DILLON CONSULTING

OTTAWA CATHOLIC SCHOOL BOARD

Transportation Impact Assessment

Proposed Elementary School, 60 Defense Street

August 2021– 21-1824

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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1.0 Screening

1.1 Summary of Development

Municipal Address	60 Defense Street
Description of Location	Located within Phase 4 of the Fernbank Community, southwest of the Cope Drive / Defense Street intersection
Land Use Classification	Institutional
Development Size	1 story elementary school and daycare 507 students, 40 childcare spaces, and 36 staff There is anticipated to be 9 school buses initially with up to 11 buses in the future.
Number of accesses and locations	Parking lot (with daycare drop off) via Defense Street School bus layby on Defense Street Parent drop-off/pick-up layby on Cope Drive
Phases of development	1
Build-out year	September 2023

1.2 Trip Generation Trigger

The proposed elementary school is anticipated to generate over 60 person trips during the peak hour, therefore the trip generation trigger has been satisfied and a transportation impact assessment is required.

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	

Since the development satisfies the Trip Generation Trigger, both the Design Review and Network Impact Components will be addressed in the TIA study.

2.0 Scoping

2.1 Existing and Planned Conditions

2.1.1 Proposed Development

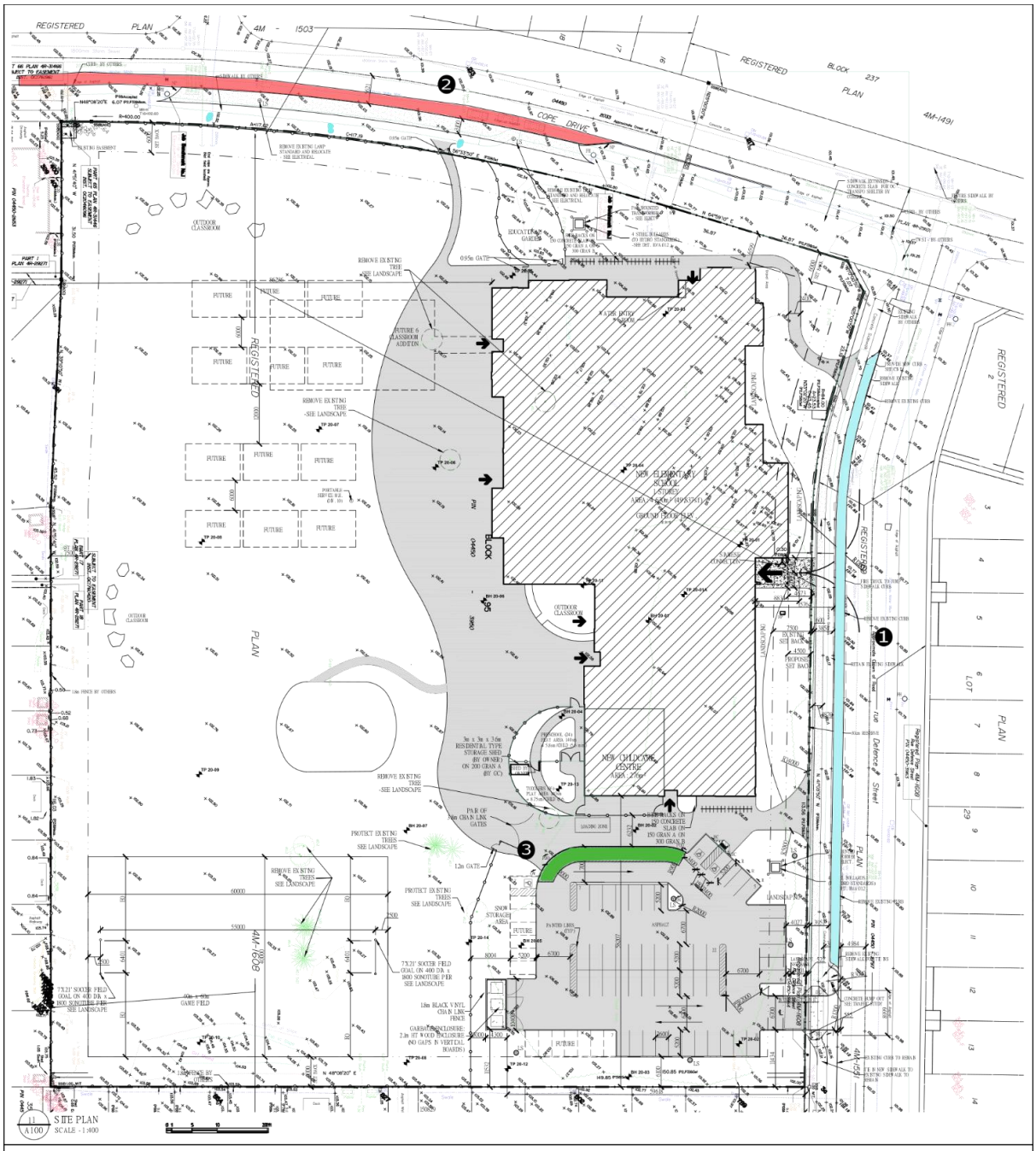
The proposed development is located at 60 Defense Road in the Fernbank community. The site is currently zoned as I1B/R3Z Minor Institutional Zone which permits a school and daycare among other types of developments. The site is anticipated to open September 2023.

The site would have a parking lot for staff and daycare drop-off/pick-ups. Access to the parking lot would be via a single-lane entrance on Defence Street. The site would also have two on-street lay-bys for buses and student drop-off & pick-ups. The bus lay-by area would have space for 9 school buses, which will accommodate the anticipated number of school buses when the school opens. In the future if there are 11 school buses, the additional school buses are anticipated to use the parent drop-off lay-by to queue during the afternoon pick up period.

Figure 1 illustrates the location of the proposed development and **Figure 2** illustrates the proposed site plan.

Figure 1: Site Location

Figure 2: Proposed Site Plan



2.1.2 Existing Conditions

2.1.2.1 Roads and Traffic Control

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

Cope Drive	Cope Drive is a municipally-owned, two-lane Major Collector Road running east-west from Robert Grant Avenue to Eagleson Road. There are at least three (3) other planned schools on Cope Drive, at 480 Cope Drive, 625 Cope Drive, and 700 Cope Drive.
Defence Street	Defence Street is a municipally-owned, two-lane Collector Road running north-south from Cope Drive to Fernbank Road.
Fernbank Road	Fernbank Road is a municipally-owned, two-lane Arterial Road running east-west from Eagleson Road to Dwyer Hill Road. It has a two-lane rural cross section with gravel shoulders and a posted speed limit of 80 km/hr in the vicinity of the site.
Robert Grant Avenue	Robert Grant Avenue is a municipally-owned, two-lane Arterial Road running north-south from Abbott Street East to Fernbank Road.

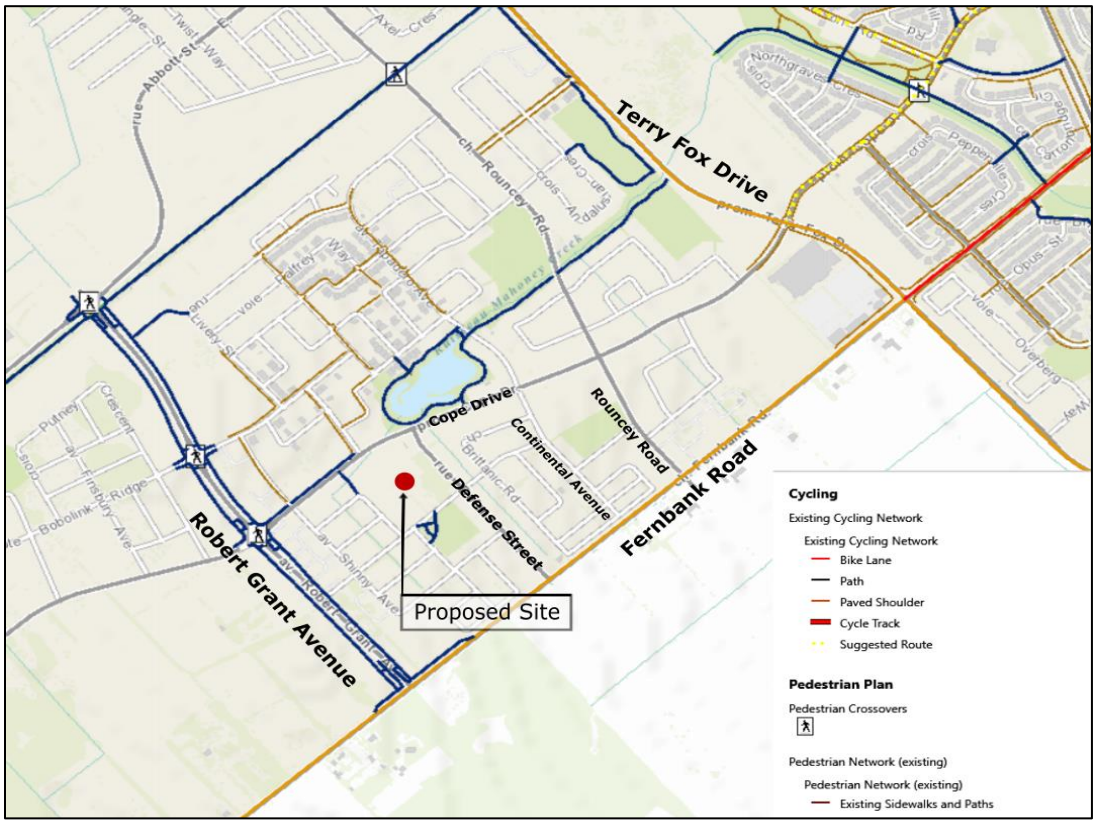
2.1.2.2 Walking and Cycling

Figure 3 illustrates the existing pedestrian and cycling facilities in the study area, and **Figure 4** shows an aerial image captured during a recent site visit. The geoOttawa data is somewhat out of date due to the rapidly developing neighbourhood.

A recent site visit showed that there is a multi-use pathway on the north side of Cope Drive and a concrete sidewalk on the south side of Cope Drive, though it is currently discontinuous across the frontage of 60 Defense Street.

The City of Ottawa's 2013 Cycling Plan identifies Robert Grant Avenue, Fernbank Road, and Cope Drive as Spine Routes.

Figure 3: Existing Walking and Cycling Facilities



Source: geoOttawa, accessed April 30, 2021

Figure 4: Recent Aerial Image

Source: Dillon, April 7th, 2021

2.1.2.3 Transit

Figure 5 shows the existing transit service near the proposed school including Route #167 and #252. The transit stops are approximately 120 metres away from the entrance to the proposed school.

Route #167 operates on 60 minute headways inbound to the school during the AM peak hour and outbound from the school during the PM peak hour. The opposite direction operates on 30 minute headways during the AM and PM peak hours.

Route #252 starts Cope Drive and ends at Tunney's Pasture Station during the AM peak hour, and operates in the other direction during the PM peak hour. Route #252 is an Express route and therefore unlikely to be used by school staff since it operates outbound from the Fernbank community during the AM peak hour and inbound to the Fernbank community during the PM peak hour.

Figure 5: Existing Transit Service for Route 167

Source: OC Transpo System Map, April 2021

2.1.2.4 Traffic Management Measures

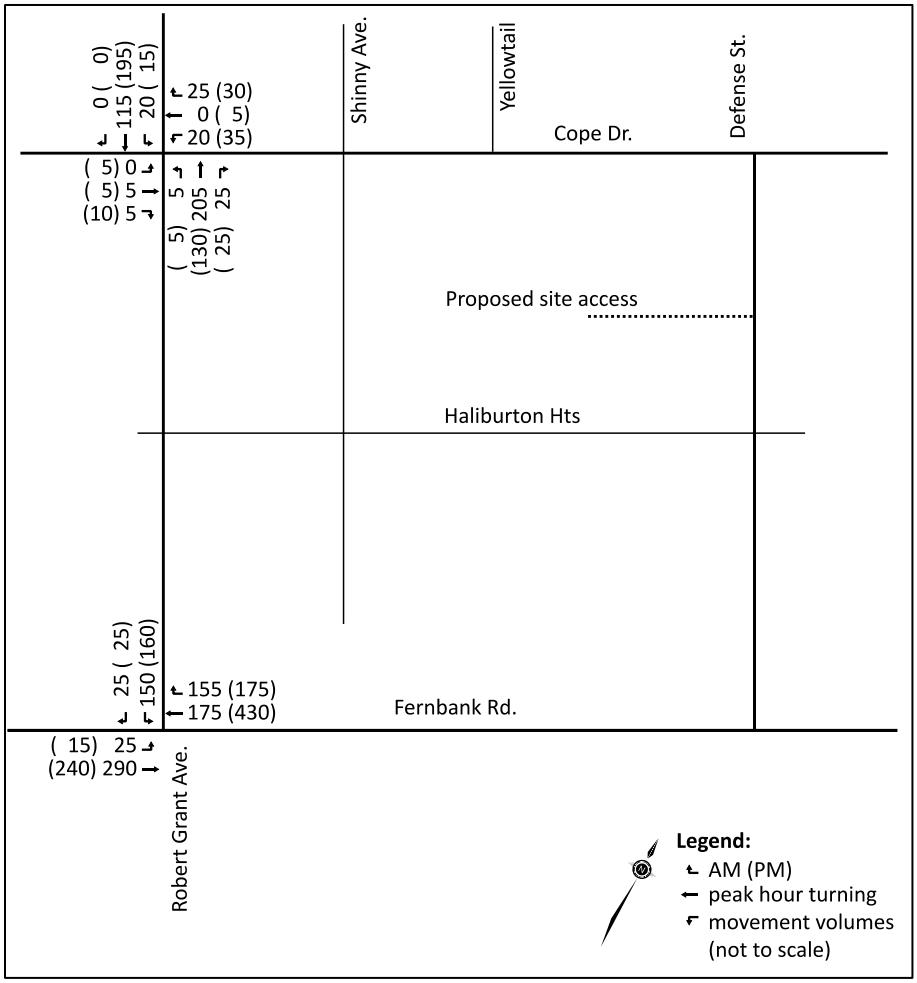
There are no traffic management measures in the study area.

2.1.2.5 Traffic Volumes

Figure 6 illustrates the existing traffic volumes which were obtained from a TIA completed for 700 Cope Drive, dated December 2019. **Appendix A** contains the relevant pages from the 700 Cope Drive TIA. These traffic volumes represent 2018-2019 traffic conditions pre-COVID-19.

There were no traffic counts available at Defense Street / Cope Drive or Defense Street / Fernbank Road and new traffic counts were not collected since they would not represent typical conditions due to COVID-19; traffic volumes at these intersections were estimated during the Forecasting step using traffic volume forecasts from other TIA's completed for nearby areas.

Figure 6: Existing Traffic Volumes (2018-2019)



2.1.2.6 Collision History

Figure 6 illustrates the number of collisions in the general vicinity of the site between 2015 and 2019. Many of the locations only show one or two collisions which does not suggest a pattern. However, this is a developing area and additional data will be needed to identify if there is a collision pattern.

Figure 7: Number of Collisions occurred (2015-2019)

Source: Open Ottawa, accessed May 3, 2021

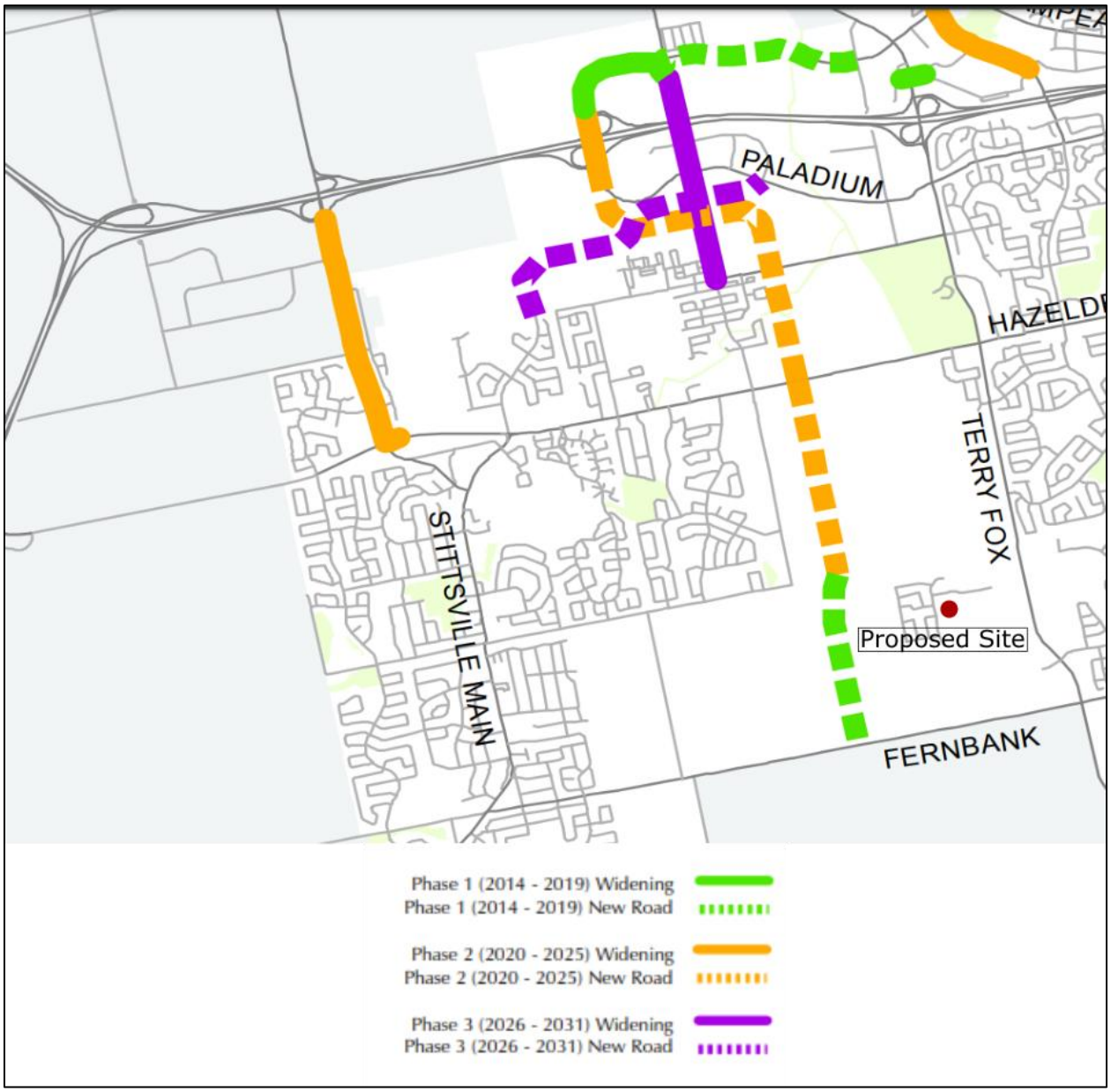
2.1.3 Planned Conditions

2.1.3.1 Road Network Improvements

Figure 8 shows the 2031 'affordable' road network for the study area. Notable changes are that Robert Grant Avenue has been extended north to Palladium Drive during Phase 2 (2020-2025).

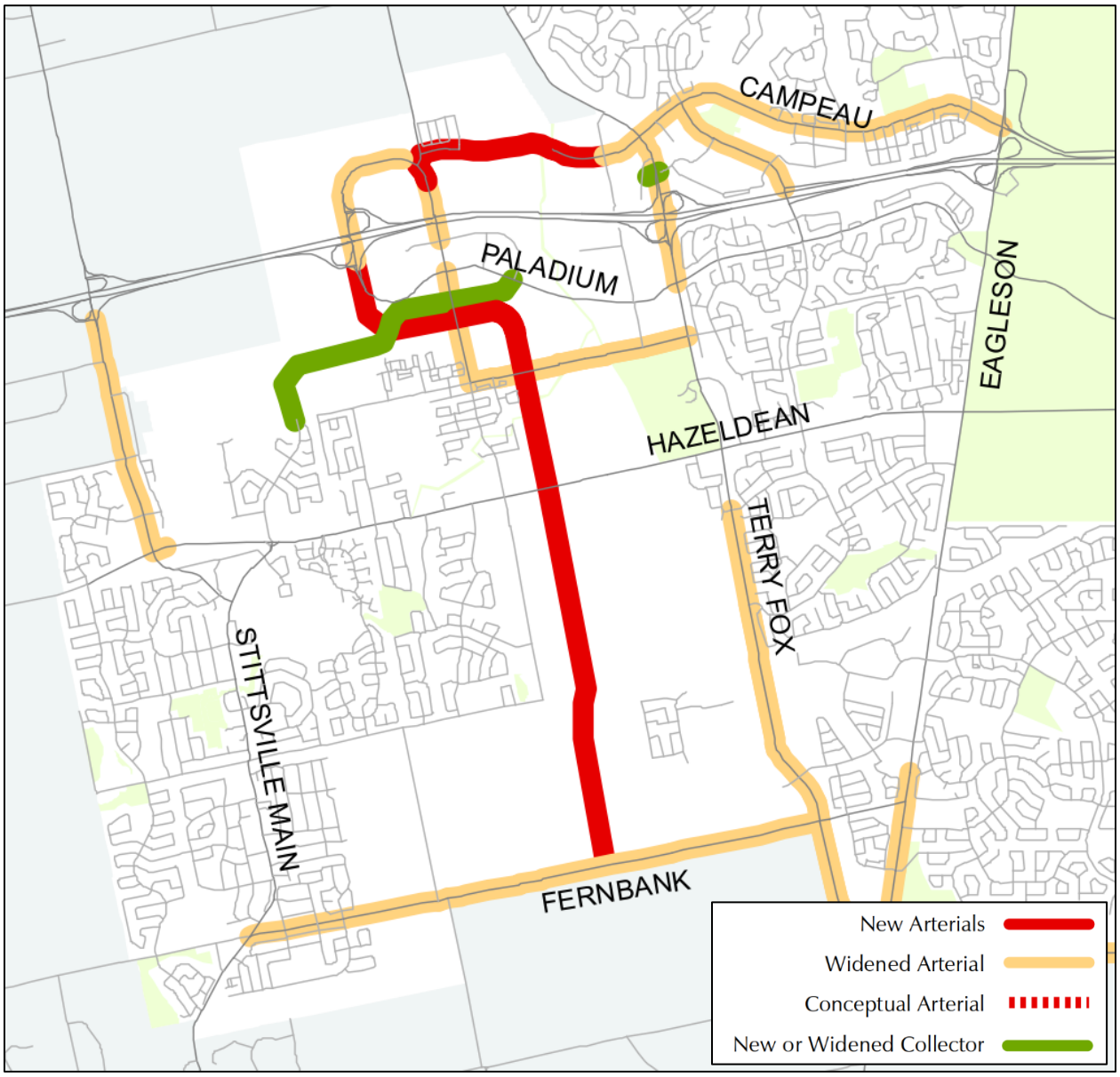
Figure 9 shows the 2031 road network concept which includes the widening of Fernbank Road and Terry Fox Drive in addition to the changes noted for the affordable road network. The timing for these projects is currently unknown but it is likely beyond 2031, if at all.

Figure 8: 2031 Affordable Road Network



Source: City of Ottawa 2013 TMP, 2031 Affordable Road Network

Figure 9: 2031 Road Network Concept



Source: City of Ottawa 2013 TMP, 2031 Road Network Concept

2.1.3.2 Walking and Cycling

Figure 10 illustrates the planned walking and cycling facilities from the Fernbank Community Design Plan (CDP) Update. The CDP shows an on-road pathway will be provided on one side of Cope Drive to connect the proposed school and Terry Fox Drive. The recent site visit showed a multi-use pathway (MUP) on the north side of Cope Drive and a concrete sidewalk on the south side of Cope Drive. The concrete sidewalk is currently discontinuous across 60 Defense Street but it will be completed once the school is constructed.

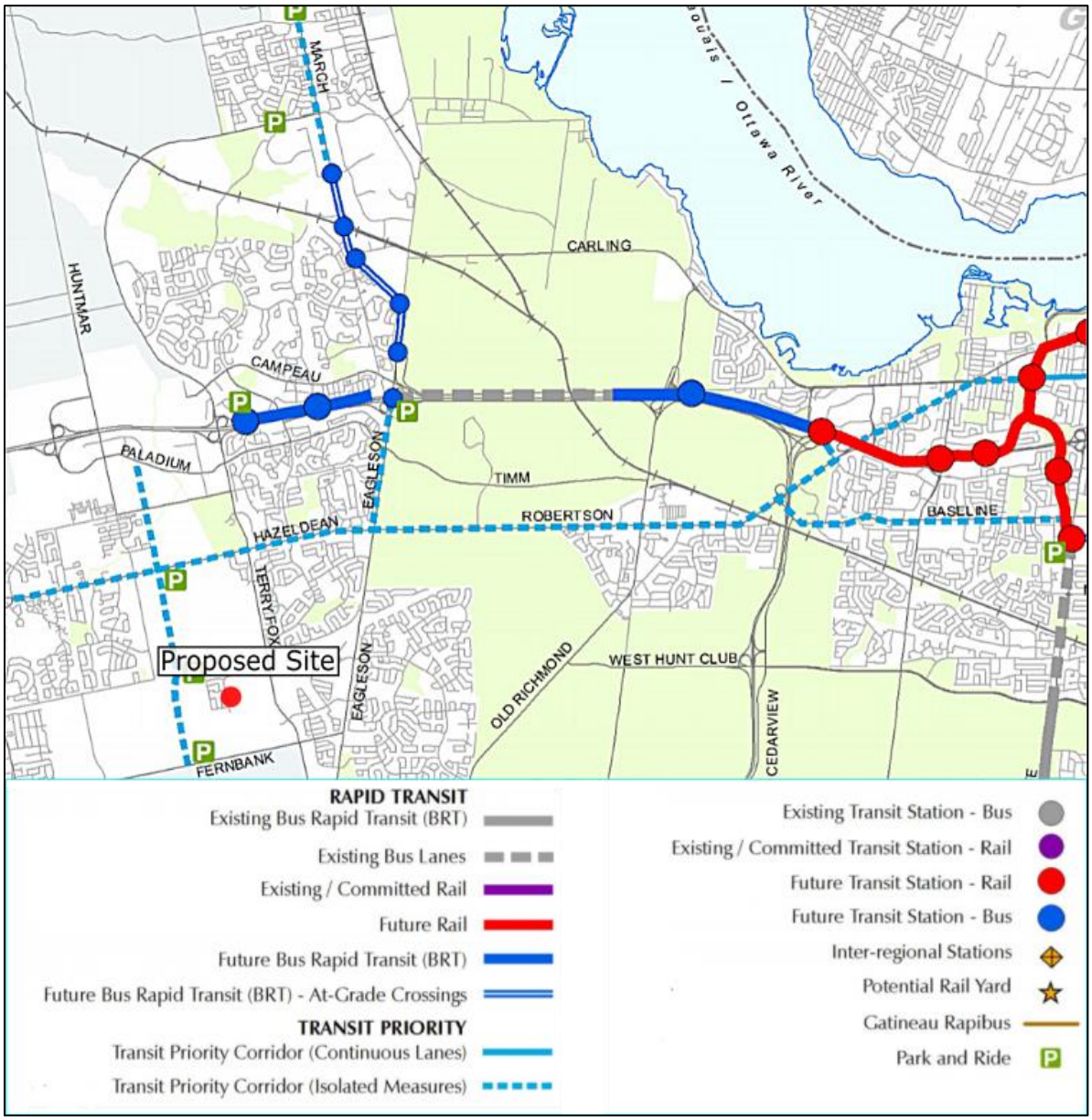
Figure 10: Planned Walking and Cycling Facilities (Fernbank CDP Update)

Source: Fernbank CDP Update (accessed May 2021)

2.1.3.3 Transit

Figure 11 illustrates the Affordable Transit Network from the City's 2013 TMP. The Affordable Transit Network includes a transit priority corridor on Robert Grant Drive between Fernbank Road and Palladium Drive, with park and rides located at Fernbank Road, Abbott Street, and Hazeldean Road.

Figure 11: Rapid Transit and Transit Priority Network - 2031 Affordable Network

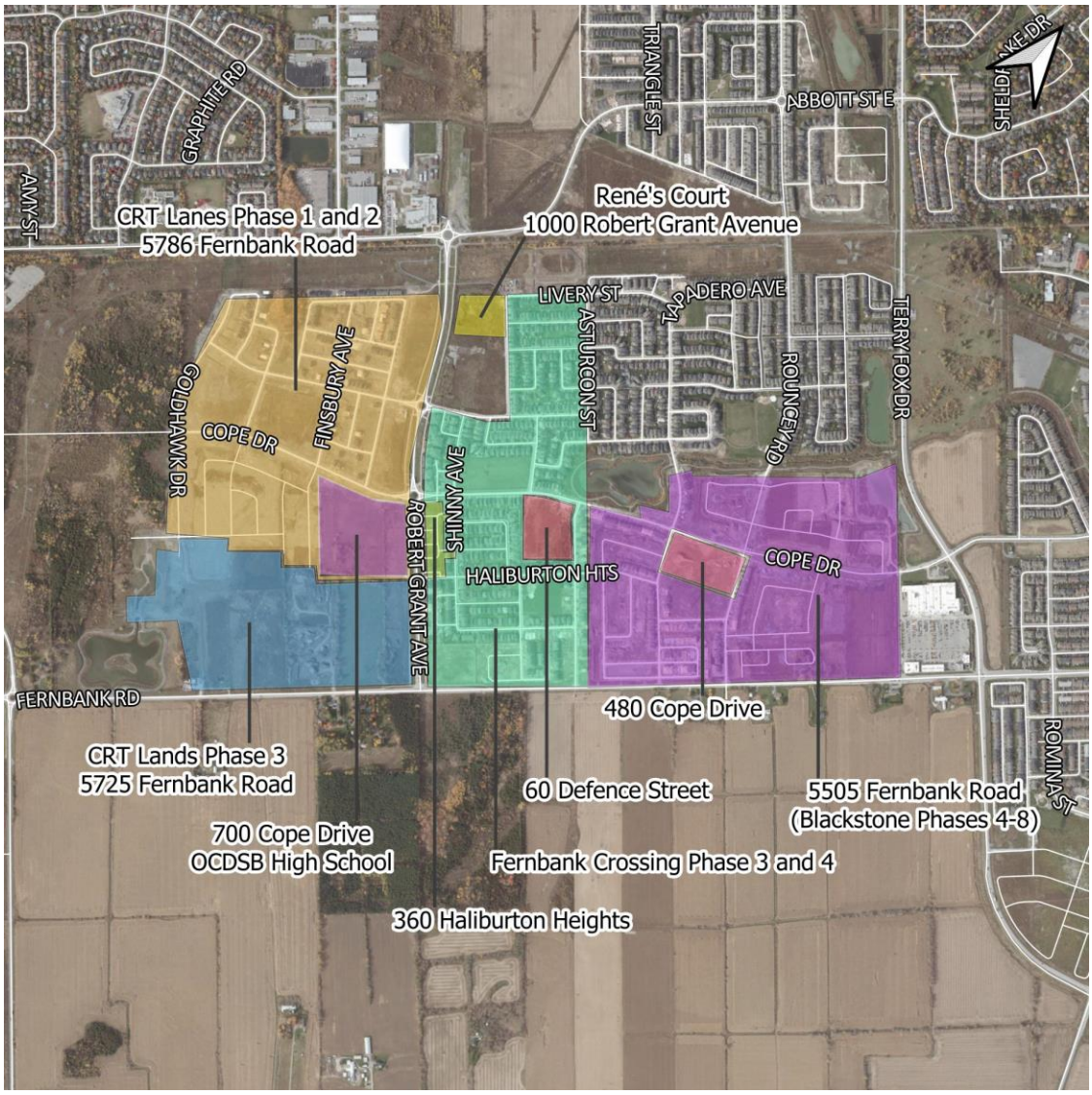


Source: City of Ottawa 2013 TMP

2.1.3.4 Future Background Developments

Figure 12 illustrates the location of the background developments. It should be noted that the TIA for Fernbank Crossing Phase 4 (see **Appendix B**) accounted for traffic generated by the proposed elementary school and daycare at 60 Defense Street. However, the assumptions about layby locations, school size, daycare size, and traffic assignment used in that study are out of date and therefore they will be updated as part of this study while also accounting for traffic generated by other developments that have been approved since the Fernbank Crossing Phase 4 TIA study was completed in 2017.

Figure 12: Background Developments



Background image source: GeoOttawa, 2019 aerial imagery

The Fernbank Crossing Phase 4 TIA included traffic generated by Blackstone Phases 4-8, and Fernbank Crossing Phase 3. It did not include traffic generated by the CRT Lands Phases 1, 2, or 3, René's Court at 1000 Robert Grant Avenue, or the other schools at 480 Cope Drive and 700 Cope Drive.

2.2 Study Area and Time Periods

The study area for this report will include the following intersections: Cope Drive/Robert Grant Avenue, Cope Drive/Defence Street, and Defence Street/Fernbank Road. The selected time periods for analysis are the weekday AM and PM peak hours of adjacent street traffic (i.e. the AM and PM rush hours), since these are often the time periods that govern roadway design. Notably, many elementary schools end before the PM rush hour and therefore the impact of the school will be governed by the AM peak hour.

The proposed development is anticipated to open 2023 school year. However, to simplify the analysis the 2025 and 2030 horizon years will be used to coincide with the general horizon years used for other TIA's and the build-out of the surrounding area.

2.3 Exemptions Review

Table 1 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 45 parking spaces provided for 36 staff and therefore the demand is not expected to exceed the supply. There is also provision for an additional 14 parking spaces when 12 portables are added, which should exceed the demand (assume 1 teacher per portable).

Module 4.6 was not included since traffic generated by the development is not anticipated to exceed the Area Traffic Management (ATM) thresholds of 2,500 vehicles per day or 300 vehicles during the peak hours. The majority of school traffic is anticipated to be pass-by traffic from residents in the nearby community. The only new trips are the school buses and staff, which will be less than 100 vehicles during the peak hours.

Table 1: 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
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

As noted in section 2.1.3.4, the TIA for Fernbank Crossing Phase 4 accounted for traffic generated by the proposed elementary school and daycare at 60 Defense Street. However, the assumptions about layby locations, school size, daycare size, and traffic assignment used in that study are out of date and therefore they were updated as part of this study, while also accounting for traffic generated by other developments that have been approved since the Fernbank Crossing Phase 4 TIA was completed in 2017. Appendix B contains excerpts from the Fernbank Crossing Phase 4 TIA related to trip generation.

3.1.1 Trip Generation and Mode Shares

The trip generation and mode share for the proposed school and daycare was calculated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th edition.* **Table 2** summarizes the vehicle trip generation for the proposed elementary school based on ITE Rates

Table 2: Trip Generation – Vehicle Trips

Land Use (ITE Land Use Code)	Size	AM Peak Hour of Adjacent Street Traffic (i.e. 7-9 AM)			PM Peak Hour of Adjacent Street Traffic (i.e. 4-6 PM)		
		Inbound	Outbound	Total	Inbound	Outbound	Total
Elementary school (520)	507 students	183	157	340	41	45	86
Daycare (565)	40 daycare spaces	18	17	35	15	18	33
Total Auto Trips		**201**	**174**	**375**	**56**	**63**	**119**

These trip generation estimates were rationalized as follows:

1. During the AM peak hour, the elementary school was calculated to have 157 outbound vehicle trips. These outbound vehicle trips would be student drop-offs which represent a ~30% (157/507) student drop-off rate. This seems reasonable, if slightly conservative, and it is only slightly higher than the 25% student drop-off percentage applied for the proposed public elementary school 480 Cope Drive.
2. During the AM peak hour, the elementary school is anticipated to have 26 vehicles (183-157=26) which arrive and do not immediately leave (i.e. school staff). This seems reasonable since many of the teachers are likely to drive to school; the proposed school is located in a developing suburban area far from rapid transit (at least when the school opens).
3. Of the 36 staff, 26 will arrive during the peak hour and the other 10 will arrive before or after the peak hour.
4. During the PM peak hour, there are anticipated to be 41 inbound vehicle trips to the school and 45 outbound vehicle trips, which suggests are 41 student pick-ups and 4 staff leaving. The elementary school pick-up trips were assumed to be for an after-school program.

5. During the AM and PM peak hours, approximately 50% (18/40) of daycare drop-offs or pick-ups are anticipated to occur by vehicle during the peak hour. This seems reasonable since daycare drop-offs and pick-ups are likely to occur over a two hour window. Daycare drop-offs and pick-ups are anticipated to be primarily vehicle trips due to convenience reasons for parents.

Table 3 summarizes the trip generation of the school in terms of person trips based on the above observations and assumptions. This is likely conservative with 30% of students being picked-up/dropped-off and 25% of students either walking or cycling. During winter months, the percentage of students on the school bus will likely be higher. However, for the purpose of this analysis, the estimates below will provide a conservative estimate of potential traffic impacts.

Table 3: Trip Generation – Persons Trips

Location / Activity	AM Peak Hour of Roadway Traffic			PM Peak Hour of Roadway Traffic		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Staff Parking Lot						
Staff parking (vehicles)	26	0	26	0	4	4
Daycare drop-off / pick-up (vehicles)	18	17	35	15	18	33
On-Street Laybys						
School bus trips (vehicles)	9	9	18	0	0	0
School bus trips (students)(~45% of students)	223	0	223	0	0	0
Student pick-up/drop-off trips (~30% of students)	157	157	314	41	41	82
Active Transportation[1]						
Walking (assume 15% of students)	76	0	76	0	0	0
Cycling (assume 10% of students)	51	0	51	0	0	0
Total Person Trips	560	183	743	56	63	119

3.1.2 Trip Distribution for Vehicle Trips

The distribution of school trips was treated differently for staff trips and pick-up/drop-off trips, since staff likely live across Kanata and across the City, whereas the school trips will be confined to the Fernbank community.

The proposed school is located in the southwest part of Ottawa and therefore the majority of staff are anticipated to live east and north of the site. The TIA's completed for 480 Cope Drive and 5725 Fernbank Road (CRT Phase 3) both assumed approximately 40% of trips to the north, 40% of trips to the east, 10% of trips to the south, and 10% of trips to the west. This assumption was also used for this study.

[1] Walking & cycling are anticipated to very low or negligible during the PM peak hour (of adjacent roadway traffic) since the school day is long over by the afternoon rush hour. Students participating in the after-school program were assumed to be picked-up.

Student and daycare pick-up and drop-off trips were assumed to be primarily from within the Fernbank Community between Terry Fox Drive and Shea Road, and between Hazeldean Road and Fernbank Road. The distribution of trips was approximated based on the relative number of houses within the catchment area located north, east, south, and west of the proposed elementary school.

Table 4 summarizes the assumed distribution for vehicle trips based on the above assumptions.

Table 4: Assumed Trip Distribution – Vehicle Trips

Direction Relative to Site	Staff	Student & daycare drop-off / pick-up
North	40%	55%
East	40%	20%
South	10%	5%
West	10%	20%
Total	100%	100%

3.1.3 Trip Assignment

Vehicle trips were assigned to the road network using a logical routing of vehicles. Student & daycare drop-off / pick-up trips south and west of the site were assumed to travel towards Terry Fox Drive and drop off students on their way past the school. These are “pass-by” trips which do not impact the study area intersections since they were already on the study area road network.

Student & daycare drop-off / pick-up trips north and east of the site were treated as “new” trips since these vehicle trips would likely not travel through study area intersections if it was not for the proposed elementary school.

Figure 13 and **Figure 14** illustrate the student drop-off / pick up trip routing for the AM and PM peak hours. During the afternoon peak hour (~5 PM), student pick-ups and drop-offs were assumed to use the Defence Street bus lay-by (which is not being used by school buses at that time) or the staff parking lot drop off area instead of looping around the school counter-clockwise to orient the vehicle with the Cope Drive lay-by.

The daycare drop-offs would be similar to the student drop-off/pick-up routing except for a detour onto Defence Street and into the staff parking lot where the daycare is located.

Figure 13: Student Drop-Off Trip Routing – AM Peak Hour

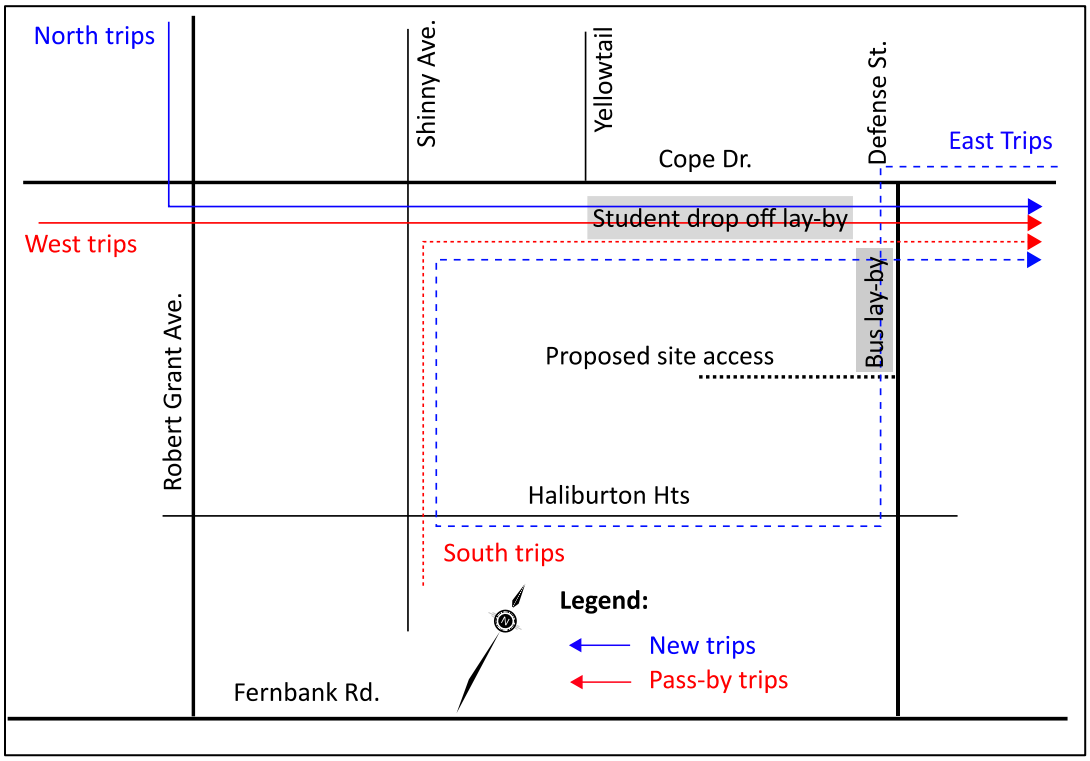


Figure 14: Student Pick-up Trip Routing – PM Peak Hour

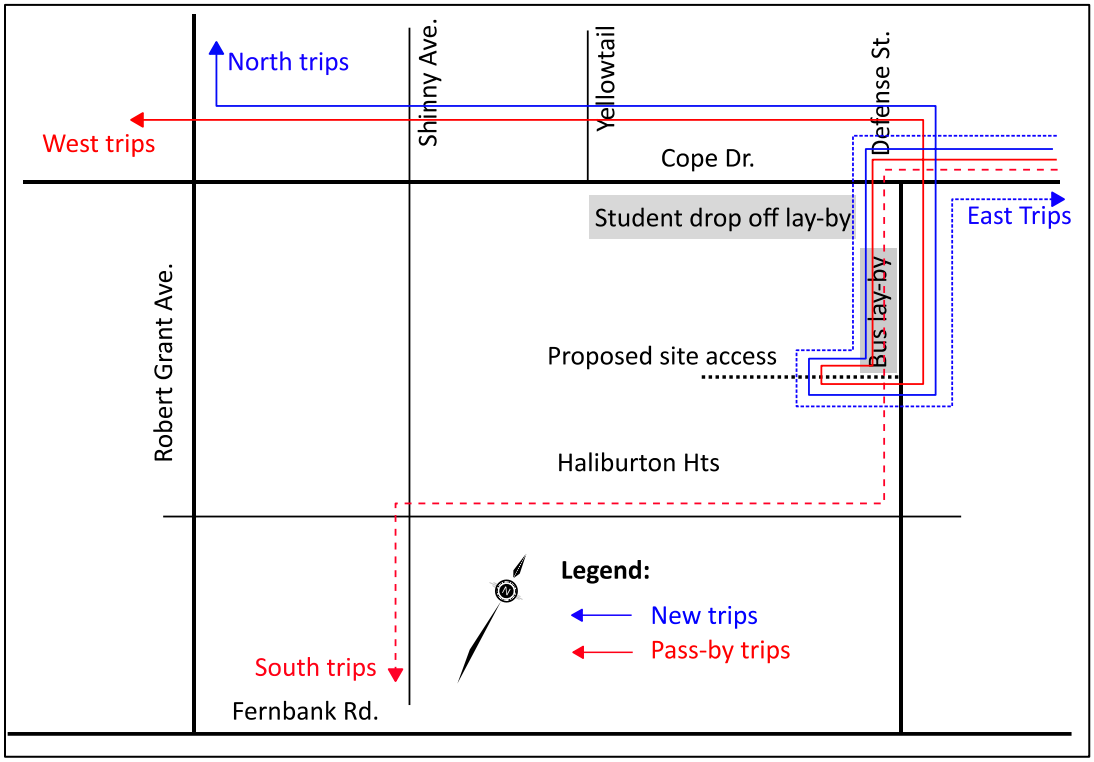
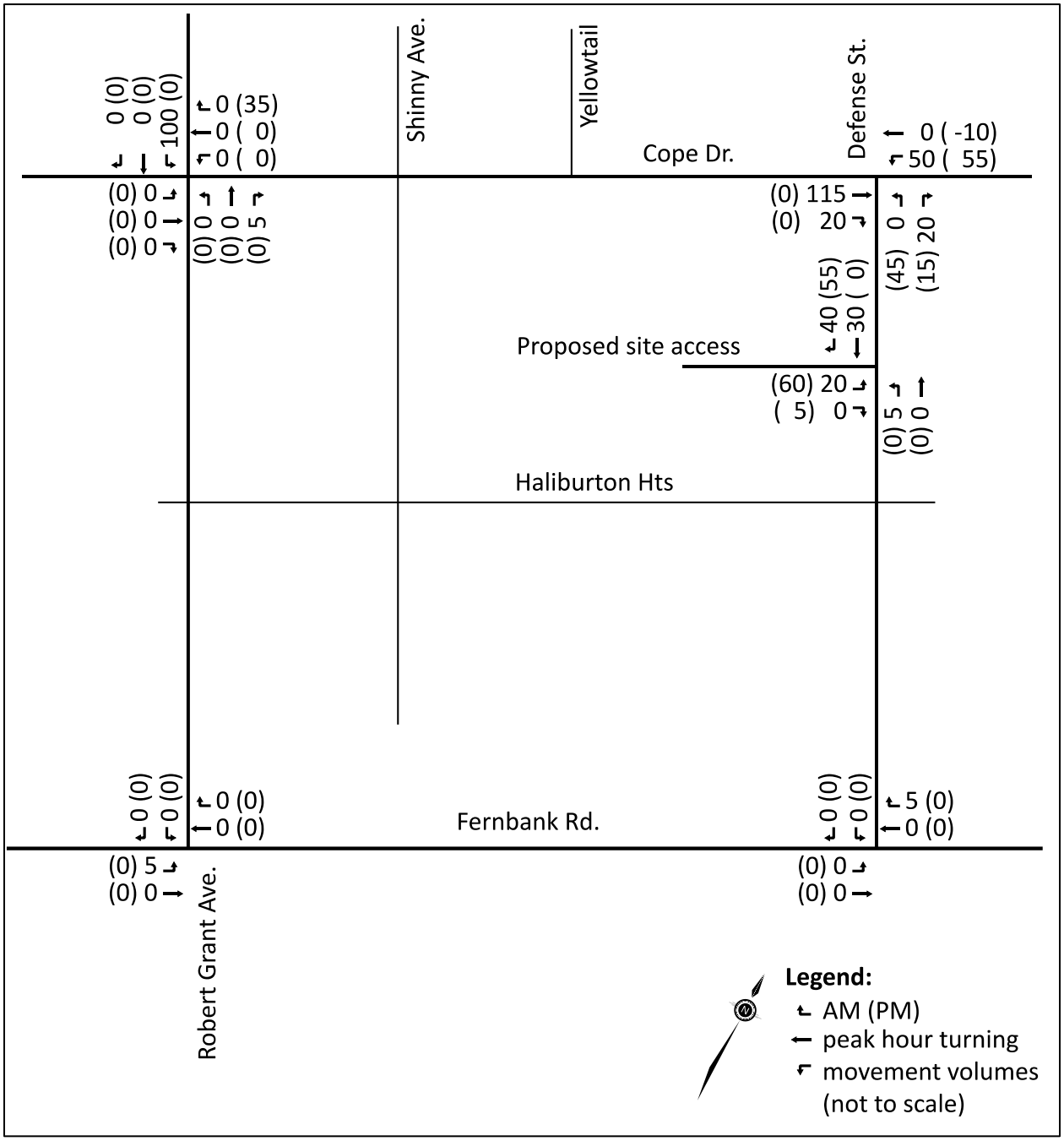


Figure 15 illustrates the site generated trips for the weekday AM and PM peak hours of the site based on the above assumptions and routing. The site generated traffic is not anticipated to change between 2025 and 2030. There are only anticipated to be 9 school buses and therefore the impact of school buses was not considered.

Figure 15: Site Generated Trips



3.2 Background Network Travel Demand

3.2.1 Transportation Network Plans

The City's 2013 Transportation Master Plan identified the extension of Robert Grant Avenue north to Palladium Drive during Phase 2 (2020-2025). Funding limitations at the City resulted in this being delayed to beyond 2031; however, land developers in Stittsville expressed an interest in working with the City to examine alternative funding solutions.

As a result, City staff were directed to conduct a background study to amend the Development Charges (DC) by-law and introduce an area specific charge for Stittsville to accelerate the Robert Grant Avenue extension and related improvements to Huntmar Drive[2].

For the purpose of this study it was assumed that Robert Grant Avenue will be constructed between the 2025 and 2030 horizon years. This is consistent with the other TIA's completed for the surrounding area.

3.2.2 Background Traffic Growth

The background traffic growth (i.e. without the school) is anticipated to be consistent with the traffic growth rate used for other TIA's such as the recently completed TIA for 5725 Fernbank Road (CRT Lands Phase 3) which applied a 2% per year growth rate to all through movements on Robert Grant Avenue and Fernbank Road.

Traffic volumes along Cope Drive and Defence Street are anticipated to increase as adjacent developments are constructed; traffic from adjacent developments was accounted for explicitly.

3.2.3 Other Developments

As noted in section 2.1.3.4, there are several background developments in the study area. The TIA's for these background developments account for traffic generated by adjacent developments and repeating these forecasts is outside of the scope of this study. Therefore, traffic volume forecasts from previous TIA's were used as the background traffic volumes for this study.

Specifically, the TIA completed for 5725 Fernbank Road (CRT Phase 3, completed in May 2021) was used for traffic volume forecasts along Robert Grant Avenue and the TIA completed in 2017 for Fernbank Crossing Phase 4 was used for traffic volume forecasts along Defence Street.

Appendix B contains excerpts from the Fernbank Crossing Phase 4 TIA and **Appendix C** contains excerpts from the CRT Phase 3 TIA.

[2] http://ottwatch.ca/meetings/votes/198187

The CRT Phase 3 TIA included the following background developments which were therefore included in the analysis for this school site:

1. 700 Cope Drive – OCSDB High School
2. Fernbank Crossing (Phase 3 – Block 129)
3. Fernbank Crossing (Phase 3 – Block 135)
4. Fernbank Crossing (Phase 4) – note, it did not include traffic generated by 60 Defence Street
5. CRT Phase 1 & 2
6. Blackstone Phases 4-8
7. René's Court

The traffic volume forecasts from the 5725 Fernbank Road (CRT Phase 3) TIA were newer and higher than the Fernbank Crossing Phase 4 forecasts; the Fernbank Crossing Phase 4 forecasts were increased to balance with the traffic volume forecasts from the newer 5725 Fernbank Road (CRT Phase 3) TIA.

It should be noted that the Fernbank Crossing Phase 4 TIA included traffic generated by the proposed elementary school; to avoid double-counting school trips, school trips were removed from the traffic volume forecasts.

3.2.4 Traffic Volumes

Figure 16 and **Figure 17** illustrate the 2025 and 2030 traffic volumes without the school, commonly called "background" traffic volumes.

Figure 16: 2025 Traffic Volumes without School

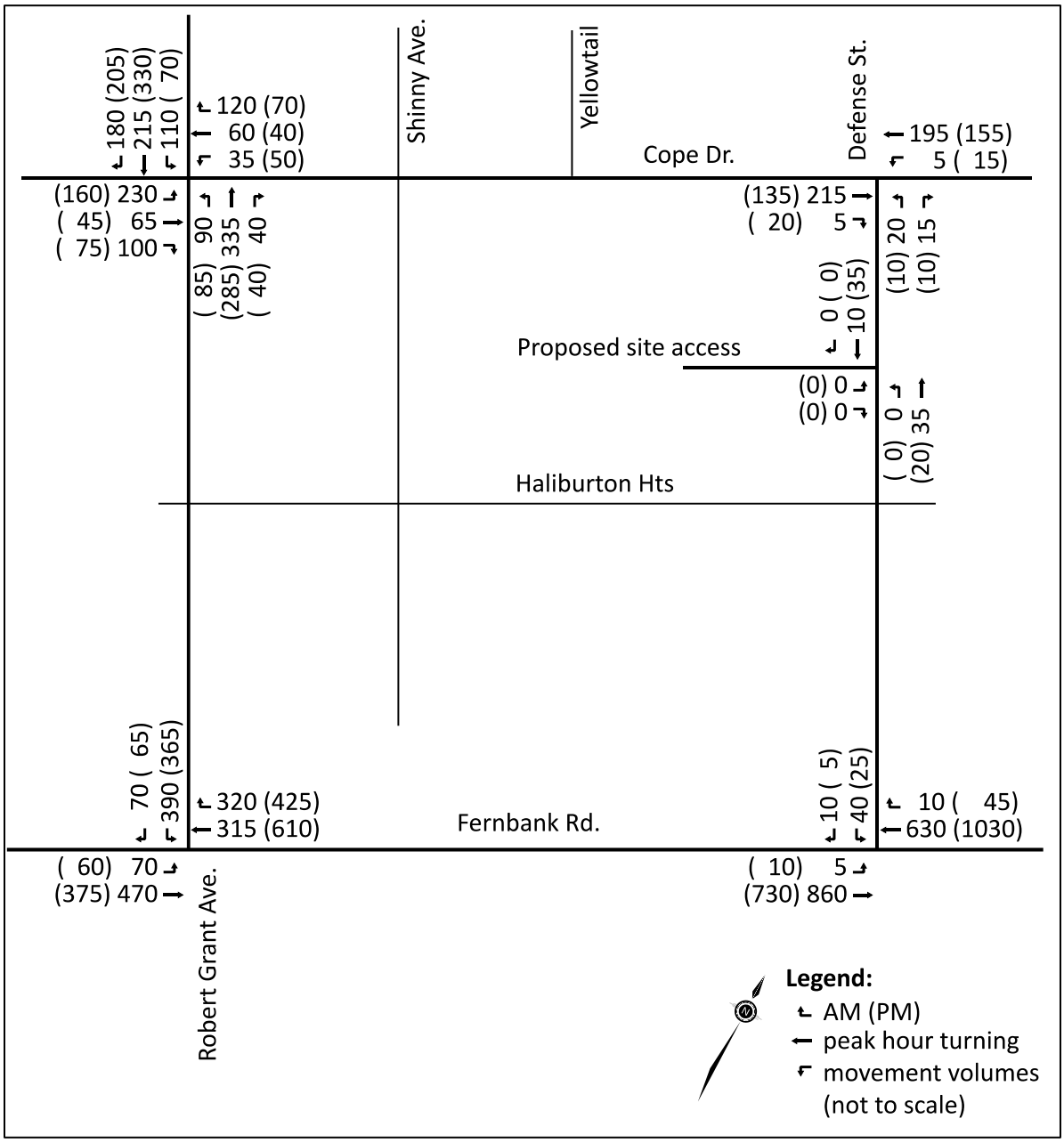
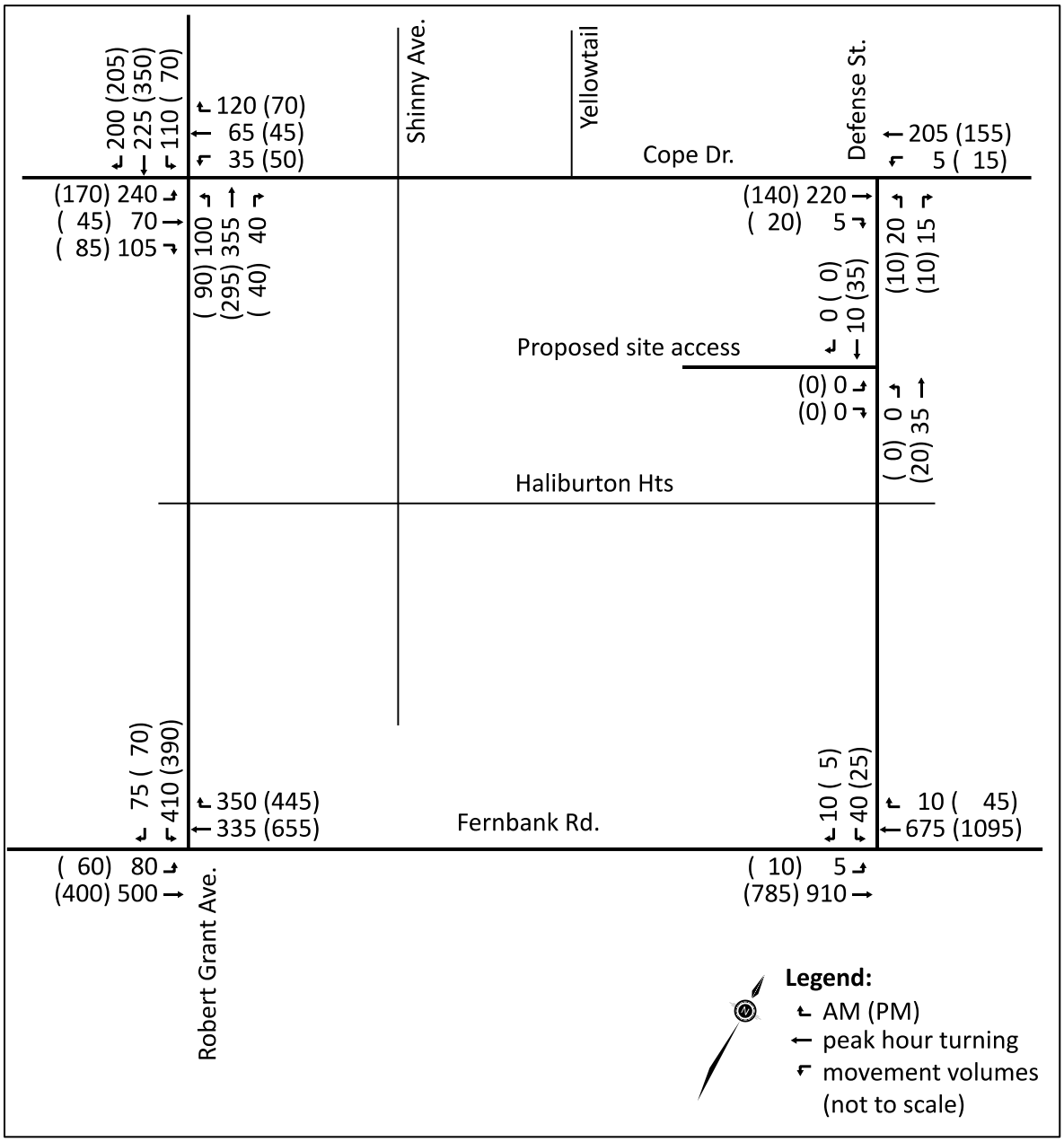


Figure 17: 2030 Traffic Volumes without School



3.3 Demand Rationalization

The proposed development is not anticipated to increase traffic volumes significantly. Traffic volumes along Cope Drive are not anticipated to exceed capacity. For these reasons demand rationalization was not completed.

3.4 Traffic Forecasts with School

Figure 18 and **Figure 19** illustrate the forecasted 2025 and 2030 traffic volumes with the school, which were calculated by adding background traffic volumes and site generated traffic volumes.

Figure 18: 2025 Traffic Volumes with School

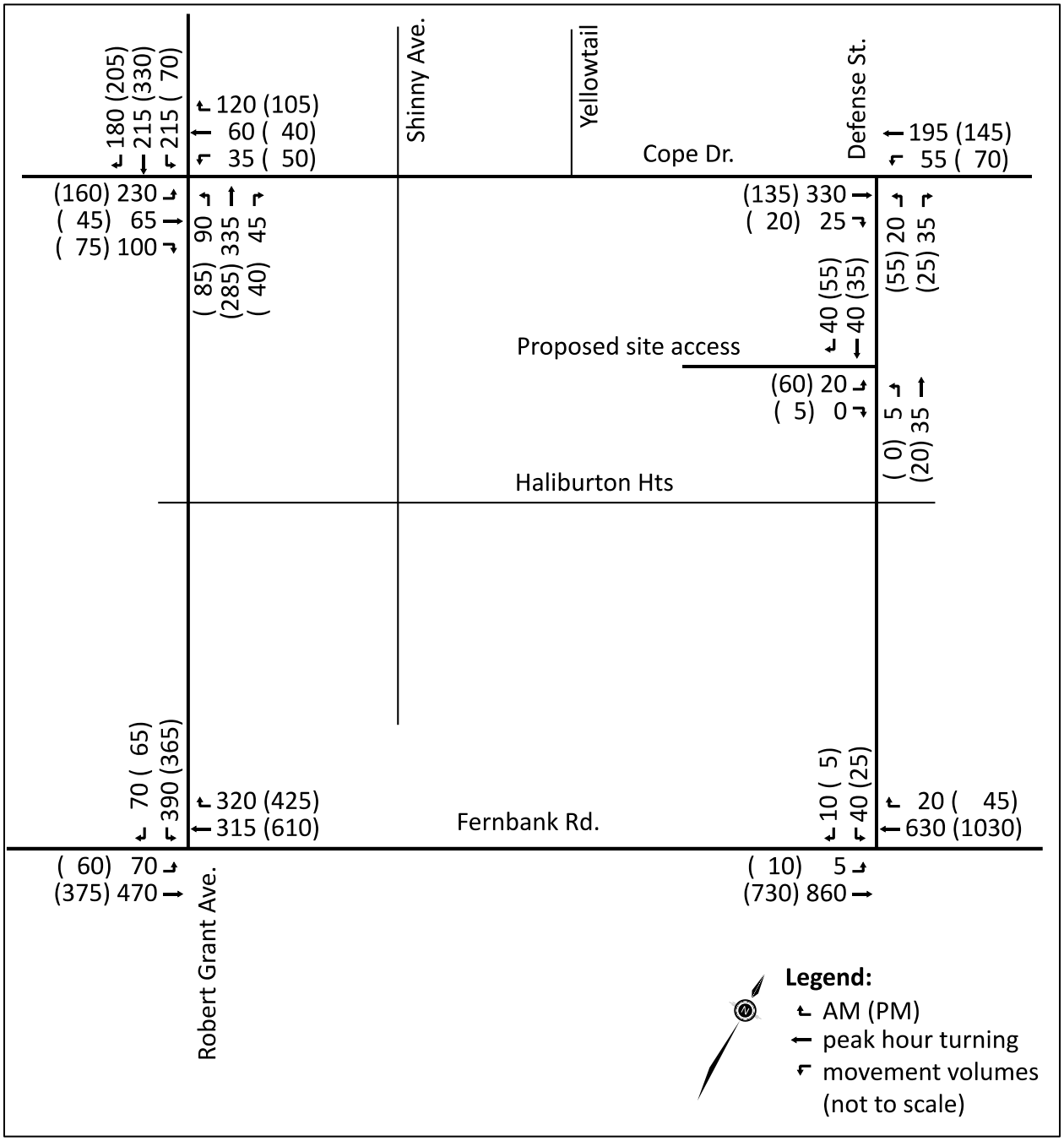
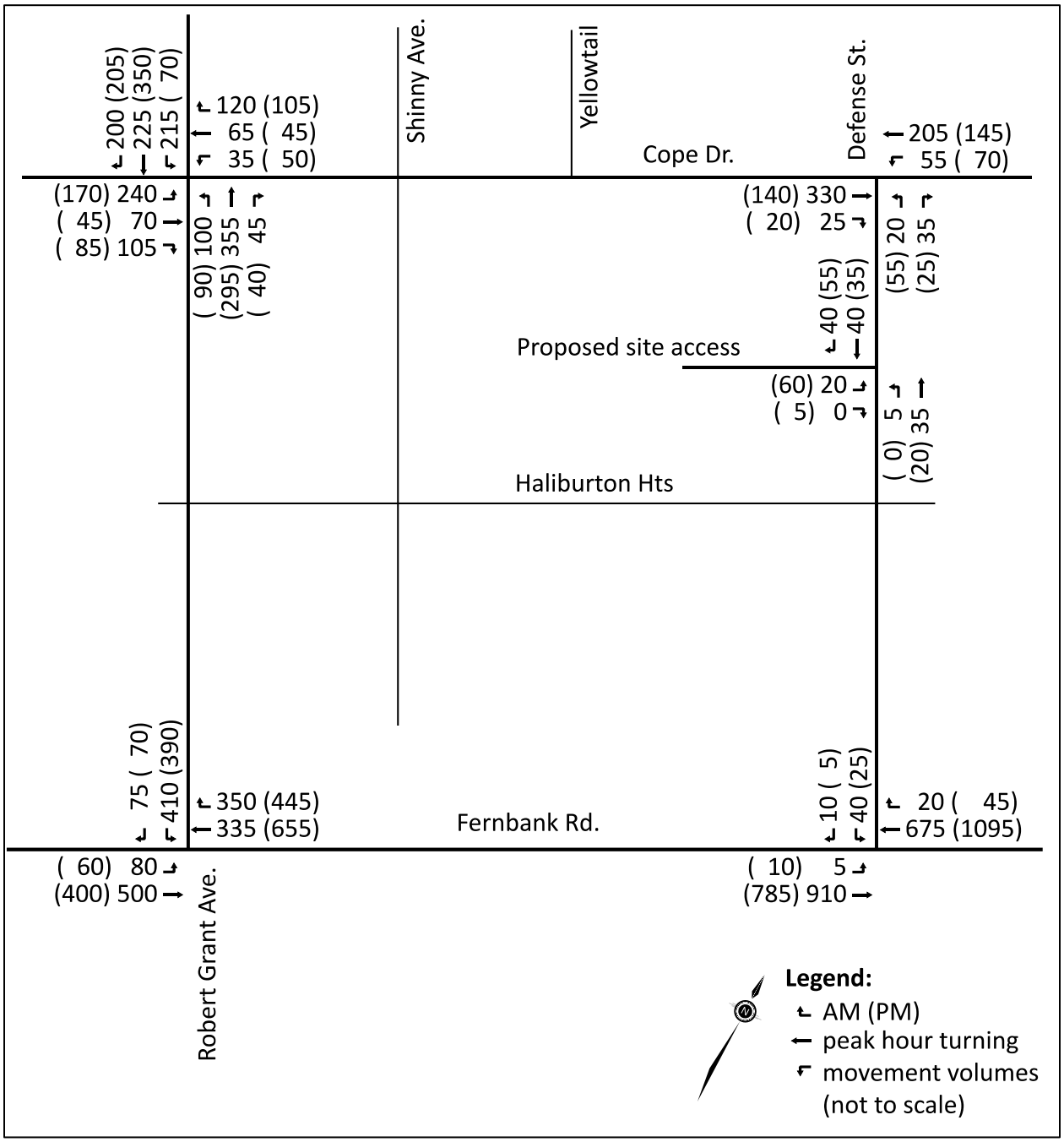


Figure 19: 2030 Traffic Volumes with School



4.0 Analysis

4.1 Development Design

4.1.1 Design for Sustainable Modes

Bicycle facilities: several bike racks are proposed on the north and south sides of the school. There are direct and convenient paved surfaces to access all other areas of the school.

Pedestrian access and circulation: there are two primary entrances for the school and daycare on the east side of the building. Sidewalks on Cope Drive and Defence Street provide direct access from the student drop-off layby to the school entrances. The sidewalk and paved surfaces around the school provide direct access from the school bus layby to the main school entrance. Paved surfaces around the school also provide direct and convenient access from the staff parking lot, bicycling parking area, and daycare drop-off / pick-up area to the main school entrance and daycare entrance.

Transit facilities: a transit stop is expected at the intersection of Cope Drive / Defence Street, specifically the south west corner of the intersection, closest to the school. There are direct and convenient sidewalks and paved surfaces between the main school entrance and the transit stop.

4.1.2 Circulation and Access

There will be an on-street layby on Defence Street for school buses and an on-street layby on Cope Drive for parents dropping off and picking up students. The school will have one driveway to Defence Street, for access to the staff parking lot. The staff parking lot also contains the waste bins and will function as a drop-off / pick-up area for the daycare.

School bus layby: the school bus layby will have space for nine (9) full length school buses. The school board indicated there will nine (9) school buses when the school opens and up to 11 school buses in the future when portables are added. If the Defence Street layby is not adequate for all 11 school buses, the school is anticipated to use the parent drop-off / pick-up area on Cope Drive for one or two school buses.

Parent drop-off / pick-up layby: the parent drop-off / pick-up layby on Cope Drive is approximately 105 metres between the bulb-out near Defence Street and the edge of the school property. This provides enough space for approximately 17 vehicles. During the morning there are anticipated to be up to 157 vehicles using these drop-off parking spaces over the period of 60 minutes, which would require each drop-off space to process 9 vehicles (157/17). The drop-offs would therefore need to be less than 6.5 minutes (60/9). At the end of the school day these pick-ups may occur in a shorter amount of time such as 15 minutes. In this case, the length of the on-street lay-by should be adequate as long as pick-ups do not exceed 1.6 minutes (15/9) in duration. Regardless, the Cope Drive on-street layby is already very

long and extending it further is not practical since pick-ups and drop-offs likely represent a very short period of time each day.

Waste collection: the staff parking lot will have painted lines instead of concrete curb and therefore waste collection vehicles will be able to easily maneuver through the parking lot on weekends or after the school day has finished. **Appendix D** contains the Road Modification Approval (RMA) package which includes a swept path analysis (using AutoTURN software) showing the turning requirements for a garbage truck.

Daycare drop-off / pick-up area: the daycare drop-off / pick-up area will be within the staff parking lot and has approximately 30 metres designated for a drop-off/pick-up area, which can accommodate approximately five (5) vehicles at a time. There are up to 40 drop-offs/pick-ups that may need to occur within an hour, which would require that each drop-off/pick-up parking space process eight (8) vehicles per hour (40/5). The drop-offs and pick-ups would therefore need to be less than 7.5 minutes (60/8). In reality the drop-offs and pick-ups are likely spread over more than one hour and therefore the drop-off/pick-up area is anticipated to be adequate.

4.2 Parking

4.2.1 Parking Supply

Automobile Parking – As per City of Ottawa Zoning By-law 2008-250 (Sections 101 and 102), the minimum parking space rate is 1.5 parking spaces per classroom and two parking spaces per 100 sq.m. daycare. Initially there will be 22 classrooms with up to 12 portables in the future. Based on this, 39 parking spaces are required at school opening and 57 parking spaces may be required if the school expands. The site plan shows that 45 parking spaces will be provided at build-out and 59 parking spaces could be provided if the school expands. The site plan shows that the parking supply is adequate for build-out and for possible future expansion.

Bicycle Parking – As per City of Ottawa Zoning By-law 2016-249 (Section 111), the minimum bicycle parking rate is 1 bicycle parking space per 100 sq.m. school gross floor area and 1 bicycle parking space per 250 sq.m. daycare. Therefore, 47 bicycle parking spaces will be required and the site plan shows approximately six (6) bicycle parking racks will be provided. Each bicycle parking rack should accommodate at least 8 bicycles to meet the bylaw requirements. However, as noted in section 3.1.1, up to 51 students are anticipated to bike to school and therefore an additional bicycle parking rack may be required. Additional bicycle parking racks should be provided, or provision for additional bicycle parking racks should be included in the design so that they can be added at a later date if needed.

4.3 Boundary Street Design

4.3.1 Multi-Model Level of Service

The Multi-Modal Level of Service (MMLOS) was evaluated for Cope Drive and Defence Street to assist with developing a site plan concept that maximizes the achievement of the MMLOS objectives. Since the development is within 300 metres of a school (the site itself), it is subject to MMLOS targets of 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).

Table 5 presents the MMLOS conditions for roadway segments. The analysis was based on conditions at build-out which includes a bidirectional multi-use pathway (MUP) on the north side of Cope Drive and a sidewalk on the south side of Cope Drive.

The analysis shows that all MMLOS targets have been achieved except for the pedestrian LOS target for Cope Drive which is a B instead of the target of A. This is due to the operating speed on Cope Drive which is likely 30-50 km/h. Traffic calming measures for Cope Drive should be considered to keep the operating speed as close to 30 km/h as possible, especially at the beginning and end of the school day. This is discussed briefly in the next section.

Table 5: MMLOS Conditions - Segments

Travel Mode	Criteria	Target	Cope Drive Major Collector Spine Cycling Route	Defence Street Collector Not a cycling route
Pedestrian LOS	Sidewalk width	A	2 metres	1.8 metres
	Boulevard width		0.5 – 2 metres	0.5 – 2 metres
	AADT > 3000?		Yes (assume 10x multiplier for AM peak hour volumes)	No
	On-Street Parking		Yes	No
	Operating Speed		30-50 km/h	30-50 km/h
	Level of Service		**B**	**A**
Cycling LOS	Type of facility	B	MUP on north side	Mixed traffic
	Number of travel lanes		2	2
	Bike lane width		n/a	n/a
	Operating speed		n/a for MUP	<= 40 km/h
	Centreline (yes/no)		n/a for MUP	no
	Bike lane blockage frequency		n/a	n/a
	Level of Service		**A**	**A**
Transit LOS	Type of facility	D	Mixed traffic	Mixed traffic
	Parking/driveway friction		Limited / Low	Limited / Low
	Level of Service		**D**	**D**

4.3.2 Road Safety

Cope Drive is a Major Collector road with a 26-metre right of way in front of the school with an anticipated AADT of over 3,000 vehicles per day. As noted in the previous section, maintaining low speeds on Cope Drive is important to meet the MMLOS targets. A curb bulb-out at Yellowtail Walk and/or speed cushions should be considered to deter speeding on Cope Drive. The curb bulb-out would:

a) reduce the appearance of the road width, thereby reduce vehicle travel speeds;
b) clearly delineate the start of the on-street parent drop-off/pick-up lay-by, and,
c) protect parked vehicles from a rear-end collision.

Speed cushions with spacing of 80 metres to 150 metres would also be effective at maintaining travel speeds between 40-50 km/h[3]. Closer cushion spacing would reduce speeds further. The speed cushions would reduce 85th percentile speeds up to 8 km/h without significantly impacting buses, cyclists, resident access, street sweeping, drainage, or police enforcement. It may slightly affect emergency vehicle response time, transit route travel time, and snow plowing/removal.

4.3.3 Mobility

Figure 20 illustrates the existing designated pedestrian & cycling crossing locations on Cope Drive. This figure shows there are currently very few designated crossings for Cope Drive in the vicinity of the proposed school and stormwater pond. The nearest designated crossings are located at the roundabouts 750 metres east and west of the school/stormwater pond.

The City should consider implementing a pedestrian crossover in this area to provide a safer crossing for school children, transit users, residents wishing to access to stormwater pond trails, among other amenities. A pedestrian crossover is likely warranted at this location based on the *Decision Support Tool – Preliminary Assessment* found in the Transportation Association of Canada (TAC) *Pedestrian Crossing Control Guide (December 2012)*. Specifically:

a) the forecasted traffic volumes on Cope Drive will exceed 1,500 vehicles per day;
b) the forecasted pedestrian volumes exceed 15 Equivalent Adult Units (EAU's[4]) per hour[5];
c) the site is approximately 750 metres away from another traffic control device;
d) the location is on a pedestrian desire line; and,
e) there is a requirement for system connectivity.

A crossing guard should also be considered to provide protection to children crossing at school times.

[3] *Traffic Calming Speed Humps and Speed Cushions*, Catherine Berthod, Ministère des Transports du Québec
[4] Unaccompanied children <=12 years are counted as two (2) equivalent adult units (EAU)'s. Children crossing with a crossing guard or parent were counted as a one (1) EAU for this study.
[5] Based on trip gen calculations, there will be 25% of students (127 students) biking or walking to school. Assuming 50% live north of Cope Drive, there will be 65 students needing to cross Cope Drive during the morning and afternoon or 127 student crossings per day over 2 hours or more. There is also a bus stop at the school and there are likely to be other crossings as well during other parts of the day which exceeds the threshold of 15 EAU's/hour on average.

Figure 20: Cope Drive Pedestrian & Cycling Crossings near the proposed school

4.4 Access Intersection Design

4.4.1 Location and Design of Driveway

The site driveway is located on Defence Street providing a single lane in and out of the site.

4.4.2 Intersection Control

The site driveway will be located on a low-volume Collector roadway; therefore Two-Way Stop-Control (TWSC) on the side streets (site driveway) is appropriate.

4.4.3 Intersection Design

Table 6 summarizes the Synchro results for the intersection of Defence Street/Site driveway for the 2025 and 2030 total traffic horizon during the weekday AM and PM peak hours. **Appendix D** contains

the intersection performance worksheets. The analysis shows that the intersection will operate well under TWSC.

Table 6: Synchro Results – Defence Street / Site Driveway (Two-way stop-control)

Year	Time Period	Overall Intersection		Critical Movement (Highest V/C)			
		LOS	Delay	Movement	LOS	V/C	Delay
2025	AM Peak Hour	A	1.6	EBL/R	A	0.02	9.2
	PM Peak Hour	A	3.4	EBL/R	A	0.08	9.3
2030	AM Peak Hour	A	1.6	EBL/R	A	0.02	9.2
	PM Peak Hour	A	3.4	EBL/R	A	0.08	9.3

4.5 Transportation Demand Management

The proposed school will have 40 staff and 412 students; 10-15% of students are anticipated walk to school, ~10% of students are anticipated to bike to school, and 25% of students are anticipated to be dropped off at the school. The majority of students will take the school bus. The majority of students are expected to arrive between 8:30 AM and 9:00 AM and leave at 3:30 PM.

The majority of staff are expected to drive to school due to free parking, its location in a developing neighbourhood, and the lack of transit facilities in the area. Staff are expected to arrive at least half an hour before school starts and leave shortly after school ends.

Appendix E contains the TDM checklists. From the TDM checklists, some recommendations are as follows: display relevant transit schedules and route maps at entrances, and provide shower and lockers for staff use (these measures are provided).

4.6 Neighbourhood Traffic Management

The proposed school is located within a residential community and relies on Major Collector and Collector roads for access. It does not rely on Local roads for access. The 2025 and 2030 total future traffic volumes (see Figure 18 and Figure 19) are anticipated to be well below the capacity of Major Collector and Collector roads and therefore a Neighbourhood Traffic Management plan is not required as per the TIA Guidelines.

4.7 Transit

The proposed school is not anticipated to generate transit trips and therefore transit service will not be impacted.

4.8 Review of Network Concept

Not applicable; exempted during Screening & Scoping.

4.9 Intersection Design

Table 7, **Table 8**, and **Table 9** summarize the future forecast traffic operational results of the network intersections (intersections other than the site driveway), for the 2025 and 2030 for the weekday AM and PM peak hours.

Appendix D contains the intersection performance worksheets.

The results show that the proposed school will not have a meaningful impact on traffic operations in the study area. All intersections and all turning movements are anticipated to operate well except for the southbound approach at the Defence Street / Fernbank Road intersection which is forecast to operate poorly with a long delays (LOS F, up to 108 seconds of delay).

The Defence Street / Fernbank Road intersection southbound approach operates poorly because of high traffic volumes on Fernbank Road which provide few gaps for left-turning traffic which then results in long delays. The high traffic volumes on Fernbank Road are the result of other background developments in the area. School traffic volumes account for less than 5 vehicles at this intersection and therefore the poor intersection performance is not anticipated to impact school traffic. In other words, this is not an issue caused by the school, it does not affect the school, and therefore mitigation has not been considered as part of this study.

It is worth nothing that the poor southbound left turn performance is likely to be self-correcting due to the relatively low southbound left turn traffic volumes and the availability of other routes. As delays increase, fewer vehicles will use the southbound left turn at Defence Street / Fernbank Road intersection; drivers will divert west to Robert Grant Avenue and to the signalized intersection.

The Fernbank Road / Robert Grant Avenue intersection was not considered within the scope of this analysis but the additional traffic volumes diverted from the Defence Street/Fernbank Road intersection are unlikely to require mitigation.

Table 7: Cope Dr. / Robert Grant Ave. (Roundabout) – Intersection Traffic Operations

Horizon	Condition	Period	Overall Intersection		Critical Movements (highest V/C or poor LOS)				
			LOS	Delay	Movement	LOS	V/C	Delay	95th %'ile Queue (m)
2025	Without school	AM	A	9.3	Northbound	A	0.69	10.0	38.4
		PM	A	8.0	Southbound	A	0.70	7.5	44.2
	With school	AM	B	11.3	Northbound	B	0.79	13.6	49.7
		PM	A	8.0	Southbound	A	0.70	7.5	44.2
2030	Without school	AM	B	10.1	Northbound	B	0.75	11.4	46.8
		PM	A	8.4	Southbound	A	0.73	8.1	50.7
	With school	AM	B	12.8	Northbound	C	0.85	16.8	64.3
		PM	A	8.5	Southbound	A	0.73	8.1	50.7

Table 8: Cope Dr. / Defence St. (T.W.S.C.) – Intersection Traffic Operations

Horizon	Condition	Period	Overall Intersection		Critical Movements (highest V/C or poor LOS)				
			LOS	Delay	Movement	LOS	V/C	Delay	95th %'ile Queue (m)
2025	Without School	AM	A	0.9	NBL/R	B	0.06	11.0	1.4
		PM	A	1.0	NBL/R	B	0.03	10.0	0.7
	With school	AM	A	1.9	NBL/R	B	0.11	12.7	2.9
		PM	A	3.5	NBL/R	B	0.15	12.7	3.8
2030	Without School	AM	A	0.9	NBL/R	B	0.06	11.1	1.5
		PM	A	0.9	NBL/R	B	0.03	10.1	0.7
	With school	AM	A	1.9	NBL/R	B	0.11	12.8	2.9
		PM	A	3.5	NBL/R	B	0.15	12.1	3.9

Table 9: Defence St. / Fernbank Rd. (T.W.S.C.) – Intersection Traffic Operations

Horizon	Condition	Period	Overall Intersection		Critical Movements (highest V/C or poor LOS)				
			LOS	Delay	Movement	LOS	V/C	Delay	95th %'ile Queue (m)
2025	Without School	AM	B	1.7	SBL/R	F	0.41	50.9	13.6
		PM	C	1.5	SBL/R	F	0.41	81.4	12.5
	With school	AM	B	1.7	SBL/R	F	0.42	51.5	13.7
		PM	C	1.5	SBL/R	F	0.41	81.4	12.5
2030	Without School	AM	C	2.0	SBL/R	F	0.48	63.1	16.2
		PM	D	1.9	SBL/R	F	0.50	107.5	15.2
	With school	AM	C	2.0	SBL/R	F	0.48	63.9	16.3
		PM	D	1.9	SBL/R	F	0.50	107.5	15.2

5.0 Conclusions

Based on the transportation evaluation presented in this study, the proposed elementary school and daycare to be located at 60 Defence Street should be permitted to proceed from a transportation impact perspective.

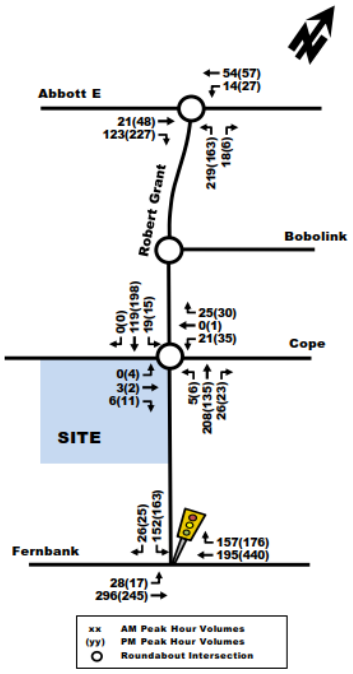
- The proposed elementary school and daycare is located at 60 Defence Street in south Kanata. The anticipated build-out is 2023, at which time the school will have 507 students, 40 childcare spaces, and 36 staff.
- The proposed school is forecasted to generate 375 auto trips during the weekday AM peak hour and 119 auto trips during the weekday PM peak hour. Many of these vehicle trips will be pass-by trips which will not have a meaningful impact on traffic operations in the study area.
- All intersections are anticipated to operate well except for the southbound approach at the Defence Street / Fernbank Road intersection. The southbound approach will experience long delays and poor LOS. This issue is not caused by the school and does not impact school traffic.
- On-site parking for staff meets by-law requirements and the drop-off / pick-up area for the daycare is adequate. The laybys for buses and parent drop-offs/pick-ups is adequate.
- The bicycle parking supply meets bylaw requirements; however, additional bicycle parking should be provided or provisioned for since the demand for bicycle parking may exceed the by-law requirements.
- The school should display relevant transit schedules and route maps at entrances to promote transit usage.
- A pedestrian crossover should be provided on Cope Drive in front of the school. This would benefit school children, parents, transit users, and local residents wishing to access the school, bus stop, stormwater pond, among other things. The pedestrian crossover is anticipated to be warranted based on the TAC *Pedestrian Crossing Control Guide*.
- A school crossing guard should be considered to facilitate the safe crossing of children crossing Cope Drive.

Appendix A

700 Cope Drive TIA Excerpts

PARSONS

Figure 5: Existing Peak Hour Traffic Volumes



Existing Road Safety Conditions

As the study area is relatively new, the five-year collision history on boundary streets does not exist. The collision data available for Robert Grant Avenue indicates that there were two collisions since the road was built: a sideswipe collision in July 2016 and an angle collision in October 2017. Both collisions resulted in property damage only and no pedestrians and cyclists were involved. The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix C.

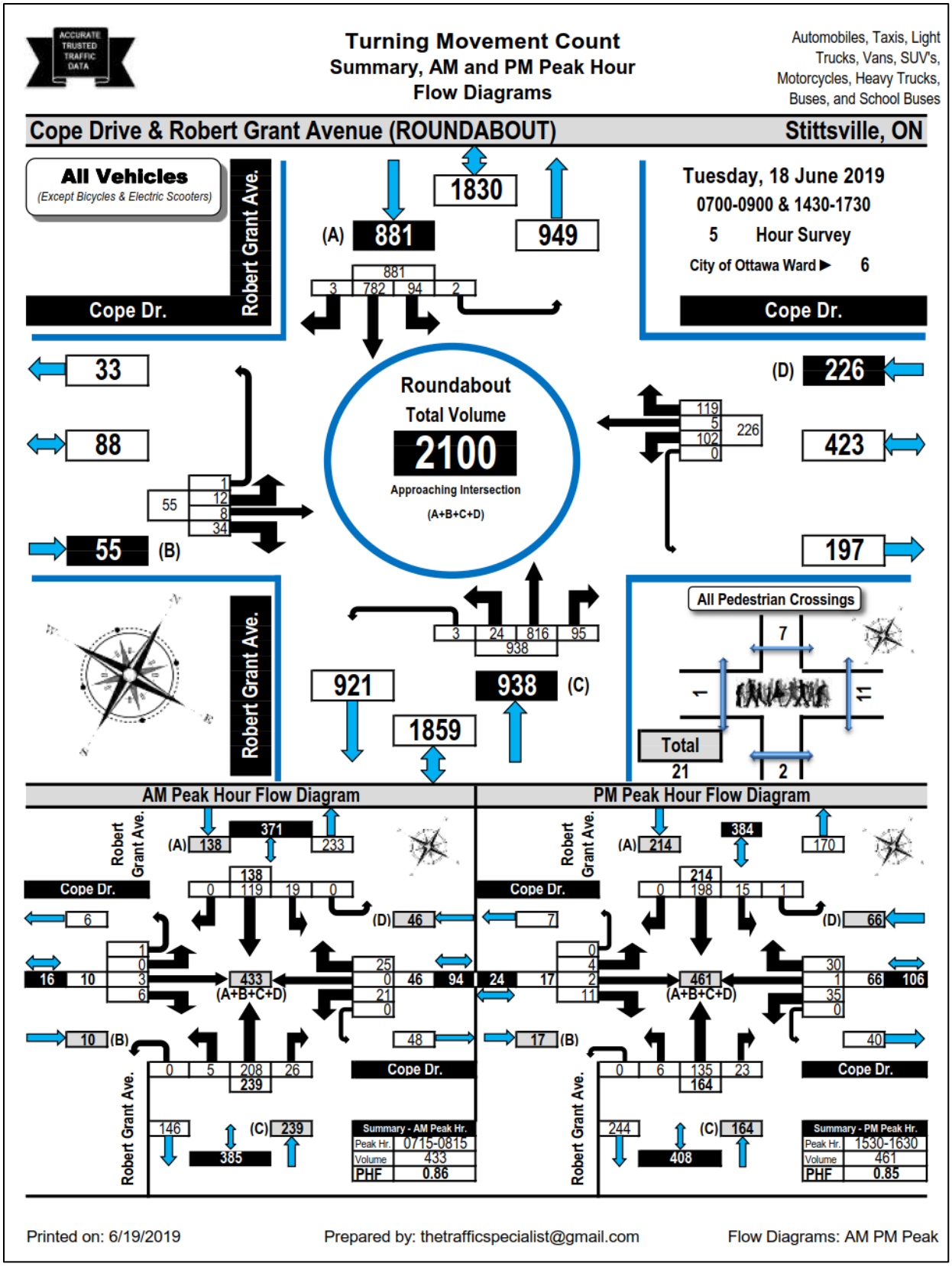
2.1.3. PLANNED CONDITIONS

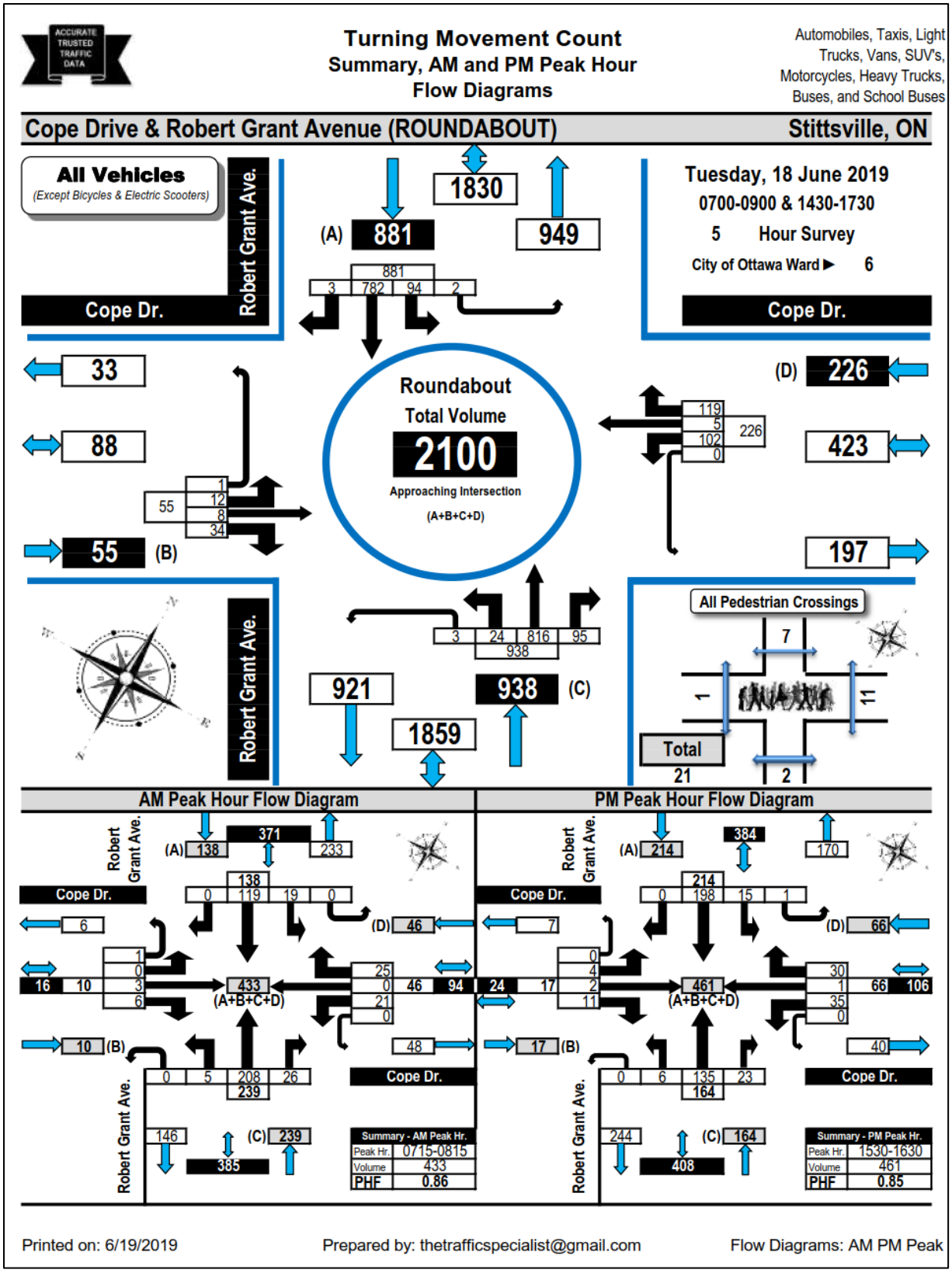
Planned Study Area Transportation Network Changes

Fernbank Road is identified as a transit priority corridor with isolated measures (City of Ottawa Transportation Master Plan (TMP) 2013, Ultimate Network) and widening has been proposed in the Network Concept Map 10 (TMP).

Robert Grant Avenue is identified as a transit priority corridor with isolated measures in the Affordable Network Plan and a future Bus Rapid Transit (BRT) corridor in the Network Concept Plan. Additionally, Park and Rides have been proposed at the Abbot E/Robert Grant and Fernbank/Robert Grant intersections in the Affordable Network Plan, the Network Concept Plan and the Fernbank Community Design Plan.

A high-level design for Robert Grant Ave was completed as part of the West Transit Way Connections (Terry Fox Dr. to Fernbank Rd) EA study. The section of this design, along the proposed development frontage is shown in Figure 6. This section includes exclusive bus lanes along the roadway centreline, the future Abbott BRT station, and park and ride location.

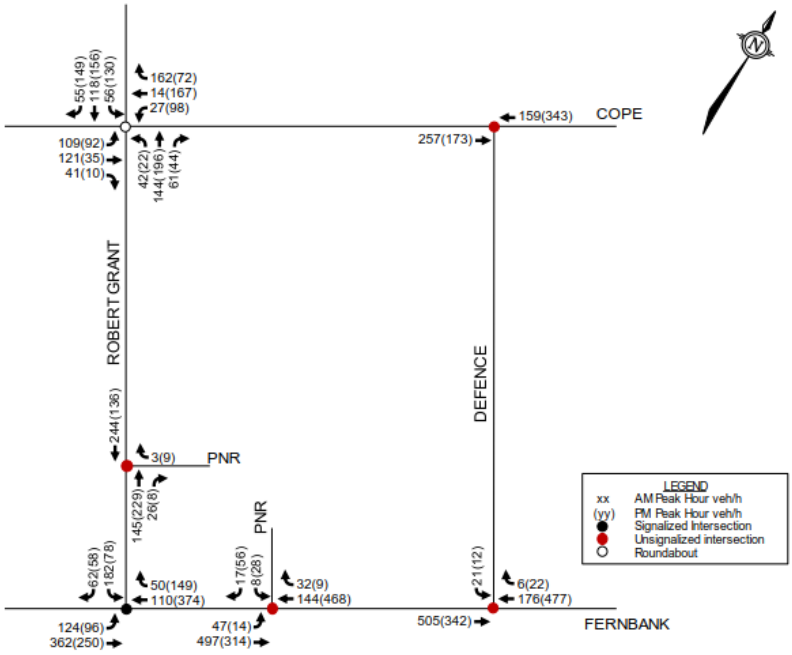

ACCURATE TRUSTED TRAFFIC DATA
Turning Movement Count
Summary, AM and PM Peak Hour
Flow Diagrams
Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses
Cope Drive & Robert Grant Avenue (ROUNDABOUT)
Stittsville, ON
All Vehicles
(Except Bicycles & Electric Scooters)
Robert Grant Ave.
Cope Dr.
Tuesday, 18 June 2019
0700-0900 & 1430-1730
5 Hour Survey
City of Ottawa Ward ▶ 6
1830
(A) 881
949
881
3 782 94 2
33
88
55 (B)
1 12 8 34
55
Roundabout
Total Volume
2100
Approaching Intersection
(A+B+C+D)
(D) 226
119 5 102 0
226
423
197
3 24 816 95
938
921
938 (C)
1859
All Pedestrian Crossings
7
1
11
Total
21
2
AM Peak Hour Flow Diagram
PM Peak Hour Flow Diagram
Robert Grant Ave.
Cope Dr.
(A) 138 371 233
138
0 119 19 0
(D) 46
6
16 10 1 0 3 6
433
(A+B+C+D)
25 0 46 94 21 0
48
10 (B)
0 5 208 26
239
146
(C) 239
385
Summary - AM Peak Hr.
Peak Hr. 0715-0815
Volume 433
PHF 0.86
(A) 214 384 170
214
0 198 15 1
(D) 66
7
24 17 0 4 2 11
461
(A+B+C+D)
30 1 66 106 35 0
40
17 (B)
0 6 135 23
164
244
(C) 164
408
Summary - PM Peak Hr.
Peak Hr. 1530-1630
Volume 461
PHF 0.85
Printed on: 6/19/2019
Prepared by: thetrafficspecialist@gmail.com
Flow Diagrams: AM PM Peak


ACCURATE TRUSTED TRAFFIC DATA
Turning Movement Count
Summary, AM and PM Peak Hour
Flow Diagrams
Automobiles, Taxis, Light Trucks, Vans, SUV's, Motorcycles, Heavy Trucks, Buses, and School Buses
Cope Drive & Robert Grant Avenue (ROUNDABOUT)
Stittsville, ON
All Vehicles
(Except Bicycles & Electric Scooters)
Tuesday, 18 June 2019
0700-0900 & 1430-1730
5 Hour Survey
City of Ottawa Ward ► 6
Robert Grant Ave.
Cope Dr.
Roundabout
Total Volume
2100
Approaching Intersection
(A+B+C+D)
(A) 881
1830
949
(B) 55
(C) 938
(D) 226
921
1859
All Pedestrian Crossings
Total
AM Peak Hour Flow Diagram
PM Peak Hour Flow Diagram
433 (A+B+C+D)
461 (A+B+C+D)
Summary - AM Peak Hr.
Peak Hr. 0715-0815
Volume 433
PHF 0.86
Summary - PM Peak Hr.
Peak Hr. 1530-1630
Volume 461
PHF 0.85
Printed on: 6/19/2019
Prepared by: thetrafficspecialist@gmail.com
Flow Diagrams: AM PM Peak

Appendix B

Fernbank Crossing Phase 4 TIA Excerpts

Figure 6: 2026 Background Traffic Volumes



3.4 Site Trip Generation

Trips generated by the proposed development have been estimated using relevant peak hour trip generation rates identified in the ITE *Trip Generation Manual, 9th Edition*. The estimated peak hour vehicle trips generated by the proposed development during the weekday AM and PM peak hours are outlined in **Table 2**.

Table 2: ITE Trip Generation

Land Use	ITE Code	Dwelling Units	AM Peak (vph[1])			PM Peak (vph)		
			IN	OUT	TOTAL	IN	OUT	TOTAL
Single Family Detached	210	112	22	66	88	73	43	116
Townhouse	230	47	4	24	28	21	11	32
Elementary School	520	580	143	118	261	42	45	87

1. vph = vehicles per hour

The trip generation surveys compiled in the ITE *Trip Generation Manual* only record vehicle trips, and the sites surveyed are typically located in the suburban locations in the United States where non-auto modes of transportation typically have a modal share of 10% or less. For urban infill developments where multiple modes of transportation are readily available, it is considered good

practice to express projected trip generation volumes in terms of person trips instead of vehicle trips.

Based on our review of available literature, a factor of 1.3 applied to ITE vehicle trip generation rates is considered to be a reasonable estimate of "person" trips, given typical auto occupancy in North America is approximately 1.15 and the typical modal share of non-auto person trips is approximately 10% (e.g. 70% Auto Driver, 10% Auto Passenger, 10% Transit, and 10% Non-motorized).

It is noteworthy that the 1.3 person trip factor was not applied to the trips generated by the elementary school due to the nature of the land use.

Table 3: Person Trips

Land Use	IN (vph)	OUT (vph)	TOTAL (vph)	Person Trip Factor	IN (pph[1])	OUT (pph)	TOTAL (pph)
AM Peak							
Single Detached	20	62	83	**x 1.3 →**	28	87	115
Townhouse	4	24	28		6	31	37
PM Peak							
Single Detached	68	41	109	**x 1.3 →**	95	56	151
Townhouse	21	11	32		28	14	42

1. pph = persons per hour

The number of car trips that the site will generate has been estimated by categorizing the person trips by modal share. The modal shares are based on observed percentages in the *2011 TRANS O-D Survey Report* that are specific to the region referred to as the Kanata – Stittsville Area as well as the future projections in the Fernbank TMP.

A full breakdown of the projected person trips by modal share and arrival/departure is shown in **Table 4** below.

Table 4: Site-Generated Person Trips by Modal Share

Travel Mode	Modal Share	AM Peak			PM Peak		
		IN	OUT	TOTAL	IN	OUT	TOTAL
SINGLE DETACHED PERSON TRIPS		*28*	*87*	*115*	*95*	*56*	*151*
Auto Driver	65%	19	57	76	62	37	99
Auto Passenger	10%	3	9	12	10	6	16
Transit	20%	5	17	22	19	11	30
Non-Motorized	5%	1	4	5	4	2	6
TOWNHOUSE PERSON TRIPS		*6*	*31*	*37*	*28*	*14*	*42*
Auto Driver	65%	4	21	25	19	10	29
Auto Passenger	10%	1	3	4	3	2	5
Transit	20%	1	6	7	5	2	7
Non-Motorized	5%	0	1	1	0	0	0

For the purposes of this analysis, the proposed elementary school has been assumed to primarily serve developments within the Fernbank Community. As such it has been assumed that approximately 50% of the elementary school trips will be internally captured within the Fernbank Community. The following table shows the breakdown of internal/external trips generated by the elementary school.

Table 5: Internally Captured Trips

Trip Type	AM Peak			PM Peak		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Elementary School Trips	*143*	*118*	*261*	*42*	*45*	*87*
Internal	71	59	130	21	22	43
External	72	59	131	21	23	44

3.5 Site Trip Distribution

The assumed distribution of trips generated by the proposed development during the weekday AM and PM peak hours has been derived from existing traffic patterns on the study area roadways, and is consistent with other development applications within the Fernbank Community. External trips generated by the proposed development were distributed to the road network as follows:

- 45% to/from the north via Robert Grant Avenue
- 20% to/from the east via Cope Drive
- 25% to/from the east via Fernbank Road
- 10% to/from the west via Fernbank Road

The proposed elementary school has been assumed to have all movement access along Cope Drive and Defence Street. The Cope Drive access is assumed to facilitate bus pick-up/drop-off. The Defence Street access is assumed to facilitate parent pick-up/drop-off. As identified above, the proposed elementary school has been assumed to primarily serve developments within the Fernbank Community. The methodology used to determine the distribution of elementary school trips that are internally captured within the Fernbank Community is described below.

The Fernbank Community was split into zones based on the existing/future road network. Internally captured trips generated by the elementary school were then distributed to each zone within the Fernbank Community based on the size of the zone. Internally captured trips generated by the elementary school were distributed to/from the road network as follows:

- 35% to/from the north via Robert Grant Avenue
- 40% to/from the west via Cope Drive
- 15% to/from the east via Cope Drive
- 5% to/from the north via Shinny Avenue
- 5% to/from the Fernbank Crossing Phase 3 and 4 lands

Traffic generated by the proposed development are shown in **Figure 7**. Total traffic volumes for the 2021 build-out year and the 2026 horizon year are shown in **Figure 8** and **9** respectively.

Figure 7: Site Generated Traffic Volumes

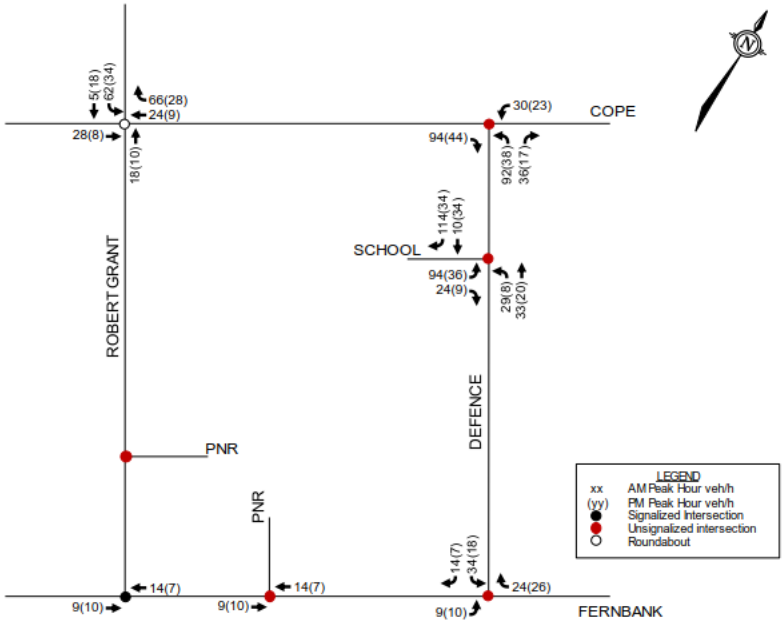
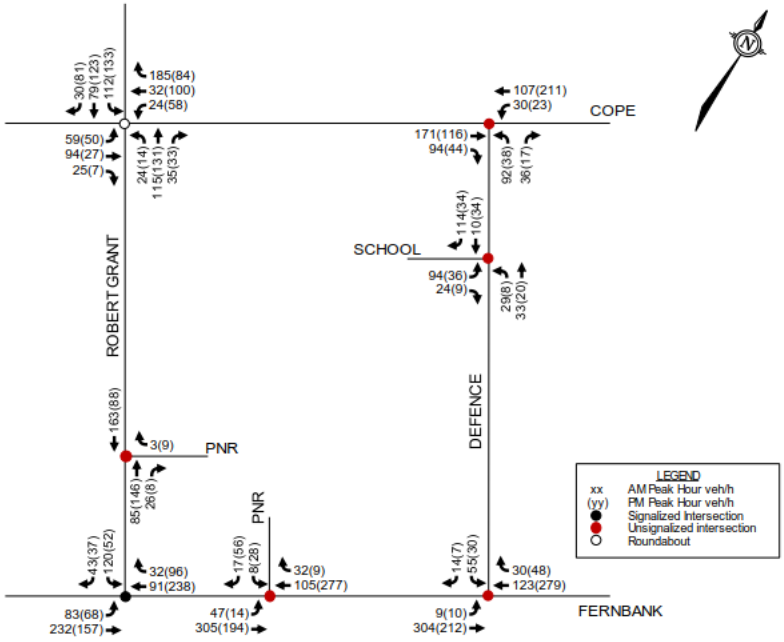
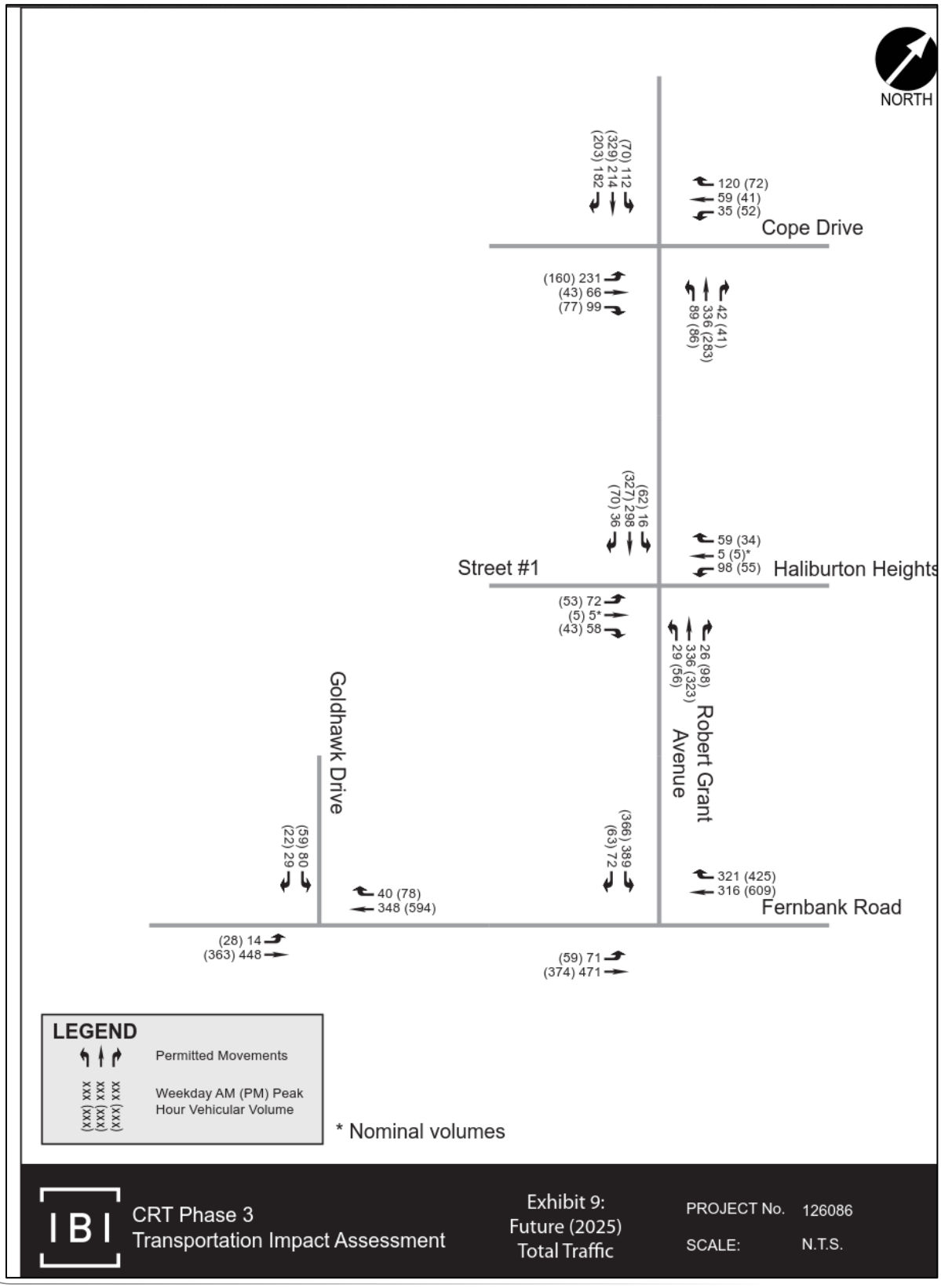


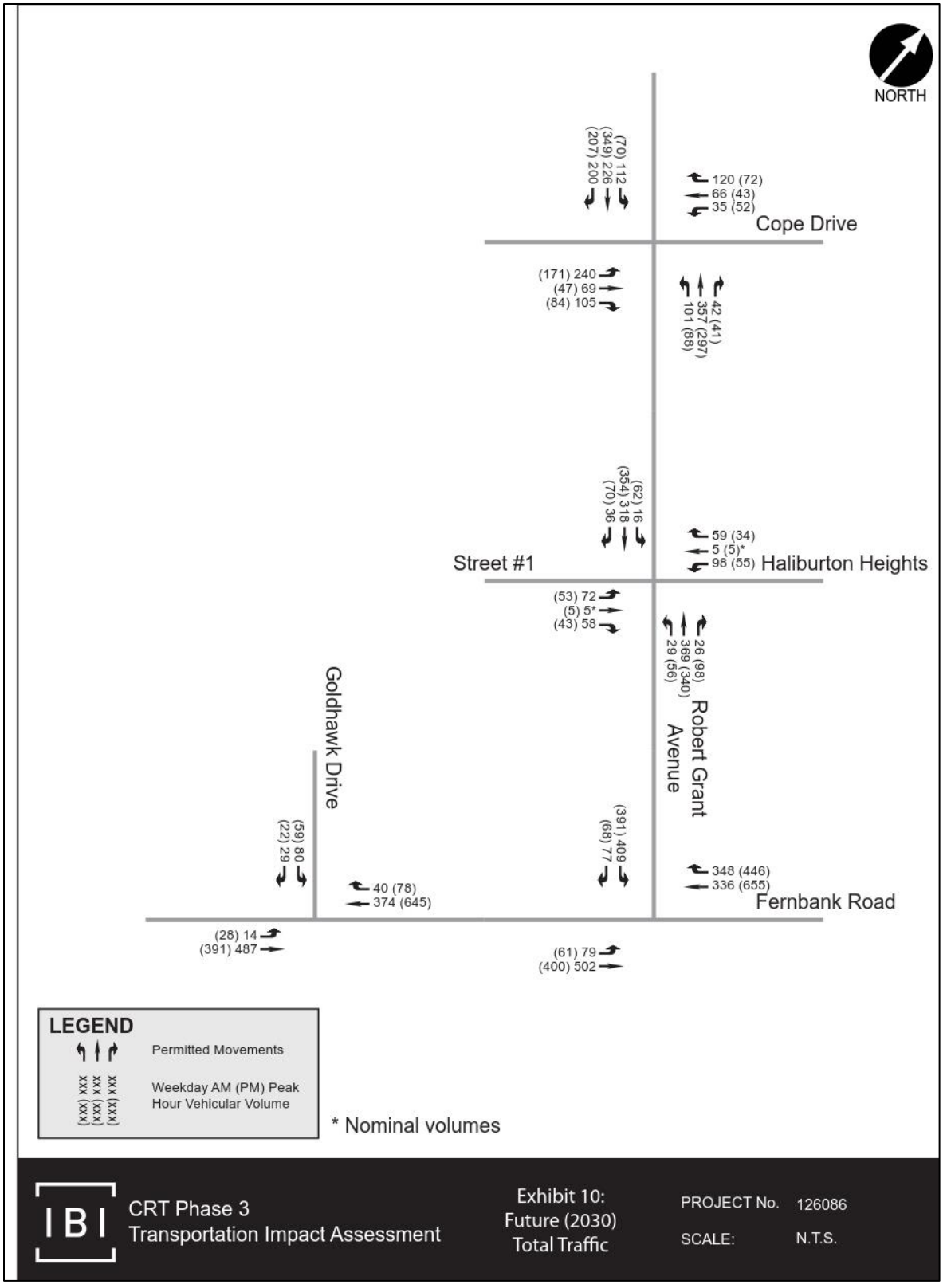
Figure 8: 2021 Total Traffic Volumes



Appendix C

CRT Phase 3 TIA Excerpts


NORTH
(70) 112
(329) 214
(203) 182
120 (72)
59 (41)
35 (52)
Cope Drive
(160) 231
(43) 66
(77) 99
42 (41)
336 (283)
89 (86)
(62) 16
(327) 298
(70) 36
59 (34)
5 (5)*
98 (55)
Street #1
Haliburton Heights
(53) 72
(5) 5*
(43) 58
26 (98)
336 (323)
29 (56)
Goldhawk Drive
Robert Grant Avenue
(59) 80
(22) 29
(366) 389
(63) 72
321 (425)
316 (609)
40 (78)
348 (594)
Fernbank Road
(28) 14
(363) 448
(59) 71
(374) 471
LEGEND
Permitted Movements
xxx (xxx)
Weekday AM (PM) Peak Hour Vehicular Volume
* Nominal volumes
IBI
CRT Phase 3
Transportation Impact Assessment
Exhibit 9:
Future (2025)
Total Traffic
PROJECT No. 126086
SCALE: N.T.S.


NORTH
Cope Drive
Street #1
Haliburton Heights
Goldhawk Drive
Robert Grant Avenue
Fernbank Road
(70) 112
(349) 226
(207) 200
120 (72)
66 (43)
35 (52)
(171) 240
(47) 69
(84) 105
42 (41)
357 (297)
101 (88)
(62) 16
(354) 318
(70) 36
59 (34)
5 (5)*
98 (55)
(53) 72
(5) 5*
(43) 58
26 (98)
369 (340)
29 (56)
(59) 80
(22) 29
40 (78)
374 (645)
(391) 409
(68) 77
348 (446)
336 (655)
(28) 14
(391) 487
(61) 79
(400) 502
LEGEND
Permitted Movements
Weekday AM (PM) Peak Hour Vehicular Volume
* Nominal volumes
IBI
CRT Phase 3
Transportation Impact Assessment
Exhibit 10:
Future (2030)
Total Traffic
PROJECT No. 126086
SCALE: N.T.S.

Appendix D

Synchro and Sidra Reports

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2025 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	489	7.7	706	0.693	100	10.0	LOS A	5.2	38.4	Full	500	0.0	0.0
Approach	489	7.7		0.693		10.0	LOS A	5.2	38.4				
East: RoadName													
Lane 1[d]	226	2.0	551	0.411	100	10.5	LOS B	1.8	12.7	Full	500	0.0	0.0
Approach	226	2.0		0.411		10.5	LOS B	1.8	12.7				
North: RoadName													
Lane 1[d]	532	4.9	904	0.588	100	7.1	LOS A	3.8	27.9	Full	500	0.0	0.0
Approach	532	4.9		0.588		7.1	LOS A	3.8	27.9				
West: RoadName													
Lane 1[d]	416	2.0	759	0.548	100	10.7	LOS B	3.3	23.3	Full	500	0.0	0.0
Approach	416	2.0		0.548		10.7	LOS B	3.3	23.3				
Intersection	1663	4.6		0.693		9.3	LOS A	5.2	38.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: RoadName

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	95	353	42	489	7.7	706	0.693	100	NA	NA
Approach	95	353	42	489	7.7		0.693			

East: RoadName

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	37	63	126	226	2.0	551	0.411	100	NA	NA
Approach	37	63	126	226	2.0		0.411			

North: RoadName

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	116	226	189	532	4.9	904	0.588	100	NA	NA
Approach	116	226	189	532	4.9		0.588			

West: RoadName

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	242	68	105	416	2.0	759	0.548	100	NA	NA
Approach	242	68	105	416	2.0		0.548			

	Total	%HV	Deg.Satn (v/c)
Intersection	1663	4.6	0.693

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2025 PM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	432	5.5	820	0.526	100	6.5	LOS A	3.0	22.0	Full	500	0.0	0.0
Approach	432	5.5		0.526		6.5	LOS A	3.0	22.0				
East: RoadName													
Lane 1[d]	168	2.0	633	0.266	100	9.0	LOS A	1.0	7.1	Full	500	0.0	0.0
Approach	168	2.0		0.266		9.0	LOS A	1.0	7.1				
North: RoadName													
Lane 1[d]	637	4.8	915	0.696	100	7.5	LOS A	6.1	44.2	Full	500	0.0	0.0
Approach	637	4.8		0.696		7.5	LOS A	6.1	44.2				
West: RoadName													
Lane 1[d]	295	2.0	689	0.428	100	10.5	LOS B	2.0	14.3	Full	500	0.0	0.0
Approach	295	2.0		0.428		10.5	LOS B	2.0	14.3				
Intersection	1532	4.2		0.696		8.0	LOS A	6.1	44.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: RoadName

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	89	300	42	432	5.5	820	0.526	100	NA	NA
Approach	89	300	42	432	5.5		0.526			

East: RoadName

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	53	42	74	168	2.0	633	0.266	100	NA	NA
Approach	53	42	74	168	2.0		0.266			

North: RoadName

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	74	347	216	637	4.8	915	0.696	100	NA	NA
Approach	74	347	216	637	4.8		0.696			

West: RoadName

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	168	47	79	295	2.0	689	0.428	100	NA	NA
Approach	168	47	79	295	2.0		0.428			

	Total	%HV	Deg.Satn (v/c)
Intersection	1532	4.2	0.696

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2030 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	521	7.7	695	0.750	100	11.4	LOS B	6.3	46.8	Full	500	0.0	0.0
Approach	521	7.7		0.750		11.4	LOS B	6.3	46.8				
East: RoadName													
Lane 1[d]	232	2.0	527	0.439	100	11.2	LOS B	1.9	13.8	Full	500	0.0	0.0
Approach	232	2.0		0.439		11.2	LOS B	1.9	13.8				
North: RoadName													
Lane 1[d]	563	4.9	889	0.633	100	7.7	LOS A	4.7	33.9	Full	500	0.0	0.0
Approach	563	4.9		0.633		7.7	LOS A	4.7	33.9				
West: RoadName													
Lane 1[d]	437	2.0	751	0.582	100	11.1	LOS B	3.7	26.2	Full	500	0.0	0.0
Approach	437	2.0		0.582		11.1	LOS B	3.7	26.2				
Intersection	1753	4.6		0.750		10.1	LOS B	6.3	46.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
South: RoadName											
Lane 1	105	374	42	521	7.7	695	0.750	100	NA	NA	
Approach	105	374	42	521	7.7		0.750				
East: RoadName											
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	37	68	126	232	2.0	527	0.439	100	NA	NA	
Approach	37	68	126	232	2.0		0.439				
North: RoadName											
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	116	237	211	563	4.9	889	0.633	100	NA	NA	
Approach	116	237	211	563	4.9		0.633				
West: RoadName											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	253	74	111	437	2.0	751	0.582	100	NA	NA	
Approach	253	74	111	437	2.0		0.582				
	Total	%HV	Deg. Satn (v/c)								
Intersection	1753	4.6	0.750								

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2030 PM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	447	5.5	811	0.551	100	6.8	LOS A	3.3	24.2	Full	500	0.0	0.0
Approach	447	5.5		0.551		6.8	LOS A	3.3	24.2				
East: RoadName													
Lane 1[d]	174	2.0	616	0.282	100	9.2	LOS A	1.1	7.5	Full	500	0.0	0.0
Approach	174	2.0		0.282		9.2	LOS A	1.1	7.5				
North: RoadName													
Lane 1[d]	658	4.8	905	0.727	100	8.1	LOS A	7.0	50.7	Full	500	0.0	0.0
Approach	658	4.8		0.727		8.1	LOS A	7.0	50.7				
West: RoadName													
Lane 1[d]	316	2.0	675	0.468	100	11.0	LOS B	2.3	16.6	Full	500	0.0	0.0
Approach	316	2.0		0.468		11.0	LOS B	2.3	16.6				
Intersection	1595	4.1		0.727		8.4	LOS A	7.0	50.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
South: RoadName											
Lane 1	95	311	42	447	5.5	811	0.551	100	NA	NA	
Approach	95	311	42	447	5.5		0.551				
East: RoadName											
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	53	47	74	174	2.0	616	0.282	100	NA	NA	
Approach	53	47	74	174	2.0		0.282				
North: RoadName											
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	74	368	216	658	4.8	905	0.727	100	NA	NA	
Approach	74	368	216	658	4.8		0.727				
West: RoadName											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	179	47	89	316	2.0	675	0.468	100	NA	NA	
Approach	179	47	89	316	2.0		0.468				
	Total	%HV	Deg. Satn (v/c)								
Intersection	1595	4.1	0.727								

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2025 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	495	7.7	631	0.785	100	13.6	LOS B	6.7	49.7	Full	500	0.0	0.0
Approach	495	7.7		0.785		13.6	LOS B	6.7	49.7				
East: RoadName													
Lane 1[d]	226	2.0	551	0.411	100	10.5	LOS B	1.8	12.7	Full	500	0.0	0.0
Approach	226	2.0		0.411		10.5	LOS B	1.8	12.7				
North: RoadName													
Lane 1[d]	642	4.9	904	0.711	100	9.0	LOS A	6.5	47.1	Full	500	0.0	0.0
Approach	642	4.9		0.711		9.0	LOS A	6.5	47.1				
West: RoadName													
Lane 1[d]	416	2.0	678	0.613	100	12.6	LOS B	3.9	27.8	Full	500	0.0	0.0
Approach	416	2.0		0.613		12.6	LOS B	3.9	27.8				
Intersection	1779	4.6		0.785		11.3	LOS B	6.7	49.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
South: RoadName											
Lane 1	95	353	47	495	7.7	631	0.785	100	NA	NA	
Approach	95	353	47	495	7.7		0.785				
East: RoadName											
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	37	63	126	226	2.0	551	0.411	100	NA	NA	
Approach	37	63	126	226	2.0		0.411				
North: RoadName											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	226	226	189	642	4.9	904	0.711	100	NA	NA	
Approach	226	226	189	642	4.9		0.711				
West: RoadName											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	242	68	105	416	2.0	678	0.613	100	NA	NA	
Approach	242	68	105	416	2.0		0.613				
	Total	%HV	Deg.Satn (v/c)								
Intersection	1779	4.6	0.785								

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap pcu/h sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2025 PM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	432	5.5	820	0.526	100	6.5	LOS A	3.0	22.0	Full	500	0.0	0.0
Approach	432	5.5		0.526		6.5	LOS A	3.0	22.0				
East: RoadName													
Lane 1[d]	205	2.0	633	0.325	100	8.9	LOS A	1.3	9.1	Full	500	0.0	0.0
Approach	205	2.0		0.325		8.9	LOS A	1.3	9.1				
North: RoadName													
Lane 1[d]	637	4.8	915	0.696	100	7.5	LOS A	6.1	44.2	Full	500	0.0	0.0
Approach	637	4.8		0.696		7.5	LOS A	6.1	44.2				
West: RoadName													
Lane 1[d]	295	2.0	689	0.428	100	10.5	LOS B	2.0	14.3	Full	500	0.0	0.0
Approach	295	2.0		0.428		10.5	LOS B	2.0	14.3				
Intersection	1568	4.1		0.696		8.0	LOS A	6.1	44.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
South: RoadName											
Lane 1	89	300	42	432	5.5	820	0.526	100	NA	NA	
Approach	89	300	42	432	5.5		0.526				
East: RoadName											
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	53	42	111	205	2.0	633	0.325	100	NA	NA	
Approach	53	42	111	205	2.0		0.325				
North: RoadName											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Ov. %	Lane No.
Lane 1	74	347	216	637	4.8	915	0.696	100	NA	NA	
Approach	74	347	216	637	4.8		0.696				
West: RoadName											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL %	Ov. %	Lane No.
Lane 1	168	47	79	295	2.0	689	0.428	100	NA	NA	
Approach	168	47	79	295	2.0		0.428				
	Total	%HV	Deg.Satn (v/c)								
Intersection	1568	4.1	0.696								

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap pcu/h sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2030 AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	526	7.7	621	0.848	100	16.8	LOS C	8.6	64.3	Full	500	0.0	0.0
Approach	526	7.7		0.848		16.8	LOS C	8.6	64.3				
East: RoadName													
Lane 1[d]	232	2.0	527	0.439	100	11.2	LOS B	1.9	13.8	Full	500	0.0	0.0
Approach	232	2.0		0.439		11.2	LOS B	1.9	13.8				
North: RoadName													
Lane 1[d]	674	4.9	889	0.758	100	10.1	LOS B	7.9	57.8	Full	500	0.0	0.0
Approach	674	4.9		0.758		10.1	LOS B	7.9	57.8				
West: RoadName													
Lane 1[d]	437	2.0	671	0.651	100	13.3	LOS B	4.4	31.5	Full	500	0.0	0.0
Approach	437	2.0		0.651		13.3	LOS B	4.4	31.5				
Intersection	1868	4.7		0.848		12.8	LOS B	8.6	64.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: RoadName

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	105	374	47	526	7.7	621	0.848	100	NA	NA
Approach	105	374	47	526	7.7		0.848			

East: RoadName

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	37	68	126	232	2.0	527	0.439	100	NA	NA
Approach	37	68	126	232	2.0		0.439			

North: RoadName

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	226	237	211	674	4.9	889	0.758	100	NA	NA
Approach	226	237	211	674	4.9		0.758			

West: RoadName

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	253	74	111	437	2.0	671	0.651	100	NA	NA
Approach	253	74	111	437	2.0		0.651			

	Total	%HV	Deg.Satn (v/c)
Intersection	1868	4.7	0.848

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101 [Robert Grant Ave at Cope Drive 2030 PM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	447	5.5	811	0.551	100	6.8	LOS A	3.3	24.2	Full	500	0.0	0.0
Approach	447	5.5		0.551		6.8	LOS A	3.3	24.2				
East: RoadName													
Lane 1[d]	211	2.0	616	0.342	100	9.3	LOS A	1.4	9.8	Full	500	0.0	0.0
Approach	211	2.0		0.342		9.3	LOS A	1.4	9.8				
North: RoadName													
Lane 1[d]	658	4.8	905	0.727	100	8.1	LOS A	7.0	50.7	Full	500	0.0	0.0
Approach	658	4.8		0.727		8.1	LOS A	7.0	50.7				
West: RoadName													
Lane 1[d]	316	2.0	675	0.468	100	11.0	LOS B	2.3	16.6	Full	500	0.0	0.0
Approach	316	2.0		0.468		11.0	LOS B	2.3	16.6				
Intersection	1632	4.1		0.727		8.5	LOS A	7.0	50.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: RoadName

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	95	311	42	447	5.5	811	0.551	100	NA	NA
Approach	95	311	42	447	5.5		0.551			

East: RoadName

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	53	47	111	211	2.0	616	0.342	100	NA	NA
Approach	53	47	111	211	2.0		0.342			

North: RoadName

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	74	368	216	658	4.8	905	0.727	100	NA	NA
Approach	74	368	216	658	4.8		0.727			

West: RoadName

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	179	47	89	316	2.0	675	0.468	100	NA	NA
Approach	179	47	89	316	2.0		0.468			

	Total	%HV	Deg.Satn (v/c)
Intersection	1632	4.1	0.727

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: RoadName Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	5	5	195	20	15
Future Volume (Veh/h)	215	5	5	195	20	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	5	5	212	22	16
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			239		458	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			239		458	236
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	98
cM capacity (veh/h)			1328		558	802

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	239	217	38
Volume Left	0	5	22
Volume Right	5	0	16
cSH	1700	1328	640
Volume to Capacity	0.14	0.00	0.06
Queue Length 95th (m)	0.0	0.1	1.4
Control Delay (s)	0.0	0.2	11.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.2	11.0
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	860	630	10	40	10
Future Volume (Veh/h)	5	860	630	10	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	935	685	11	43	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	696				1636	690
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	696				1636	690
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				61	98
cM capacity (veh/h)	900				110	445

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	940	696	54
Volume Left	5	0	43
Volume Right	0	11	11
cSH	900	1700	130
Volume to Capacity	0.01	0.41	0.41
Queue Length 95th (m)	0.1	0.0	13.6
Control Delay (s)	0.2	0.0	50.9
Lane LOS	A		F
Approach Delay (s)	0.2	0.0	50.9
Approach LOS			F

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	135	20	15	155	10	10
Future Volume (Veh/h)	135	20	15	155	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	147	22	16	168	11	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			169		358	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			169		358	158
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
cM capacity (veh/h)			1409		633	887

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	169	184	22
Volume Left	0	16	11
Volume Right	22	0	11
cSH	1700	1409	739
Volume to Capacity	0.10	0.01	0.03
Queue Length 95th (m)	0.0	0.3	0.7
Control Delay (s)	0.0	0.7	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	10.0
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	730	1030	45	25	5
Future Volume (Veh/h)	10	730	1030	45	25	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	793	1120	49	27	5
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	1169				1960	1144
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1169				1960	1144
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				61	98
cM capacity (veh/h)	598				69	243

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	804	1169	32
Volume Left	11	0	27
Volume Right	0	49	5
cSH	598	1700	77
Volume to Capacity	0.02	0.69	0.41
Queue Length 95th (m)	0.4	0.0	12.5
Control Delay (s)	0.5	0.0	81.4
Lane LOS	A		F
Approach Delay (s)	0.5	0.0	81.4
Approach LOS			F

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	330	25	55	195	20	35
Future Volume (Veh/h)	330	25	55	195	20	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	359	27	60	212	22	38
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			386		704	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		704	372
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		94	94
cM capacity (veh/h)			1172		382	673

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	386	272	60
Volume Left	0	60	22
Volume Right	27	0	38
cSH	1700	1172	527
Volume to Capacity	0.23	0.05	0.11
Queue Length 95th (m)	0.0	1.2	2.9
Control Delay (s)	0.0	2.2	12.7
Lane LOS		A	B
Approach Delay (s)	0.0	2.2	12.7
Approach LOS			B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	0	5	35	40	40
Future Volume (Veh/h)	20	0	5	35	40	40
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)	22	0	5	38	43	43
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	112	64	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	112	64	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	881	1000	1510			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	43	86
Volume Left	22	5	0
Volume Right	0	0	43
cSH	881	1510	1700
Volume to Capacity	0.02	0.00	0.05
Queue Length 95th (m)	0.6	0.1	0.0
Control Delay (s)	9.2	0.9	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	0.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	16.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	860	630	20	40	10
Future Volume (Veh/h)	5	860	630	20	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	935	685	22	43	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	707				1641	696
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	707				1641	696
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				61	98
cM capacity (veh/h)	891				109	442

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	940	707	54
Volume Left	5	0	43
Volume Right	0	22	11
cSH	891	1700	129
Volume to Capacity	0.01	0.42	0.42
Queue Length 95th (m)	0.1	0.0	13.7
Control Delay (s)	0.2	0.0	51.5
Lane LOS	A		F
Approach Delay (s)	0.2	0.0	51.5
Approach LOS			F

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	135	20	70	145	55	25
Future Volume (Veh/h)	135	20	70	145	55	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	147	22	76	158	60	27
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			169		468	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			169		468	158
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		89	97
cM capacity (veh/h)			1409		524	887

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	169	234	87
Volume Left	0	76	60
Volume Right	22	0	27
cSH	1700	1409	600
Volume to Capacity	0.10	0.05	0.15
Queue Length 95th (m)	0.0	1.3	3.8
Control Delay (s)	0.0	2.8	12.0
Lane LOS		A	B
Approach Delay (s)	0.0	2.8	12.0
Approach LOS			B

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	5	0	20	35	55
Future Volume (Veh/h)	60	5	0	20	35	55
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)	65	5	0	22	38	60
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	90	68	98			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90	68	98			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	99	100			
cM capacity (veh/h)	910	995	1495			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	70	22	98
Volume Left	65	0	0
Volume Right	5	0	60
cSH	916	1495	1700
Volume to Capacity	0.08	0.00	0.06
Queue Length 95th (m)	1.9	0.0	0.0
Control Delay (s)	9.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.3	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	16.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	730	1030	45	25	5
Future Volume (Veh/h)	10	730	1030	45	25	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	793	1120	49	27	5
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	1169				1960	1144
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1169				1960	1144
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				61	98
cM capacity (veh/h)	598				69	243

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	804	1169	32
Volume Left	11	0	27
Volume Right	0	49	5
cSH	598	1700	77
Volume to Capacity	0.02	0.69	0.41
Queue Length 95th (m)	0.4	0.0	12.5
Control Delay (s)	0.5	0.0	81.4
Lane LOS	A		F
Approach Delay (s)	0.5	0.0	81.4
Approach LOS			F

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	220	5	5	205	20	15
Future Volume (Veh/h)	220	5	5	205	20	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	239	5	5	223	22	16
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			244		474	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			244		474	242
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	98
cM capacity (veh/h)			1322		547	797

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	244	228	38
Volume Left	0	5	22
Volume Right	5	0	16
cSH	1700	1322	630
Volume to Capacity	0.14	0.00	0.06
Queue Length 95th (m)	0.0	0.1	1.5
Control Delay (s)	0.0	0.2	11.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.2	11.1
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	910	675	10	40	10
Future Volume (Veh/h)	5	910	675	10	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	989	734	11	43	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	745				1738	740
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	745				1738	740
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				55	97
cM capacity (veh/h)	863				95	417

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	994	745	54
Volume Left	5	0	43
Volume Right	0	11	11
cSH	863	1700	113
Volume to Capacity	0.01	0.44	0.48
Queue Length 95th (m)	0.1	0.0	16.2
Control Delay (s)	0.2	0.0	63.1
Lane LOS	A		F
Approach Delay (s)	0.2	0.0	63.1
Approach LOS			F

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	140	20	15	155	10	10
Future Volume (Veh/h)	140	20	15	155	10	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	152	22	16	168	11	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			174		363	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			174		363	163
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
cM capacity (veh/h)			1403		629	882

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	174	184	22
Volume Left	0	16	11
Volume Right	22	0	11
cSH	1700	1403	734
Volume to Capacity	0.10	0.01	0.03
Queue Length 95th (m)	0.0	0.3	0.7
Control Delay (s)	0.0	0.7	10.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	10.1
Approach LOS			B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	785	1095	45	25	5
Future Volume (Veh/h)	10	785	1095	45	25	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	853	1190	49	27	5
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	1239				2090	1214
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1239				2090	1214
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				52	98
cM capacity (veh/h)	562				57	221

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	864	1239	32
Volume Left	11	0	27
Volume Right	0	49	5
cSH	562	1700	64
Volume to Capacity	0.02	0.73	0.50
Queue Length 95th (m)	0.5	0.0	15.2
Control Delay (s)	0.6	0.0	107.5
Lane LOS	A		F
Approach Delay (s)	0.6	0.0	107.5
Approach LOS			F

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	330	25	55	205	20	35
Future Volume (Veh/h)	330	25	55	205	20	35
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	359	27	60	223	22	38
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			386		716	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		716	372
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		94	94
cM capacity (veh/h)			1172		377	673

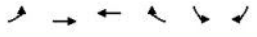
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	386	283	60
Volume Left	0	60	22
Volume Right	27	0	38
cSH	1700	1172	523
Volume to Capacity	0.23	0.05	0.11
Queue Length 95th (m)	0.0	1.2	2.9
Control Delay (s)	0.0	2.1	12.8
Lane LOS		A	B
Approach Delay (s)	0.0	2.1	12.8
Approach LOS			B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	0	5	35	40	40
Future Volume (Veh/h)	20	0	5	35	40	40
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)	22	0	5	38	43	43
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	112	64	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	112	64	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	881	1000	1510			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	43	86
Volume Left	22	5	0
Volume Right	0	0	43
cSH	881	1510	1700
Volume to Capacity	0.02	0.00	0.05
Queue Length 95th (m)	0.6	0.1	0.0
Control Delay (s)	9.2	0.9	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	0.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	16.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	910	675	20	40	10
Future Volume (Veh/h)	5	910	675	20	40	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	989	734	22	43	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	756				1744	745
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	756				1744	745
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				55	97
cM capacity (veh/h)	855				95	414

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	994	756	54
Volume Left	5	0	43
Volume Right	0	22	11
cSH	855	1700	112
Volume to Capacity	0.01	0.44	0.48
Queue Length 95th (m)	0.1	0.0	16.3
Control Delay (s)	0.2	0.0	63.9
Lane LOS	A		F
Approach Delay (s)	0.2	0.0	63.9
Approach LOS			F

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	140	20	70	145	55	25
Future Volume (Veh/h)	140	20	70	145	55	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	152	22	76	158	60	27
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			174		473	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			174		473	163
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		88	97
cM capacity (veh/h)			1403		520	882

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	174	234	87
Volume Left	0	76	60
Volume Right	22	0	27
cSH	1700	1403	596
Volume to Capacity	0.10	0.05	0.15
Queue Length 95th (m)	0.0	1.3	3.9
Control Delay (s)	0.0	2.8	12.1
Lane LOS		A	B
Approach Delay (s)	0.0	2.8	12.1
Approach LOS			B

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	5	0	20	35	55
Future Volume (Veh/h)	60	5	0	20	35	55
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)	65	5	0	22	38	60
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	90	68	98			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90	68	98			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	99	100			
cM capacity (veh/h)	910	995	1495			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	70	22	98
Volume Left	65	0	0
Volume Right	5	0	60
cSH	916	1495	1700
Volume to Capacity	0.08	0.00	0.06
Queue Length 95th (m)	1.9	0.0	0.0
Control Delay (s)	9.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.3	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	16.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	785	1095	45	25	5
Future Volume (Veh/h)	10	785	1095	45	25	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	853	1190	49	27	5
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	1239				2090	1214
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1239				2090	1214
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				52	98
cM capacity (veh/h)	562				57	221

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	864	1239	32
Volume Left	11	0	27
Volume Right	0	49	5
cSH	562	1700	64
Volume to Capacity	0.02	0.73	0.50
Queue Length 95th (m)	0.5	0.0	15.2
Control Delay (s)	0.6	0.0	107.5
Lane LOS	A		F
Approach Delay (s)	0.6	0.0	107.5
Approach LOS			F

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

Appendix E

TDM Checklists

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 next to staff parking lot. Parking lot assumed to have lights.
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	☐ School will monitor bicycle parking spaces.
	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	☒ Teachers have access to lockable cupboard in classroom
	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	☒ Shelter 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 provided on-site
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	☐ N/A for school
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	☐ N/A for school
BETTER ★	3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	☐ N/A for school
		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

Appendix F

Road Modification Approval (RMA) Drawings