DILLON CONSULTING

CONSEIL DES ECOLES CATHOLIQUES DU CENTRE-EST (CECCE)

Transportation Impact Assessment

Proposed Expansion of Paul-Desmarais High School in the Community of Stittsville

October 2022-22-4505

Certification

1. I have reviewed and have a sound understanding of the objectives, needs, and requirements of the City of Ottawa's Official Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the presentation of transportation impact assessment reports, including multimodal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering, or traffic operations; and,
4. I am either a licensed or registered professional in good standing, whose field of expertise is either transportation engineering or transportation planning.

Signature of individual certifier that s/he meets the above four criteria.

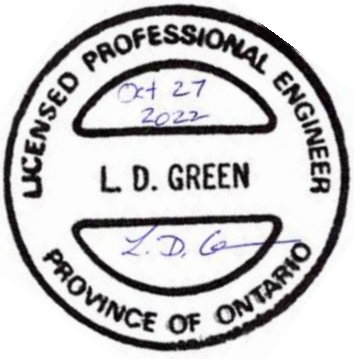

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Table of Contents

Figures

Tables

Appendices

1.0 Screening

1.1 Summary of Development

Municipal Address	5315 Abbott Street East, Ottawa
Description of Location	The site is located in the community of Stittsville on the northwest corner of Abbott Street East and Robert Grant Avenue. Access to the school is currently provided on Abbott Street East which is classified as a Major Collector roadway. The school is within the City's urban boundary.
Land Use Classification	I1A [2129] – Minor Institutional Zone
Development Size	École secondaire catholique Paul-Desmarais is an existing middle and high school with an enrolment of 1,250 students, 100 staff members, and 22 portable classrooms (portables). The CECCE proposal is to replace the existing portables with the construction of new school classrooms. A new pavilion is also planned, connecting to the existing inflatable dome. The pavilion will accommodate two new classrooms, increasing the total new classroom to 18. The number of students and staff at the school are expected to remain the same.
Number of Accesses and Locations	The existing bus loop is planned to be maintained however a new bus loop is being constructed with access to the planned extension of Robert Grant Avenue. The new bus loop will spread the bus traffic over the two access locations, being Abbott Street East and Robert Grant Avenue. The existing and future staff and student parking lot access will remain on Abbott Street East.
Phases of Development	1
Build-out Year	2024 (Start of Construction, June 2023)

1.2 Trip Generation Trigger

The proposed expansion of Paul-Desmarais High School is anticipated to maintain the number of students and staff trips during the peak hour, the number of site trips is expected to remain the same as existing, which exceeds 60 person trips. A traffic impact study was not previously completed for this site.

Land Use Type	Minimum Development Size	Yes	No
Single-Family Homes	40 units		x
Townhomes or Apartments	90 units		x
Office	3,500 sq.m.		x
Industrial	5,000 sq.m.		x
Fast-Food Restaurant or Coffee Shop	100 sq.m.		x
Destination Retail	1,000 sq.m.		x
Gas Station or Convenience Market	75 sq.m.		x
Other	60 person trips or more during weekday peak hours	x	

1.3 Location Triggers

Criteria	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	

1.4 Safety Triggers

Criteria	Yes	No
Are posted speed limits on a boundary street 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? **The intersection of Abbott Street East at Iber Road operates over capacity at certain periods of the day and requires a Police Point Duty officer to control traffic. There have also been parking issues on Abbott Street, however additional signage and bylaw enforcement have been implemented.**	x	
Does the development include a drive-thru facility?		x

1.5 Summary

Criteria	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	

Since the development satisfies the trip generation and safety trigger, both the design review component and the network impact component will be addressed in the TIA.

2.0 Scoping

2.1 Existing and Planned Conditions

2.1.1 Proposed Development

École Secondaire Catholique Paul-Desmarais ('Paul-Desmarais Secondary School') is an existing middle and high school with an enrolment of 1,250 students, 100 staff members, and 22 portable classrooms (portables). The school is located on the northwest corner of Abbott Street East and Robert Grant Avenue within the Fernbank Community Design Plan (CDP). The existing site provides 123 parking spaces for vehicles and 90 bike parking spaces.

The CECCE is proposing to construct 16 new classrooms, while reducing the number of portables (from 22 to approximately 6). A new pavilion is also planned, connecting to the existing inflatable dome.

Robert Grant Avenue is planned to be extended from Abbott Street East to north of Hazeldean Road. Numerous residential / mixed use developments are proposed or under construction in the area. There is an existing bus loop at the school and a new additional bus loop is planned to be constructed with access being provided to the planned extension of Robert Grant Avenue. The existing parking lot will remain accessible via Abbott Street East. No additional trips are expected to be generated by the school based on the proposed upgrades. The number of students and staff will remain the same, before and after the school modifications. The wide area context is provided in **Figure 1** and the local area context is provided in **Figure 2**.

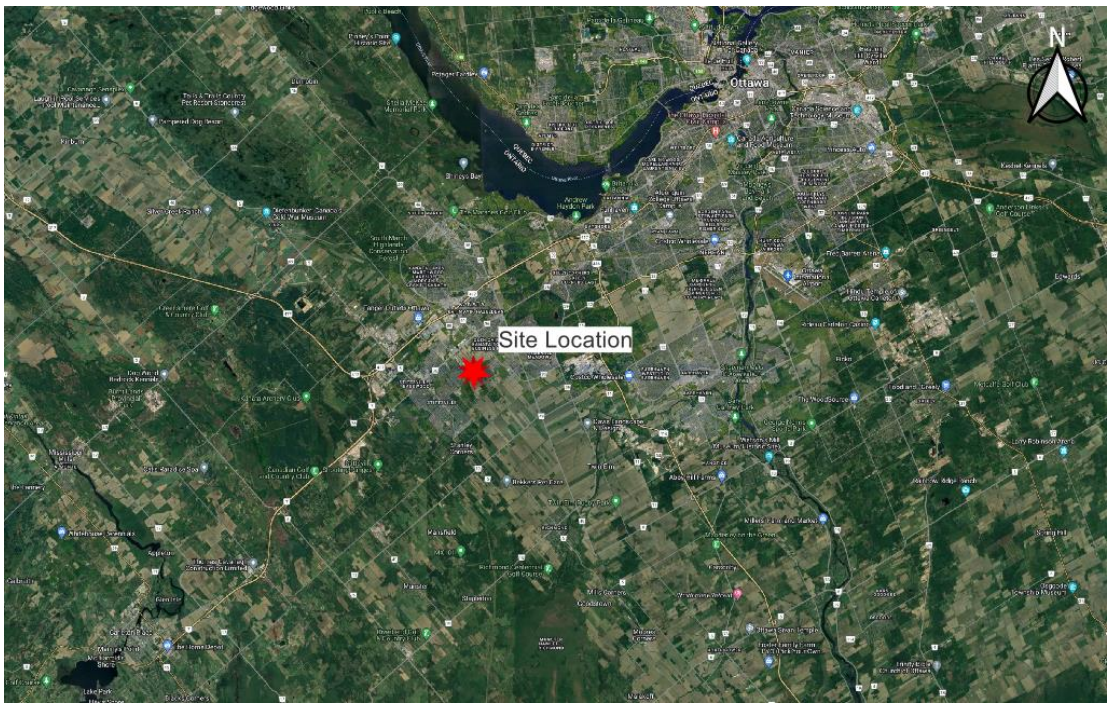


Figure 1: Wide Area Location Context

Figure 2: Local Area Context

The existing conditions study area intersections include three (3) intersections under consideration for this study are as follows,

- Abbott Street East & Iber Road
- Abbot Street East & Robert Grant Avenue
- Abbot Street East & Existing Access

The study area intersections were chosen based on the understanding that the no additional trips will be generated by upgrades taking place at the school. The traffic circulation surrounding the school will be the most critical element of the analysis as there will be minimal impact to the surrounding road network intersections. The school buses will divided between the existing and proposed bus loops. The existing and proposed site plan is provided in **Figure 3**.

Figure 3: Existing and Proposed Site Plan

2.1.2 Existing Conditions

2.1.2.1 Existing Roadways

The roadways under consideration in the study area are described as follows:

Abbott Street East	Abbott Street East runs nominally east-west and is classified as a Major Collector and is under the jurisdiction of the City of Ottawa. Within the vicinity of the school, Abbott Street East is a two-lane undivided roadway with a posted speed limit of 50 kilometers per hour which is reduced to 40 kilometers per hour during school hours.
Robert Grant Avenue	Robert Grant Avenue runs nominally north-south and is classified as an Arterial roadway and is under the jurisdiction of the City of Ottawa. In the vicinity of the school, Robert Grant Avenue is a two-lane undivided roadway with a posted speed limit of 60 kilometers per hour.

Iber Road	Iber Road runs nominally north-south and is classified as a Major Collector and is under the jurisdiction of the City of Ottawa. The roadway has a two-lane cross-section and a posted speed limit of 50 kilometers per hour.

2.1.2.2 Existing Intersections

The lane configurations and the traffic control for each of the study intersections is provided below.

Abbott Street East / Robert Grant Avenue

This intersection is a single lane roundabout with an advisory speed of 30 kilometers per hour. The north approach is currently unconstructed. A view of the intersection is provided in **Figure 4**.

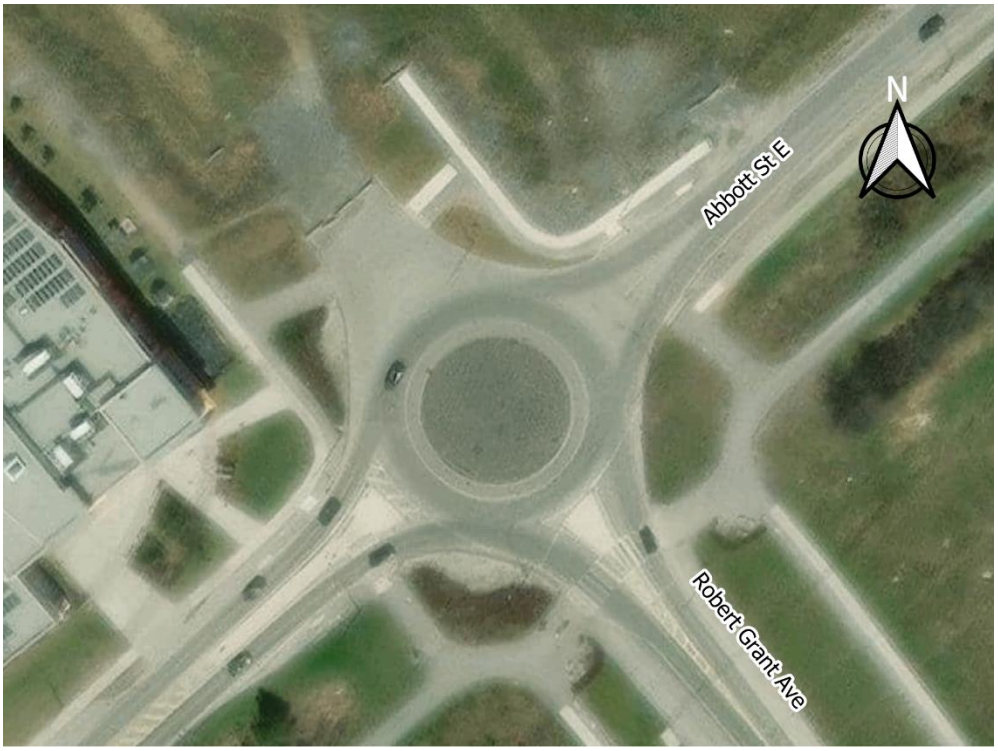


Figure 4: Intersection of Robert Grant Ave and Abbott St E.

Abbott Street East / Iber Road

This intersection is a three-legged stop-controlled intersection. Auxiliary left turn lanes are provided on the north approach and the west approach. A path connecting Abbott Street and the Trans Canada Trail is located to the south of the intersection and leads to the west pedestrian crossing. A view of the intersection is provided in **Figure 5**.

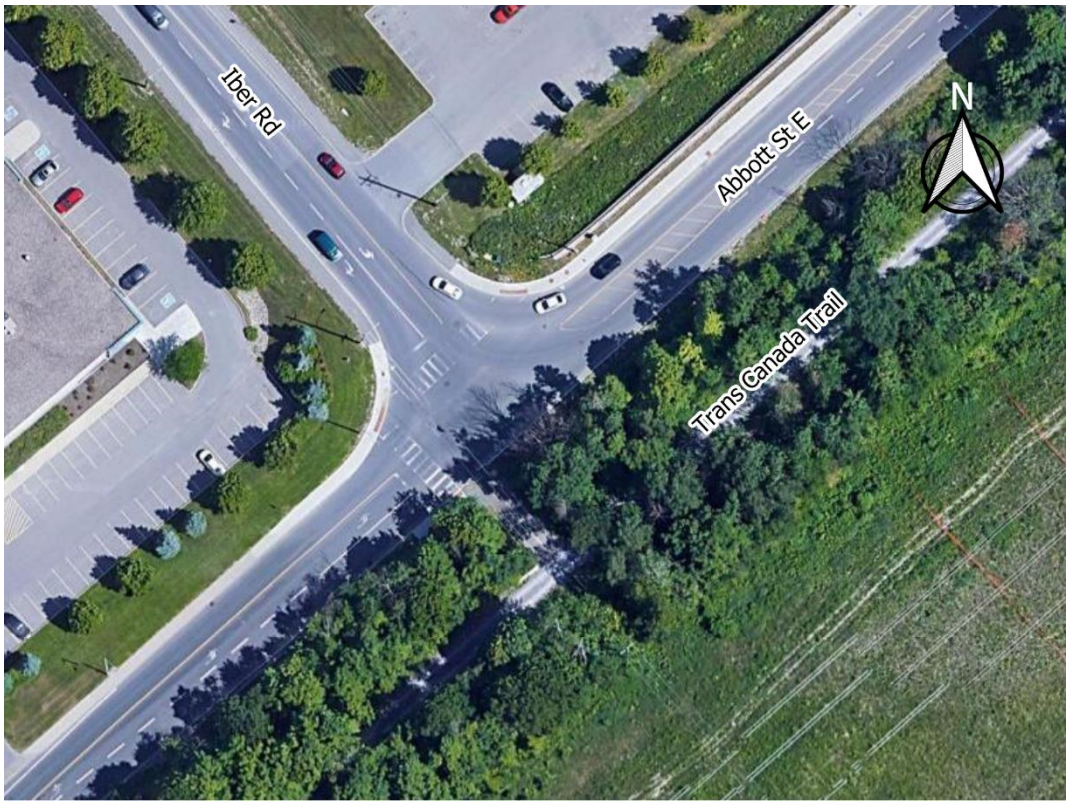


Figure 5: Intersection of Abbott St E and Iber Rd

2.1.2.3 Walking and Cycling

A sidewalk is provided on the north side of Abbott Street, west of Robert Grant Ave. To the east, the south side of Abbott Street East has been reconstructed with a sidewalk and cycle track. The urbanization of the north side of Abbott Street East has not yet been completed. The Trans Canada Trail runs parallel to Abbott Street to the south. Sidewalks and cycle tracks are provided on Robert Grant Ave to the south of Abbott Street. A figure showing the cycling facilities is provided in **Figure 6** and pedestrian facilities is provided in **Figure 7**.

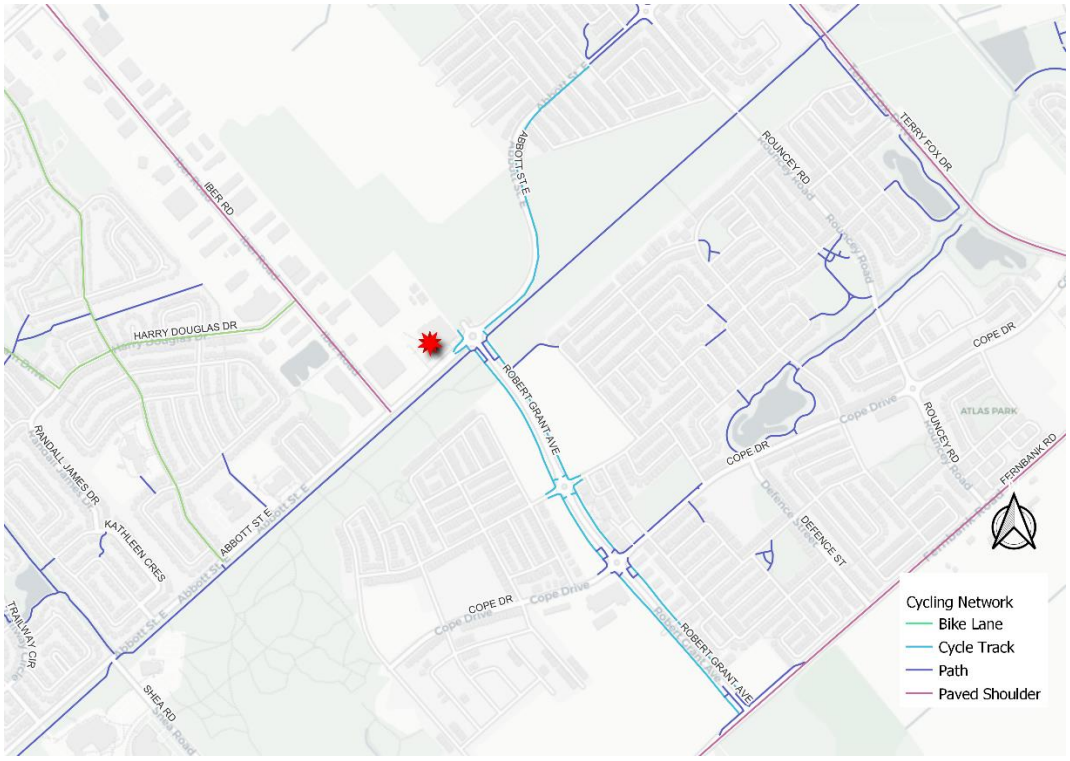


Figure 6: Cycling Facilities

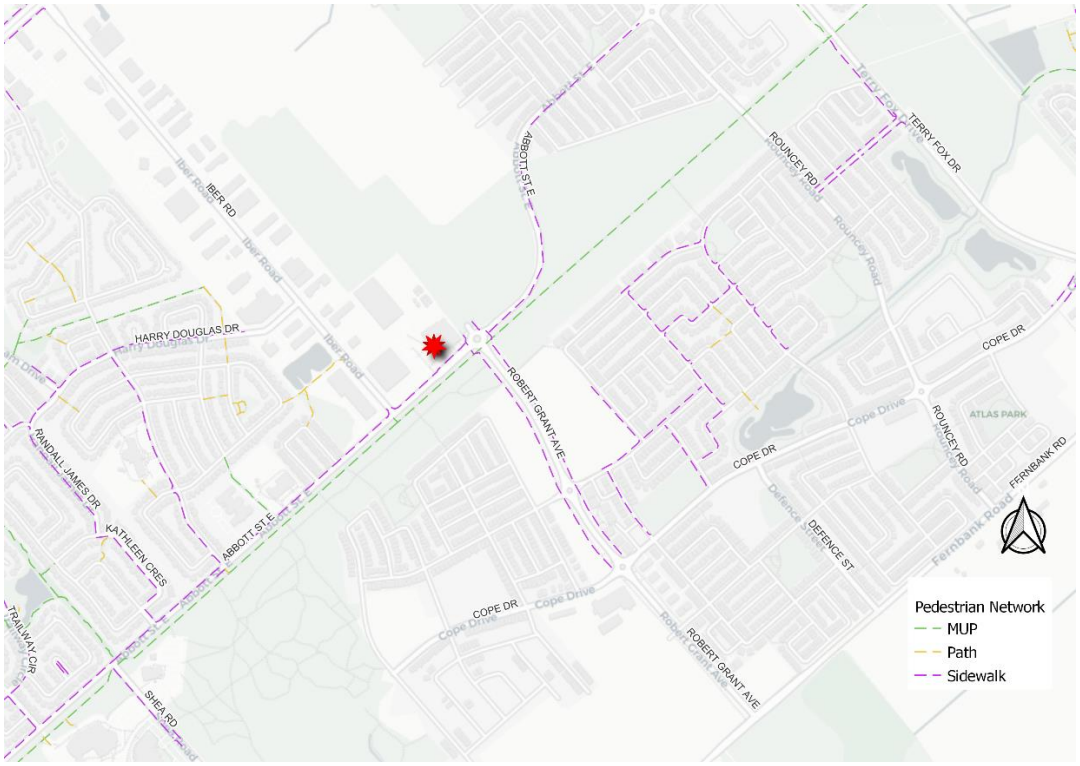


Figure 7: Pedestrian Facilities

2.1.2.4 Existing Driveways

The school currently borders only Abbott Street East, a driveway access is provided to access the school. There are no other driveways within 200 meters of the subject site. **Figure 8** illustrates the existing driveways within 200 m of proposed site driveway.

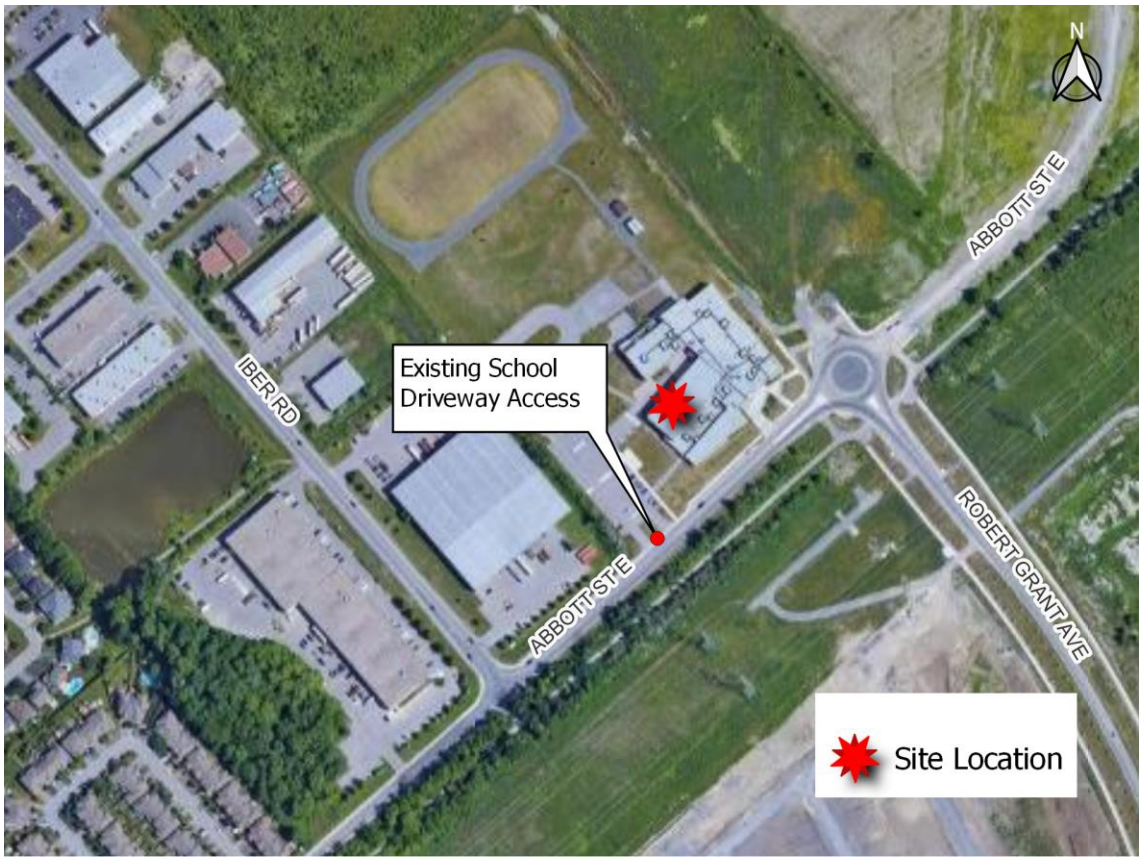


Figure 8: Driveways within 200 meters on Boundary Roads

2.1.2.5 Existing Public Transit Service

The existing public transit operations in proximity to the school are shown in **Figure 9** and the nearby bus stops are shown in **Figure 10**. Route 62 currently serves the school. The bus stops are approximately 240 metres from the school's main entrance.

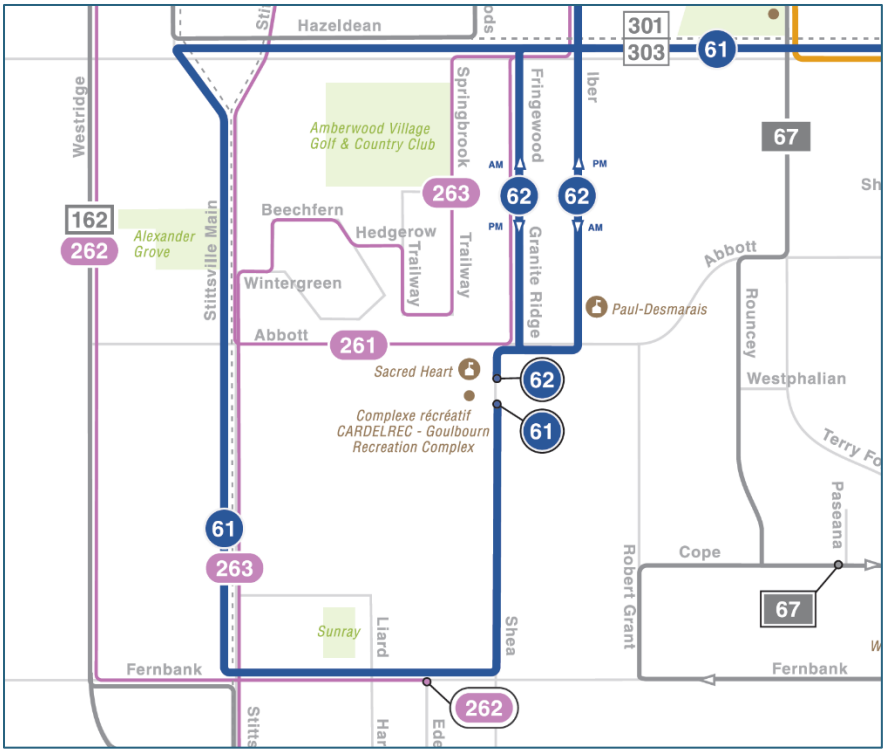


Figure 9: Existing Transit Service

Figure 10: Existing Bus Stop Locations

2.1.2.6 Traffic Management Measures

There are no Area Traffic Management (ATM) studies that Dillon Consulting is aware of that have been completed or are currently in progress within the study area. There are no traffic calming measures in place along the study area roadways.

2.1.2.7 Peak Hour Travel Demands by Mode

The selected time periods for analysis are the weekday AM and PM school peak hours, since these periods govern roadway design during peak school commuter hours. The AM school peak hour corresponds with the adjacent street peak hour. The PM school peak hour occurs between 3 and 4 PM. The school generates passenger vehicles, school buses, transit, walking and cycling trips. Existing traffic volumes are provided in **Figure 11** and lane configurations are provided in **Figure 12**. Traffic counts were undertaken by the City of Ottawa on September 27, 2022.

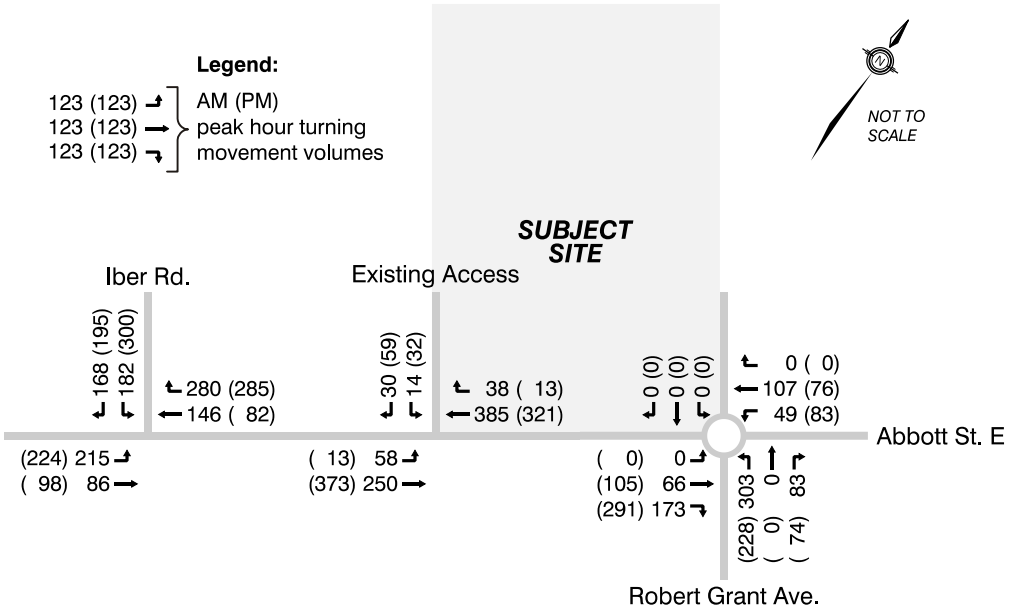


Figure 11: Existing Traffic Volumes

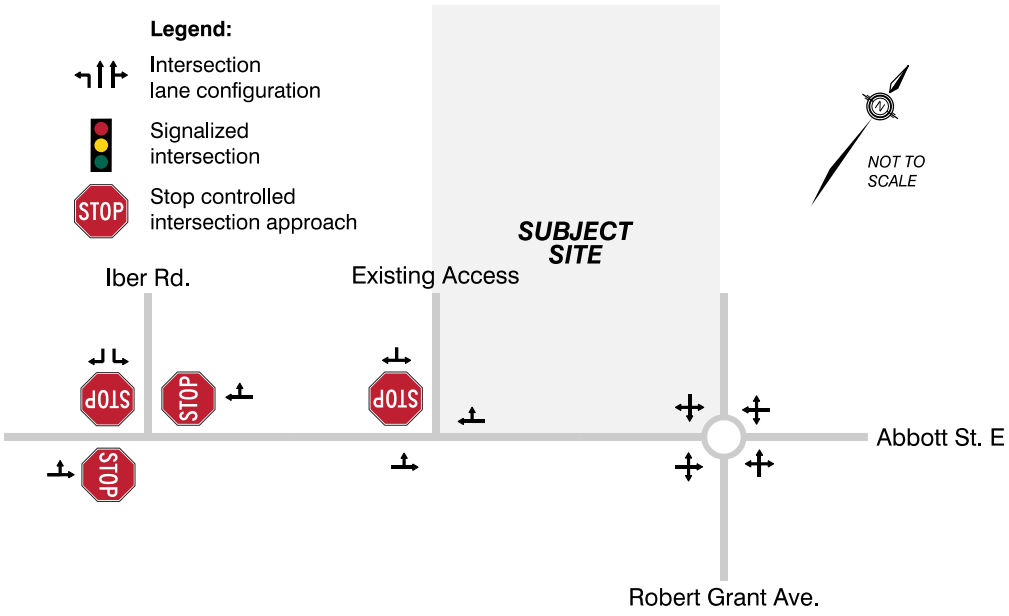


Figure 12: Existing Lane Configurations

Table 1 and **Table 2** document the existing pedestrian and cycling activity, respectively.

Table 1: Existing Pedestrian Activity

Intersection	AM peak hour					PM peak hour				
	North leg	South leg	West leg	East leg	Total	North leg	South leg	West leg	East leg	Total
Abbott Street East at Iber Road	4	-	0	0	4	76	-	29	11	116
Abbott Street East at Robert Grant Avenue	41	33	33	7	114	159	96	190	29	474
Abbott Street East at Site Driveway	26	-	0	0	26	105	-	2	2	109

Table 2: Existing Cycling Activity

Intersection	AM peak hour					PM peak hour				
	WB	EB	SB	NB	Total	WB	EB	SB	NB	Total
Abbott Street East at Iber Road	0	0	0	0	0	30	0	18	9	57
Abbott Street East at Robert Grant Avenue	29	6	2	29	66	13	34	44	9	100
Abbott Street East at Site Driveway	1	16	0	0	17	27	2	0	0	29

2.1.2.8 Collision History

The collision history along boundary roads of the site was accessed from the City of Ottawa's open data portal. The sites selected for analysis were the intersections of Iber Rd & Abbott Street East and the intersection of Abbott Street East & Robert Grant Avenue, as well as the midblock segment between these intersections. The collisions by location and year are provided in **Table 3**. The data indicates a total of nine (9) collisions over the five-year period between calendar year 2016 and 2020.

Table 3: Collisions by Location and Year

Location	2016	2017	2018	2019	2020
ABBOTT ST @ IBER RD	1	2	1		1
ABBOTT ST @ ROBERT GRANT AVE			1	2	
ABBOTT ST E between IBER RD & ROBERT GRANT AVE			1		

2.1.3 Planned Conditions

2.1.3.1 Road Network Improvements

Figure 13 shows the 2031 Network Concept proposed in the 2013 TMP for the area surrounding Paul-Desmarais Secondary School. Notable proposed road network changes include the extension of Robert Grant Avenue from Fernbank Road to north of Hazeldean Road. The segment between Fernbank Road and Abbott Road East has already been constructed at the time of writing this report, and the segment between Abbott Road East and Hazeldean Road is expected to be constructed in calendar year 2022. Robert Grant Avenue is classified as an Arterial roadway under the jurisdiction of the City of Ottawa. It is currently consists of a two-lane cross-section however, it will ultimately be widened to a 4-lane cross-section.

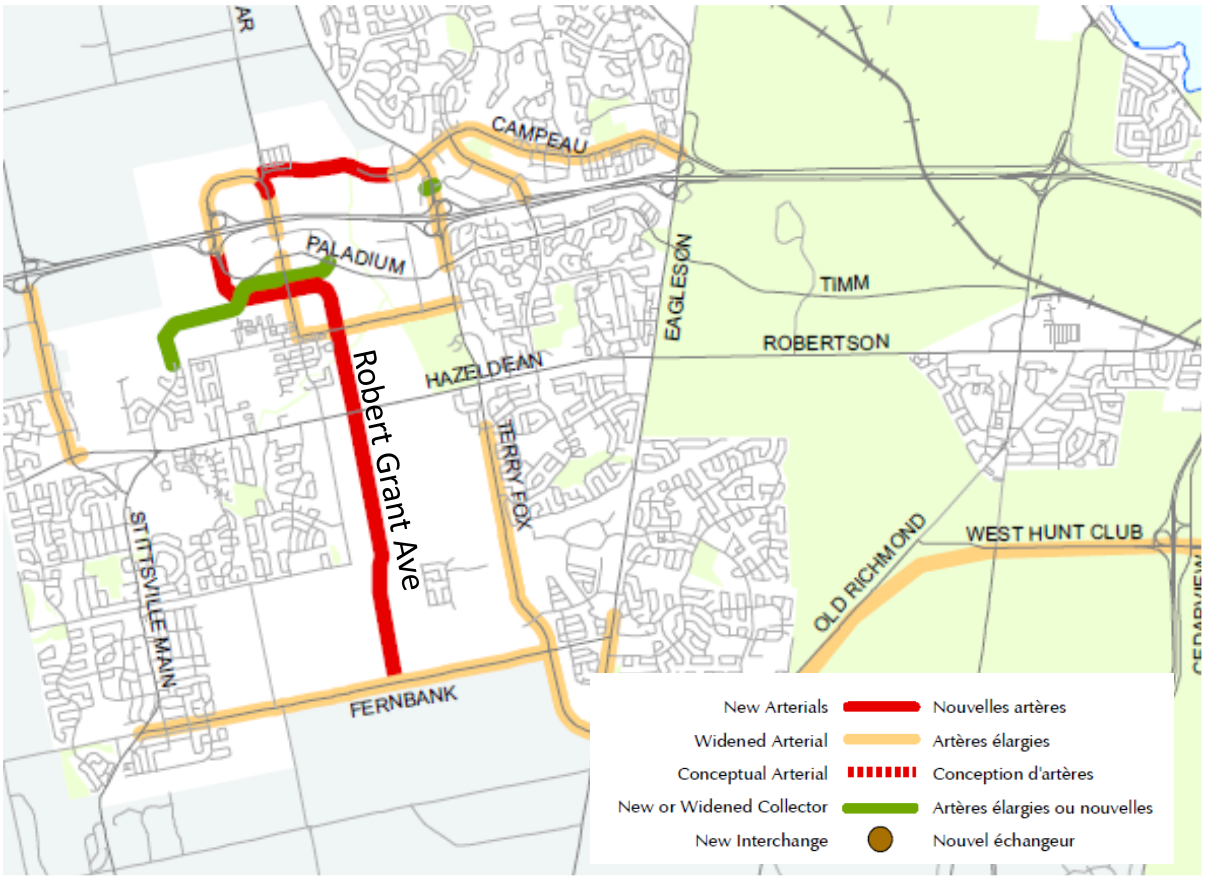


Figure 13: 2031 Road Network Concept

2.1.3.2 Walking and Cycling

Robert Grant Avenue between Abbott Street and Hazeldean Road is identified as spine cycling route, in the City's Ultimate Cycling Network. Cycle tracks will also be constructed as part of Robert Grant Avenue between Abbott Street and Hazeldean Road. A map of the ultimate cycling network is provided in **Figure 14**.

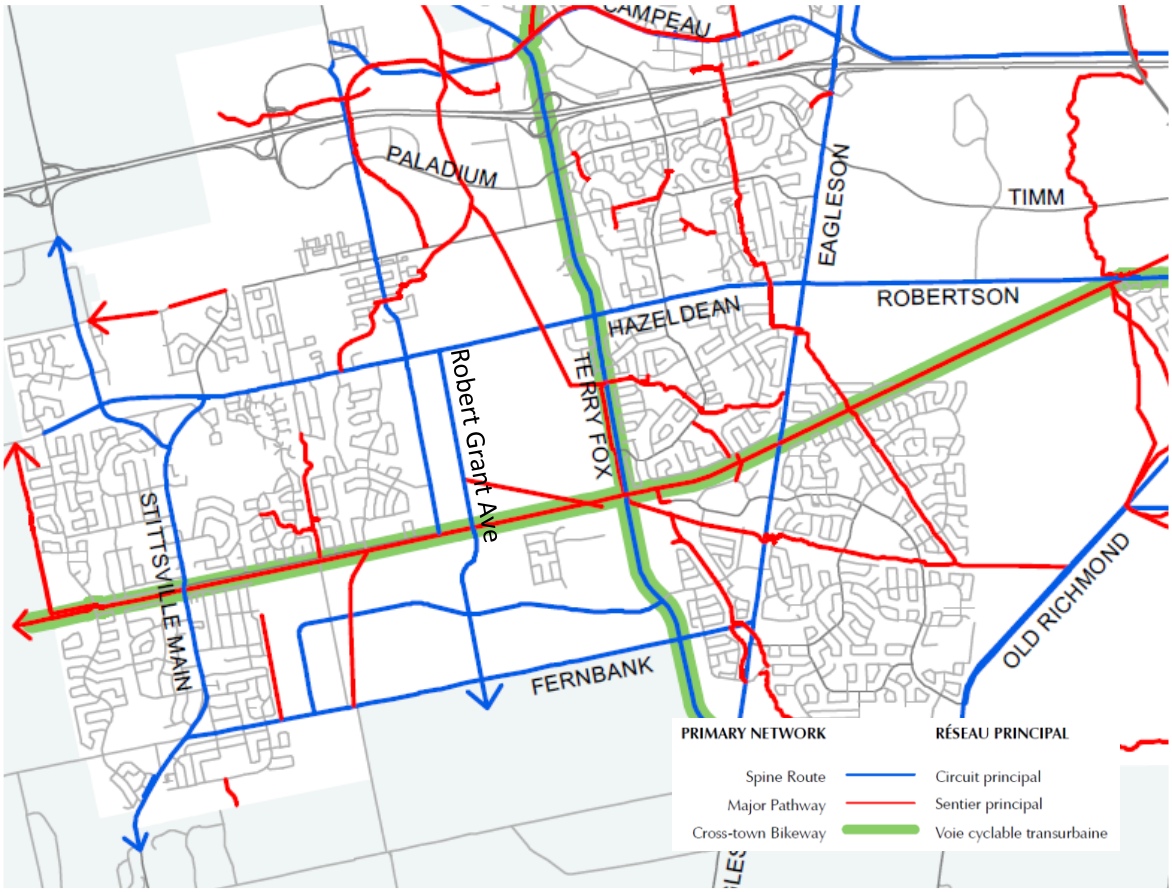


Figure 14: City of Ottawa Ultimate Cycling Network

2.1.3.3 Transit

Figure 15 illustrates the 2031 Affordable Transit Priority Network from the City's 2013 TMP. The City's TMP indicates that Robert Grant Avenue will have transit signal priority and queue jump lanes at select intersections. Further, transit stations are planned in the vicinity of Paul-Desmarais high school as shown in **Figure 16** however, there is no timeline associated with this work.

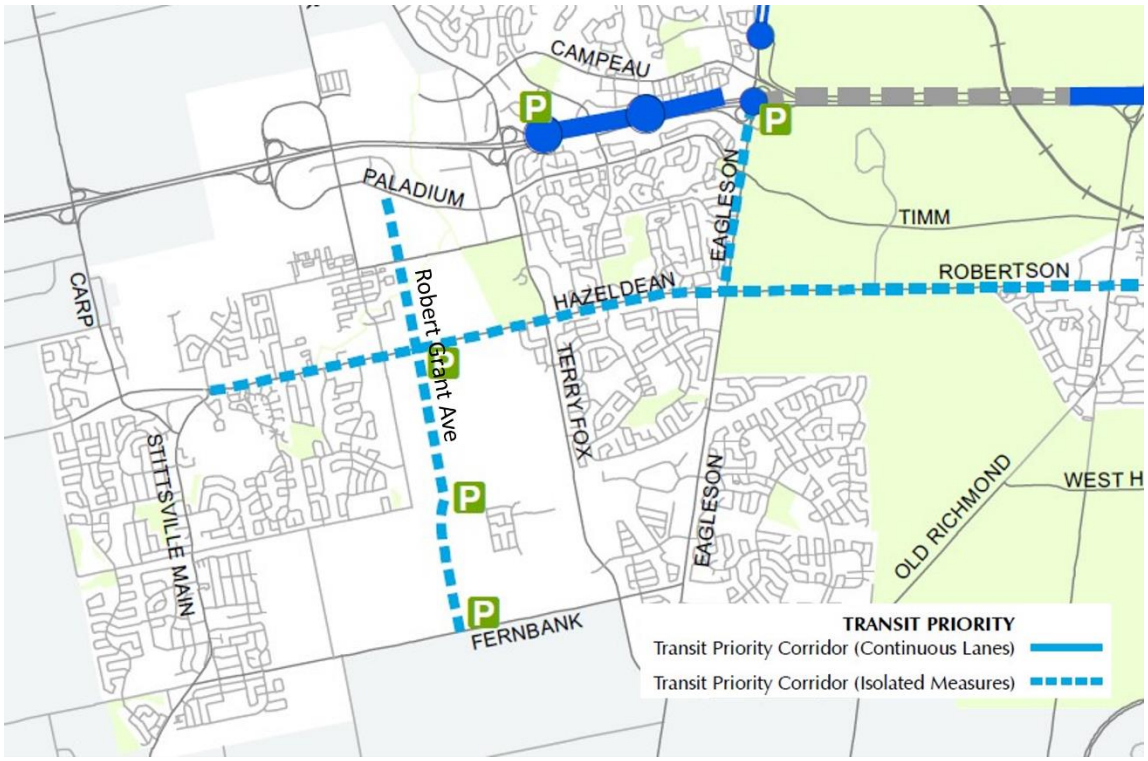


Figure 15: Rapid Transit and Transit Priority Network - 2031 Affordable Network

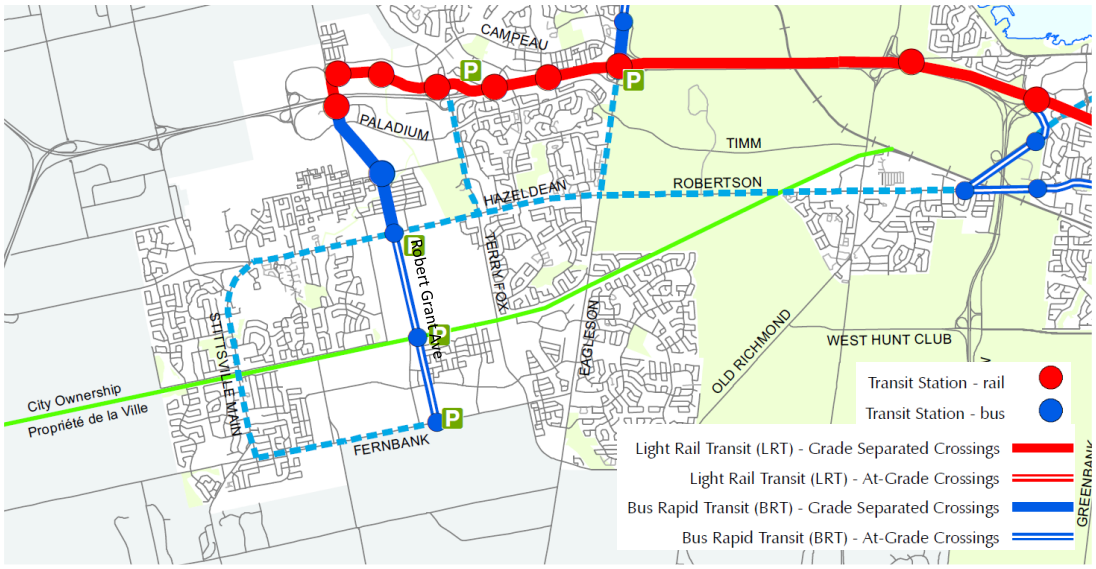


Figure 16: Rapid Transit and Transit Priority Network – Ultimate Network

2.1.3.4 Future Background Developments

There are multiple developments, planned or underway, in proximity to Paul-Desmarais High School. These background developments are described in the Kizell Lands Community Transportation Study

(CTS) (*5618 Hazeldean Road Transportation Impact Study, May 2020*). For the purposes of this study, the "Scenario 1" future development assumptions from the Kizell Lands CTS were used for analysis. This scenario includes the density assumptions and full build-out date of 2028, as described in the Fernbank CDP. The future background development are as follows:

- 288 Single Detached Dwellings
- 469 Townhouse Dwellings
- 878 Multi-Family Housing Dwellings (Low Rise)
- 297 Apartment Units (High Density)
- 191 Apartments and 140,910 ft^2 of Retail (Mixed Use)
- 580 Student Elementary School
- 325 Parking Space Parking and Ride

Figure 17 illustrates the location of the background developments as shown in the Kizell Lands CTS.

Figure 17: Background Developments (*5618 Hazeldean Road Transportation Impact Study, May 2020*)

Further, the City's development application search tool was accessed to verify other developments that may be unaccounted in the previous traffic study noted above. Three development applications were identified as follows:

- A planned development of four six-storey apartment buildings consisting of 354 dwelling units along with 7,353 square feet of commercial space being proposed at 360 Bobolink Ridge;
- A planned development of 76 townhome units proposed at 585 Bobolink Ridge;

- A planned development of 112 townhome dwellings proposed at 723 Putney Crescent;
- A new elementary school proposed at 755 Cope Drive.

2.2 Study Area and Time Periods

The study area for the future planned conditions consists of the following intersections:

1. Iber Road & Abbott Street East
2. Abbott Street East and Robert Grant Avenue.
3. Abbott Street East and Existing Paul-Desmarais School Access
4. Robert Grant Avenue and proposed bus loop access
5. Robert Grant Avenue and Street 14
6. Robert Grant Avenue and Street 8
7. Robert Grant Avenue and Cransbill Road

The study area was selected based on the understanding that there are no new additional trips generated by the Paul-Desmarais school. The traffic circulation surrounding the school will be the most critical element of the analysis as there will be minimal impact to the greater road network and study intersections. The future road network and the proposed study intersections are shown in **Figure 18**.

The selected time periods for analysis are the weekday AM peak period of the adjacent roadway and the PM peak period of the school driveway (i.e. the AM and PM school pickup and drop-off hours), since these are the time periods when the school generates the most traffic.

The proposed development is anticipated to be open for the 2024 school year however, the surrounding developments will not be built out until 2030. Therefore, this analysis will examine the full build-out 2030 future horizon year.

Figure 18: Future Study Intersections

2.3 Exemptions Review

Table 4 summarizes the exemptions review table from the City of Ottawa's 2017 *Transportation Impact Assessment Guidelines*. **Module 4.2.2** is not included since there are 123 parking spaces provided as compared with the required 114 parking spaces. Parking calculations are provided in **Appendix A**.

Module 4.6 was not included since the school is not anticipated to generate new vehicle trips.

Table 4: Exemptions Review

Module	Element	Exemption Consideration	Status
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Included
	4.1.3 New Street Networks	Only required for plans of subdivision	Not included
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Included
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Not included

Module	Element	Exemption Consideration	Status
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Included
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on Local or Collector streets for access and total volumes exceed ATM capacity thresholds	Not included
4.8 Network Concept		Only required when proposed development generates more than 200 person trips during the peak hour in excess of the equivalent volume permitted by established zoning	Not included
4.9 Intersection Design	All Elements	Not required if site generation trigger is not met	Included

3.0 Forecasting

3.1 Development-Generated Travel Demand

The forecast traffic volumes within the study area will consist of trips generated by background land use, and changes to the school bus traffic patterns with the new bus loop to Robert Grant Avenue. No new additional trips are to be generated by the Paul-Desmarais High School; however, there will be changes to how school buses access the school as they will be divided between the existing and the proposed bus loop access.

The background traffic volume growth will be generated by the lands contained within the Kizell Lands CTS and additional developments noted in **Section 2.1.3.4**.

3.1.1 Paul-Desmarais School Trips

The school will generate no new additional trips as a result of the proposed school modifications. However, a new bus loop will be constructed connecting to the extension of Robert Grant Avenue. The new school bus loop will be used in addition to the existing school access on Abbott Street East. The number of school buses will be split between the two accesses based on their routes.

The number of school buses using the new bus loop will be managed to eliminate northbound left turns from Robert Grant Avenue. The school bus routes, volumes, and schedules were observed. The school buses destined to the school from the north will utilize the new access on Robert Grant Avenue. The school buses arriving from the west, south and the east will continue to utilize the existing access on Abbott Street East. The forecast school bus volumes are shown in **Figure 19**.

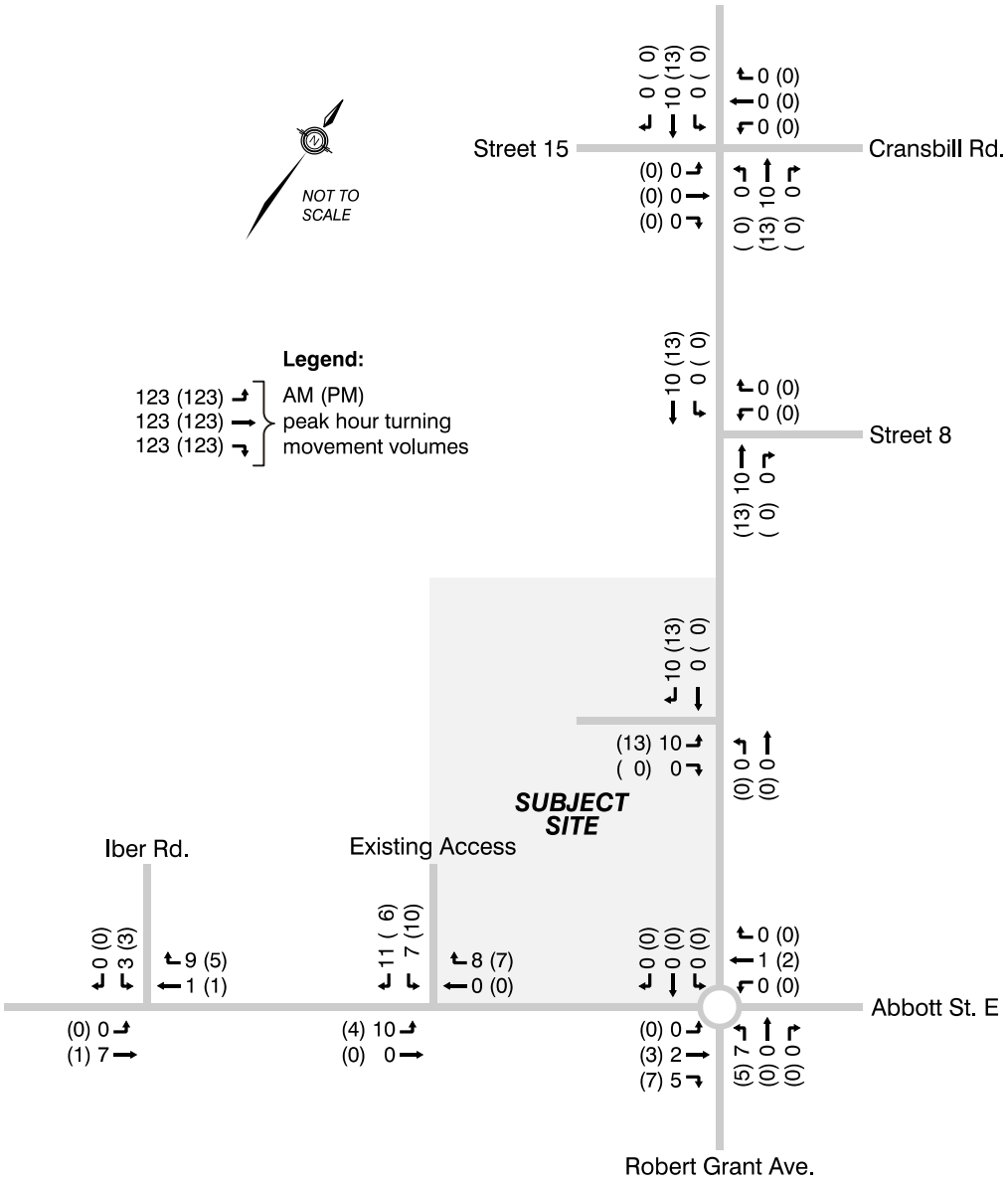


Figure 19: Future School Bus Traffic Volumes

3.2 Background Network Travel Demand

3.2.1 Transportation Network Plans

The Robert Grant Avenue extension is planned to be constructed as a two-lane arterial in the fall of 2022, being front ended by the adjacent developers. The City's 2013 Transportation Master Plan identifies the widening of Robert Grant Avenue from a two-lane cross section to a four-lane cross section, however timing of the widening of Robert Grant Avenue is unknown.

There are no other network modifications which will directly impact the study area road network.

3.2.2 Background Traffic Volume Growth

Background traffic growth was determined based on the Kizell Lands CTS undertaken in June 2020. The study utilized a 2% growth rate and included several background developments within the study area. The Kizell Lands CTS forecast the 2030 traffic volumes.

The Kizell Lands CTS forecast the weekday AM and PM commuter peak hour traffic volumes. This report evaluates the impacts during peak school hours, which generally overlap the weekday AM peak hour but occur earlier during the PM period, between 3:15 and 4:15 PM. Therefore, the Kizell PM peak hour traffic volumes were scaled down to 81% of the peak commuter hour to reflect the off-peak characteristics at the end of the school day. The traffic volumes from the Kizell Lands CTS is provided in **Appendix B**.

3.2.3 Other Background Developments

Other developments which were not included in the Kizell Lands CTS were added from the City's development application portal. These other developments included the following:

- A planned development of four six-storey apartment buildings consisting of 354 dwelling units along with 7,353 square feet of commercial space being proposed at 360 Bobolink Ridge;
- A planned development of 76 townhome units proposed at 585 Bobolink Ridge;
- A planned development of 112 townhome dwellings proposed at 723 Putney Crescent;
- A new elementary school proposed at 755 Cope Drive.

The trips generated by these developments were determined through the TRANS Trip Generation Manual methodology or otherwise obtained from the respective traffic study for each development. Similar to the methodology applied to the PM peak hour Kizell traffic volumes, the PM background development traffic volumes were reduced to 81% of the peak PM commuter hour traffic volumes to reflect the traffic on the roadway at the end of the school day, between 3:15 and 4:15 PM.

3.2.4 Traffic Volumes

The future 2030 background traffic volumes are provided in **Figure 20.**

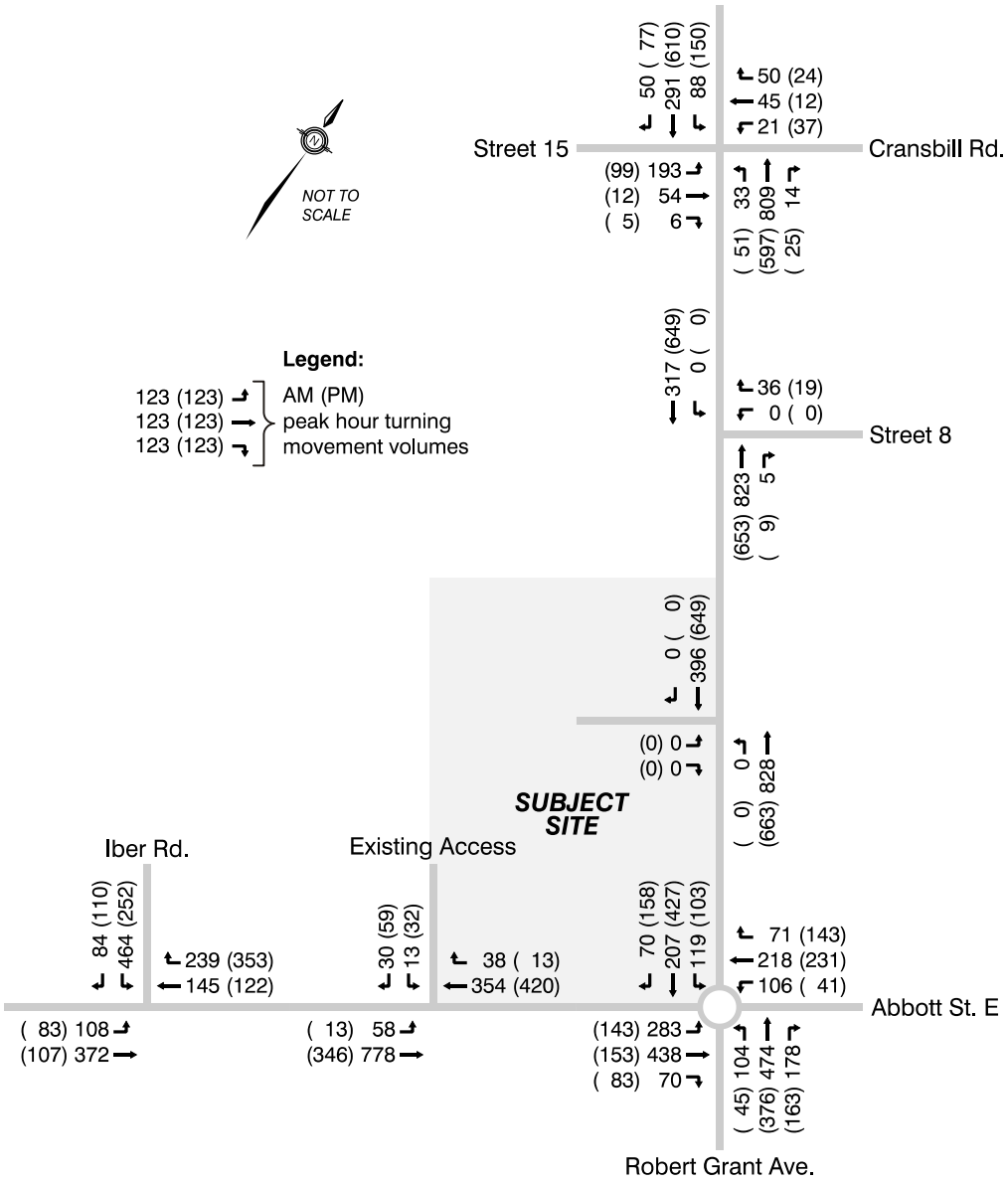


Figure 20: Future 2030 Background Volumes

3.3 Demand Rationalization

The proposed modifications to the school site are not anticipated to increase traffic volumes on adjacent roadways. Traffic volumes along Abbott Drive East or on Robert Grant Avenue are not anticipated to exceed capacity. For these reasons demand rationalization was not undertaken.

3.4 Total Future Traffic Forecasts

The total future volumes for the AM and PM peak periods are provided in **Figure 21**. The total traffic volumes include the redistribution of school bus traffic, which is the only difference between the background and total traffic volumes.

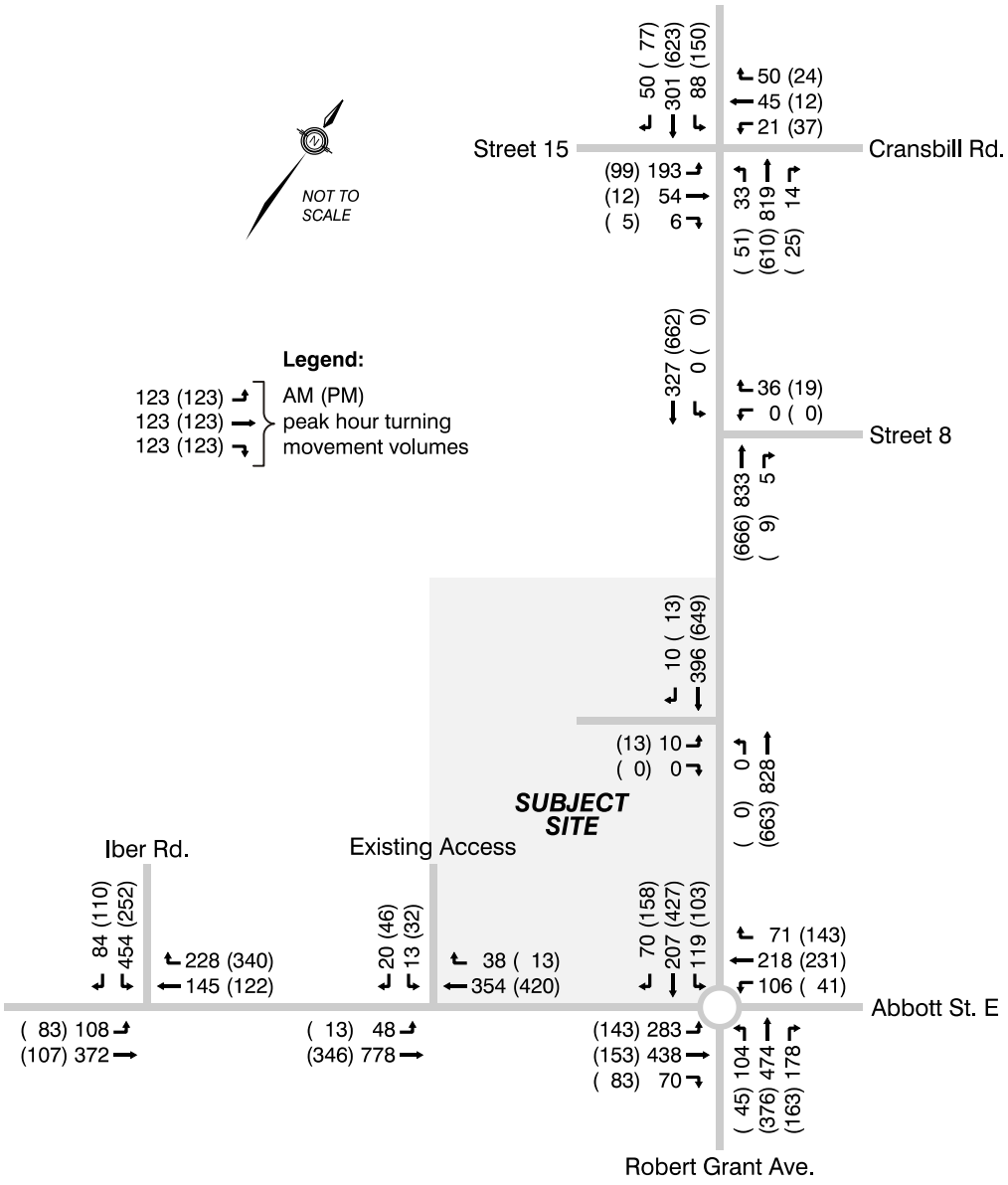


Figure 21: Future Total 2030 Volumes

4.0 Analysis

4.1 Development Design

4.1.1 Design for Sustainable Modes

Bicycle facilities – A total of 90 bicycle parking spaces are provided at the school. Direct and convenient paved surfaces are provided to access the school from the bike parking areas.

Pedestrian access and circulation – The sidewalk and paved surfaces around the school provide direct access to the main school entrance. The bus loops provide sidewalk connections to the school student entrance. Paved surfaces around the school also provide direct and convenient access from the existing staff parking lot, existing bicycle parking areas, and drop-off/pick-up lay-by area to the school entrances.

Transit facilities – OC Transpo stops are provided adjacent to the site at the intersection of Abbott Street East and Iber Road. The transit stops are connected to the school by sidewalks on the north side of Abbott Street East. An existing school bus loop is provided north of the on-site parking lot. An additional bus loop will be added north of the school building, connecting to the Robert Grant Avenue extension. The existing and new bus loop will be connected to the school through pedestrian walkways.

4.1.2 Circulation and Access

The school has one driveway to Abbott Street East on the west side of the school, which is intended for staff parking and access to the existing school bus loop to the north of the parking lot. A driveway to Robert Grant Avenue connecting to the proposed new bus loop will be added on the east side of the site, between the school and soccer field. An on-street parent drop-off/pick-up lay-by on Abbott Street East is provided.

School bus loops – The existing school bus loop provides approximately 205 metres of bus storage space plus there is an additional 100 metres within the parking lot area. At approximately 3:40 PM (approximately 10 minutes following the end of the day bell), the school closes the inbound driveway to the parking lot and a traffic control person directs traffic on Abbott Street to aid in the departure of busses from the parking lot. The new bus loop will provide in excess of an additional 150 metres of bus storage (and the school has the opportunity to manage which school buses will access the new bus loop.

Parent drop-off/pick-up – The parent drop-off/pick-up lay-by is located on the north side of Abbott Street. The lay-by parking bay provides 60 metres of storage space for approximately 8 vehicles. In the AM peak hour, video data at the Abbott Street East and Robert Grant Avenue roundabout showed a quick turnover rate in the lay-by, with maximum utilization peaking at 100% between 8:55 AM to 9:05 AM. During the PM peak hour, parents picking up at the 3:30 bell time start arriving at 3:00 PM and were observed waiting until 3:30 PM with minimal turnover. Vehicles began turning over at 3:30 PM

when the majority of students exited the school.

Waste collection – There are no proposed changes to the existing parking lot where the waste collection occurs. The school board has not reported any waste collection operational issues, it is assumed that waste collection will continue to operate without issues.

4.2 Parking

4.2.1 Parking Supply

Automobile Parking – There are no new trips generated by the proposed modifications to the school. The number of students and staff will remain as per the existing operations. As per City of Ottawa Zoning By-law 2008-250 (Section 101), 112 parking spaces are required and there are 123 provided, exceeding the zoning by-law requirement.

Bicycle Parking – As per City of Ottawa Zoning By-law 2016-249 (Section 111), the minimum bicycle parking rate is one bicycle parking space per 100 m^2 of gross floor area. Therefore, 90 bicycle parking spaces[1] are required and 90 bicycle parking spaces are provided.

4.3 Boundary Street Design

4.3.1 Mobility

The Multi-Modal Level of Service (MMLOS) was evaluated for Abbott Street East and Robert Grant Avenue to assist with developing a concept that maximizes the achievement of the MMLOS objectives. Since the development is within 300 metres of a school (the site itself), the MMLOS targets are subject to the school policy area. Note that there are no targets for trucks on a collector roadway within the school policy area, and there are no targets for auto traffic between intersections (there are targets for auto traffic at signalized intersections only, there are no signalized intersections within proximity of the site).

Table 5 presents the MMLOS conditions for roadway segments adjacent the school on Abbott Street East and Robert Grant Avenue. This MMLOS analysis is based on the existing conditions on Abbott Street East and the planned conditions of Robert Grant Avenue adjacent the school site. Abbott Street East is provided with a parking lay-by and sidewalk on the north side of the roadway. Abbott Street East has a posted speed limit of 50 km/h (40 km/h during school hours) and the posted speed limit on Robert Grant Avenue is assumed as 60 km/h.

The analysis shows that all MMLOS targets are met for cycling, transit, and truck modes on Abbott Street East and Robert Grant Avenue. The MMLOS targets for pedestrians are not met and could only be met if

[1] 4,647sq.m gross school floor area x 1 bicycle parking space / 100 sq.m = 47 bicycle parking spaces

the speed limit on both roads were reduced to 30 km/h and if a boulevard of at least 0.5 metres wide was added beside the sidewalk on Abbott Street East.

Table 5: MMLOS Conditions – Segments

Travel Mode	Criteria	Target	Abbott Street East (North Side) Collector Road	Robert Grant Avenue Arterial Road
Pedestrian LOS	Sidewalk width	A	2.0 metres	2.0 metres
	Boulevard width		0 metres	> 2.0 metres
	AADT < 3000		No	No
	On-Street Parking		No	No
	Operating Speed		> 30 or <50 km/h	> 50 or 60 km/h
	Level of Service		**C**	**C**
Cycling LOS	Type of facility	D	Mixed traffic	Bike Lane Not Adjacent Parking Lane
	Number of travel lanes/direction		1	1
	Operating speed		≤ 40 km/h	60 km/h
	Level of Service		**A**	**C**
Transit LOS	Type of facility	D	Mixed traffic	**No target**
	Parking/driveway friction		Limited / Low	
	Level of Service		**D**	
Truck LOS	Curb lane width	E	**No target**	> 3.7 metres
	More than two travel lanes			No
	Level of Service			**B**

4.3.2 Road Safety

The collision history in Section 2.1.2.8 indicates very few collisions have occurred in proximity to the school over the past five years. The extension of Robert Grant Avenue between Abbott Street and Hazeldean Road is being designed to current City of Ottawa standards. The terrain is flat and sight lines from the school driveways should be clear.

4.4 Access Intersection Design

4.4.1 Location and Design of Driveway

The proposed site bus loop driveway is located on Robert Grant Avenue, providing a single lane in and out of the site. The site driveway is approximately 10 metres wide and provides a clear throat distance of greater than 15 metres from the property line. The proposed width exceeds the typical City of Ottawa Private Approach Bylaw (#2003-447, Section 25) requirements of 9 metres, by 1 metre. It is noted that

the By-Law Section 25.1.e indicates that a private approach may exceed 9 metres in width to permit off-street bus loading areas, therefore the design meets the requirements of the by-law. The driveway is located with clear sightline; no safety concerns were identified.

4.4.2 Intersection Control

The proposed site driveway will serve only school buses and will experience minimal volume throughout the day except for the morning and afternoon drop-off and pickup periods. Stop sign controls facing vehicles exiting the site are not required however could be considered by the school board.

4.4.3 Access Intersection Design

Table 6 summarizes the traffic operations for the intersection of Abbott Street East and the existing site driveway for the weekday AM and PM peak hours, for existing conditions and the 2030 horizon year. **Appendix C** contains the City of Ottawa LOS definitions and **Appendix D** contains the intersection performance worksheets. Assuming single lane approaches and stop conditions exiting the school, the driveway intersection will operate at a LOS A with minimal delay. The level-of-service (LOS) of traffic signal-controlled intersections in the City of Ottawa is based on the volume to capacity (v/c) ratio.

Table 6: Site Driveway and Abbott Street East Intersection Operations

Existing Conditions				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
SB LR	18.8 (20.1)	C (C)	0.17 (0.41)	5 (16)
WB TR	0.0 (0.0)	A (A)	0.31 (0.22)	0 (0)
EB LT	2.6 (0.5)	A (A)	0.08 (0.02)	2 (1)
Total Future 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
SB LR	33.5 (23.3)	D (C)	0.25 (0.42)	7 (16)
WB TR	0.0 (0.0)	A (A)	0.28 (0.29)	1 (0)
EB LT	1.9 (0.5)	A (A)	0.07 (0.02)	0 (0)

Note: Results are presented in the format AM (PM) peak hour; Q95th (m) indicates the 95th percentile queues, LOS is an abbreviation for Level-of-Service, EB = eastbound, WB = westbound, SB = southbound; LTR = left, through, right movements for single/shared lane approaches.

Table 7 summarizes the operation of the proposed bus-loop driveway to Robert Grant Avenue. Robert Grant Avenue does not currently exist, therefore only the forecast 2030 traffic operations are provided.

Table 7: Proposed Site Driveway and Robert Grant Avenue Intersection Operations

Total Future 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
SB TR	0.0 (0.0)	A (A)	0.26 (0.42)	0.0 (0.0)
NB LT	0.0 (0.0)	A (A)	0.00 (0.00)	0.0 (0.0)
EB LR	28.5 (33.7)	D (D)	0.11 (0.16)	2.8 (4.4)

Note: Results are presented in the format AM (PM) peak hour; Q95th (m) indicates the 95th percentile queues, LOS is an abbreviation for Level-of-Service, EB = eastbound, WB = westbound, SB = southbound; LTR = left, through, right movements for single lane

4.5 Transportation Demand Management

Appendix E contains the TDM checklists. From the TDM checklists, some recommendations are as follows:

- Display relevant transit schedules and route maps at entrances;
- Provide links to OC Transpo and STO information on the school board website; and,
- Provide shower and lockers for staff use (these measures are provided).

The school board should also consider offering preloaded PRESTO cards to encourage commuters to use transit, or provide reimbursement of monthly transit passes for employees. It is noted that a very large percentage of the student population are bused to the site on school buses.

4.6 Neighbourhood Traffic Management

The proposed changes to the school will not generate any additional trips. Therefore, neighbourhood traffic management is deemed unnecessary.

4.7 Transit

The proposed changes to the school will not generate any new trips, therefore transit service will not be impacted.

4.8 Review of Network Concept

A review of the network concept is not included within this study. The network concept review is only required when a proposed development generates more than 200 person trips during the peak hour in excess of the equivalent volume permitted by established zoning. The proposed school is in keeping with the proposed zoning.

4.9 Intersection Design

The following subsections provide a review of the study area intersection traffic operations. The existing 2022 and 2030 forecast total future traffic conditions have been analysed using Synchro 11 software. The analysis includes the existing and planned lane geometry and traffic control, as shown in **Figure 22**. Refer to **Appendix C** for the City of Ottawa LOS definitions.

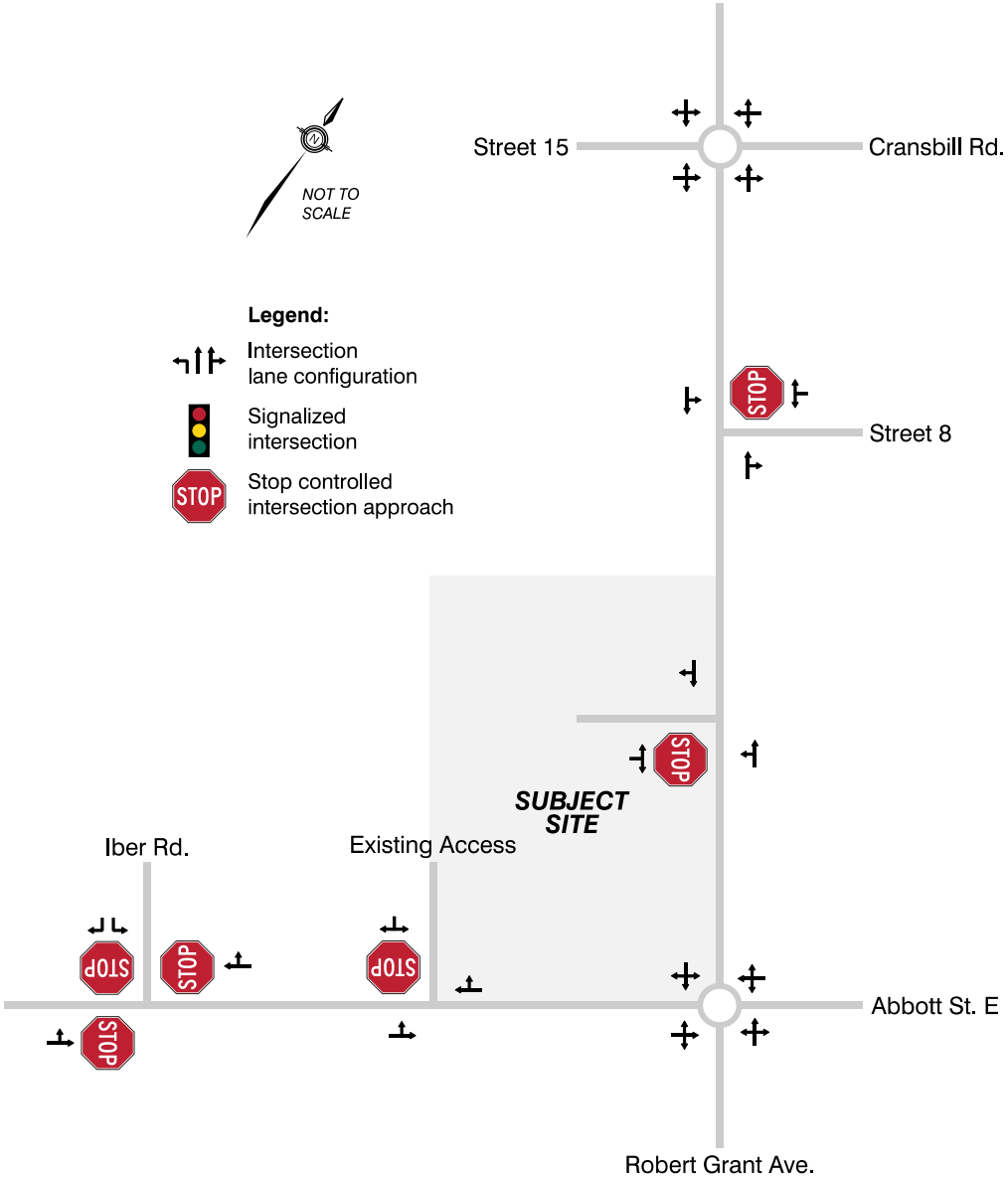


Figure 22: Future Lane Configurations

4.9.1 Abbott Street East and Robert Grant Avenue

The roundabout intersection is forecast to operate below an acceptable LOS in future, as indicated in **Table 8**. The results are based on the Highway Capacity Manual 6th Edition methodology for roundabouts. The school impact on the intersection is negligible. The City should monitor the operations of the roundabout over time and consider the need for a two-lane northbound entry to address future demands. It is noted that Robert Grant Avenue is planned to widen to a four-lane cross section in the future, which will increase the capacity of the roadway. The roundabout analysis utilized a saturated flow of 1960 vehicles per hour per lane, consistent with the Kizell Lands Transportation Study.

Table 8: Abbott Street East and Robert Grant Avenue Intersection Operations

Existing				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB	5.0 (6.8)	A (A)	0.22 (0.37)	1 (2)
WB	5.5 (5.3)	A (A)	0.18 (0.18)	1 (1)
NB	6.3 (5.8)	A (A)	0.35 (0.29)	2 (1)
SB	4.5 (4.1)	A (A)	0.00 (0.00)	0 (0)
Future Background 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB	36.3 (12.9)	E (B)	0.92 (0.52)	13 (3)
WB	23.9 (14.5)	C (B)	0.71 (0.58)	6 (4)
NB	182 (14.8)	F (B)	1.33 (0.66)	32 (5)
SB	9.7 (16.0)	A (C)	0.45 (0.71)	2 (6)
Total Future 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB	36.3 (12.9)	E (B)	0.92 (0.52)	13 (3)
WB	23.9 (14.5)	C (B)	0.71 (0.58)	6 (4)
NB	182 (14.8)	F (B)	1.33 (0.66)	32 (5)
SB	9.7 (16.0)	A (C)	0.45 (0.71)	2 (6)

Note: Results are presented in the format AM (PM) peak hour; Q95th (m) indicates the 95th percentile queues, LOS is an abbreviation for Level-of-Service, EB = eastbound, WB = westbound, SB = southbound; LTR = left, through, right movements for single lane

4.9.2 Abbott Street East and Iber Road

The intersection is forecast to operate below an acceptable LOS in future, as indicated in **Table 9**. The modifications of the school will have a negligible impact on the intersection. Intersection modifications or traffic control modifications are required to address auto traffic demands. In 2030, the intersection may require signalization, which should include separate left-turn lanes in the eastbound and southbound directions. Alternatively, a roundabout should be considered at this location.

Table 9: Abbott Street East and Iber Road Intersection Operations

Existing				
Approach/ Movement	**Delay (s)** AM (PM)	**LOS** AM (PM)	**V/C** AM (PM)	**Q95th (m)** AM (PM)
EB LT	19.4 (22.4)	C (C)	0.62 (0.67)	-
WB TR	25.5 (22.3)	D (C)	0.78 (0.70)	-
SB LR	22.3 (47.1)	C (E)	0.70 (0.93)	-
Future Background 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB LT	90.5 (12.6)	F (B)	1.08 (0.36)	-
WB TR	34.4 (23.2)	D (C)	0.83 (0.76)	-
SB LR	144 (19.3)	F (C)	1.23 (0.65)	-
Total Future 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB LT	88.9 (12.5)	F (B)	1.08 (0.36)	-
WB TR	31.9 (21.8)	D (C)	0.80 (0.74)	-
SB LR	134 (19.0)	F (C)	1.21 (0.65)	-
Total Future 2030 (Signalized)				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB L	15.9 (8.6)	B (A)	0.53 (0.40)	34 (14)
EB T	19.0 (7.1)	B (A)	0.71 (0.20)	92 (13)
WB TR	16.4 (8.9)	B (A)	0.62 (0.53)	74 (26)
SB L	17.3 (8.2)	B (A)	0.75 (0.48)	103 (31)
SB R	8.8 (6.6)	A (A)	0.07 (0.09)	7 (7)

4.9.3 Robert Grant Avenue and Street 8

The Street 8 Stop controlled intersection is forecast to operate at an acceptable LOS in future, as indicated in **Table 10**. The school impact on the intersection is negligible. Intersection modifications or traffic control modifications are not required to address auto traffic demands.

Table 10: Robert Grant Avenue and Street 8

Future Background 2030			
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**
WB LR	16.9 (13.7)	C (B)	0.11 (0.05)
NB TR	0.0 (0.0)	A (A)	0.53 (0.42)
SB LT	0.0 (0.0)	A (A)	0.00 (0.00)
Total Future 2030			
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**
WB LR	17.1 (13.9)	C (B)	0.12 (0.05)
NB TR	0.0 (0.0)	A (A)	0.54 (0.43)
SB LT	0.0 (0.0)	A (A)	0.00 (0.00)

4.9.4 Robert Grant Avenue and Cransbill Road / Street 15

The proposed roundabout is forecast to operate at an acceptable LOS in future, as indicated in **Table 11**. The results are based on the Highway Capacity Manual 6th Edition methodology for roundabouts. The northbound movement operates with a delay of 28 seconds during the AM peak period and a volume-to-capacity ratio of 0.88. The school impact on the intersection is negligible. Intersection modifications or traffic control modifications are not required to address auto traffic demands.

Table 11: Robert Grant Avenue and Cransbill Road / Street 15 Intersection Operations

Future Background 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB	6.8 (8.2)	A (A)	0.28 (0.19)	1 (1)
WB	11.1 (6.9)	B (A)	0.24 (0.11)	1 (0)
NB	27.0 (12.3)	D (B)	0.87 (0.64)	12 (5)
SB	6.1 (11.9)	A (B)	0.34 (0.67)	2 (6)
Total Future 2030				
Approach/ Movement	**Delay (s)**	**LOS**	**V/C**	**Q95th (m)**
EB	6.9 (8.3)	A (A)	0.28 (0.19)	1 (1)
WB	11.2 (7.0)	B (A)	0.24 (0.12)	0 (0)
NB	28.2 (12.7)	D (B)	0.88 (0.65)	5 (5)
SB	6.2 (12.3)	A (B)	0.35 (0.68)	6 (6)

5.0 Summary and Conclusions

École Secondaire Catholique Paul-Desmarais ('Paul-Desmarais Secondary School') is an existing middle and high school with an enrolment of 1,250 students, 100 staff members, and 22 portable classrooms (portables). The school is located on the northwest corner of Abbott Street East and Robert Grant Avenue within the Fernbank Community Design Plan (CDP). There is an existing bus loop at the school and a new additional bus loop is planned to be constructed, with access planned to the extension of Robert Grant Avenue.

The existing school driveway and access to the parking lot will remain accessible via Abbott Street East. The modifications to the school are not expected to impact the school student or staff population. The existing vehicle and bicycle parking is adequate and meets the requirements set by the City of Ottawa.

The existing school bus loop provides approximately 205 metres of storage space and the proposed bus loop will provide an additional 150 metres of storage space. There is also a Passenger Pickup Drop-Off lay-by area situated in front of the school which provides 60 metres of storage space, for eight (8) vehicles. In the AM peak hour, video data at the Abbott Street East and Robert Grant Avenue roundabout showed a quick turnover rate in the lay-by, with maximum utilization peaking at 100% between 8:55 AM to 9:05 AM. During the PM peak hour, layby area was full between 3:00 and 3:30 PM. Students start exiting the school at 3:30 PM, at which point turnover within the lay-by occurred.

It is forecast that Abbott Street East and Robert Grant Avenue will meet the MMLOS targets for cycling, transit, and trucks; however, both roadways will only achieve a pedestrian LOS C whereas the target is LOS A. The MMLOS pedestrian target could only be met if the speed limit on both roads were reduced to 30 km/h and if a boulevard of at least 0.5 metre wide was provided between the Abbott Street East sidewalk and the roadway.

The school driveway to Abbott Street East is anticipated to operate at LOS A with minimal delay during the weekday AM and PM peak hours. The intersection operates adequately under the existing condition. It is noted that the school currently provides a traffic control person following the afternoon bell to stop traffic on Abbott Street to allow the 28 school buses to exit. With the additional bus loop, there will be fewer school buses accessing Abbott Street. The school should continue to monitor the driveway operations.

The roundabout intersection of Robert Grant Avenue at Abbott Street is forecast to operate below an acceptable LOS in future, as indicated in Table 8. The results are based on the Highway Capacity Manual 6th Edition methodology for roundabouts. The school impact on the intersection is negligible. The City should monitor the operations of the roundabout over time and consider the need for a two-lane northbound entry to address future demands. It is noted that Robert Grant Avenue is planned to widen to a four-lane cross section in the future, which will increase the capacity of the roadway.

The Abbott Street East and Iber Road intersection is expected to operate at LOS F under future conditions. The proposed changes to the school bus routes have negligible impacts on the performance of the intersection. The City should monitor the intersection over time. Future improvement should consider include implementing a traffic control signal with separate eastbound and southbound left turn lanes; or, provide a roundabout.

The intersection of Robert Grant Avenue and Street 8 is forecasted to operate with LOS A.

The proposed roundabout of Robert Grant Avenue at Cransbill Avenue / Street 15 is forecast to operate at an acceptable LOS in future, as indicated in Table 11. The results are based on the Highway Capacity Manual 6th Edition methodology for roundabouts. The northbound movement operates with a delay of 28 seconds during the AM peak period and a volume-to-capacity ratio of 0.88. The school impact on the intersection is negligible. Intersection modifications or traffic control modifications are not required to address auto traffic demands.

Appendix A

Parking Calculations

MOTOR VEHICLE PARKING, BICYCLE PARKING, LOADING SPACES

Parking requirements as per Part 4 - Parking, Queuing and Loading Provisions, Area C on Schedule 1, Urban and Area.
Bicycle parking requirements as per Part 4, Section 111.
Loading spaces requirements as per Part 4, Table 113A and 113B.

PARKING CALCULATIONS

MOTOR VEHICLE PARKING: EXISTING SCHOOL, ADDITION, DOME, PORTABLES, PAVILION

REQUIRED	**USE**	**No. Class**	**Spaces per**	**Spaces required**
	Middle School	18	1.5/Class	27
	Middle School Portables	2	1.5/Class	3
	High School	35	2/Class	70
	High School Portables	4	2/Class	8
	Athletic Facility	1 surface	4/Suraface	4
	TOTAL REQUIRED PARKING SPACES			112 Spaces
	TOTAL REQUIRED BARRIER FREE SPACES			2 Spaces
PROVIDED	SPACES @ 5.2mD X 2.6mW			121 Spaces
	BARRIER FREE SPACES @ 5.2mD X 3.67mW			2 Spaces
	TOTAL SPACES PROVIDED			123 Spaces

BICYCLE PARKING (0.6 m X 1.8m)

REQUIRED	**USE**	**GROSS AREA**	**SPACES PER**	**SPACES REQ'D**
	School	8,217.1 m2	1 / 100 m2	83 Spaces
	Athletic Facility	10,165.6 m2	1 / 1500 m2	7 Spaces
	TOTAL REQUIRED PARKING SPACES			90 Spaces
PROVIDED	School			90 Spaces
	Athletic Facility			0 Spaces
	TOTAL SPACES PROVIDED			90 Spaces

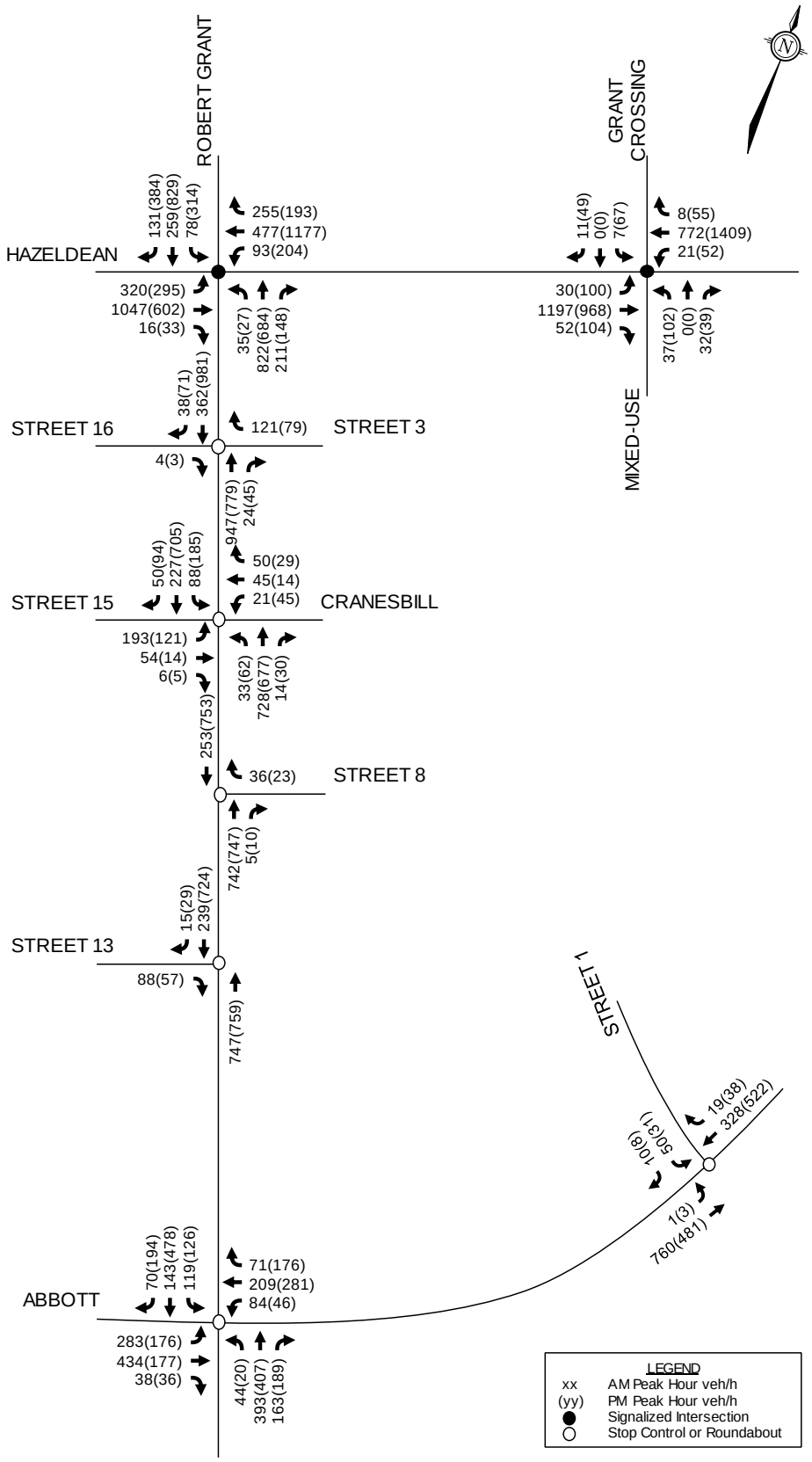
LOADING SPACES (3.5 m X 7.0 m)

REQUIRED	**USE**	**GROSS AREA**	**TABLE 113A**	**SPACES REQ'D**
	School	8,217.1 m2	Column VI	1 Spaces
	Athletic Facility	10,165.6 m2	Column VII	2 Spaces
	TOTAL REQUIRED PARKING SPACES			3 Spaces
PROVIDED	School			2 Spaces
	Athletic Facility			2 Spaces
	TOTAL SPACES PROVIDED			4 Spaces

Appendix B

Kizell Lands Volume Figure

Figure 9: 2030 Total Traffic Volumes (Scenario One)



Appendix C

Level of Service Descriptions

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS[1]

The term "level of service" implies a qualitative measure of traffic flow at an intersection. It is dependent upon the vehicle delay and vehicle queue lengths at approaches. The level of service at unsignalized intersections is often related to the delay accumulated by flows on the minor streets, caused by all other conflicting movements. The following table describes the characteristics of each level.

Level of Service	Features
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.
E	Very long traffic delays occur. Operations approach the capacity of the intersection.
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.

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(1) Highway Capacity Manual - Special Report No. 209, Transportation Research Board, 1985.

LEVEL OF SERVICE ANALYSIS AT SIGNALIZED INTERSECTIONS

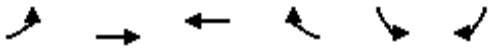
To assist in clarifying the arithmetic analysis associated with traffic engineering, it is often useful to refer to "Level of Service". The term Level of Service implies a qualitative measure of traffic flow at an intersection. It is dependent upon vehicle delay and vehicle queue lengths at the approaches. Specifically, Level of Service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period. The following table describes the characteristics of each level:

Level of Service	Features	Stopped Delay per Vehicle (sec)
A	At this level of service, almost no signal phase is fully utilized by traffic. Very seldom does a vehicle wait longer than one red indication. The approach appears open, turning movements are easily made and drivers have freedom of operation.	≤ 10
B	At this level, an occasional signal phase is fully utilized and many phases approach full use. Many drivers begin to feel somewhat restricted within platoons of vehicles approaching the intersection.	> 10-20
C	At this level, the operation is stable though with more frequent fully utilized signal phases. Drivers feel more restricted and occasionally may have to wait more than one red signal indication, and queues may develop behind turning vehicles. This level is normally employed in urban intersection design.	> 20-35
D	At this level, the motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough cycles with lower demand to permit occasional clearance of developing queues and prevent excessive backups.	> 35-55
E	At this level, capacity is reached. There are long queues of vehicles waiting upstream of the intersection and delays to vehicles may extend to several signal cycles.	> 55-80
F	At this level, saturation occurs, with vehicle demand exceeding the available capacity.	> 80

Appendix D

Intersection Performance Worksheets

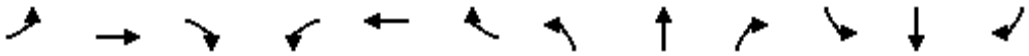
Existing Conditions



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	215	86	146	280	182	168
Future Volume (vph)	215	86	146	280	182	168
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	247	99	168	322	209	193

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	346	490	402
Volume Left (vph)	247	0	209
Volume Right (vph)	0	322	193
Hadj (s)	0.31	-0.26	-0.03
Departure Headway (s)	6.5	5.7	6.2
Degree Utilization, x	0.62	0.78	0.70
Capacity (veh/h)	535	607	551
Control Delay (s)	19.4	25.5	22.3
Approach Delay (s)	19.4	25.5	22.3
Approach LOS	C	D	C

Intersection Summary			
Delay	22.8		
Level of Service	C		
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		



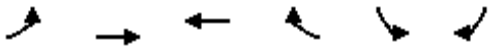
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	66	173	49	107	0	303	0	83	0	0	0
Future Volume (veh/h)	0	66	173	49	107	0	303	0	83	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	72	188	53	116	0	329	0	90	0	0	0
Approach Volume (veh/h)		260			169			419			0	
Crossing Volume (veh/h)		53			329			72			498	
High Capacity (veh/h)		1329			1069			1309			935	
High v/c (veh/h)		0.20			0.16			0.32			0.00	
Low Capacity (veh/h)		1110			876			1092			756	
Low v/c (veh/h)		0.23			0.19			0.38			0.00	

Intersection Summary					
Maximum v/c High	0.32				
Maximum v/c Low	0.38				
Intersection Capacity Utilization	69.1%	ICU Level of Service		C	

Intersection	
Intersection Delay, s/veh	5.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	260	169	419	0
Demand Flow Rate, veh/h	288	172	440	0
Vehicles Circulating, veh/h	53	349	74	521
Vehicles Exiting, veh/h	468	165	267	0
Ped Vol Crossing Leg, #/h	33	7	41	33
Ped Cap Adj	0.995	0.999	0.994	0.995
Approach Delay, s/veh	5.0	5.5	6.3	0.0
Approach LOS	A	A	A	-

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	288	172	440	0
Cap Entry Lane, veh/h	1307	967	1280	811
Entry HV Adj Factor	0.902	0.980	0.952	1.000
Flow Entry, veh/h	260	169	419	0
Cap Entry, veh/h	1174	946	1212	807
V/C Ratio	0.221	0.178	0.346	0.000
Control Delay, s/veh	5.0	5.5	6.3	4.5
LOS	A	A	A	A
95th %tile Queue, veh	1	1	2	0



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	58	250	385	38	14	30
Future Volume (Veh/h)	58	250	385	38	14	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	72	309	475	47	17	37
Pedestrians					26	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	548				978	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	548				978	524
tC, single (s)	4.4				7.0	6.9
tC, 2 stage (s)						
tF (s)	2.5				4.0	3.9
p0 queue free %	92				91	91
cM capacity (veh/h)	860				199	431

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	381	522	54
Volume Left	72	0	17
Volume Right	0	47	37
cSH	860	1700	315
Volume to Capacity	0.08	0.31	0.17
Queue Length 95th (m)	2.2	0.0	4.9
Control Delay (s)	2.6	0.0	18.8
Lane LOS	A		C
Approach Delay (s)	2.6	0.0	18.8
Approach LOS			C

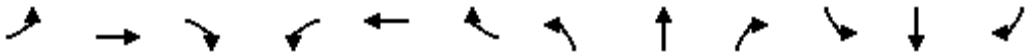
Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1029	1091			1636	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



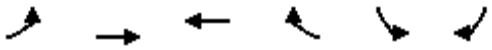
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Approach Volume (veh/h)		0			0			0			0	
Crossing Volume (veh/h)		0			0			0			0	
High Capacity (veh/h)		1385			1385			1385			1385	
High v/c (veh/h)		0.00			0.00			0.00			0.00	
Low Capacity (veh/h)		1161			1161			1161			1161	
Low v/c (veh/h)		0.00			0.00			0.00			0.00	

Intersection Summary					
Maximum v/c High	0.00				
Maximum v/c Low	0.00				
Intersection Capacity Utilization	0.0%	ICU Level of Service		A	

Intersection	
Intersection Delay, s/veh	0.0
Intersection LOS	-

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	0	0	0	0
Demand Flow Rate, veh/h	0	0	0	0
Vehicles Circulating, veh/h	0	0	0	0
Vehicles Exiting, veh/h	0	0	0	0
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	0.0	0.0	0.0	0.0
Approach LOS	-	-	-	-

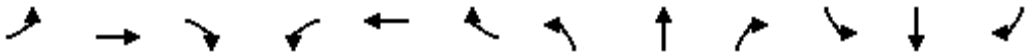
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	0	0	0	0
Cap Entry Lane, veh/h	1380	1380	1380	1380
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	0	0	0	0
Cap Entry, veh/h	1380	1380	1380	1380
V/C Ratio	0.000	0.000	0.000	0.000
Control Delay, s/veh	2.6	2.6	2.6	2.6
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	224	98	82	285	300	195
Future Volume (vph)	224	98	82	285	300	195
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	246	108	90	313	330	214

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	354	403	544
Volume Left (vph)	246	0	330
Volume Right (vph)	0	313	214
Hadj (s)	0.21	-0.31	-0.04
Departure Headway (s)	6.8	6.2	6.2
Degree Utilization, x	0.67	0.70	0.93
Capacity (veh/h)	517	550	574
Control Delay (s)	22.4	22.3	47.1
Approach Delay (s)	22.4	22.3	47.1
Approach LOS	C	C	E

Intersection Summary			
Delay	32.7		
Level of Service	D		
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		



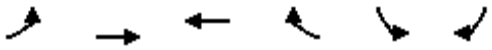
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	105	291	83	76	0	228	0	74	0	0	0
Future Volume (veh/h)	0	105	291	83	76	0	228	0	74	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	114	316	90	83	0	248	0	80	0	0	0
Approach Volume (veh/h)		430			173			328			0	
Crossing Volume (veh/h)		90			248			114			421	
High Capacity (veh/h)		1291			1140			1267			994	
High v/c (veh/h)		0.33			0.15			0.26			0.00	
Low Capacity (veh/h)		1076			939			1054			808	
Low v/c (veh/h)		0.40			0.18			0.31			0.00	

Intersection Summary				
Maximum v/c High	0.33			
Maximum v/c Low	0.40			
Intersection Capacity Utilization	75.2%	ICU Level of Service	D	

Intersection	
Intersection Delay, s/veh	6.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	430	173	328	0
Demand Flow Rate, veh/h	462	185	344	0
Vehicles Circulating, veh/h	92	263	124	448
Vehicles Exiting, veh/h	356	205	430	0
Ped Vol Crossing Leg, #/h	75	43	94	13
Ped Cap Adj	0.990	0.994	0.987	0.998
Approach Delay, s/veh	6.8	5.3	5.8	0.0
Approach LOS	A	A	A	-

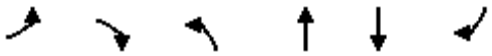
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	462	185	344	0
Cap Entry Lane, veh/h	1256	1055	1216	874
Entry HV Adj Factor	0.930	0.935	0.953	1.000
Flow Entry, veh/h	430	173	328	0
Cap Entry, veh/h	1157	981	1144	872
V/C Ratio	0.372	0.176	0.287	0.000
Control Delay, s/veh	6.8	5.3	5.8	4.1
LOS	A	A	A	A
95th %tile Queue, veh	2	1	1	0



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	373	321	13	32	59
Future Volume (Veh/h)	13	373	321	13	32	59
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.88	0.88	0.55	0.55
Hourly flow rate (vph)	15	444	365	15	58	107
Pedestrians					44	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					4	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	424				890	416
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	424				890	416
tC, single (s)	4.4				6.7	6.5
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.6
p0 queue free %	98				78	81
cM capacity (veh/h)	960				264	555

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	459	380	165
Volume Left	15	0	58
Volume Right	0	15	107
cSH	960	1700	401
Volume to Capacity	0.02	0.22	0.41
Queue Length 95th (m)	0.4	0.0	15.8
Control Delay (s)	0.5	0.0	20.1
Lane LOS	A		C
Approach Delay (s)	0.5	0.0	20.1
Approach LOS			C

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1029	1091	1636			

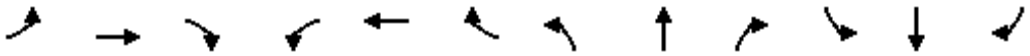
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	0	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1029	1091			1636	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	0	0
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Approach Volume (veh/h)		0			0			0			0	
Crossing Volume (veh/h)		0			0			0			0	
High Capacity (veh/h)		1385			1385			1385			1385	
High v/c (veh/h)		0.00			0.00			0.00			0.00	
Low Capacity (veh/h)		1161			1161			1161			1161	
Low v/c (veh/h)		0.00			0.00			0.00			0.00	

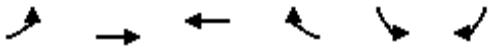
Intersection Summary					
Maximum v/c High	0.00				
Maximum v/c Low	0.00				
Intersection Capacity Utilization	0.0%	ICU Level of Service		A	

Intersection	
Intersection Delay, s/veh	0.0
Intersection LOS	-

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	0	0	0	0
Demand Flow Rate, veh/h	0	0	0	0
Vehicles Circulating, veh/h	0	0	0	0
Vehicles Exiting, veh/h	0	0	0	0
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	0.0	0.0	0.0	0.0
Approach LOS	-	-	-	-

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	0	0	0	0
Cap Entry Lane, veh/h	1380	1380	1380	1380
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	0	0	0	0
Cap Entry, veh/h	1380	1380	1380	1380
V/C Ratio	0.000	0.000	0.000	0.000
Control Delay, s/veh	2.6	2.6	2.6	2.6
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

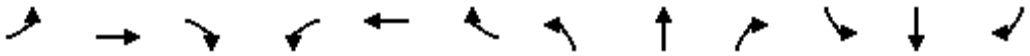
Future Background



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	108	372	145	239	464	84
Future Volume (vph)	108	372	145	239	464	84
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	124	428	167	275	533	97

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	552	442	630
Volume Left (vph)	124	0	533
Volume Right (vph)	0	275	97
Hadj (s)	0.28	-0.24	0.27
Departure Headway (s)	7.1	6.7	7.0
Degree Utilization, x	1.08	0.83	1.23
Capacity (veh/h)	521	528	518
Control Delay (s)	90.5	34.4	144.3
Approach Delay (s)	90.5	34.4	144.3
Approach LOS	F	D	F

Intersection Summary			
Delay	96.1		
Level of Service	F		
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		



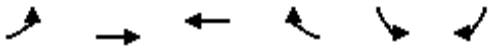
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	283	438	70	106	218	71	104	474	178	119	207	70
Future Volume (veh/h)	283	438	70	106	218	71	104	474	178	119	207	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	283	438	70	106	218	71	104	474	178	119	207	70
Approach Volume (veh/h)		791			395			756			396	
Crossing Volume (veh/h)		432			861			840			428	
High Capacity (veh/h)		985			697			709			989	
High v/c (veh/h)		0.80			0.57			1.07			0.40	
Low Capacity (veh/h)		801			547			558			804	
Low v/c (veh/h)		0.99			0.72			1.36			0.49	

Intersection Summary				
Maximum v/c High	1.07			
Maximum v/c Low	1.36			
Intersection Capacity Utilization	114.0%	ICU Level of Service	H	

Intersection	
Intersection Delay, s/veh	76.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	791	395	756	396
Demand Flow Rate, veh/h	814	402	764	396
Vehicles Circulating, veh/h	432	867	853	441
Vehicles Exiting, veh/h	405	750	393	828
Ped Vol Crossing Leg, #/h	33	7	41	33
Ped Cap Adj	0.995	0.999	0.994	0.995
Approach Delay, s/veh	36.3	23.9	181.6	9.7
Approach LOS	E	C	F	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	814	402	764	396
Cap Entry Lane, veh/h	888	570	578	880
Entry HV Adj Factor	0.972	0.984	0.990	1.000
Flow Entry, veh/h	791	395	756	396
Cap Entry, veh/h	859	560	569	876
V/C Ratio	0.921	0.706	1.329	0.452
Control Delay, s/veh	36.3	23.9	181.6	9.7
LOS	E	C	F	A
95th %tile Queue, veh	13	6	32	2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	58	778	354	38	13	30
Future Volume (Veh/h)	58	778	354	38	13	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	72	960	437	47	16	37
Pedestrians					26	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	510				1590	486
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	510				1590	486
tC, single (s)	4.4				7.0	6.9
tC, 2 stage (s)						
tF (s)	2.5				4.0	3.9
p0 queue free %	92				80	92
cM capacity (veh/h)	890				79	455

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	1032	484	53
Volume Left	72	0	16
Volume Right	0	47	37
cSH	890	1700	187
Volume to Capacity	0.08	0.28	0.28
Queue Length 95th (m)	2.1	0.0	8.9
Control Delay (s)	2.3	0.0	31.7
Lane LOS	A		D
Approach Delay (s)	2.3	0.0	31.7
Approach LOS			D

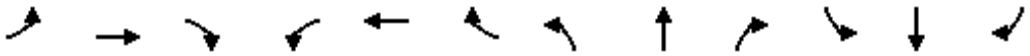
Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

Intersection Sign configuration not allowed in HCM analysis.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	36	823	5	0	317
Future Volume (Veh/h)	0	36	823	5	0	317
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	39	895	5	0	345
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1242	898			900	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1242	898			900	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	89			100	
cM capacity (veh/h)	195	341			763	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	39	900	345
Volume Left	0	0	0
Volume Right	39	5	0
cSH	341	1700	763
Volume to Capacity	0.11	0.53	0.00
Queue Length 95th (m)	3.1	0.0	0.0
Control Delay (s)	16.9	0.0	0.0
Lane LOS	C		
Approach Delay (s)	16.9	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		



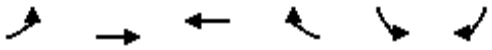
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	193	54	6	21	45	50	33	809	14	88	291	50
Future Volume (veh/h)	193	54	6	21	45	50	33	809	14	88	291	50
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	193	54	6	21	45	50	33	809	14	88	291	50
Approach Volume (veh/h)		253			116			856			429	
Crossing Volume (veh/h)		400			1035			335			99	
High Capacity (veh/h)		1011			605			1064			1282	
High v/c (veh/h)		0.25			0.19			0.80			0.33	
Low Capacity (veh/h)		823			468			871			1068	
Low v/c (veh/h)		0.31			0.25			0.98			0.40	

Intersection Summary				
Maximum v/c High	0.80			
Maximum v/c Low	0.98			
Intersection Capacity Utilization	82.9%	ICU Level of Service	E	

Intersection	
Intersection Delay, s/veh	17.4
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	253	116	856	429
Demand Flow Rate, veh/h	253	116	856	429
Vehicles Circulating, veh/h	400	1035	335	99
Vehicles Exiting, veh/h	128	156	318	1052
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.8	11.1	27.0	6.1
Approach LOS	A	B	D	A

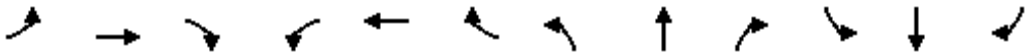
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	253	116	856	429
Cap Entry Lane, veh/h	918	480	981	1247
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	253	116	856	429
Cap Entry, veh/h	918	480	981	1247
V/C Ratio	0.276	0.242	0.873	0.344
Control Delay, s/veh	6.8	11.1	27.0	6.1
LOS	A	B	D	A
95th %tile Queue, veh	1	1	12	2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	83	107	122	353	252	110
Future Volume (vph)	83	107	122	353	252	110
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	91	118	134	388	277	121

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	209	522	398
Volume Left (vph)	91	0	277
Volume Right (vph)	0	388	121
Hadj (s)	0.18	-0.29	0.03
Departure Headway (s)	6.2	5.3	5.9
Degree Utilization, x	0.36	0.76	0.65
Capacity (veh/h)	539	663	579
Control Delay (s)	12.6	23.2	19.3
Approach Delay (s)	12.6	23.2	19.3
Approach LOS	B	C	C

Intersection Summary			
Delay	19.8		
Level of Service	C		
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		



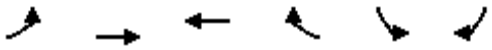
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	143	153	83	41	231	143	45	376	163	103	427	158
Future Volume (veh/h)	143	153	83	41	231	143	45	376	163	103	427	158
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	143	153	83	41	231	143	45	376	163	103	427	158
Approach Volume (veh/h)		379			415			584			688	
Crossing Volume (veh/h)		571			564			399			317	
High Capacity (veh/h)		882			887			1012			1080	
High v/c (veh/h)		0.43			0.47			0.58			0.64	
Low Capacity (veh/h)		709			713			824			885	
Low v/c (veh/h)		0.53			0.58			0.71			0.78	

Intersection Summary				
Maximum v/c High	0.64			
Maximum v/c Low	0.78			
Intersection Capacity Utilization	116.0%	ICU Level of Service	H	

Intersection	
Intersection Delay, s/veh	14.8
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	379	415	584	688
Demand Flow Rate, veh/h	399	444	589	688
Vehicles Circulating, veh/h	572	567	413	349
Vehicles Exiting, veh/h	465	435	558	662
Ped Vol Crossing Leg, #/h	75	43	94	13
Ped Cap Adj	0.990	0.994	0.987	0.998
Approach Delay, s/veh	12.9	14.5	14.8	16.0
Approach LOS	B	B	B	C

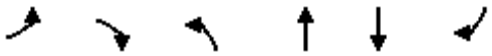
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	399	444	589	688
Cap Entry Lane, veh/h	770	774	906	967
Entry HV Adj Factor	0.950	0.935	0.992	1.000
Flow Entry, veh/h	379	415	584	688
Cap Entry, veh/h	724	720	886	965
V/C Ratio	0.524	0.577	0.659	0.713
Control Delay, s/veh	12.9	14.5	14.8	16.0
LOS	B	B	B	C
95th %tile Queue, veh	3	4	5	6



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	346	420	13	32	59
Future Volume (Veh/h)	13	346	420	13	32	59
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.88	0.88	0.55	0.55
Hourly flow rate (vph)	15	412	477	15	58	107
Pedestrians					44	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					4	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	536				970	528
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	536				970	528
tC, single (s)	4.4				6.7	6.5
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.6
p0 queue free %	98				75	78
cM capacity (veh/h)	868				236	477

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	427	492	165
Volume Left	15	0	58
Volume Right	0	15	107
cSH	868	1700	351
Volume to Capacity	0.02	0.29	0.47
Queue Length 95th (m)	0.4	0.0	19.3
Control Delay (s)	0.5	0.0	24.0
Lane LOS	A		C
Approach Delay (s)	0.5	0.0	24.0
Approach LOS			C

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	663	649	0
Future Volume (Veh/h)	0	0	0	663	649	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	721	705	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1426	705	705			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1426	705	705			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	151	440	902			

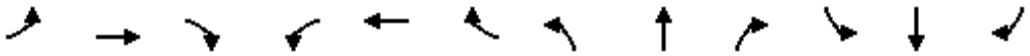
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	721	705
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	902	1700
Volume to Capacity	0.00	0.00	0.41
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	19	653	9	0	649
Future Volume (Veh/h)	0	19	653	9	0	649
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	21	710	10	0	705
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1420	715			720	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1420	715			720	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			100	
cM capacity (veh/h)	152	434			891	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	21	720	705
Volume Left	0	0	0
Volume Right	21	10	0
cSH	434	1700	891
Volume to Capacity	0.05	0.42	0.00
Queue Length 95th (m)	1.2	0.0	0.0
Control Delay (s)	13.7	0.0	0.0
Lane LOS	B		
Approach Delay (s)	13.7	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	99	12	5	37	12	24	51	597	25	150	610	77
Future Volume (veh/h)	99	12	5	37	12	24	51	597	25	150	610	77
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	99	12	5	37	12	24	51	597	25	150	610	77
Approach Volume (veh/h)		116			73			673			837	
Crossing Volume (veh/h)		797			747			261			100	
High Capacity (veh/h)		735			765			1129			1281	
High v/c (veh/h)		0.16			0.10			0.60			0.65	
Low Capacity (veh/h)		580			606			929			1067	
Low v/c (veh/h)		0.20			0.12			0.72			0.78	

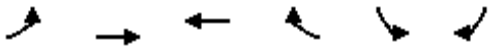
Intersection Summary				
Maximum v/c High	0.65			
Maximum v/c Low	0.78			
Intersection Capacity Utilization	95.6%	ICU Level of Service	F	

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	116	73	673	837
Demand Flow Rate, veh/h	116	73	673	837
Vehicles Circulating, veh/h	797	747	261	100
Vehicles Exiting, veh/h	140	187	652	720
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.2	6.9	12.3	11.9
Approach LOS	A	A	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	116	73	673	837
Cap Entry Lane, veh/h	612	644	1057	1246
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	116	73	673	837
Cap Entry, veh/h	612	644	1057	1246
V/C Ratio	0.190	0.113	0.636	0.672
Control Delay, s/veh	8.2	6.9	12.3	11.9
LOS	A	A	B	B
95th %tile Queue, veh	1	0	5	6

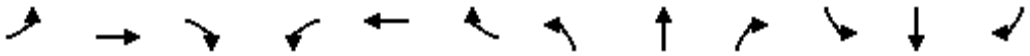
Future Total



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	108	372	145	228	454	84
Future Volume (vph)	108	372	145	228	454	84
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	124	428	167	262	522	97

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	552	429	619
Volume Left (vph)	124	0	522
Volume Right (vph)	0	262	97
Hadj (s)	0.28	-0.23	0.26
Departure Headway (s)	7.0	6.8	7.0
Degree Utilization, x	1.08	0.80	1.21
Capacity (veh/h)	522	527	519
Control Delay (s)	88.9	31.9	133.8
Approach Delay (s)	88.9	31.9	133.8
Approach LOS	F	D	F

Intersection Summary			
Delay	91.0		
Level of Service	F		
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		



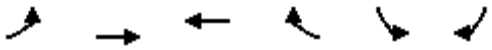
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	283	438	70	106	218	71	104	474	178	119	207	70
Future Volume (veh/h)	283	438	70	106	218	71	104	474	178	119	207	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	283	438	70	106	218	71	104	474	178	119	207	70
Approach Volume (veh/h)		791			395			756			396	
Crossing Volume (veh/h)		432			861			840			428	
High Capacity (veh/h)		985			697			709			989	
High v/c (veh/h)		0.80			0.57			1.07			0.40	
Low Capacity (veh/h)		801			547			558			804	
Low v/c (veh/h)		0.99			0.72			1.36			0.49	

Intersection Summary					
Maximum v/c High	1.07				
Maximum v/c Low	1.36				
Intersection Capacity Utilization	114.0%	ICU Level of Service		H	

Intersection	
Intersection Delay, s/veh	76.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	791	395	756	396
Demand Flow Rate, veh/h	814	402	764	396
Vehicles Circulating, veh/h	432	867	853	441
Vehicles Exiting, veh/h	405	750	393	828
Ped Vol Crossing Leg, #/h	33	7	41	33
Ped Cap Adj	0.995	0.999	0.994	0.995
Approach Delay, s/veh	36.3	23.9	181.6	9.7
Approach LOS	E	C	F	A

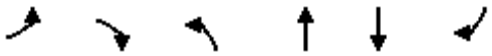
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	814	402	764	396
Cap Entry Lane, veh/h	888	570	578	880
Entry HV Adj Factor	0.972	0.984	0.990	1.000
Flow Entry, veh/h	791	395	756	396
Cap Entry, veh/h	859	560	569	876
V/C Ratio	0.921	0.706	1.329	0.452
Control Delay, s/veh	36.3	23.9	181.6	9.7
LOS	E	C	F	A
95th %tile Queue, veh	13	6	32	2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	48	778	354	38	13	20
Future Volume (Veh/h)	48	778	354	38	13	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	59	960	437	47	16	25
Pedestrians					26	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	510				1564	486
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	510				1564	486
tC, single (s)	4.4				7.0	6.9
tC, 2 stage (s)						
tF (s)	2.5				4.0	3.9
p0 queue free %	93				81	95
cM capacity (veh/h)	890				84	455

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	1019	484	41
Volume Left	59	0	16
Volume Right	0	47	25
cSH	890	1700	167
Volume to Capacity	0.07	0.28	0.25
Queue Length 95th (m)	1.7	0.0	7.4
Control Delay (s)	1.9	0.0	33.5
Lane LOS	A		D
Approach Delay (s)	1.9	0.0	33.5
Approach LOS			D

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	0	0	828	396	10
Future Volume (Veh/h)	10	0	0	828	396	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.55	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	0	0	900	430	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1336	436	441			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1336	436	441			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	100	100			
cM capacity (veh/h)	171	625	1130			

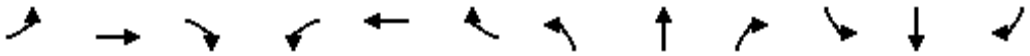
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	900	441
Volume Left	18	0	0
Volume Right	0	0	11
cSH	171	1130	1700
Volume to Capacity	0.11	0.00	0.26
Queue Length 95th (m)	2.8	0.0	0.0
Control Delay (s)	28.5	0.0	0.0
Lane LOS	D		
Approach Delay (s)	28.5	0.0	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	36	833	5	0	327
Future Volume (Veh/h)	0	36	833	5	0	327
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	39	905	5	0	355
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1262	908			910	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1262	908			910	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	88			100	
cM capacity (veh/h)	189	337			757	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	39	910	355
Volume Left	0	0	0
Volume Right	39	5	0
cSH	337	1700	757
Volume to Capacity	0.12	0.54	0.00
Queue Length 95th (m)	3.1	0.0	0.0
Control Delay (s)	17.1	0.0	0.0
Lane LOS	C		
Approach Delay (s)	17.1	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		



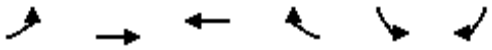
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	193	54	6	21	45	50	33	819	14	88	301	50
Future Volume (veh/h)	193	54	6	21	45	50	33	819	14	88	301	50
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	193	54	6	21	45	50	33	819	14	88	301	50
Approach Volume (veh/h)		253			116			866			439	
Crossing Volume (veh/h)		410			1045			335			99	
High Capacity (veh/h)		1003			600			1064			1282	
High v/c (veh/h)		0.25			0.19			0.81			0.34	
Low Capacity (veh/h)		816			463			871			1068	
Low v/c (veh/h)		0.31			0.25			0.99			0.41	

Intersection Summary					
Maximum v/c High	0.81				
Maximum v/c Low	0.99				
Intersection Capacity Utilization	83.5%	ICU Level of Service		E	

Intersection	
Intersection Delay, s/veh	18.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	253	116	866	439
Demand Flow Rate, veh/h	253	116	866	439
Vehicles Circulating, veh/h	410	1045	335	99
Vehicles Exiting, veh/h	128	156	328	1062
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.9	11.2	28.2	6.2
Approach LOS	A	B	D	A

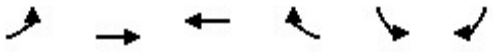
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	253	116	866	439
Cap Entry Lane, veh/h	908	475	981	1247
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	253	116	866	439
Cap Entry, veh/h	908	475	981	1247
V/C Ratio	0.279	0.244	0.883	0.352
Control Delay, s/veh	6.9	11.2	28.2	6.2
LOS	A	B	D	A
95th %tile Queue, veh	1	1	12	2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	108	372	145	228	454	84
Future Volume (vph)	108	372	145	228	454	84
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.92		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1594	1552	1508		1527	1443
Flt Permitted	0.36	1.00	1.00		0.95	1.00
Satd. Flow (perm)	606	1552	1508		1527	1443
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	124	428	167	262	522	97
RTOR Reduction (vph)	0	0	65	0	0	53
Lane Group Flow (vph)	124	428	364	0	522	44
Confl. Peds. (#/hr)	4			4		
Heavy Vehicles (%)	7%	16%	9%	7%	12%	6%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)	22.4	22.4	22.4		26.5	26.5
Effective Green, g (s)	22.4	22.4	22.4		26.5	26.5
Actuated g/C Ratio	0.39	0.39	0.39		0.46	0.46
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	234	600	583		698	660
v/s Ratio Prot		c0.28	0.24		c0.34	
v/s Ratio Perm	0.20					0.03
v/c Ratio	0.53	0.71	0.62		0.75	0.07
Uniform Delay, d1	13.7	15.0	14.3		12.9	8.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.2	4.0	2.1		4.4	0.0
Delay (s)	15.9	19.0	16.4		17.3	8.8
Level of Service	B	B	B		B	A
Approach Delay (s)		18.3	16.4		16.0	
Approach LOS		B	B		B	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

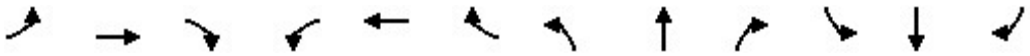
c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	83	107	122	340	252	110
Future Volume (vph)	83	107	122	340	252	110
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	91	118	134	374	277	121

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	209	508	398
Volume Left (vph)	91	0	277
Volume Right (vph)	0	374	121
Hadj (s)	0.18	-0.29	0.03
Departure Headway (s)	6.2	5.3	5.9
Degree Utilization, x	0.36	0.74	0.65
Capacity (veh/h)	542	663	583
Control Delay (s)	12.5	21.8	19.0
Approach Delay (s)	12.5	21.8	19.0
Approach LOS	B	C	C

Intersection Summary			
Delay	19.1		
Level of Service	C		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		



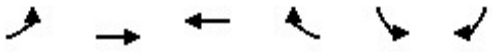
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	143	153	83	41	231	143	45	376	163	103	427	158
Future Volume (veh/h)	143	153	83	41	231	143	45	376	163	103	427	158
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	143	153	83	41	231	143	45	376	163	103	427	158
Approach Volume (veh/h)		379			415			584			688	
Crossing Volume (veh/h)		571			564			399			317	
High Capacity (veh/h)		882			887			1012			1080	
High v/c (veh/h)		0.43			0.47			0.58			0.64	
Low Capacity (veh/h)		709			713			824			885	
Low v/c (veh/h)		0.53			0.58			0.71			0.78	

Intersection Summary				
Maximum v/c High	0.64			
Maximum v/c Low	0.78			
Intersection Capacity Utilization	116.0%	ICU Level of Service		H

Intersection	
Intersection Delay, s/veh	14.8
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	379	415	584	688
Demand Flow Rate, veh/h	399	444	589	688
Vehicles Circulating, veh/h	572	567	413	349
Vehicles Exiting, veh/h	465	435	558	662
Ped Vol Crossing Leg, #/h	75	43	94	13
Ped Cap Adj	0.990	0.994	0.987	0.998
Approach Delay, s/veh	12.9	14.5	14.8	16.0
Approach LOS	B	B	B	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	399	444	589	688
Cap Entry Lane, veh/h	770	774	906	967
Entry HV Adj Factor	0.950	0.935	0.992	1.000
Flow Entry, veh/h	379	415	584	688
Cap Entry, veh/h	724	720	886	965
V/C Ratio	0.524	0.577	0.659	0.713
Control Delay, s/veh	12.9	14.5	14.8	16.0
LOS	B	B	B	C
95th %tile Queue, veh	3	4	5	6



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	346	420	13	32	46
Future Volume (Veh/h)	13	346	420	13	32	46
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.88	0.88	0.55	0.55
Hourly flow rate (vph)	15	412	477	15	58	84
Pedestrians					44	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					4	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	536				970	528
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	536				970	528
tC, single (s)	4.4				6.7	6.5
tC, 2 stage (s)						
tF (s)	2.5				3.8	3.6
p0 queue free %	98				75	82
cM capacity (veh/h)	868				236	477

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	427	492	142
Volume Left	15	0	58
Volume Right	0	15	84
cSH	868	1700	336
Volume to Capacity	0.02	0.29	0.42
Queue Length 95th (m)	0.4	0.0	16.2
Control Delay (s)	0.5	0.0	23.3
Lane LOS	A		C
Approach Delay (s)	0.5	0.0	23.3
Approach LOS			C

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	0	0	663	649	13
Future Volume (Veh/h)	13	0	0	663	649	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.55	0.55	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	0	0	721	705	14
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1433	712	719			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1433	712	719			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	100	100			
cM capacity (veh/h)	149	436	892			

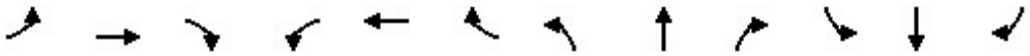
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	24	721	719
Volume Left	24	0	0
Volume Right	0	0	14
cSH	149	892	1700
Volume to Capacity	0.16	0.00	0.42
Queue Length 95th (m)	4.4	0.0	0.0
Control Delay (s)	33.7	0.0	0.0
Lane LOS	D		
Approach Delay (s)	33.7	0.0	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	19	666	9	0	662
Future Volume (Veh/h)	0	19	666	9	0	662
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	21	724	10	0	720
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1449	729			734	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1449	729			734	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			100	
cM capacity (veh/h)	146	426			880	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	21	734	720
Volume Left	0	0	0
Volume Right	21	10	0
cSH	426	1700	880
Volume to Capacity	0.05	0.43	0.00
Queue Length 95th (m)	1.2	0.0	0.0
Control Delay (s)	13.9	0.0	0.0
Lane LOS	B		
Approach Delay (s)	13.9	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		



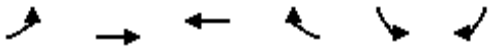
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	99	12	5	37	12	24	51	610	25	150	623	77
Future Volume (veh/h)	99	12	5	37	12	24	51	610	25	150	623	77
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	99	12	5	37	12	24	51	610	25	150	623	77
Approach Volume (veh/h)		116			73			686			850	
Crossing Volume (veh/h)		810			760			261			100	
High Capacity (veh/h)		727			757			1129			1281	
High v/c (veh/h)		0.16			0.10			0.61			0.66	
Low Capacity (veh/h)		573			599			929			1067	
Low v/c (veh/h)		0.20			0.12			0.74			0.80	

Intersection Summary				
Maximum v/c High	0.66			
Maximum v/c Low	0.80			
Intersection Capacity Utilization	96.7%	ICU Level of Service		F

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	116	73	686	850
Demand Flow Rate, veh/h	116	73	686	850
Vehicles Circulating, veh/h	810	760	261	100
Vehicles Exiting, veh/h	140	187	665	733
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.3	7.0	12.7	12.3
Approach LOS	A	A	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	116	73	686	850
Cap Entry Lane, veh/h	604	636	1057	1246
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	116	73	686	850
Cap Entry, veh/h	604	636	1057	1246
V/C Ratio	0.192	0.115	0.649	0.682
Control Delay, s/veh	8.3	7.0	12.7	12.3
LOS	A	A	B	B
95th %tile Queue, veh	1	0	5	6



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	83	107	122	340	252	110
Future Volume (vph)	83	107	122	340	252	110
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98		1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.90		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1660	1682	1455		1629	1393
Flt Permitted	0.38	1.00	1.00		0.95	1.00
Satd. Flow (perm)	666	1682	1455		1629	1393
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	91	118	134	374	277	121
RTOR Reduction (vph)	0	0	243	0	0	78
Lane Group Flow (vph)	91	118	265	0	277	43
Confl. Peds. (#/hr)				11		33
Confl. Bikes (#/hr)						15
Heavy Vehicles (%)	3%	7%	9%	9%	5%	3%
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)	10.5	10.5	10.5		10.8	10.8
Effective Green, g (s)	10.5	10.5	10.5		10.8	10.8
Actuated g/C Ratio	0.35	0.35	0.35		0.36	0.36
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	230	582	504		580	496
v/s Ratio Prot		0.07	c0.18		c0.17	
v/s Ratio Perm	0.14					0.03
v/c Ratio	0.40	0.20	0.53		0.48	0.09
Uniform Delay, d1	7.5	7.0	7.9		7.6	6.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.1	0.2	1.0		0.6	0.1
Delay (s)	8.6	7.1	8.9		8.2	6.6
Level of Service	A	A	A		A	A
Approach Delay (s)		7.8	8.9		7.7	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	30.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Appendix E

TDM-Supportive Development Design and Infrastructure Checklist

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	☒
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☒
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)*	☒
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)*	☒

	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	☒
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☒
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	☐ N/A for site plan application.
	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	☐ N/A site is located near street
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)	☐ N/A school site

		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)*	☒ Bicycle parking is located at north and south ends of school.
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)*	☒
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	☒
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 for school
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)	☐ N/A for school
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☒ Shower provided for staff.
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)	☐ N/A for school

	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, shelter already provided
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, shelter already provided
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐ N/A for school
	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	☐ N/A for school
	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	☐ N/A for school
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐ N/A for school
	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)*	☐ N/A for school
	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	☐ N/A for school

		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	☐ N/A parking meets zoning requirements
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	☐ N/A for school
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)*	☐ N/A for school
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)*	☐ N/A for school
	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)	☐ N/A for school
	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	☐ N/A for school

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	☐ N/A for school
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐ N/A for school
	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	☐ N/A for school
	2.2	**Bicycle skills training**	
		Commuter travel	
BETTER ★	2.2.1	Offer on-site cycling courses for commuters, or subsidize off-site courses	☐ N/A for school
	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)	☐ N/A for school

		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	☒ Recommended
BASIC	3.1.2	Provide online links to OC Transpo and STO information	☒ Recommended
BETTER	3.1.3	Provide real-time arrival information display at entrances	☐ N/A for school
		3.2 Transit fare incentives	
		Commuter travel	
BETTER	3.2.1	Offer preloaded PRESTO cards to encourage commuters to use transit	☒ Recommended
BETTER ★	3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	☒ Recommended
		Visitor travel	
BETTER	3.2.3	Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐ N/A for school
		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)	☐ N/A for school
		Visitor travel	
BETTER	3.3.2	Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐ N/A for school
		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)	☐ N/A for school
		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)	☐ N/A for school

		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	☐ N/A for school
	4.2	**Carpool parking price incentives**	
		Commuter travel	
BETTER	4.2.1	Provide discounts on parking costs for registered carpools	☐ N/A for school
	4.3	**Vanpool service**	
		Commuter travel	
BETTER	4.3.1	Provide a vanpooling service for long-distance commuters	☐ N/A for school
	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	☐ N/A for school
		Commuter travel	
BETTER	5.1.2	Provide employees with bikeshare memberships for local business travel	☐ N/A for school
	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	☐ N/A for school
BETTER	5.2.2	Provide employees with carshare memberships for local business travel	☐ N/A for school
	6.	**PARKING**	
	6.1	**Priced parking**	
		Commuter travel	
BASIC ★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	☐ N/A for school
BASIC	6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	☐ N/A for school
		Visitor travel	
BETTER	6.1.3	Charge for short-term parking (hourly)	☐ N/A for school

		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	☐ N/A for school
		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)	☐ N/A for school
	7.2	**Personalized trip planning**	
		Commuter travel	
BETTER ★	7.2.1	Offer personalized trip planning to new/relocating employees	☐ N/A for school
	7.3	**Promotions**	
		Commuter travel	
BETTER	7.3.1	Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐ N/A for school
	8.	**OTHER INCENTIVES & AMENITIES**	
	8.1	**Emergency ride home**	
		Commuter travel	
BETTER ★	8.1.1	Provide emergency ride home service to non-driving commuters	☐ N/A for school
	8.2	**Alternative work arrangements**	
		Commuter travel	
BASIC ★	8.2.1	Encourage flexible work hours	☐ N/A for school
BETTER	8.2.2	Encourage compressed workweeks	☐ N/A for school
BETTER ★	8.2.3	Encourage telework	☐ N/A for school
	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	☐ N/A for school
	8.4	**Commuter incentives**	
		Commuter travel	
BETTER	8.4.1	Offer employees a taxable, mode-neutral commuting allowance	☐ N/A for school
	8.5	**On-site amenities**	
		Commuter travel	
BETTER	8.5.1	Provide on-site amenities/services to minimize mid-day or mid-commute errands	☐ N/A for school