PROPOSED KOREAN COMMUNITY CHURCH,
3555 BORRISOKANE ROAD
CITY OF OTTAWA

TRAFFIC IMPACT ASSESSMENT REPORT

Presented to:

Ms. Josiane Gervais
Transportation Services Department
City of Ottawa
110 Laurier Avenue

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Project 7320

CASTLEGLENN CONSULTANTS LTD.

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INTRODUCTION

The 2017 City of Ottawa "*Transportation Impact Assessment Guidelines*" set out a multi-step pre-application process where the scope, assumptions, study area and methodology to conduct a transportation impact assessment (TIA) are detailed and each sequential stage approved by City of Ottawa staff.

This report provides a summary of the following reports which have already been submitted to City staff:

- the Screening Report (Step 1) that was submitted to the City on Wednesday, January 18th, 2023; and
- the Scoping Report (Step 2) that was submitted to the City on Tuesday, February 28th, 2023

Transportation comments from City staff, as well as consultant responses, concerning both the pre-consultation phase (March 26th, 2021) and the various TIA submissions are documented within Appendix "G".

This report represents a combined Forecasting Report and Strategy Report (representing Steps 3 and 4) of the multi-step TIA process.

1.0 SCREENING REPORT (Submitted to the City on Jan. 18th, 2023)

1.1 SUMMARY OF DEVELOPMENT

Exhibit 2-2 illustrates proposed site plan (July, 2023) for the Korean Community Church which is proposed as a single storey building with a gross area of 2,913.5 m^2 to be located at 3555 Borrisokane Road. The development is proposed to have two entrances:

- An access onto Borrisokane Road; and
- A secondary access through the adjacent Halo Car Wash that would connect to Flagstaff Drive.

1.2 SCREENING RESULTS

The City of Ottawa's initial screening process is used to determine…:

- if the number of trips generated by the development makes it desirable to assess the development design and transportation system performance of one or more modes;
- if the development's location makes it desirable to assess development design; or
- if the development and/or boundary street conditions yield a high potential for safety concerns.

1.2.1 Screening: Trip Generation Triggers

The City of Ottawa TIA guidelines set the threshold for the trip generation trigger at 60 person-trips-or-more during the weekday peak hours. If the proposed development meets the trip threshold, both the Design Review and Network Impact components of the TIA are to be considered.

The threshold to meet a trip generation warrant[1] for the existing industrial land use zoning (which is acceptable zoning for "a place of assembly") is established at 5,000 m^2. Since the proposed Korean

1. "*City of Ottawa Transportation Impact Assessment Guidelines*". Dillon Consulting, June 2017

Community Church is approximately 2,913.5 m^2 (or 31,360 ft^2), **the Trip Generation Trigger was found NOT to be satisfied.**

1.2.2 Screening: Location Triggers

The development site is not proposing any new driveways onto boundary streets that are part of the City of Ottawa's Transit Priority, Rapid Transit or Spine Bicycle Networks. The parcel is currently zoned "IL(304)" which is defined as a "Light Industrial Zone". As well the location is not designated as a Design Priority Area; **therefore, the Location Trigger was found NOT to be satisfied.**

1.2.3 Screening: Safety Triggers

The proposed development is located on Borrisokane Road, which has a posted speed limit of 80km/h. The entrance onto Borrisokane Road is located on a horizontal curve, raising the possibility of limited sight lines; **therefore, the "Safety Trigger" was found to be satisfied.**

1.2.4 Screening: Conclusions

The screening results indicate that only the Safety Trigger was found to be satisfied, **therefore, the TIA is required to address the "Design Review" component of the TIA process.**

The completed stamped and signed screening forms can be found within Appendix "B".

2.0 SCOPING REPORT (Submitted to the City on Feb. 28th, 2023)

2.1 EXISTING AND PLANNED CONDITIONS

2.1.1 The Proposed Development

Exhibit 2-1 conceptually illustrates the location of the proposed Korean Community Church. The frontage of the lot faces Borrisokane Road and the lot is situated south of Flagstaff Drive and North of Cambrian Road.

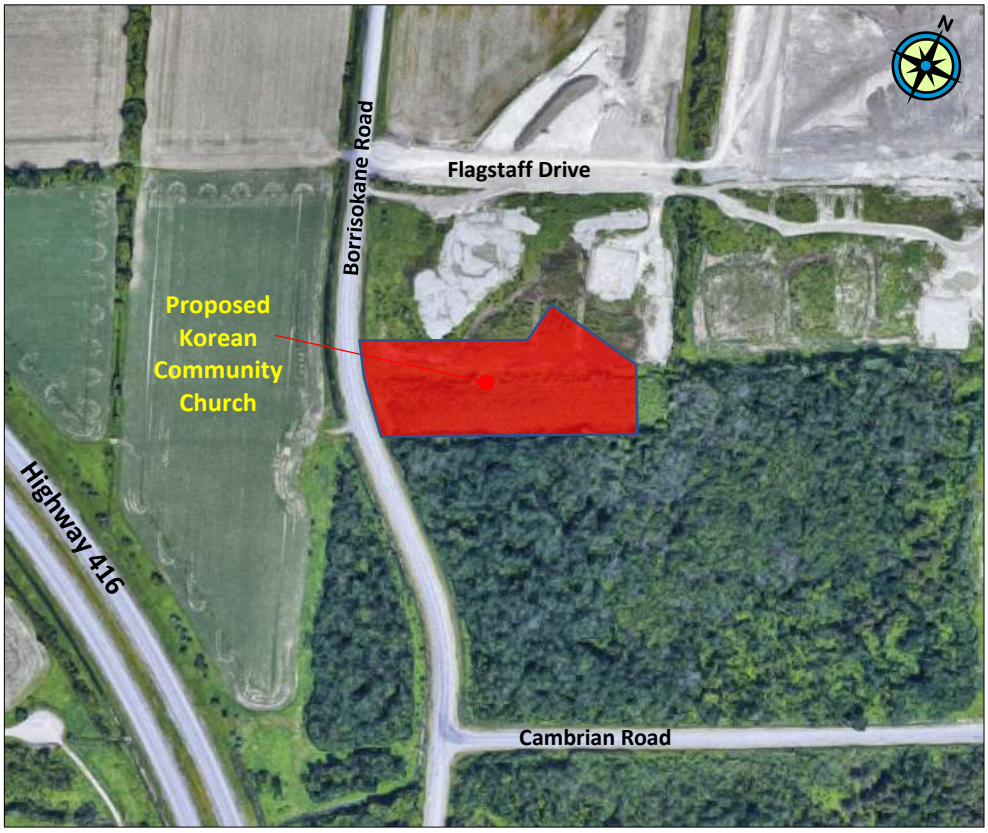


Exhibit 2-1: Location of Proposed Development

The development lands are currently zoned *"IL[304] – Light industrial Zone"*, which accommodates acceptable zoning for "a place of assembly" such as a church. The lot is currently undeveloped.

The development of the Korean Community Church:

- would provide for a building structure of approximately 31,360 ft^2;
- the assembly area, (on which the City of Ottawa's parking requirement is based), sums to 541 m^2 [Chapel No. 1: 383 m^2 4,123 ft^2 : Chapel No. 2: 158 m^2 1,700 ft^2]
- would be developed within a single construction phase.;
- has an anticipated estimated timing of occupancy of the Fall of 2024; and
- would accommodate 136 on-site parking stalls. [Based on the City of Ottawa Zoning By-Law which indicated for N66 Place-of-Worship a parking rate of 10 stalls-per-100m^2 of assembly area, a total of 54 parking stalls would be required.]

During the pre-consultation meeting (held March 26, 2021), it was noted that the church may choose in the future to use some of its facilities as a daycare during the week as current zoning permits this use. However, it was later clarified that there are currently no formal plans in place for this land use. The traffic forecasting component of the TIA study was therefore assumed to include a maximum 30 child daycare facility.

Exhibit 2-2 illustrates the proposed site plan upon which this traffic impact assessment (TIA) is based. (See Appendix "C" for the full site plan.)

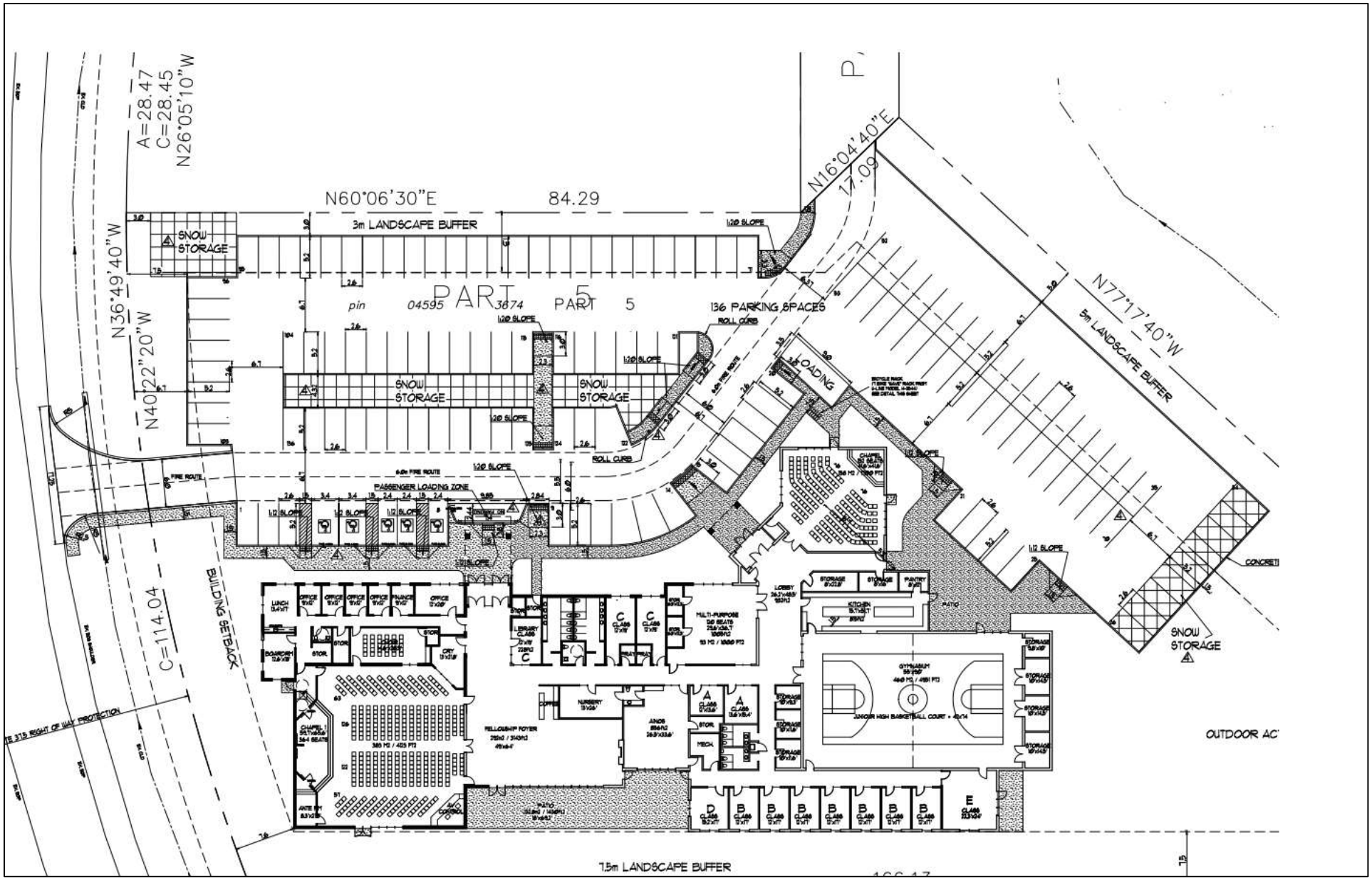


Exhibit 2-2: Site Plan (January 2024)

2.1.2 Existing Conditions

2.1.2.1 Study Area Roadways

The City of Ottawa's Transportation Master Plan (2013 TMP), a desktop review of aerial photography, the GeoOttawa web site and available TIA's / community plans of adjacent sites, the City of Ottawa Official Plan Schedule C16 and related documents were referenced to document the existing roadways that would serve the proposed church site and the surrounding area.

The municipal-owned roadways in the vicinity of the proposed development include the following:

Borrisokane Road
- is an existing 2-lane arterial roadway;
- posted speed limit of 80 km/hr;
- has a 37.5m ROW protection between Strandherd Drive and Cambrian Road (as per Schedule C16);

Cambrian Road
- is an existing 2-lane arterial roadway;
- posted speed limit of 70 km/hr;
- has a 37.5m ROW protection between Borrisokane Road and Longfields Drive (as per Schedule C16);

Flagstaff Drive
- is an existing 2-lane collector roadway;
- unposted speed limit of 50 km/hr;
- has a 24m ROW (as per GeoOttawa measurement);

2.1.2.2 Study Area Intersections

1. Borrisokane Road and Flagstaff Drive

This existing intersection is a 3-leg traffic minor east leg STOP-controlled intersection.

- All approaches currently provide for a single lane of shared traffic;
- There are currently no sidewalks or bicycle provisions along either corridor.

Exhibit 2-3: Borrisokane Road and Flagstaff Drive Intersection

Exhibit 2-4: Borrisokane Road and Cambrian Road Intersection

2. Borrisokane Road and Cambrian Road

This existing intersection is a 3-leg intersection. The westbound approach from Cambrian Road is currently STOP-controlled.

- All approaches provide for a single all-movement shared lane;
- There are no sidewalks or bicycle provisions along either corridor.

2.1.2.3 Existing Surrounding Driveways

Exhibit 2-5 illustrates the adjacent existing driveways within the immediate proximity of the site. (Within 200 meters from the proposed 3555 Borrisokane Road development access along each boundary street).

The following adjacent existing accesses/driveways were identified along the three boundary streets surrounding the development (Borrisokane Road, Cambrian Road and Flagstaff Drive):

Borrisokane Road Accesses:

- *Borrisokane Road* has 2 existing farmland acreage accesses:
- One access is located directly west of the Borrisokane Road / Flagstaff Drive intersection; and
- The other is across the street from the southern limit of the development.

Exhibit 2-5: Existing Accesses & Driveways within 200m Radius of Proposed Site

2.1.2.4 Pedestrian Facilities

No existing pedestrian facilities exist within the immediate proximity of the development.

2.1.2.5 Cycling Facilities

No existing cycling facilities exist within the immediate proximity of the development.

2.1.2.6 Area Traffic Management

No area traffic management strategies were found to be in place within the immediate proximity of the development.

2.1.2.7 Existing Transit Provisions

There are no existing transit operational service along roadways within the immediate proximity of the proposed development. (As of December 2022.) The Half Moon Bay subdivision to the east has several routes, which have the potential to be extended towards the development as the community continues to grow. These routes include 671 and 675, which are special high school and middle school buses, and route 75 from Barrhaven Centre to Tunney's Pasture.

2.1.2.8 Existing Peak Hour Travel Demand by Mode

Pedestrian and Cyclist Travel Demand

There were no recorded current pedestrian or cyclist traffic volumes recorded at the time of the traffic count provided by the City of Ottawa (November 9, 2018).

Vehicular Travel Demand

Exhibit 2-6 illustrates the existing (unbalanced) morning and afternoon peak hour traffic volumes within the study area as referenced from a recent traffic impact study[2]. The referenced traffic count information for the Borrisokane Road/Cambrian Road intersection was derived from a City of Ottawa traffic count undertaken on November 9, 2018. The study also provided forecast 2018 traffic for the Borrisokane Road/Flagstaff intersection as illustrated in the exhibit.

Exhibit 2-7 illustrates the existing balanced morning and afternoon peak hour traffic volumes. The following steps were completed in order to bring the traffic to a balanced 2023 horizon year:

- Traffic volumes were balanced along Borrisokane Road; and
- A 2% annual growth rate was applied to traffic along Borrisokane Road to update the counts to a 2022 horizon year.

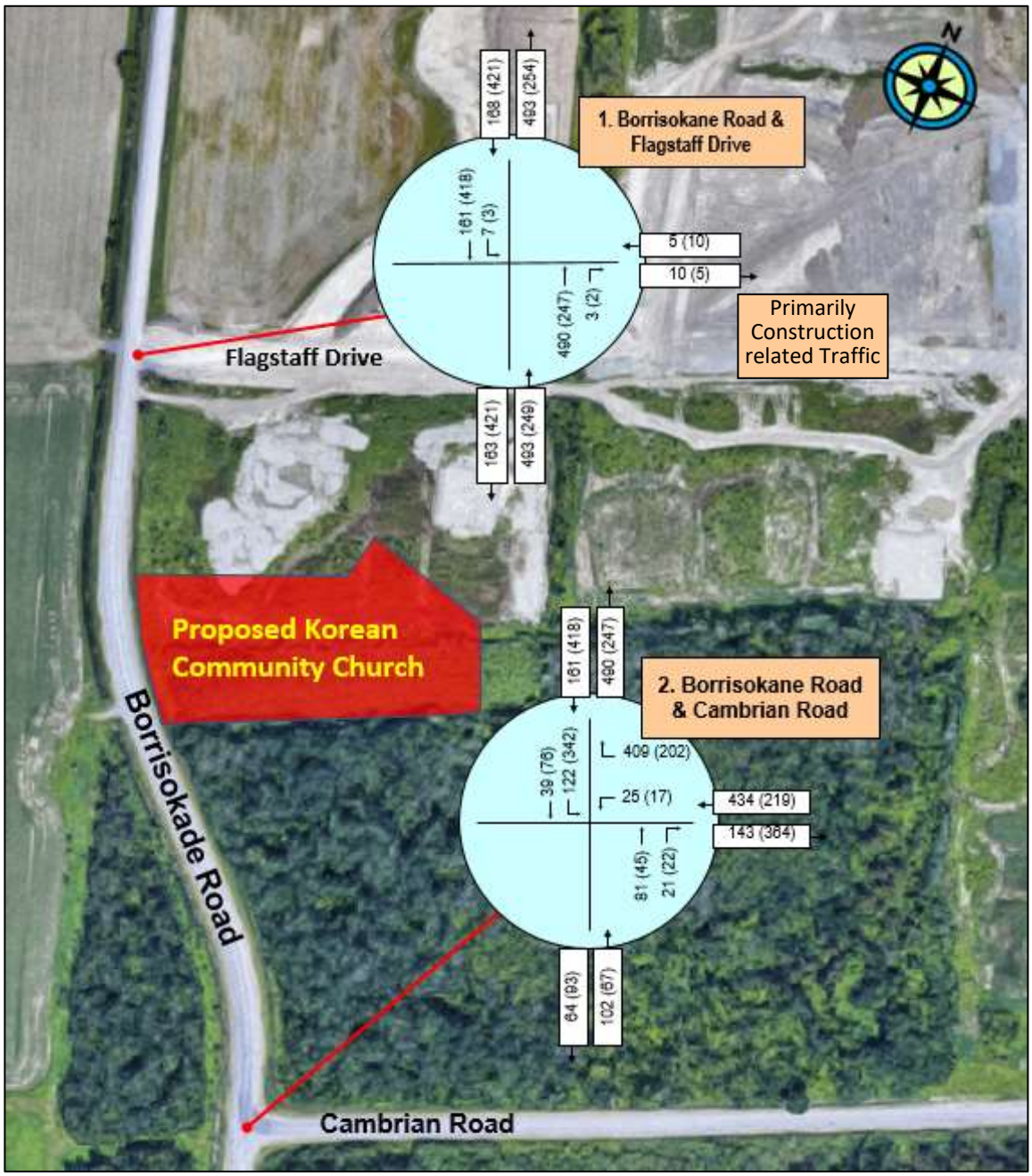
Existing Traffic Volumes Intersection Capacity Analysis

Table 2-1 summarizes the existing (2022) intersection capacity analysis undertaken with Synchro™ 10 traffic software assuming STOP controlled intersections. City of Ottawa's MMLOS Guidelines were consulted to determine appropriate level of service metrics for each intersection. The levels

2. *"Halo Car Wash, 3555 Borrisokane Road, TIA Strategy Report (Revised)"* Sept. 23, 2022 D. J. Halpenny & Assoc Ltd.

of service are based on the volume-to-capacity (v/c) ratios. The City of Ottawa's target level of service for motor vehicle traffic for "All Other Designations" is LOS "D"[3].

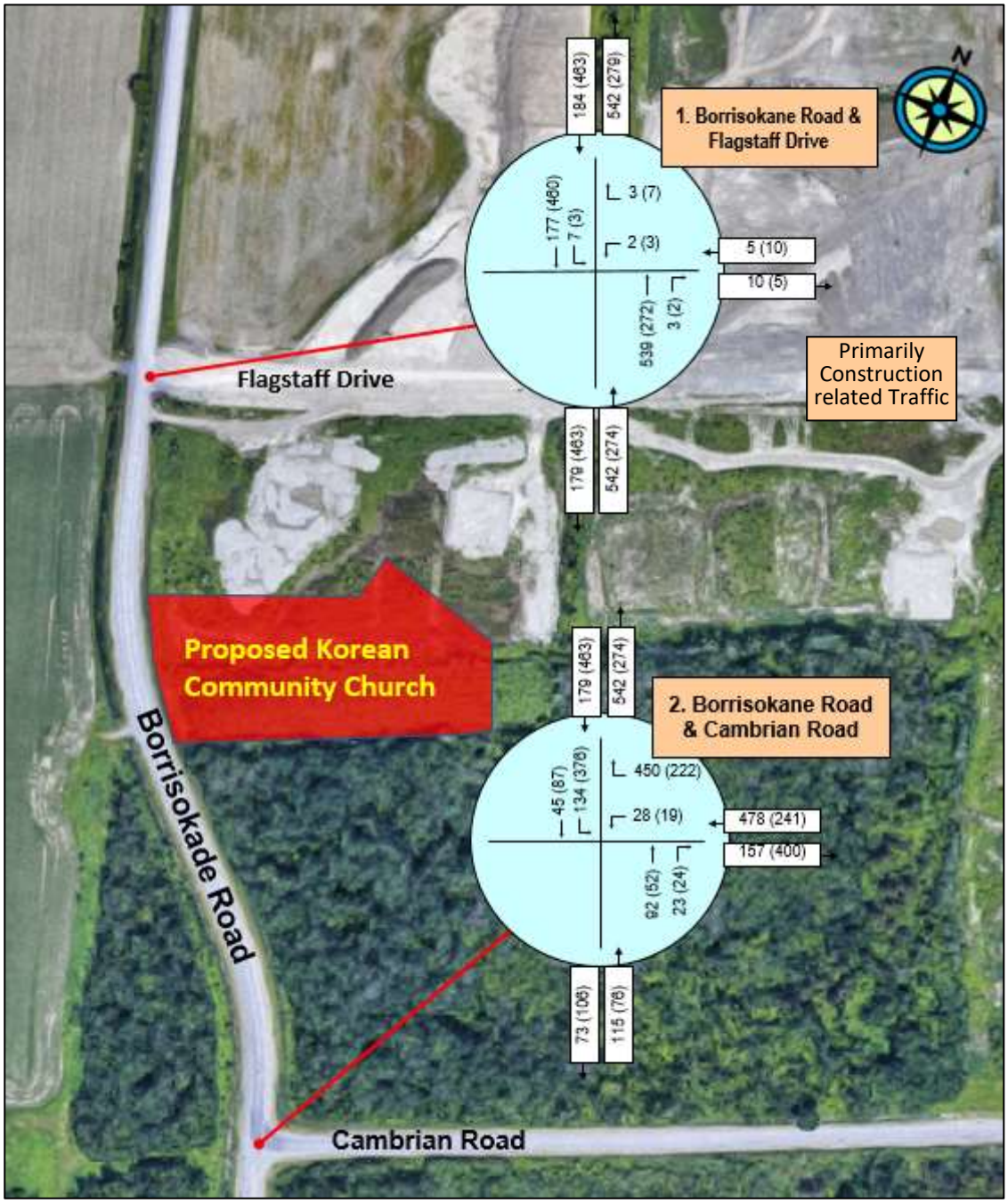
This analysis assumes existing conditions (without the development in place) and only considers the effects of background growth to a 2023 horizon year. The Synchro analysis output sheets can be found in Appendix "F". [The digital Synchro files were forwarded along with this report for review.]



Morning (Afternoon) Peak Hour

Exhibit 2-6: 2018 Non-Balanced Morning and Afternoon Peak Hour Traffic Volumes

3. "*City of Ottawa MMLOS Guidelines, Draft Report*", September 2015. Pages 21-24



Morning (Afternoon) Peak Hour

Exhibit 2-7: (2022) Balanced Morning and Afternoon Peak Hour Traffic Volumes

Table 2-1: Existing (2022) Traffic Operational Analysis Results

Borrisokane Road Intersection with ….		*Control Type*	*Weekday Morning Peak Hour (Afternoon Peak Hour)*				
			Critical Movement				
			Approach / Movement	**95th Percentile Queue (m)**	**Delay (seconds)**	**LOS**	**v/c**
1.	Flagstaff Drive*	Minor Leg-STOP control	*WB (WB)*	0 (0.75)	13.2 (11.4)	B (B)	0.01 (0.02)
			SB-LT (SB-LT)	0 (0)	8.6 (7.8)	A (A)	0.01 (0.02)
2.	Cambrian Road	Minor Leg-STOP control	*WB (WB)*	27.75 (11.25)	14.3 (12.6)	B (B)	0.57 (0.35)
			SB-LT (SB-LT)	2.25 (8.25)	7.8 (8.4)	A (A)	0.01 (0.27)

* Construction was taking place along Flagstaff Road at the time of this study.

Table 2-1 indicates that the above intersections presently operate at LOS "B" or higher in their current configuration and STOP controlled operation.

2.1.2.9 Existing Road Safety Information

The City of Ottawa's five-year (2016-through-2020) historical collision information was reviewed for each of the study area intersections and roadway segments. The collision information provided included:

- the date and time of each collision;
- the type of collision (e.g., angle collision, rear-end); and
- vehicle details (truck, passenger vehicle, etc.);

Table 2-2 provides:

- a summary of the recorded intersection and mid-block collisions for the locations within the study area in terms of the type of collision and collision severity.
- the calculated collision rate [as measured in number of collisions-per-million-vehicles that travelled either through the intersection or along the corridor.] A rate greater than 1.0 collisions/MEV was considered to indicate a potential area of concern.

Table 2-2: Five-Year Collision History (January 1st 2016 – December 31st 2020)

Intersection / Mid-block Segment		**Cambrian Road and Borrisokane Road Intersection**	**Borrisokane Road between Cambrian Road and Jock River**	**Cambrian Road between Borrisokane Road and Apolune St.**
Total Collisions		**12**	**13**	**1**
Collision Type	Rear End	6	1	-
	Single Vehicle	-	-	-
	Sideswipe	-	-	-
	Turning Movement	1	-	-
	Angle	1	-	-
	Pedestrian	-	-	-
	Other	4	12	1
Average Annual Daily Traffic		**14,000**	**11,400**	**5,800**
Collision Rate [per-Millions of-Entering-Vehicles] (MEV)]		**0.46**	**0.63**	**0.1**

* Source: AADT estimated from Borrisokane Road/Cambrian Road City of Ottawa Traffic Count, November 9, 2018 with Peak-Hr-to-AADT conversion factor of 10.

Table 2-2 indicates the following:

- The *Cambrian Road and Borrisokane Road* 3-leg intersection was determined to have 12 collisions over a five-year period and, due to its low AADT, exhibited an overall collision rate of 0.46 collisions/MEV, which is above the acceptable range. As well, approximately 50% of the collisions were rear-end collisions;
- The *Mid-block on Borrisokane Road [between Cambrian Road and the Jock River]* experienced 13 collisions.
- The *Mid-block on Cambrian Road [between Borrisokane Road and Apolune Street]* experienced a single collision.

Conclusions:

- The *mid-block along Borrisokane Road [between Cambrian Road and the Jock River]* and the midblock along Cambrian Road [between Borrisokane Road and Apolune Street] exhibited acceptable levels of safety; and
- The *Cambrian Road / Borrisokane Road intersection* exhibits a rate of 0.46 which is less than 1.0 collisions/MEV. This was therefore considered to have an acceptable levels of safety.

2.1.3 Planned Conditions

The following documents and sources of information were referenced to document the planned conditions of roadways that would serve the proposed church site and the surrounding area. These include:

- City of Ottawa's Transportation Master Plan (2013 TMP);
- a desktop review of aerial photography;
- the GeoOttawa web site;
- available TIA's of adjacent sites;
- "*Barrhaven South Urban Expansion Study Area Community Design Plan Transportation Master Study*" (2018); and
- Mattamy Homes Half Moon Bay West Subdivision draft plan.

2.1.3.1 Changes to the Study Area Transportation Network

The development is within the Barrhaven South Community Design Plan (CDP) Area. This plan call for a protected 37.5m wide right-of-way to accommodate a future expansion to four-lane arterials on the following roadways:

- Borrisokane Road north of Cambrian Road; and
- Cambrian Road between Borrisokane Road and Jockvale Road.

The "*Barrhaven South Urban Expansion Study*" also indicated the need for the installation of traffic signals with left turn auxiliary lanes at the intersection of Borrisokane Road and Cambrian Road by 2031. The City of Ottawa also noted that the intersection of Borrisokane Road and Flagstaff Drive is expected to be upgraded to include a southbound left turn lane and associated widening in 2023 at, complete with a gored area south of the intersection, and sidewalk/separated cycle track on the northeast and southeast corners.

2.1.3.2 Other Study Area Developments

A review of the City of Ottawa's development applications website indicated 2 major development proposals as "active applications" adjacent to the study area that are anticipated to have an impact on the traffic volumes in the study area's transportation network.

Exhibit 2-8 illustrates the location of the adjacent development initiatives:

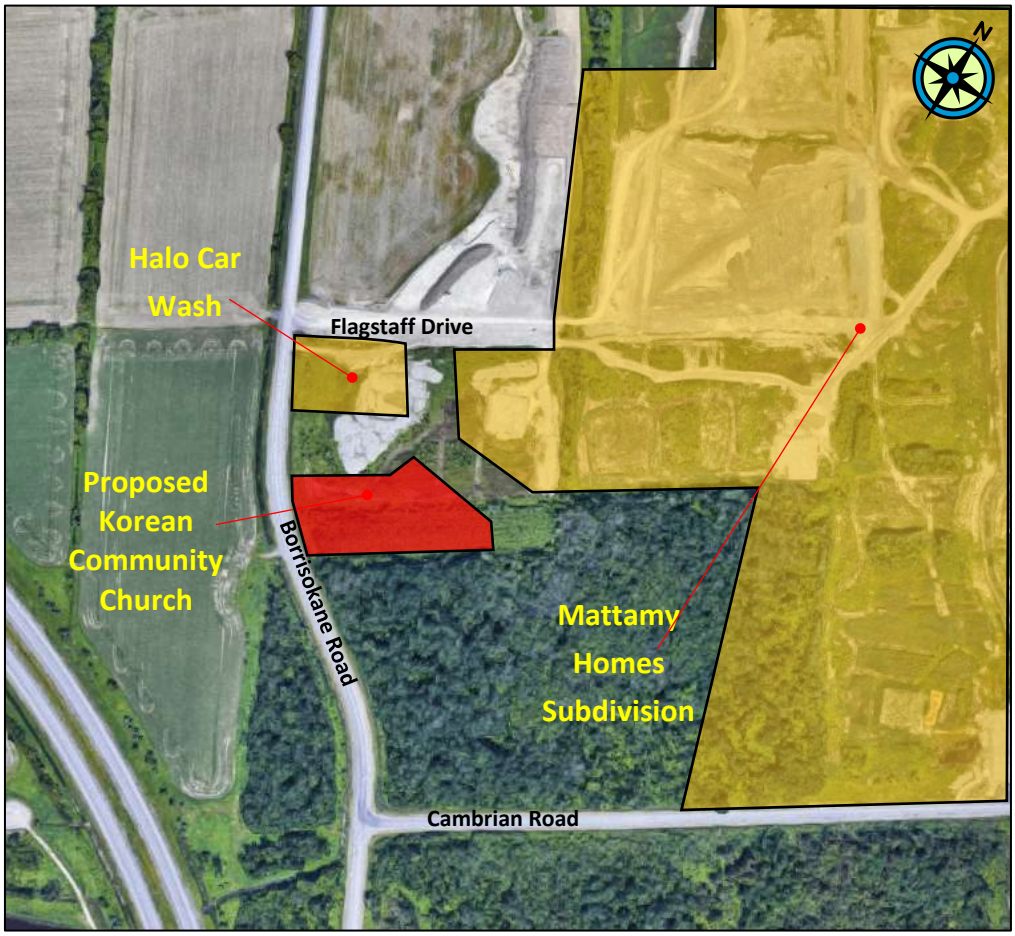


Exhibit 2-8: Adjacent Development Initiatives

a. "Mattamy Homes: Half Moon Bay West"
3345 Borrisokane Road, 3640 Greenbank Road, 3853 & 3900 Cambrian Road

This is a proposal for a planned subdivision which will include 973 residential units, consisting of 447 detached dwellings, 300 townhouse dwellings, 154 back-to-back townhouse dwellings, and 72 apartment units.

Additionally, the subject properties will contain a school (6.07 hectares), 4.58 hectares of parkland, 4.07 hectares reserved for a stormwater management (two blocks) facility, a 2.11 hectare employment block, and several new streets and pathways.

Upon completion of the subdivision, Flagstaff Drive will be urbanized to include sidewalks.

b. "Halo Car Wash" 3555 Borrisokane Road

The Halo Car Wash facility is a proposal for an automated car wash that would accommodate a single storey 476 m^2 (5,125 ft^2] building on-site and 21 parking stalls. It is expected to be completed by the end of 2023.

2.2 STUDY AREA AND TIME PERIODS

2.2.1 Study Area

The study area around the proposed development includes the following boundary streets:

- Borrisokane Road;
- Cambrian Road; and
- Flagstaff Drive.

A total of two intersections along the above boundary streets reside within the study area:

- Borrisokane Road/Flagstaff Drive;
- Borrisokane Road/Cambrian Road

2.2.2 Time Periods

In accordance with TIA Guidelines, the forecasting report will conduct its operational analysis of the weekday morning and afternoon peak hours of travel demand.

The Client has indicated that there are currently no formal plans in place to support a daycare facility. However, this study conservatively assumes that a daycare facility with a capacity for 30 children would be in place contributing to weekday morning drop-offs and afternoon pick-ups.

As regards weekend traffic, City staff responded on May 19th, 2023 that "*since the main driver of trips is Sunday and Flagstaff is not yet constructed, no analysis of Sunday traffic will be required."*

2.2.3 Horizon Years

The proposed development, at this point in time, is anticipated to be achieved by the Fall of 2024. The analysis to be undertaken for the forecasting report also include a period anticipated to be five years beyond buildout, which would be 2029.

2.3 EXEMPTION REQUEST

Table 2-3 reflects exemptions/reductions in scope of work that were requested subsequent to the submission of the Screening Report. These exemption requests are normally addressed within the Design Review and Network Impact components of the TIA.

Table 2-3: Requested Exemptions as per TIA Guidelines

Module	Element	Exemption Considerations	Include Module in TIA
Design Review Component			
4.1 Development Design	**4.1.3 New Street Networks**	Only required for plans of subdivision	No
4.2 Parking	**4.2.2 Spillover Parking**	The 136 parking stalls being supplied exceeds the City of Ottawa Zoning By-Law requirement of 55 stalls.	No
Network Impact Component			
4.5 through 4.9	**All Elements**	The development is not expected to generate more than 60 vehicle-trips during the peak hours of travel demand. Therefore, the "Network Impact" component of the TIA is not required	No

3.0 FORECASTING REPORT

3.1 DEVELOPMENT GENERATED TRAVEL DEMAND

This section of the report describes the projected traffic generation by mode, as well as vehicle trip distribution and trip assignment associated with the full build-out and occupancy of the proposed development planned for 2024.

3.1.1 Trip Generation and Mode Shares

3.1.1.1 Trip Generation Rate and Split

The City of Ottawa TIA guidelines indicate that the source for forecasting traffic generation for employment generators is the ITE Trip Generation Manual, 11th Edition[4].

- The proposed expansion is classified as a "Institutional (500-599)"
- The Church component is analyzed as ITE Land Use "560 – Church"
- An optional daycare maybe in operation in the future, with a maximum capacity of 30 students, analyzed as ITE Land Use "565 – Daycare Center"

Table 3-1 outlines the average number of trip-ends as referenced from the ITE Trip Generation Manual, 11th Edition for the proposed Korean Church and the potential day care facility

Table 3-1: Vehicle Trip Generation per Peak Period
(ITE Trip Generation Manual, 11th Edition)

ITE Land Use	Variable	Morning Peak Hour		Afternoon Peak Hour	
		Entry	Exit	Entry	Exit
560 - Church	31,360 Sq. Ft. GFA	6	4	7	8
565 – Day Care Center	30 Students	12	11	11	13
	Total	**18**	**15**	**18**	**21**
		33		**39**	

Table 3-1 outlines the inbound/outbound directional split characteristics that were applied to forecast the number of inbound and outbound vehicle trips. The development is forecast to generate:

- 18 inbound and 15 outbound trips during the morning peak hour; and
- 18 inbound and 21 outbound trips during the afternoon peak hour.

3.1.1.2 Mode Shares

Table 3-2 outlines the mode shares for an employment generator within the South Nepean district, as referenced from the 2020 TRANS Trip Generation Manual[5]. Other than school land uses the document does not provide similar information for the intended place-of-worship/daycare land use.

In lue of not having other reliable information available Table 3-3 presents the resulting peak hour person trips for the proposed church that were derived from applying the values in Table 3-2.

4. "*TIA Guidelines",* City of Ottawa, Page 27
5. "*TRANS Trip Generation Manual*" Summary Report, Page 14, Table 12: Employment Generator Mode Share by District

Table 3-2: Mode Shares
Employment Generator, South Nepean (TRANS 2020)

Peak Period Mode Share Split (TRANS 2020 Table 12)		
Mode	**Mode Share, AM**	**Mode Share, PM***
Auto Driver	80%	80%
Auto Passenger	10%	10%
Transit	5%	5%
Cycling	1%	1%
Walking	4%	4%

* Employees are likely using the same mode of transportation when leaving work, it is fair to equivocate the PM peak period employment generator mode with the AM peak period.

Table 3-3: Peak Hour Person Trips* by Mode

Mode	**Morning**	**Afternoon**
Auto Driver	33	39
Auto Passenger	4	5
Transit	2	2
Cycling	1	1
Walking	2	2
Total Person Trips	**42**	**49**

* Values Rounded Up

3.1.1.3 Future Mode Shares

Table 3-4 outlines the future mode share targets for this development, along with justifications for each target. The existing mode shares indicated in Table 3-2 were used for trip forecasting.

Table 3-4: Future (2029) Assumed Weekday Mode Share Targets for Community Church

Travel Mode	**Target Mode Share**	**Rationale**
Auto-driver	80%	Borrisokane Road is expected to be widened to 4 lanes based on the Barrhaven South Community Design Plan (CDP), but since the development horizon year is 2024, the auto-driver mode share is anticipated to remain the same.
Auto Passenger	10%	Auto passenger mode share is expected to remain the same.
Transit	5%	There are no nearby transit facilities, with no plans currently in place for any such provisions. Transit mode share should be decreased.
Cycling	2%	No current pedestrian or cycling facilities are present, however the intersection of Borriskane / Flagstaff is expected to be upgraded with a sidewalk/separated cycle track on the northeast and southeast corners. Flagstaff Drive is to be urbanized, and will also have sidewalks. An increase to walking and/or cycling mode shares are expected.
Walking	3%	

3.1.2 Trip Distribution

A review of the 2022 traffic flows along the roadways near the proposed site was used as the basis for the following site generated traffic distribution trends being adopted:

Table 3-5 Traffic Distribution Assumptions

Origin and Destination of Traffic	2024	2029
• Traffic coming to/from Borrisokane Road north of Flagstaff Drive;	50 percent	40 percent
• Traffic coming to/from the Borrisokane Road south of Cambrian Road; and	20 percent	20 percent
• Traffic coming to/from the East along Cambrian Road.	30 percent	20 percent
• Traffic coming to/from the east along Flagstaff Drive	0 Percent	20 percent

3.1.3 Trip Assignment

Exhibit 3-1 displays site-generated vehicle trips upon full occupanc"y of the development (in 2024). For the purpose of this TIA, it was assumed that by 2024 the Halo Car Wash development and the corresponding access to Flagstaff Drive would NOT be in place. All site traffic would use the Borrisokane Road access, however by 2029, it is assumed that the access to Flagstaff Drive would exist.

Exhibit 3-1: Site Generated Traffic 2024

Exhibit 3-2 shows site-generated vehicle trips for the 2029 horizon year, assuming the Flagstaff Drive access is in place as a result of the development of the Halo Car Wash to the north.

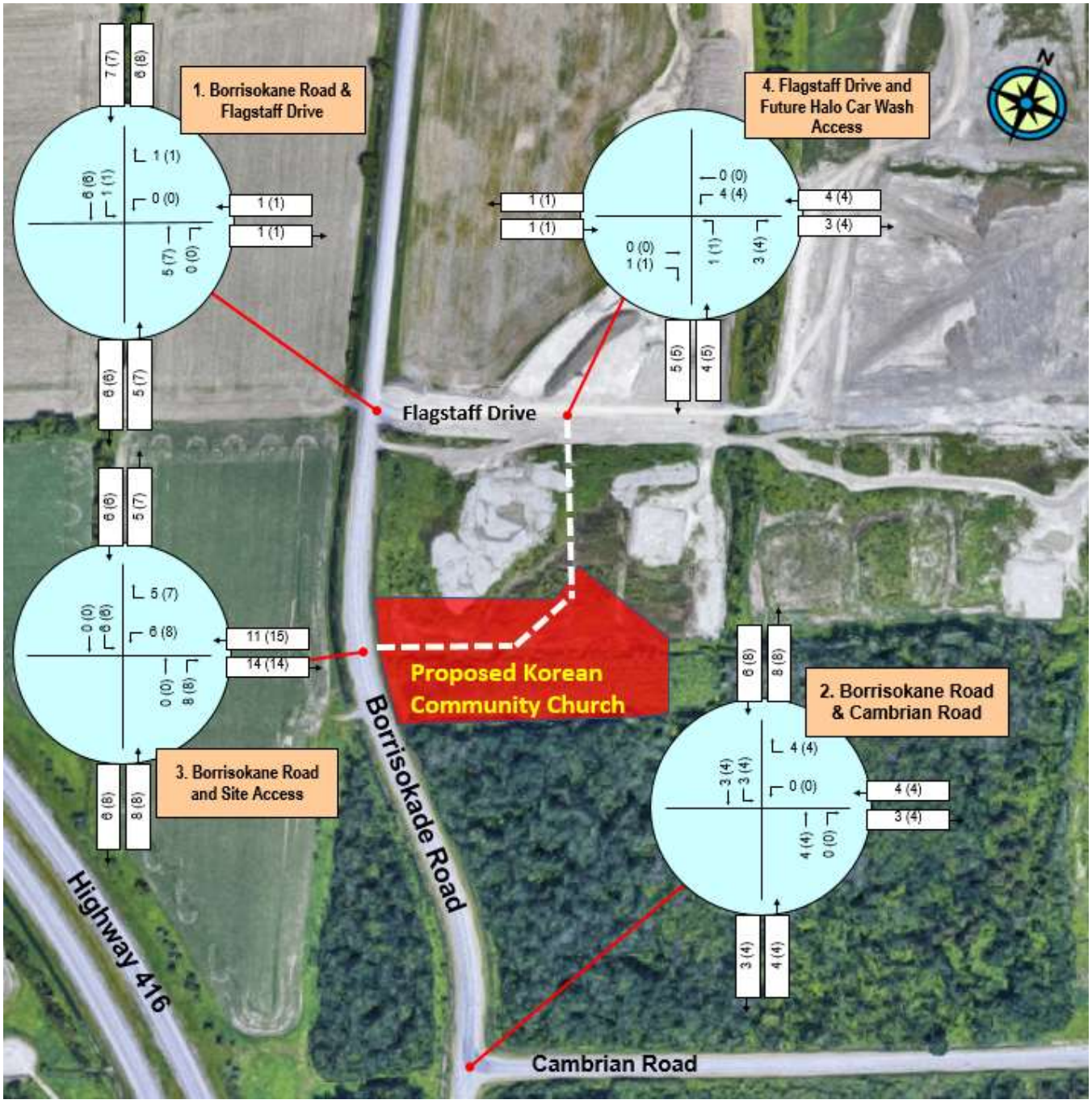


Exhibit 3-2: Site Generated Traffic 2029

3.2 BACKGROUND NETWORK TRAVEL DEMAND

3.2.1 Transportation Network Plans

Section 2.1.3.1 indicated the following changes are anticipated to occur to the transportation network:

- As part of the "*Barrhaven South Community Development Plan*"[6], the following two roads are anticipated to be widened to accommodate a four-lane cross-section:
  - Borrisokane Road north of Cambrian Road (A 37.5m right-of-way was noted at the pre-consultation meeting.); and
  - Cambrian Road between Borrisokane Road and Jockvale Road
- As part of the "*Barrhaven South Urban Expansion Study*"[7], the installation of traffic signals with left turn auxiliary lanes at the Borrisokane Road / Cambrian Road intersection is expected by 2031.

3.2.2 Background Growth

The traffic growth from the proposed subdivision developments in the area would account for the majority of growth in the area. Any additional growth would be attributed to further development beyond the study area.

This study has utilized a 2 percent average annual growth that was applied to the 2018 traffic counts to produce estimates for the base year (2022), the year of occupancy of the Church (2024), and a period 5 years after occupancy (2029). Over the 11-year period between 2018 and 2029 the growth was assumed to be 22% along the corridors surround the development.

All of the traffic along Flagstaff Drive would likely originate from the proposed subdivision developments east of the site.

3.2.3 Other Developments

There are two developments in the study area with active development applications and completed TIA studies (previously summarized in Section 2.1.3.2). The traffic generation and distribution for these developments is summarized below.

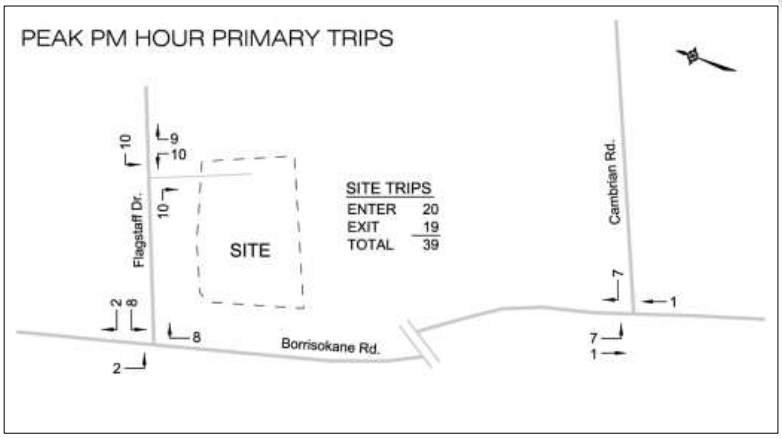
- *3555 Borrisokane Road "Halo Car Wash" and*
- *Mattamy Homes: Half Moon Bay West*
  3345 Borrisokane Road, 3640 Greenbank Road, 3853 & 3900 Cambrian Road

A previous TIA for 3555 Borrisokane Road "Halo Car Wash" was prepared by D. J. Halpenny & Associates Ltd. utilized the trips generated at the completion of the "Half Moon Bay West" development for its forecasted background traffic.

Exhibit 3-2 (adopted from the Halpenny TIA) illustrates the afternoon peak hour vehicle traffic generated by both of the above developments assuming full occupancy. It was assumed for the purposes of this study that the morning peak hour volumes would be inversely proportional to the afternoon peak hour volumes

6. *"Barrhaven South Urban Expansion Area Community Design Plan (CDP)"* - May 2018
7. *"Barrhaven South Urban Expansion Study Area Community Design Plan Transportation Master Study"* (2018)

with the vast majority of traffic leaving the residential community in the morning and returning in the afternoon.



Halo Car Wash Site Generated Traffic

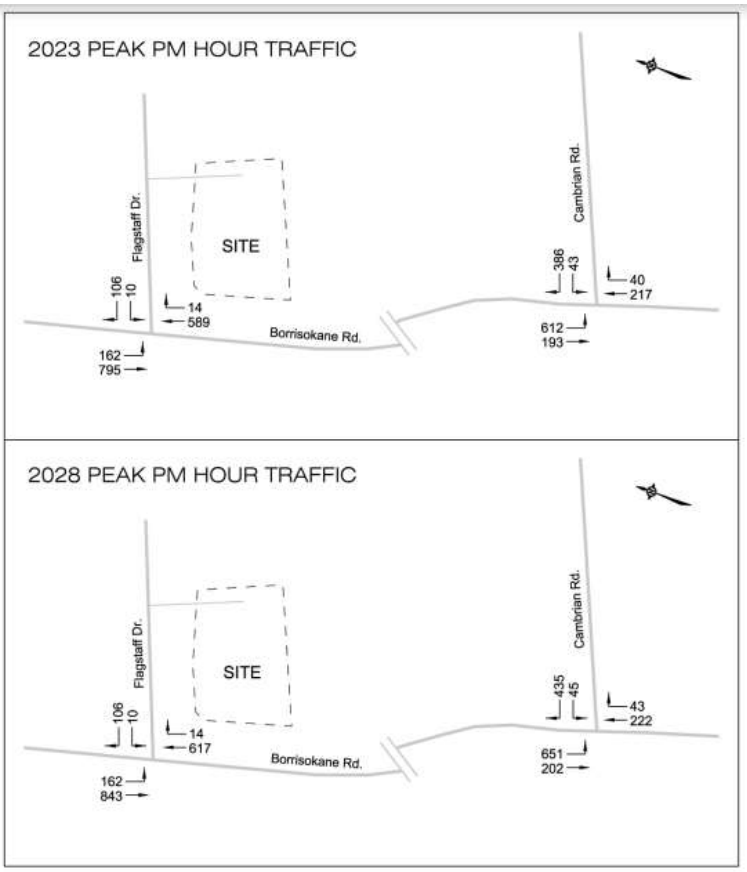


Exhibit 3-3: Other Development Traffic

Mattamy Homes Subdivision and Background Traffic

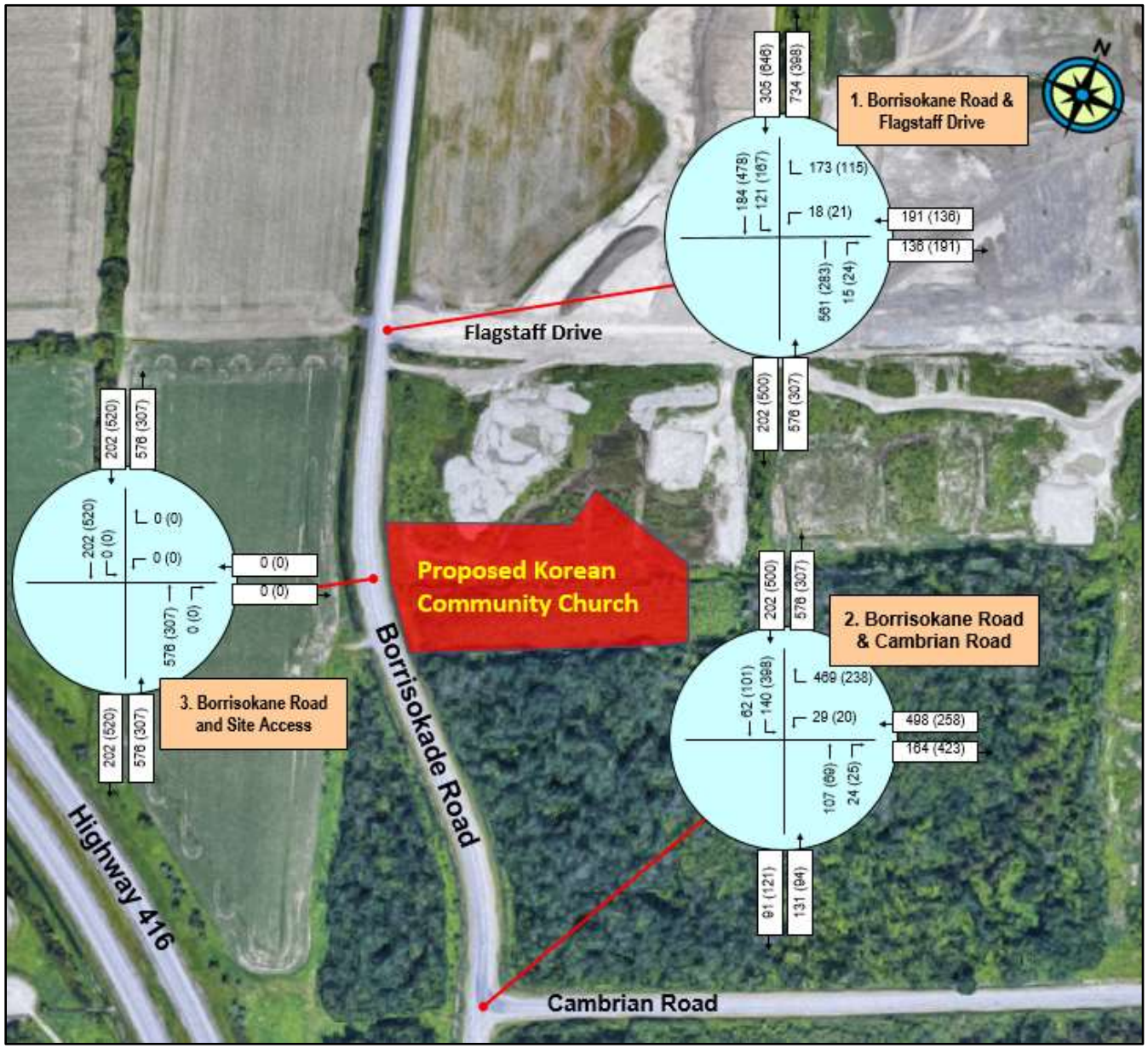
3.3 DEMAND RATIONALIZATION

The following section contains forecast traffic volumes for the forecast time of build-out (2024) and 5-years after build-out (2029), both with, and without, the proposed Korean Community Church development.

3.3.1 Background Traffic Forecasts – Without Korean Church Development

Exhibit 3-4 and Exhibit 3-5 illustrate background traffic forecasts for the forecast years 2024 and 2029, which combine the existing traffic network and the traffic generated by future developments in the study area.

These exhibits present forecast traffic without the Korean Community Church in place, for comparison purposes.



Morning (Afternoon) Peak Hour

Exhibit 3-4: Forecast 2024 Background Morning and Afternoon Peak Hour Vehicle Traffic Volumes - Without Church Development

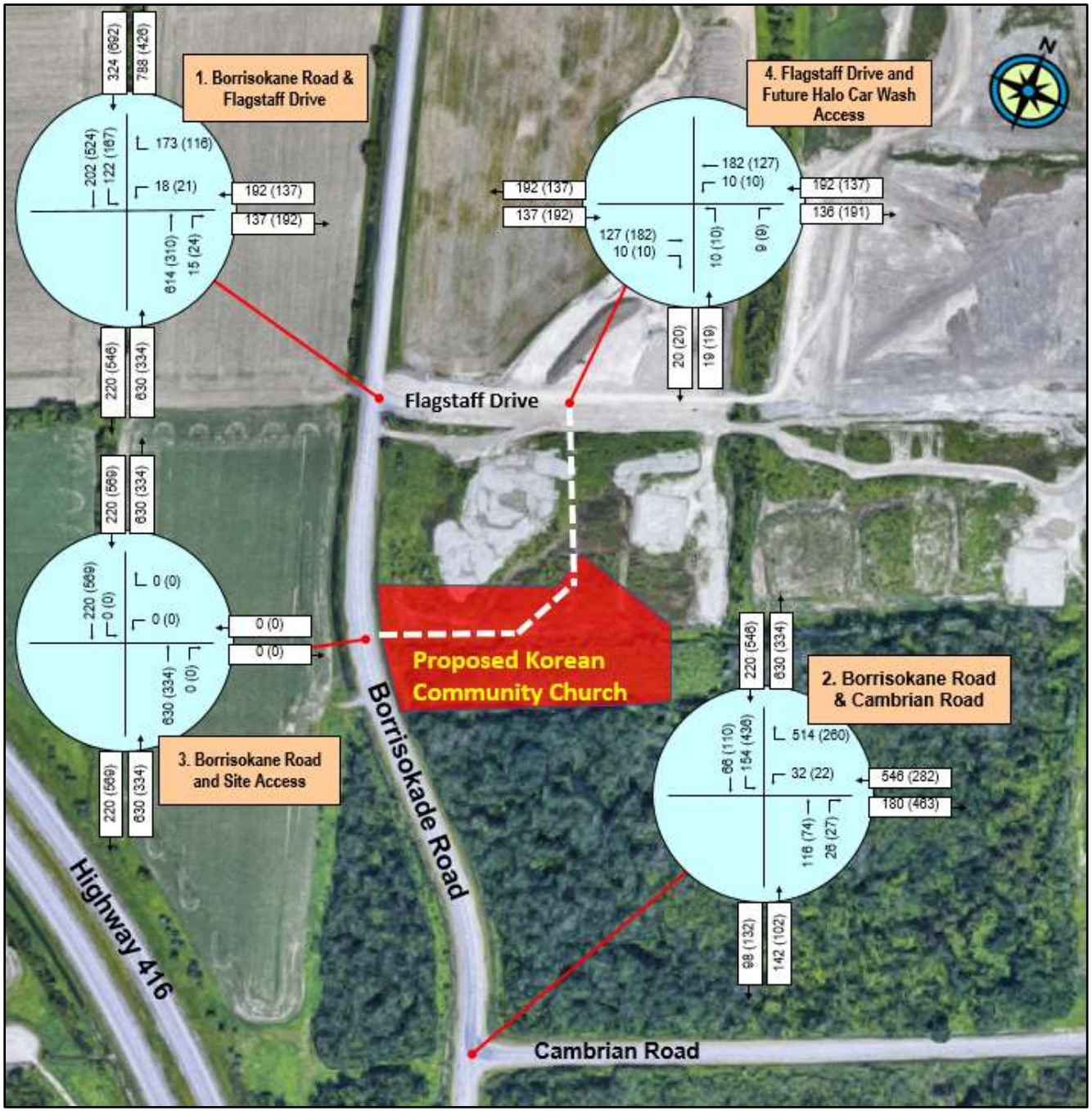


Exhibit 3-5: Forecast 2029 Background Morning and Afternoon Peak Hour Vehicle Traffic Volumes - Without Church Development

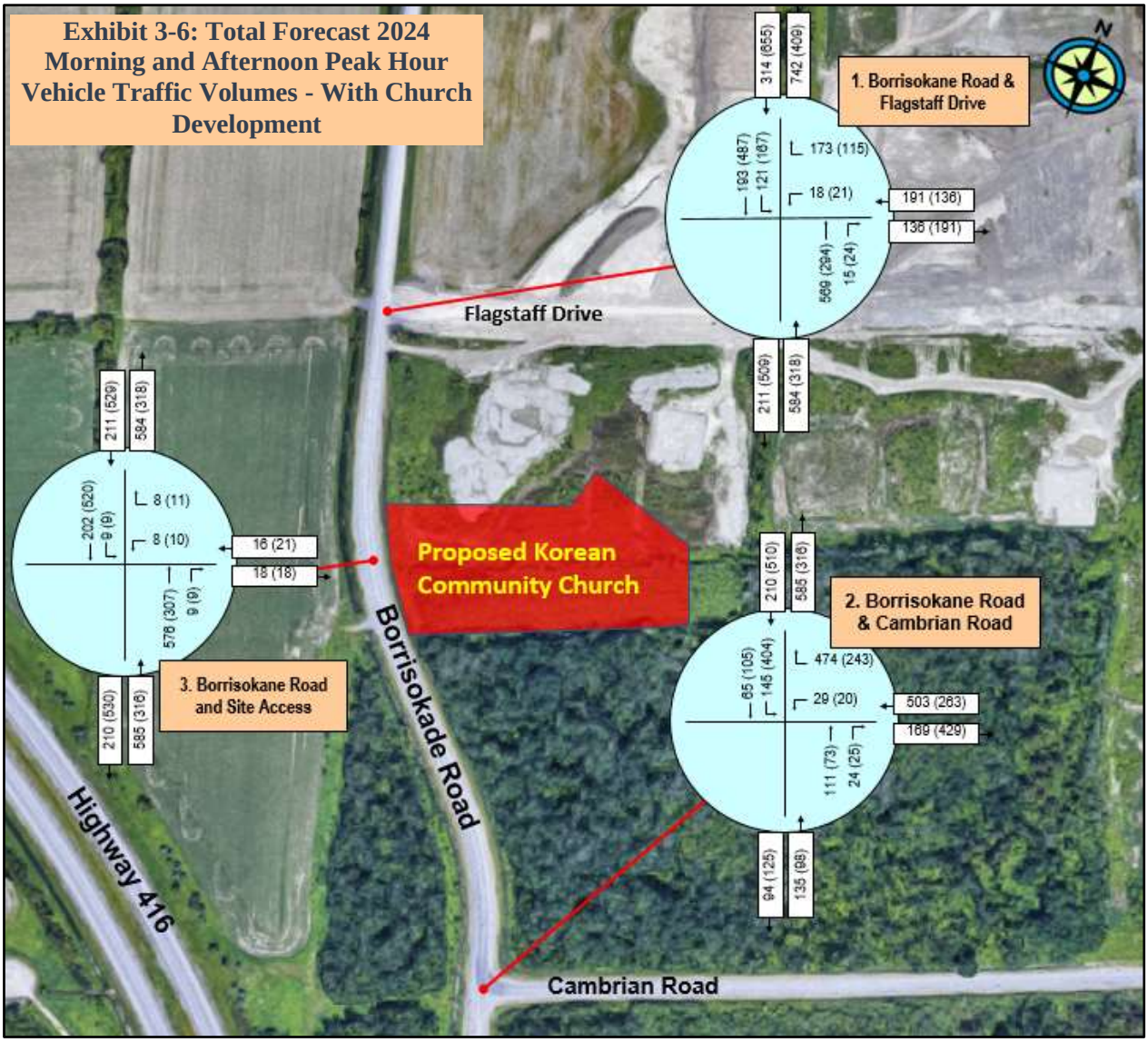
3.3.2 Total Traffic Forecasts – With Korean Church Development

Exhibit 3-6 and Exhibit 3-7 illustrate the total traffic forecasts for the 2024 and 2029 horizon years. The forecasts were developed by combining the forecast background network traffic and Korean Church development-generated traffic demands.

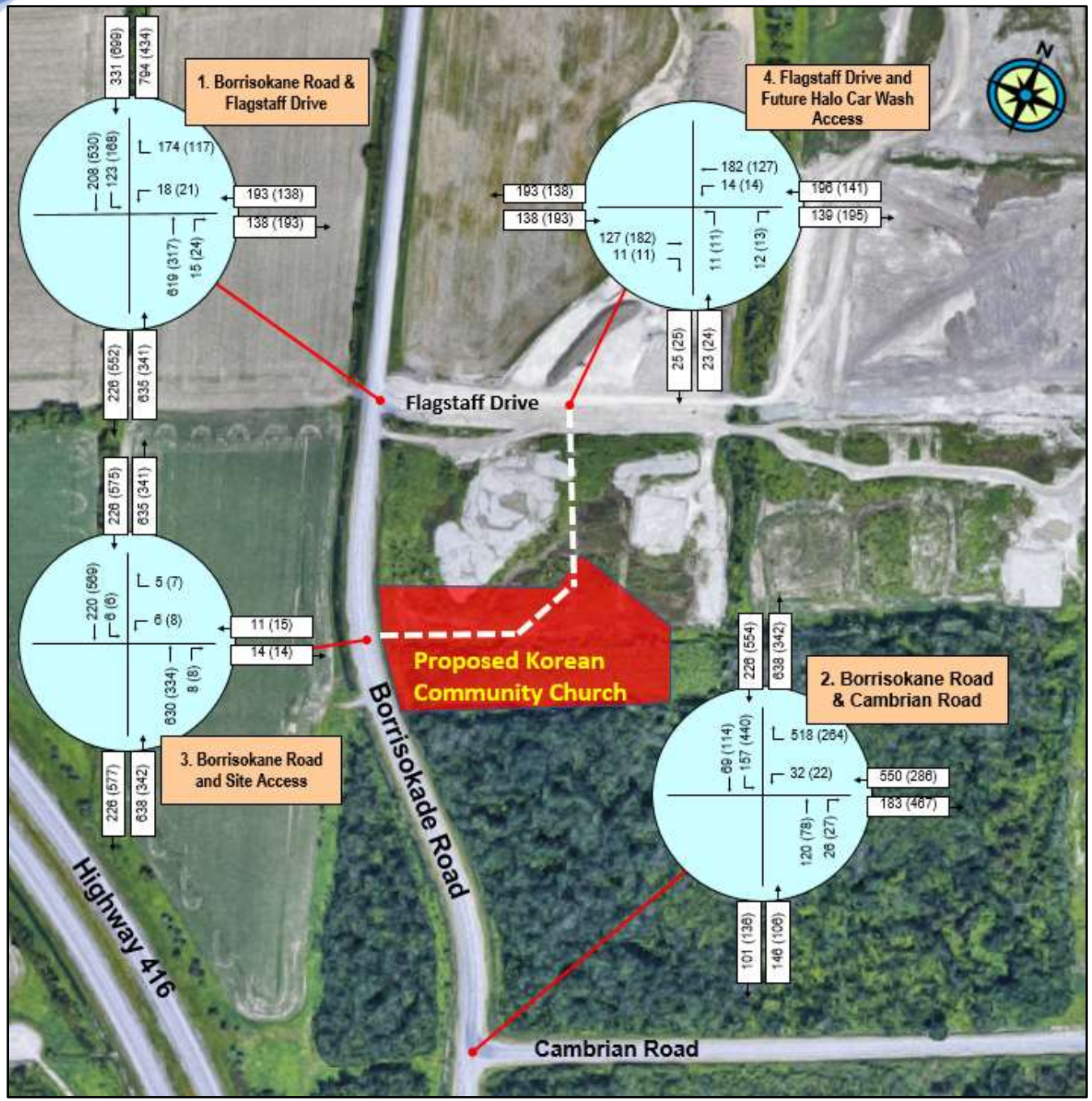
Development-Generated Traffic Impacts

The advent of development is expected to cause minor impact on the surrounding transportation network, with a total addition of:

- 33 two-way auto-vehicle trips (18 inbound and 15 outbound) during the morning peak hour; and
- 39 two-way auto-vehicle trips (18 inbound and 21 outbound) during the afternoon peak hour.



Morning (Afternoon) Peak Hour



Morning (Afternoon) Peak Hour

Exhibit 3-7: Total 2029 Forecast Morning and Afternoon Peak Hour Vehicle Traffic Volumes - With Church Development

4.0 STRATEGY REPORT

4.1 DEVELOPMENT DESIGN

4.1.1 Design for Sustainable Modes

Travel Demand Management (TDM): The City of Ottawa's "TDM Supportive Development Design and Infrastructure" checklist was reviewed as part of this strategy report and it was determined that proposed development meets all of the required TDM infrastructure measures (See Appendix "F").

Pedestrian/Cycling Infrastructure: The proposed site plan provides convenient and safe facilities such as sidewalks/paths that accommodate both pedestrian and cycling modes that are consistent with the requirements under the City's Accessibility Design Standards (2015).

Parking: All parking requirements for motor-vehicles and bicycles were found to be satisfied. (See Sections 4.1.3)

Other TDM Measures: The following TDM measures were considered in the evaluation process:

- *Pick-up & Drop-off Area*. The architect is encouraged to consider the viability of incorporating a pick-up & drop-off area fronting the building entrance to accommodate deliveries, and pick-up/drop offs of employees and visitors. This would be particularly useful in the case of the potential day-care centre land use should it materialize;
- *Carpool/Rideshare*: This TDM measure is useful for high employment land uses where preferential parking locations are reserved for those employees who actively and consistently share vehicle rides to/from a site. However, in the case of a church/daycare land this measure is thought to not be useful, nor applicable. Visitors to a church already by tradition ride share in that young families and spouses travel together to attend services. During the week the need for carpooling/ride sharing is not thought to be critical as parking demand is expected to be low, and motorist have a plentiful supply of nearby stalls that would be utilized;
- *Bicycle Facilities*: Secure bicycle parking and repair station. The mode share for cyclist is expected to be low, as such a simple bike rack would suffice. Other services such as bicycle repair stations would be inconsistent with the proposed land use;
- *On-Site Amenities:* This generally refers to much larger employment generators that offer convenience amenities that accommodate activities such as going to lunch, exercising, games rooms etc. that can take place without having to leave the site. In general, churches cater to services and special events for their congregants that include kitchen's, study halls, reception areas, wedding halls and sanctuaries that represent common amenities; and
- *Transit:* Currently, there are no transit facilities that exist within the vicinity of the proposed site. OC Transpo is encouraged to coordinate future service to the community as whole that would provide extended convenient transit services to the proposed church.

Active Transportation Infrastructure: A review of nearby active transportation infrastructure indicates that a sidewalk has recently been constructed along the south side of Flagstaff Drive extending from the residential community on the east to Borrisokane Road. In addition, City staff have confirmed that future plan are being prepared that would include sidewalks and separated cycle tracks on the NE and SE corners of the Borrisokane Road/Flagstaff Drive intersection. As well, the proposed Halo Car Wash

development provides for a sidewalk on the east side of the connecting private driveway that would provide good pedestrian connectivity to the church and cycling activity along Borrisokane Road.

4.1.2 Circulation and Access

The proposed development will have access onto Borrisokane Road, and eventually Flagstaff Drive through the Halo Car Wash Development. The Borrisokane access road fronting the Church is designed with a width of 6.7m. The north-south accessway connecting to Flagstaff Road will have a width of 7.5 m.

4.1.2.1 Turning Movement Analysis

Turning movement analysis was completed at both accesses to the property. Analysis was done using the following design vehicles:

- Fire Truck;
- Garbage Truck; and
- Delivery Vehicle (Medium Single Unit Truck or MSU).

The access roadway into the proposed church from Borrisokane Road is 6m wide. The width of the access at the road edge is 17.25 meters which exceeds the City of Ottawa's by-law requirement for a maximum of 9, however this was necessary to accommodate the narrow roadway width along Borrisokane Road and avoid heavy vehicles leaving the site conflicting with the southbound traffic stream. The access provides for a throat length of 15 meters. The access onto Flagstaff has been designed as per the Halo Car Wash Landscape plan, completed in April 2022.

Appendix "J" contains the turning movement diagrams for all 3 design vehicles at both accesses. While the MSU's can complete all the turns without encroaching onto opposing lanes, the garbage truck and fire truck require to cross the centre line. As garbage truck collection occurs only once a week, and in the case of an emergency all other vehicles give way to fire trucks, these turning movements are still deemed acceptable.

4.1.3 Motor Vehicle Parking

Table 4-1 summarizes the supply of parking required by the City of Ottawa's by-laws compared to the planned parking provisions associated with the proposed development.

- *Place of Worship Parking:* The City of Ottawa's minimum parking requirements[8] indicate that 10 parking spaces-per-100 m^2 of gross floor area is required for a place of worship. The assembly area sums to 541 m^2, and therefore 54 vehicle parking stalls would be required.

Table 4-1: Auto Parking Provisions Summary

Land Use	*Development Size*	*City Parking Requirement Rate*	*City Parking Requirement*	*Parking Provisions*
Place of Worship	541.0 m2	10 per 100 m^2	54 stalls	
Daycare	106.6 m2	2 per 100 m^2	3 stalls	
Total			**57 stalls**	**136 stalls**

8. "*City of Ottawa By-Law 2016-249*", Table 101, Row N59, area D on Schedule A1

- *Daycare Parking:* The advent of a potential daycare requires 2 parking spaces-per-100 m^2 of gross floor area. The daycare sums to 106.6 m^2 (4 classrooms: 12 x 17 * 3 = 612SF & 22.3 x 24 = 535.2SF, for a total of 1147.2SF or 106.6 m^2), and therefore 3 vehicle parking stalls would be required.

Conservatively assuming both of these land uses to be in place, the Zoning bylaw requirements for the site when combined require 57 motor-vehicle parking stalls. The current site plan would provide for 136 parking stalls.

In summary, Table 4-1 indicates that the planned Korean Church development's supply of parking (136 stalls) fully satisfies the City of Ottawa's parking by-law requirements.

4.1.4 Bicycle Parking

Table 4-2 summarizes the bicycle parking stall requirement of the City of Ottawa's By-law.

The City of Ottawa's bicycle parking By-law[9] indicates that 1 bicycle stall is required-per-1,500 m^2 of gross floor area for all other non-residential land uses.

Table 4-2: Bicycle Parking Provisions Summary

Land Use	*City Requirement*	*Parking Provisions*
All other non-residential uses	2 stalls	**7 stalls**
Total	**2 stalls**	

The gross church area of 2,913.5 m^2 would require a total of two bicycle stalls. A small outdoor bike rack with space for 7 bicycles will be provided on-site. The bike rack is located at the front of the building by the eastern entrance. (See Appendix "C" for the full site plan.)

4.2 Boundary Street Design

The City of Ottawa's Multi-Modal Level of Service (MMLOS) guidelines[10] along with the associated addendum[11] document was used to evaluate the multi-modal operational characteristics of the individual roadway segments in the vicinity of the proposed church site.

Exhibit 4-1 illustrates the location of the following three boundary street segments near the proposed Korean Church development analyzed for MMLOS:

- Cambrian Road east of Borrisokane Road
- Borrisokane Road between Cambrain and Flagstaff Drive
- Flagstaff Drive east of Borrisokane Road

The City of Ottawa's Multi-Modal Level of Service Guidelines outline the following level of service measures for various non-automotive transportation modes in the city based on existing conditions:

- Pedestrian Level of Service (PLOS);
- Bicycle Level of Service (BLOS);
- Transit Level of Service (TLOS); and
- Truck Level of Service (TkLOS).

9. *"City of Ottawa By-Law 2016-249"* , Section 111, Table 11A, (b) and (g)
10. *"Multi-Modal Level of Service (MMLOS) Guidelines",* IBI Group, September 2015
11. *"Document 5: Addendum to the City's Multi-Modal Level of Service Guidelines",* December 2016

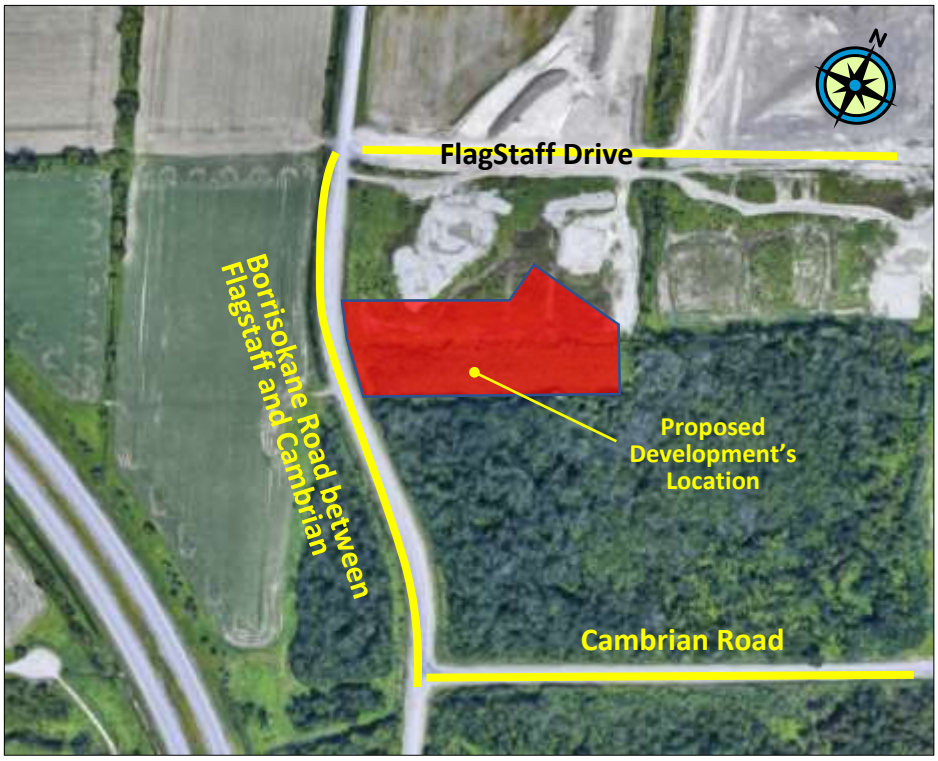


Exhibit 4-1: Boundary Street Segments for MMLOS Analysis

Table 4-3 provides the results of a segment MMLOS analysis in each direction of travel. The worst-scoring direction is used as an overall segment score.

Table 4-3: Segment MMLOS Analysis Results

Location			Level of Service and Targets							
Roadway Segment		**Policy Area/ Land Use Designation**	**PLOS**	**Target PLOS**	**BLOS**	**Target BLOS**	**TLOS**	**Target TLOS**	**TkLOS**	**Target TkLOS**
Cambrian Road east of Borrisokane Road	WB	"All other Designations"	**F**	D	**F**	D	N/A	N/A	N/A	N/A
	EB		**F**	D	**F**	D	N/A	N/A	N/A	N/A
Flagstaff Drive east of Borrisokane Road	WB		**F**	D	**E**	D	N/A	N/A	N/A	N/A
	EB		**F**	D	**E**	D	N/A	N/A	N/A	N/A
Borrisokane Road between Cambrain and Flagstaff Drive	NB		**F**	D	**F**	D	N/A	N/A	N/A	N/A
	SB		**F**	D	**F**	D	N/A	N/A	N/A	N/A

Note – Levels of Service highlighted in bold font fail to meet the respective target LOS
"All other Designations" is a catch-all category referred to within the MMLOS Guidelines under Section 7.1 – *Modal Targets by Official Plan Designation/Policy Area.*
NA – not applicable: The roadways do not have transit service and are not a City assigned truck route.

The table indicates the following:

Pedestrian Level of Service (PLOS):	All segments fail to meet their PLOS target due to the absence of existing sidewalks and operating speeds on the roadways exceeding 60km/h.
Bicycle Level of Service (BLOS):	All segments fail to meets their BLOS target due to the absence of cycling facilities and the operating speed of the roadways exceeding 70km/h.
Transit Level of Service (TLOS):	None of the study area segments have any existing transit service.
Truck Level of Service (TkLOS):	There were no target TkLOS in the study area.

- Detailed segment MMLOS analysis calculations are provided within Appendix "I".
- TLOS analysis was not performed on segments without existing transit service.
- TkLOS analysis was not performed on segments which are not designated truck routes.
- The poor existing levels of service related to pedestrian and cycling modes will likely be addressed through the anticipated ultimate upgrades to the corridors.

4.3 ACCESS INTERSECTION DESIGN

The Flagstaff Drive access will form a shared two-lane private roadway with a width of 7.5 m that would be operational only when the Halo Car Wash development to the north is completed. For the purpose of this TIA, it was assumed that the Halo Car Wash development and the private connecting roadway would not be in place by 2024, but will be completed by the 2029 horizon.

4.3.1 Location and Design of Access

The proposed development will have two accesses – one onto Borrisokane Road and the other via a private roadway through the Halo Car Wash onto Flagstaff Drive which was for the purposes of this TIA conservatively assumed to be available during the 2029-time horizon.

4.3.1.1 Access Evaluation

The City of Ottawa Private approach bylaw and TAC Geometric design were used to evaluate the accesses on the proposed development's property. The minimum widths, throat lengths and other access features were determined and applied to the intersection designs. The Flagstaff access was found to comply with City of Ottawa 9m maximum private approach bylaw. The Borrisokane Road access was found to require a larger access width of 17.25m needed to accommodate heavy vehicle truck turning movements that would avoid crossing over into the southbound traffic stream. (See Appendix "J")

A visual evaluation of the private approach onto Borrisokane Road showed potential sight line issues. Sight distance and stopping sight distance analysis for this access was completed to check these concerns. Following TAC guidelines and tables, the time gaps for a single unit truck were found for both left and right turns. It was determined using equation 9.9.1 that for a single unit truck:

- 213 meters are required to make a right turn; and
- 240 meters are required to make a left turn.

Appendix "K" provides a detailed illustration of the intersection sight distances.

4.3.2 Access Control

For the purposes of this TIA document the two intersections along Borrisokane Road were assumed to be initial configured as follows:

- The Borrisokane Road access was assumed to be operational in 2024 and be configured as a 2-lane corridor and operate as "T" intersection with minor leg-STOP control;
- The Flagstaff Dive accesses to the site through the Halo Car Wash lands was assumed to be operational by 2029 and would also be configured as a 2-lane corridor and operate as "T" intersection with minor leg-STOP control.

4.3.3 Access MMLOS Analysis

The City of Ottawa's MMLOS guidelines state that the LOS analysis is applicable to signalized intersections only[12]. Since the accesses to the proposed Korean Church were assumed to operate using minor leg-STOP control, no MMLOS analysis (including the auto LOS intersection capacity analysis) is required to be performed for the proposed access to the Korean Church.

4.4 Level of Service Analysis

4.4.1 Intersection Analysis (2024 Horizon Year)

Table 4-4 and Table 4-5 summarize the intersection capacity analysis results for the 2024 horizon year, both with, and without, the proposed Korean Community Church development.

As indicated in Section 4.3.2 the Flagstaff Drive access was not considered to be operational by 2024.

The analysis was undertaken with Synchro™ 10 traffic software. The Synchro analysis output sheets can be found within Appendix "E".

Table 4-4: 2024 Intersection Capacity Analysis (Without the Korean Community Church)

Borrisokane Road Intersection with ….		*Control Type*	*Weekday Morning Peak Hour (Afternoon Peak Hour)*				
			Critical Movement				
			Approach / Movement	**95th Percentile Queue (m)**	**Delay (seconds)**	**LOS**	**v/c**
1.	Flagstaff Drive	Minor Leg-STOP control	*WB (WB)*	17.25 (9.0)	19.5 (15.5)	C (C)	0.45 (0.30)
			SB-LT (SB-LT)	3.75 (3.75)	9.3 (8.4)	A (A)	0.13 (0.14)
2.	Cambrian Road	Minor Leg-STOP control	*WB (WB)*	31.5 (14.25)	15.4 (13.6)	C (B)	0.61 (0.40)
			SB-LT (SB-LT)	3.0 (9.0)	7.9 (8.5)	A (A)	0.11 (0.29)

12. *"Multi-Modal Level of Service (MMLOS) Guidelines",* IBI Group, September 2015. Page 4

Table 4-5: Total 2024 Intersection Capacity Analysis (With the Korean Community Church)

Borrisokane Road Intersection with ….		*Control Type*	*Weekday Morning Peak Hour (Afternoon Peak Hour)*				
			Critical Movement				
			Approach / Movement	**95th Percentile Queue (m)**	**Delay (seconds)**	**LOS**	**v/c**
1.	Flagstaff Drive	Minor Leg-STOP control	*WB (WB)*	17.25 (9.75)	19.9 (15.8)	C (C)	0.46 (0.30)
			SB-LT (SB-LT)	3.75 (3.75)	9.3 (8.4)	A (A)	0.13 (0.14)
2.	Cambrian Road	Minor Leg-STOP control	*WB (WB)*	33.0 (15)	15.8 (13.9)	C (B)	0.62 (0.41)
			SB-LT (SB-LT)	3.0 (9.0)	7.9 (8.5)	A (A)	0.11 (0.30)
3.	Korean Church Access	Minor Leg-STOP control	*WB (WB)*	0.75 (1.50)	14.5 (13.6)	B (B)	0.04 (0.05)
			SB-LT (SB-LT)	0.0 (0.0)	8.8 (8.0)	A (A)	0.01 (0.01)

The City of Ottawa's MMLOS Guidelines were referenced to determine the appropriate level of service metrics for each intersection. The levels of service are based on the volume-to-capacity (v/c) ratios. The target auto level-of-service for the "All Other Designations" is LOS "D"[13].

A comparison of the result of Table 4-4 (without the proposed Korean Community Church) to Table 4-5 (with the proposed Korean Community Church) indicate the following:

- All critical intersections turning movements are anticipated to operate at acceptable levels of service "C"-or-better with delays being less than 20 seconds and queues along Borrisokane Road at the proposed access being less than a single car length.

4.4.2 Intersection Analysis (2029 Horizon Year)

Table 4-6 and Table 4-7 summarize the intersection capacity analysis results for the 2029 horizon year both with, and without the proposed Korean Community Church development in place.

Table 4-6: 2029 Intersection Capacity Analysis (Without the Korean Church)

Borrisokane Road Intersection with ….		*Control Type*	*Weekday Morning Peak Hour (Afternoon Peak Hour)*				
			Critical Movement				
			Approach / Movement	**95th Percentile Queue (m)**	**Delay (seconds)**	**LOS**	**v/c**
1.	Flagstaff Drive	Minor Leg-STOP control	*WB (WB)*	19.5 (10.50)	21.9 (16.7)	C (C)	0.49 (0.32)
			SB-LT (SB-LT)	3.75 (3.75)	9.5 (8.5)	A (A)	0.14 (0.15)
2.	Cambrian Road	Minor Leg-STOP control	*WB (WB)*	41.25 (18.75)	17.9 (15.4)	C (C)	0.69 (0.47)
			SB-LT (SB-LT)	3.0 (10.5)	7.9 (8.7)	A (A)	0.12 (0.32)
4.	Flagstaff Drive / Halo Car Wash	Minor Leg-STOP control	*NB (NB)*	0.75 (0.75)	10.0 (10.1)	B (B)	0.03 (0.03)
			WB-LT (WB-LT)	0.0 (0.0)	7.5 (7.7)	A (A)	0.01 (0.01)

13. "*City of Ottawa MMLOS Guidelines, Draft Report*", September 2015. Pages 21-24

Table 4-7: 2029 Intersection Capacity Analysis (With the Korean Community Church)

Intersection		*Control Type*	*Weekday Morning Peak Hour (Afternoon Peak Hour)*				
			Critical Movement				
			Approach / Movement	**95th Percentile Queue (m)**	**Delay (seconds)**	**LOS**	**v/c**
1.	Borrisokane Road / Flagstaff Drive	Minor Leg-STOP control	*WB (WB)*	20.25 (10.5)	22.3 (17.0)	C (C)	0.50 (0.33)
			SB-LT (SB-LT)	3.75 (3.75)	9.5 (8.5)	A (A)	0.14 (0.15)
2.	Borrisokane Road / Cambrian Road	Minor Leg-STOP control	*WB (WB)*	42.75 (19.5)	18.3 (15.8)	C (C)	0.69 (0.48)
			SB-LT (SB-LT)	3.0 (10.5)	8.0 (8.7)	A (A)	0.12 (0.32)
3.	Borrisokane Road / Site Access	Minor Leg-STOP control	*WB (WB)*	0.75 (0.75)	15.4 (14.3)	C (B)	0.03 (0.04)
			SB-LT (SB-LT)	0.0 (0.0)	8.9 (8.0)	A (A)	0.01 (0.01)
4.	Flagstaff Drive / Halo Car Wash	Minor Leg-STOP control	*NB (NB)*	0.75 (0.75)	10.0 (10.1)	B (B)	0.03 (0.04)
			WB-LT (WB-LT)	0.0 (0.0)	7.5 (7.7)	A (A)	0.01 (0.01)

A comparison of the result of Table 4-6 (without the proposed Korean Community Church) to Table 4-7 (with the Korean Community Church) for the 2029 Horizon year indicates the following:

- All critical intersections turning movements are anticipated to operate at acceptable levels of service "C"-or-better with delays less than 23 seconds; and
- The forecast SB-LT queue turning from Borrisokane Road into the development is anticipated to operate at LOS "A" with a 9 second delay and an average queue length of less than a single car length.
- Similarly, the forecast SB-LT queue at the Borrisokane Road / Flagstaff Drive intersection is anticipated to operate at LOS "A" with an 10 second delay and an average queue length of less than a single car length.

4.4.3 Intersection Analysis Conclusions

The 2024 and 2029 results both indicate that the effect of the proposed Korean Community Church can be considered to be essentially negligible, as the adjacent intersections operates well, with or without, the development in place for both time horizons.

- Based on the results of the Synchro analysis, it was determined that the low peak hour traffic volumes of generated traffic were found not to warrant traffic signals nor additional auxiliary turning lanes at the proposed Korean Church access on Borrisokane Road or the Flagstaff Drive/Halo Car Wash by the 2029 horizon year.

4.5 INTERSECTION DESIGN

4.5.1 Left Turn Lane Warrants

As stated in Section 2.1.3.1, future plans for the Borrisokane Road corridor inclusive of the Flagstaff Drive (Intersections 1) and Cambrian Road (Intersections 2) intersection include widening of the corridors and auxiliary turning lanes.

It is anticipated that the Flagstaff Drive intersection is to be upgraded by the end of 2023 and the Cambrian Road intersection by 2031. Requests were made to the City of Ottawa staff to review these plans, but unfortunately the plans could not be provided until they had been finalized.

An auxiliary left turn lane warrant analysis was undertaken for the Borrisokane Road /Site access and the Flagstaff/Halo Car Wash intersections following MTO geometric design standards[14] for Ontario highways. The warrants for an auxiliary left turn lanes are based on:

- the left turn volume: (LTvol);
- the volume of opposing vehicles: (Vo); and
- the volume of advancing vehicles: (Va).

The analysis assumed the 5-Year Horizon (2029) morning and afternoon peak hours of travel demand as illustrated within Exhibit 3-7. It was found that southbound left turn auxiliary lanes are not warranted at either intersection based on the traffic forecasts contained within this document.

The complete analysis tables can be found within Appendix "I".

The Borrisokane Road / Site Access intersection can continue to operate as a minor leg STOP-controlled intersection with no auxiliary lanes.

14 *"Geometric Design Guide for Canadian Roads, Chapter 9: Intersections"* TAC, June 2017, MTO Design Supplement, Appendix 9

5.0 CONCLUSION

The following traffic operation related conclusions have been found relating to the proposed 3555 Borrisokane Road Korean Community Church Development:

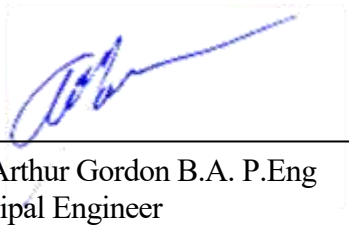
- The net effect of the site generated traffic associated with the proposed Korean Community Church Development upon the adjacent roadway network is anticipated to result in negligible impacts to traffic operational characteristics such as levels-of-service, volume-to-capacity ratios and delays at the adjacent intersections;
- Although the existing levels of service related to pedestrian and cycling modes along the area corridors can be considered poor, it is anticipated that the future proposed improvements along the Borrisokane Road, Flagstaff Drive and Cambrian Road corridors will represent significant improvements to the local community.
- A review of current parking demand and supply indicates that the development site has sufficient parking supply to accommodate the proposed Korean Community Church and the site plans are in full compliance with the City's current municipal parking by-laws for motor vehicles. The bicycle parking provisions will be confirmed upon site plan submission.
- A review of the warrants for left-turn auxiliary lanes at the proposed access into the site from Borrisokane Road and Flagstaff Drive indicated that there is no need, nor justification, for auxiliary left turn lanes that would provide access into the site.
- The Borrisokane Road Access is required to be wider at the edge of the roadway (Bylaw maximum is 9 meters, 17.25 meters needed) than the City's Private approach bylaw allows. This is in order to accommodate the turning movements of trucks, without encroaching over the median line or impeding oncoming traffic along Borrisokane Road.

6.0 SIGN-OFF

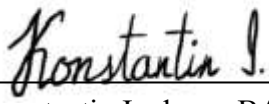
Should you have any questions or comments, please do not hesitate to contact us.

We await your feedback prior to finalizing the Traffic Impact Assessment report.

Yours truly,



Mr. Arthur Gordon B.A. P.Eng
Principal Engineer
Castleglenn Consultants Inc.



Mr. Konstantin Joulanov BASc., M. Eng
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APPENDIX A: CERTIFICATION FORM FOR TIA STUDY PROJECT MANAGER

Certification Form for TIA Study PM

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

- ☑ I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
- ☑ I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
- ☑ 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
- ☑ I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise
  - ☑ is either transportation engineering
  - ☑ or transportation planning.

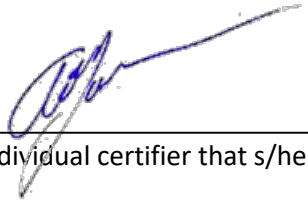
[1,2] License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Dated at Ottawa (City) this 18 day of January, 20 23.

Name : Arthur Gordon

Professional title: Principal, Chairman Board of Directors



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

Office Contact Information (Please Print)
Address: 2460 Lancaster Road, Suite 200
City / Postal Code: K1B 4S5
E-Mail Address: agordon@castleglenn.ca

Stamp

APPENDIX B: SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	
Description of Location	
Land Use Classification	
Development Size (units)	
Development Size (m^2)	
Number of Accesses and Locations	
Phase of Development	
Buildout Year	

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

2. Trip Generation Trigger

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

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

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

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

The average trip generation for a church during peak weekday hours based on ITE Trip Generation Manual is estimated to be under 20 trips, way below the 60 trips required for the Trip Generation Trigger.

3. Location Triggers

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

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

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

4. Safety Triggers

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

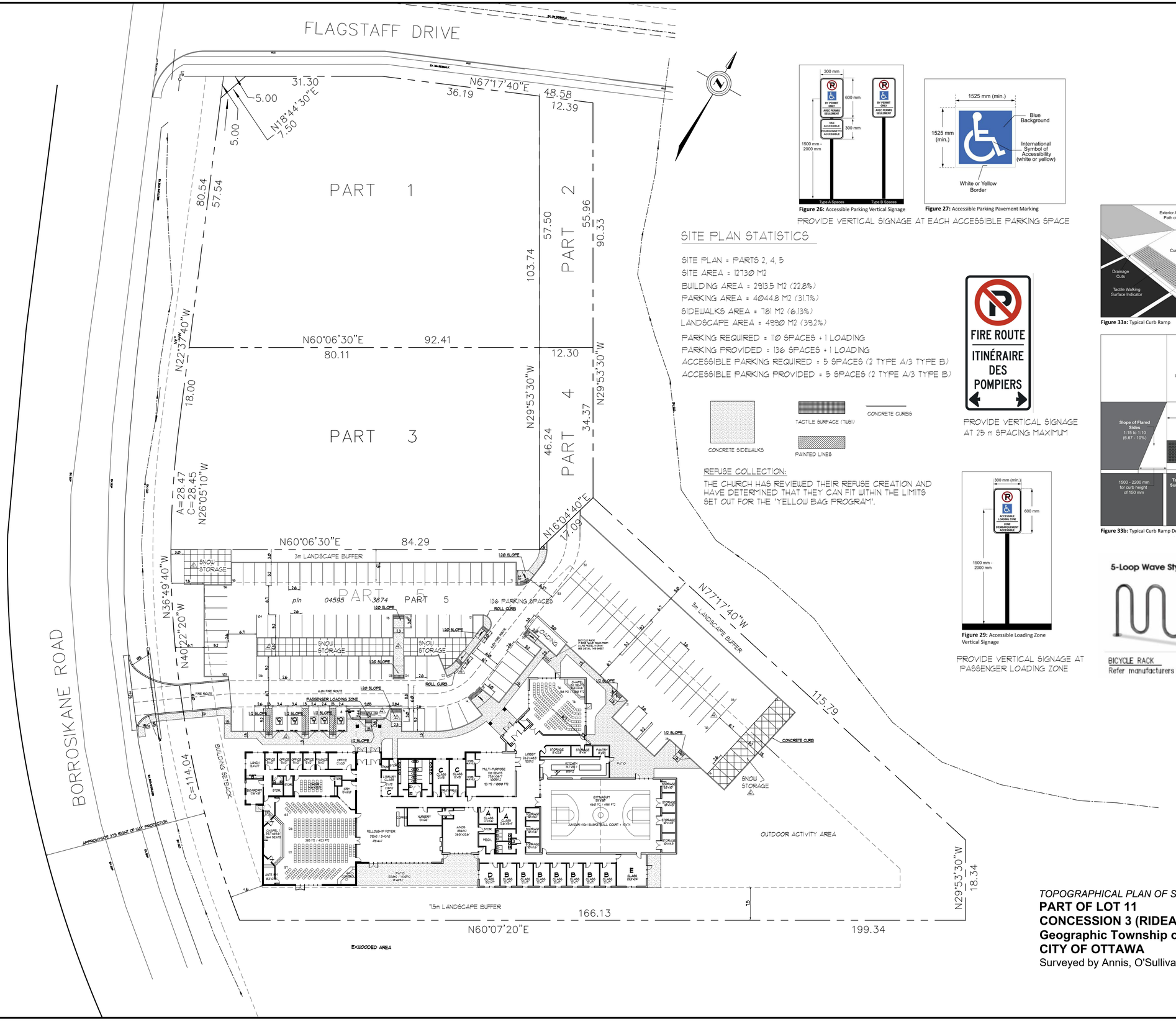
If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

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

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

APPENDIX C: SITE PLAN



SITE PLAN STATISTICS

SITE PLAN = PARTS 2, 4, 5
SITE AREA = 12730 M2
BUILDING AREA = 2913.5 M2 (22.8%)
PARKING AREA = 4044.8 M2 (31.7%)
SIDEWALKS AREA = 781 M2 (6.13%)
LANDSCAPE AREA = 4990 M2 (39.2%)
PARKING REQUIRED = 110 SPACES + 1 LOADING
PARKING PROVIDED = 136 SPACES + 1 LOADING
ACCESSIBLE PARKING REQUIRED = 5 SPACES (2 TYPE A/3 TYPE B)
ACCESSIBLE PARKING PROVIDED = 5 SPACES (2 TYPE A/3 TYPE B)

░ CONCRETE SIDEWALKS
▦ TACTILE SURFACE (TWSI)
▨ PAINTED LINES
— CONCRETE CURBS

REFUSE COLLECTION:

THE CHURCH HAS REVIEWED THEIR REFUSE CREATION AND HAVE DETERMINED THAT THEY CAN FIT WITHIN THE LIMITS SET OUT FOR THE "YELLOW BAG PROGRAM".

Figure 26: Accessible Parking Vertical Signage

Figure 27: Accessible Parking Pavement Marking

PROVIDE VERTICAL SIGNAGE AT EACH ACCESSIBLE PARKING SPACE

PROVIDE VERTICAL SIGNAGE AT 25 m SPACING MAXIMUM

Figure 29: Accessible Loading Zone Vertical Signage

PROVIDE VERTICAL SIGNAGE AT PASSENGER LOADING ZONE

Figure 33a: Typical Curb Ramp

Figure 33b: Typical Curb Ramp Design - Plan View

5-Loop Wave Style Bike Rack - 7 Bike Capacity

BICYCLE RACK
Refer manufacturers specifications for installation detail

TOPOGRAPHICAL PLAN OF SURVEY OF
PART OF LOT 11
CONCESSION 3 (RIDEAU FRONT)
Geographic Township of Nepean
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID T. PARKER
LICENCE
4608
2023 02 09

REVISIONS

1	SITE PLAN APPLICATION	JUNE 28/23
2	SPA REVIEW COMMENTS	OCT 04/23
3	SPA REVIEW COMMENTS	OCT 30/23
4	SPA REVIEW COMMENTS	JAN 02/24
5		
6		
7		
8		
9		
10		

OTTAWA KOREAN COMMUNITY CHURCH
3555 BORROSIKANE ROAD
OTTAWA, ONTARIO

Parker Architects Inc.
156 St. Paul Street
St. Catharines, ON, L2R 3M2
tel: 905-687-6681
email: info@parkerarchitects.ca

A1.1
drawing SITE PLAN
drawn DTP
checked -
scale 1:400
NL 22 - 106
date JUNE 28, 2023

APPENDIX D: EXISTING TRAFFIC COUNTS

Transportation Services - Traffic Services

Work Order 38148

Turning Movement Count - Full Study Summary (No AADT) Report

BORRISOKANE RD @ CAMBRIAN RD

Survey Date: Friday, November 09, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 2

Full Study

	BORRISOKANE RD									CAMBRIAN RD									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
06:30 07:30	0	30	13	**43**	103	28	0	**131**	**174**	0	0	0	**0**	6	0	308	**313**	**313**	**487**
07:30 08:30	0	81	21	**102**	122	39	0	**161**	**263**	0	0	0	**0**	25	0	409	**434**	**434**	**697**
08:30 09:30	0	66	18	**84**	140	34	0	**174**	**258**	0	0	0	**0**	19	0	332	**351**	**351**	**609**
15:30 16:30	0	43	13	**56**	295	63	0	**358**	**414**	0	0	0	**0**	11	0	202	**213**	**213**	**627**
16:30 17:30	0	39	18	**57**	328	65	0	**393**	**450**	0	0	0	**0**	11	0	191	**202**	**202**	**652**
17:30 18:30	0	23	2	**25**	369	49	0	**418**	**443**	0	0	0	**0**	5	0	190	**195**	**195**	**638**
18:30 19:30	0	6	2	**8**	147	18	0	**165**	**173**	0	0	0	**0**	1	0	96	**97**	**97**	**270**
Sub Total	0	288	87	**375**	1504	296	0	**1800**	**2175**	0	0	0	**0**	77	0	1728	**1805**	**1805**	**3980**
U Turns	0			**0**	0			**0**	**0**	0			**0**	2			**2**	**2**	**2**
Total	0	288	87	**375**	1504	296	0	**1800**	**2175**	0	0	0	**0**	79	0	1728	**1807**	**1807**	**3982**

Comments:

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

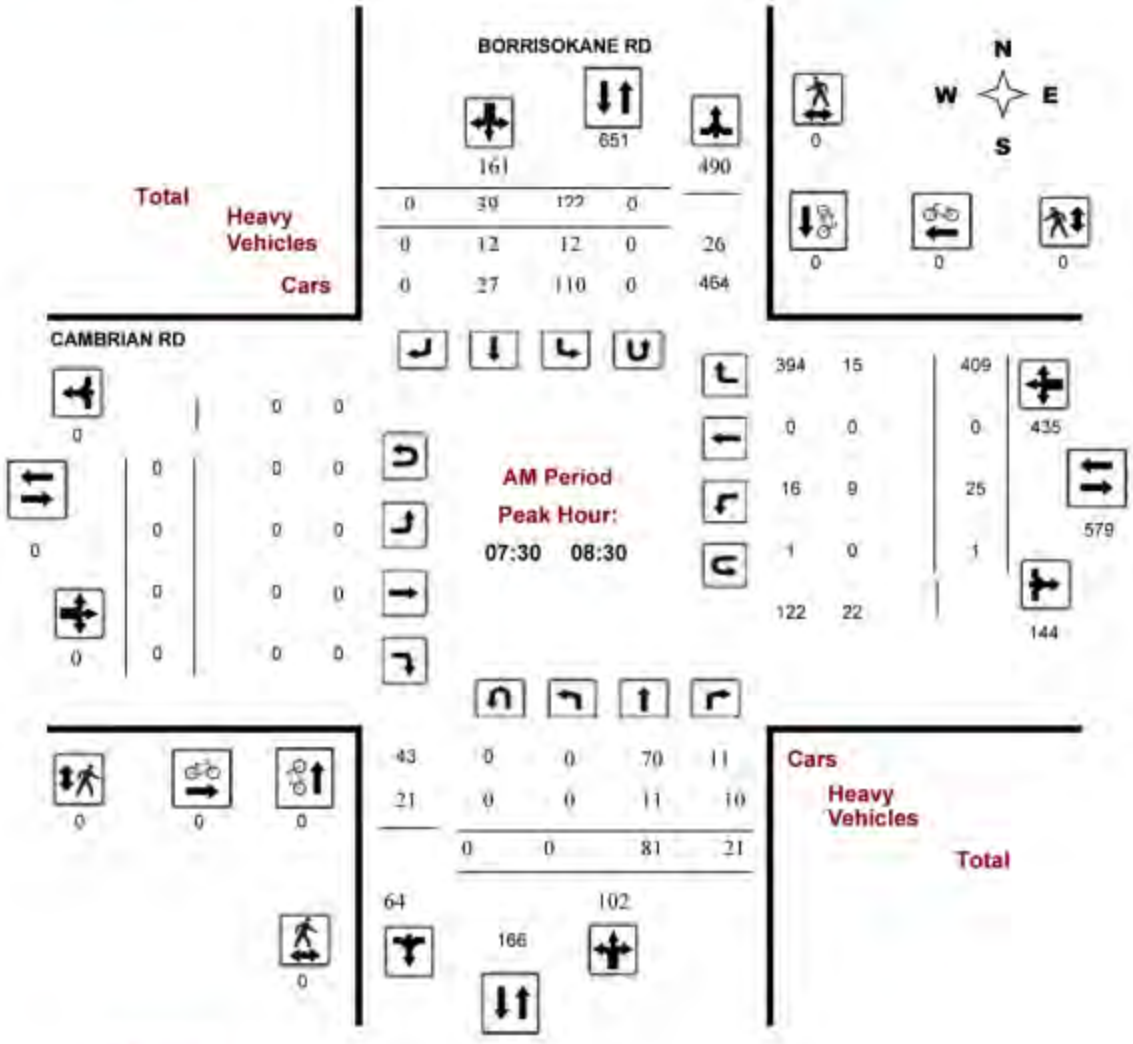
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BORRISOKANE RD @ CAMBRIAN RD

Survey Date: Friday, November 09, 2018 **WO No:** 38148

Start Time: 06:30 **Device:** Miovision



Comments

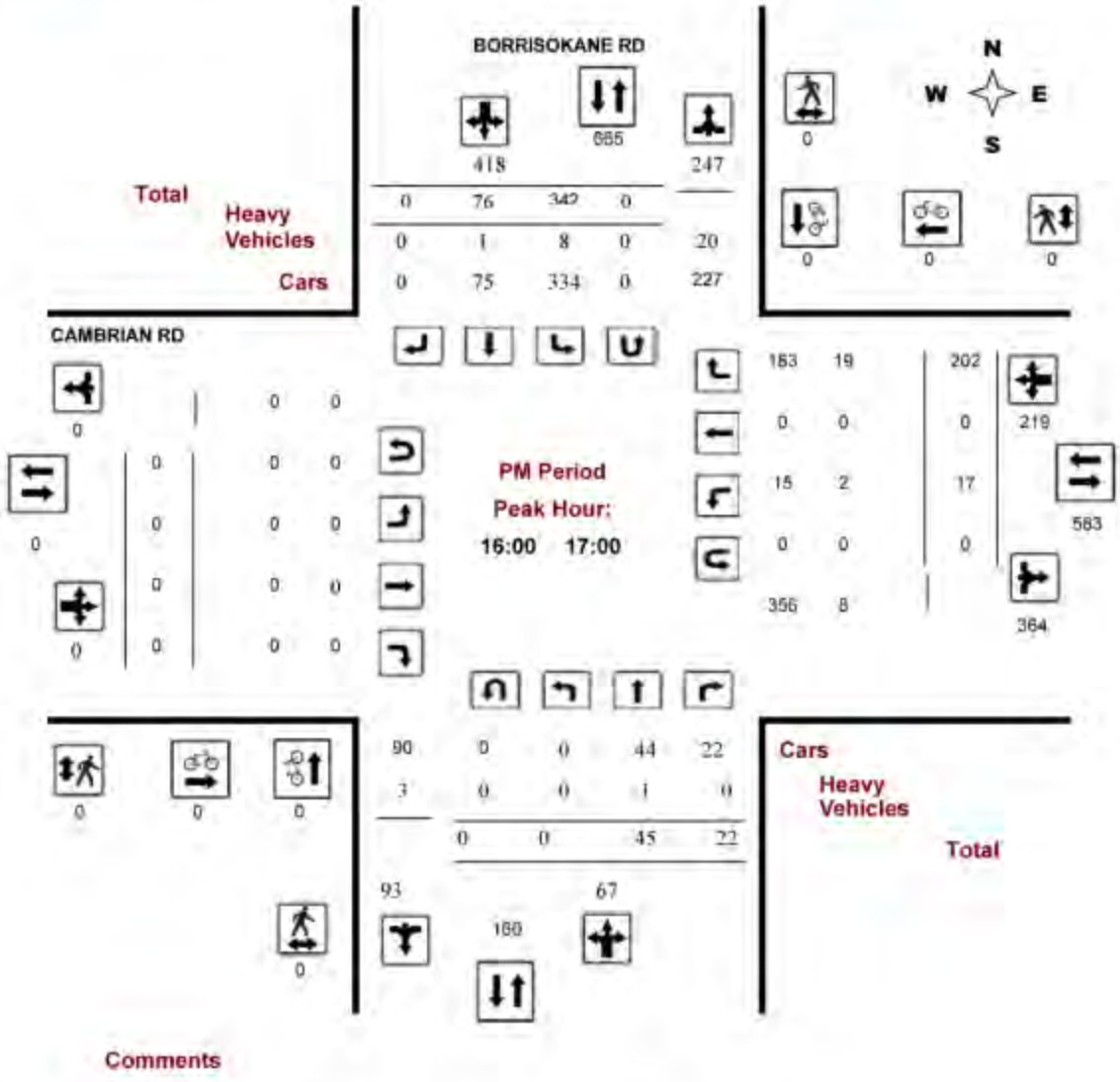
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BORRISOKANE RD @ CAMBRIAN RD

Survey Date: Friday, November 09, 2018 **WO No:** 38148

Start Time: 06:30 **Device:** Miovision



Comments

APPENDIX E: SYNCHRO ANALYSIS

Intersection	
Int Delay, s/veh	10.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	450	92	23	134	45
Future Vol, veh/h	28	450	92	23	134	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	29	474	97	24	141	47

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	438	109	0	0	121	0
Stage 1	109	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	517	939	-	-	1418	-
Stage 1	837	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	464	939	-	-	1418	-
Mov Cap-2 Maneuver	464	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	592	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.3	0	5.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	886	1418	-
HCM Lane V/C Ratio	-	-	0.568	0.099	-
HCM Control Delay (s)	-	-	14.3	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	3.7	0.3	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	3	539	3	7	177
Future Vol, veh/h	2	3	539	3	7	177
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	2	3	567	3	7	186

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	769	569	0	0	570	0
Stage 1	569	-	-	-	-	-
Stage 2	200	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	369	522	-	-	1002	-
Stage 1	566	-	-	-	-	-
Stage 2	834	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	366	522	-	-	1002	-
Mov Cap-2 Maneuver	366	-	-	-	-	-
Stage 1	566	-	-	-	-	-
Stage 2	827	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	446	1002	-
HCM Lane V/C Ratio	-	-	0.012	0.007	-
HCM Control Delay (s)	-	-	13.2	8.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	7.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	222	52	24	376	87
Future Vol, veh/h	19	222	52	24	376	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	20	234	55	25	396	92

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	952	68	0	0	80	0
Stage 1	68	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	250	990	-	-	1469	-
Stage 1	875	-	-	-	-	-
Stage 2	353	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	179	990	-	-	1469	-
Mov Cap-2 Maneuver	179	-	-	-	-	-
Stage 1	875	-	-	-	-	-
Stage 2	253	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	6.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	729	1469	-
HCM Lane V/C Ratio	-	-	0.348	0.269	-
HCM Control Delay (s)	-	-	12.6	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.6	1.1	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	7	272	2	3	460
Future Vol, veh/h	3	7	272	2	3	460
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	3	7	286	2	3	484

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	777	287	0	0	288	0
Stage 1	287	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	365	752	-	-	1274	-
Stage 1	762	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	364	752	-	-	1274	-
Mov Cap-2 Maneuver	364	-	-	-	-	-
Stage 1	762	-	-	-	-	-
Stage 2	614	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	570	1274	-
HCM Lane V/C Ratio	-	-	0.018	0.002	-
HCM Control Delay (s)	-	-	11.4	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	630	0	0	220
Future Vol, veh/h	0	0	630	0	0	220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	663	0	0	232

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	895	663	0	0	663	0
Stage 1	663	-	-	-	-	-
Stage 2	232	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	311	461	-	-	926	-
Stage 1	512	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	311	461	-	-	926	-
Mov Cap-2 Maneuver	311	-	-	-	-	-
Stage 1	512	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	926	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	12.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	514	116	26	154	66
Future Vol, veh/h	32	514	116	26	154	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	34	541	122	27	162	69

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	529	136	0	0	149	0
Stage 1	136	-	-	-	-	-
Stage 2	393	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	456	907	-	-	1385	-
Stage 1	813	-	-	-	-	-
Stage 2	614	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	400	907	-	-	1385	-
Mov Cap-2 Maneuver	400	-	-	-	-	-
Stage 1	813	-	-	-	-	-
Stage 2	539	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.9	0	5.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	844	1385	-
HCM Lane V/C Ratio	-	-	0.681	0.117	-
HCM Control Delay (s)	-	-	17.9	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	5.5	0.4	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	173	614	15	122	202
Future Vol, veh/h	18	173	614	15	122	202
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	19	182	646	16	128	213

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1123	654	0	0	662	0
Stage 1	654	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	227	467	-	-	927	-
Stage 1	517	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	191	467	-	-	927	-
Mov Cap-2 Maneuver	191	-	-	-	-	-
Stage 1	517	-	-	-	-	-
Stage 2	531	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.9	0	3.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	411	927	-
HCM Lane V/C Ratio	-	-	0.489	0.139	-
HCM Control Delay (s)	-	-	21.9	9.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.6	0.5	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	127	10	10	182	10	9
Future Vol, veh/h	127	10	10	182	10	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	134	11	11	192	11	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	145	0	354	140
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	214	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1437	-	644	908
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	822	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1437	-	638	908
Mov Cap-2 Maneuver	-	-	-	-	638	-
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	743	-	-	1437	-
HCM Lane V/C Ratio	0.027	-	-	0.007	-
HCM Control Delay (s)	10	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	334	0	0	559
Future Vol, veh/h	0	0	334	0	0	559
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	352	0	0	588

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	940	352	0	0	352	0
Stage 1	352	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	293	692	-	-	1207	-
Stage 1	712	-	-	-	-	-
Stage 2	555	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	293	692	-	-	1207	-
Mov Cap-2 Maneuver	293	-	-	-	-	-
Stage 1	712	-	-	-	-	-
Stage 2	555	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1207	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	8.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	260	74	27	436	110
Future Vol, veh/h	22	260	74	27	436	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	23	274	78	28	459	116

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1126	92	0	0	106	0
Stage 1	92	-	-	-	-	-
Stage 2	1034	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	195	960	-	-	1437	-
Stage 1	853	-	-	-	-	-
Stage 2	297	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	129	960	-	-	1437	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	196	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.4	0	6.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	639	1437	-
HCM Lane V/C Ratio	-	-	0.465	0.319	-
HCM Control Delay (s)	-	-	15.4	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.5	1.4	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	116	310	24	167	524
Future Vol, veh/h	21	116	310	24	167	524
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	22	122	326	25	176	552

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1243	339	0	0	351	0
Stage 1	339	-	-	-	-	-
Stage 2	904	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	193	703	-	-	1208	-
Stage 1	722	-	-	-	-	-
Stage 2	395	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	152	703	-	-	1208	-
Mov Cap-2 Maneuver	152	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	312	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.7	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	452	1208	-
HCM Lane V/C Ratio	-	-	0.319	0.146	-
HCM Control Delay (s)	-	-	16.7	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0.5	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	182	10	10	127	10	9
Future Vol, veh/h	182	10	10	127	10	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	192	11	11	134	11	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	203	0	354	198
Stage 1	-	-	-	-	198	-
Stage 2	-	-	-	-	156	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1369	-	644	843
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	872	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1369	-	638	843
Mov Cap-2 Maneuver	-	-	-	-	638	-
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	864	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	721	-	-	1369	-
HCM Lane V/C Ratio	0.028	-	-	0.008	-
HCM Control Delay (s)	10.1	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	5	630	8	6	220
Future Vol, veh/h	6	5	630	8	6	220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	5	663	8	6	232

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	911	667	0	0	671	0
Stage 1	667	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	304	459	-	-	919	-
Stage 1	510	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	302	459	-	-	919	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	510	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.4	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	358	919	-
HCM Lane V/C Ratio	-	-	0.032	0.007	-
HCM Control Delay (s)	-	-	15.4	8.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	12.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	518	120	26	157	69
Future Vol, veh/h	32	518	120	26	157	69
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	34	545	126	27	165	73

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	543	140	0	0	153	0
Stage 1	140	-	-	-	-	-
Stage 2	403	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	447	903	-	-	1380	-
Stage 1	810	-	-	-	-	-
Stage 2	607	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	391	903	-	-	1380	-
Mov Cap-2 Maneuver	391	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	531	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	5.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	839	1380	-
HCM Lane V/C Ratio	-	-	0.69	0.12	-
HCM Control Delay (s)	-	-	18.3	8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	5.7	0.4	-

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	174	619	15	123	208
Future Vol, veh/h	18	174	619	15	123	208
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	19	183	652	16	129	219

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1137	660	0	0	668	0
Stage 1	660	-	-	-	-	-
Stage 2	477	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	223	463	-	-	922	-
Stage 1	514	-	-	-	-	-
Stage 2	624	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	188	463	-	-	922	-
Mov Cap-2 Maneuver	188	-	-	-	-	-
Stage 1	514	-	-	-	-	-
Stage 2	525	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.3	0	3.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	407	922	-
HCM Lane V/C Ratio	-	-	0.497	0.14	-
HCM Control Delay (s)	-	-	22.3	9.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.7	0.5	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	127	11	14	182	11	12
Future Vol, veh/h	127	11	14	182	11	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	134	12	15	192	12	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	146	0	362	140
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	222	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1436	-	637	908
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1436	-	629	908
Mov Cap-2 Maneuver	-	-	-	-	629	-
Stage 1	-	-	-	-	887	-
Stage 2	-	-	-	-	805	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	749	-	-	1436	-
HCM Lane V/C Ratio	0.032	-	-	0.01	-
HCM Control Delay (s)	10	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	7	334	8	6	559
Future Vol, veh/h	8	7	334	8	6	559
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	7	352	8	6	588

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	956	356	0	0	360	0
Stage 1	356	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	286	688	-	-	1199	-
Stage 1	709	-	-	-	-	-
Stage 2	548	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	284	688	-	-	1199	-
Mov Cap-2 Maneuver	284	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	544	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	391	1199	-
HCM Lane V/C Ratio	-	-	0.04	0.005	-
HCM Control Delay (s)	-	-	14.6	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	8.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	264	78	27	440	114
Future Vol, veh/h	22	264	78	27	440	114
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	23	278	82	28	463	120

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1142	96	0	0	110	0
Stage 1	96	-	-	-	-	-
Stage 2	1046	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	190	955	-	-	1432	-
Stage 1	849	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	124	955	-	-	1432	-
Mov Cap-2 Maneuver	124	-	-	-	-	-
Stage 1	849	-	-	-	-	-
Stage 2	191	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	6.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	630	1432	-
HCM Lane V/C Ratio	-	-	0.478	0.323	-
HCM Control Delay (s)	-	-	15.8	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.6	1.4	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	117	317	24	168	530
Future Vol, veh/h	21	117	317	24	168	530
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	22	123	334	25	177	558

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1259	347	0	0	359	0
Stage 1	347	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	188	696	-	-	1200	-
Stage 1	716	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	148	696	-	-	1200	-
Mov Cap-2 Maneuver	148	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	308	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	445	1200	-
HCM Lane V/C Ratio	-	-	0.326	0.147	-
HCM Control Delay (s)	-	-	17	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0.5	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	182	11	14	127	11	13
Future Vol, veh/h	182	11	14	127	11	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	192	12	15	134	12	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	204	0	362	198
Stage 1	-	-	-	-	198	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1368	-	637	843
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	865	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1368	-	629	843
Mov Cap-2 Maneuver	-	-	-	-	629	-
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	855	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	729	-	-	1368	-
HCM Lane V/C Ratio	0.035	-	-	0.011	-
HCM Control Delay (s)	10.1	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	576	0	0	202
Future Vol, veh/h	0	0	576	0	0	202
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	606	0	0	213

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	819	606	0	0	606	0
Stage 1	606	-	-	-	-	-
Stage 2	213	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	345	497	-	-	972	-
Stage 1	545	-	-	-	-	-
Stage 2	823	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	345	497	-	-	972	-
Mov Cap-2 Maneuver	345	-	-	-	-	-
Stage 1	545	-	-	-	-	-
Stage 2	823	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	972	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	10.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	29	469	107	24	140	62
Future Vol, veh/h	29	469	107	24	140	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	31	494	113	25	147	65

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	485	126	0	0	138	0
Stage 1	126	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	485	919	-	-	1398	-
Stage 1	822	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	432	919	-	-	1398	-
Mov Cap-2 Maneuver	432	-	-	-	-	-
Stage 1	822	-	-	-	-	-
Stage 2	568	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.4	0	5.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	862	1398	-
HCM Lane V/C Ratio	-	-	0.608	0.105	-
HCM Control Delay (s)	-	-	15.4	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	4.2	0.4	-

Intersection	
Int Delay, s/veh	4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	173	561	15	121	184
Future Vol, veh/h	18	173	561	15	121	184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	19	182	591	16	127	194

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1047	599	0	0	607	0
Stage 1	599	-	-	-	-	-
Stage 2	448	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	253	502	-	-	971	-
Stage 1	549	-	-	-	-	-
Stage 2	644	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	216	502	-	-	971	-
Mov Cap-2 Maneuver	216	-	-	-	-	-
Stage 1	549	-	-	-	-	-
Stage 2	549	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.5	0	3.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	446	971	-
HCM Lane V/C Ratio	-	-	0.451	0.131	-
HCM Control Delay (s)	-	-	19.5	9.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.5	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	307	0	0	520
Future Vol, veh/h	0	0	307	0	0	520
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	323	0	0	547

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	870	323	0	0	323	0
Stage 1	323	-	-	-	-	-
Stage 2	547	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	322	718	-	-	1237	-
Stage 1	734	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	322	718	-	-	1237	-
Mov Cap-2 Maneuver	322	-	-	-	-	-
Stage 1	734	-	-	-	-	-
Stage 2	580	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1237	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	8.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	238	69	25	398	101
Future Vol, veh/h	20	238	69	25	398	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	21	251	73	26	419	106

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1030	86	0	0	99	0
Stage 1	86	-	-	-	-	-
Stage 2	944	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	224	967	-	-	1445	-
Stage 1	858	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	155	967	-	-	1445	-
Mov Cap-2 Maneuver	155	-	-	-	-	-
Stage 1	858	-	-	-	-	-
Stage 2	228	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	6.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	688	1445	-
HCM Lane V/C Ratio	-	-	0.395	0.29	-
HCM Control Delay (s)	-	-	13.6	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.9	1.2	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	115	283	24	167	478
Future Vol, veh/h	21	115	283	24	167	478
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	22	121	298	25	176	503

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1166	311	0	0	323	0
Stage 1	311	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	214	729	-	-	1237	-
Stage 1	743	-	-	-	-	-
Stage 2	417	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	172	729	-	-	1237	-
Mov Cap-2 Maneuver	172	-	-	-	-	-
Stage 1	743	-	-	-	-	-
Stage 2	335	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.5	0	2.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	486	1237	-
HCM Lane V/C Ratio	-	-	0.295	0.142	-
HCM Control Delay (s)	-	-	15.5	8.4	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0.5	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	8	576	9	9	202
Future Vol, veh/h	8	8	576	9	9	202
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	8	606	9	9	213

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	842	611	0	0	615	0
Stage 1	611	-	-	-	-	-
Stage 2	231	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	334	494	-	-	965	-
Stage 1	542	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	330	494	-	-	965	-
Mov Cap-2 Maneuver	330	-	-	-	-	-
Stage 1	542	-	-	-	-	-
Stage 2	798	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	396	965	-
HCM Lane V/C Ratio	-	-	0.043	0.01	-
HCM Control Delay (s)	-	-	14.5	8.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	10.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	29	474	111	24	145	65
Future Vol, veh/h	29	474	111	24	145	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	31	499	117	25	153	68

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	504	130	0	0	142	0
Stage 1	130	-	-	-	-	-
Stage 2	374	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	472	914	-	-	1393	-
Stage 1	819	-	-	-	-	-
Stage 2	627	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	418	914	-	-	1393	-
Mov Cap-2 Maneuver	418	-	-	-	-	-
Stage 1	819	-	-	-	-	-
Stage 2	556	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	5.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	855	1393	-
HCM Lane V/C Ratio	-	-	0.619	0.11	-
HCM Control Delay (s)	-	-	15.8	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	4.4	0.4	-

Intersection	
Int Delay, s/veh	4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	173	569	15	121	193
Future Vol, veh/h	18	173	569	15	121	193
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	19	182	599	16	127	203

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1064	607	0	0	615	0
Stage 1	607	-	-	-	-	-
Stage 2	457	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	247	496	-	-	965	-
Stage 1	544	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	210	496	-	-	965	-
Mov Cap-2 Maneuver	210	-	-	-	-	-
Stage 1	544	-	-	-	-	-
Stage 2	544	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.9	0	3.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	440	965	-
HCM Lane V/C Ratio	-	-	0.457	0.132	-
HCM Control Delay (s)	-	-	19.9	9.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.5	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	11	307	9	9	520
Future Vol, veh/h	10	11	307	9	9	520
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	12	323	9	9	547

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	893	328	0	0	332	0
Stage 1	328	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	312	713	-	-	1227	-
Stage 1	730	-	-	-	-	-
Stage 2	569	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	309	713	-	-	1227	-
Mov Cap-2 Maneuver	309	-	-	-	-	-
Stage 1	730	-	-	-	-	-
Stage 2	563	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	439	1227	-
HCM Lane V/C Ratio	-	-	0.05	0.008	-
HCM Control Delay (s)	-	-	13.6	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	8.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	243	73	25	404	105
Future Vol, veh/h	20	243	73	25	404	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	36	4	14	47	10	30
Mvmt Flow	21	256	77	26	425	111

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1051	90	0	0	103	0
Stage 1	90	-	-	-	-	-
Stage 2	961	-	-	-	-	-
Critical Hdwy	6.76	6.24	-	-	4.2	-
Critical Hdwy Stg 1	5.76	-	-	-	-	-
Critical Hdwy Stg 2	5.76	-	-	-	-	-
Follow-up Hdwy	3.824	3.336	-	-	2.29	-
Pot Cap-1 Maneuver	217	962	-	-	1440	-
Stage 1	855	-	-	-	-	-
Stage 2	323	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	149	962	-	-	1440	-
Mov Cap-2 Maneuver	149	-	-	-	-	-
Stage 1	855	-	-	-	-	-
Stage 2	222	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.9	0	6.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	680	1440	-
HCM Lane V/C Ratio	-	-	0.407	0.295	-
HCM Control Delay (s)	-	-	13.9	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	2	1.2	-

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	21	115	294	24	167	487
Future Vol, veh/h	21	115	294	24	167	487
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	5	2	2	15
Mvmt Flow	22	121	309	25	176	513

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1187	322	0	0	334	0
Stage 1	322	-	-	-	-	-
Stage 2	865	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	208	719	-	-	1225	-
Stage 1	735	-	-	-	-	-
Stage 2	412	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	166	719	-	-	1225	-
Mov Cap-2 Maneuver	166	-	-	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	329	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	2.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	475	1225	-
HCM Lane V/C Ratio	-	-	0.301	0.144	-
HCM Control Delay (s)	-	-	15.8	8.4	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0.5	-

APPENDIX F: TDM SUPPORTIVE DEVELOPMENT" CHECKLIST

TDM-Supportive Development Design and Infrastructure Checklist:

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

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
	The measure is generally feasible and effective, and in most cases would benefit the development and its users
	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)*	☒ No current transit provisions are provided in the area of the development
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)*	☑ Sidewalks are provided from the building entrances to Borrisokane Road

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)*	☑	Concrete slab sidewalks are provided to and from the building entrances
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)*	☑	Sidewalks are easily accessible with gradual grade transition
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)*	☒	No current public sidewalks or cycling paths are located in the area. The sidewalk from the building entrance connects to Borrisokane Road, which will have sidewalk and cycling facilities in the future.
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☒	No transit provisions are available in the area.
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	☒	Borrisokane Road has an operating speed of 80 km/h, with no bike lanes
	1.3	**Amenities for walking & cycling**		
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☑	
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☑	Wayfinding not required

		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 racks are provided near the main entrance
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well- used areas *(See Zoning By-law Section 111)*	☑ 7 bicycle parking spaces are provided based zoning By-law regulations
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)*	☑ Bicycle spaces meet minimum dimensions, all are horizontal spaces, racks anchored to concrete
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	☑ Expected number of cyclists based on mode share is 1, 7 parking spaces are provided
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	☑ The 7 provided stalls provides a massive buffer over the expected number of cyclists
	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)*	☑ The City bylaw requires 2 stalls and provision is being made for 7outdoor bicycle parking spaces on racks.
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)	☒ There is no secure bicycle parking provision in the bylaw for less than 50 stalls.
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☒
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☒
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☒ No repair station is provided

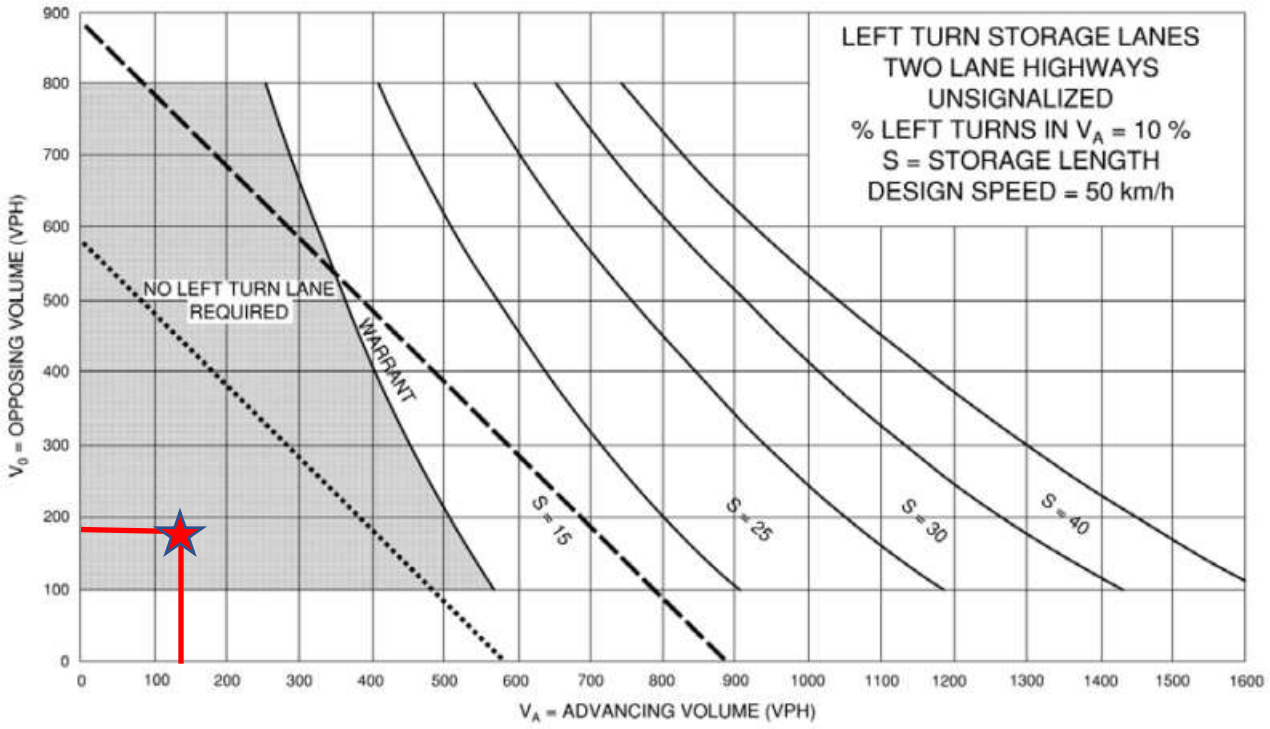
		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☒ There are no on-site transit stops
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	☒ There are no off-site transit stops abutting the site
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☒ There are no on-site transit stops
	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	☒ There is no dedicated area for carpool motorists as stalls are available on a 1st come basis.
	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	☒ There are no signed parking spaces for carpools
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☒ There are no signed parking spaces for carpools
	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)*	☒ There are no carsharing spaces
	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	☒ There are no bike-sharing spaces

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	☑	Sufficient parking is provided based on zoning By-laws
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	☑	136 stalls are provided, while only 57 are necessary based on zoning by-laws
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)*	☒	Does not apply to site land uses
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)*	☒	No reduction has been made
	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)	☒	All parking spaces are shared
	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	☒	No amenities are provided in this office building

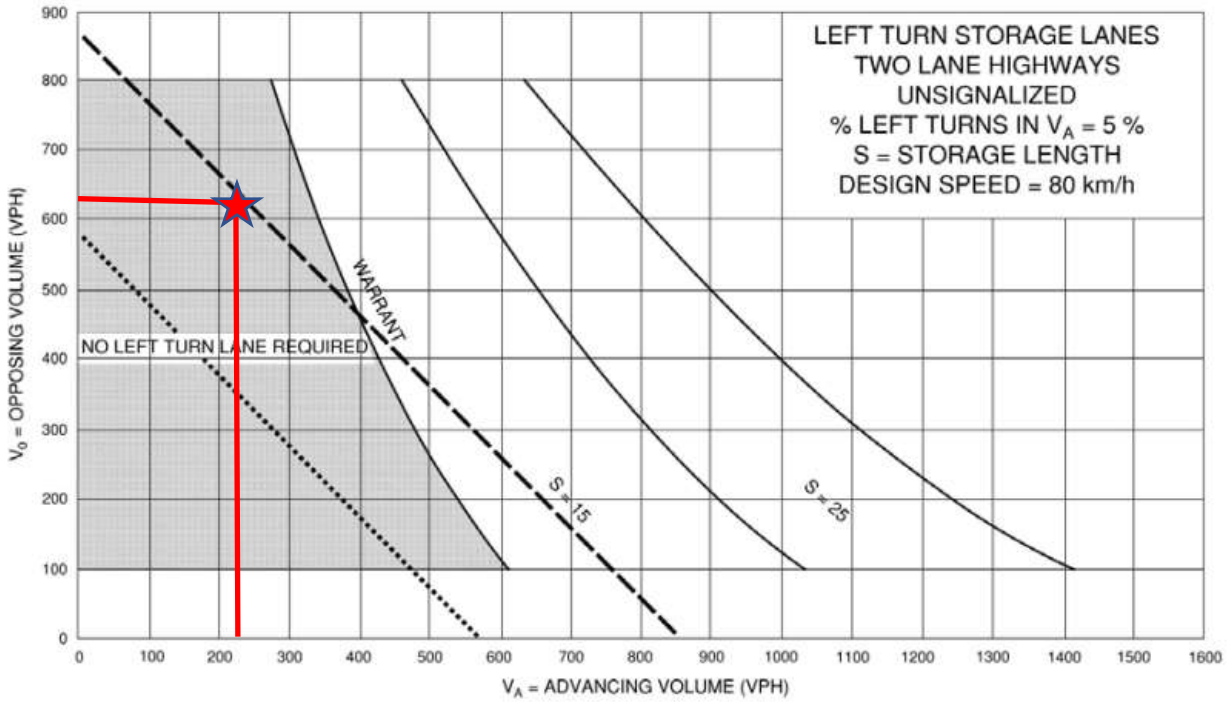
APPENDIX G: MMLOS ANALYSIS WORKSHEET

Performance Measure	*Roadway Segments Adjacent to the Development*		
	Cambrian Road East of Borrisokane Road	Flagstaff Drive East of Borrisokane Road	Borrisokane Road b/w Cambrian Road and Flagstaff Drive
Pedestrian LOS (PLOS)			
Sidewalk Width (m)	No sidewalk	No sidewalk	No sidewalk
Boulevard Width (m)	N/A	N/A	N/A
Average Daily Curb Lane Traffic Volume	N/A	N/A	N/A
Presence of On-Street Parking	N/A	N/A	N/A
Operating Speed (km/h) Posted +10 km/hr	80	60	90
Segment PLOS	**F**	**F**	**F**
Target PLOS	D	D	D
Bicycle LOS (BLOS)			
Bikeway Type	Mixed Traffic	Mixed Traffic	Mixed Traffic
Number of Lanes per direction	1	1	1
Bike Lane Width (m)	N/A	N/A	N/A
Operating Speed (km/h) Posted +10 km/hr	80	60	90
Bike Lane Blockage	N/A	N/A	N/A
Segment BLOS	**F**	**F**	**F**
Target BLOS	D	D	D
Transit LOS (TLOS)			
Facility Type	N/A		
Level/Exposure to Parking/Driveway Friction			
Average Transit Travel Speed (km/h)			
Posted Speed Limit (km/h)			
Segment TLOS			
Target TLOS			
Truck LOS (TkLOS)			
Number of lanes (in each direction)	N/A		
Curb Lane Width (m)			
Segment TkLOS			
Target TkLOS			

APPENDIX H: LEFT TURN LANE WARRANTS



Flagstaff Drive and Halo Car Wash Intersection Results



Borrisokane Road and Site Access Intersection Results

APPENDIX I: TURNING MOVEMENT ANALYSIS

CITY OF OTTAWA
FUNCTIONAL PLANNING DESIGN
3555 BORRISOKANE ROAD

ACCESS ON BORRISOKANE ROAD
DESIGN VEHICLE TURNING MANEUVERS

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PROJECT REF. NUMBER: 7320

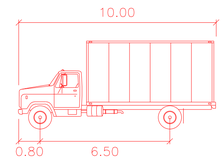
Contract No. 7320	Dwg. No. 03
Sheet 3 of 5	
Asset Group: ISD	
Des. RM	Chk'd. AEG
Dwn. RM	Chk'd. AK
Utility Circ. No.	Index No.
Cost. Inspector	
Scale: 5m 0 5m — HORIZ 1:250	

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (dd/mm/yy)
1	AS PER CITY COMMENTS	RM	20/09/23

NOTES



MSU	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.1

CITY OF OTTAWA
FUNCTIONAL PLANNING DESIGN
3555 BORRISOKANE ROAD

ACCESS ON BORRISOKANE ROAD
DESIGN VEHICLE TURNING MANEUVERS

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PROJECT REF. NUMBER: 7320

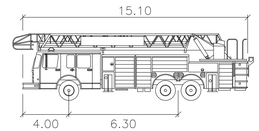
Contract No.	7320
Dwg. No.	03
Sheet	3 of 5
Asset Group	ISD
Des.	RM
Chk'd.	AEG
Dwn.	RM
Chk'd.	AK
Utility Circ. No.	
Index No.	
Cost. Inspector	
Scale:	5m 0 5m HORIZ 1:250

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (dd/mm/yy)
1	AS PER CITY COMMENTS	RM	20/09/23

NOTES



Fire Truck

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 32.6

CITY OF OTTAWA
FUNCTIONAL PLANNING DESIGN
3555 BORRISOKANE ROAD

ACCESS ON BORRISOKANE ROAD
DESIGN VEHICLE TURNING MANEUVERS

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PROJECT REF. NUMBER: 7320

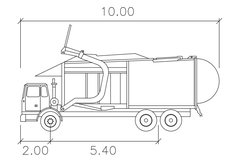
Contract No. 7320	Dwg. No. 03
Sheet 3 of 5	
Asset Group: ISD	
Des. RM	Chk'd. AEG
Dwn. RM	Chk'd. AK
Utility Circ. No.	Index No.
Cost. Inspector	
Scale: 5m 0 5m HORIZ 1:250	

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

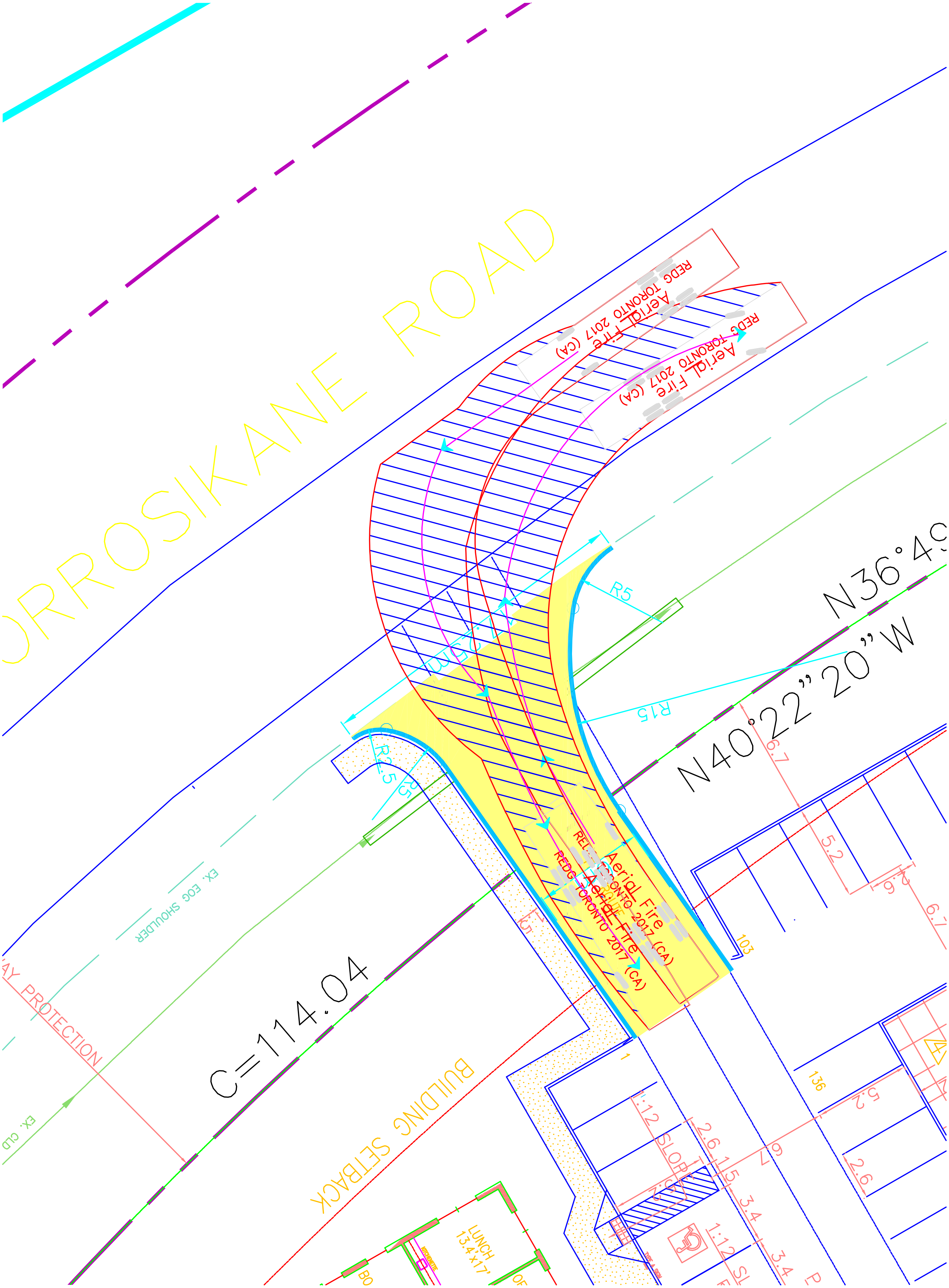
No.	Description	By	Date (dd/mm/yy)
1	AS PER CITY COMMENTS	RM	20/09/23

NOTES

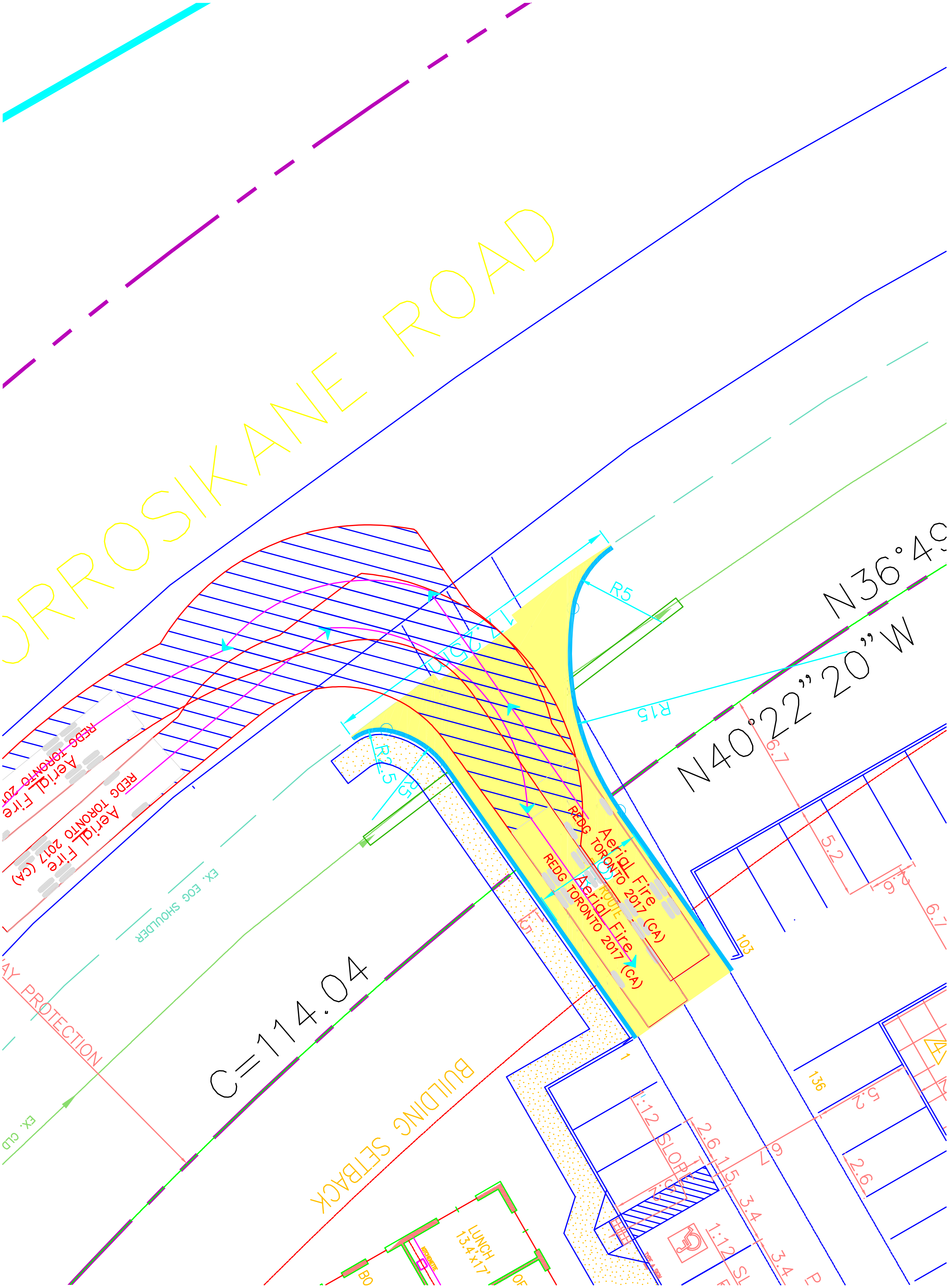


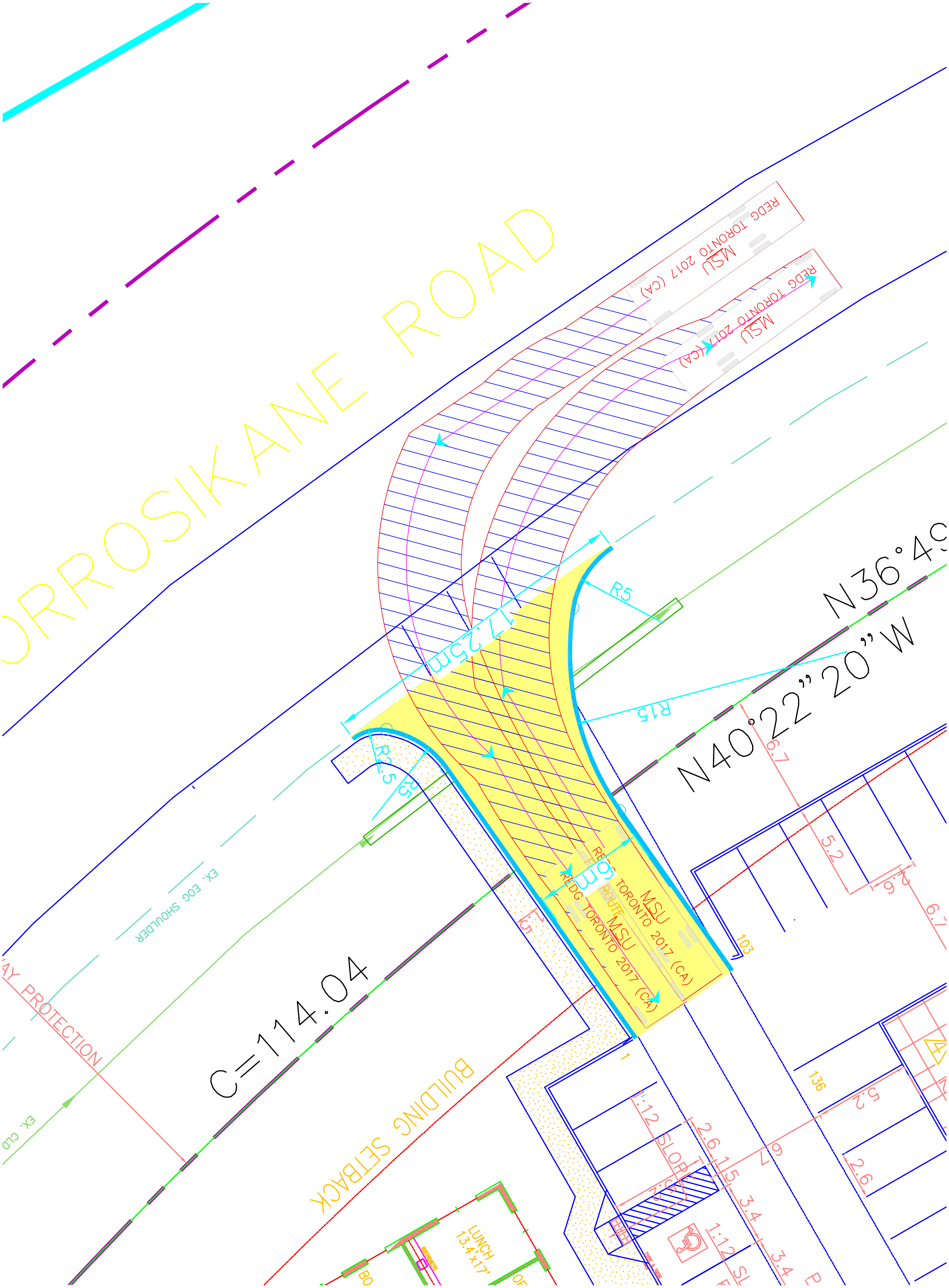
Waste Collection Truck

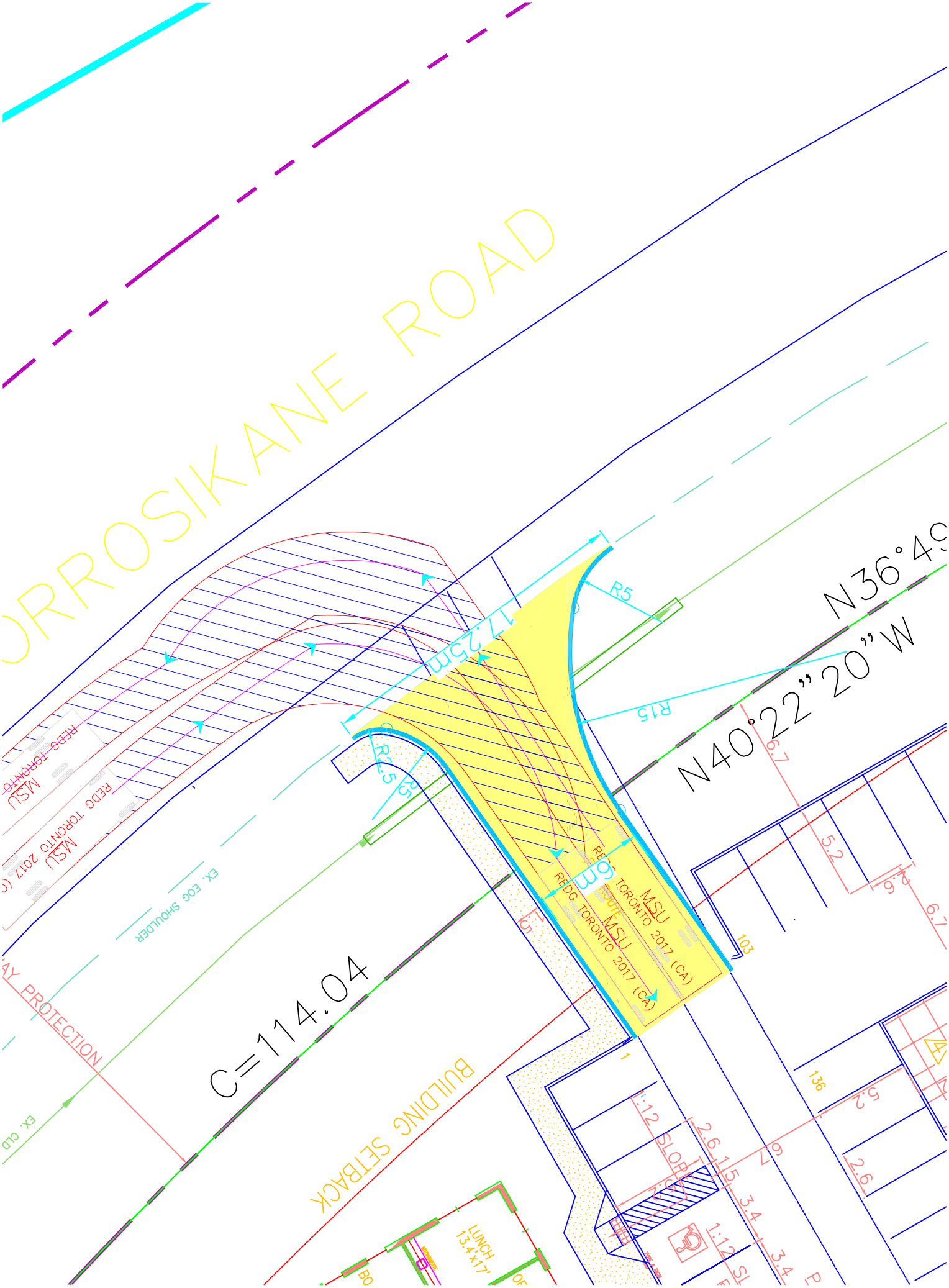
	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 27.7



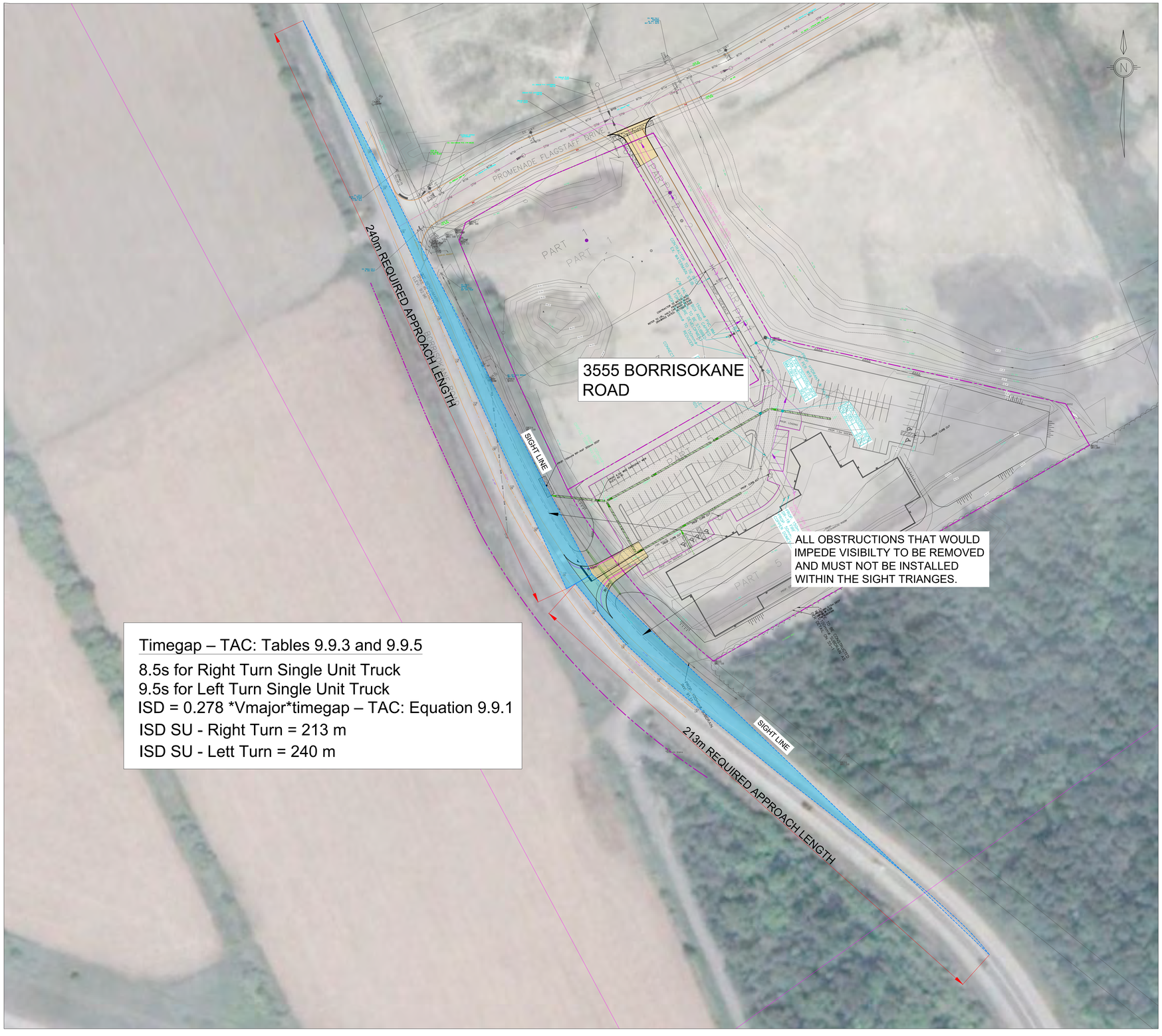
ORRISKANE ROAD
N36°49
N40°22"20"W
C=114.04
BUILDING SETBACK
EX. EOG SHOULDER
EX. CLD
AY PROTECTION
Aerial Fire
REDG TORONTO 2017 (CA)
R5
R15
R2.5
LUNCH
13.4'x17'


ORROSIKANE ROAD
N40°22"20"W
C=114.04
BUILDING SETBACK
EX. EOG SHOULDER
EX. CLD
R5
R15
R2.5
Aerial Fire
REDG TORONTO 2017 (CA)
LUNCH
13.4'x17'
1:12 SLOPE
6.7
5.2
2.6
3.4
136
103


ORROSIKANE ROAD
REDG TORONTO 2017 (CA)
MSU
17.25m
R5
R15
R2.5
6m
N36°49
N40°22'20"W
C=114.04
EX. EOG SHOULDER
AY PROTECTION
EX. CLD
BUILDING SETBACK
103
136
6.7
5.2
6
2.6
3.4
1:12 SLOPE
LUNCH
13.4'x17'


URROSIKANE ROAD
N40°22"20"W
N36°4
C=114.04
17.25m
R5
R15
R2.5
R5
6m
MSU
TORONTO 2017 (CA)
REDG TORONTO 2017 (CA)
MSU
TORONTO 2017 (CA)
REDG TORONTO 2017 (CA)
EX. EOG SHOULDER
BUILDING SETBACK
AY PROTECTION
EX. CLD
6.7
5.2
6.7
103
136
1:12 SLOPE
2.6
1.5
3.4
3.4
LUNCH
13.4'X17'

APPENDIX J: SIGHT DISTANCE ANALYSIS



CITY OF OTTAWA
FUNCTIONAL PLANNING DESIGN
3555 BORRISOKANE ROAD

ACCESS AT BORRISOKANE ROAD
INTERSECTION SIGHT DISTANCE

Castleglenn Consultants
Engineers, Project Managers & Planners

PROJECT REF. NUMBER: 7320

Contract No. 7320	Dwg. No. 02
Sheet 2 of 5	
Asset Group: ISD	
Des. RM	Chk'd. AEG
Dwn. RM	Chk'd. AK
Utility Circ. No.	Index No.
Cost. Inspector	
Scale: 15m 0 15m HORIZ 1: 750	

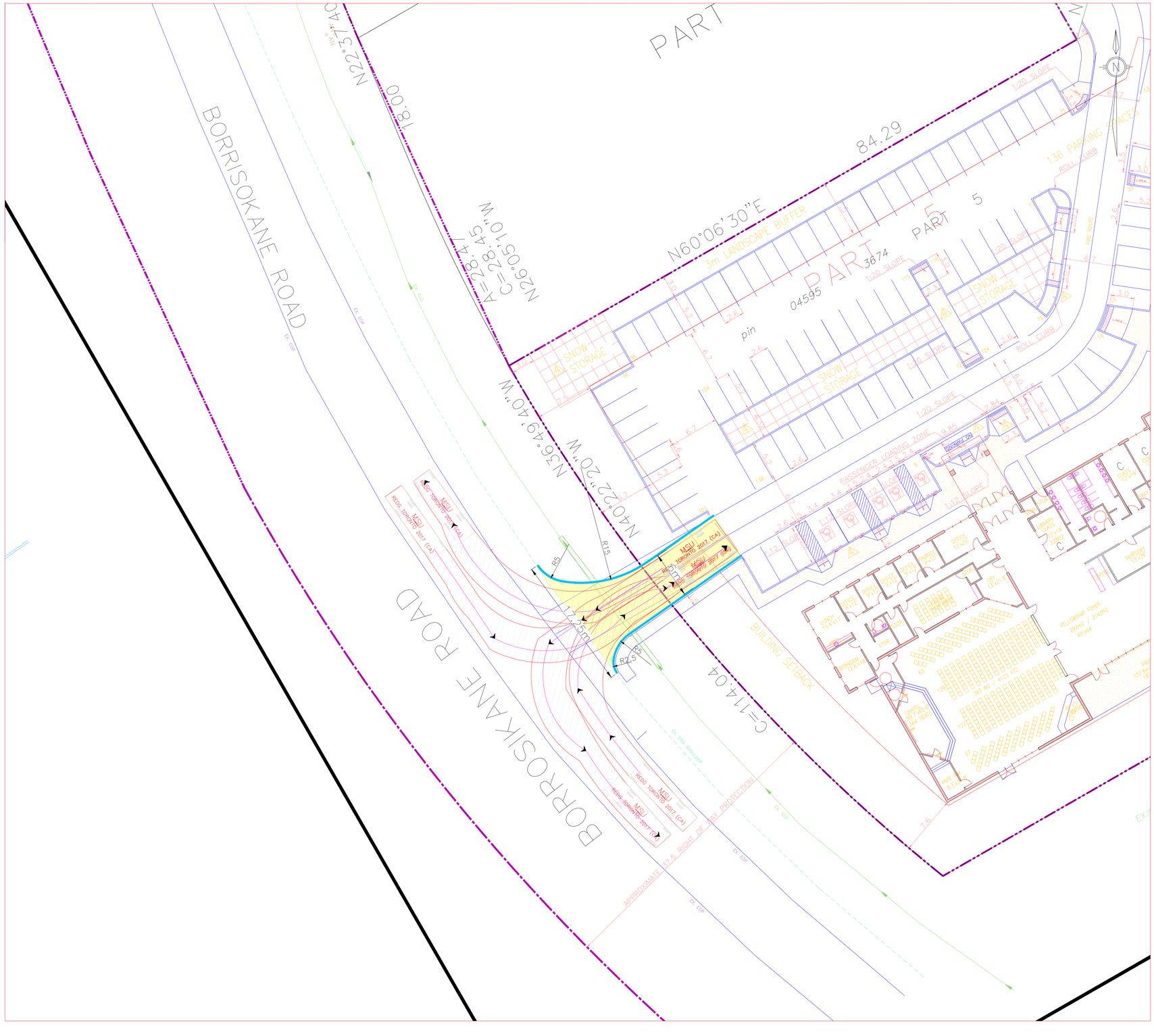
NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (dd/mm/yy)
1	AS PER CITY COMMENTS	RM	20/09/23

NOTES

APPENDIX K: ACCESS DESIGNS



CITY OF OTTAWA
FUNCTIONAL PLANNING DESIGN
3555 BORRISOKANE ROAD

ACCESS ON BORRISOKANE ROAD
DESIGN VEHICLE TURNING MANEUVERS

Castleglenn Consultants
Engineers, Project Managers & Planners

PROJECT REF. NUMBER: 7320

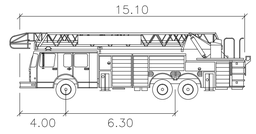
Contract No. 7320	Dwg. No. 03
Sheet 3 of 5	
Asset Group: ISD	
Des. RM	Chk'd. AEG
Dwn. RM	Chk'd. AK
Utility Circ. No.	Index No.
Cost. Inspector	
Scale: 5m 0 5m HORIZ 1:250	

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (dd/mm/yy)
1	AS PER CITY COMMENTS	RM	20/09/23

NOTES



Fire Truck

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 32.6