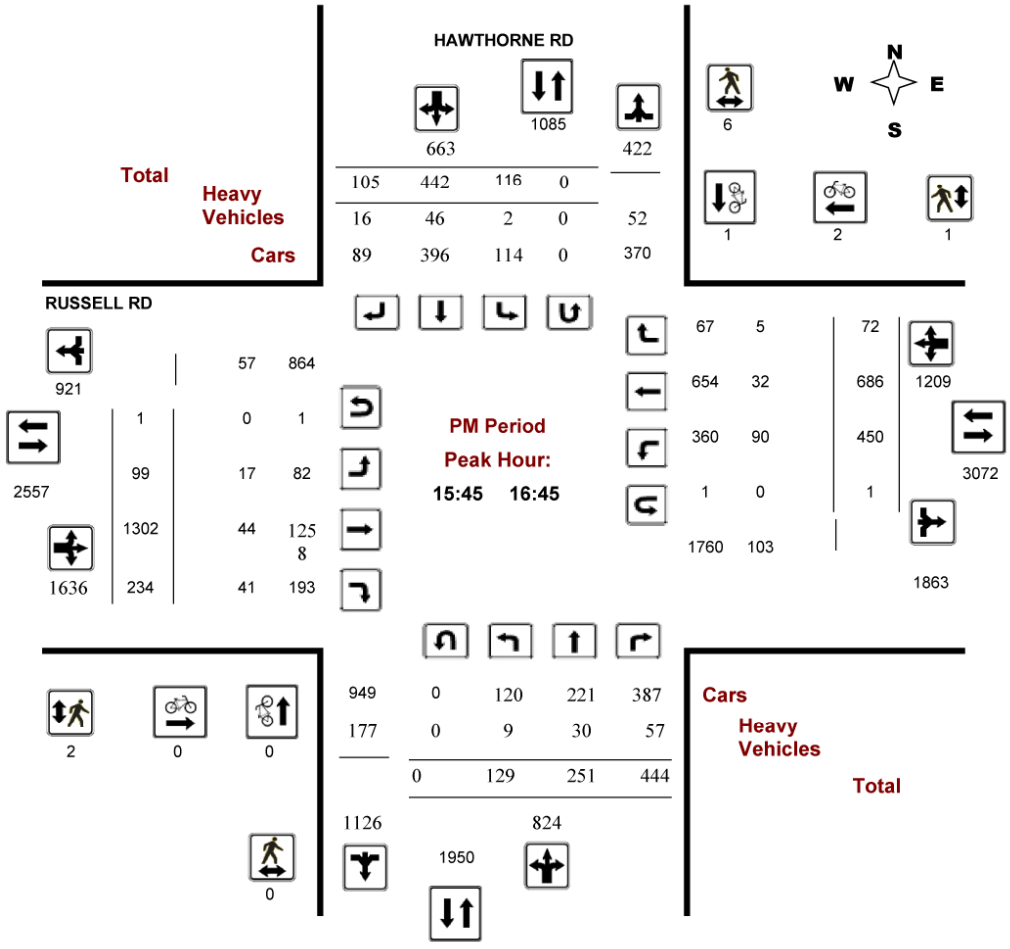
Public Works - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

HAWTHORNE RD @ RUSSELL RD

Survey Date: Thursday, September 17, 2015 **WO No:** 35401

Start Time: 07:00 **Device:** Miovision



Comments

Public Works - Traffic Services

Work Order 35401

Turning Movement Count - Full Study Summary Report

HAWTHORNE RD @ RUSSELL RD

Survey Date: Thursday, September 17, 2015

Total Observed U-Turns

Northbound: 2 Southbound: 0

Eastbound: 6 Westbound: 3

AADT Factor 1.00

Full Study

	HAWTHORNE RD									RUSSELL RD									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	**NB TOT**	LT	ST	RT	**SB TOT**	**STR TOT**	LT	ST	RT	**EB TOT**	LT	ST	RT	**WB TOT**	**STR TOT**	**Grand Total**
07:00 08:00	162	408	368	**938**	42	215	91	**348**	**1286**	48	459	89	**596**	403	1109	59	**1571**	**2167**	**3453**
08:00 09:00	185	441	444	**1070**	45	234	111	**390**	**1460**	68	519	148	**735**	373	1019	73	**1465**	**2200**	**3660**
09:00 10:00	109	306	511	**926**	50	213	89	**352**	**1278**	69	439	155	**663**	341	657	56	**1054**	**1717**	**2995**
11:30 12:30	114	312	441	**867**	45	289	69	**403**	**1270**	108	622	168	**898**	395	528	62	**985**	**1883**	**3153**
12:30 13:30	100	287	339	**726**	45	345	99	**489**	**1215**	90	518	162	**770**	420	547	66	**1033**	**1803**	**3018**
15:00 16:00	136	277	502	**915**	90	450	112	**652**	**1567**	105	1062	203	**1370**	379	599	53	**1031**	**2401**	**3968**
16:00 17:00	130	234	448	**812**	114	426	109	**649**	**1461**	99	1278	212	**1589**	472	687	80	**1239**	**2828**	**4289**
17:00 18:00	125	220	373	**718**	86	384	98	**568**	**1286**	94	867	179	**1140**	340	603	75	**1018**	**2158**	**3444**
Total	1061	2485	3426	**6972**	517	2556	778	**3851**	**10823**	681	5764	1316	**7761**	3123	5749	524	**9396**	**17157**	**27980**
Equ 12Hr	1474	3454	4762	**9690**	718	3552	1081	**5351**	**15041**	946	8011	1829	**10786**	4340	7991	728	**13059**	**23845**	**38886**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.															**1.39**				
Avg 12Hr	1474	3454	4762	**9690**	718	3552	1081	**5351**	**15041**	946	8011	1829	**10786**	4340	7991	728	**13059**	**23845**	**38886**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.															**1.00**				
Avg 24Hr	1930	4524	6238	**12693**	940	4653	1416	**7009**	**19703**	1239	10494	2395	**14129**	5685	10468	953	**17107**	**31236**	**50940**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.															**1.31**				

Comments:

Note: U-Turns are **not** included in Totals.

EXHIBIT 3
ITE TRIP GENERATION MANUAL 10th Edition – Industrial Park (130)

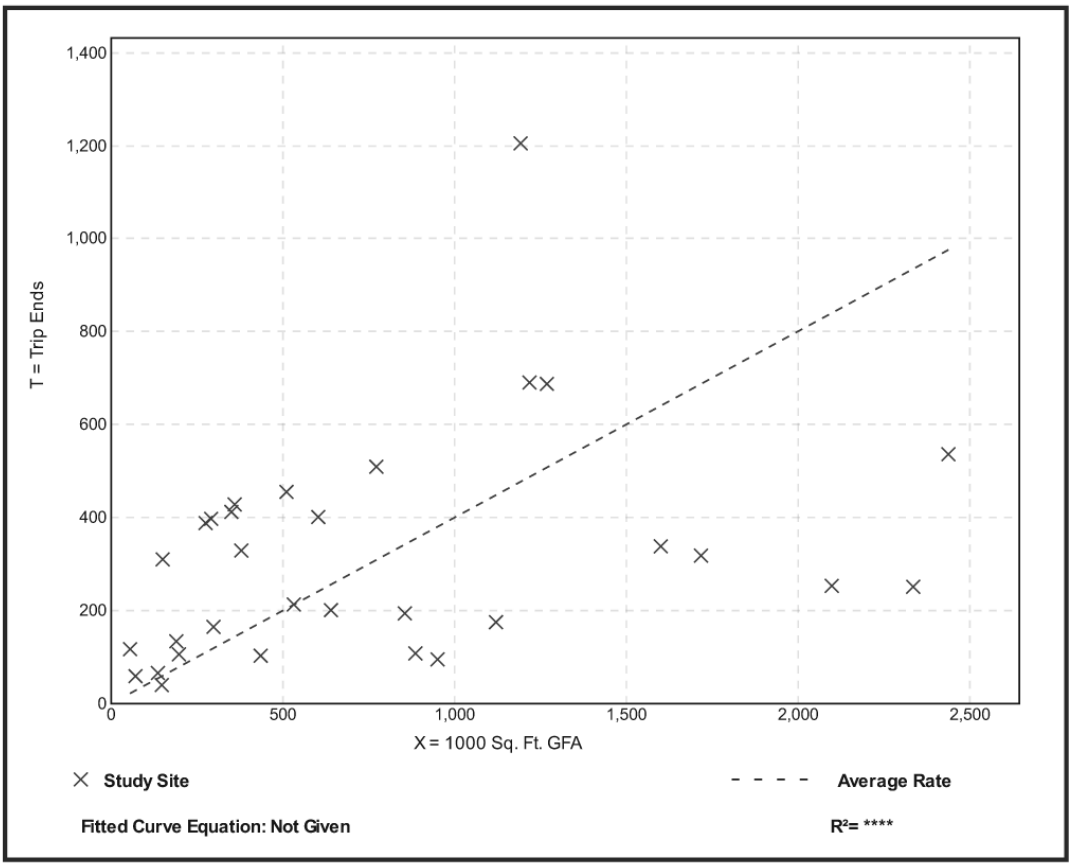
Industrial Park
(130)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GFA**
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:	31
1000 Sq. Ft. GFA:	776
Directional Distribution:	81% entering, 19% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.40	0.10 - 2.13	0.37

Data Plot and Equation



Industrial Park
(130)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
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: 32
1000 Sq. Ft. GFA: 720
Directional Distribution: 21% entering, 79% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.40	0.10 - 2.85	0.41

Data Plot and Equation

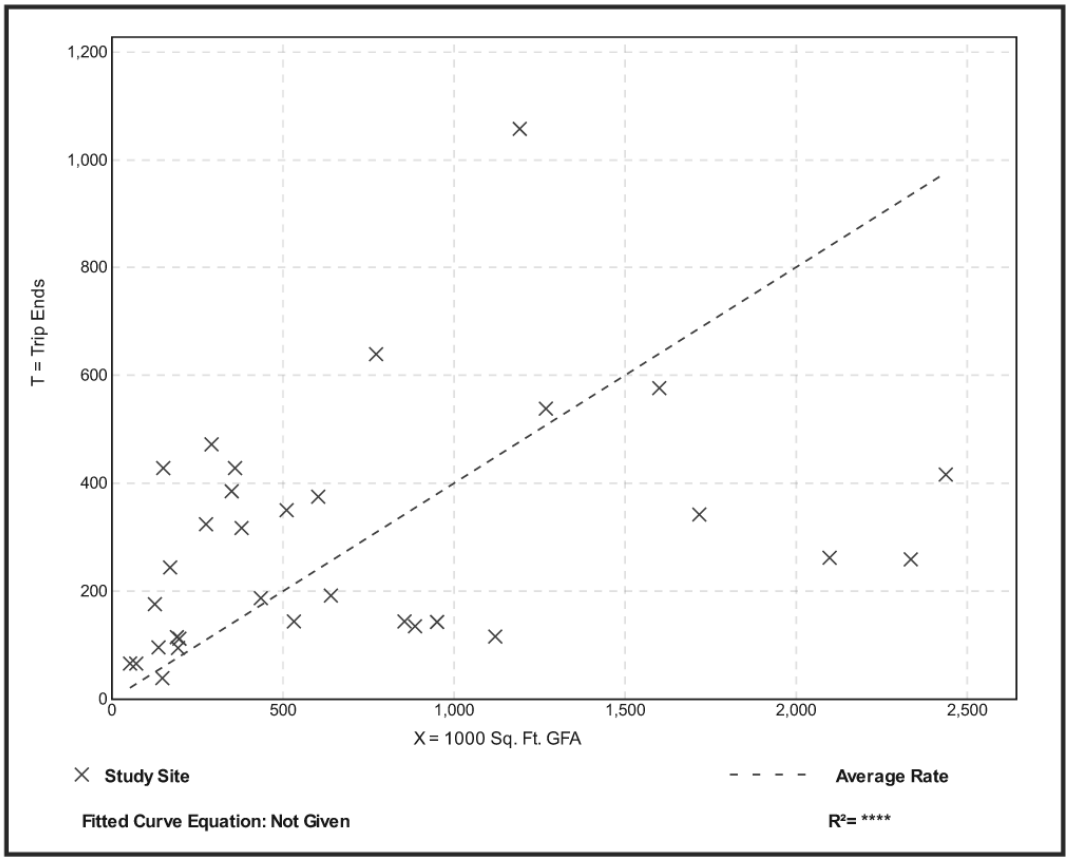
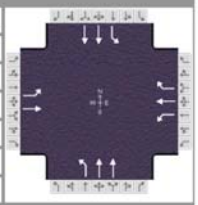


EXHIBIT 4
YEAR 2015 PEAK AM HOUR TRAFFIC ANALYSIS – Hawthorne/Russell Intersection

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	10/29/2018	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Site Access Approach	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Hawthorne/Russell	File Name	2015_ex_am.xus		
Project Description	3020 Hawthorne Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	24	0		14	1	28	16	888		47	663	

Signal Information													
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	69.1	8.7	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.2	3.7	0.0	0.0	0.0	0.0			
				Red	2.3	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		5.0		6.0		6.0
Phase Duration, s		14.4		14.4		75.6		75.6
Change Period, ($Y+R_c$), s		5.7		5.7		6.5		6.5
Max Allow Headway (*MAH*), s		3.1		3.1		0.0		0.0
Queue Clearance Time (g_s), s		3.6		3.9				
Green Extension Time (g_e), s		0.1		0.1		0.0		0.0
Phase Call Probability		0.84		0.84				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2		1	6	
Adjusted Flow Rate (*v*), veh/h	26	0		15	1	30	17	965		51	721	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1386	1800		1621	1800	1316	709	1580		499	1500	
Queue Service Time (g_s), s	1.5	0.0		0.8	0.0	1.9	0.7	8.8		3.3	6.3	
Cycle Queue Clearance Time (g_c), s	1.6	0.0		0.8	0.0	1.9	7.0	8.8		12.0	6.3	
Green Ratio (*g/C*)	0.11	0.11		0.11	0.11	0.11	0.78	0.78		0.78	0.78	
Capacity (*c*), veh/h	229	194		255	194	142	582	2461		420	2336	
Volume-to-Capacity Ratio (*X*)	0.114	0.000		0.060	0.006	0.215	0.030	0.392		0.122	0.308	
Back of Queue (*Q*), ft/ln (50 th percentile)	13	0		7.7	0.5	16.9	2.1	40.9		9.3	29.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.5	0.0		0.3	0.0	0.6	0.1	1.5		0.3	1.0	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.10	0.00		0.05	0.00	0.05	0.01	0.08		0.03	0.06	
Uniform Delay (d_1), s/veh	36.6	0.0		36.2	35.8	36.7	3.9	3.2		5.1	2.9	
Incremental Delay (d_2), s/veh	0.1	0.0		0.0	0.0	0.3	0.1	0.5		0.6	0.3	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	36.6	0.0		36.2	35.8	36.9	4.0	3.6		5.7	3.2	
Level of Service (LOS)	D			D	D	D	A	A		A	A	
Approach Delay, s/veh / LOS	36.6	D		36.7	D		3.6	A		3.4	A	
Intersection Delay, s/veh / LOS	4.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	2.02	B	1.83	B
Bicycle LOS Score / LOS	0.53	A	0.56	A	1.30	A	1.12	A

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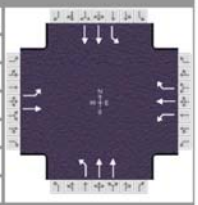
EXHIBIT 5

YEAR 2015 PEAK PM HOUR TRAFFIC ANALYSIS – Hawthorne/Russell Intersection

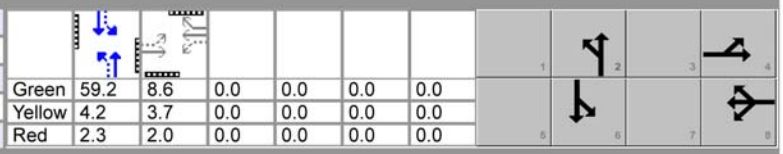
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	10/29/2018	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Site Access Approach	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Hawthorne/Russell	File Name	2015_ex_pm.xus		
Project Description	3020 Hawthorne Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	8		17	0	41	4	670		82	990	

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



	EB			WB			NB			SB		
Green	59.2	8.6		0.0	0.0	0.0	0.0					
Yellow	4.2	3.7		0.0	0.0	0.0	0.0					
Red	2.3	2.0		0.0	0.0	0.0	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		5.0		6.0		6.0
Phase Duration, s		14.3		14.3		65.7		65.7
Change Period, ($Y+R_c$), s		5.7		5.7		6.5		6.5
Max Allow Headway (*MAH*), s		3.2		3.2		0.0		0.0
Queue Clearance Time (g_s), s		2.8		4.3				
Green Extension Time (g_e), s		0.1		0.1		0.0		0.0
Phase Call Probability		0.86		0.86				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2		1	6	
Adjusted Flow Rate (*v*), veh/h	17	9		18	0	45	4	728		89	1076	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1634	1800		1206	1800	1383	533	1620		640	1567	
Queue Service Time (g_s), s	0.8	0.3		1.1	0.0	2.3	0.2	5.7		4.1	10.4	
Cycle Queue Clearance Time (g_c), s	0.8	0.3		1.4	0.0	2.3	10.6	5.7		9.9	10.4	
Green Ratio (*g/C*)	0.12	0.12		0.12	0.12	0.12	0.75	0.75		0.75	0.75	
Capacity (*c*), veh/h	287	216		230	216	166	422	2437		526	2357	
Volume-to-Capacity Ratio (*X*)	0.061	0.040		0.080	0.000	0.268	0.010	0.299		0.170	0.457	
Back of Queue (*Q*), ft/ln (50 th percentile)	7.4	3.5		8.9	0	20.6	0.7	27.1		13.2	49.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	0.1		0.3	0.0	0.8	0.0	1.0		0.5	1.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.06	0.02		0.06	0.00	0.07	0.00	0.05		0.04	0.10	
Uniform Delay (d_1), s/veh	31.3	31.1		31.7	0.0	32.0	5.7	3.2		4.7	3.7	
Incremental Delay (d_2), s/veh	0.0	0.0		0.1	0.0	0.3	0.0	0.3		0.7	0.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	31.3	31.1		31.8	0.0	32.3	5.8	3.5		5.4	4.4	
Level of Service (LOS)	C	C		C		C	A	A		A	A	
Approach Delay, s/veh / LOS	31.3	C		32.2	C		3.5	A		4.5	A	
Intersection Delay, s/veh / LOS	5.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	2.03	B	1.84	B
Bicycle LOS Score / LOS	0.53	A	0.59	A	1.09	A	1.45	A

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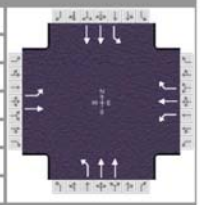
EXHIBIT 6
TOTAL 2024 PEAK AM HOUR TRAFFIC ANALYSIS – Hawthorne/Russell Intersection

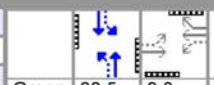
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	10/29/2018	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Site Access Approach	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Hawthorne/Russell	File Name	2024_tot_am.xus		
Project Description	3020 Hawthorne Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	32	0		18	1	33	40	1061		61	792	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	68.5	9.3	0.0	0.0	0.0	0.0	
Yellow	4.2	3.7	0.0	0.0	0.0	0.0	
Red	2.3	2.0	0.0	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		5.0		6.0		6.0
Phase Duration, s		15.0		15.0		75.0		75.0
Change Period, ($Y+R_c$), s		5.7		5.7		6.5		6.5
Max Allow Headway (*MAH*), s		3.1		3.1		0.0		0.0
Queue Clearance Time (g_s), s		4.1		4.2				
Green Extension Time (g_e), s		0.1		0.1		0.0		0.0
Phase Call Probability		0.90		0.90				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2		1	6	
Adjusted Flow Rate (*v*), veh/h	35	0		20	1	36	43	1153		66	861	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1386	1800		1621	1800	1316	622	1580		418	1500	
Queue Service Time (g_s), s	2.1	0.0		1.0	0.0	2.2	2.2	11.8		6.1	8.2	
Cycle Queue Clearance Time (g_c), s	2.1	0.0		1.0	0.0	2.2	10.4	11.8		17.9	8.2	
Green Ratio (*g/C*)	0.11	0.11		0.11	0.11	0.11	0.77	0.77		0.77	0.77	
Capacity (*c*), veh/h	238	206		265	206	150	503	2441		348	2317	
Volume-to-Capacity Ratio (*X*)	0.146	0.000		0.074	0.005	0.239	0.086	0.473		0.191	0.372	
Back of Queue (*Q*), ft/ln (50 th percentile)	17.3	0		9.8	0.5	19.8	6.7	57.9		15.7	39.9	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.7	0.0		0.4	0.0	0.7	0.3	2.1		0.5	1.4	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.13	0.00		0.07	0.00	0.06	0.05	0.12		0.05	0.08	
Uniform Delay (d_1), s/veh	36.3	0.0		35.7	35.3	36.3	4.9	3.7		6.9	3.3	
Incremental Delay (d_2), s/veh	0.1	0.0		0.0	0.0	0.3	0.3	0.7		1.2	0.5	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	36.4	0.0		35.8	35.3	36.6	5.3	4.3		8.1	3.7	
Level of Service (LOS)	D			D	D	D	A	A		A	A	
Approach Delay, s/veh / LOS	36.4	D		36.3	D		4.4	A		4.0	A	
Intersection Delay, s/veh / LOS	5.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.30	B	2.30	B	2.03	B	1.84	B
Bicycle LOS Score / LOS	0.54	A	0.58	A	1.47	A	1.25	A

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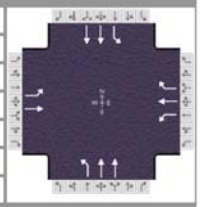
EXHIBIT 7
TOTAL 2024 PEAK PM HOUR TRAFFIC ANALYSIS – Hawthorne/Russell Intersection

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	10/29/2018	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Site Access Approach	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Hawthorne/Russell	File Name	2024_tot_pm.xus		
Project Description	3020 Hawthorne Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	51	8		25	0	54	10	801		99	1183	

Signal Information													
Cycle, s	80.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	58.2	9.6	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.2	3.7	0.0	0.0	0.0	0.0			
				Red	2.3	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		6.0		5.0		6.0		6.0
Phase Duration, s		15.3		15.3		64.7		64.7
Change Period, (*Y*+*R c*), s		5.7		5.7		6.5		6.5
Max Allow Headway (*MAH*), s		3.2		3.2		0.0		0.0
Queue Clearance Time (*g s*), s		4.4		5.1				
Green Extension Time (*g e*), s		0.2		0.2		0.0		0.0
Phase Call Probability		0.96		0.96				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2		1	6	
Adjusted Flow Rate (*v*), veh/h	55	9		27	0	59	11	871		108	1286	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1634	1800		1206	1800	1383	436	1620		561	1567	
Queue Service Time (*g s*), s	2.4	0.3		1.6	0.0	3.1	0.9	7.7		6.8	14.5	
Cycle Queue Clearance Time (*g c*), s	2.4	0.3		1.9	0.0	3.1	15.4	7.7		14.4	14.5	
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13	0.13	0.74	0.74		0.74	0.74	
Capacity (*c*), veh/h	307	239		245	239	184	333	2396		451	2317	
Volume-to-Capacity Ratio (*X*)	0.180	0.036		0.111	0.000	0.319	0.033	0.363		0.239	0.555	
Back of Queue (*Q*), ft/ln (50 th percentile)	23.8	3.5		12.9	0	26.9	2.2	38.9		21	75	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	0.1		0.4	0.0	1.0	0.1	1.5		0.7	2.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.18	0.02		0.09	0.00	0.09	0.01	0.08		0.06	0.15	
Uniform Delay (*d 1*), s/veh	31.1	30.2		31.1	0.0	31.4	8.0	3.7		6.3	4.6	
Incremental Delay (*d 2*), s/veh	0.1	0.0		0.1	0.0	0.4	0.2	0.4		1.2	1.0	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	31.2	30.2		31.1	0.0	31.8	8.2	4.1		7.5	5.6	
Level of Service (LOS)	C	C		C		C	A	A		A	A	
Approach Delay, s/veh / LOS	31.1	C		31.6	C		4.2	A		5.7	A	
Intersection Delay, s/veh / LOS	6.8						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.29	B	2.03	B	1.84	B
Bicycle LOS Score / LOS	0.59	A	0.63	A	1.21	A	1.64	B

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