CAR WASH STATION
6111 HAZELDEAN ROAD
OTTAWA, ONTARIO

TRANSPORTATION IMPACT ASSESSMENT STRATEGY REPORT

February 11, 2021

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Consulting Transportation Engineers
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Prepared for:

Halo Car Wash Inc.

726 TIA Analysis.doc

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CAR WASH STATION
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INTRODUCTION

A commercial development has been proposed on a vacant parcel of land along the north side of Hazeldean Road 385 m west of the intersection of Hazeldean Road and Stittsville Main Street. The development has a municipal address of 6111 Hazeldean Road, and will contain a car wash station, an oil change station, a coffee shop, and some retail/commercial buildings. The site proposes one new right-in/right-out access onto Hazeldean Road. The site will be connected to the Jackson Trails Centre shopping plaza adjacent to the east limit of the site and will share the existing shopping plaza signalized access onto Hazeldean Road.

The firm of D. J. Halpenny & Associates Ltd. was retained to prepare a Transportation Impact Assessment report in support of the Site Plan Application for the project. The following documents the study steps which conform to the City of Ottawa *Transportation Impact Assessment Guidelines (2017)*.

STEP 1 - SCREENING

A Screening Form has been prepared by the Civil Engineer for the project and is provided as Exhibit 1.1 in the Appendix. The Screening Form was submitted to the City of Ottawa which determined that the Trip Generation, Location, and Safety Triggers were all met and a Transportation Impact Assessment (TIA) study must continue onto the next stage. The following will address the requirements of the Scoping Document.

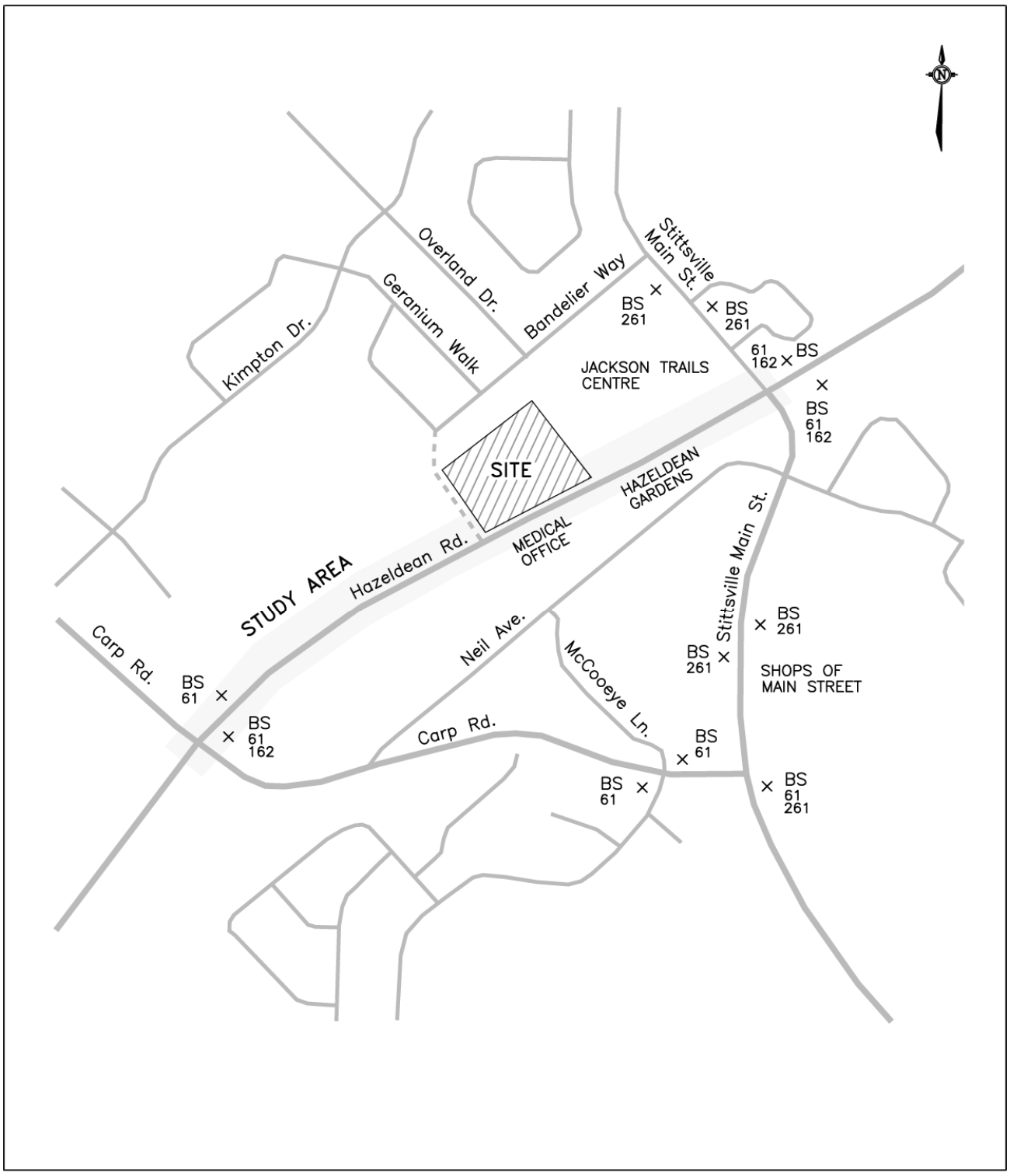
STEP 2 - SCOPING

MODULE 2.1 – Existing and Planned Conditions

Element 2.1.1 – Proposed Development

The proposed car wash station development is located at 6111 Hazeldean Road, approximately 385 m west of the Stittsville Main/Hazeldean intersection and 530 m east of the Carp/Hazeldean intersection. The development will be located on 1.849 ha of land which includes 0.51 ha of undeveloped land at the northwest corner of the property. The property is currently zoned AM9[1699]-h “Arterial Mainstreet” which will support the development. Figure 2.1 provides a site location plan of the development.

FIGURE 2.1
SITE LOCATION PLAN



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The total development will comprise of four free-standing single storey buildings. The four buildings on site will consist of a car wash station (Halo Car Wash), an oil change station (Mr. Lube), a retail building, and a retail building with an attached coffee shop with drive-through window (Starbucks).

The site will provide 84 parking spaces which includes 6 barrier-free spaces which will exceed City of Ottawa By-law requirements. All of the spaces are in a surface parking lot with spaces provided at each building. Bicycle parking will be provided for employees and customers with one bike rack placed in close proximity to the entrance of each building. The number of bicycle storage spaces will exceed City By-laws.

The site will have one right-in/right-out access onto Hazeldean Road, and will share an existing full movement signalized access to the Jackson Trails Centre shopping plaza. The accesses will have a separation of 135 m.

The development will be constructed in a single phase with completion expected by the year 2021. Figure 2.2 shows a conceptual site plan of the development.

Element 2.1.2 – Existing Conditions

ROADS

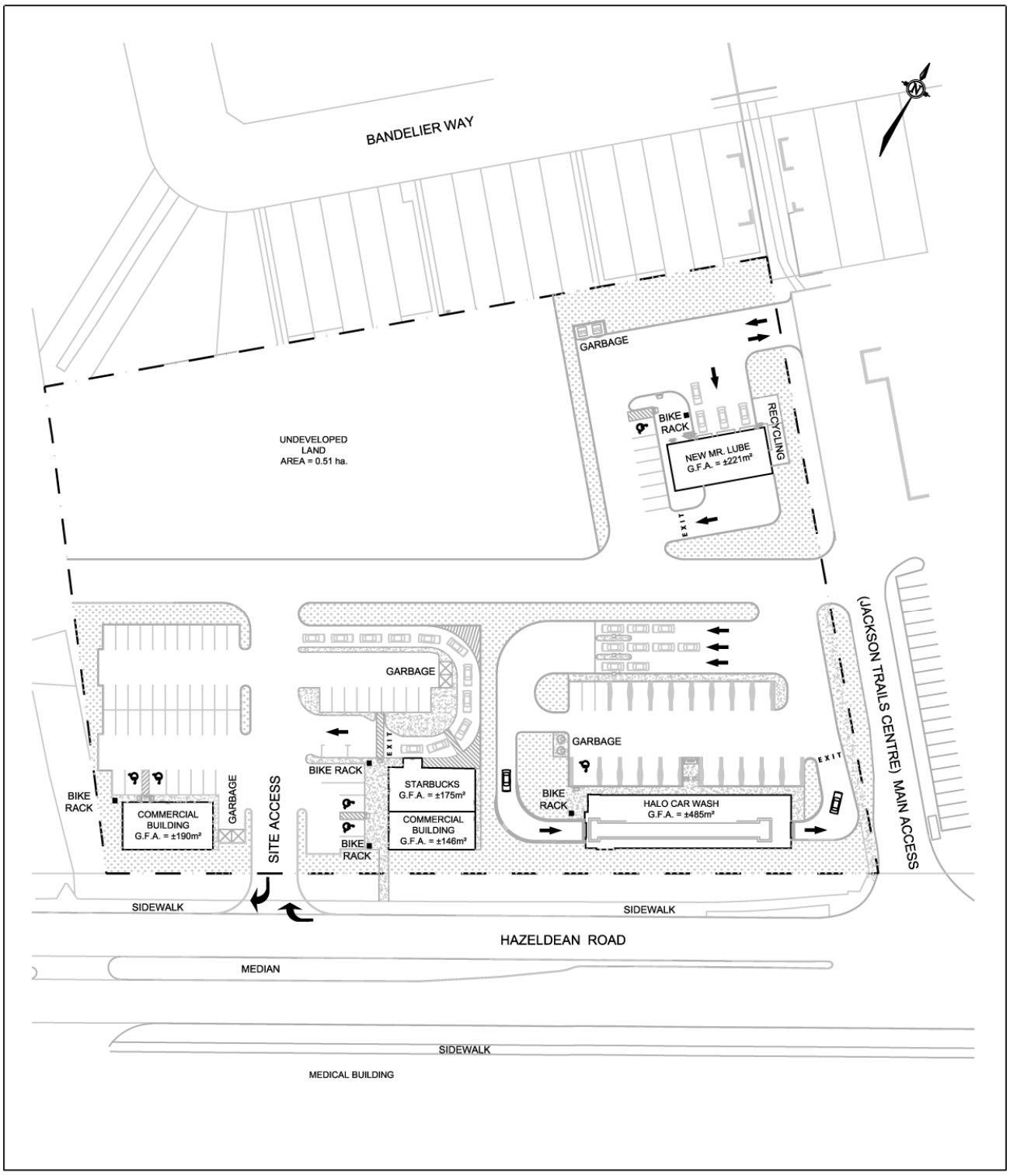
The car wash station site will be located on the north side of Hazeldean Road. Hazeldean Road is under the jurisdiction of the City of Ottawa and is designated as an arterial road in the City of Ottawa *Transportation Master Plan* (TMP). The road was reconstructed in 2010 from a two lane road to a four lane divided urban arterial road. The road has pedestrian sidewalks along both sides of the road with the north sidewalk adjacent to the curb across the frontage of the site, and along the south side a sidewalk with a 3.0 m boulevard between the curb and sidewalk. Hazeldean Road is designated as a Spine Route and provides cycling lanes on both sides of the road. The road has a posted speed limit of 60 km./h.

INTERSECTIONS

Jackson Trails/Hazeldean Intersection - The site will share the westerly site access to the Jackson Trails Centre shopping plaza which is adjacent to the east property limit of the site. The access is a full movement signalized “T” intersection with the Jackson Trails Centre access forming the southbound approach. Cycling lanes exist along Hazeldean Road at the east and west approaches, and pedestrian crosswalks exist at the east, west Hazeldean Road approaches, and north Jackson Trails approach. Below is the lane configuration to the intersection:

Southbound Jackson Trails Access	One left turn lane One right turn lane
Eastbound Hazeldean Road	One left turn lane (50 m storage) Two through lanes
Westbound Hazeldean Road	One through lane One shared through/right lane

FIGURE 2.2
CONCEPTUAL SITE PLAN



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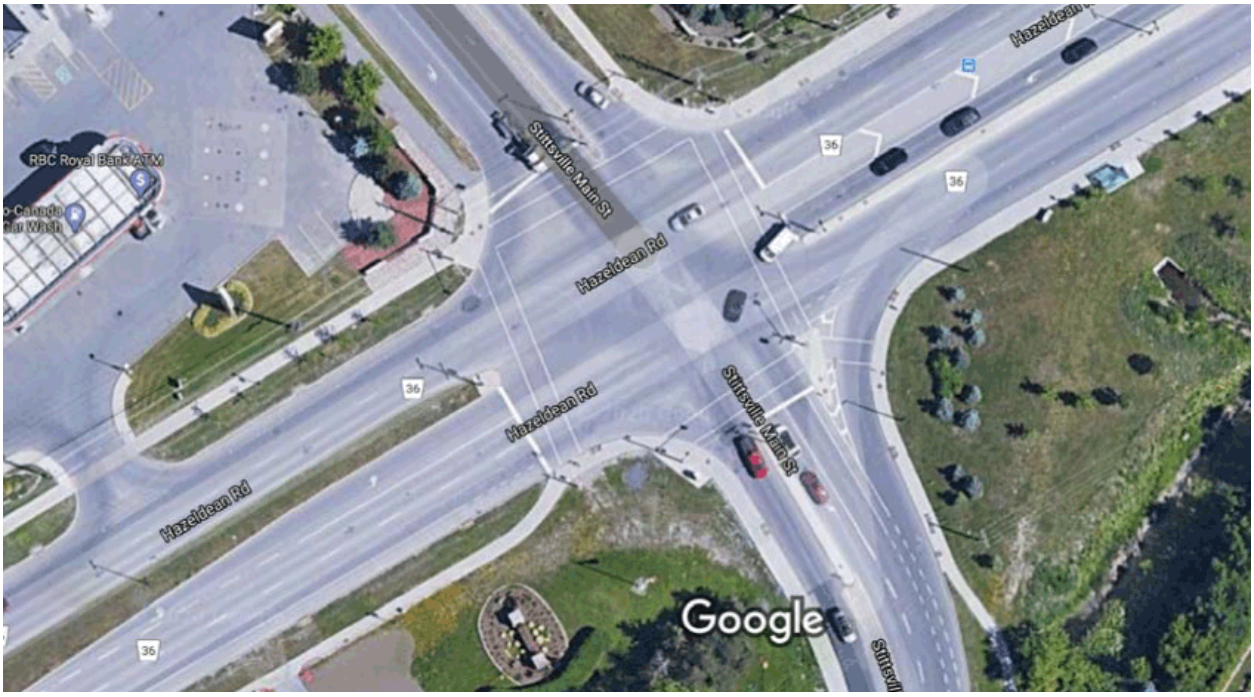
INTERSECTION OF JACKSON TRAILS CENTRE AND HAZELDEAN ROAD

Stittsville Main/Hazeldean Intersection - Approximately 385 m east of the site is the intersection of Stittsville Main Street and Hazeldean Road. Hazeldean Road east and west of the intersection is designated as an arterial road in the TMP. Stittsville Main Street is designated as an arterial road south of the intersection and as a major collector road north of the intersection. The intersection is controlled by traffic signals with Stittsville Main Street forming the northbound and southbound approaches and Hazeldean Road the eastbound and westbound approaches. Hazeldean Road provides cycling lanes at both the eastbound and westbound approaches, and Stittsville Main Street a pocket lane at the northbound approach. Pedestrian crosswalks are provided for crossing at all four intersection approaches. The intersection has the following lane configuration:

Northbound Stittsville Main Street	One left turn lane (40 m storage) One through lane One channelized right turn lane
Southbound Stittsville Main Street	One left turn lane (55 m storage) One through lane One right turn lane
Eastbound Hazeldean Road	One left turn lane (40 m storage) One through lane One shared through/right lane
Westbound Hazeldean Road	One left turn lane (290 m storage) One through lane One shared through/right lane

INTERSECTION OF STITTSVILLE MAIN STREET AND HAZELDEAN ROAD

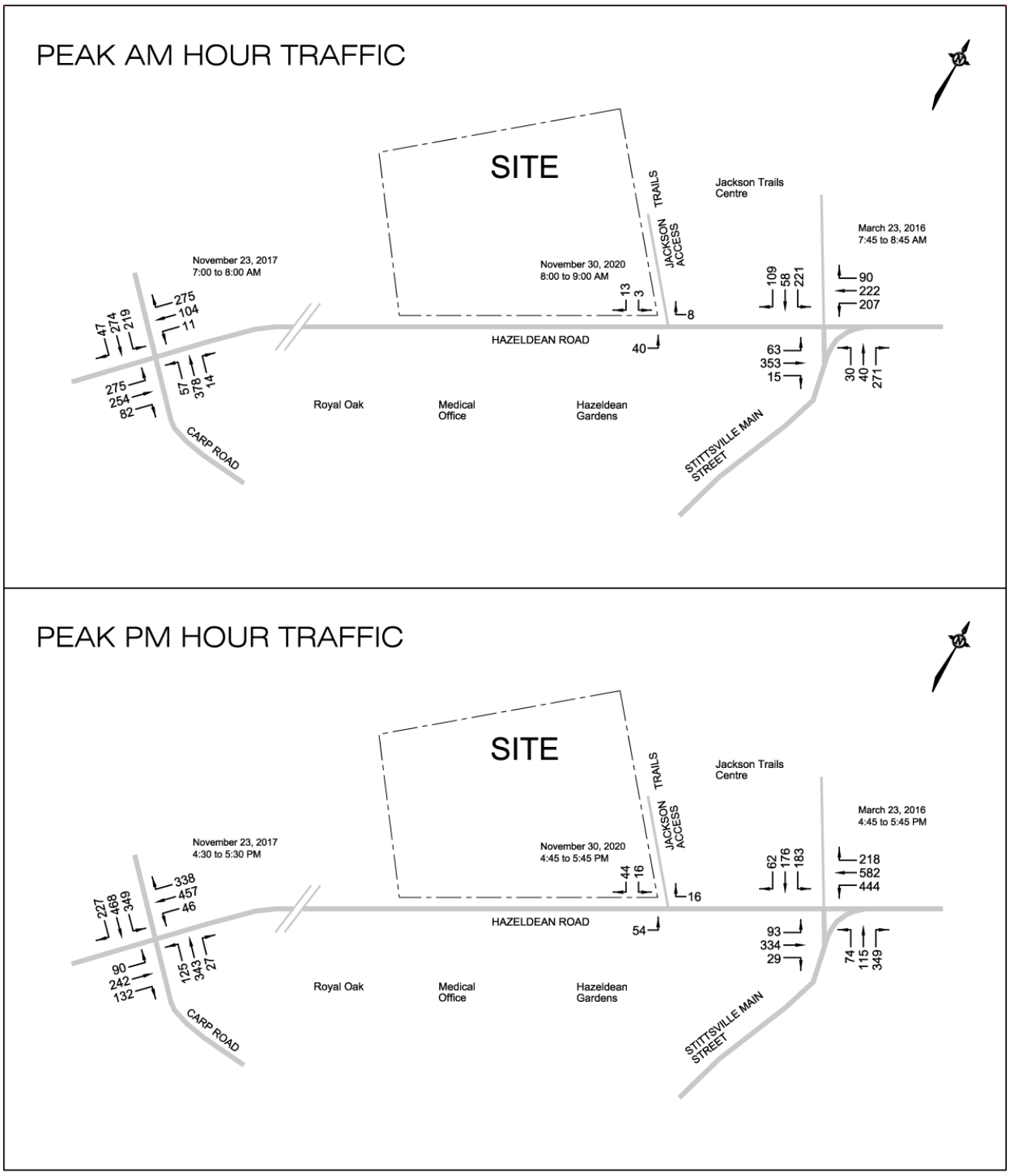


Carp/Hazeldean Intersection - The intersection of Hazeldean Road and Carp Road is located 530 m west of the site. The intersection is controlled by traffic signals with cycling lanes at the north, south and east approaches. All four approaches have pedestrian cross walks. The intersection has the following lane configuration:

Northbound Carp Road	One left turn lane (60 m storage) One through lane One shared through/right lane
Southbound Carp Road	One left turn lane (70 m storage) One through lane One channelized right turn lane
Eastbound Hazeldean Road	One left turn lane (55 m storage) One through lane One shared through/right lane
Westbound Hazeldean Road	One left turn lane (50 m storage) One through lane One channelized right turn lane

The most recent weekday peak AM and PM hour traffic counts were obtained from the City of Ottawa and are provided in the Appendix as Exhibit 2.1 for the 2016 counts at the intersection of Stittsville Main/Hazeldean, and Exhibit 2.2 for the 2017 counts at the intersection of Carp/Hazeldean. The site trips entering/exiting the Jackson Trails Centre were counted by the consultant on November 30, 2020 and are provided as Exhibit 2.3. Figure 2.3 presents the weekday peak hour counts at the intersections within the study area.

FIGURE 2.3
EXISTING PEAK AM AND PM HOUR TRAFFIC COUNTS



INTERSECTION OF CARP ROAD AND HAZELDEAN ROAD

TRANSIT

The site is serviced by OC Transpo Local Route 162 which is scheduled all day and weekends. The route travels along Hazeldean Road past the site to Kanata and the Terry Fox Transitway Station. Rapid Route 61 travels along Hazeldean Road past the site providing all day 7 days a week transit service. The route travels to the Eagleson Road Park & Ride and Tunney's Pasture Transitway Station. Connexion Route 261 provides service Monday to Friday during peak periods. The route travels along Stittsville Main Street with peak AM service to Tunney's Pasture and peak PM service to downtown Stittsville. The bus route maps are provided as Exhibit 2.4 to Exhibit 2.6.

Bus stops are currently located at the Stittsville Main/Hazeldean intersection for transit Routes 162 and 61. The stops are located approximately 385 m east of the site with the eastbound far side Hazeldean Road stop and westbound near side stop. The location of the bus stops is shown in Figure 2.1.

COLLISION HISTORY

Collision reports were obtained from the City of Ottawa through Open Data Ottawa for the five year time period between the years January 1, 2014 and December 31, 2018. The collision reports were obtained for the three intersections of Jackson Trails Centre access (250 m W of Stittsville Main) and Hazeldean Road, Carp Road and Hazeldean Road, and Stittsville Main Street and Hazeldean Road. Reported collisions were also obtained for the road segment of Hazeldean Road between Carp Road and Stittsville Main Street. Table 2.1 summarizes the collisions by year and type.

TABLE 2.1
COLLISION SUMMARY

YEAR	COLLISION TYPE					TOTAL
	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER (SMV)	
Jackson Trails Access at Hazeldean Road (250 m W of Stittsville Main) Intersection						
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
Stittsville Main Street at Hazeldean Road Intersection						
2014	11	1	2	2	1	17
2015	10	0	2	0	0	12
2016	4	1	3	1	0	9
2017	6	1	2	0	0	9
2018	7	1	5	0	1	14
Carp Road at Hazeldean Road Intersection						
2014	10	1	6	0	1	18
2015	6	1	2	0	1	10
2016	5	3	3	0	1	12
2017	9	4	7	0	2	22
2018	10	2	1	0	1	14
Hazeldean Road Segment between Carp Road and Stittsville Main Street						
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0

Element 2.1.3 – Planned Conditions

The *Transportation Master Plan 2013* (TMP) has identified the widening of Carp Road from two to four lanes between Highway 417 and Hazeldean Road. The project is listed in the Affordable Network (Phase 2: 2020 - 2025) and provides capacity for growth in the Stittsville area.

The TMP identifies the construction of the North-South Arterial Road in the Affordable Network. The road would be constructed between Palladium Drive and Fernbank Road, reducing congestion within the Stittsville area.

Transit Signal Priority and queue jumps are identified in the TMP for Hazeldean Road between Stittsville Main Street and Eagleson Road. The transit measures are listed in the Affordable Network (2014 - 2031) and would reduce transit time and increase the reliability of transit service along Hazeldean Road.

Below are proposed or recently developed lands within the immediate area of the site:

- The Hazeldean Gardens Retirement Residence at 6130 Hazeldean Road is located at the southwest corner of the intersection of Hazeldean Road and Stittsville Main Street. The residence was completed in 2018.
- A medical pharmacy and restaurant/pub are located on the south side of Hazeldean Road across from the site at 6150 and 6160 Hazeldean Road. The developments were completed in 2020.
- A residential development is proposed at 6171 Hazeldean Road adjacent to the west property limit of the site. The subdivision will contain 529 dwelling units and have one access onto Hazeldean Road and a second access onto Kimpton Drive to the north of the development. The subdivision is expected to be completed by the year 2024.
- A residential subdivision is located on a parcel of land at 6141 Hazeldean Road. The development has been recently completed with access to/from the local-collector roads north of the proposed site.
- A residential development with some commercial is proposed at 1145 Carp Road at the northeast corner of the Carp/Hazeldean intersection.

MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The study area for the commercial/retail development will be confined to the section of Hazeldean Road between Stittsville Main Street and Carp Road. The study area would include the existing intersections of Stittsville Main/Hazeldean, Carp/Hazeldean, and Jackson Trails/Hazeldean which will be shared as an access to the proposed car wash station development. The study will also examine the proposed right-in/right-out access to the site.

The study will examine the intersection geometry and roadway segments in accordance with the City of Ottawa *Transportation Impact Assessment Guidelines (2017).*

Element 2.2.2 – Time Periods

The time period for the analysis would be the weekday peak AM and PM time period of the background roadway traffic. This would be the peak period of traffic along Hazeldean Road and pass-by trips to the site.

Element 2.2.3 – Horizon Years

The TIA will address the impact of the site generated trips from the proposed commercial/retail development at 6111 Hazeldean Road. The horizon year of the study will be the total completion of the development at the year 2021. The analysis will further examine the impact at the year 2026 which represents five years beyond completion.

MODULE 2.3 – Exemptions Review

The exemptions, which provide possible reductions to the scope of work of the TIA Study, were examined using Table 4: Possible Exemptions which is provided in the City's *Transportation Impact Assessment Guidelines (2017).* Utilizing the table, the following lists the possible exemptions proposed for the TIA Study report:

MODULE	ELEMENT	EXEMPTION CONSIDERATIONS
Design Review Component		
4.1 Development Design	4.1.2 Circulation and Access	No – The site access onto Hazeldean Road will be examined along with the circulation of traffic within the site.
	4.1.3 New Street Networks	Yes - Only required for subdivisions.
4.2 Parking	4.2.1 Parking Supply	No – The parking supply will be examined with the supply of parking compared to the required as determined from City By-laws..
	4.2.2 Spillover Parking	Yes - Parking will meet the City of Ottawa By-laws. Spillover parking is not expected due to the long walking distance to nearby streets.
Network Impact Component		
4.5 Transportation Demand Management	All Elements	No – TDM measures will be examined.
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Yes – The site will have access onto an arterial road and would not exceed ATM capacity thresholds.
4.8 Network Concept		Yes - The site would not generate more than 200 person-trips per peak hour in excess of the volume permitted by established zoning.

STEP 3 - FORECASTING

MODULE 3.1 - Development-generated Travel Demand

Element 3.1.1 – Trip Generation and Mode Shares

The development at 6111 Hazeldean Road will consist of four free-standing buildings. The buildings will be a mixture of commercial and retail uses. Table 3.1 presents an inventory of the type and size of development for each individual use.

TABLE 3.1
INVENTORY OF COMMERCIAL/RETAIL UNITS

COMMERCIAL/RETAIL UNIT TYPE	GROSS FLOOR AREA/SERVICE BAYS
Automated Car Wash (Halo Car Wash)	485 m^2 (5,220 ft^2)
Oil Change Station (Mr. Lube)	3 Service Bays
Coffee Shop - Drive-Through Window (Starbucks)	175 m^2 (1,884 ft^2)
Commercial/Retail Shop - Retail/Apparel Store	146 m^2 (1,572 ft^2)
Commercial/Retail Shop - Retail/Apparel Store	190 m^2 (2,045 ft^2)

The number of expected site generated trips utilized the trip statistical data in the Institute of Transportation Engineers (ITE) document, *Trip Generation Manual 10th Edition*. The existing traffic counts determined the peak AM hour to occur between 7:00 and 8:00 at the Carp/Hazeldean intersection, and between 7:45 and 8:45 at the Stittsville Main/Hazeldean intersection. The ITE trip manual does not provide data for the AM hours of a car wash, with most car washes taking place during the weekday peak PM hours or on weekends. The retail stores are not expected to be open during the peak AM hours of the adjacent streets and were not examined in the analysis. The trip rates are shown in Table 3.2 with the ITE trip data graphs provided in the Appendix.

TABLE 3.2
VEHICLE TRIP GENERATION RATES

Land Use	Peak AM Hour	Peak PM Hour
Halo Car Wash	-	14.20 T/1000 ft^2 GFA
Mr. Lube	3.00 T/Servicing Positions	4.85 T/Servicing Positions
Starbucks Coffee Shop	88.99 T/1000 ft^2 GFA	43.38 T/1000 ft^2 GFA
Retail/Apparel Store	-	4.12 T/1000 ft^2 GFA

The auto-trips are shown in Table 3.3 and are the product of the gross floor area and service positions of the commercial/retail land uses (Table 3.1) and the trip generation rates of Table 3.2. The number of future person-trips was determined by the number of auto-trips calculated from the ITE trip rates, and multiplied by 1.28 (from the TIA Guidelines) to convert auto-trips to person-trips. Table 3.3 shows the future peak hour auto-trips and person-trips.

TABLE 3.3
PEAK HOUR SITE GENERATED TRIPS

Trips	AUTO-TRIP GENERATION		FUTURE PERSON-TRIPS	
	Peak AM Hr.	Peak PM Hr.	Peak AM Hr.	Peak PM Hr.
Halo Car Wash	-	74 veh.	-	95 per.
Mr. Lube	9 veh.	15 veh.	12 per.	19 per.
Starbucks	168 veh.	82 veh.	215 per.	105 per.
Retail Store	-	15 veh.	-	19 per.
Total Trips	177 veh.	186 veh.	227 per.	238 per.

The Trip Reduction Factors which were provided in the TIA Guidelines were applied to the land uses as discussed below:

1) *Deduction of Existing Development Trips* - A small single floor office building is located on the site. It is currently vacant and is not expected to generate trips.

2) *Pass-by Vehicle Trips* - Pass-by trips are trips that are already on the road and are passing by the site on their way to their primary destination. They are not considered new trips generated by the site. The surveys provided in the ITE *Trip Generation Handbook 3rd Edition* for the closest land use to that of the proposed site were utilized to determine the average pass-by trip percentage which was applied to both the peak AM and PM hours. For the Halo Car Wash, the study used the percentage of pass-by traffic for a Gasoline/Service Station (ITE 944) which determined an average pass-by trip percentage of 42%. The study applied a 45% pass-by factor to the car wash use. For the Mr. Lube, the study used the Tire Store (ITE 848) which determined an average pass-by trip percentage of 28%. The study applied a 25% pass-by factor for the Mr. Lube. For the Starbucks use, the study used the pass-by percentage for a Coffee/Donut Shop with Drive-Through Window (ITE 938) use which determined the average pass-by trip percentage to be 89%. The study applied an 85% pass-by factor to the Starbucks coffee shop. For the retail, the study examined the pass-by for a weekday PM hour of Shopping Center which determined an average pass-by trip

percentage of 34%. The study assumed a 25% pass-by factor for the retail use. The average pass-by trip percentages are shown in Table 3.4 for each land use.

3) *Synergy or Internalization* - The site consists of a variety of mixed uses such as an oil change and car wash, or car wash and a coffee. Multiple uses within the site would reduce new trips onto the adjacent roads. The site is also linked to the Jackson Trails Centre which offers additional retail, banking and fast food. The study analysis has assumed a 10 percent reduction of all primary and pass-by trips due to the internalization of trips.

The expected number of person-trips following the application of the three Trip Reduction Factors is shown in Table 3.4.

TABLE 3.4
TOTAL PEAK HOUR SITE GENERATED PERSON-TRIPS

Trips	FUTURE PERSON-TRIPS	
	Peak AM Hr.	Peak PM Hr.
Future Peak Hour Person-Trips	**227 per.**	**238 per.**
Internal Trip Reduction (10%)	**23 per.**	**24 per.**
Total Peak Hour Person-Trips	**204 per.**	**214 per.**
Total Halo Car Wash Trips	-	**86 per.**
Primary Trips (55%)	-	47 per.
Pass-by Trips (45%)	-	39 per.
Total Mr. Lube Trips	**11 per.**	**17 per.**
Primary Trips (75%)	8 per.	13 per.
Pass-by Trips (25%)	3 per.	4 per.
Total Starbucks Trips	**193 per.**	**94 per.**
Primary Trips (15%)	29 per.	14 per.
Pass-by Trips (85%)	164 per.	80 per.
Total Retail Store Trips	-	**17 per.**
Primary Trips (75%)	-	13 per.
Pass-by Trips (25%)	-	4 per.
Total Primary Trips	**37 per.**	**87 per.**
Total Pass-By Trips	**167 per.**	**127 per.**

The modal split of trips was determined from the City of Ottawa document, *2011 NCR Household Origin-Destination Survey*, January 2013. The primary travel modal share used the demographic characteristics for the Kanata - Stittsville area (Page 116) for trips. The primary trip modal share was based on the "within District" mode shares for the AM and PM peak hours. Table 3.5 presents the average peak AM and PM hour mode share which shows the shares used in the TIA study for the primary trips.

TABLE 3.5
PRIMARY TRIP MODE SHARE SUMMARY (Person-Trips)

Future Primary Mode Share Targets		
Travel Mode		**Rationale**
Auto Driver	70%	Consistent with the type of land uses and residential development in the area
Auto Passenger	10%	
Transit	3%	Consistent with the 2011 TRANS-National Capital Region Travel Trends report and other TIA studies for development in the area
Bicycle	1%	
Walk	16%	
Total	100%	

The pass-by modal share was based on a blend of the "from" and "within" mode shares for the AM peak hour, and the "to" and "within" shares for the PM peak hour. Table 3.6 presents the mode share summary which is an average of the peak AM and PM hour shares which will be used in the TIA study for the pass-by trips.

TABLE 3.6
PASS-BY TRIP MODE SHARE SUMMARY (Person-Trips)

Future Pass-By Mode Share Targets		
Travel Mode		**Rationale**
Auto Driver	65%	Consistent with modal share targets and proximity to employment areas
Auto Passenger	11%	
Transit	8%	Consistent with the 2011 TRANS-National Capital Region Travel Trends report and other TIA studies for development in the area
Bicycle	1%	
Walk	15%	
Total	100%	

The peak hour person-trips per mode were determined by the product of the peak hour future person-trips from Table 3.4, and the primary mode share from Table 3.5 and pass-by from Table 3.6. Table 3.7 shows the future site generated person trips.

TABLE 3.7
FUTURE SITE GENERATED PERSON-TRIPS

TRAVEL MODE	DEVELOPMENT GENERATED PERSON-TRIPS			
	PRIMARY TRIPS		PASS-BY TRIPS	
	PEAK AM HR.	PEAK PM HR.	PEAK AM HR.	PEAK PM HR.
Auto Driver	26 per. trips	61 per. trips	109 per. trips	83 per. trips
Passenger	4 per. trips	8 per. trips	18 per. trips	14 per. trips
Transit	1 per. trips	3 per. trips	13 per. trips	10 per. trips
Bicycle	0 per. trips	1 per. trips	2 per. trips	1 per. trips
Walk	6 per. trips	14 per. trips	25 per. trips	19 per. trips
Total Trips	37 per. trips	87 per. trips	167 per. trips	127 per. trips

Element 3.1.2 – Trip Distribution

Since the primary trips would be mainly from the residential development in the surrounding area, the distribution of primary trips was determined by examination of the size and proximity of residential subdivisions to the proposed development. The primary trips were distribution onto the adjacent roads to the following proportion:

Primary Trips

To/From the East along Hazeldean	60%	→ To/From the North along Stittsville Main	5%
		→ To/From the South along Stittsville Main	50%
		→ To/From the East along Hazeldean	5%
To/From the West along Hazeldean	40%	→ To/From the North along Carp Road	5%
		→ To/From the South along Carp Road	10%
		→ To/From the West along Hazeldean	25%

The distribution of pass-by trips was determined by examining the *2011 NCR Household Origin-Destination Survey* for the origin/destination of peak AM hour trips for the Kanata-Stittsville Hill area, and the background traffic counts during the peak AM and PM hours. The pass-by traffic was distributed for both the pass-by trip volume and diverted trip volume.

Element 3.1.3 – Trip Assignment

The distribution of trips entering and exiting the site was determined by applying the directional distribution of vehicle trips provided for each land use in the ITE graphs of Exhibit 3.1 to Exhibit 3.4. The distribution was determined for the number of trips and distribution for each land use during the peak AM and PM hours, and averaged for the total development. Table 3.8 presents the distribution of vehicle trips (Auto Driver) entering and exiting the site during the peak AM and PM hours.

TABLE 3.8
PEAK HOUR DISTRIBUTION OF VEHICLE TRIPS

PEAK HOUR TRIPS / TRIP TYPE	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Primary Trips	26	14 (52%)	12 (48%)	61	31 (51%)	30 (49%)
Pass-By Trips	109	57 (52%)	52 (48%)	83	42 (51%)	41 (49%)
Total Trips	135	**71**	**64**	144	**73**	**71**

The peak AM and PM hour trips from Table 3.8 were distributed onto the adjacent roads using the distribution discussed in Element 3.1.2. Figure 3.1 shows the peak hour site generated trips primary trips and Figure 3.2 the peak hour pass-by trips.

MODULE 3.2 - Background Network Travel Demands

Element 3.2.1 – Transportation Network Plans

The City of Ottawa *Transportation Master Plan (TMP) 2013* was reviewed to identify transit and roadway projects in the vicinity of the development. The TMP has identified the widening of Carp Road from two lanes to four lanes between Highway 417 and Hazeldean Road in the Affordable Network, which will provide additional capacity for growth in the Stittsville area.

The TMP Affordable Network has identified the construction of the North-South Arterial Road east of Stittsville which would link Palladium Drive to Fernbank Road. The new road would decrease congestion within the village core.

The municipal road projects identified in the TMP would improve the flow of traffic in Stittsville, but would have little impact on the flow and capacity of traffic past the proposed site.

FIGURE 3.1
PEAK AM AND PM HOUR SITE GENERATED PRIMARY TRIPS

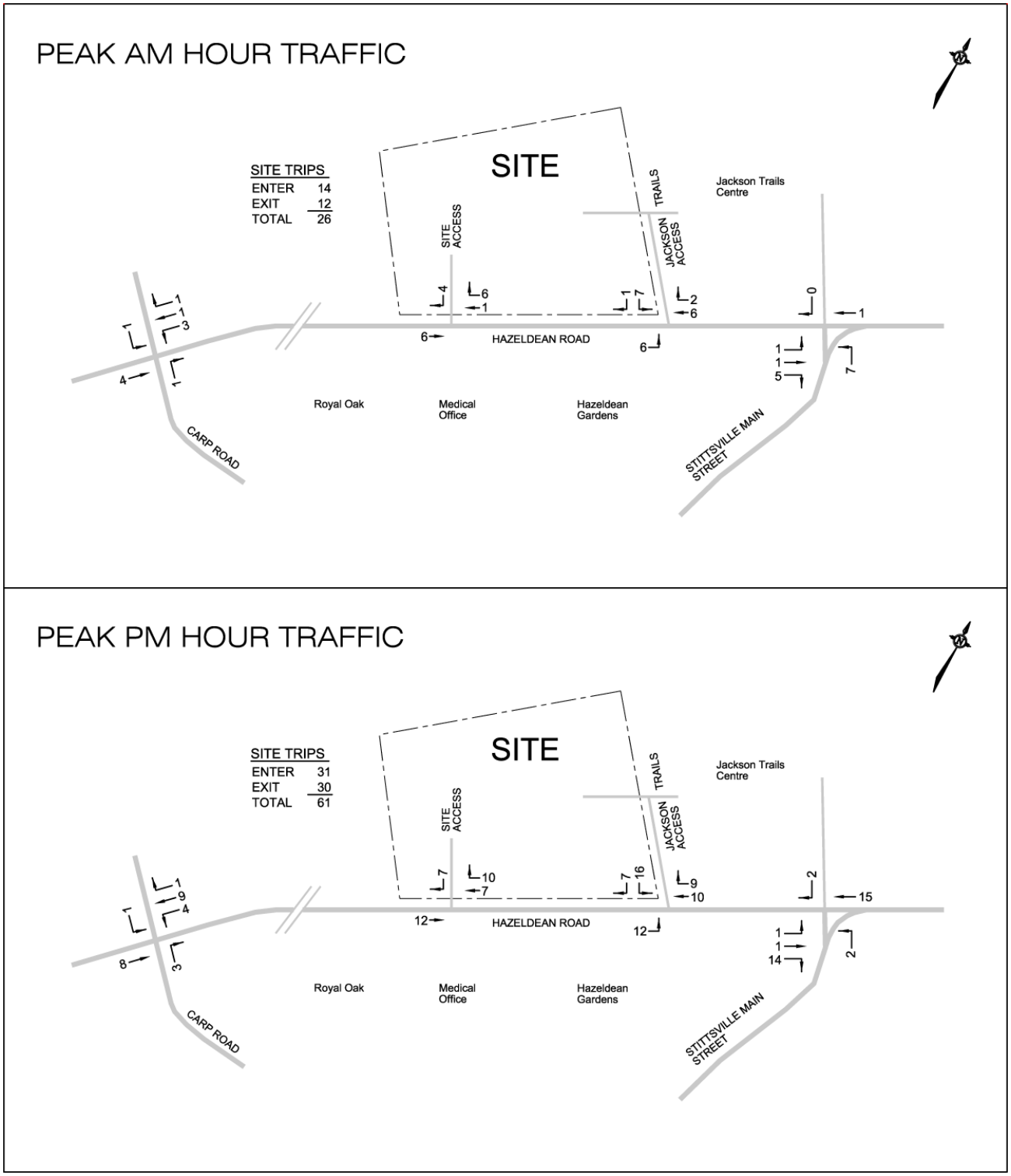


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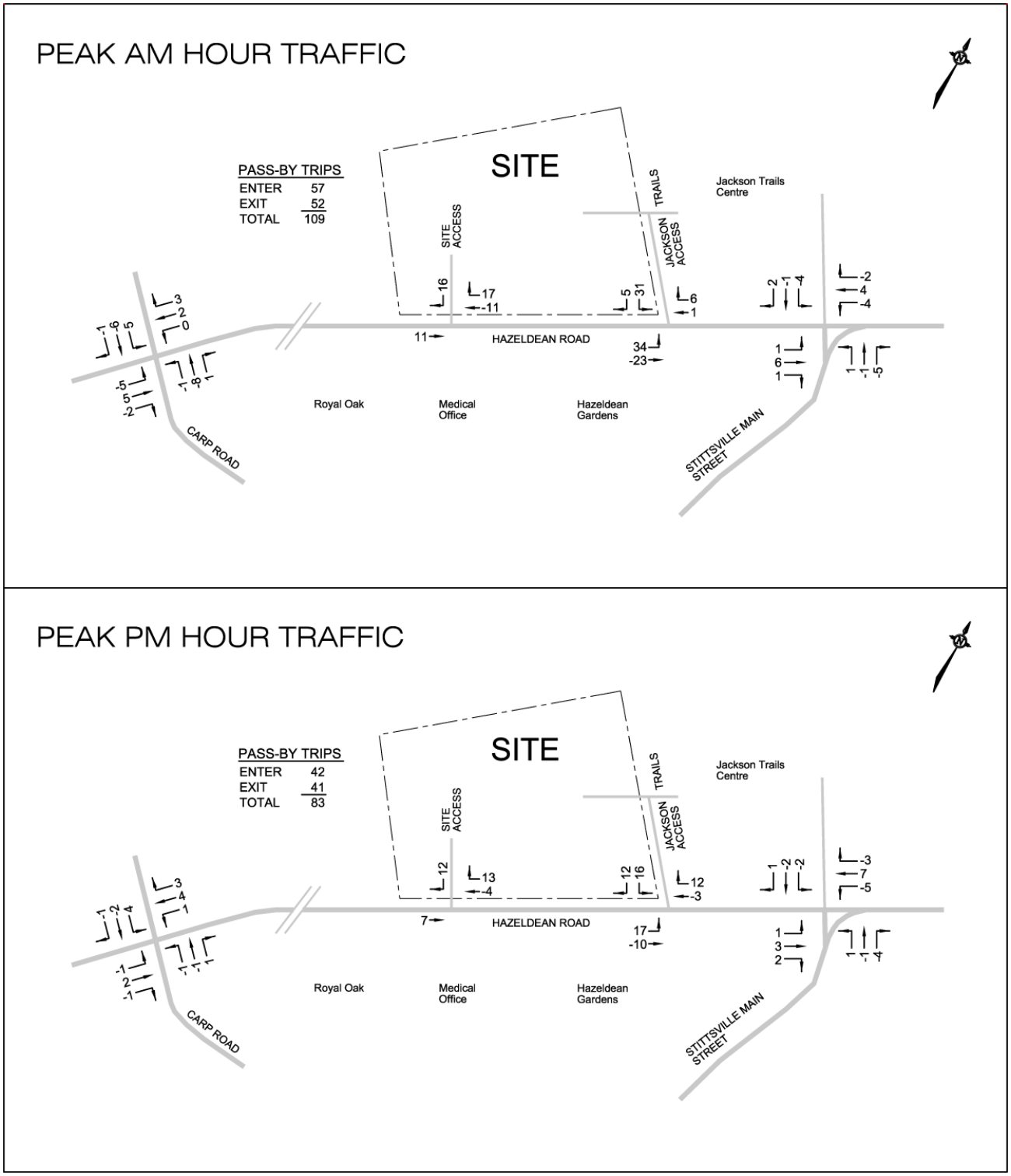
FIGURE 3.2
PEAK AM AND PM HOUR SITE GENERATED PASS-BY TRIPS



NOT TO SCALE

Element 3.2.2 – Background Growth

The background traffic would comprise of the future traffic volumes which would not include the expected site generated trips. The background traffic will include the proposed trips from developments in close proximity to the site which are either planned or have been constructed since the latest traffic counts were conducted, and an annual average compounded growth rate which would account for growth outside the study area.

The trip trend of trips to/from the Kanata/Stittsville area for auto driver trips was examined in the *National Capital Region Travel Trends* document prepared by the IBI Group. The document showed that the trend of trips from the Kanata/Stittsville area has increased at an annual compounded rate of 2.08 percent for the peak AM hour between the years of 2005 and 2011. With the development proposed on the edge of the Kanata/Stittsville area, the study has assumed that the background traffic would experience an annual average compounded increase of 2.0 percent which is consistent with traffic studies for other developments in the area. The 2.0 percent annual increase would translate to the following growth factors which were applied to all approaches to the Stittsville Main/Hazeldean and Carp/Hazeldean intersection approaches:

Growth Factor at the Stittsville Main/Hazeldean Intersection

2016 → 2021 = 1.104 Completion
2016 → 2026 = 1.219 Completion + 5 Years

Growth Factor at the Carp/Hazeldean Intersection

2017 → 2021 = 1.082 Completion
2017 → 2026 = 1.195 Completion + 5 Years

Element 3.2.3 – Other Developments

Other development in the area which would contribute to the increase in background traffic is the following:

- Development applications submitted to the City of Ottawa would consist of the Hazeldean Gardens retirement residence on the south side of Hazeldean Road across from the proposed development. The 6130 Hazeldean Road residence would generate a low volume of site trips which would have little impact on the proposed development.

- A medical/pharmacy building and restaurant were constructed across from the site at 6150 Hazeldean Road. The development was completed in 2020. The trips generated will be added to the background traffic.

- A residential subdivision is proposed at 6171 Hazeldean Road adjacent to the west limit of the site. The subdivision will provide 529 dwelling units with

construction yet to be completed. The trips generated will be added to the background traffic.

- Behind the proposed development is a proposed residential subdivision located on a parcel of land at 6141 Hazeldean Road. The development has been recently completed with access to/from the local-collector roads north of the proposed site. The trips generated will be added to the background traffic.

- A residential development with some commercial is proposed at 1145 Carp Road at the northeast corner of the Carp/Hazeldean intersection. The development would have two access points with one onto Carp Road and a second onto Hazeldean Road. The trips generated will be added to the background traffic.

The growth in background traffic is the sum of the 2.0 percent annual average growth rate applied to all approaches of the Stittsville Main/Hazeldean and Carp/Hazeldean intersections, plus the additional traffic generated by proposed developments in close proximity to the site listed above with the expected traffic obtained from the project's TIA documents. Figure 3.3 presents the 2021 peak AM and PM peak hour background vehicle traffic (does not include trips from the proposed commercial/retail site), and Figure 3.4 the expected 2026 peak hour background traffic which represents five years beyond completion of the development.

MODULE 3.3 - Demand Rationalization

Hazeldean Road was reconstructed past the site in 2010 from a two lane road to a four lane divided arterial road. The road reconstruction increased the capacity of the road and decreased congestion. The road reconstruction also included intersection modifications and the addition of traffic signals, along with cycling lanes and pedestrian sidewalks. The OC Transpo bus routes provide direct access to transit stations which would increase transit use and lower vehicular demand along the roadway network in the area.

Traffic counts taken at the Stittsville Main/Hazeldean intersection in 2016 showed that the volume of traffic at the westbound exclusive left turn lane exceeded the capacity of a single lane. As development grows in the area, travel demand will further increase resulting in low levels of service at intersections. The 2010 reconstruction of Hazeldean Road did provide an option for a westbound double left turn lane at the intersection which would increase the capacity of the intersection resulting in reduced congestion.

Traffic counts at the Carp/Hazeldean intersection taken in 2017 showed a high volume of traffic along the two lane road. Widening of Carp Road to a four lane road as identified in the TMP would increase the capacity of the road and reduce congestion.

The total vehicular traffic is the sum of the peak AM and PM hour site generated primary trips (Figure 3.1) and pass-by trips (Figure 3.2), and the future peak hour background traffic. Figure 3.5 presents the total 2021 peak hour vehicular traffic and Figure 3.6 the total 2026 peak hour vehicular traffic.

FIGURE 3.3
2021 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

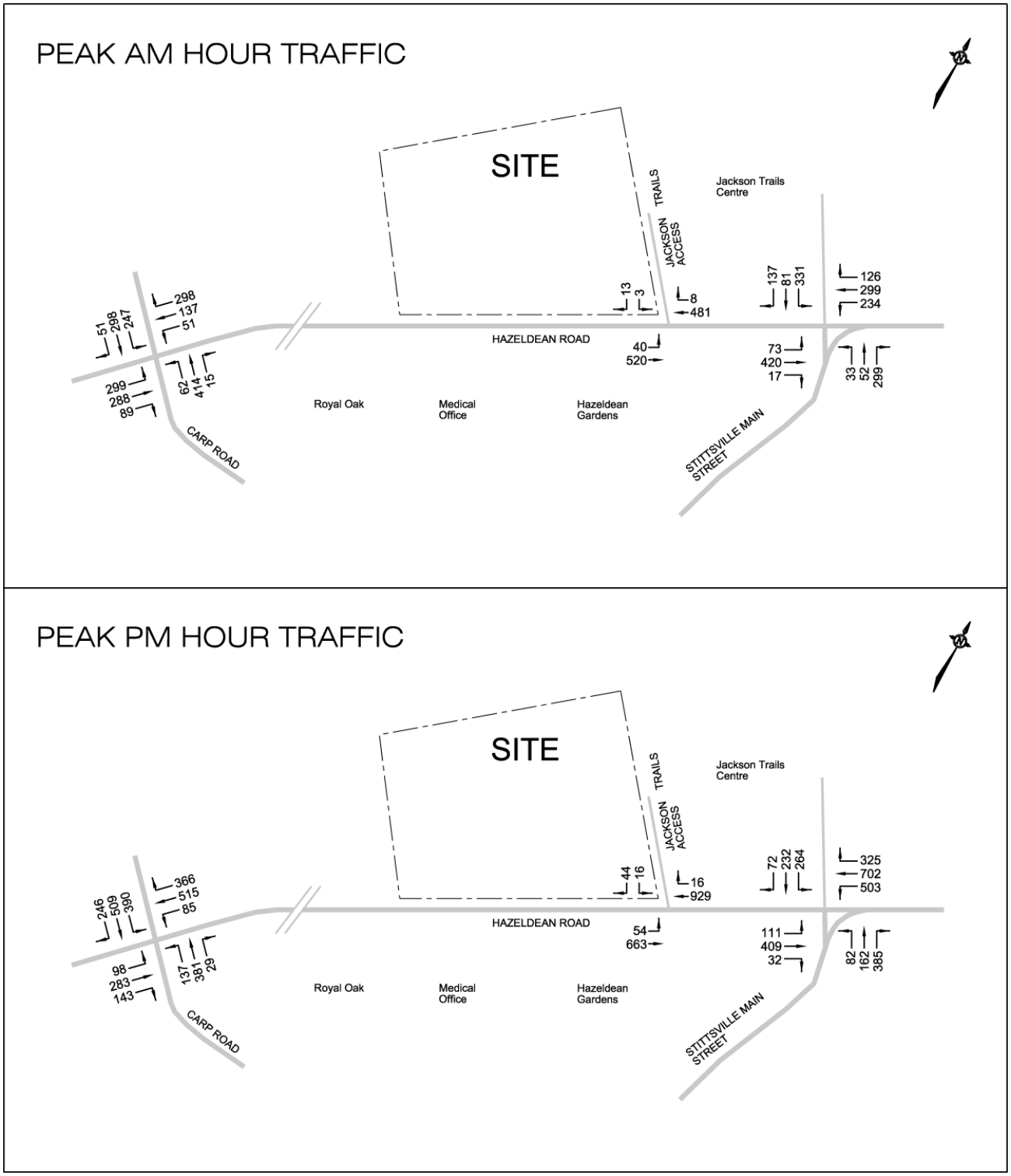
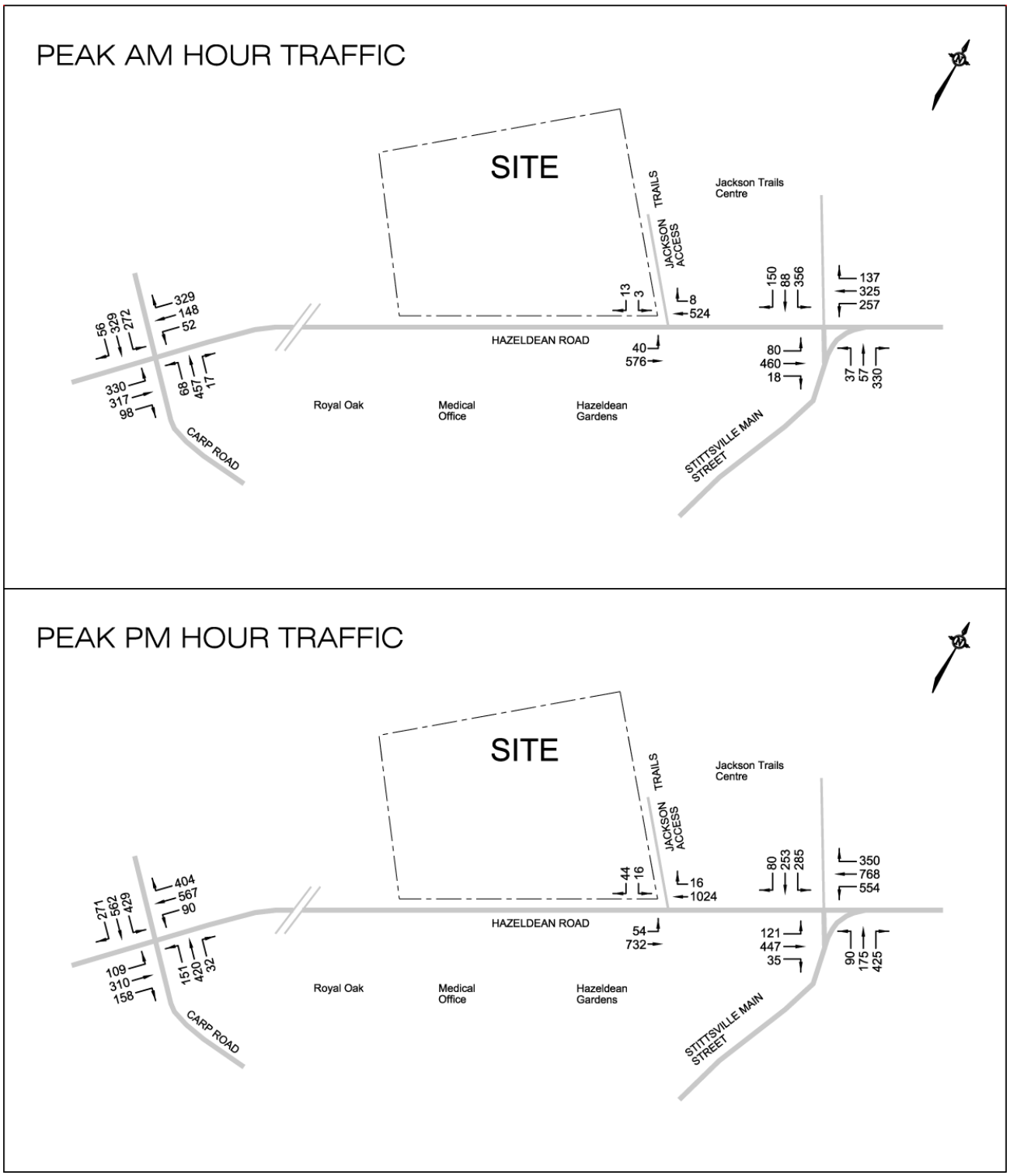


FIGURE 3.4
2026 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



NOT TO SCALE

FIGURE 3.5
2021 PEAK AM AND PM HOUR TOTAL TRAFFIC

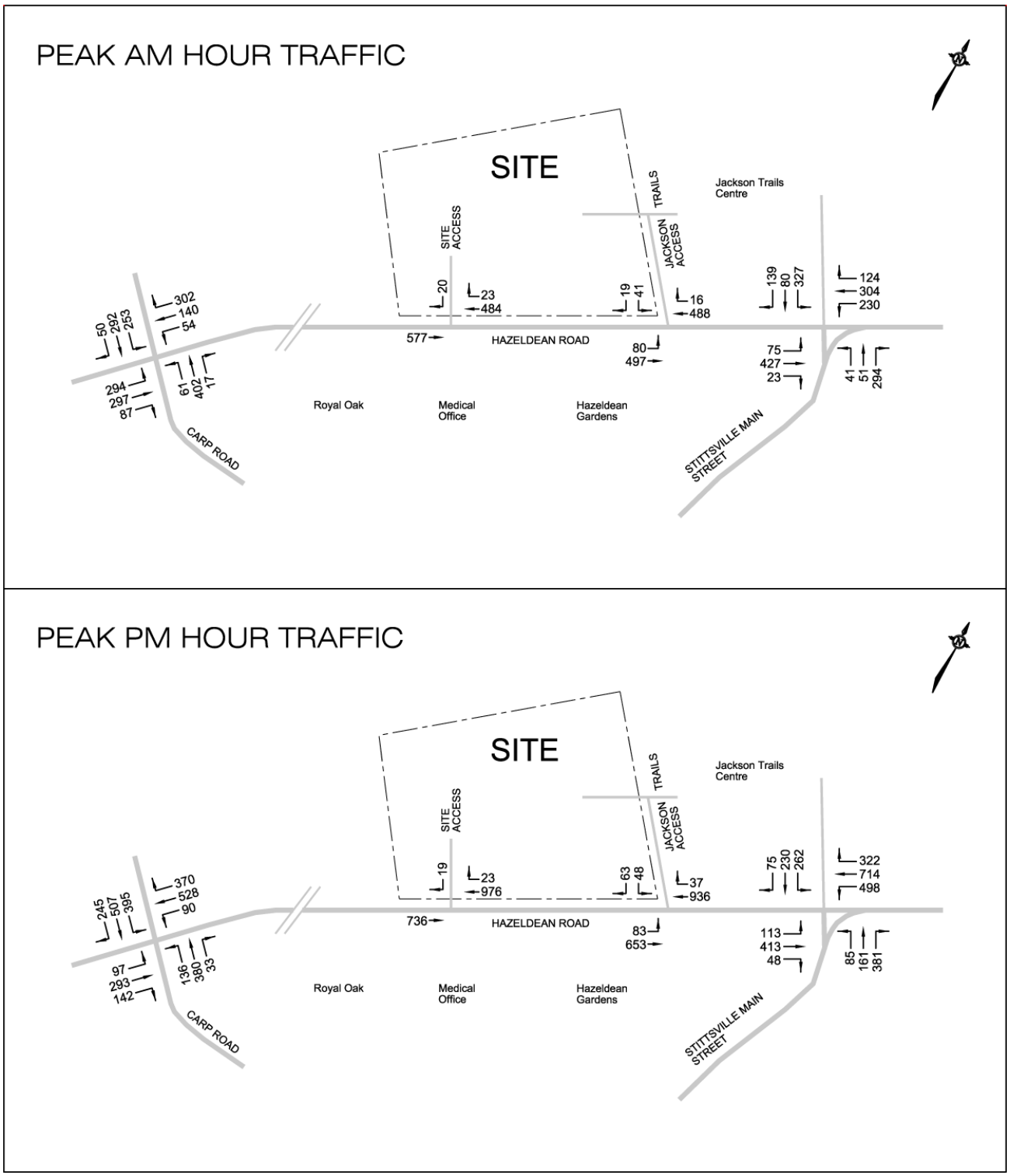
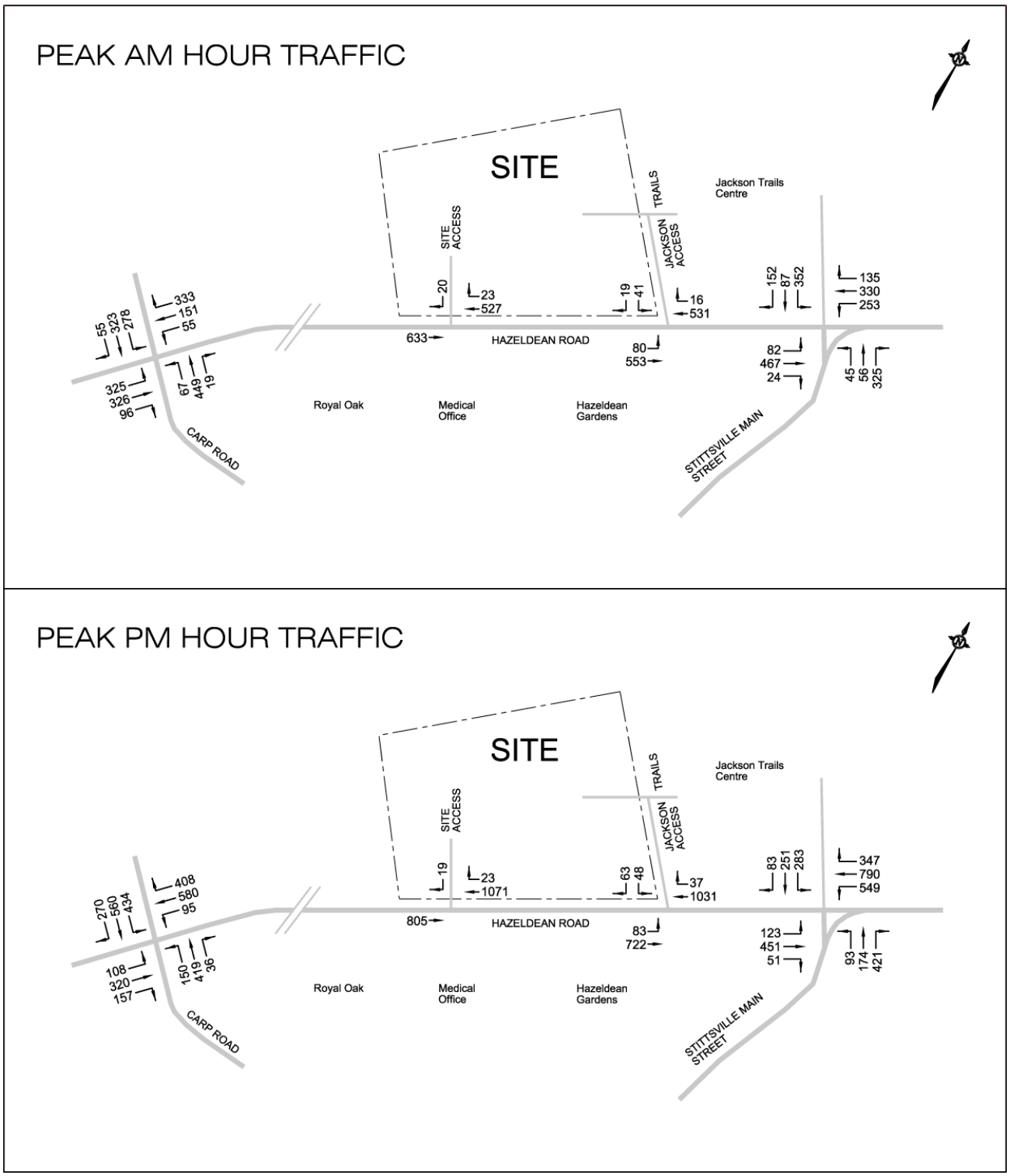


FIGURE 3.6
2026 PEAK AM AND PM HOUR TOTAL TRAFFIC



STEP 4 – ANALYSIS

MODULE 4.1 – Development Design

Element 4.1.1 – Design for Sustainable Modes

The proposed car wash station site would include a Starbucks coffee shop and some retail which would attract patrons traveling by other modes of transportation besides automobiles. Bicycle lanes exist along both sides of Hazeldean Road with a bike rack provided at the entrance to each building on site. The Site Plan meets City of Ottawa By-laws for bicycle storage with the site providing parking for 30 bicycles and the City By-laws requiring storage for 2 bicycles within the development.

Pedestrian sidewalks exist along Hazeldean Road and Stittsville Main Street which would provide safe travel of pedestrians from nearby residential areas to the site.

The site is service by OC Transpo Route 61 and 162 with bus stops located on the east side of the intersection of Hazeldean Road and Stittsville Main Street, less than 400 m from the retail portion of the site. The bus routes would provide service to the Terry Fox Transitway Station and the Tunney's Pasture Transitway Station.

The study has utilized the *TDM - Supportive Development Design and Infrastructure Checklist provided below* for the Non-Residential Development of the commercial/ retail use. The checklist examines the opportunity to implement facilities which are supportive of sustainable modes.

TDM-Supportive Development Design and Infrastructure Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

TDM-supportive design & infrastructure measures: *Non-residential developments*			Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☒ The building will be next to the sidewalk
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☒ The entrances are linked to the Hazeldean Road sidewalk by a short walkway
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☐
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☒ OC Transpo bus stops are located within a maximum 400 m walk. The transit routes provides service between Stittsville and the Tunney's Pasture and Terry Fox Transitway stations
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☒ The building entrances are close to the public sidewalk providing a short walk to the Hazeldean Road sidewalk

TDM-supportive design & infrastructure measures: *Non-residential developments*			Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☒
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☒
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☒
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☒ The building entrance is close to the public sidewalk
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☒ All walking routes are along Hazeldean Road with street lighting
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☒ Bike racks will be provided close to the building entrance
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☒ Bike parking shall meet City By-laws
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☒
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☒ The number of bike storage spaces meets City By-laws. Bike racks are located at the front of the building
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐ N/A
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ N/A
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐ N/A
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐ N/A
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	4.2	**Carpool parking**	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐

	TDM-supportive design & infrastructure measures: *Non-residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☒ The number of parking spaces will meet the needs of the land use and reduce the possibility of spillover parking
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐

Element 4.1.2 – Circulation and Access

The site proposes one new access point which will be a right-in/right-out access onto Hazeldean Road. The access will be 9.5 m in width with turning movements controlled by a center median along Hazeldean Road. The width of the access and radius at the entrance conform to the requirements for a fire route.

The site will also share the existing access to the Jackson Trails Centre plaza. The access is located 135 m east of the right-in/right-out access (center to center), and is a full movement access controlled by traffic signals with an eastbound Hazeldean Road left turn lane.

Element 4.1.3 – New Street Networks

Exempt as determined in the Scoping Document.

MODULE 4.2 – Parking

Element 4.2.1 – Parking Supply

The total development including the car wash station, oil change station and retail would provide 84 auto parking spaces which include 6 barrier-free spaces. City of Ottawa By-laws state that a total of 36 auto parking spaces must be provided. The additional parking provided on the site comprises of 21 spaces at the car wash for patrons to wipe down the car, wash floor mats and vacuum cars. City By-laws do not account for parking at a tunnel car wash. Additional parking is also provided at the commercial buildings which would be available depending on the use. The vehicular parking provided will meet and exceed the City of Ottawa parking By-laws which would reduce the possibility of spillover parking.

The site will provide spaces for the parking of 30 bicycles, with five bicycle storage racks located at the entrance to each use on site. The bike racks would be installed in a safe location close to the entrance to the buildings.

Element 4.2.2 – Spillover Parking

The site provides ample parking for customers and patrons of the development. There is no available on-street parking within a 400 m distance of the building on site. It is unlikely that spillover parking would be an issue.

MODULE 4.3 – Boundary Street Design

The City of Ottawa Complete Streets concept allows for the safe movement of everyone whether they choose to walk, bike, drive, or take public transit. The boundary road to the car wash station development would be the arterial road of Hazeldean Road. Hazeldean Road provides dedicated bike lanes, pedestrian sidewalks and OC Transpo bus service to major transit hubs. The collision reports for Hazeldean Road between

Carp Road and Stittsville Main Street recorded no collisions during the five year period between January 2014 and December 2018. The multi-modal level of service for the Hazeldean Road street segment was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The following examined the MMLOS for the various modes of travel along the Hazeldean Road street segment.

PEDESTRIAN LEVEL OF SERVICE (PLOS)

Sidewalks are located on both sides of Hazeldean Road. The sidewalk on the north side across the frontage of the site is 3 m in width and is located adjacent to the curb. On the south side of Hazeldean Road the sidewalk is 2 m in width with a 3 m boulevard between the sidewalk and curb. Table 4.1 presents the level of service for the Hazeldean Road street segment adjacent to the site, with the analysis sheets provided in the Appendix.

TABLE 4.1
PEDESTRIAN LEVEL OF SERVICE (PLOS) – Street Segment

Street	Segment	Level of Service	Analysis
Hazeldean Rd.	Between Carp Rd. and Stittsville Main St.	E	Exhibit 4.1

BICYCLE LEVEL OF SERVICE (BLOS)

Hazeldean Road is an arterial road which was reconstructed to a four lane divided roadway in 2010. The reconstruction included the provision of dedicated cycling lanes along both sides of the roadway. Hazeldean Road is identified as a Spine Route in the City of Ottawa TMP. Table 4.2 presents the level of service for the Hazeldean Road street segment with the analysis sheets provided in the Appendix.

TABLE 4.2
BICYCLE LEVEL OF SERVICE (BLOS) – Street Segment

Street	Segment	Level of Service	Analysis
Hazeldean Rd.	Between Carp Rd. and Stittsville Main St.	D	Exhibit 4.2

TRANSIT LEVEL OF SERVICE (TLOS)

OC Transpo provides transit service along Hazeldean Road past the site with Rapid Route 61 providing all day service 7 days a week and Local Route 162. The transit routes travel between Stittsville and the Terry Fox and Tunney's Pasture Transitway

Stations. Table 4.3 presents the level of service along the Hazeldean Road street segment between Carp Road and Stittsville Main Street. The analysis sheets are provided in the Appendix.

TABLE 4.3
TRANSIT LEVEL OF SERVICE (TLOS) – Street Segment

Street	Segment	Level of Service	Analysis
Hazeldean Rd.	Between Carp Rd. and Stittsville Main St.	D	Exhibit 4.3

TRUCK LEVEL OF SERVICE (TkLOS)

The truck LoS was determined for the Hazeldean Road street segment adjacent to the site. Hazeldean Road is designated as a rural truck route. Table 4.4 presents the truck level of service with the analysis sheets provided in the Appendix.

TABLE 4.4
TRUCK LEVEL OF SERVICE (TkLOS) – Street Segment

Street	Segment	Level of Service	Analysis
Hazeldean Rd.	Between Carp Rd. and Stittsville Main St.	A	Exhibit 4.4

The Hazeldean Road street segment was analyzed to determine the level of service which was compared to the MMLOS targets for pedestrians, bicycles, transit and trucks. The calculated Level of Service (LoS) as shown in Tables 4.1 to 4.4 is compared to the LoS targets for all modes of travel for an Arterial Mainstreet Zoning. The LoS targets were obtained from Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines*. Table 4.5 summarizes the MMLOS results for the road segments and targets.

TABLE 4.5
MULTI-MODAL (MMLOS) SEGMENT SUMMARY TABLE - Street Segment

SEGMENTS	Level of Service (LoS) – 2026				
	Pedestrian	Bicycle	Transit	Auto	Truck
Calculated Hazeldean Rd.	E	D	D	-	A
Target	C	C	D	-	D

The pedestrian level of service (PLOS) did not meet the target due to the volume of traffic along Hazeldean Road. The bicycle level of service (BLOS) did not meet the target due to the speed of traffic along Hazeldean Road.

MODULE 4.4 – Access Intersection Design

Element 4.4.1 – Location and Design of Access

The development proposes one new access to the site. The access will be a "T" intersection with the right-in/right-out access controlled by a median along the center of Hazeldean Road. The access will have a 9.5 m pavement width and will be controlled by a stop sign at the southbound approach.

The access will be located 135 m west of the existing Jackson Trails Centre plaza access which is a full movement access controlled by traffic signals.

On the south side of Hazeldean Road across from the site is an access to the Hazeldean Gardens retirement residence. The access is a right-in/right-out access controlled by the Hazeldean Road center median. The access would have no impact on the operation of the proposed new site access.

There is an access on the south side of Hazeldean Road to the commercial/retail property located approximately 45 m (center to center) west of the proposed access to the car wash station development. The access would provide full movements which will utilize the existing depressed median along Hazeldean Road.

Element 4.4.2 – Intersection Control

The access to the car wash development would be a "T" intersection with Hazeldean Road forming the eastbound and westbound approaches, and the site access the southbound stop controlled approach. The access would allow right-in/right-out turning movements. The volume of site generated trips and configuration of the access intersection would not trigger any further traffic control measures.

Element 4.4.3 – Intersection Design

The analysis of the intersection of the site access onto Hazeldean Road and the adjacent intersections within the study area were completed for all modes using the *Multi-Modal Level of Service (MMLOS) Guidelines* and the *Highway Capacity Manual (HCM) 2010*. Each mode will be addressed in the following sections:

VEHICLE LEVEL OF SERVICE (LoS) – Intersection Capacity Analysis

The analysis of the site access and the adjacent intersections along Hazeldean Road will use the *Highway Capacity Software, Version 7.8.5,* which uses the capacity analysis procedure as documented in the *Highway Capacity Manual (HCM) 2010 and HCM 6th Edition*.

For unsignalized intersections, the level of service of each lane movement and approach is determined as a function of the average control 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	AVERAGE CONTROL DELAY	
Level of Service A	0-10 sec./vehicle	Little or No Delay
Level of Service B	>10-15 sec./vehicle	Short Traffic Delays
Level of Service C	>15-25 sec./vehicle	Average Traffic Delays
Level of Service D	>25-35 sec./vehicle	Long Traffic Delays
Level of Service E	>35-50 sec./vehicle	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 two-way stop controlled intersection was determined by the calculation of the 95th percentile queue at the lane approach. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th 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.

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

Site Access and Hazeldean Road Intersection

The site access onto Hazeldean Road is a right-in/right-out intersection controlled by a stop sign. The following is the lane configuration of the Site Access intersection:

Southbound Site Access Approach	One right turn lane (Stop Sign)
Eastbound Hazeldean Rd. Approach	Two through lanes
Westbound Hazeldean Rd. Approach	One through lane
	One shared through/right lane

An operational analysis was conducted for the expected traffic at the year 2021 when the development is expected to be completed, and at the year 2026 which represents

five years beyond completion. The time period would be for the peak AM and PM hours of the adjacent road traffic. Traffic eastbound and westbound along Hazeldean Road past the site was projected from traffic at the Carp/Hazeldean intersection.

The 2021 operational analysis at the Site Access/Hazeldean intersection determined that the southbound Site Access approach would function at a Level of Service (LoS) "B" during both the peak AM and PM hours. Table 4.6 summarizes the operation of the intersection with the analysis sheets provided in the Appendix as Exhibit 4.5 and 4.6 for the 2021 traffic.

TABLE 4.6
SITE ACCESS/HAZELDEAN INTERSECTION – LoS & Control Delay

INTERSECTION APPROACH	**WEEKDAY PEAK AM HOUR** *2021 Total* (2026 Total)		**WEEKDAY PEAK PM HOUR** *2021 Total* (2026 Total)	
	LoS	**Delay (sec.)**	**LoS**	**Delay (sec.)**
SB Right - Site Access	*B* (B)	*10.1* (10.3)	*B* (B)	*12.7* (13.4)
Total Intersection	***B* (B)**	*10.1* (10.3)	***B* (B)**	*12.7* (13.4)

At the year 2026 the southbound right turn access approach would continue to function at a LoS "B" during both the peak AM and PM hours. Table 4.6 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.7 and 4.8.

The 95th percentile queue was calculated using the expected 2021 and 2026 traffic. The analysis determined that the southbound right turn access approach would experience a 0.1 vehicle queue (7 m) during both the 2021 and 2026 peak AM and PM hours. The Site Plan provides a clear throat length of 15 m which meets the Transportation Association of Canada (TAC) guidelines, *Geometric Design Guide for Canadian Roads,* for a shopping centre access onto an arterial road.

Jackson Trails Centre Access and Hazeldean Road Intersection

The site access to the Jackson Trails Centre shopping plaza is located 135 m east of the proposed right-in/right-out site access. The Jackson Trails Centre access will be shared with the car wash station development and would provide full turning movements onto Hazeldean Road from a traffic signal controlled intersection.

The operational analysis was completed for the 2021 and 2026 traffic which would include the expected trips from the car wash station development. The operational analysis utilized the traffic signal timing plan obtained from the City of Ottawa, and the existing lane geometry as described in Element 2.1.2.

The operational analysis determined that all approaches to the intersection would function at a LoS "A" during the 2021 and 2026 peak AM and PM hours. Table 4.7 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.9 and 4.10 for the 2021 traffic and Exhibits 4.11 and 4.12 for the 2026 traffic.

TABLE 4.7
JACKSON TRAILS/HAZELDEAN INTERSECTION – LoS & v/c Ratio

INTERSECTION APPROACH	**WEEKDAY PEAK AM HOUR** *2021 Total* (2026 Total)		**WEEKDAY PEAK PM HOUR** *2021 Total* (2026 Total)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left	*A* (A)	*0.167* (0.175)	*A* (A)	*0.297* (0.335)
EB Through	*A* (A)	*0.267* (0.297)	*A* (A)	*0.341* (0.377)
WB Through	*A* (A)	*0.263* (0.285)	*A* (A)	*0.496* (0.544)
WB Right	*A* (A)	*0.263* (0.286)	*A* (A)	*0.496* (0.544)
SB Left/Through/Right	*A* (A)	*0.140* (0.140)	*A* (A)	*0.281* (0.281)

The eastbound Hazeldean Road left turn lane contains 50 m of vehicular storage. The 2026 peak PM hour traffic at the eastbound left turn lane would require 29 m of storage. There would be no requirement for modifications to the intersection due to the development of the car wash station site.

Stittsville Main Street and Hazeldean Road Intersection

The Stittsville Main/Hazeldean intersection is located 385 m east of the site. The intersection is controlled by traffic signals. The analysis was completed for the peak AM and PM hours using the existing 2016 traffic counts and traffic signal timing plan obtained from the City of Ottawa.

The 2016 operational analysis determined that all approaches to the intersection functioned at an acceptable level of service during both the peak AM and PM hours. During the peak PM hour all movements at the westbound approach functioned at a LoS "D" due to the high volume of background traffic travelling to the residential areas of Stittsville. Table 4.8 summarizes the 2016 operation of the intersection with the analysis sheets provided as Exhibit 4.13 for the peak AM hour and 4.14 for the peak PM hour.

TABLE 4.8
STITTSVILLE MAIN/HAZELDEAN INTERSECTION – LoS & v/c Ratio

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR 2016 Existing **2026 Background** *2021 Total* (2026 Total)		WEEKDAY PEAK PM HOUR 2016 Existing **2026 Background** *2021 Total* (2026 Total)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left	A **A** *A* (A)	0.139 **0.208** *0.188* (0.214)	A **A** *A* (A)	0.259 **0.354** *0.330* (0.360)
EB Through	A **A** *A* (A)	0.329 **0.427** *0.403* (0.440)	A **A** *A* (A)	0.380 **0.442** *0.423* (0.463)
EB Right	A **A** *A* (A)	0.331 **0.429** *0.405* (0.441)	A **A** *A* (A)	0.384 **0.445** *0.427* (0.467)
WB Left	A **B** *A* (B)	0.472 **0.657** *0.572* (0.656)	D **F** *E* (F)	0.864 **1.093** *0.966* (1.102)
WB Through	A **A** *A* (A)	0.295 **0.442** *0.409* (0.445)	D **F** *F* (F)	0.883 **1.085** *1.008* (1.101)
WB Right	A **A** *A* (A)	0.308 **0.453** *0.420* (0.455)	D **F** *F* (F)	0.884 **1.094** *1.011* (1.111)
NB Left	A **A** *A* (A)	0.044 **0.057** *0.062* (0.069)	A **A** *A* (A)	0.143 **0.223** *0.202* (0.230)
NB Through	A **A** *A* (A)	0.092 **0.132** *0.118* (0.129)	A **A** *A* (A)	0.281 **0.513** *0.472* (0.510)
SB Left	A **B** *A* (B)	0.386 **0.638** *0.581* (0.630)	**A B** *B* (B)	0.358 **0.694** *0.621* (0.688)
SB Through	A **A** *A* (A)	0.135 **0.205** *0.186* (0.202)	A **C** *B* (C)	0.427 **0.736** *0.669* (0.730)
SB Right	A **A** *A* (A)	0.305 **0.419** *0.388* (0.425)	A **A** *A* (A)	0.181 **0.280** *0.263* (0.291)

Note: The peak PM hour analysis for the 2026 Background, 2021 Total, and 2026 Total traffic has adjusted the traffic signal phase timing

As development continues in the Stittsville area, new subdivisions have been constructed or proposed north of the site. This has increased the traffic demands along Hazeldean Road at the westbound approach during the peak PM hour. The traffic analysis for the expected 2026 background traffic (excluding proposed site trips) determined that all westbound approach movements functioned at a LoS “F”. This was due to the high volume of westbound left turning vehicles, and the high volume of right turning vehicles which share movements with one of the westbound through lanes resulting in a reduction in level of service for the westbound through movements. Table 4.8 summarizes the 2026 background traffic analysis (no site trips), with the analysis sheets provided as Exhibit 4.15 and Exhibit 4.16.

The existing lane configuration at the westbound approach has one left turn lane and a second left turn lane which is painted out with a chevron. Due to the high volume of left turning traffic, a double left is recommended at the westbound approach. In order to increase the capacity of the westbound through movement, an exclusive westbound right turn lane should also be provided. These modifications would be required to handle the increase in background traffic, and would result in the intersection functioning at an acceptable level of service. The modifications would comprise of

adjusting the pavement marking at the westbound approach to provide a double left, and widening of the south Stittsville Main Street approach to provide two receiving lanes for the double left turn movement. A new westbound right turn lane would be also required.

Following the completion of the site and using the existing intersection lane configuration, the intersection would continue to function at an acceptable level of service for the 2021 total peak AM hour traffic, and during the peak PM hour all approaches with the exception of the westbound Hazeldean Road approach would function at an acceptable level of service. Table 4.8 provides the 2021 operation for the total trips, with the analysis sheets provided as Exhibit 4.17 for the peak AM hour and Exhibit 4.18 for the peak PM hour.

For the total traffic at the year 2026, the intersection would operate at an acceptable level of service during the peak AM hour. The northbound, eastbound and southbound approaches would function at an acceptable level of service during the peak PM hour, but the westbound Hazeldean Road approach would function at a LoS “F”. Table 4.8 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.19 and 4.20.

With the addition of the westbound Hazeldean Road double left and exclusive right turn lane, all lane movements would function at an acceptable level of service during the peak PM hour for the 2026 background, 2021 total and 2026 total traffic scenarios. The intersection modifications are the result of the growing background traffic and development in the Stittsville area and would not be triggered by the development of the car wash station development.

Carp Road and Hazeldean Road Intersection

The Carp/Hazeldean intersection is located 530 m west of the site. The intersection is controlled by traffic signals with Carp Road forming the northbound and southbound approaches, and Hazeldean Road the eastbound and westbound approaches.

The intersection was analyzed using the 2017 traffic counts and traffic signal timing plan obtained from the City of Ottawa. The intersection was determined to operate at an acceptable level of service during both the peak AM and PM hours. Table 4.9 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.21 and Exhibit 4.22.

By the year 2026 there would be substantial growth in the area with an increase in the volume of the background traffic (no site trips). The operational analysis for the future 2026 background traffic determined that all approaches functioned at an acceptable level of service during the peak AM hour, and during the peak PM hour all approaches functioned at an acceptable level of service with the exception of the southbound Carp Road approach which functioned at a LoS “F”. Table 4.9 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.23 and 4.24.

TABLE 4.9
CARP/HAZELDEAN INTERSECTION – LoS & v/c Ratio

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR 2017 Existing **2026 Background** *2021 Total* (2026 Total)		WEEKDAY PEAK PM HOUR 2017 Existing **2026 Background** *2021 Total* (2026 Total)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left	A **B** *A* (B)	0.473 **0.611** *0.537* (0.605)	B **E** *E* (E)	0.611 **0.920** *0.994* (0.996)
EB Through	A **A** *A* (A)	0.269 **0.333** *0.307* (0.338)	A **A** *A* (A)	0.328 **0.370** *0.382* (0.377)
EB Right	A **A** *A* (A)	0.278 **0.341** *0.315* (0.346)	A **A** *A* (A)	0.342 **0.380** *0.394* (0.387)
WB Left	A **A** *A* (A)	0.036 **0.181** *0.183* (0.192)	A **A** *A* (A)	0.161 **0.317** *0.347* (0.339)
WB Through	A **A** *A* (A)	0.249 **0.355** *0.336* (0.362)	C **D** *D* (D)	0.775 **0.862** *0.896* (0.882)
NB Left	A **A** *A* (A)	0.123 **0.160** *0.135* (0.156)	A **A** *A* (A)	0.307 **0.428** *0.357* (0.425)
NB Through	A **A** *A* (A)	0.484 **0.586** *0.518* (0.579)	A **A** *A* (A)	0.356 **0.472** *0.398* (0.475)
NB Right	A **A** *A* (A)	0.486 **0.588** *0.520* (0.581)	A **A** *A* (A)	0.359 **0.475** *0.401* (0.479)
SB Left	A **A** *A* (A)	0.432 **0.568** *0.509* (0.579)	B **D** *C* (D)	0.601 **0.867** *0.704* (0.879)
SB Through	C **D** *C* (D)	0.714 **0.857** *0.761* (0.842)	D **F** *E* (F)	0.886 **1.152** *0.959* (1.148)

Note: The peak PM hour analysis for the 2026 Background, 2021 Total, and 2026 Total traffic has adjusted the traffic signal phase timing

The *Transportation Master Plan 2013* (TMP) has identified the widening of Carp Road from two to four lanes between Highway 417 and Hazeldean Road under Phase 2 with construction between the years 2020 and 2025. The project is listed in the 2031 Affordable Road Network and is intended to provide capacity for growth in the Stittsville area. The widening of Carp Road would improve the future operation of the southbound Carp Road approach resulting in all approaches functioning at an acceptable level of service during the peak PM hour.

The development is expected to be completed by 2021. The operational analysis for the 2021 total traffic has assumed all of the background development to be completed and the background traffic to increase at an annual average compounded rate of 2.0 percent. The analysis determined that all approaches functioned at an acceptable level of service during the peak AM hour, and at an acceptable level of service during the peak PM hour with the exception of the southbound Carp Road through movement which functioned at a LoS “E”. Table 4.9 shows the level of service at each approach with the analysis sheets provided as Exhibit 4.25 and Exhibit 4.26.

The 2026 total traffic analysis of the intersection produced similar results as the 2021 analysis using the existing lane configuration. During the peak AM hour all approaches

functioned at an acceptable level of service, and during the peak PM hour all approaches functioned at an acceptable level of service with the exception of the southbound Carp Road through movement which functioned at a LoS “F”. Table 4.9 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.27 and 4.28.

An analysis of the 2026 total traffic assuming the Carp Road widening project to be completed determined all approaches to function at an acceptable level of service during peak hours at the year 2026.

PEDESTRIAN LEVEL OF SERVICE (PLOS)

The pedestrian level of service was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. There are sidewalks along both sides of Hazeldean Road and Stittsville Main Street at the Stittsville Main/Hazeldean intersection. The Carp/Hazeldean intersection has sidewalks on both sides at the westbound Hazeldean Road and southbound Carp Road approaches, but only on the east side at the northbound approach and north side at the eastbound approach. Table 4.10 presents the level of service for the three intersections in the study area, with the analysis sheets provided in the Appendix.

TABLE 4.10
PEDESTRIAN LEVEL OF SERVICE (PLOS) – Intersection

Intersection	Level of Service	Analysis
Jackson Trails Centre Access and Hazeldean Road	D	Exhibit 4.29
Stittsville Main Street and Hazeldean Road	D	Exhibit 4.30
Carp Road and Hazeldean Road	D	Exhibit 4.31

BICYCLE LEVEL OF SERVICE (BLOS)

The bicycle level of service (BLOS) was determined for the three adjacent intersections. There are dedicated cycling lanes along Hazeldean Road from Carp Road travelling east past the site. Table 4.11 presents the level of service for the intersections within the study area with the analysis sheets provided in the Appendix.

TABLE 4.11
BICYCLE LEVEL OF SERVICE (BLOS) – Intersection

Intersection	Level of Service	Analysis
Jackson Trails Centre Access and Hazeldean Road	F	Exhibit 4.32
Stittsville Main Street and Hazeldean Road	E	Exhibit 4.33
Carp Road and Hazeldean Road	E	Exhibit 4.34

TRANSIT LEVEL OF SERVICE (TLOS)

OC Transpo provides transit service along Hazeldean Road past the site with Rapid Route 61 and Local Route 162 traveling to the Tunney's Pasture Transitway Station and the Terry Fox Transitway Station. Bus stops are located within a 400 m walk of the site. Table 4.12 presents the level of service at the intersections which were determined from the evaluation tables provided in the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The analysis sheets are provided in the Appendix.

TABLE 4.12
TRANSIT LEVEL OF SERVICE (TLOS) – Intersection

Intersection	Level of Service	Analysis
Jackson Trails Centre Access and Hazeldean Road	C	Exhibit 4.35
Stittsville Main Street and Hazeldean Road	C	Exhibit 4.36
Carp Road and Hazeldean Road	C	Exhibit 4.37

TRUCK LEVEL OF SERVICE (TkLOS)

Hazeldean Road is a dedicated truck route. Table 4.13 presents the level of service of trucks along Hazeldean Road with the analysis sheets provided in the Appendix.

TABLE 4.13
TRUCK LEVEL OF SERVICE (TkLOS) – Intersection

Intersection	Level of Service	Analysis
Jackson Trails Centre Access and Hazeldean Road	B	Exhibit 4.38
Stittsville Main Street and Hazeldean Road	A	Exhibit 4.39
Carp Road and Hazeldean Road	A	Exhibit 4.40

MODULE 4.5 – Transportation Demand Management

Element 4.5.1 – Context for TDM

The car wash development and retail are located along an arterial road with pedestrian sidewalks along both sides of the road and designated cycling lanes. Transit is provided past the site with connections to Transitway stations. Hazeldean Road past the site is a four lane arterial roadway which has underwent roadway modifications from a two lane road in 2010. There are no residential or recreational areas along Hazeldean Road in the vicinity of the site where site generated trips would have an impact if volumes were higher than expected.

Element 4.5.2 – Need and Opportunity

The site provides ample parking for vehicles and bicycles which meet and exceed City By-laws. The car wash and oil change station are two uses in which automobiles are the primary mode of travel which is accounted for in the site generated trip modal share. Failure to meet the sustainable modal share would have little impact on the surrounding area which provides the infrastructure for all modes of travel.

Element 4.5.3 – TDM Program

TDM measures could be implemented to encourage travel by sustainable modes which would be applied to the retail component of the development. The TDM measures which would reduce the number of vehicle trips would mainly be the encouragement of transit and bicycle use for the Starbucks and retail uses. The programs would mainly be that of providing information in the form of transit schedules/routes, and maps showing designated bike routes.

The study has utilized the TDM Measures Checklist for a Non-Residential Development which examines the implementation of facilities that are supportive of sustainable modes. The following provides the checklist which will examine the Site Plan and transportation components for the proposed commercial/retail development at 6111 Hazeldean Road.

TDM Measures Checklist:

Non-Residential Developments (office, institutional, retail or industrial)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances	☒ Local area map and walking/cycling facilities can be displayed on an information board at the retail entrances
	2.2	**Bicycle skills training**	
		Commuter travel	
BETTER ★	2.2.1	Offer on-site cycling courses for commuters, or subsidize off-site courses	☐
	2.3	**Valet bike parking**	
		Visitor travel	
BETTER	2.3.1	Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	☐

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances	☒ Bus schedules and route maps can be displayed on an information board at the retail entrances
BASIC		3.1.2	Provide online links to OC Transpo and STO information	☐
BETTER		3.1.3	Provide real-time arrival information display at entrances	☐
		3.2	**Transit fare incentives**	
			Commuter travel	
BETTER		3.2.1	Offer preloaded PRESTO cards to encourage commuters to use transit	☐
BETTER	★	3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	☐
			Visitor travel	
BETTER		3.2.3	Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐
		3.3	**Enhanced public transit service**	
			Commuter travel	
BETTER		3.3.1	Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	☐
			Visitor travel	
BETTER		3.3.2	Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐
		3.4	**Private transit service**	
			Commuter travel	
BETTER		3.4.1	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	☐
			Visitor travel	
BETTER		3.4.2	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	☐

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		4.	**RIDESHARING**	
		4.1	**Ridematching service**	
			Commuter travel	
BASIC	★	4.1.1	Provide a dedicated ridematching portal at OttawaRideMatch.com	☐
		4.2	**Carpool parking price incentives**	
			Commuter travel	
BETTER		4.2.1	Provide discounts on parking costs for registered carpools	☐
		4.3	**Vanpool service**	
			Commuter travel	
BETTER		4.3.1	Provide a vanpooling service for long-distance commuters	☐
		5.	**CARSHARING & BIKESHARING**	
		5.1	**Bikeshare stations & memberships**	
BETTER		5.1.1	Contract with provider to install on-site bikeshare station for use by commuters and visitors	☐
			Commuter travel	
BETTER		5.1.2	Provide employees with bikeshare memberships for local business travel	☐
		5.2	**Carshare vehicles & memberships**	
			Commuter travel	
BETTER		5.2.1	Contract with provider to install on-site carshare vehicles and promote their use by tenants	☐
BETTER		5.2.2	Provide employees with carshare memberships for local business travel	☐
		6.	**PARKING**	
		6.1	**Priced parking**	
			Commuter travel	
BASIC	★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	☐
BASIC		6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	☐
			Visitor travel	
BETTER		6.1.3	Charge for short-term parking (hourly)	☐

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		7.	**TDM MARKETING & COMMUNICATIONS**	
		7.1	**Multimodal travel information**	
			Commuter travel	
BASIC	★	7.1.1	Provide a multimodal travel option information package to new/relocating employees and students	☐
			Visitor travel	
BETTER	★	7.1.2	Include multimodal travel option information in invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	☐
		7.2	**Personalized trip planning**	
			Commuter travel	
BETTER	★	7.2.1	Offer personalized trip planning to new/relocating employees	☐
		7.3	**Promotions**	
			Commuter travel	
BETTER		7.3.1	Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐
		8.	**OTHER INCENTIVES & AMENITIES**	
		8.1	**Emergency ride home**	
			Commuter travel	
BETTER	★	8.1.1	Provide emergency ride home service to non-driving commuters	☐
		8.2	**Alternative work arrangements**	
			Commuter travel	
BASIC	★	8.2.1	Encourage flexible work hours	☐
BETTER		8.2.2	Encourage compressed workweeks	☐
BETTER	★	8.2.3	Encourage telework	☐
		8.3	**Local business travel options**	
			Commuter travel	
BASIC	★	8.3.1	Provide local business travel options that minimize the need for employees to bring a personal car to work	☐
		8.4	**Commuter incentives**	
			Commuter travel	
BETTER		8.4.1	Offer employees a taxable, mode-neutral commuting allowance	☐
		8.5	**On-site amenities**	
			Commuter travel	
BETTER		8.5.1	Provide on-site amenities/services to minimize mid-day or mid-commute errands	☐

MODULE 4.6 – Neighbourhood Traffic Management

Element 4.6.1 – Adjacent Neighbourhoods

Exempt as determined in the Scoping Document.

MODULE 4.7 - Transit

Element 4.7.1 – Route Capacity

OC Transpo provides Rapid Route 61 and Local Route 162 which travel past the site 7 days a week with destinations to the Terry Fox and Tunney's Pasture Transitway Stations. Connexion Route 261 provides peak period Monday to Friday service to the Tunney's Pasture Transitway Station with bus stops along Stittsville Main Street. All bus stops are within a 400 m walk.

With the recent completion of the medical building on the south side of Hazeldean Road across from the site and a new access planned just west of the site which will access the residential subdivision behind the site, new bus stops would likely be installed close to the entrance to the site.

The low number of transit person trips from the site would produce a minor impact on the capacity of transit in the area and would not trigger the need for additional capacity.

Element 4.7.2 – Transit Priority

Transit Priority Measures are proposed under the TMP for Hazeldean Road between Stittsville Main Street and Eagleson Road which would reduce travel time and improve reliability.

MODULE 4.8 – Review of Network Concept

Exempt as determined in the Scoping Document.

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The proposed site access will be a "T" intersection which would be restricted to right-in/right-out turning movements controlled by a center median along Hazeldean Road. The intersection would be controlled by a stop sign at the southbound site exiting movement. The configuration of the intersection and low volume of traffic entering/exiting the site would not trigger the installation of traffic control signals.

The intersections examined within the study consist of the Jackson Trails/Hazeldean, Stittsville Main/Hazeldean and Carp/Hazeldean intersections. All intersections are currently controlled by traffic signals.

Element 4.9.2 – Intersection Design

MMLOS for Intersections Within the Study Area

The signalized intersections within the study area were analyzed to determine the level of service which was compared to the MMLOS targets for pedestrians, bicycles, transit, and autos. The calculated Level of Service (LoS) as shown in Tables 4.10 to 4.13, is compared to the LoS targets for all modes of travel. The LoS targets were obtained from Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines*. The Auto level of service is not presented for a signalized intersection as the capacity is not addressed as a whole because both the design and the signalization of the intersection focus on the accommodation of traffic movement at approaches to the intersection. The MMLOS results are presented in Table 4.14 with the following discussing the level of service for each intersection:

TABLE 4.14
MULTI-MODAL (MMLOS) INTERSECTION SUMMARY TABLE - Intersection

INTERSECTION	Level of Service (LoS) – 2026				
	Pedestrian	Bicycle	Transit	Auto	Truck
Jackson Trails/Hazeldean	D	F	C	-	B
Stittsville Main/Hazeldean	D	E	C	-	A
Carp/Hazeldean	D	E	C	-	A
Target LoS	C	C	D	D	D

Intersection of the Site Access and Hazeldean Road

The site access onto Hazeldean Road would be a right-in/right-out access controlled by a stop sign at the southbound site exit approach. The site exit approach would be 9.5 m in width with one lane entering and one lane exiting. The westbound Hazeldean Road right turn movement would be from a shared through/right lane movement. There would be no exclusive turn lanes at the intersection. Table 4.6 showed that the access would operate at an acceptable level of service during the 2026 peak AM and PM hours.

Intersection of Jackson Trails Centre Access and Hazeldean Road

The Jackson Trails/Hazeldean signalized intersection was analyzed to determine the level of service which was compared to the MMLOS targets for pedestrians, bicycles, transit, and autos. The auto level of service was calculated to be acceptable at all approaches (Table 4.7) during both the peak AM and PM hours. The pedestrian level of service shown in Table 4.14 (PLOS) did not meet target due to the number of lanes and distance crossing the road, and the cycle length of the traffic signals. The bicycle level

of service (BLOS) did not meet target due to the number of lanes crossed in making a left turn movement and the speed of traffic along the road.

There would be no requirement for modifications to the Jackson Trails/Hazeldean intersection.

Intersection of Stittsville Main Street and Hazeldean Road

The auto level of service is presented in Table 4.8 which shows that for the 2026 background traffic which does not include any site generated trips, all lane movements to the westbound approach functioned at a LoS “F”. The low level of service is due to the increasing development within the Stittsville Area. To improve the level of service, the chevron painted westbound left turn lane must be open providing a westbound double left turn movement which would reduce green time for the movement and increase capacity for other signal phases. The intersection would also require an exclusive westbound right turn lane to replace the shared through/right movement which would better handle the increased development north of Hazeldean Road and increase the capacity of the westbound through movement.

Following the completion of the development in 2021, the westbound approach would continue to function at a LoS “F” with the existing lane configuration. With the recommended intersection modifications discussed above, all approaches to the intersection would function at an acceptable level of service using the 2026 total traffic (including site generated trips). The low level of service was determined to be related to the increase in background traffic and that there would be no modifications to the intersection due to the development of the car wash station development.

The Stittsville Main/Hazeldean intersection did not meet the PLOS target due to the walking distance crossing the road and the length of the traffic signal cycle. The BLOS was not meet due to the number of lanes crossed for a left turn movement and the speed of traffic along the road.

Intersection of Carp Road and Hazeldean Road

The Carp/Hazeldean intersection is located 530 m west of the site. The intersection is a signalized intersection with the existing 2017 traffic counts determining that all approaches functioned at an acceptable level of service (Table 4.9). When examining the intersection using the 2026 background traffic, the southbound Carp Road through movement functioned at a LoS “F” due to the increasing traffic within the Stittsville area. The TMP did identify in the Affordable Network the widening of Carp Road between Highway 417 and Hazeldean Road from a two lane road to a four lane road. The widening would increase the capacity of the road resulting in an acceptable level of service at all approaches for the expected 2026 total traffic. The widening is necessary due to the increasing development in the Stittsville area with the 2026 background traffic analysis determining that the widening would not be triggered by the car wash station development.

The intersection of Carp Road and Hazeldean Road did not meet the PLOS target as shown in Table 4.14 due to the walking distance crossing the road and the length of the traffic signal cycle. The BLOS was not meet due to the number of lanes crossed for a left turn movement and the speed of traffic along the road.

SUMMARY

A Site Plan has been prepared for the construction of a commercial/retail development on a 1.849 ha parcel of land at 6111 Hazeldean Road. The site is located on the north side of Hazeldean Road approximately 385 m west of the intersection of Stittsville Main Street and Hazeldean Road.

The proposed development will comprise of four free-standing buildings consisting of a Halo Car Wash Station, an oil change station (Mr. Lube), a coffee shop with a drive-through window (Starbucks) and retail. The site will have one new access onto Hazeldean Road which will be restricted to right-in/right-out turning movements which would be controlled by a center median along Hazeldean Road. The site will also have an interior connection with the Jackson Trails Centre plaza adjacent to the east limit of the property. The connection will allow trips from the proposed car wash station development to utilize the full movement signalized intersection to the Jackson Trails Centre plaza. The development is expected to be completed and occupied by the year 2021.

The TIA analysis has examined the modes of transportation along the Hazeldean Road street segment between Stittsville Main Street and Carp Road, and the new site access intersection, Jackson Trails/Hazeldean, Stittsville Main/Hazeldean and Carp/Hazeldean intersections. The time period would be the peak AM and PM hour of the adjacent roads. The transportation analysis has determined the following:

1. The proposed car wash station development is expected to generate 71 vehicle trips arriving and 64 vehicle trips departing during the weekday peak AM hour for a total of 135 trips, and 73 vehicle trips arriving and 71 vehicle trips departing during the weekday peak PM hour for a total of 144 trips. The site trips would be divided into primary trips and pass-by/diverted trips.

2. The site will provide 84 parking spaces for customers including 6 barrier-free spaces. The number of parking spaces will meet the requirements of the City of Ottawa Zoning By-law. The Halo car wash provides storage for 21 queued vehicles for the automated car wash. The Starbucks coffee shop has a drive-through window with the aisle to the order window providing space for 11 queued vehicles. The Mr. Lube oil change station provides space for 9 queued vehicles for the three service position garage.

3. The Site Plan provides five bicycle racks for the storage of 30 bicycles which meets the City of Ottawa Zoning By-law. The bike racks would be installed close to the building entrance in a secure location.

4. The MMLOS analysis of the Hazeldean Road street segment determined that the pedestrian (PLOS) level of service did not meet the MMLOS target due to the volume of traffic along Hazeldean Road. The bicycle (BLOS) level of service did not meet the target due to the speed of traffic along Hazeldean Road.

5. The MMLOS analysis of the intersections are as follows:

    - Site Access/Hazeldean - The site access would be a "T" intersection with right-in/right-out turn movements and a stop sign placed at the southbound site exit. The intersection would operate at a Level of Service (LoS) "B" for the 2021 and 2026 traffic. There would be no requirement for modifications to Hazeldean Road with the exception of a private approach permit.

    - Jackson Trails/Hazeldean - All approaches to the intersection would function at a LoS "A" for the 2021 and 2026 auto mode share. For the MMLOS, the pedestrian (PLOS) target was not met due to the number of lanes and distance traveled crossing the road, and the length of the traffic signal cycle. The Bicycle (BLOS) target was not met due to the number of lanes crossed making a left turn movement and the speed of traffic along Hazeldean Road. There would be no requirement for modifications to the intersection due to the proposed development.

    - Stittsville Main/Hazeldean - For the existing traffic counts, all approaches functioned at an acceptable level of service for the auto mode share. At the year 2026, the background traffic analysis (no site trips) determined that all lane movements at the westbound approach during the peak PM hour would function at a LoS "F" due to the increasing development in the Stittsville area. It is recommended that the existing chevron painted westbound Hazeldean Road left turn lane be opened to allow for a double left turn movement. It is also recommended that an exclusive right turn lane be provided so that there would be more capacity for the westbound through movements. With these intersection modifications the intersection would function at an acceptable level of service for the 2021 and 2026 traffic including the expected site trips. Modifications to the Stittsville Main/Hazeldean intersection would be due to the increasing background traffic from new development north and south of Hazeldean Road with the car wash station development having only a minor impact on the operation of the intersection. The PLOS target was not met due to the walking distance crossing the road and the length of the traffic signal cycle. The BLOS target was not met due to the speed of traffic along Hazeldean Road and the number of lanes crossed for making a left turn maneuver.

    - Carp/Hazeldean - The auto mode share analysis determined that the intersection would function at an acceptable level of service using the 2017 traffic counts. For the 2026 background traffic the analysis

determined that the through movement at the southbound Carp Road approach would function at a LoS “F during the peak PM hour. The low level of service was due to the increasing development within Stittsville. The City of Ottawa TMP has identified the widening of Carp Road from a two lane road to a four lane road between Highway 417 and Hazeldean Road. With the road widening, the 2021 and 2026 total traffic analysis determined that all approaches to the intersection would function at an acceptable level of service. The requirement for intersection modifications would not be triggered due to the construction of the car wash development. The PLOS target was not met due to the walking distance crossing the road and the length of the traffic signal cycle. The BLOS target was not met due to the speed of traffic along Hazeldean Road and the number of lanes crossed for making a left turn maneuver.

Prepared by:

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

APPENDIX

SCREENING FORM

TRAFFIC COUNTS

ITE TRIP GENERATION STATISTICAL GRAPHS

EXHIBIT 1.1
SCREENING FORM

Ottawa *Transportation Impact Assessment Guidelines*

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	6111 Hazeldean Rd. Ottawa
Description of Location	vacant grass field
Land Use Classification	AM9 (1699)H
Development Size (units)	1
Development Size (m^2)	18464
Number of Accesses and Locations	1
Phase of Development	1
Buildout Year	2021

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
Single-family homes	40 units
Townhomes or apartments	90 units
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

** 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 2.1
2016 PEAK AM HOUR TRAFFIC COUNTS - Stittsville Main/Hazeldean

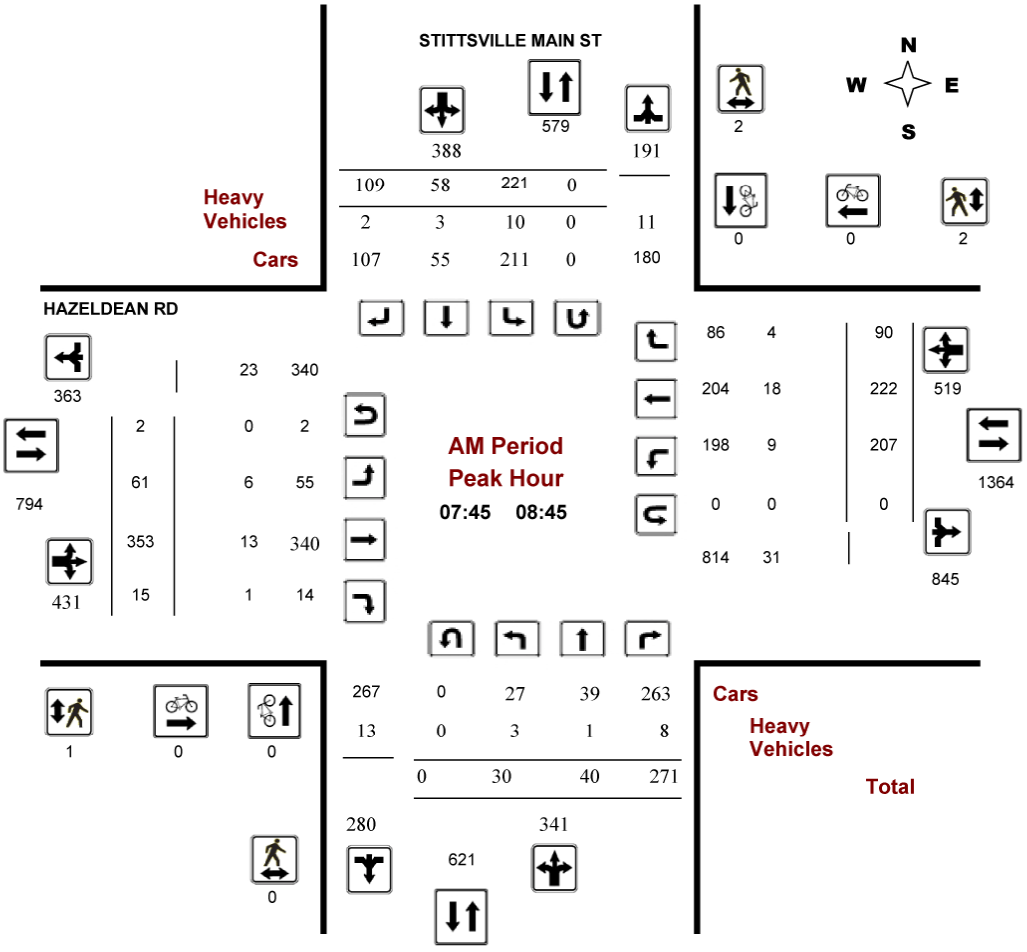
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

STITTSVILLE MAIN ST @ HAZELDEAN RD

Survey Date: Wednesday, March 23, 2016 **WO No:** 35821

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



Comments

2016 PEAK PM HOUR TRAFFIC COUNTS - Stittsville Main/Hazeldean

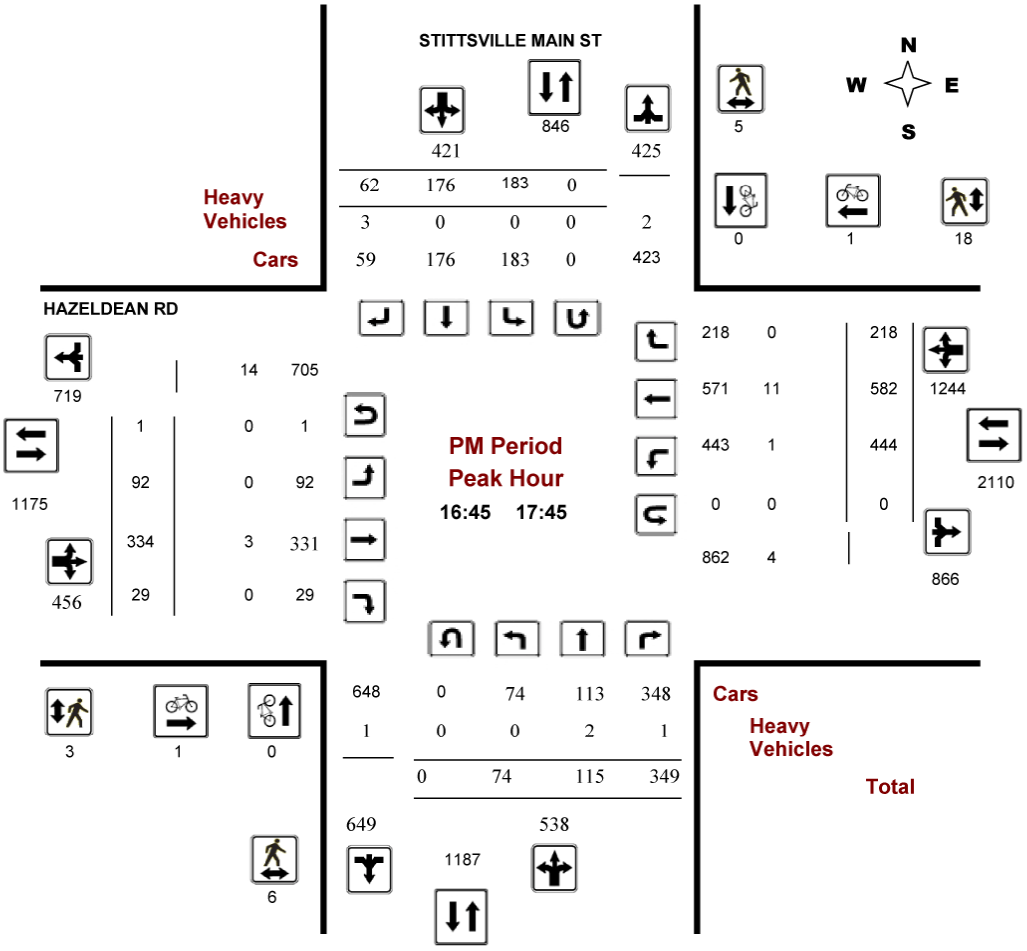
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

STITTSVILLE MAIN ST @ HAZELDEAN RD

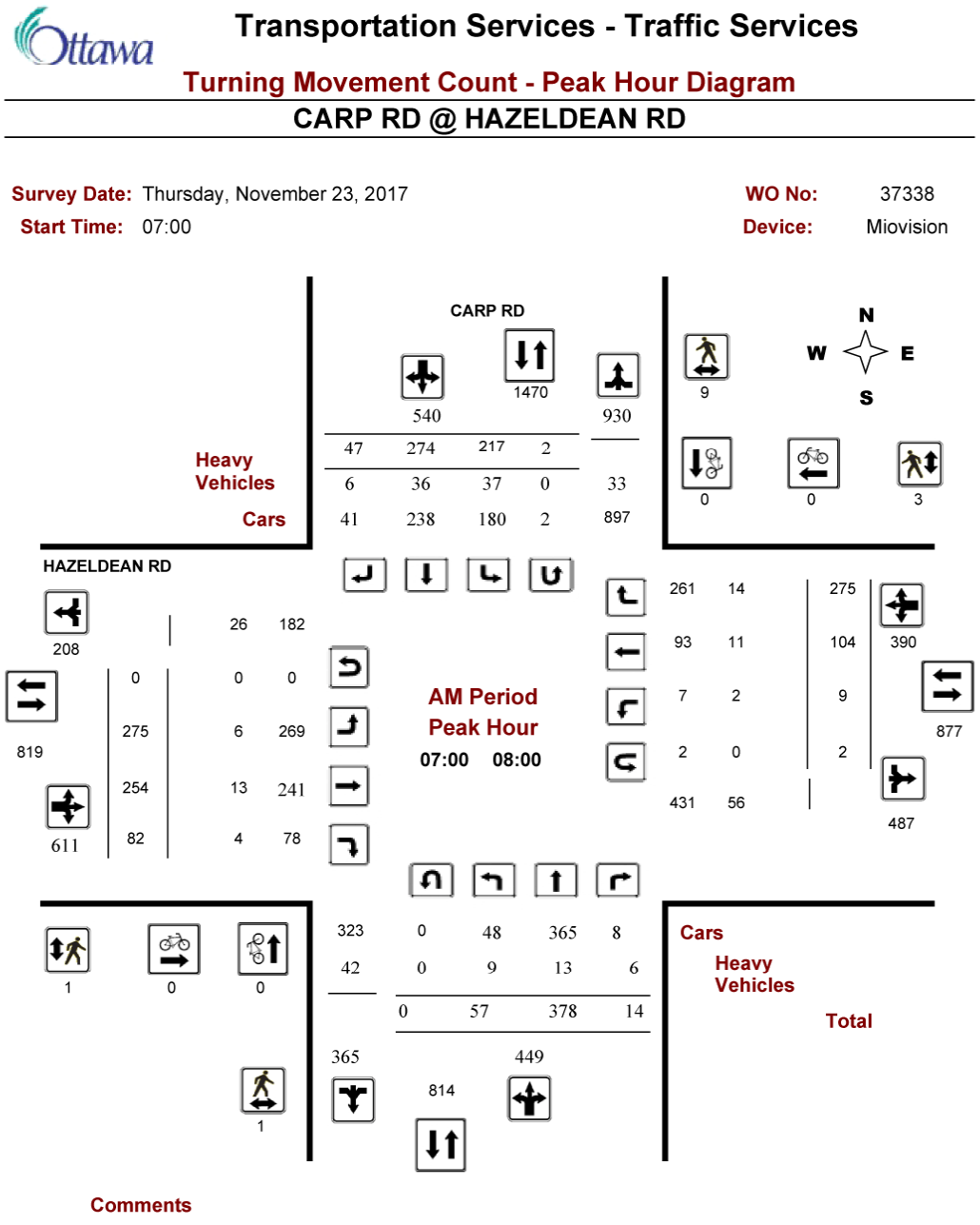
Survey Date: Wednesday, March 23, 2016 **WO No:** 35821

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



Comments

EXHIBIT 2.2
2017 PEAK AM HOUR TRAFFIC COUNTS - Carp/Hazeldean



2017 PEAK PM HOUR TRAFFIC COUNTS - Carp/Hazeldean

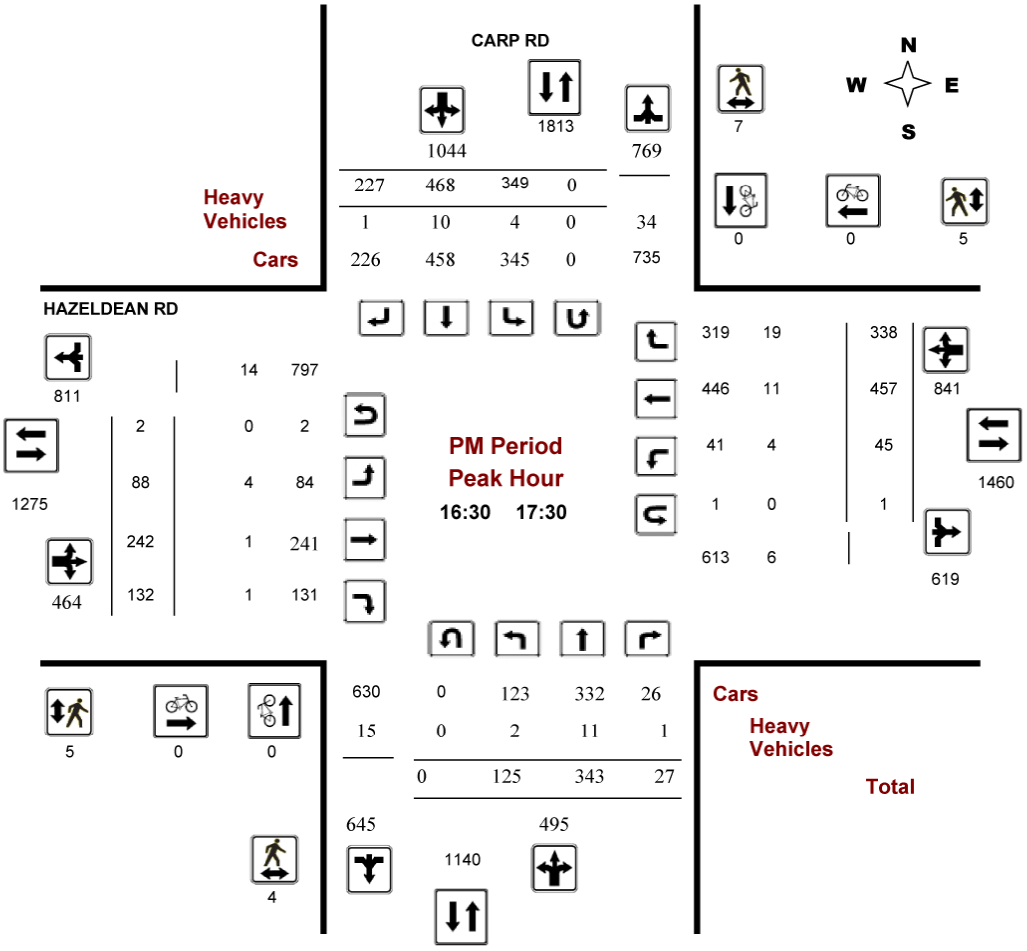
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CARP RD @ HAZELDEAN RD

Survey Date: Thursday, November 23, 2017 **WO No:** 37338

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



Comments

EXHIBIT 2.3
2020 PEAK AM AND PM HOUR TRAFFIC COUNTS – Jackson Trails Centre Access

All Vehicles

Time Period	Northbound			Southbound			Eastbound			Westbound			
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	Total
07:00 – 07:15	-	-	-	1	-	2	10	-	-	-	-	0	**13**
07:15 – 07:30	-	-	-	0	-	0	7	-	-	-	-	0	**7**
07:30 – 07:45	-	-	-	1	-	1	13	-	-	-	-	0	**15**
07:45 – 08:00	-	-	-	1	-	0	5	-	-	-	-	2	**8**
08:00 – 08:15	-	-	-	1	-	0	4	-	-	-	-	0	**5**
08:15 – 08:30	-	-	-	2	-	2	15	-	-	-	-	1	**20**
08:30 – 08:45	-	-	-	0	-	5	11	-	-	-	-	5	**21**
08:45 – 09:00	-	-	-	0	-	6	10	-	-	-	-	2	**18**
16:00 – 16:15	-	-	-	1	-	10	8	-	-	-	-	5	**24**
16:15 – 16:30	-	-	-	4	-	6	9	-	-	-	-	2	**21**
16:30 – 16:45	-	-	-	4	-	10	11	-	-	-	-	4	**29**
16:45 – 17:00	-	-	-	5	-	6	11	-	-	-	-	7	**29**
17:00 – 17:15	-	-	-	4	-	15	20	-	-	-	-	7	**46**
17:15 – 17:30	-	-	-	3	-	8	12	-	-	-	-	0	**23**
17:30 – 17:45	-	-	-	4	-	15	11	-	-	-	-	2	**32**
17:45 – 18:00	-	-	-	2	-	3	12	-	-	-	-	1	**18**

Truck & Bus Traffic

Time Period	Northbound			Southbound			Eastbound			Westbound			
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT	Total
07:00 – 07:15	-	-	-	1	-	0	1	-	-	-	-	0	**2**
07:15 – 07:30	-	-	-	0	-	0	3	-	-	-	-	0	**3**
07:30 – 07:45	-	-	-	0	-	0	2	-	-	-	-	0	**2**
07:45 – 08:00	-	-	-	0	-	0	0	-	-	-	-	0	**0**
08:00 – 08:15	-	-	-	0	-	0	0	-	-	-	-	0	**0**
08:15 – 08:30	-	-	-	0	-	0	0	-	-	-	-	0	**0**
08:30 – 08:45	-	-	-	0	-	0	0	-	-	-	-	0	**0**
08:45 – 09:00	-	-	-	0	-	0	0	-	-	-	-	0	**0**
16:00 – 16:15	-	-	-	0	-	0	0	-	-	-	-	0	**0**
16:15 – 16:30	-	-	-	0	-	0	0	-	-	-	-	0	**0**
16:30 – 16:45	-	-	-	0	-	0	0	-	-	-	-	0	**0**
16:45 – 17:00	-	-	-	0	-	0	0	-	-	-	-	0	**0**
17:00 – 17:15	-	-	-	0	-	0	0	-	-	-	-	0	**0**
17:15 – 17:30	-	-	-	0	-	0	0	-	-	-	-	0	**0**
17:30 – 17:45	-	-	-	0	-	0	0	-	-	-	-	0	**0**
17:45 – 18:00	-	-	-	0	-	0	0	-	-	-	-	0	**0**

EXHIBIT 2.4
OC TRANSPO ROUTE 61 TRANSIT MAP

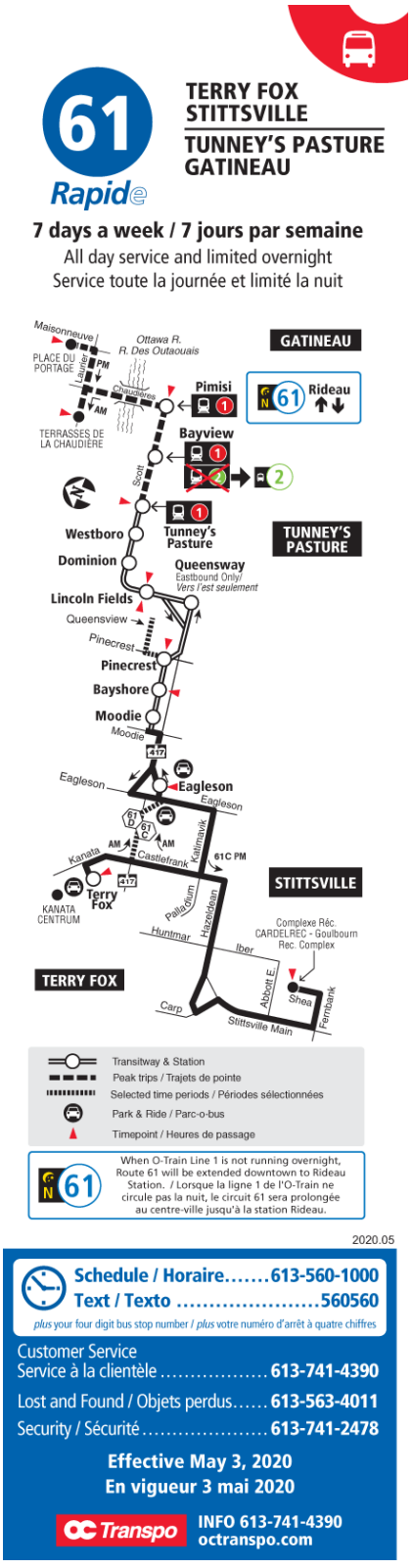


EXHIBIT 2.5
OC TRANSPO ROUTE 162 TRANSIT MAP

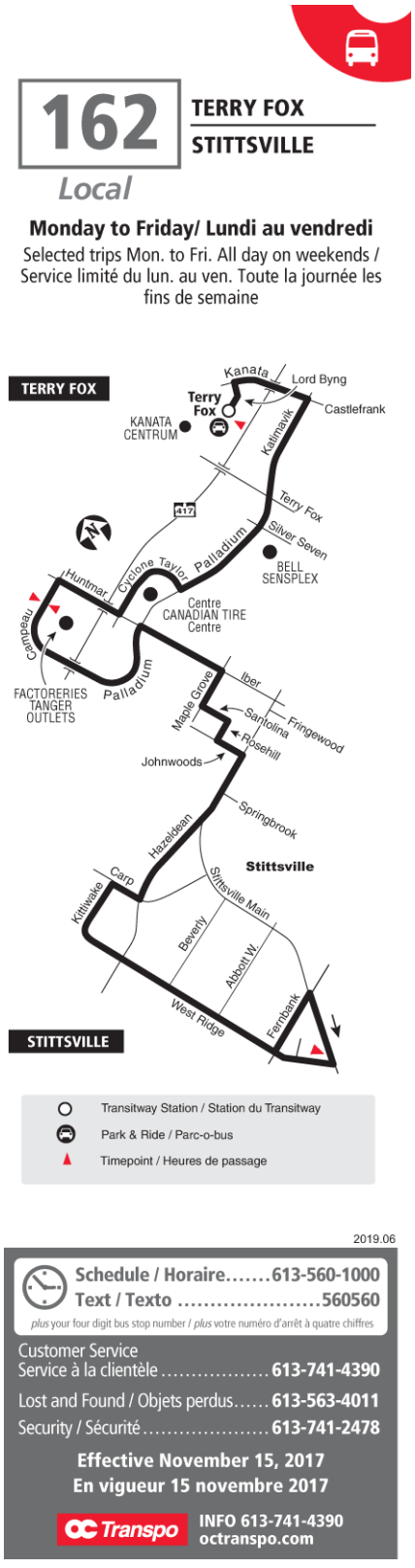


EXHIBIT 2.6
OC TRANSPO ROUTE 261 TRANSIT MAP

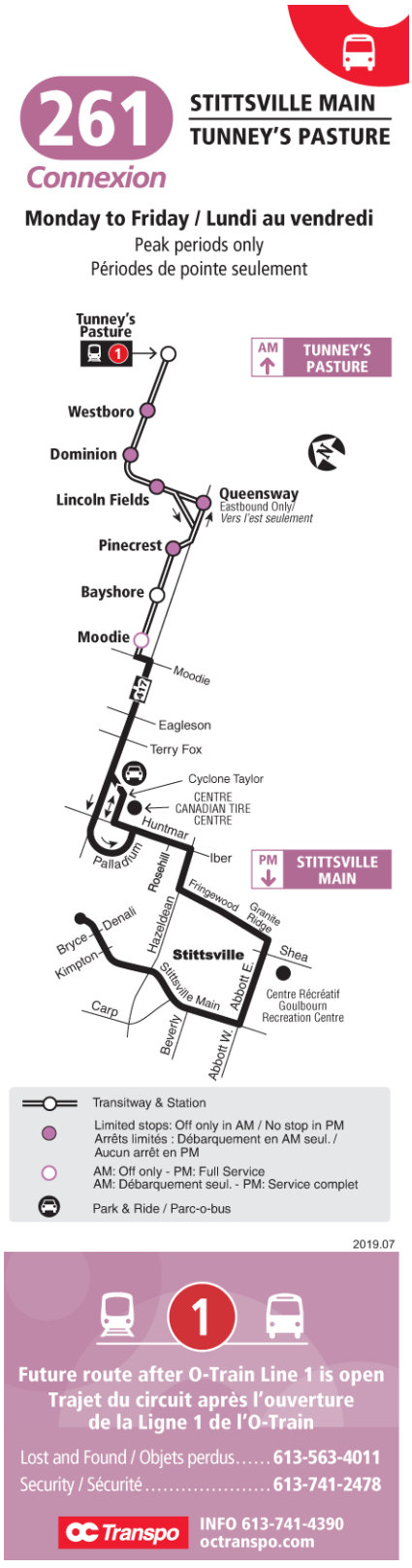


EXHIBIT 3.1
ITE TRIP GENERATION 10th Ed. – Automatic Car Wash (948) Peak PM Hr.

Automated Car Wash
(948)

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:	1
1000 Sq. Ft. GFA:	2
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
14.20	14.20 - 14.20	*

Data Plot and Equation

Caution – Small Sample Size

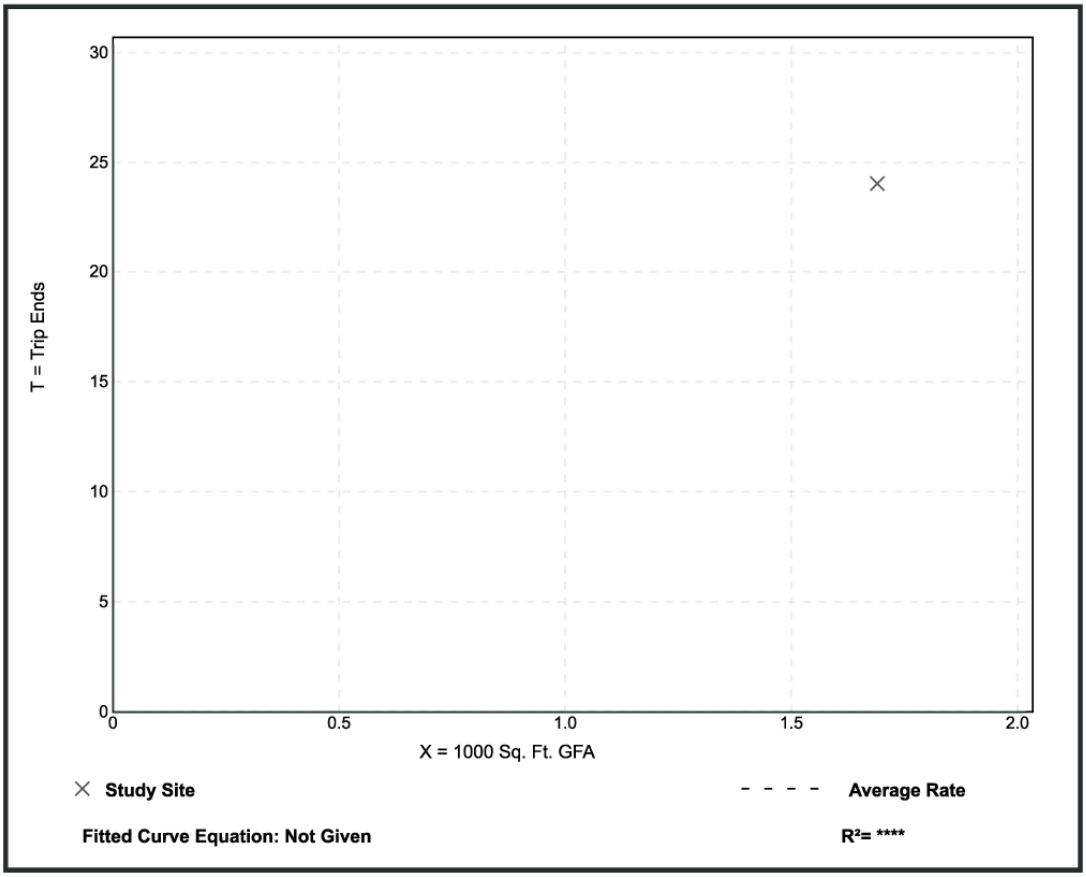


EXHIBIT 3.2
ITE TRIP GENERATION 10th Ed. – Quick Lubrication Shop (941) Peak AM Hr.

Quick Lubrication Vehicle Shop
(941)

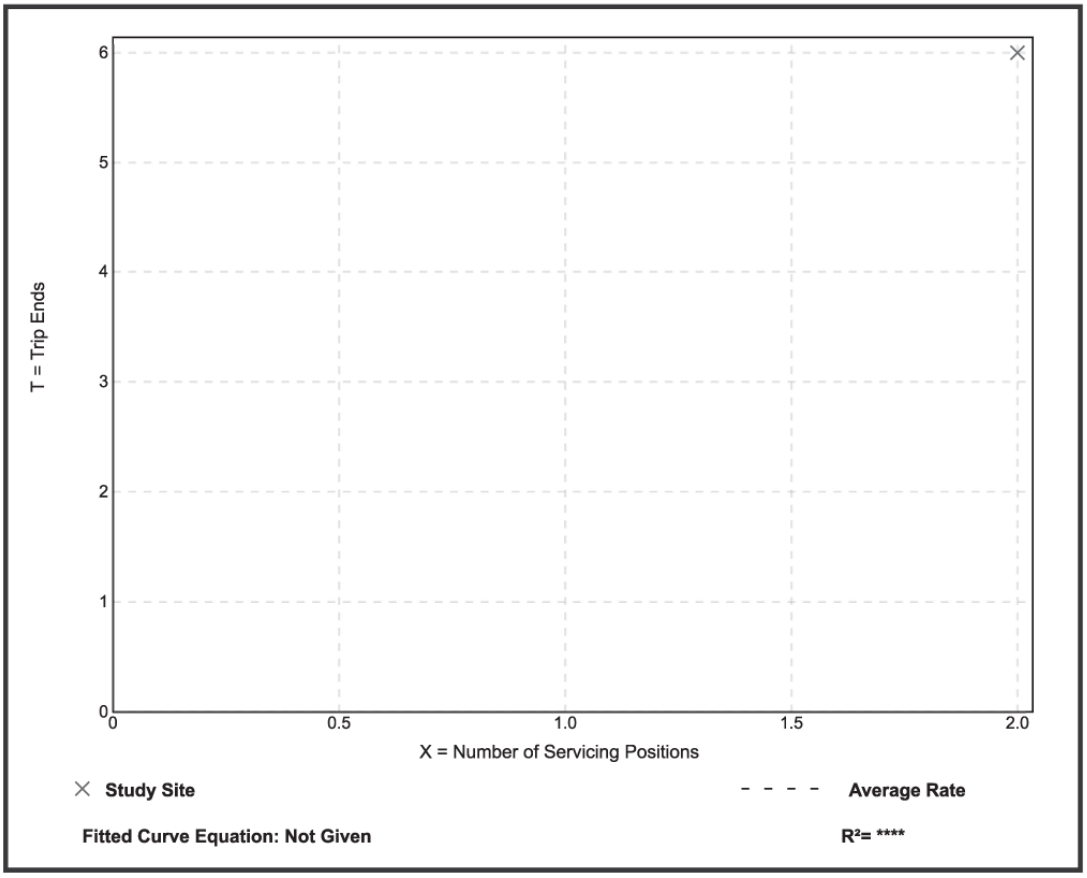
Vehicle Trip Ends vs:	**Servicing Positions**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	1
Avg. Num. of Servicing Positions:	2
Directional Distribution:	67% entering, 33% exiting

Vehicle Trip Generation per Servicing Position

Average Rate	Range of Rates	Standard Deviation
3.00	3.00 - 3.00	*

Data Plot and Equation

Caution – Small Sample Size



ITE TRIP GENERATION 10th Ed. – Quick Lubrication Shop (941) Peak PM Hr.

Quick Lubrication Vehicle Shop
(941)

Vehicle Trip Ends vs:	**Servicing Positions**
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:	10
Avg. Num. of Servicing Positions:	3
Directional Distribution:	56% entering, 44% exiting

Vehicle Trip Generation per Servicing Position

Average Rate	Range of Rates	Standard Deviation
4.85	2.67 - 10.00	2.25

Data Plot and Equation

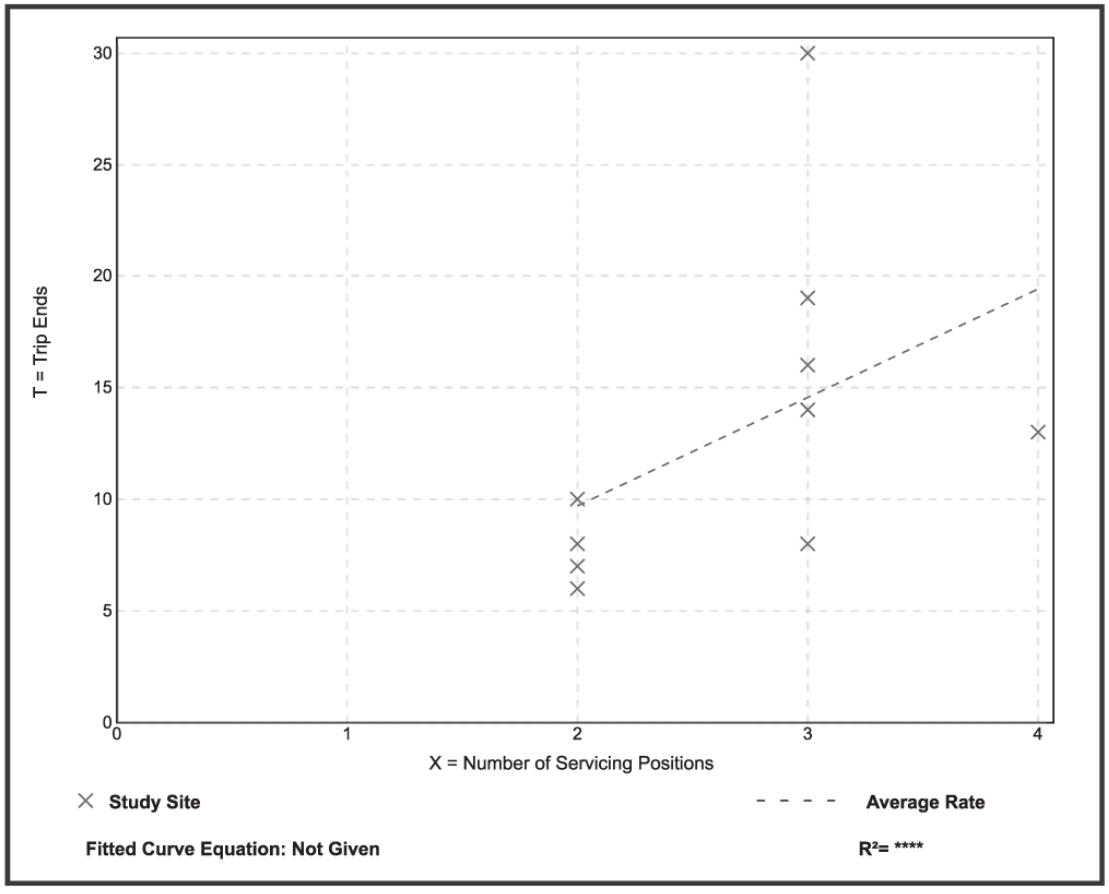


EXHIBIT 3.3
ITE TRIP GENERATION 10th Ed. – Coffee Shop with Drive-Through (937) Peak AM Hr.

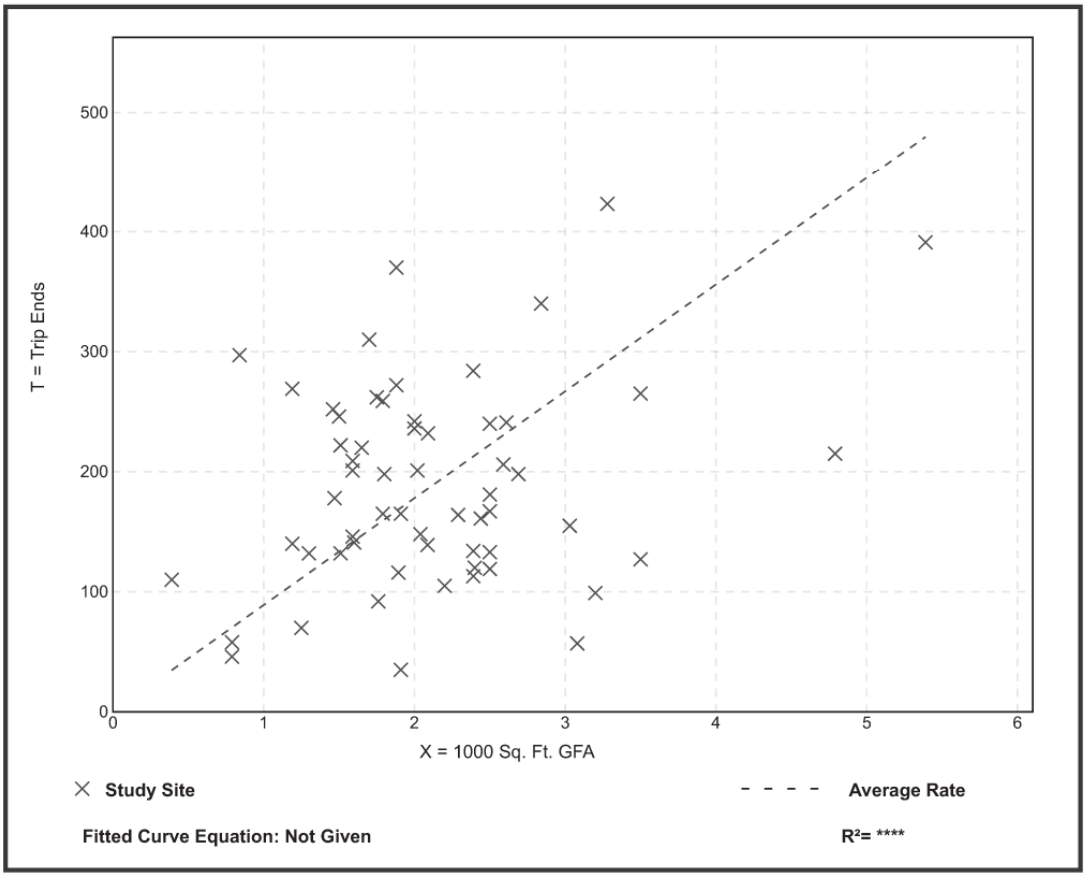
Coffee/Donut Shop with Drive-Through Window
(937)

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:	61
1000 Sq. Ft. GFA:	2
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
88.99	18.32 - 353.57	48.19

Data Plot and Equation



ITE TRIP GENERATION 10th Ed. – Coffee Shop with Drive-Through (937) Peak PM Hr.

Coffee/Donut Shop with Drive-Through Window
(937)

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:	26
1000 Sq. Ft. GFA:	2
Directional Distribution:	50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
43.38	2.09 - 92.31	18.88

Data Plot and Equation

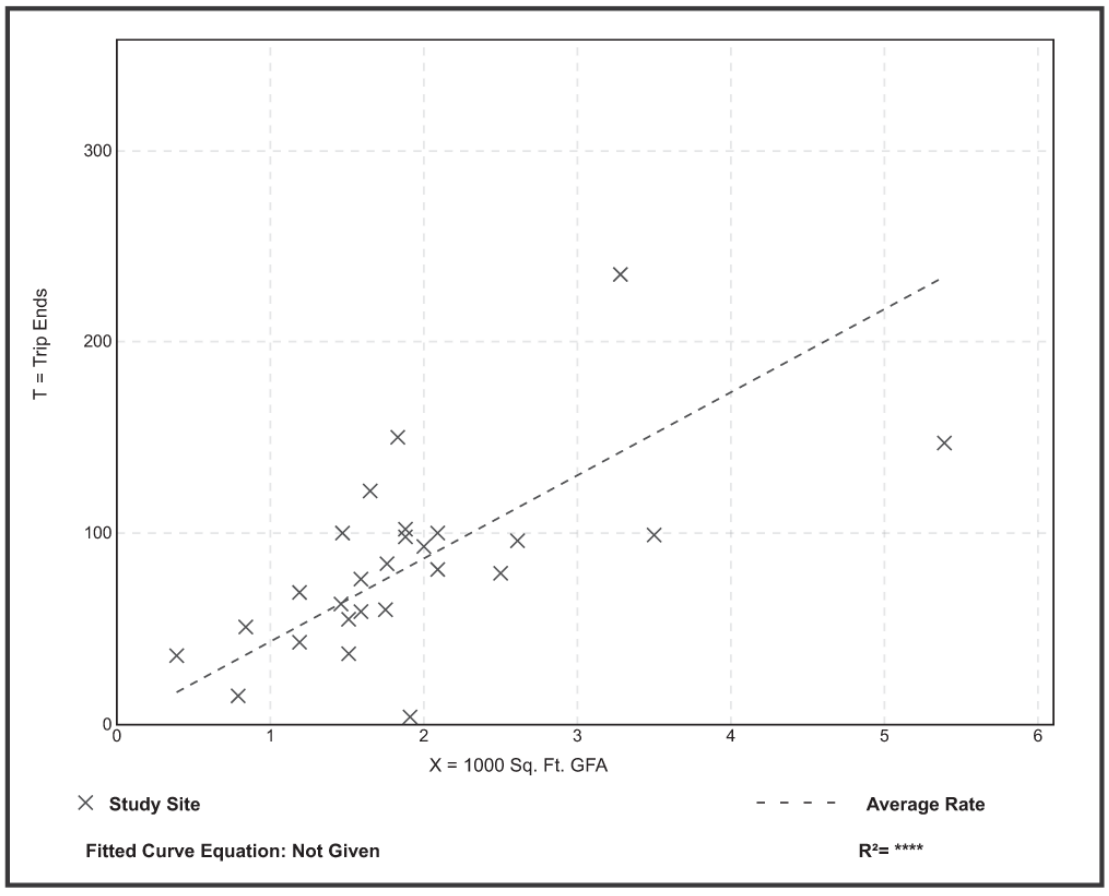


EXHIBIT 3.4
ITE TRIP GENERATION 10th Ed. – Apparel Store (876) Peak PM Hr.

Apparel Store
(876)

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:	9
1000 Sq. Ft. GFA:	5
Directional Distribution:	51% entering, 49% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
4.12	1.50 - 6.80	2.18

Data Plot and Equation

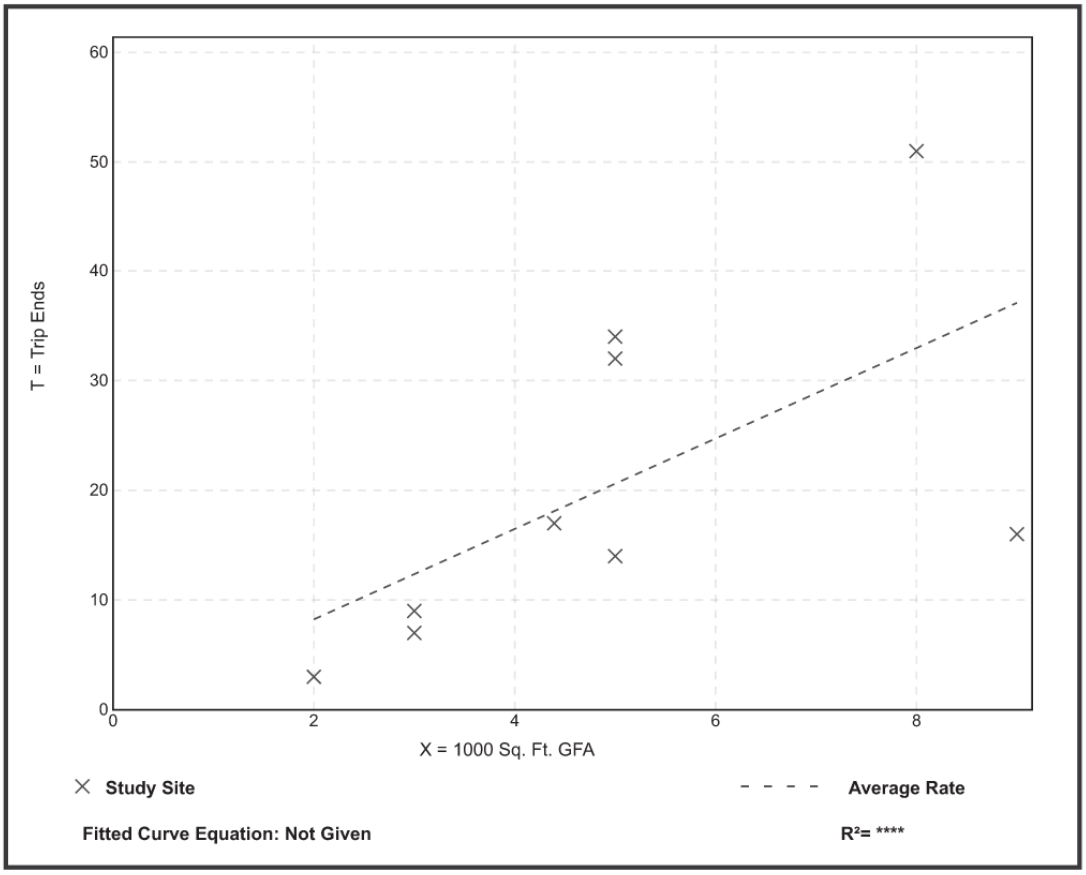


EXHIBIT 4.1
HAZELDEAN ROAD - PLOS SEGMENT EVALUATION

STREET	Hazeldean Road
FROM	Carp Road
TO	Stittsville Main Street
YEAR	2026
DIRECTION	Eastbound–Westbound
MMLOS MODE	PLOS

SEGMENT SCORE **E**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 4.2
HAZELDEAN ROAD - BLOS SEGMENT EVALUATION

STREET	Hazeldean Road
FROM	Carp Road
TO	Stittsville Main Street
YEAR	2026
DIRECTION	Eastbound–Westbound
MMLOS MODE	BLOS

SEGMENT SCORE **D**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	≥ 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	≥ 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	< 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	≥ 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE

NOT APPLICABLE

NOT APPLICABLE

NOT APPLICABLE

EXHIBIT 4.3
HAZELDEAN ROAD - TLOS SEGMENT EVALUATION

STREET	Hazeldean Road
FROM	Carp Road
TO	Stittsville Main Street
YEAR	2026
DIRECTION	Eastbound–Westbound
MMLOS MODE	TLOS

SEGMENT SCORE **D**

Facility Type		Level/exposure to congestion delay, friction and incidents			Quantitative Measurement	LOS
		Congestion	Friction	Incident Potential		
Segregated ROW		No	No	No	N/A	A
Bus lane	No/limited parking/driveway friction	No	Low	Low	$C_f \leq 60$	B
	Frequent parking/driveway friction	No	Medium	Medium	$C_f > 60$	C
Mixed Traffic	Limited parking/driveway friction	Yes	Low	Medium	$Vt/Vp \geq 0.8$	D
	Moderate parking/driveway friction	Yes	Medium	Medium	$Vt/Vp \leq 0.6$	E
	Frequent parking/driveway friction	Yes	High	High	$Vt/Vp < 0.4$	F

Notes:

Cf, Conflict Factor = = (Number of driveways x crossing volume) / 1 km

Vt/Vp is the ratio of average transit travel speed to posted speed limit

EXHIBIT 4.4
HAZELDEAN ROAD - TkLOS SEGMENT EVALUATION

STREET	Hazeldean Road
FROM	Carp Road
TO	Stittsville Main Street
YEAR	2026
DIRECTION	Eastbound–Westbound
MMLOS MODE	TkLOS

SEGMENT SCORE **A**

Exhibit 20 – TkLOS Segment Evaluation Table

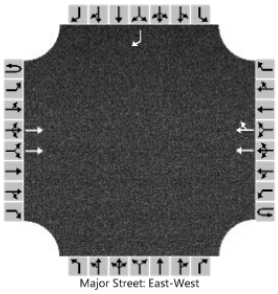
Curb Lane Width (m)	Only two travel lanes (one in each direction)	More than two travel lanes
>3.7	B	A
≤3.5	C	A
≤3.3	D	C
≤3.2	E	D
≤3	F	E

EXHIBIT 4.5
2021 PEAK AM HOUR ANALYSIS (Total Traffic) - Site Access/Hazeldean

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Site Access/Hazelderan
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	1/17/2021	East/West Street	Hazeldean Road
Analysis Year	2021	North/South Street	Site Access
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Car Wash Station		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	0	1
Configuration			T				T	TR								R
Volume (veh/h)			577				484	23								20
Percent Heavy Vehicles (%)																1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																6.9
Critical Headway (sec)																6.92
Base Follow-Up Headway (sec)																3.3
Follow-Up Headway (sec)																3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)																22
Capacity, c (veh/h)																723
v/c Ratio																0.03
95% Queue Length, Q_{95} (veh)																0.1
Control Delay (s/veh)																10.1
Level of Service (LOS)																B
Approach Delay (s/veh)													10.1			
Approach LOS													B			

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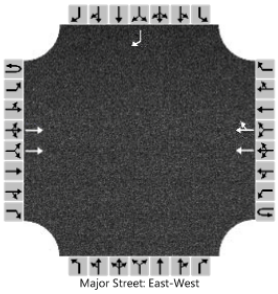
EXHIBIT 4.6
2021 PEAK PM HOUR ANALYSIS (Total Traffic) - Site Access/Hazeldean

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Site Access/Hazelderan
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	1/17/2021	East/West Street	Hazeldean Road
Analysis Year	2021	North/South Street	Site Access
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Car Wash Station		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	0	1
Configuration			T				T	TR								R
Volume (veh/h)			736				976	23								19
Percent Heavy Vehicles (%)																1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																6.9
Critical Headway (sec)																6.92
Base Follow-Up Headway (sec)																3.3
Follow-Up Headway (sec)																3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)																21
Capacity, c (veh/h)																485
v/c Ratio																0.04
95% Queue Length, Q_{95} (veh)																0.1
Control Delay (s/veh)																12.7
Level of Service (LOS)																B
Approach Delay (s/veh)													12.7			
Approach LOS													B			

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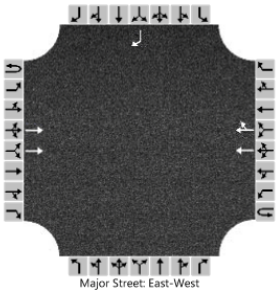
EXHIBIT 4.7
2026 PEAK AM HOUR ANALYSIS (Total Traffic) - Site Access/Hazeldean

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Site Access/Hazelderan
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	1/17/2021	East/West Street	Hazeldean Road
Analysis Year	2026	North/South Street	Site Access
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Car Wash Station		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	0	1
Configuration			T				T	TR								R
Volume (veh/h)			633				527	23								20
Percent Heavy Vehicles (%)																1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																6.9
Critical Headway (sec)																6.92
Base Follow-Up Headway (sec)																3.3
Follow-Up Headway (sec)																3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)																22
Capacity, c (veh/h)																699
v/c Ratio																0.03
95% Queue Length, Q_{95} (veh)																0.1
Control Delay (s/veh)																10.3
Level of Service (LOS)																B
Approach Delay (s/veh)													10.3			
Approach LOS													B			

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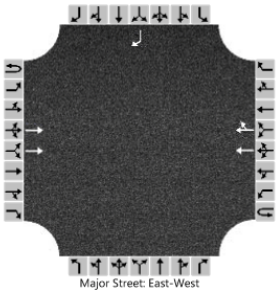
EXHIBIT 4.8
2026 PEAK PM HOUR ANALYSIS (Total Traffic) - Site Access/Hazeldean

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Site Access/Hazelderan
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	1/17/2021	East/West Street	Hazeldean Road
Analysis Year	2026	North/South Street	Site Access
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Car Wash Station		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	0	1
Configuration			T				T	TR								R
Volume (veh/h)			805				1071	23								19
Percent Heavy Vehicles (%)																1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																6.9
Critical Headway (sec)																6.92
Base Follow-Up Headway (sec)																3.3
Follow-Up Headway (sec)																3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)																21
Capacity, c (veh/h)																449
v/c Ratio																0.05
95% Queue Length, Q_{95} (veh)																0.1
Control Delay (s/veh)																13.4
Level of Service (LOS)																B
Approach Delay (s/veh)													13.4			
Approach LOS													B			

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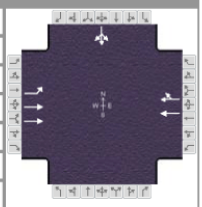
EXHIBIT 4.9
2021 PEAK AM HOUR ANALYSIS (Total Traffic) - Jackson Trails/Hazeldean

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Jackson Trails/Hazeldean	File Name	2021_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	497			488	16				41	0	19

Signal Information					EB			WB				NB				SB			
Cycle, s	115.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	69.6	32.7	0.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.7	3.3	0.0	0.0	0.0	0.0									
				Red	2.7	3.0	0.0	0.0	0.0	0.0									

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6				4
Case Number		6.0		8.0				12.0
Phase Duration, s		76.0		76.0				39.0
Change Period, (*Y+R c*), s		6.4		6.4				6.3
Max Allow Headway (*MAH*), s		0.0		0.0				3.2
Queue Clearance Time (*g s*), s								5.4
Green Extension Time (*g e*), s		0.0		0.0				0.1
Phase Call Probability								1.00
Max Out Probability								0.00

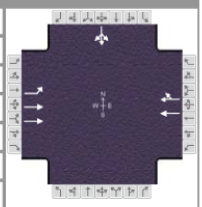
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	87	540			275	273					65	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	866	1674			1730	1710					1635	
Queue Service Time (*g s*), s	6.0	8.7			8.6	8.6					3.4	
Cycle Queue Clearance Time (*g c*), s	14.6	8.7			8.6	8.6					3.4	
Green Ratio (*g/C*)	0.61	0.61			0.61	0.61					0.28	
Capacity (*c*), veh/h	522	2026			1047	1035					465	
Volume-to-Capacity Ratio (*X*)	0.167	0.267			0.263	0.263					0.140	
Back of Queue (Q), ft/ln (50 th percentile)	31.5	80.5			85.3	81.3					33.9	
Back of Queue (Q), veh/ln (50 th percentile)	1.2	3.1			3.3	3.3					1.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.19	0.00			0.00	0.00					0.00	
Uniform Delay (*d 1*), s/veh	14.1	10.7			10.7	10.7					30.7	
Incremental Delay (*d 2*), s/veh	0.7	0.3			0.6	0.6					0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (*d*), s/veh	14.8	11.0			11.3	11.3					30.7	
Level of Service (LOS)	B	B			B	B					C	
Approach Delay, s/veh / LOS	11.5	B		11.3	B		0.0			30.7	C	
Intersection Delay, s/veh / LOS	12.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.37	A	1.66	B	2.15	B	2.32	B
Bicycle LOS Score / LOS	1.01	A	0.94	A			0.60	A

EXHIBIT 4.10
2021 PEAK PM HOUR ANALYSIS (Total Traffic) - Jackson Trails/Hazeldean

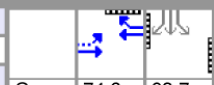
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Jackson Trails/Hazeldean	File Name	2021_tot_pm.xus		
Project Description	Car Wash Station				

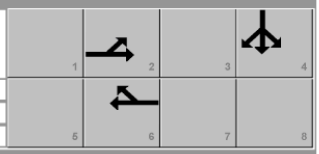


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	83	653			936	37				48	0	63

Signal Information			
Cycle, s	120.0	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	74.6	32.7	0.0	0.0	0.0	0.0	
Yellow	3.7	3.3	0.0	0.0	0.0	0.0	
Red	2.7	3.0	0.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6				4
Case Number		6.0		8.0				12.0
Phase Duration, s		81.0		81.0				39.0
Change Period, (*Y+R c*), s		6.4		6.4				6.3
Max Allow Headway (*MAH*), s		0.0		0.0				3.3
Queue Clearance Time (*g s*), s								9.3
Green Extension Time (*g e*), s		0.0		0.0				0.2
Phase Call Probability								1.00
Max Out Probability								0.00

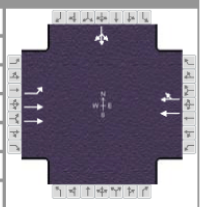
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	90	710			533	525					121	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	538	1674			1730	1702					1573	
Queue Service Time (*g s*), s	13.2	12.2			20.2	20.2					7.3	
Cycle Queue Clearance Time (*g c*), s	33.5	12.2			20.2	20.2					7.3	
Green Ratio (*g/C*)	0.62	0.62			0.62	0.62					0.27	
Capacity (*c*), veh/h	304	2081			1075	1058					429	
Volume-to-Capacity Ratio (*X*)	0.297	0.341			0.496	0.496					0.281	
Back of Queue (Q), ft/ln (50 th percentile)	46.6	112.8			202.8	192.2					70	
Back of Queue (Q), veh/ln (50 th percentile)	1.8	4.4			7.8	7.7					2.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.28	0.00			0.00	0.00					0.00	
Uniform Delay (*d 1*), s/veh	21.6	10.9			12.4	12.4					34.4	
Incremental Delay (*d 2*), s/veh	2.5	0.4			1.6	1.7					0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (*d*), s/veh	24.0	11.3			14.0	14.1					34.5	
Level of Service (LOS)	C	B			B	B					C	
Approach Delay, s/veh / LOS	12.8	B		14.1	B		0.0			34.5	C	
Intersection Delay, s/veh / LOS	14.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.37	A	1.66	B	2.16	B	2.33	B
Bicycle LOS Score / LOS	1.15	A	1.36	A			0.69	A

EXHIBIT 4.11
2026 PEAK AM HOUR ANALYSIS (Total Traffic) - Jackson Trails/Hazeldean

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Jackson Trails/Hazeldean	File Name	2026_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	553			531	16				41	0	19

Signal Information					EB			WB				NB				SB			
Cycle, s	115.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On	Green	69.6	32.7	0.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.7	3.3	0.0	0.0	0.0	0.0									
				Red	2.7	3.0	0.0	0.0	0.0	0.0									

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6				4
Case Number		6.0		8.0				12.0
Phase Duration, s		76.0		76.0				39.0
Change Period, (*Y+R c*), s		6.4		6.4				6.3
Max Allow Headway (*MAH*), s		0.0		0.0				3.2
Queue Clearance Time (*g s*), s								5.4
Green Extension Time (*g e*), s		0.0		0.0				0.1
Phase Call Probability								1.00
Max Out Probability								0.00

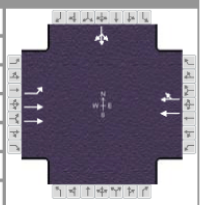
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	87	601			299	296					65	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	829	1674			1730	1711					1635	
Queue Service Time (*g s*), s	6.4	9.9			9.5	9.5					3.4	
Cycle Queue Clearance Time (*g c*), s	15.9	9.9			9.5	9.5					3.4	
Green Ratio (*g/C*)	0.61	0.61			0.61	0.61					0.28	
Capacity (*c*), veh/h	496	2026			1047	1036					465	
Volume-to-Capacity Ratio (*X*)	0.175	0.297			0.285	0.286					0.140	
Back of Queue (Q), ft/ln (50 th percentile)	32.4	91.6			94.3	89.9					33.9	
Back of Queue (Q), veh/ln (50 th percentile)	1.3	3.6			3.6	3.6					1.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.20	0.00			0.00	0.00					0.00	
Uniform Delay (*d 1*), s/veh	14.6	10.9			10.8	10.8					30.7	
Incremental Delay (*d 2*), s/veh	0.8	0.4			0.7	0.7					0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (*d*), s/veh	15.4	11.3			11.5	11.5					30.7	
Level of Service (LOS)	B	B			B	B					C	
Approach Delay, s/veh / LOS	11.8	B		11.5	B		0.0			30.7	C	
Intersection Delay, s/veh / LOS	12.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.37	A	1.66	B	2.15	B	2.32	B
Bicycle LOS Score / LOS	1.06	A	0.98	A			0.60	A

EXHIBIT 4.12
2026 PEAK PM HOUR ANALYSIS (Total Traffic) - Jackson Trails/Hazeldean

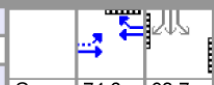
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	Citty of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Jackson Trails/Hazeldean	File Name	2026_tot_pm.xus		
Project Description	Car Wash Station				

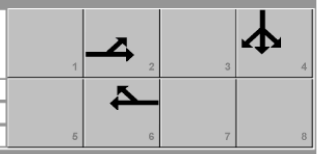


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	83	722			1031	37				48	0	63

Signal Information			
Cycle, s	120.0	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	74.6	32.7	0.0	0.0	0.0	0.0	
Yellow	3.7	3.3	0.0	0.0	0.0	0.0	
Red	2.7	3.0	0.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6				4
Case Number		6.0		8.0				12.0
Phase Duration, s		81.0		81.0				39.0
Change Period, (*Y+R c*), s		6.4		6.4				6.3
Max Allow Headway (*MAH*), s		0.0		0.0				3.3
Queue Clearance Time (*g s*), s								9.3
Green Extension Time (*g e*), s		0.0		0.0				0.2
Phase Call Probability								1.00
Max Out Probability								0.00

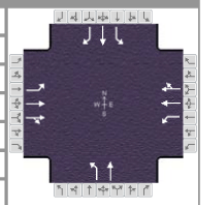
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	90	785			584	576					121	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	488	1674			1730	1705					1573	
Queue Service Time (*g s*), s	15.6	13.9			23.1	23.2					7.3	
Cycle Queue Clearance Time (*g c*), s	38.8	13.9			23.1	23.2					7.3	
Green Ratio (*g/C*)	0.62	0.62			0.62	0.62					0.27	
Capacity (*c*), veh/h	269	2081			1075	1060					429	
Volume-to-Capacity Ratio (*X*)	0.335	0.377			0.544	0.544					0.281	
Back of Queue (Q), ft/ln (50 th percentile)	50.7	128.3			233.2	221.3					70	
Back of Queue (Q), veh/ln (50 th percentile)	2.0	5.0			9.0	8.9					2.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.31	0.00			0.00	0.00					0.00	
Uniform Delay (*d 1*), s/veh	24.1	11.2			13.0	13.0					34.4	
Incremental Delay (*d 2*), s/veh	3.3	0.5			2.0	2.0					0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (*d*), s/veh	27.4	11.7			14.9	15.0					34.5	
Level of Service (LOS)	C	B			B	B					C	
Approach Delay, s/veh / LOS	13.4	B		15.0	B		0.0			34.5	C	
Intersection Delay, s/veh / LOS	15.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.37	A	1.66	B	2.16	B	2.33	B
Bicycle LOS Score / LOS	1.21	A	1.45	A			0.69	A

EXHIBIT 4.13
2016 PEAK AM HOUR ANALYSIS (Existing Traffic) - Stittsville Main/Hazeldean

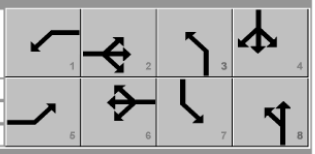
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2016	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2016_ex_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	63	353	15	207	222	90	30	40		221	58	109

Signal Information			
Cycle, s	115.0	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	5.5	40.3	12.7	30.1	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.8	3.0	3.0	3.6	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.0	47.0	12.0	47.0	19.0	37.0	19.0	37.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s	4.4		10.5		3.1	4.1	12.1	9.4
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	1.00		1.00		0.00	0.00	1.00	0.00

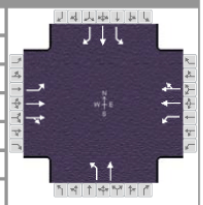
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	68	201	199	225	175	164	33	43		240	63	118
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1744	1719	1661	1688	1522	1714	1800		1607	1786	1486
Queue Service Time (*g s*), s	2.4	9.7	9.8	8.5	8.6	9.0	1.1	2.1		10.1	3.1	7.4
Cycle Queue Clearance Time (*g c*), s	2.4	9.7	9.8	8.5	8.6	9.0	1.1	2.1		10.1	3.1	7.4
Green Ratio (*g/C*)	0.53	0.35	0.35	0.53	0.35	0.35	0.50	0.26		0.50	0.26	0.26
Capacity (*c*), veh/h	493	611	602	476	591	533	740	471		622	467	389
Volume-to-Capacity Ratio (*X*)	0.139	0.329	0.331	0.472	0.295	0.308	0.044	0.092		0.386	0.135	0.305
Back of Queue (*Q*), ft/ln (50 th percentile)	22.3	109.7	105.5	80.9	97.1	86.9	10.7	22.9		97.2	33.8	67.9
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	4.3	4.2	3.1	3.6	3.5	0.4	0.9		3.7	1.3	2.7
Queue Storage Ratio (*RQ*) (50 th percentile)	0.17	0.00	0.00	0.09	0.00	0.00	0.08	0.00		0.53	0.00	0.00
Uniform Delay (*d 1*), s/veh	15.1	27.4	27.4	17.1	27.1	27.2	14.8	32.1		17.8	32.5	34.1
Incremental Delay (*d 2*), s/veh	0.0	1.4	1.5	0.3	1.3	1.5	0.0	0.0		0.1	0.0	0.2
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	0.0	0.0
Control Delay (*d*), s/veh	15.2	28.9	28.9	17.4	28.3	28.7	14.8	32.1		17.9	32.5	34.2
Level of Service (LOS)	B	C	C	B	C	C	B	C		B	C	C
Approach Delay, s/veh / LOS	26.9	C		24.1	C		24.7	C		24.7	C	
Intersection Delay, s/veh / LOS	25.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	0.87	A	0.95	A	0.61	A	1.18	A

EXHIBIT 4.14
2016 PEAK PM HOUR ANALYSIS (Existing Traffic) - Stittsville Main/Hazeldean

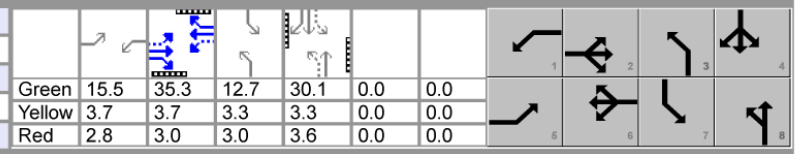
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2016	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2016_ex_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	93	334	29	444	582	218	74	115		183	176	62

Signal Information			
Cycle, s	120.0	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	15.5	35.3	12.7	30.1	0.0	0.0	
Yellow	3.7	3.7	3.3	3.3	0.0	0.0	
Red	2.8	3.0	3.0	3.6	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	22.0	42.0	22.0	42.0	19.0	37.0	19.0	37.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	5.4		23.5		5.1	8.8	10.3	12.8
Green Extension Time (*g e*), s	0.1	0.0	0.0	0.0	0.1	0.7	0.1	0.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		1.00		0.00	0.00	1.00	0.00

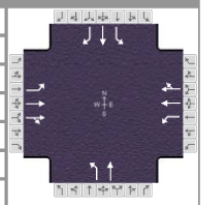
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	101	200	195	483	460	409	80	125		199	191	67
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1701	1786	1725	1701	1772	1575	1701	1772		1701	1786	1484
Queue Service Time (*g s*), s	3.4	10.7	10.8	21.5	29.7	29.8	3.1	6.8		8.3	10.8	4.3
Cycle Queue Clearance Time (*g c*), s	3.4	10.7	10.8	21.5	29.7	29.8	3.1	6.8		8.3	10.8	4.3
Green Ratio (*g/C*)	0.55	0.29	0.29	0.55	0.29	0.29	0.48	0.25		0.48	0.25	0.25
Capacity (*c*), veh/h	391	525	507	559	521	463	562	444		556	448	372
Volume-to-Capacity Ratio (*X*)	0.259	0.380	0.384	0.864	0.883	0.884	0.143	0.281		0.358	0.427	0.181
Back of Queue (*Q*), ft/ln (50 th percentile)	64.6	123.3	120	251.5	392.8	350.4	30.4	75		81.2	118.7	39.7
Back of Queue (*Q*), veh/ln (50 th percentile)	2.6	4.9	4.8	10.0	15.5	14.0	1.2	3.0		3.2	4.7	1.6
Queue Storage Ratio (*RQ*) (50 th percentile)	0.50	0.00	0.00	0.26	0.00	0.00	0.23	0.00		0.44	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.7	33.7	33.7	20.8	40.4	40.4	18.2	36.2		19.9	37.7	35.3
Incremental Delay (*d 2*), s/veh	0.1	2.1	2.2	12.7	19.1	21.1	0.0	0.1		0.1	0.2	0.1
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	0.0	0.0
Control Delay (*d*), s/veh	20.8	35.7	35.9	33.4	59.5	61.5	18.2	36.4		20.1	38.0	35.4
Level of Service (LOS)	C	D	D	C	E	E	B	D		C	D	D
Approach Delay, s/veh / LOS	32.8	C		50.8	D		29.3	C		29.8	C	
Intersection Delay, s/veh / LOS	41.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	0.90	A	1.60	B	0.83	A	1.24	A

EXHIBIT 4.15
2026 PEAK AM HOUR ANALYSIS (Background Traffic) - Stittsville Main/Hazeldean

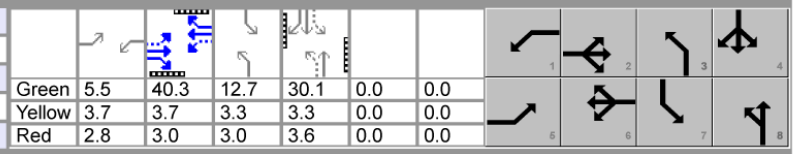
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2026_bak_am.xus		
Project Description	Car Wash Station - BACKGROUND TRAFFIC				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	460	18	257	325	137	37	57		356	88	150

Signal Information			
Cycle, s	115.0	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	5.5	40.3	12.7	30.1	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.8	3.0	3.0	3.6	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.0	47.0	12.0	47.0	19.0	37.0	19.0	37.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s	5.0		13.0		3.4	5.0	20.3	12.5
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	1.00		1.00		0.00	0.00	1.00	0.00

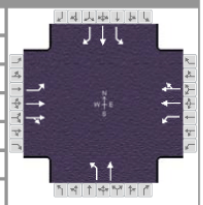
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	87	261	258	279	262	241	40	62		387	96	163
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1744	1720	1661	1688	1516	1714	1800		1607	1786	1486
Queue Service Time (*g s*), s	3.0	13.2	13.2	11.0	13.7	14.1	1.4	3.0		18.3	4.8	10.5
Cycle Queue Clearance Time (*g c*), s	3.0	13.2	13.2	11.0	13.7	14.1	1.4	3.0		18.3	4.8	10.5
Green Ratio (*g/C*)	0.53	0.35	0.35	0.53	0.35	0.35	0.50	0.26		0.50	0.26	0.26
Capacity (*c*), veh/h	419	611	603	425	591	531	709	471		607	467	389
Volume-to-Capacity Ratio (*X*)	0.208	0.427	0.429	0.657	0.442	0.453	0.057	0.132		0.638	0.205	0.419
Back of Queue (*Q*), ft/ln (50 th percentile)	28.7	149.5	143.5	112	155.8	136.6	13.3	33		181.9	52.4	96.6
Back of Queue (*Q*), veh/ln (50 th percentile)	1.1	5.8	5.7	4.3	5.9	5.5	0.5	1.3		6.8	2.1	3.8
Queue Storage Ratio (*RQ*) (50 th percentile)	0.22	0.00	0.00	0.12	0.00	0.00	0.10	0.00		0.98	0.00	0.00
Uniform Delay (*d 1*), s/veh	16.4	28.5	28.5	19.0	28.7	28.8	15.0	32.5		20.1	33.1	35.2
Incremental Delay (*d 2*), s/veh	0.1	2.2	2.2	2.9	2.4	2.8	0.0	0.0		1.7	0.1	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	0.0	0.0
Control Delay (*d*), s/veh	16.5	30.7	30.8	21.9	31.1	31.6	15.0	32.5		21.8	33.2	35.5
Level of Service (LOS)	B	C	C	C	C	C	B	C		C	C	D
Approach Delay, s/veh / LOS	28.7	C		28.0	C		25.6	C		27.0	C	
Intersection Delay, s/veh / LOS	27.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	0.99	A	1.13	A	0.66	A	1.55	B

EXHIBIT 4.16
2026 PEAK PM HOUR ANALYSIS (Background Traffic) - Stittsville Main/Hazeldean

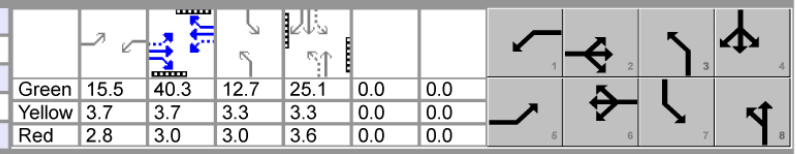
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2026_bak_pm.xus		
Project Description	Car Wash Station - BACKGROUND TRAFFIC				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	121	447	35	554	768	350	90	175		285	253	80

Signal Information			
Cycle, s	120.0	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	15.5	40.3	12.7	25.1	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.8	3.0	3.0	3.6	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	22.0	47.0	22.0	47.0	19.0	32.0	19.0	32.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	6.1		24.0		6.1	13.4	17.1	19.3
Green Extension Time (*g e*), s	0.1	0.0	0.0	0.0	0.1	0.9	0.0	0.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		1.00		0.01	0.01	1.00	0.21

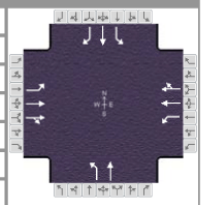
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	132	265	259	602	646	569	98	190		310	275	87
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1701	1786	1731	1701	1772	1550	1701	1772		1701	1786	1483
Queue Service Time (*g s*), s	4.1	13.9	14.0	22.0	40.3	40.3	4.1	11.4		15.1	17.3	5.9
Cycle Queue Clearance Time (*g c*), s	4.1	13.9	14.0	22.0	40.3	40.3	4.1	11.4		15.1	17.3	5.9
Green Ratio (*g/C*)	0.59	0.34	0.34	0.59	0.34	0.34	0.44	0.21		0.44	0.21	0.21
Capacity (*c*), veh/h	372	600	581	551	595	520	438	371		446	374	310
Volume-to-Capacity Ratio (*X*)	0.354	0.442	0.445	1.093	1.085	1.094	0.223	0.513		0.694	0.736	0.280
Back of Queue (*Q*), ft/ln (50 th percentile)	87.1	159.3	154.7	686.8	694.4	616.9	41.1	127.2		161.1	207.5	55.4
Back of Queue (*Q*), veh/ln (50 th percentile)	3.5	6.3	6.2	27.3	27.3	24.7	1.6	5.0		6.4	8.2	2.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.67	0.00	0.00	0.72	0.00	0.00	0.32	0.00		0.87	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.9	31.1	31.1	22.2	39.9	39.9	22.3	42.0		25.9	44.4	39.9
Incremental Delay (*d 2*), s/veh	0.2	2.4	2.5	66.0	62.2	67.5	0.1	0.5		3.9	6.6	0.2
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	0.0	0.0
Control Delay (*d*), s/veh	21.1	33.4	33.6	88.2	102.0	107.3	22.4	42.6		29.8	50.9	40.0
Level of Service (LOS)	C	C	C	F	F	F	C	D		C	D	D
Approach Delay, s/veh / LOS	31.0	C		99.1	F		35.7	D		39.8	D	
Intersection Delay, s/veh / LOS	69.2						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	1.03	A	1.99	B	0.96	A	1.60	B

EXHIBIT 4.17
2021 PEAK AM HOUR ANALYSIS (Total Traffic) - Stittsville Main/Hazeldean

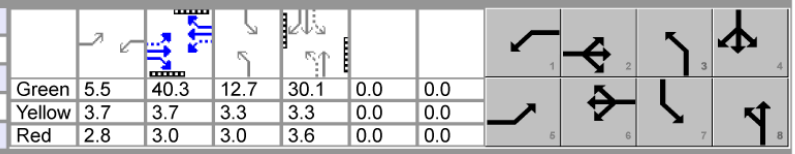
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2021_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	75	427	23	230	304	124	41	51		327	80	139

Signal Information			
Cycle, s	115.0	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	5.5	40.3	12.7	30.1	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.8	3.0	3.0	3.6	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.0	47.0	12.0	47.0	19.0	37.0	19.0	37.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s	4.8		11.6		3.5	4.7	18.4	11.6
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.5
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	1.00		1.00		0.00	0.00	1.00	0.00

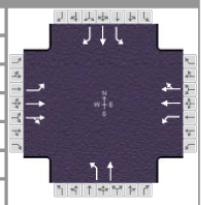
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	82	246	243	250	242	224	45	55		355	87	151
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1744	1712	1661	1688	1520	1714	1800		1607	1786	1486
Queue Service Time (*g s*), s	2.8	12.3	12.3	9.6	12.5	12.9	1.5	2.7		16.4	4.3	9.6
Cycle Queue Clearance Time (*g c*), s	2.8	12.3	12.3	9.6	12.5	12.9	1.5	2.7		16.4	4.3	9.6
Green Ratio (*g/C*)	0.53	0.35	0.35	0.53	0.35	0.35	0.50	0.26		0.50	0.26	0.26
Capacity (*c*), veh/h	435	611	600	437	591	533	717	471		612	467	389
Volume-to-Capacity Ratio (*X*)	0.188	0.403	0.405	0.572	0.409	0.420	0.062	0.118		0.581	0.186	0.388
Back of Queue (*Q*), ft/ln (50 th percentile)	26.8	139.2	133.4	94.1	141.6	124.7	14.7	29.4		160.2	47.3	88.8
Back of Queue (*Q*), veh/ln (50 th percentile)	1.0	5.4	5.3	3.6	5.3	5.0	0.6	1.2		6.0	1.9	3.5
Queue Storage Ratio (*RQ*) (50 th percentile)	0.21	0.00	0.00	0.10	0.00	0.00	0.11	0.00		0.87	0.00	0.00
Uniform Delay (*d 1*), s/veh	16.1	28.3	28.3	18.2	28.3	28.4	15.0	32.3		19.5	32.9	34.9
Incremental Delay (*d 2*), s/veh	0.1	2.0	2.0	1.2	2.1	2.4	0.0	0.0		0.9	0.1	0.2
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	0.0	0.0
Control Delay (*d*), s/veh	16.1	30.2	30.3	19.3	30.4	30.9	15.0	32.4		20.5	33.0	35.1
Level of Service (LOS)	B	C	C	B	C	C	B	C		C	C	D
Approach Delay, s/veh / LOS	28.2	C		26.7	C		24.6	C		26.0	C	
Intersection Delay, s/veh / LOS	26.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	0.96	A	1.08	A	0.65	A	1.47	A

EXHIBIT 4.18
2021 PEAK PM HOUR ANALYSIS (Total Traffic) - Stittsville Main/Hazeldean

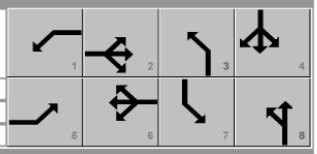
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2021_tot_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	113	413	46	498	714	322	85	161		262	230	75

Signal Information										
Cycle, s	120.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	No	Simult. Gap E/W	On	Green	15.5	40.3	12.7	25.1	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.7	3.7	3.3	3.3	0.0	0.0
				Red	2.8	3.0	3.0	3.6	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	22.0	47.0	22.0	47.0	19.0	32.0	19.0	32.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	5.8		24.0		5.9	12.4	15.6	17.4
Green Extension Time (*g e*), s	0.1	0.0	0.0	0.0	0.1	0.8	0.0	0.7
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		1.00		0.01	0.00	1.00	0.06

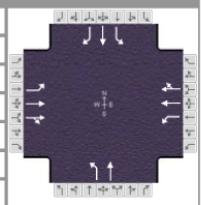
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	123	254	245	541	600	526	92	175		285	250	82
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1701	1786	1711	1701	1772	1551	1701	1772		1701	1786	1483
Queue Service Time (*g s*), s	3.8	13.2	13.3	22.0	40.3	40.3	3.9	10.4		13.6	15.4	5.5
Cycle Queue Clearance Time (*g c*), s	3.8	13.2	13.3	22.0	40.3	40.3	3.9	10.4		13.6	15.4	5.5
Green Ratio (*g/C*)	0.59	0.34	0.34	0.59	0.34	0.34	0.44	0.21		0.44	0.21	0.21
Capacity (*c*), veh/h	372	600	574	560	595	521	458	371		458	374	310
Volume-to-Capacity Ratio (*X*)	0.330	0.423	0.427	0.966	1.008	1.011	0.202	0.472		0.621	0.669	0.263
Back of Queue (*Q*), ft/ln (50 th percentile)	80.9	151	145.5	376.2	596.2	525.7	38.7	115.5		140.8	180	51.7
Back of Queue (*Q*), veh/ln (50 th percentile)	3.2	6.0	5.8	14.9	23.5	21.0	1.5	4.5		5.6	7.1	2.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.62	0.00	0.00	0.40	0.00	0.00	0.30	0.00		0.76	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.8	30.8	30.9	21.2	39.9	39.9	21.9	41.6		25.2	43.6	39.7
Incremental Delay (*d 2*), s/veh	0.2	2.2	2.3	29.4	38.8	42.2	0.1	0.3		1.9	3.7	0.2
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	0.0	0.0
Control Delay (*d*), s/veh	21.0	33.0	33.2	50.6	78.7	82.0	22.0	42.0		27.1	47.4	39.9
Level of Service (LOS)	C	C	C	D	F	F	C	D		C	D	D
Approach Delay, s/veh / LOS	30.7	C		70.6	E		35.1	D		37.0	D	
Intersection Delay, s/veh / LOS	53.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	1.00	A	1.86	B	0.93	A	1.50	B

EXHIBIT 4.19
2026 PEAK AM HOUR ANALYSIS (Total Traffic) - Stittsville Main/Hazeldean

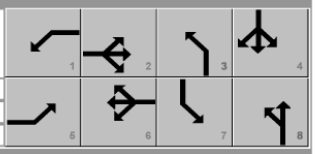
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2026_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	82	467	24	253	330	135	45	56		352	87	152

Signal Information										
Cycle, s	115.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	No	Simult. Gap E/W	On	Green	5.5	40.3	12.7	30.1	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.7	3.7	3.3	3.3	0.0	0.0
				Red	2.8	3.0	3.0	3.6	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.0	47.0	12.0	47.0	19.0	37.0	19.0	37.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s	5.1		12.8		3.7	5.0	20.0	12.6
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.6
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	1.00		1.00		0.00	0.00	1.00	0.00

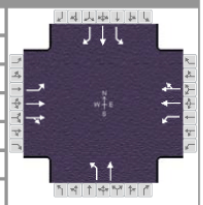
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	89	269	265	275	263	242	49	61		383	95	165
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1744	1713	1661	1688	1519	1714	1800		1607	1786	1486
Queue Service Time (*g s*), s	3.1	13.6	13.7	10.8	13.8	14.2	1.7	3.0		18.0	4.7	10.6
Cycle Queue Clearance Time (*g c*), s	3.1	13.6	13.7	10.8	13.8	14.2	1.7	3.0		18.0	4.7	10.6
Green Ratio (*g/C*)	0.53	0.35	0.35	0.53	0.35	0.35	0.50	0.26		0.50	0.26	0.26
Capacity (*c*), veh/h	417	611	600	419	591	532	710	471		607	467	389
Volume-to-Capacity Ratio (*X*)	0.214	0.440	0.441	0.656	0.445	0.455	0.069	0.129		0.630	0.202	0.425
Back of Queue (*Q*), ft/ln (50 th percentile)	29.4	154.7	148.2	110.1	156.9	137.6	16.2	32.4		178.8	51.8	98.2
Back of Queue (*Q*), veh/ln (50 th percentile)	1.1	6.0	5.9	4.3	5.9	5.5	0.6	1.3		6.7	2.1	3.8
Queue Storage Ratio (*RQ*) (50 th percentile)	0.23	0.00	0.00	0.12	0.00	0.00	0.12	0.00		0.97	0.00	0.00
Uniform Delay (*d 1*), s/veh	16.5	28.7	28.7	19.0	28.7	28.9	15.1	32.4		20.0	33.1	35.3
Incremental Delay (*d 2*), s/veh	0.1	2.3	2.3	2.9	2.4	2.8	0.0	0.0		1.6	0.1	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	0.0	0.0
Control Delay (*d*), s/veh	16.5	31.0	31.0	22.0	31.2	31.7	15.1	32.5		21.6	33.2	35.5
Level of Service (LOS)	B	C	C	C	C	C	B	C		C	C	D
Approach Delay, s/veh / LOS	28.9	C		28.1	C		24.7	C		26.9	C	
Intersection Delay, s/veh / LOS	27.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	1.00	A	1.13	A	0.67	A	1.55	B

EXHIBIT 4.20
2026 PEAK PM HOUR ANALYSIS (Total Traffic) - Stittsville Main/Hazeldean

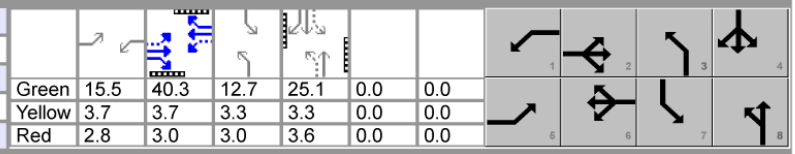
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/18/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Stittsville Main/Hazeldean	File Name	2026_tot_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	123	451	51	549	790	347	93	174		283	251	83

Signal Information			
Cycle, s	120.0	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	15.5	40.3	12.7	25.1	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.8	3.0	3.0	3.6	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	22.0	47.0	22.0	47.0	19.0	32.0	19.0	32.0
Change Period, (*Y+R c*), s	6.5	6.7	6.5	6.7	6.3	6.9	6.3	6.9
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0	3.1	3.1	3.1	3.1
Queue Clearance Time (*g s*), s	6.2		24.0		6.3	13.3	16.9	19.1
Green Extension Time (*g e*), s	0.1	0.0	0.0	0.0	0.1	0.9	0.0	0.7
Phase Call Probability	1.00		1.00		1.00	1.00	1.00	1.00
Max Out Probability	0.00		1.00		0.01	0.01	1.00	0.19

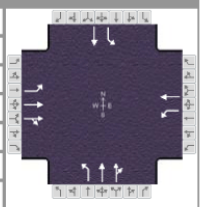
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8		7	4	14
Adjusted Flow Rate (*v*), veh/h	134	278	268	597	655	580	101	189		308	273	90
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1701	1786	1709	1701	1772	1555	1701	1772		1701	1786	1483
Queue Service Time (*g s*), s	4.2	14.7	14.8	22.0	40.3	40.3	4.3	11.3		14.9	17.1	6.1
Cycle Queue Clearance Time (*g c*), s	4.2	14.7	14.8	22.0	40.3	40.3	4.3	11.3		14.9	17.1	6.1
Green Ratio (*g/C*)	0.59	0.34	0.34	0.59	0.34	0.34	0.44	0.21		0.44	0.21	0.21
Capacity (*c*), veh/h	372	600	574	542	595	522	440	371		447	374	310
Volume-to-Capacity Ratio (*X*)	0.360	0.463	0.467	1.102	1.101	1.111	0.230	0.510		0.688	0.730	0.291
Back of Queue (*Q*), ft/ln (50 th percentile)	88.6	168.6	162.1	683.9	717.8	641	42.5	126.3		159.2	204.8	57.6
Back of Queue (*Q*), veh/ln (50 th percentile)	3.5	6.7	6.5	27.1	28.3	25.6	1.7	5.0		6.3	8.1	2.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.68	0.00	0.00	0.72	0.00	0.00	0.33	0.00		0.86	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.9	31.3	31.4	21.9	39.9	39.9	22.4	42.0		25.9	44.3	40.0
Incremental Delay (*d 2*), s/veh	0.2	2.6	2.7	69.5	67.8	73.5	0.1	0.5		3.7	6.3	0.2
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	0.0	0.0
Control Delay (*d*), s/veh	21.1	33.9	34.1	91.4	107.6	113.4	22.5	42.5		29.5	50.5	40.1
Level of Service (LOS)	C	C	C	F	F	F	C	D		C	D	D
Approach Delay, s/veh / LOS	31.5	C		104.2	F		35.5	D		39.5	D	
Intersection Delay, s/veh / LOS	71.7						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	2.12	B	2.30	B	2.30	B
Bicycle LOS Score / LOS	1.05	A	2.00	B	0.97	A	1.59	B

EXHIBIT 4.21
2017 PEAK AM HOUR ANALYSIS (Existing Traffic) - Carp/Hazeldean

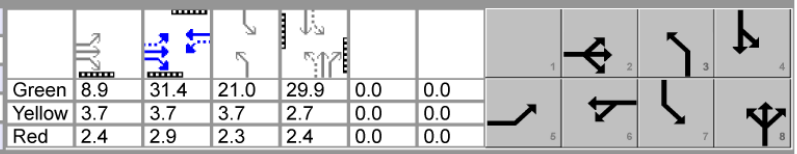
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2017_ex_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	275	254	82	11	104		57	378	14	219	274	

Signal Information			
Cycle, s	115.0	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	8.9	31.4	21.0	29.9	0.0	0.0
Yellow	3.7	3.7	3.7	2.7	0.0	0.0
Red	2.4	2.9	2.3	2.4	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	4.0		6.3	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	53.0		38.0	27.0	35.0	27.0	35.0
Change Period, ($Y+R_c$), s	6.1	6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s	3.1	0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s	15.0				4.1	14.0	11.1	20.8
Green Extension Time (g_e), s	0.0	0.0		0.0	0.1	1.2	0.3	1.0
Phase Call Probability	1.00				1.00	1.00	1.00	1.00
Max Out Probability	1.00				0.00	0.00	0.00	0.09

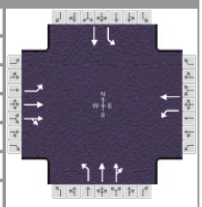
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	299	188	178	12	113		62	214	212	238	298	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1730	1585	991	1660		1581	1758	1735	1581	1660	
Queue Service Time (g_s), s	13.0	8.3	8.7	1.0	6.1		2.1	11.9	12.0	9.1	18.8	
Cycle Queue Clearance Time (g_c), s	13.0	8.3	8.7	1.0	6.1		2.1	11.9	12.0	9.1	18.8	
Green Ratio (*g/C*)	0.47	0.40	0.40	0.27	0.27		0.56	0.25	0.25	0.56	0.25	
Capacity (*c*), veh/h	632	698	640	333	453		505	442	436	550	417	
Volume-to-Capacity Ratio (*X*)	0.473	0.269	0.278	0.036	0.249		0.123	0.484	0.486	0.432	0.714	
Back of Queue (*Q*), ft/ln (50 th percentile)	126.6	92	84.6	6.8	70.3		19.4	130.8	126.7	84.4	219.6	
Back of Queue (*Q*), veh/ln (50 th percentile)	5.0	3.5	3.4	0.3	2.6		0.7	5.1	5.1	3.1	8.1	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.70	0.00	0.00	0.04	0.00		0.10	0.00	0.00	0.37	0.00	
Uniform Delay (d_1), s/veh	19.7	22.9	23.0	30.8	32.6		15.7	36.7	36.7	16.2	39.3	
Incremental Delay (d_2), s/veh	0.2	0.9	1.1	0.2	1.3		0.0	0.3	0.3	0.2	4.9	
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	0.0	
Control Delay (*d*), s/veh	19.9	23.9	24.1	31.0	33.9		15.7	37.0	37.0	16.4	44.2	
Level of Service (LOS)	B	C	C	C	C		B	D	D	B	D	
Approach Delay, s/veh / LOS	22.2	C		33.6	C		34.3	C		31.9	C	
Intersection Delay, s/veh / LOS	29.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.13	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.04	A	0.69	A	0.89	A	1.37	A

EXHIBIT 4.22
2017 PEAK PM HOUR ANALYSIS (Existing Traffic) - Carp/Hazeldean

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2017_ex_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	90	242	132	46	457		125	343	27	349	468	

Signal Information					EB			WB			NB			SB		
Cycle, s	120.0	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	43.4	19.0		39.9	0.0	0.0	0.0					
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.7	3.7		2.7	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.9	2.3		2.4	0.0	0.0	0.0					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		50.0		50.0	25.0	45.0	25.0	45.0
Change Period, (*Y+R c*), s		6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s		0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s					6.2	12.7	15.8	34.7
Green Extension Time (*g e*), s		0.0		0.0	0.2	1.7	0.3	0.9
Phase Call Probability					1.00	1.00	1.00	1.00
Max Out Probability					0.00	0.00	0.95	0.63

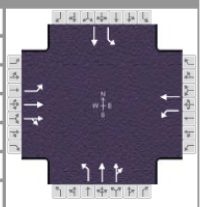
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	98	212	194	50	497		136	203	199	379	509	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	887	1786	1570	924	1772		1688	1758	1711	1701	1772	
Queue Service Time (*g s*), s	13.2	10.3	10.8	5.0	29.8		4.2	10.6	10.7	13.8	32.7	
Cycle Queue Clearance Time (*g c*), s	43.0	10.3	10.8	15.8	29.8		4.2	10.6	10.7	13.8	32.7	
Green Ratio (*g/C*)	0.36	0.36	0.36	0.36	0.36		0.60	0.32	0.32	0.60	0.32	
Capacity (*c*), veh/h	160	646	568	311	641		443	570	555	631	574	
Volume-to-Capacity Ratio (*X*)	0.611	0.328	0.342	0.161	0.775		0.307	0.356	0.359	0.601	0.886	
Back of Queue (*Q*), ft/ln (50 th percentile)	93.6	116.5	107.3	32.6	359.2		38.8	114.7	110.2	130.6	412.3	
Back of Queue (*Q*), veh/ln (50 th percentile)	3.6	4.6	4.3	1.2	14.1		1.5	4.5	4.4	5.2	16.2	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.52	0.00	0.00	0.20	0.00		0.20	0.00	0.00	0.57	0.00	
Uniform Delay (*d 1*), s/veh	53.1	27.7	27.9	33.7	34.0		19.2	31.0	31.0	15.3	38.4	
Incremental Delay (*d 2*), s/veh	16.1	1.4	1.6	1.1	8.9		0.1	0.1	0.1	1.1	14.9	
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	0.0	
Control Delay (*d*), s/veh	69.2	29.1	29.5	34.8	42.9		19.3	31.1	31.2	16.4	53.3	
Level of Service (LOS)	E	C	C	C	D		B	C	C	B	D	
Approach Delay, s/veh / LOS	37.1	D		42.1	D		28.2	C		37.6	D	
Intersection Delay, s/veh / LOS	36.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.12	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	0.90	A	1.39	A	0.93	A	1.95	B

EXHIBIT 4.23
2026 PEAK AM HOUR ANALYSIS (Background Traffic) - Carp/Hazeldean

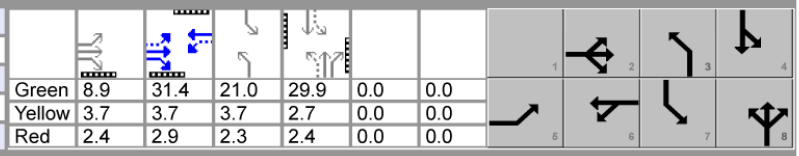
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2026_bak_am.xus		
Project Description	Car Wash Station - BACKGROUND TRAFFIC				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	330	317	98	52	148		68	457	17	272	329	

Signal Information			
Cycle, s	115.0	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	8.9	31.4	21.0	29.9	0.0	0.0
Yellow	3.7	3.7	3.7	2.7	0.0	0.0
Red	2.4	2.9	2.3	2.4	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	4.0		6.3	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	53.0		38.0	27.0	35.0	27.0	35.0
Change Period, (*Y+R c*), s	6.1	6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s	3.1	0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s	17.0				4.5	16.9	13.8	25.6
Green Extension Time (*g e*), s	0.0	0.0		0.0	0.1	1.4	0.4	0.7
Phase Call Probability	1.00				1.00	1.00	1.00	1.00
Max Out Probability	1.00				0.00	0.03	0.03	0.92

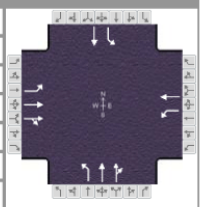
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	359	232	219	57	161		74	259	256	296	358	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1730	1589	916	1660		1581	1758	1735	1581	1660	
Queue Service Time (*g s*), s	15.0	10.6	10.9	5.5	9.0		2.5	14.9	14.9	11.8	23.6	
Cycle Queue Clearance Time (*g c*), s	15.0	10.6	10.9	5.5	9.0		2.5	14.9	14.9	11.8	23.6	
Green Ratio (*g/C*)	0.47	0.40	0.40	0.27	0.27		0.56	0.25	0.25	0.56	0.25	
Capacity (*c*), veh/h	587	698	641	313	453		461	442	436	520	417	
Volume-to-Capacity Ratio (*X*)	0.611	0.333	0.341	0.181	0.355		0.160	0.586	0.588	0.568	0.857	
Back of Queue (Q), ft/ln (50 th percentile)	163.3	117.9	107.6	34.4	104.1		23.3	166.1	160.9	112.1	304.4	
Back of Queue (Q), veh/ln (50 th percentile)	6.4	4.5	4.3	1.3	3.9		0.9	6.5	6.4	4.2	11.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.91	0.00	0.00	0.21	0.00		0.12	0.00	0.00	0.49	0.00	
Uniform Delay (*d 1*), s/veh	21.6	23.6	23.7	32.4	33.6		17.2	37.8	37.8	18.1	41.1	
Incremental Delay (*d 2*), s/veh	1.4	1.3	1.4	1.3	2.2		0.1	1.4	1.4	0.9	15.4	
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	0.0	
Control Delay (*d*), s/veh	23.0	24.9	25.2	33.6	35.8		17.3	39.2	39.2	19.1	56.5	
Level of Service (LOS)	C	C	C	C	D		B	D	D	B	E	
Approach Delay, s/veh / LOS	24.1	C		35.3	D		36.5	D		39.6	D	
Intersection Delay, s/veh / LOS	32.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.13	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.16	A	0.85	A	0.97	A	1.57	B

EXHIBIT 4.24
2026 PEAK PM HOUR ANALYSIS (Background Traffic) - Carp/Hazeldean

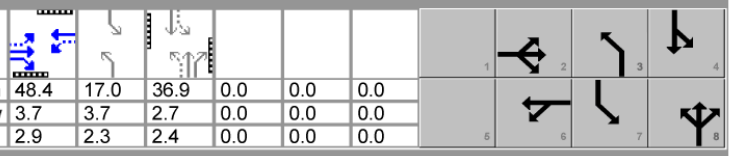
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2026_bak_pm.xus		
Project Description	Car Wash Station - BACKGROUND TRAFFIC				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	108	310	158	90	567		151	420	32	429	562	

Signal Information			
Cycle, s	120.0	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	48.4	17.0	36.9	0.0	0.0	0.0
Yellow	3.7	3.7	2.7	0.0	0.0	0.0
Red	2.9	2.3	2.4	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		55.0		55.0	23.0	42.0	23.0	42.0
Change Period, (*Y+R c*), s		6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s		0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s					7.7	15.9	22.1	37.9
Green Extension Time (*g e*), s		0.0		0.0	0.2	2.1	0.0	0.0
Phase Call Probability					1.00	1.00	1.00	1.00
Max Out Probability					0.00	0.00	1.00	1.00

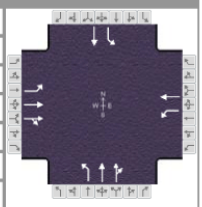
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	117	267	242	98	616		164	248	243	466	611	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	794	1786	1578	841	1772		1688	1758	1712	1701	1772	
Queue Service Time (*g s*), s	10.2	12.6	13.0	11.1	38.2		5.7	13.8	13.9	20.1	35.9	
Cycle Queue Clearance Time (*g c*), s	48.4	12.6	13.0	24.1	38.2		5.7	13.8	13.9	20.1	35.9	
Green Ratio (*g/C*)	0.40	0.40	0.40	0.40	0.40		0.56	0.30	0.30	0.56	0.30	
Capacity (*c*), veh/h	128	720	636	308	715		383	526	512	538	530	
Volume-to-Capacity Ratio (*X*)	0.920	0.370	0.380	0.317	0.862		0.428	0.472	0.475	0.867	1.152	
Back of Queue (Q), ft/ln (50 th percentile)	146.8	140.1	127.6	66.6	468.8		54.5	150.7	144.5	238.3	720.2	
Back of Queue (Q), veh/ln (50 th percentile)	5.7	5.6	5.1	2.5	18.5		2.1	5.9	5.8	9.5	28.4	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.82	0.00	0.00	0.40	0.00		0.28	0.00	0.00	1.04	0.00	
Uniform Delay (*d 1*), s/veh	57.1	25.1	25.2	33.7	32.8		21.1	34.3	34.3	21.0	42.1	
Incremental Delay (*d 2*), s/veh	60.6	1.5	1.7	2.7	13.0		0.3	0.2	0.3	13.4	88.5	
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	0.0	
Control Delay (*d*), s/veh	117.6	26.6	27.0	36.4	45.8		21.3	34.6	34.6	34.4	130.5	
Level of Service (LOS)	F	C	C	D	D		C	C	C	C	F	
Approach Delay, s/veh / LOS	43.8	D		44.5	D		31.3	C		88.9	F	
Intersection Delay, s/veh / LOS	57.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.11	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	1.00	A	1.67	B	1.03	A	2.26	B

EXHIBIT 4.25
2021 PEAK AM HOUR ANALYSIS (Total Traffic) - Carp/Hazeldean

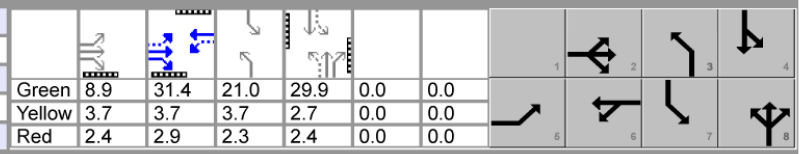
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2021_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	294	297	87	54	140		61	402	17	253	292	

Signal Information			
Cycle, s	115.0	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	8.9	31.4	21.0	29.9	0.0	0.0
Yellow	3.7	3.7	3.7	2.7	0.0	0.0
Red	2.4	2.9	2.3	2.4	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	4.0		6.3	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	53.0		38.0	27.0	35.0	27.0	35.0
Change Period, ($Y+R_c$), s	6.1	6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s	3.1	0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s	16.1				4.2	15.0	12.8	22.4
Green Extension Time (g_e), s	0.0	0.0		0.0	0.1	1.3	0.3	1.0
Phase Call Probability	1.00				1.00	1.00	1.00	1.00
Max Out Probability	1.00				0.00	0.01	0.01	0.20

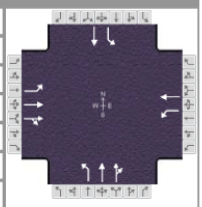
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	320	214	203	59	152		66	229	226	275	317	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1730	1595	945	1660		1581	1758	1732	1581	1660	
Queue Service Time (g_s), s	14.1	9.7	10.0	5.5	8.4		2.2	12.9	13.0	10.8	20.4	
Cycle Queue Clearance Time (g_c), s	14.1	9.7	10.0	5.5	8.4		2.2	12.9	13.0	10.8	20.4	
Green Ratio (*g/C*)	0.47	0.40	0.40	0.27	0.27		0.56	0.25	0.25	0.56	0.25	
Capacity (*c*), veh/h	595	698	644	321	453		490	442	435	540	417	
Volume-to-Capacity Ratio (*X*)	0.537	0.307	0.315	0.183	0.336		0.135	0.518	0.520	0.509	0.761	
Back of Queue (*Q*), ft/ln (50 th percentile)	138.6	107.4	98.5	35.7	97.9		20.8	141.9	137.2	100.6	243.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	5.5	4.1	3.9	1.4	3.6		0.8	5.5	5.5	3.7	9.0	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.77	0.00	0.00	0.22	0.00		0.11	0.00	0.00	0.44	0.00	
Uniform Delay (d_1), s/veh	20.3	23.4	23.4	32.4	33.5		16.1	37.1	37.1	17.1	39.9	
Incremental Delay (d_2), s/veh	0.5	1.1	1.3	1.3	2.0		0.0	0.5	0.5	0.3	7.2	
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	0.0	
Control Delay (*d*), s/veh	20.8	24.5	24.7	33.7	35.4		16.2	37.6	37.6	17.4	47.1	
Level of Service (LOS)	C	C	C	C	D		B	D	D	B	D	
Approach Delay, s/veh / LOS	23.0	C		34.9	C		34.9	C		33.3	C	
Intersection Delay, s/veh / LOS	30.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.13	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.10	A	0.84	A	0.92	A	1.47	A

EXHIBIT 4.26
2021 PEAK PM HOUR ANALYSIS (Total Traffic) - Carp/Hazeldean

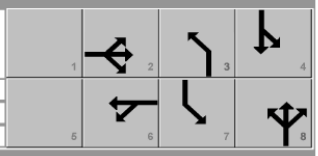
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2021_tot_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	97	293	142	90	528		136	380	33	395	507	

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	43.4	19.0	39.9	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.7	3.7	2.7	0.0	0.0	0.0		
				Red	2.9	2.3	2.4	0.0	0.0	0.0		



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		50.0		50.0	25.0	45.0	25.0	45.0
Change Period, (*Y+R c*), s		6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s		0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s					6.6	14.1	18.2	38.6
Green Extension Time (*g e*), s		0.0		0.0	0.2	1.9	0.1	0.1
Phase Call Probability					1.00	1.00	1.00	1.00
Max Out Probability					0.00	0.00	1.00	1.00

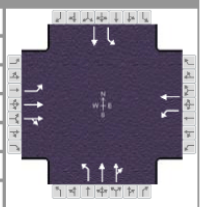
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	105	247	226	98	574		148	227	222	429	551	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	825	1786	1584	869	1772		1688	1758	1707	1701	1772	
Queue Service Time (*g s*), s	6.7	12.3	12.7	11.3	36.7		4.6	12.0	12.1	16.2	36.6	
Cycle Queue Clearance Time (*g c*), s	43.4	12.3	12.7	24.1	36.7		4.6	12.0	12.1	16.2	36.6	
Green Ratio (*g/C*)	0.36	0.36	0.36	0.36	0.36		0.60	0.32	0.32	0.60	0.32	
Capacity (*c*), veh/h	106	646	573	282	641		414	570	553	610	574	
Volume-to-Capacity Ratio (*X*)	0.994	0.382	0.394	0.347	0.896		0.357	0.398	0.401	0.704	0.959	
Back of Queue (Q), ft/ln (50 th percentile)	147.3	139.2	127.7	71.2	471.3		42.6	130.2	124.7	161.2	505.7	
Back of Queue (Q), veh/ln (50 th percentile)	5.7	5.5	5.1	2.7	18.6		1.7	5.1	5.0	6.4	19.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.82	0.00	0.00	0.43	0.00		0.22	0.00	0.00	0.70	0.00	
Uniform Delay (*d 1*), s/veh	58.5	28.4	28.5	37.5	36.2		19.7	31.5	31.5	16.6	39.8	
Incremental Delay (*d 2*), s/veh	85.6	1.7	2.0	3.3	17.5		0.2	0.2	0.2	3.1	27.4	
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	0.0	
Control Delay (*d*), s/veh	144.2	30.1	30.5	40.8	53.7		19.9	31.6	31.7	19.7	67.2	
Level of Service (LOS)	F	C	C	D	D		B	C	C	B	E	
Approach Delay, s/veh / LOS	51.1	D		51.8	D		28.7	C		46.4	D	
Intersection Delay, s/veh / LOS	44.9						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.12	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	0.96	A	1.60	B	0.98	A	2.11	B

EXHIBIT 4.27
2026 PEAK AM HOUR ANALYSIS (Total Traffic) - Carp/Hazeldean

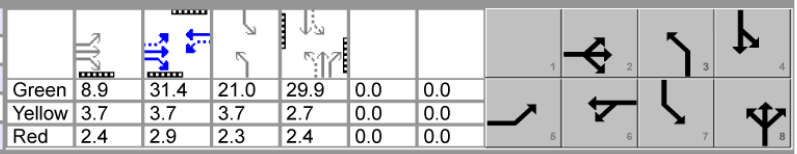
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak AM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2026_tot_am.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	325	326	96	55	151		67	449	19	278	323	

Signal Information			
Cycle, s	115.0	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	8.9	31.4	21.0	29.9	0.0	0.0
Yellow	3.7	3.7	3.7	2.7	0.0	0.0
Red	2.4	2.9	2.3	2.4	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6	3	8	7	4
Case Number	1.0	4.0		6.3	1.1	4.0	1.1	4.0
Phase Duration, s	15.0	53.0		38.0	27.0	35.0	27.0	35.0
Change Period, (*Y+R c*), s	6.1	6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s	3.1	0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s	17.0				4.5	16.7	14.1	25.1
Green Extension Time (*g e*), s	0.0	0.0		0.0	0.1	1.4	0.4	0.8
Phase Call Probability	1.00				1.00	1.00	1.00	1.00
Max Out Probability	1.00				0.00	0.02	0.05	0.73

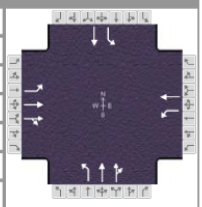
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	353	236	223	60	164		73	256	253	302	351	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1730	1594	910	1660		1581	1758	1732	1581	1660	
Queue Service Time (*g s*), s	15.0	10.8	11.1	5.9	9.2		2.5	14.7	14.7	12.1	23.1	
Cycle Queue Clearance Time (*g c*), s	15.0	10.8	11.1	5.9	9.2		2.5	14.7	14.7	12.1	23.1	
Green Ratio (*g/C*)	0.47	0.40	0.40	0.27	0.27		0.56	0.25	0.25	0.56	0.25	
Capacity (*c*), veh/h	584	698	643	311	453		466	442	435	522	417	
Volume-to-Capacity Ratio (*X*)	0.605	0.338	0.346	0.192	0.362		0.156	0.579	0.581	0.579	0.842	
Back of Queue (Q), ft/ln (50 th percentile)	159.8	120	109.8	36.5	106.6		23	163.5	158.1	115.7	293.1	
Back of Queue (Q), veh/ln (50 th percentile)	6.3	4.6	4.4	1.4	3.9		0.9	6.4	6.3	4.3	10.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.89	0.00	0.00	0.22	0.00		0.12	0.00	0.00	0.50	0.00	
Uniform Delay (*d 1*), s/veh	21.4	23.7	23.8	32.5	33.7		17.1	37.7	37.7	18.2	40.9	
Incremental Delay (*d 2*), s/veh	1.3	1.3	1.5	1.4	2.2		0.1	1.3	1.3	1.1	13.7	
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	0.0	
Control Delay (*d*), s/veh	22.7	25.0	25.3	33.9	36.0		17.1	39.0	39.0	19.2	54.5	
Level of Service (LOS)	C	C	C	C	D		B	D	D	B	D	
Approach Delay, s/veh / LOS	24.1	C		35.4	D		36.3	D		38.2	D	
Intersection Delay, s/veh / LOS	32.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.13	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.16	A	0.86	A	0.97	A	1.57	B

EXHIBIT 4.28
2026 PEAK PM HOUR ANALYSIS (Total Traffic) - Carp/Hazeldean

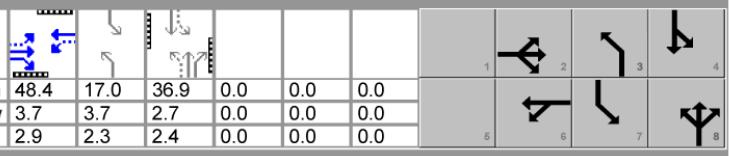
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.250
Analyst		Analysis Date	1/17/2021	Area Type	Other
Jurisdiction	City of Ottawa	Time Period	Peak PM Hour	PHF	0.92
Urban Street	Hazeldean Road	Analysis Year	2026	Analysis Period	1> 7:00
Intersection	Carp/Hazeldean	File Name	2026_tot_pm.xus		
Project Description	Car Wash Station				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	108	320	157	95	580		150	419	36	434	560	

Signal Information			
Cycle, s	120.0	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	48.4	17.0	36.9	0.0	0.0	0.0
Yellow	3.7	3.7	2.7	0.0	0.0	0.0
Red	2.9	2.3	2.4	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6	3	8	7	4
Case Number		6.0		6.0	1.1	4.0	1.1	4.0
Phase Duration, s		55.0		55.0	23.0	42.0	23.0	42.0
Change Period, ($Y+R_c$), s		6.6		6.6	6.0	6.1	6.0	6.1
Max Allow Headway (*MAH*), s		0.0		0.0	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s					7.7	16.1	22.4	37.9
Green Extension Time (g_e), s		0.0		0.0	0.2	2.1	0.0	0.0
Phase Call Probability					1.00	1.00	1.00	1.00
Max Out Probability					0.00	0.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	117	272	247	103	630		163	250	245	472	609	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	783	1786	1583	834	1772		1688	1758	1707	1701	1772	
Queue Service Time (g_s), s	8.9	12.8	13.2	12.0	39.5		5.7	13.9	14.1	20.4	35.9	
Cycle Queue Clearance Time (g_c), s	48.4	12.8	13.2	25.2	39.5		5.7	13.9	14.1	20.4	35.9	
Green Ratio (*g/C*)	0.40	0.40	0.40	0.40	0.40		0.56	0.30	0.30	0.56	0.30	
Capacity (*c*), veh/h	118	720	638	304	715		383	526	511	536	530	
Volume-to-Capacity Ratio (*X*)	0.996	0.377	0.387	0.339	0.882		0.425	0.475	0.479	0.879	1.148	
Back of Queue (*Q*), ft/ln (50 th percentile)	160.7	143.2	130.6	71.5	492		53.9	152.2	145.6	246.9	714.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	6.2	5.7	5.2	2.7	19.4		2.1	5.9	5.8	9.8	28.1	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.89	0.00	0.00	0.43	0.00		0.28	0.00	0.00	1.07	0.00	
Uniform Delay (d_1), s/veh	57.8	25.2	25.3	34.2	33.2		21.0	34.4	34.4	21.1	42.1	
Incremental Delay (d_2), s/veh	82.0	1.5	1.8	3.0	14.7		0.3	0.2	0.3	14.9	86.9	
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	0.0	
Control Delay (*d*), s/veh	139.8	26.7	27.1	37.2	47.9		21.3	34.6	34.7	36.1	129.0	
Level of Service (LOS)	F	C	C	D	D		C	C	C	D	F	
Approach Delay, s/veh / LOS	47.7	D		46.4	D		31.3	C		88.4	F	
Intersection Delay, s/veh / LOS	58.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.11	B	2.11	B	2.12	B	2.12	B
Bicycle LOS Score / LOS	1.01	A	1.70	B	1.03	A	2.27	B

EXHIBIT 4.29
JACKSON TRAILS/HAZELDEAN ROAD - PLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Jackson Trails Centre Access
APPROACHES	All
YEAR	2026
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		East Approach 120		West Approach	
	Comment	Points	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions								
Median?	No				Yes		Yes	
Total Travel Lanes Crossed	2	120			4	90	5	75
5.2 Signal Phasing & Timing Features								
Left Turn Conflict	Permissive	−8			No Left Turn	0	Permissive	−8
Right Turn Conflict	Permissive or Yield Control	−5			Permissive or Yield Control	−5	No Right Turn	0
Right Turns on Red	RTOR Allowed	−3			RTOR Allowed	−3	No Right Turn	0
Leading Ped Interval	No	−2			No	−2	No	−2
5.3a Corner Radius	> 10m to 15m	−6			> 10m to 15m	−6	> 10m to 15m	−6
5.3b Right Turn Channel	No Right Turn Channel	−4			No Right Turn Channel	−4	No Right Turn Channel	−4
5.4 Crosswalk Treatment	Standard Transverse Markings	−7			Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		85				63		48
DELAY SCORE								
Cycle length from Signal Timing Plan		120				120		120
Delay (sec.)		39				38		38
PETSI SCORE		**B**				**C**		**D**
DELAY SCORE		**D**				**D**		**D**
OVERALL APPROACH SCORE		**D**				**D**		**D**

OVERALL INTERSECTION SCORE **D**

EXHIBIT 4.30
STITTSVILLE MAIN/HAZELDEAN ROAD - PLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Stittsville Main Street
APPROACHES	All
YEAR	2026
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		East Approach		West Approach	
	Comment	Points	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions								
Median?	No		Yes		Yes		Yes	
Total Travel Lanes Crossed	3	105	3	105	5	75	5	75
5.2 Signal Phasing & Timing Features								
Left Turn Conflict	Protected	0	Protected	0	Protected	0	Protected	0
Right Turn Conflict	Permissive or Yield Control	−5	Permissive or Yield Control	−5	Permissive or Yield Control	−5	Permissive or Yield Control	−5
Right Turns on Red	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3
Leading Ped Interval	No	−2	No	−2	No	−2	No	−2
5.3a Corner Radius	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8
5.3b Right Turn Channel	No Right Turn Channel	−4	Right Turn Channel Without Receiving Lane	0	No Right Turn Channel	−4	No Right Turn Channel	−4
5.4 Crosswalk Treatment	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		76		80		46		46
DELAY SCORE								
Cycle length from Signal Timing Plan		120		120		120		120
Delay (sec.)		34		34		34		34
PETSI SCORE		**B**		**B**		**D**		**D**
DELAY SCORE		**D**		**D**		**D**		**D**
OVERALL APPROACH SCORE		**D**		**D**		**D**		**D**

OVERALL INTERSECTION SCORE **D**

EXHIBIT 4.31
CARP/HAZELDEAN ROAD - PLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Carp Road
APPROACHES	All
YEAR	2026
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		East Approach 120		West Approach	
	Comment	Points	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions								
Median?	No		Yes		Yes		Yes	
Total Travel Lanes Crossed	4	90	4	90	4	90	4	90
5.2 Signal Phasing & Timing Features								
Left Turn Conflict	Protected	0	Protected	0	Protected/ Permissive	−8	Protected/ Permissive	−8
Right Turn Conflict	Permissive or Yield Control	−5	Permissive or Yield Control	−5	Permissive or Yield Control	−5	Permissive or Yield Control	−5
Right Turns on Red	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3
Leading Ped Interval	No	−2	No	−2	No	−2	No	−2
5.3a Corner Radius	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8
5.3b Right Turn Channel	Right Turn Channel Without Receiving Lane	0	No Right Turn Channel	−4	Right Turn Channel Without Receiving Lane	0	No Right Turn Channel	−4
5.4 Crosswalk Treatment	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		65		61		57		53
DELAY SCORE								
Cycle length from Signal Timing Plan		120		120		120		120
Delay (sec.)		37		34		37		37
PETSI SCORE		**C**		**C**		**D**		**D**
DELAY SCORE		**D**		**D**		**D**		**D**
OVERALL APPROACH SCORE		**D**		**D**		**D**		**D**

OVERALL INTERSECTION SCORE **D**

EXHIBIT 4.32
JACKSON TRAILS/HAZELDEAN ROAD - BLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Jackson Trails Centre Access
APPROACHES	Eastbound–Westbound
YEAR	2026
DIRECTION	All
MMLOS MODE	BLOS

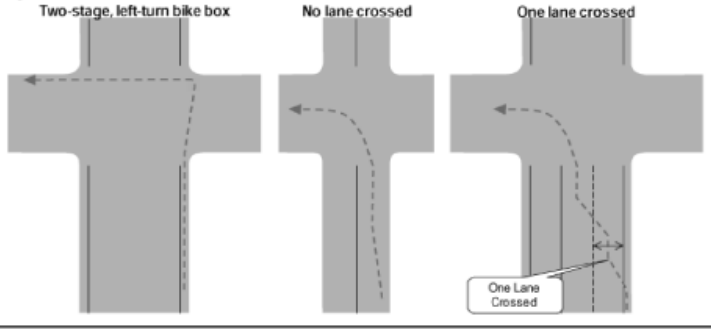
INTERSECTION SCORE **F**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

NOT APPLICABLE

NOT APPLICABLE

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 4.33
STITTSVILLE MAIN/HAZELDEAN ROAD - BLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Stittsville Main Street Street
APPROACHES	Eastbound–Westbound
YEAR	2026
DIRECTION	All
MMLOS MODE	BLOS

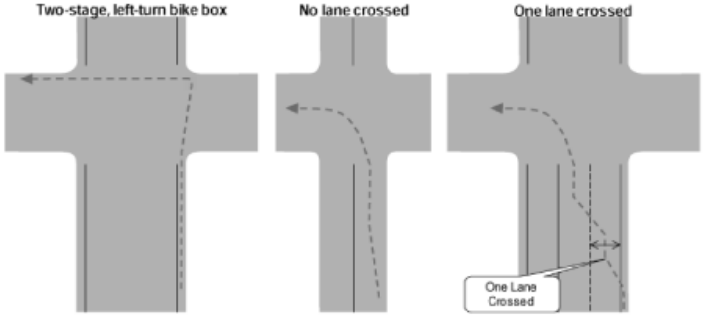
INTERSECTION SCORE **E**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

NOT APPLICABLE

NOT APPLICABLE

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 4.34
CARP/HAZELDEAN ROAD - BLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Carp Road
APPROACHES	Eastbound–Westbound
YEAR	2026
DIRECTION	All
MMLOS MODE	BLOS

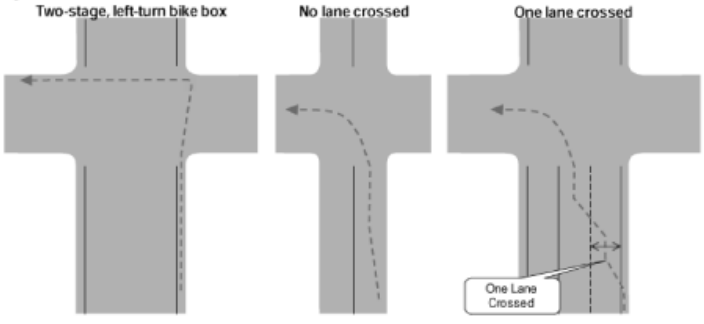
INTERSECTION SCORE **E**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

NOT APPLICABLE

NOT APPLICABLE

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 4.35
JACKSON TRAILS/HAZELDEAN ROAD - TLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Jackson Trails Centre Access
APPROACHES	All
YEAR	2026
MMLOS MODE	TLOS

INTERSECTION SCORE **C**

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec	TSP & short (e.g. <60 sec) to medium (e.g.	C
≤30 sec	60-90 sec) cycle length	D
≤40 sec	TSP & long cycle length (e.g. >90 sec)	E
>40 sec	No TSP & long cycle length (e.g. >90 sec)	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 4.36
STITTSVILLE MAIN/HAZELDEAN ROAD - TLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Stittsville Main Street
APPROACHES	All
YEAR	2026
MMLOS MODE	TLOS

INTERSECTION SCORE **C**

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec	TSP & short (e.g. <60 sec) to medium (e.g. 60-90 sec) cycle length	C
≤30 sec		D
≤40 sec	TSP & long cycle length (e.g. >90 sec)	E
>40 sec	No TSP & long cycle length (e.g. >90 sec)	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 4.37
CARP/HAZELDEAN ROAD - TLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Carp Road
APPROACHES	All
YEAR	2026
MMLOS MODE	TLOS

INTERSECTION SCORE **C**

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec	TSP & short (e.g. <60 sec) to medium (e.g. 60-90 sec) cycle length	C
≤30 sec		D
≤40 sec	TSP & long cycle length (e.g. >90 sec)	E
>40 sec	No TSP & long cycle length (e.g. >90 sec)	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 4.38
JACKSON TRAILS/HAZELDEAN ROAD - TkLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Jackson Trails Centre Access
APPROACHES	Eastbound–Westbound
YEAR	2026
MMLOS MODE	TkLOS

INTERSECTION SCORE **B**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	A

EXHIBIT 4.39
STITTSVILLE MAIN/HAZELDEAN ROAD - TkLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Stittsville Main Street
APPROACHES	Eastbound–Westbound
YEAR	2026
MMLOS MODE	TkLOS

INTERSECTION SCORE **A**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	A

EXHIBIT 4.40
CARP/HAZELDEAN ROAD - TkLOS INTERSECTION EVALUATION

MAIN STREET	Hazeldean Road
MINOR STREET	Carp Road
APPROACHES	Eastbound–Westbound
YEAR	2026
MMLOS MODE	TkLOS

INTERSECTION SCORE **A**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	**A**