CEPEO

BARRHAVEN-SUD ELEMENTARY SCHOOL TRANSPORTATION IMPACT ASSESSMENT

STRATEGY REPORT

SEPTEMBER 09, 2022

FINAL

wsp

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.

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Dated at Ottawa (City) this 9 day of September, 20 22.

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

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Stamp

BARRHAVEN-SUD ELEMENTARY SCHOOL TRANSPORTATION IMPACT ASSESSMENT

STRATEGY REPORT

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FINAL

PROJECT NO.: 219-00014-01

DATE: SEPTEMBER 09, 2022

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1 SCREENING

This Transportation Impact Assessment (TIA) has been prepared to support the Site Plan Control application for the development at located at the southwest corner of Kilbirnie Drive and Robin Easey Avenue (municipally addressed as 1045 Kilbirnie Drive in Ottawa. The TIA follows the City of Ottawa (the City) TIA Guidelines (2017) which potentially includes five steps:

1 Screening
2 Scoping
3 Forecasting
4 Analysis
5 TIA Submission

The Screening Step determines the need to continue with a Transportation Impact Assessment (TIA) Study. The development is assessed against three triggers: trip generation, location, and safety to identify the next step of the study. If one or more of the triggers is satisfied, the Scoping Step must be completed. If none of the triggers are satisfied, the TIA is deemed complete. If one or more triggers are satisfied, specific TIA components are required to be carried out depending on the combination of triggers (**Table 1-1**) that have been satisfied.

The proposed development at 1045 Kilbirnie Drive **satisfied the Trip Generation trigger** indicating that, as part of Steps Two through Five of the TIA process, the Design Review and Network Impact components should be completed. For reference, the completed Screening Form is provided in **Appendix A**.

Table 1-1. Transportation Impact Assessment (TIA) Screening Triggers

	TIA TRIGGERS SATISFIED		
Next Step of the TIA Process	**Trip Generation**	**Location**	**Safety**
Design Review and Network Impact	**Yes**	**No**	**No**

2 SCOPING

2.1 SCREENING FORM

The completed Screening Form is provided in **Appendix A**.

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The Conseil des écoles publiques de l'Est Ontario (CEPEO) is planning to construct a new elementary school located in the developing Quinn's Pint neighbourhood in Barrhaven-Sud, Ottawa. The proposed development site, located at 1045 Kilbirnie Drive, is currently vacant and undeveloped with a site area of approximately 2.43 ha (24,316 m^2). Residential uses have been approved and developments are occurring on land to the north, south and east of the subject site, while land to the west is yet to be developed. The subject site is bounded by local roads Robin Easey Avenue and Kilbirnie Drive to the east and to the north respectively, and zoned as Minor Institutional Zone, Sub-zone A (I1A) and Residential Third Density Zone, Subzone YY (R3YY). As per the I1A zone, a school and a daycare are permitted uses.

The proposed development will include a building, with a Gross Floor Area (GFA) of approximately 4,781 m^2, providing capacity for 800 students and consisting of one (1) library, one (1) gymnasium, one (1) multi-purpose room, 12 portable classrooms, and 20 classrooms among which five (5) classrooms will be for daycare use. The most up-to-date draft site plan (September 2, 2022) is attached as **Appendix B.** The proposed vehicle access includes a passenger vehicle access from Robin Easey Avenue to the 61-space surface parking lot and off-street drop-off area. School bus laybys will be provided on the south side of Kilbirnie Drive and west side of Robin Easey Avenue with a portion of the layby area on Robin Easey Avenue being dedicated for on-street passenger car drop-offs. Fifty parking spaces will be provided for bicycles within the subject site. **Figure 2-1** illustrates the Study Area Context.

The development will be built as a single phase with an estimated date of completion in 2023.

Figure 2-1. Site Area Context

2.3 EXISTING CONDITIONS

2.3.1 ROADWAYS

The existing roadways in proximity to the subject development site that will be considered in the TIA are all city-owned roadways and include those listed below. The road classifications for City of Ottawa roadways are defined in the City of Ottawa Official Plan, 2013, Volume 1, Section 7, Annex 1 Road Classifications and Rights-of-Way.

Greenbank Road is a north-south roadway classified as Arterial north of Barnsdale Road, with a posted speed limit of 60 km/h. North of Kilbirnie Drive, Greenbank has been constructed as an undivided two-lane urban arterial road, while south of Kilbirnie Drive, it remains with a rural arterial road cross-section with no sidewalk and paved shoulders on both sides.

Kilbirnie Drive in the close vicinity of the subject development site currently runs on an east-west alignment from west of Cedardown Private and terminates at Alex Polowin Avenue. It is designated as a Local Road per the City of

Ottawa Transportation Master Plan (2013), while the Barrhaven South Community Development Plan shows it is classified as a Collector Road. Kilbirnie Drive is an undivided roadway with a 22.0m road right-of-way featuring an urban collector road cross-section with monolithic sidewalks on both sides. Residential driveways front onto the roadway. The speed limit is unposted but assumed to be 50 km/h.

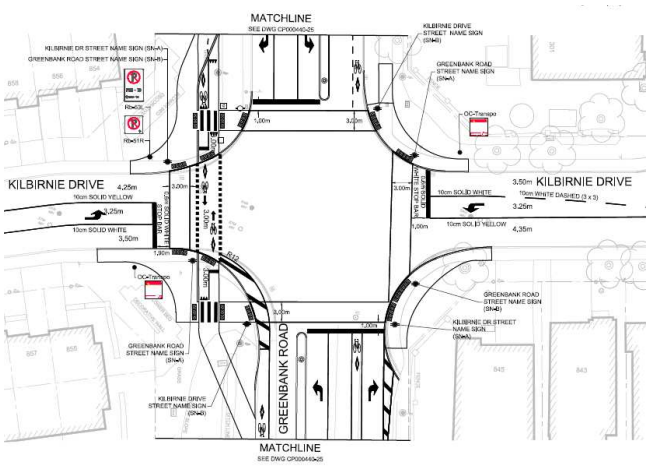
Alex Polowin Avenue is a Local Road with 18.0m right-of-way running on a north-south alignment with sidewalks on both sides.

Robin Easey Avenue is a Local Road with 18.0m right-of-way running along the east frontage of the subject development site on a north-south alignment. The subject development will have a driveway and a layby area on the west side of Robin Easey Avenue.

2.3.2 INTERSECTIONS

There are three existing intersections adjacent to the development site along Kilbirnie Drive as described in Table 2-1.

Table 2-1. Description of Study Area Intersections

INTERSECTION (DESCRIPTION)	LANE CONFIGURATION
Kilbirnie Drive and Greenbank Road [1] - Signalized intersection - One left turn lane, one through lane and one right turn lane in the southbound and northbound directions - One left-turn lane and one shared through/right-turn lane in both the eastbound and westbound directions - Crosswalks on all approaches - Bidirectional crossride on the west leg	
Kilbirnie Drive and River Mist Road - All-way stop controlled intersection - Two-way traffic on all four approaches with no centre-line markings - No crosswalk on any of the four approaches	

INTERSECTION (DESCRIPTION)	LANE CONFIGURATION
Kilbirnie Drive and Alex Polowin Avenue - All-way stop controlled intersection - Two-way traffic on all four approaches with no centre-line markings - No crosswalk on any of the four approaches	

1. *Intersection modifications at Greenbank Road and Kilbirnie Drive started in November 2020 and completed in summer 2021 per the information from the City of Ottawa's website. The new intersection configuration illustrated above is from Appendix F, 2535 River Mist Road TIA (March 2021) prepared by Novatech. Google Streetview is yet to be updated.*

2.3.3 DRIVEWAYS

Based on Google Streetview and Property Parcels layer from GeoOttawa, the existing and approved driveways within 200m from the subject development site include the following:

- Approximately 40 residential driveways fronting onto the north side of Kilbirnie Drive
- 17 residential driveways fronting onto the east side of Alex Polowin Avenue
- Approximately 31 residential driveways on both sides of Robin Easey Avenue

There are other residential driveways on the local roads (i.e. Galmoy Way, Teelin Circle) within a 200m vicinity of the development site. Those driveways are not anticipated to be directly affected by the proposed school development.

2.3.4 PEDESTRIAN AND CYCLING FACILITIES

Greenbank Road north of Kilbirnie Drive has a multi-use-pathway (MUP) on the west side and a boulevard sidewalk on the east side, except for a section of approximately 100m south of Dundonald Drive where there is no buffer between the travel lane and sidewalk. Collector roads in proximity of the subject development site, including Kilbirnie Drive and River Mist Road, have sidewalks on both sides. The local roads within 200m area from the subject site have either a sidewalk on one side (i.e. Alex Polowin Avenue) or do not have a sidewalk.

Greenbank Road is identified as a Spine Cycling Route north of Barnsdale Road, and currently has an on-road curbside bike lane on the east side for northbound cyclists.

2.3.5 TRANSIT FACILITIES

OC Transpo Route 75 and Route 675 provides transit services along Kilbirnie Drive and River Mist Road.

- Route 75 is a Rapid Route running between Minto Recreation Centre (Cambrian) and Tunney's Pasture Station. Route 75's travel segment between Minto Recreation Centre (Cambrian) and Barrhaven Centre operates seven days a week with a 15-minute frequency during weekday peak hours and 30-minute frequency during weekday off-peak hours and on weekends. Between Barrhaven Centre and Tunney's Pasture, Route 75 operates at 15-minute frequencies throughout the day, and 10-minute frequencies in the peak direction during peak periods.
- Route 675 is a school route traveling between Minto Recreation Complex in Barrhaven South and Bell High School. Route 675 only operates twice per weekday starting from the terminal stations in the morning and afternoon respectively. No service is provided by Route 675 on weekends.

Bus stops closest to the subject development sites are Bus Stop #2807 and Bus Stop #2808 located at the northwest and northeast corners of Kilbirnie Drive and River Mist Road intersection respectively. Bus Stop #2809 and Bus Stop #2810 located at the intersection of Kilbirnie Drive and Breakstone Road are also with 400m walking distance from the development site.

Figure 2-2 highlights the OC Transpo bus routes on adjacent roadways in proximity of the proposed development.

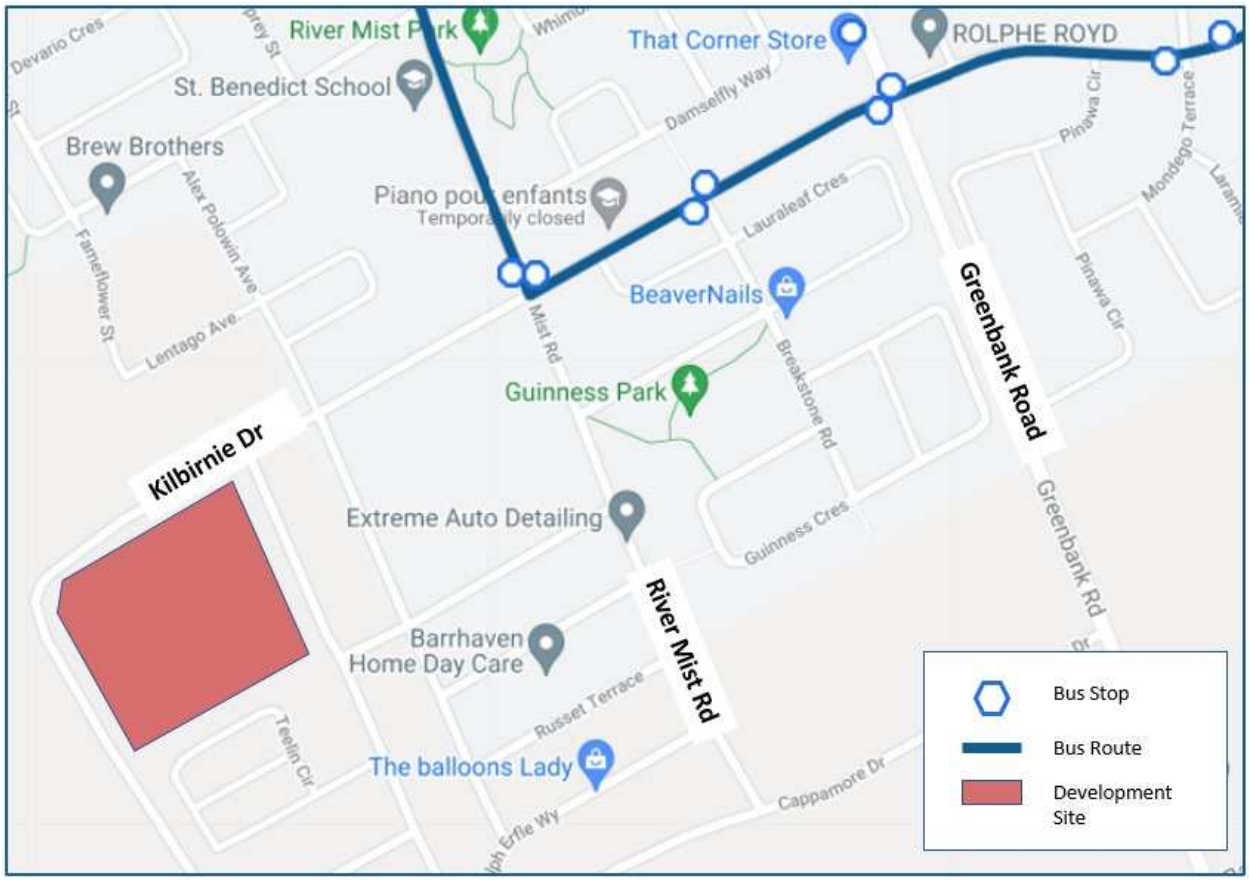


Figure 2-2: OC Transpo Bus Routes (Source: OC Transpo Network Map)

2.3.6 AREA TRAFFIC MANAGEMENT MEASURES

The subject development site is within a developing neighbourhood with limited existing traffic management measures implemented. The existing area traffic management measures identified adjacent to the proposed development site include:

- School Zone designation along the segment of River Mist Road in the vicinity of St. Benedict School
- Curb extension on the north, south and west approaches of the Kilbirnie Drive and River Mist Road intersection

2.3.7 PEAK HOUR TRAVEL DEMANDS

The TRANS Committee was established to co-ordinate transportation planning efforts among various planning agencies located within the National Capital Region. The proposed development is located in South Nepean, corresponding to the TRANS District 425. The complete TRANS O-D results (including a map of the district area) is provided in **Appendix C**. The most recent Origin-Destination (O-D) survey was completed by TRANS in the Fall of 2011. The TRANS trip data for South Nepean is summarized in **Table 2-2.**

Table 2-2. Peak Hour Trips by Primary Travel Mode – TRANS District 425 South Nepean

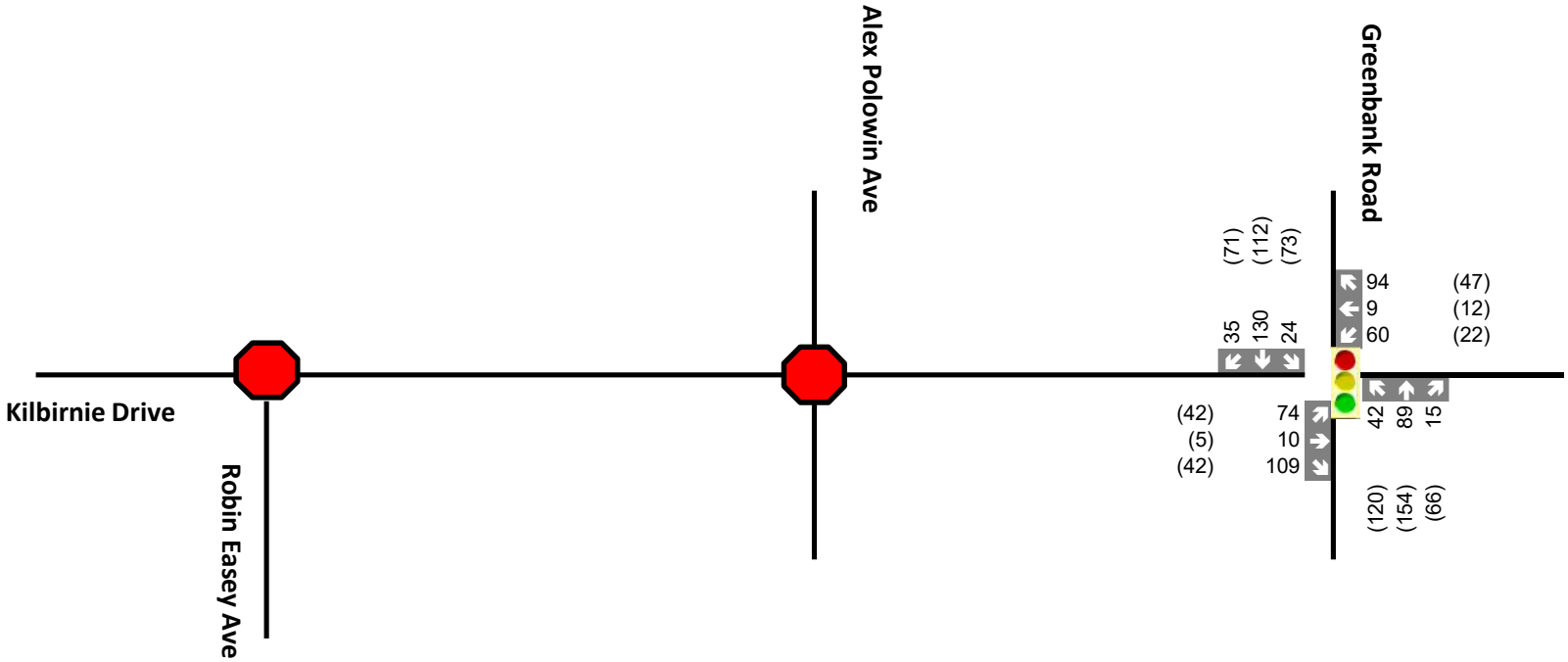
TRAVEL MODE	AM PEAK PERIOD (6:30 A.M. – 8:59 A.M.)			PM PEAK PERIOD (3:30 P.M. – 5:59 P.M.)		
	FROM DISTRICT	TO DISTRICT	WITHIN DISTRICT	FROM DISTRICT	TO DISTRICT	WITHIN DISTRICT
Auto-Driver	60%	71%	34%	72%	65%	46%
Auto-Passenger	19%	13%	19%	21%	11%	21%
Transit	27%	5%	4%	4%	24%	4%
Bicycle	0%	1%	2%	1%	0%	1%
Walk	0%	0%	17%	0%	0%	20%
Other	4%	10%	24%	1%	2%	9%
Total Vehicles	**24,140**	**6,120**	**17,260**	**8,130**	**23,580**	**18,420**

Source: TRANS 2011 O-D Survey Report, District 425 - South Nepean

Based on the Trans 2011 O-D Survey, the majority of the population use personal vehicles as their main source of transport to and from the district. During both AM and PM peak hour periods, auto-driver and auto-passenger modes account for between 76% to 93% of the total vehicles that are travelling to and from the South Nepean district. The remaining 7% to 24% are split between transit, bicycle, walk, or other modes of transportation.

Within the district, travel modes are more diversified. People tend to less rely on auto modes for travelling and would choose other modes especially by walking and other modes.

The existing peak hour turning movement volumes at the Greenbank Road and Kilbirnie intersection are presented in Figure 2-3. The traffic counts were collected by the City of Ottawa on March 3, 2020; the AM and PM peak hours from this count at 7:45-8:45 AM and 4:45-5:45 PM.



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-3

Existing Traffic (2020)

2.3.8 FIVE-YEAR COLLISION HISTORY

The boundary road for the proposed development is Kilbirnie Drive between Greenbank Road and Robin Easey Avenue. The latest past five years (January 1, 2015 through December 31, 2019) collision history available on the City of Ottawa Open Data website were reviewed, which provides yearly total collisions by location. Table 2-3 summarizes the five-year collision history on the boundary road.

More detailed five-year collision data will be required to identify if any collision pattern and/or safety concern exists. A more thorough collision review will be conducted upon the request from the City.

Table 2-3. Five-Year Collision History Summary (2015-2019)

Location		Pedestrian Collisions	Cyclist Collisions	Total Collisions by Year				
				2015	2016	2017	2018	2019
Segment:	Kilbirnie Drive [Greenbank Road - Breakstone Road]	0	0	0	1	1	0	1
Intersection:	Greenbank Road @ Kilbirnie Drive	0	0	0	1	1	1	3
Five-year Total Collisions				9				

2.4 PLANNED CONDITIONS

2.4.1 CHANGES TO THE STUDY AREA TRANSPORTATION NETWORK

The City of Ottawa Official Plan, Transportation Master Plan (TMP) (2013), and Barrhaven South Community Design Plan were reviewed to identify potential future roadway upgrades in the vicinity of the subject development site.

Greenbank Road will be widened to a four-lane cross-section between Cambrian Road and Jockvale Road to accommodate growth within South Nepean as identified in the City of Ottawa Transportation Master Plan (2013). South of Cambrian Road, Greenbank Road will be realigned to run north-south to the west of the subject development site. The Greenbank Realignment and Southwest Transitway Extension project is underway. Per the updated functional design released by the City in summer 2021, a new Park and Ride facility is planned to be located on the south side of Kilbirnie Avenue, west of the future realigned Greenbank Road. The new Greenbank Road alignment from St Joseph's High School to Barnsdale Road will have four lanes and two median bus rapid transit lanes with the bus lanes ending at the new Park and Ride facility. The construction is planned to start in 2030 or later based on budget availability.

Kilbirnie Drive will be extended westwards to connect to the realigned Greenbank Road as part of the Quinn's Pointe Phase 2 Subdivision.

There are no other major changes expected to the study area transportation network.

2.4.2 OTHER STUDY AREA DEVELOPMENTS

Two developments are noted in the City of Ottawa's Development Application Search tool developments that are likely to occur within the proposed horizon years of the subject development and could have direct influences on the study area are noted below:

- 989 Kilbirnie Drive (App# D07-12-20-0181): A Site Plan Control application for a two-storey elementary school and daycare with a GFA of 6,500 m2 and 121 parking spaces. The build-out horizon is anticipated to be in 2022. The supporting TIA (March 2021) was prepared by Novatech.
- 3718 Greenbank Road (App# D07-16-21-0024): A Zoning By-law Amendment and Plan of Subdivision application for residential development consisting of a mix of 228 stacked townhouse units. The anticipated full build-out and occupancy horizon is 2024. The supporting TIA (June 2021) was prepared by CGH Transportation Inc.
- 3960 Greenbank Road – Quinn's Pointe Phase 2: A TIA dated October 2018 was prepared by Stantec in support of this application. Based on the TIA the development will contain 536 single detached houses, 493 townhouses, 100 apartment units, and two elementary schools with a combined 59,000ft2 GFA.

2.5 STUDY AREA AND TIME PERIOD

The limits for the Transportation Impact Assessment (TIA) study area and study intersections are shown in **Figure 2-4**. The boundary roads Kilbirnie Drive and Robin Easey Avenue will be reviewed. Three intersections along Kilbirnie Drive at Robin Easey Avenue, Alex Polowin Avenue and Greenbank Road will be assessed.

Figure 2-4: Study Area

It is noted that the afternoon peak of elementary schools is usually earlier than the regular PM peak hour of the roadway network, therefore the impact of the school will be mainly reflected during the morning peak which generally aligns with the regular AM peak. The study time periods identified for the traffic analysis are weekday

AM and PM peak hours as these represent the time periods with the highest traffic volumes that would govern the design of study area roadways and intersections.

These periods will be consistent with the AM and PM peak hours identified in the latest turning movement counts that were collected at the Kilbirnie Drive and River Mist Road intersection on October 25, 2018, and at the Kilbirnie Drive and Greenbank Road intersection on March 3, 2020.

The peak periods will be checked against more recent turning movement counts if any is available from the City.

2.6 HORIZON YEARS

The proposed facility is expected to be completed in one phase with a target build-out year of 2023. In accordance with the City of Ottawa TIA Guidelines (2017), the following horizons will be considered for analysis.

- 2023, which represents the anticipated buildout horizon,
- 2028, which represents the buildout year plus five years.

2.7 EXEMPTIONS REVIEW

Based on the review of the development and network conditions, the following elements shown in **Table 2-4** qualify for an exemption from this Transportation Impact Assessment.

Table 2-4. Exemptions Summary

MODULE	ELEMENT	EXEMPTIONS
DESIGN REVIEW COMPONENT		
4.1 Development Design	4.1.2 Circulation and Access	**Not Exempted.** This element is only required for site plans.
	4.1.3 New Street Networks	**Exempted** This element is only required for plans of subdivision.
4.2 Parking	4.2.1 Parking Supply	**Not Exempted.** This element is required for site plans.
	4.2.2 Spillover Parking	**Exempted** This element is only required for site plans where parking supply is 15% below unconstrained demand.
NETWORK IMPACT COMPONENT		
4.5 Transportation Demand Management	All Elements	**Not Exempted** Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time.
4.6 Neighborhood Traffic Management	4.6.1 Adjacent Neighbourhoods	**Not Exempted** Required when the development relies on local or collector access and total volumes exceed ATM capacity threshold.
4.8 Network Concept		**Exempted** Required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning.

Based on the above, the TIA report will include the following modules:

- Module 4.1: Development Design
- Module 4.2: Parking
- Module 4.3: Boundary Streets
- Module 4.4: Access Design
- Module 4.5: Transportation Demand Management
- Module 4.6: Neighbourhood Traffic Management
- Module 4.7: Transit
- Module 4.9: Intersection Design

3 FORECASTING

3.1 DEVELOPMENT GENERATED TRAFFIC

3.1.1 TRIP GENERATION

The proposed development consists of two primary trip generator land uses which are elementary school and daycare services. Trips generated by the elementary school and daycare service have been estimated based on the most up-to-date information provided by the school board. The elementary school is anticipated to provide capacity for 751 students, while the daycare service will provide capacity for 49 children. A total of 51 staff, including teachers, custodians, and office staff, are expected to work for the school and daycare. There is a plan for future addition to the school providing extra capacity for 200 students, but this addition was not included in this TIA study as it is not part of the current Site Plan Application and no timeline has been defined.

CEPEO has indicated that operation hours of the elementary school will be from 7:30 AM to 4:00 PM, and the daycare will operate between 6:00 AM to 5:00 PM. The start and end time of the school and daycare service generally align with the peak hours of the adjacent street traffic.

SCHOOL PERSON TRIP GENERATION (STUDENTS)

Trip generation for the student population at the proposed school has been developed using first principles analysis based on information provided by CEPEO. The 2020 TRANS Trip Generation Manual does include mode share assumptions for elementary and high schools but recommends that mode shares be developed on a site-specific basis if additional information is available from the school or school board. Information from CEPEO indicates that approximately 85% of the student population is anticipated to arrive by school bus, with the remainder by other modes. These remaining trips have been split as 10% by auto and 5% by active transportation modes, recognizing a portion of the student population will be within walking distance of the school.

SCHOOL PERSON TRIP GENERATION (STAFF)

Staff trip generation to the proposed school is based on the anticipated 51 staff. The Mode share for these trips has been based on the Employment Generator Mode Shares from the 2020 TRANS Trip Generation Manual for the South Nepean District.

DAYCARE PERSON TRIP GENERATION

Daycare person Trip Generation is based on the capacity of 49 children provided by CEPEO. A 100% auto passenger mode share has been adopted for daycare children, assuming that all children will be dropped off by parents.

TOTAL PERSON TRIP GENERATION AND MODE SHARE

Table 3-1 provides a summary of the person trip generation for all of the uses on the site.

Table 3-1: Proposed School Site Person Trip Generation and Mode Share

	AUTO DRIVER	AUTO PASSENGER	SCHOOL BUS	PUBLIC TRANSIT	WALKING & CYCLING
	Mode Shares				
School Students	0%	10%	85%	0%	5%
Staff	80%	10%	0%	5%	5%
Daycare Children	0%	100%	0%	0%	0%
	Person Trips				
School Students	0	75	638	0	38
Staff	41	5	0	3	3
Daycare Children	0	49	0	0	0
TOTAL PERSON TRIPS	**41**	**129**	**638**	**3**	**41**

CONVERSION TO VEHICLE TRIPS

The person trip generation above represents the student and staff trip generation in terms of arrivals to the school site in the morning and departures in the afternoon but do no reflect the vehicle volumes added to the surrounding road network. The conversion of the person trips to vehicle trips is based on the following:

- Auto passenger trips for student and daycare drop-offs represent one auto arrival and one auto departure from the site during the AM and PM peak hours. Vehicle trips were calculated from the auto passenger person trips assuming a vehicle occupancy of 1.2, reflecting some families who will drop off multiple children in one trip.
- Auto driver trips by staff represent one vehicle arrival in the morning and one departure in the afternoon. Staff auto trips have been calculated based on a vehicle occupancy of 1.0. No additional vehicle trips have been added to reflect staff auto passenger trips as it is anticipated these will be combined with staff auto driver arrivals (carpooling).
- School bus capacity ranges from 48-72 students based on 2-3 students per seat. School bus volumes have been estimated based on an average of 60 students per bus.

PEAK HOUR DISTRIBUTION

The person trip generation above is based on total trips made by the students and staff to and from the site. CEPEO has indicated that operation hours of the elementary school will be from 7:30 AM to 4:00 PM, and the daycare will operate between 6:00 AM to 5:00 PM. It is anticipated that the school hours provided represent before and after care in addition to classes; most CEPEO schools in Ottawa operate with morning and afternoon bell times at approximately 8:30-9:00 AM and 3:00 PM. While school student arrivals will be concentrated just before and after the opening and closing bells, trips by staff, before and after care students and daycare children may be more distributed. Given the commuter peak hours of 7:45-8:45 AM and 4:45-5:45 PM from the provided traffic count, the

proportions of the site generated vehicle trips falling within the commuter peak hours have been estimated based on the following:

- 80% of auto trips arriving during the AM peak hour, reflecting a portion of the staff arrivals, before school care and daycare drop-offs that arrive earlier in the morning.
- 50% of auto trips departing the school during the PM peak hour, reflecting a wider distribution of parent pickup between the end of the school day and end of daycare and after school programs and a wider distribution in staff departure times at the end of the day.
- 100% of school bus arrivals during the AM peak hour, corresponding with a concentration in drop-offs just before the morning bell.
- 0% of bus departures during the PM peak hour, reflecting that bus departures will occur at the end of the school day before the commuter PM peak hour.

DAYCARE DIVERTED TRIP ESTIMATION

In many cases, school and daycare drop-offs by parents will be planned as part of a parent's commute; these diverted trips will be reflected in the background traffic volumes on the road network but will divert to the school before continuing on their original path. The Trip Generation Manual 3rd Edition indicates an average diverted trip proportion of 56% specific to daycare centres; this proportion has been applied as diverted trips in the site generated traffic. The same handbook does not indicate a diverted trip proportion for the elementary school land use; to be conservative, this analysis is based on all auto trips generated by the school to be primary trips added to the road network.

TOTAL VEHICLE TRIPS

The total peak hour vehicle trips generated by the proposed school are summarized in Table 3-2.

Table 3-2: Total Site Vehicle Trip Generation

	AM PEAK HOUR		PM PEAK HOUR	
	IN	**OUT**	**IN**	**OUT**
Auto Trips	115	83	52	72
School Buses	11	11	0	0
Diverted Auto Trips (included in total above)	18	18	11	11

3.1.2 TRIP DISTRIBUTION

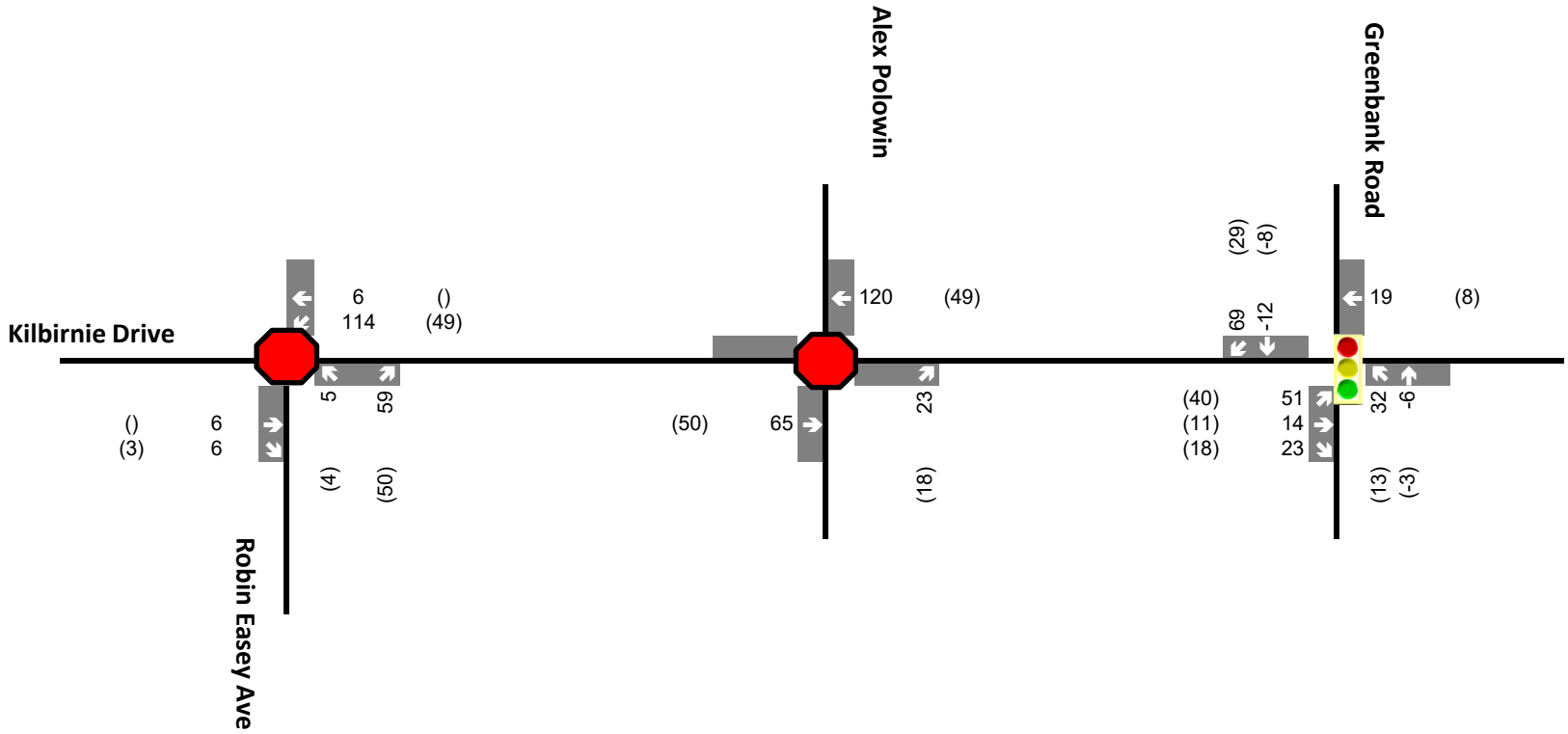
The overall trip distribution of the site generated trips has been adopted from existing traffic patterns and the TIA for 989 Kilbirnie Drive prepared by Novatech. While the catchment of the proposed school was not provided, the prominence of students on school buses suggests that the catchment area will extend beyond the local neighbourhood, and thus trip distribution based on overall commuter patterns is an appropriate estimate. Based on the surrounding road network configuration and existing traffic patterns, the overall distribution has been assigned to the network as follows:

- Inbound / Outbound Trip Distribution (2023)
    - 5% to/from Kilbirnie Drive to the west (when available 2028, via Robin Easey Avenue to/from the south in 2023).

- 15% to/from Kilbirnie Drive to the east
- 25% to/from the south via Greenbank Road
- 55% to/from the north via Greenbank Road

- Site Access Distribution
  - The proposed site plan includes school bus loading bays on both the west side of Robin Easey Avenue and south side of Kilbirnie Drive. School buses have been assigned to the network with 50% serving each of the bus bay areas. Southbound buses have been assigned to return to Kilbirnie Drive on departure by going around the block to Alex Polowin Avenue.
  - Student drop off by parents will be possible using the pickup and drop-off areas on Robin Easey Avenue and within the school parking lot. As school traffic may create difficulty in vehicles returning north to Kilbirnie Drive after pickup or drop-off, 25% of the outbound traffic has also been assigned to go around the block and return to Kilbirnie Drive via Alex Polowin Avenue.
  - Diverted trips have been assumed to originate from existing traffic volumes along Greenbank Road.

Figure 3-1 shows the development generated trips assigned to the study intersections.



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3-1

Development Generated Trips

3.2 BACKGROUND NETWORK TRAFFIC

3.2.1 CHANGES TO THE BACKGROUND TRANSPORTATION NETWORK

Kilbirnie Drive will be extended westwards to eventually connect to the realigned Greenbank Road as part of the Quinn's Pointe Subdivision (3960 Greenbank Road). While the realigned Greenbank Road is not expected to be constructed within the timeframe examined by this study, there may be potential for a connection to additional residential development to the west as the community continues to grow. The background networks for this analysis have been adapted from the 989 Kilbirnie Drive TIA and are based the existing Kilbirnie cul-de-sac in place during the 2023 scenario and a connection to the west implemented by the 2028 scenario.

3.2.2 GENERAL BACKGROUND GROWTH RATES

A 2.0% annual growth in traffic on study area arterial road (Greenbank Road) was adopted to account for traffic generated by future development that is not currently within the development application process (Section 2.4.2). The 2.0% increase was consistent with growth assumption used in approved TIA studies prepared supporting the other area developments.

3.2.3 OTHER AREA DEVELOPMENTS

Other study area developments that would influence on the subject TIA were summarized in Section 2.4.2. The estimated traffic generated by those developments were detailed in the respective TIA report which also identified other developments anticipated to occur within the same horizon years; the estimated trips were added in the 2023 and 2028 background traffic volumes. Table 3-3 summarizes the other area developments that were accounted for in the background traffic volumes of each future study horizon. The relevant excerpts from the approved TIA are included in **Appendix D.**

Table 3-3: Area Developments Built-out by 2023 and 2028

2023 BACKGROUND TRAFFIC	2028 BACKGROUND TRAFFIC
- Subdivision at 3960 Greenbank Road: Phase 1 and half of Phase 2 - Subdivision at 3718 Greenbank Road: full build-out - Development at 989 Kilbirnie Drive: full build-out	- Subdivision at 3960 Greenbank Road: full build-out - Subdivision at 3718 Greenbank Road: full build-out - Subdivision at 3713 Borrisokane Road: full build-out - Development at 989 Kilbirnie Drive: full build-out

3.3 DEMAND RATIONALIZATION

3.3.1 DESCRIPTION OF CAPACITY ISSUES

The projected 2023 and 2028 background traffic are shown in Figure 3-2 and Figure 3-3. Total traffic volumes for the 2023 and 2028 planning horizons were estimated by:

- Applying a 2% background growth rate to the existing traffic volumes along Greenbank Road
- Adding trips generated by other area developments
- Adding trips generated by the proposed development

The 2023 and 2028 total traffic volumes are shown on Figure 3-4 and Figure 3-5.

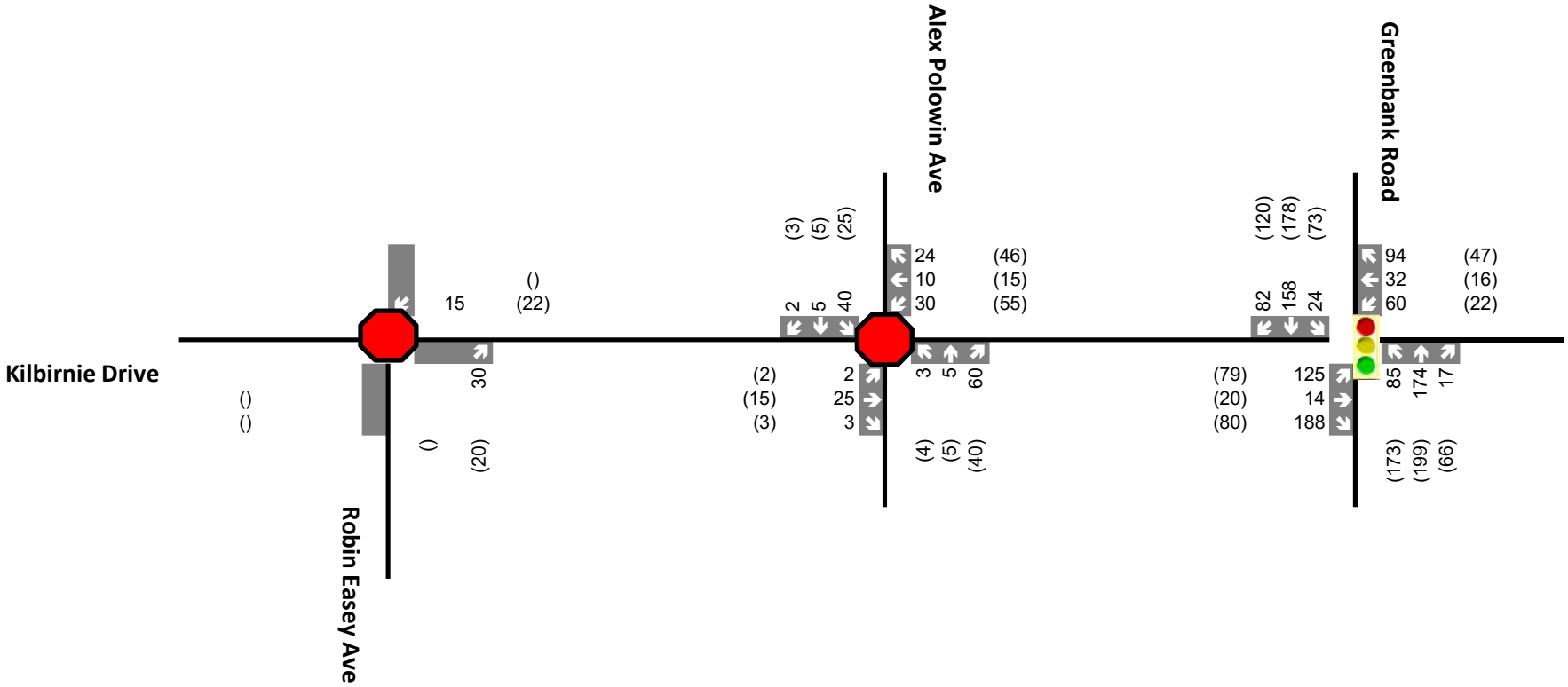
3.3.2 ADJUSTMENT TO DEVELOPMENT GENERATED TRAVEL DEMANDS

Adjustments to development generated demands have not been proposed since the trips generated by the proposed development are not expected to adversely impact the adjacent transportation network. A detailed assessment of intersection and roadway capacities by using Synchro (version 11) for 2023 and 2028 horizons will be carried out in Section 4 as part of upon the City's approval of the Forecasting Report.

3.3.3 ADJUSTMENTS TO BACKGROUND NETWORK TRAVEL DEMANDS

Adjustments to background network demands have not been proposed since the traffic forecasting analysis indicates that the future transportation roadway network within the study area will have capacity to accommodate the addition of development generated traffic.

A detailed intersection capacity and operation assessment to identify if there would be any new over-capacity movement within the study area because of the proposed development will be completed and documented in the Strategy Report (Section 4).



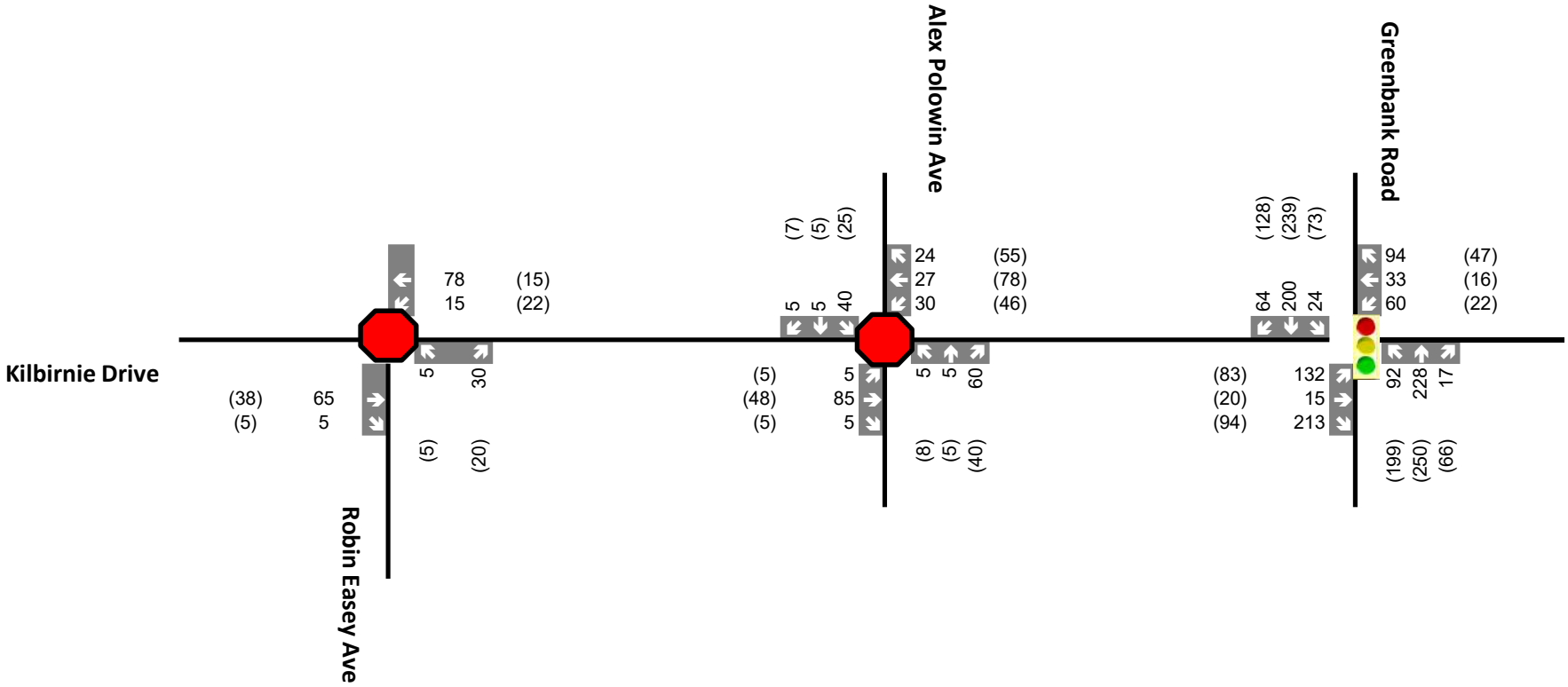
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3-2

2023 Background Traffic Volumes



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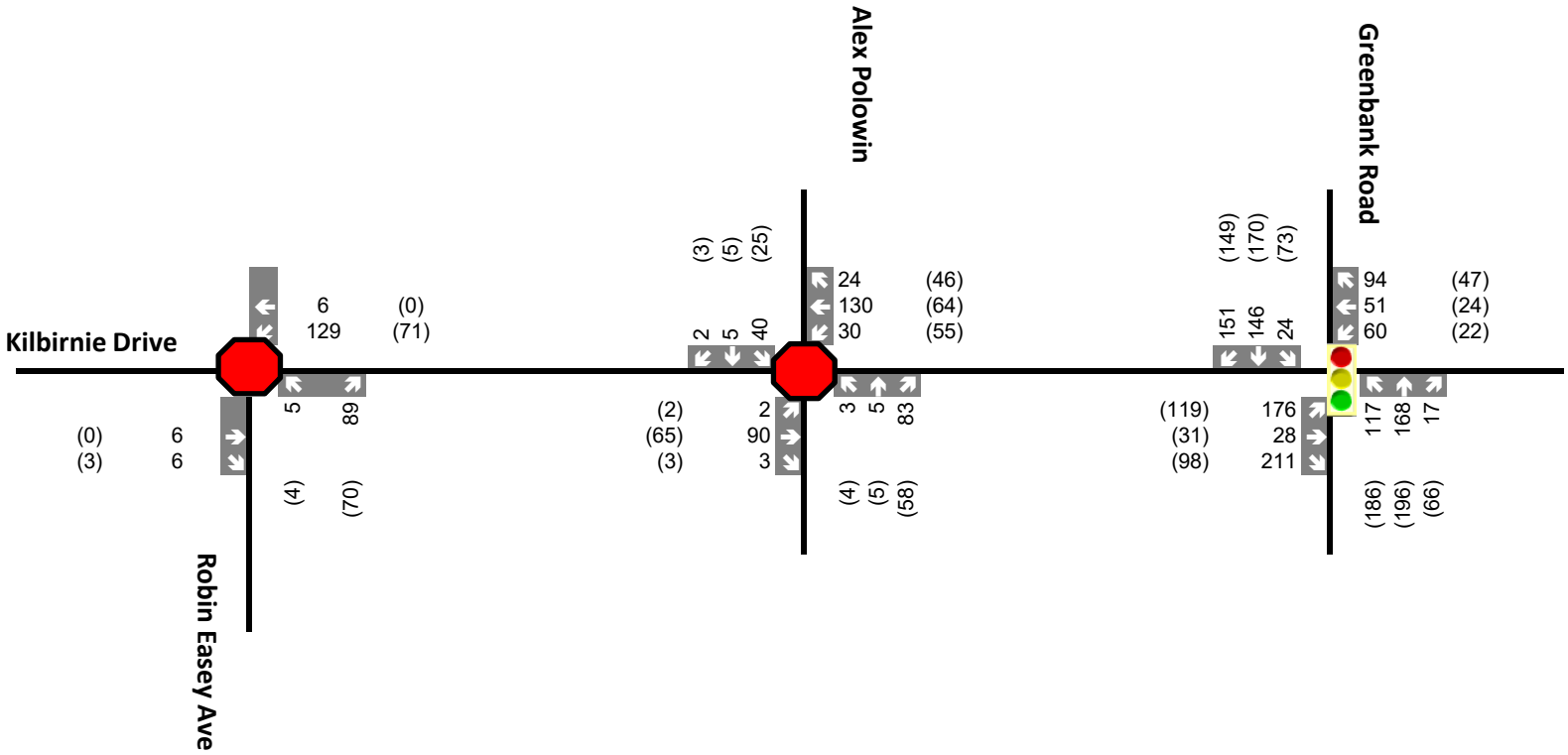
xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3-3

2028 Background Traffic Volumes



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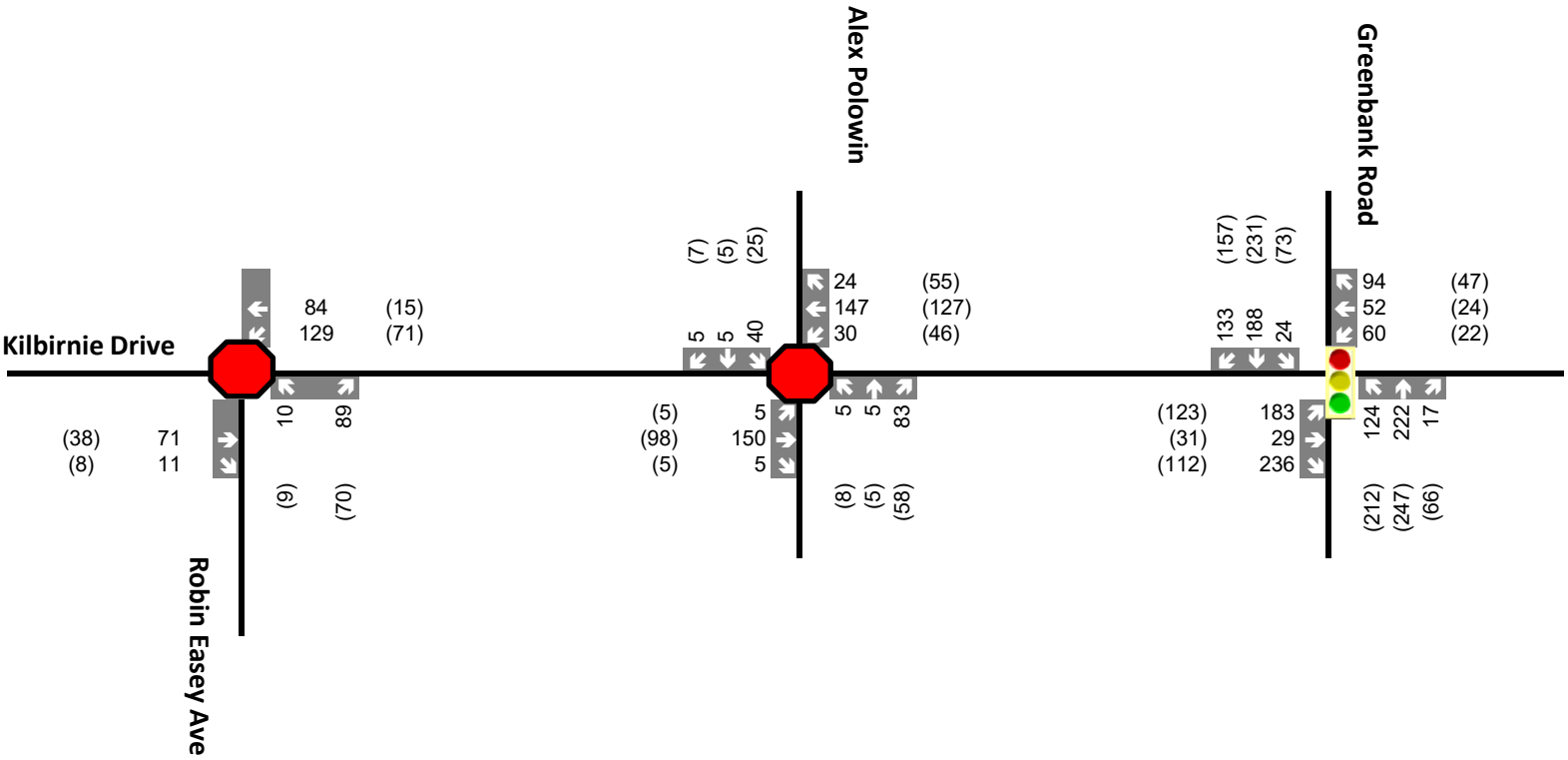
xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3-4

2023 Total Traffic Volumes



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 3-5

2028 Total Traffic Volumes

4 STRATEGY

4.1 DEVELOPMENT DESIGN

4.1.1 DESIGN FOR SUSTAINABLE MODES

The City of Ottawa's TDM-Supportive Development Design and Infrastructure Checklist for Non-Residential Developments was completed to assess the opportunity to implement facilities that are supportive of sustainable modes, including cycling, walking and transit. The completed checklist is attached as **Appendix E**.

As indicated in the TDM checklist and shown on the site plan (**Appendix B**), the proposed site accommodates sustainable modes in the following ways:

- 50 dedicated bicycle parking spaces .
- Walking distance between site and nearest transit stop is within 400m.
- Sidewalks are expected to be constructed on Kilbirnie Drive and Robin Easey Avenue fronting the school property. These sidewalks will be depressed continuous facilities to facilitate pedestrian movement and accessibility.
- Provision of pedestrian walkways (represented as a depressed concrete sidewalk) at the vehicle access on Robin Easey Avenue and crossing the drop-off area in the parking lot

It is assumed that upon completion that the intersection of Kilbirnie Drive / Robin Easey Avenue will be all-way stop controlled for pedestrian safety and that crosswalks will be provided at all legs.

4.1.2 CIRCULATION AND SITE ACCESS

The proposed school drop-off area, which is situated in the parking lot, is designed to operate with traffic circulation in a counter-clockwise direction. Unidirectional vehicle movements are indicated in the site plan at the east and north sides of the drop-off area and bidirectional vehicle movements are permitted on the west side of the drop-off area to access parking spaces. School staff and parents dropping off and picking up students will primarily utilize the site access off Robin Easey Avenue and parking lot/drop-off area.

Site circulation at the proposed access and drop-off area was assessed using AutoTURN 11 to confirm the suitability of the layout for a variety of design vehicles. The results are provided in Table 4-1 and the AutoTURN swept paths are provided in **Appendix F**.

Table 4-1: Swept Path Assessment

DESIGN VEHICLE	VEHICLE REPRESENTING	FINDINGS
HSU (TAC 2017)	Municipal Services / Waste Removal	**Access:** The proposed access configuration on Robin Easey Avenue can accommodate the inbound and outbound movements of an HSU design vehicle (rear loading) without impacting any built features but will require the vehicle to encroach on the opposing vehicle lane for inbound movements. **Circulation:** An HSU design vehicle will be able to maneuver to and from the waste containers located at the south-west corner of the drop-off area without conflicting with curbs upon reversing into the drop-off area. Parking spaces will not be impacted.

DESIGN VEHICLE	VEHICLE REPRESENTING	FINDINGS
2020 Blue Bird Vision (AutoTurn City-Transit)	School Bus	**Access:** The proposed access configuration on Robin Easey Avenue can accommodate the movements of a school bus without impacting any built features but will require the vehicle to encroach on the opposing vehicle lane for inbound movements. **Circulation:** A school bus will be able to maneuver around the drop-off area without conflicting with curbs. In addition, parking spaces will not be impacted. School buses will be utilizing the laybys on the south side of Kilbirnie Drive and west side of Robin Easey Avenue only, but in the event of additional school bus circulation measures in the future (ex. school expansion or changes to the transportation network), a school bus will be able to properly circulate around the drop-off area if necessary.

It is to be noted that the fire truck access route is from Kilbirnie Drive and shall conform to Ontario's Building Code. In other words, the parking lot and drop-off area will not be part of the fire route for the school building itself and a fire truck's main access point will be to the principal building entrance on Robin Easey Avenue. For the portables, however, the main fire access point will be through the parking lot. Parked school buses on the on-street layby may be considered an obstruction to the fire route or access to the fire hydrant in front of the school. A form of programming should be implemented to have school staff move school buses out of the layby area in the event of an emergency.

4.2 PARKING

4.2.1 PARKING SUPPLY

Based on the location of the proposed development, the minimum parking space requirements will be assessed in accordance with the Suburban Area (Area 'C') as part of Schedule 1A to the City of Ottawa's Zoning By-Law 2008-250. The Zoning By-Law requires that a school and daycare in Area 'C' provide a minimum parking space rate of 1.5 per classroom (includes portables) and 2 per 100 sq. m. of gross floor area, respectively. In addition, the Zoning By-Law requires that bicycle parking is provided for a school and daycare at a bicycle parking space rate of 1 per 100 sq. m. of gross floor area and 1 per 250 sq. m. of gross floor area, respectively.

The minimum parking space rates can be found in Section 101 of the Zoning By-Law and off-street motor vehicle parking must be provided for any land use at the rate set out in Table 101. Bicycle parking spaces rates and provisions can be found in Section 111 of the Zoning By-Law and bicycle parking must be provided for the land uses and at the rate set out in Table 111A.

The minimum parking supply requirements for this development compared with the proposed parking supply are highlighted in Table 4-2 below.

Table 4-2: Minimum Zoning By-Law Requirements for Parking and Proposed Development Parking Supply

PARKING TYPE	LAND USE	SIZE	REQUIRED SPACES (ZONING BY-LAW)	PROVIDED SPACES (SITE PLAN)
Auto Parking	School	20 classrooms, 12 portables	48	61
	Daycare	360 GFA	7	
Bicycle Parking	School	4,421 GFA	44	50
	Daycare	360 GFA	1	

Based on the provided number of auto and bicycle parking spaces for the proposed development, the auto parking supply exceeds the minimum requirements of the Zoning By-Law by 6 parking spaces (including barrier-free parking spaces) and the bicycle parking supply exceeds the minimum requirements of the Zoning By-Law by 5 bicycle parking spaces. It is noted that the parking rate used for the site plan slightly differs from the Zoning By-Law rate such that the minimum required parking spaces determined within the site plan exceeds that of the Zoning By-Law.

4.3 BOUNDARY STREETS DESIGN

4.3.1 MOBILITY

The City of Ottawa's Multi-Modal Level of Service (MMLOS) targets consider road classification, adjacent land-use designation, and special policy areas and are intended to evaluate how the proposed school users will be accommodated by the boundary streets bordering the site to the north and east.

4.3.1.1 *KILBIRNIE DRIVE*

The segment of Kilbirnie Drive within the study area is identified as a Local Road per the City of Ottawa Transportation Master Plan (2013) and a Collector Road per the Barrhaven South Community Development Plan. In addition, it is considered to have a General Urban Area land-use designation according to Schedule B – Urban Plan Policy of the City of Ottawa's Official Plan. However, it is noted that the roadway is located within 300m of a school (St. Benedict School, proposed elementary school located at 989 Kilbirnie Drive, and the proposed school itself) and the applicable MMLOS targets utilized reflect the policy area instead of the land use designation. The resulting MMLOS targets and segment scores for pedestrians, bicycles, and transit during the future background conditions (2023 build-out year) are included in Table 4-3 below and the detailed MMLOS spreadsheets are provided in **Appendix G**. It is to be noted that there is no target set for trucks and auto LOS is only reported for intersections and that the LOS targets for Collector and Local Roads are the same in this case.

Table 4-3: Segment MMLOS along Kilbirnie Drive between Robin Easey Avenue and Greenbank Road

SCENARIO	PLOS	BLOS	TLOS	TKLOS	VLOS
LOS Target	A	B	D	No target	Not reported for segments
Future Background (2023) LOS	B	B	E	-	

The future background (2023) LOS is based on the existing conditions remaining in place along Kilbirnie Drive. The Bicycle Level of Service (BLOS) is the only target that is met, and the Pedestrian Level of Service (PLOS) and Transit Level of Service (TLOS) do not meet the City of Ottawa targets. This can be attributed to the following:

- No boulevard width to provide separation between pedestrian and vehicles, with operating speeds being between 30 km/h and 50 km/h.
- Transit route along Kilbirnie Drive between Greenbank Road and River Mist Road operates in mixed traffic and there is moderate driveway friction with the presence of residential driveways on both the north and south sides of Kilbirnie Drive.

Based on the Planning Rationale prepared by Fotenn Consultants in support of Plan of Subdivision and Zoning By-law Amendment applications for Phase 2 of Minto's Quinn's Pointe community in which the proposed school is located, the proposed street network is intended to be designed and integrated with the surrounding transportation network. Kilbirnie Drive is identified as a Collector Road in the Plan of Subdivision and aligns with the collector streets identified in the Community Design Plan. Figure 4-1 illustrates a proposed cross-section for collector streets within the community, specifically for the westward expansion of Kilbirnie Drive. The segment MMLOS for such a cross-section would improve the LOS results along Kilbirnie Drive for pedestrians and bicycles with the presence of a wide boulevard between vehicle lanes and sidewalks/multi-use paths, as well as a physically separated bikeway.

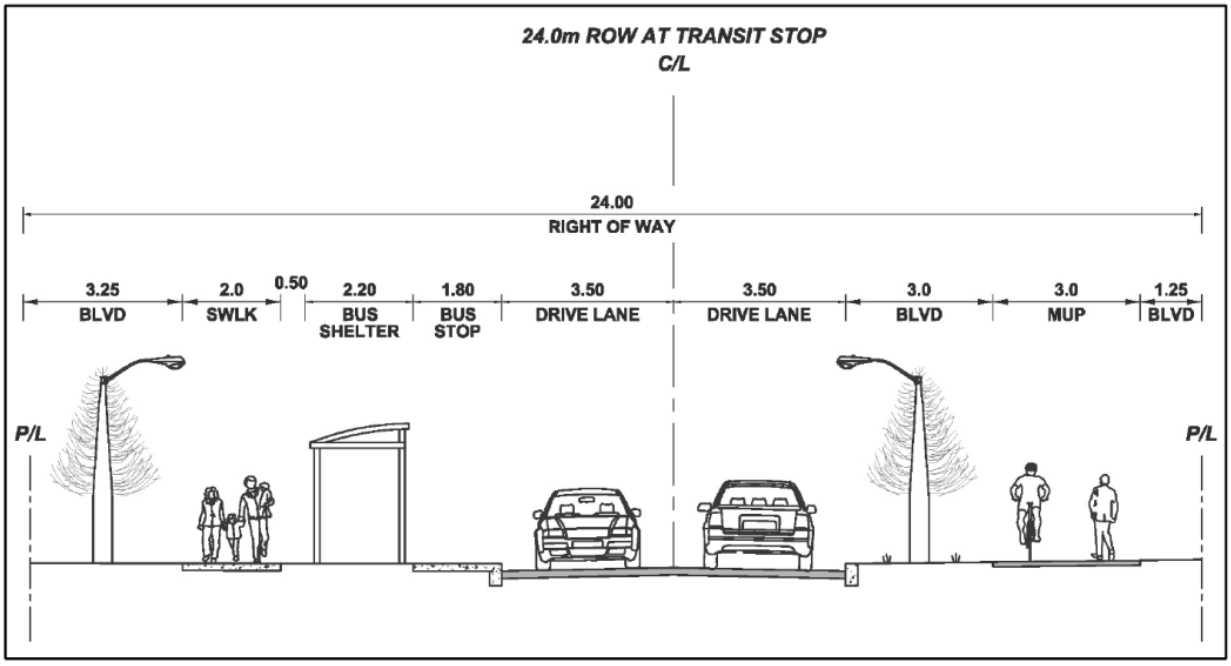


Figure 4-1: Proposed Cross-Section for 24m Collector Streets (Source: Quinn's Pointe- Phase 2 Plan of Subdivision + Zoning By-Law Amendment Planning Rationale (Fotenn Consultants, 2018))

If the existing road right-of-way is insufficient to improve or expand pedestrian/cycling facilities, pedestrian comfort and safety can be further supplemented with traffic calming measures such as reduced speed zones. Provided that the subdivision that the proposed school is in is a recent and ongoing development, road modifications will most likely not be considered for some time.

4.3.1.2 *ROBIN EASEY AVENUE*

The segment of Robin Easey Avenue within the study area is a Local Road and is considered to have a General Urban Area land-use designation according to Schedule B – Urban Plan Policy of the City of Ottawa's Official Plan. However, it is noted that the roadway is located within 300m of a school (proposed elementary school located at 989 Kilbirnie Drive and the proposed school itself) and the applicable MMLOS targets utilized reflect the policy area instead of the land use designation. The resulting MMLOS targets and segment scores for pedestrians and bicycles

during the future background conditions (2023 build-out year) are included in Table 4-4 below and the detailed MMLOS spreadsheets are provided in **Appendix G**. Due to the underdeveloped nature of Robin Easey Avenue at the time of this report, the road configuration was based on the site plan which includes sidewalks fronting the school property. It is to be noted that there is no evaluation for transit as no transit routes run along Robin Easey Avenue, there is no target set for trucks, and auto LOS is only reported for intersections.

Table 4-4: Segment MMLOS along Robin Easey Avenue between Kilbirnie Drive and Proposed School Access

SCENARIO	PLOS	BLOS	TLOS	TKLOS	VLOS
LOS Target	A	B	D	No target	Not reported for segments
Future Background (2023) LOS	B	B	-	-	

The BLOS is the only target that is met, and the PLOS is below the target by one grade level. This can be attributed to there being no boulevard width to provide separation between pedestrian and vehicles and operating speeds likely being between 30 km/h and 50 km/h.

4.3.2 ROAD SAFETY

4.3.2.1 KILBIRNIE DRIVE

Historical collision records for the study area were obtained from the City of Ottawa for the 5-years between January 2015 through December 2019. The TIA Guidelines indicate that patterns with six or more collisions should be identified. In this timeframe, there were three collisions along Kilbirnie Drive between Breakstone Road and Greenbank Road. Therefore, no collision reduction measures have been identified for this section of roadway.

4.3.2.2 ROBIN EASEY AVENUE

No collisions have been documented along Robin Easey Avenue between Kilbirnie Drive and the proposed site access due to the underdeveloped nature of the road. Therefore, no collision reduction measures have been identified for this section of roadway.

4.4 ACCESS INTERSECTIONS DESIGN

4.4.1 LOCATION AND DESIGN OF ACCESS

There is one access point proposed for this development and is indicated in the site plan (**Appendix B**). It is located off of Robin Easey Avenue at the south-east corner of the site. The three-legged access is proposed as a two-way, full movement access with stop-control on the side approach (access) and free-flow conditions for the north and south approaches along Robin Easey Avenue.

A design compliance check was carried out for the proposed school access for a variety of interrelated design elements for driveways following the Transportation Association of Canada's (TAC) Geometric Design Guidelines for Canadian Roads (2017). The design compliance check is summarized in Table 4-5.

Table 4-5: Access Intersection Design Elements

DESIGN ELEMENTS	MINIMUM REQUIRED	ROBIN EASEY AVENUE ACCESS
Access Type	-	Full Movement
One-way vs. Two-way Operation	>750 veh/d or >100 peak hour trips = high volume two-way driveway	>100 peak hour trips Two-way
Entrance Width* (Two-way)	Residential: 2.0m-7.3m Commercial: 7.2m-12.0m Industrial: 9.0m-15.0m 6.0m for a parking lot (City of Ottawa Zoning By-law)	9.5m
Right Turn Radius*	Residential: 3.0m-4.5m Commercial: 4.5m-12.0m Industrial: 9.0m-15.0m	6.0m
Corner Clearance	15m for Local Roads	>15m
Sight Distance (Intersections with Stop Control on Minor Road)	Case B1 – Left Turns from Minor Road = 105m Case B2 – Right Turns from Minor Road = 95m	No obstructions; be advised of retaining wall on either side of site access and parked vehicles on the west side of Robin Easey Avenue.
Throat Length	N/A	Located on a local road 40m
Angle of Intersection	At or near 90°	Access intersects Robin Easey Avenue at 90°
Proximity to Adjacent Driveways	N/A	No private driveways along the west side of Robin Easey Avenue between Kilbirnie Road and the proposed school access
Pedestrian + Cycling Crossing Considerations	Small curb return radii (must be suitable for design turning vehicle) with narrow driveway to minimize crossing distance	9.5m pedestrian crossing (depressed and continuous concrete sidewalk through access) No cycling crossing

*Minimum requirements for institutional developments are not listed in TAC 2017.

Overall, the design elements for the site access on Robin Easey Avenue meet the minimum requirements of TAC 2017 to be considered as good design practice.

4.4.2 INTERSECTION CONTROL

Ontario Traffic Manual (OTM) Book 12 (2012) Justification 7 includes two warrants (1 and 2) for signalization with two evaluation criteria (A and B) for each:

- 1A – total volume entering the intersection from all approaches.
- 1B – total volume entering the intersection from the minor approaches only.
- 2A – total volume entering the intersection from the main road only.

- 2B – total volume crossing major road, calculated as the left turns from the minor approaches, pedestrian crossings, highest through volume from one of the minor approaches and 50% of the heavier left turn from the main road if it exceeds 120 vehicles/hr and the opposing traffic exceeds 720 veh/hr.

Signalization can be warranted based on Warrant 1 or 2, but only if both conditions A and B are 100% met.

Based on Section 3.1.1, the site is estimated to generate 115 and 83 auto vehicle trips in and out of access during the AM Peak Hour, respectively. During the PM Peak Hour, the site is estimated to generate 52 and 72 auto vehicle trips in and out of the access, respectively.

Provided that the school access is considered a T-intersection with one vehicle travel lane in both directions and that it is a future intersection, thresholds are raised for the consideration of traffic signals as a result of using average hourly volumes instead of eight-hour volumes as they are unavailable.

In accordance with OTM Book 12, the site generated volumes listed above are below the minimum requirements for a traffic signal based on Justification 7 – Projected Volumes, as shown in Table 4-6. Therefore, the projected site generated volumes indicate that signalization at the access intersection is not warranted since the volumes fall below the minimum requirements when considering the adjusted volume thresholds for all evaluation criteria.

Table 4-6: OTM Book 12 Signal Warrant Justification 7 - Proposed School

	MINIMUM REQUIREMENT	
JUSTIFICATION 7	FLOW[1]	ADJ. FLOW[2]
1A - All Approaches	480	1080
1B - Minor Road	120	270
2A - Major Road	480	1080
2B - Crossing Major Road	50	115

Notes
[1]Base Volume Thresholds are based on a 1-lane major road with free flow conditions.
[2]Adjusted Volume Thresholds are based on the following requirements in the OTM Warrant Methodology:

- x1.5 for Justification 7, based on a new intersection
- x1.5 for a T-intersection

The proposed school access will be located on a low-volume local road such that stop-control on the minor road (site access) is sufficient.

4.4.3 INTERSECTION DESIGN

According to the City of Ottawa's MMLOS Guidelines (2015), only signalized intersections are evaluated against the LOS measures for intersections. As such, no formal evaluation has been applied to the proposed site access due to its unsignalized traffic control.

4.5 TRANSPORTATION DEMAND MANAGEMENT

4.5.1 CONTEXT FOR TDM

The proposed elementary school is anticipated to have 751 students and the on-site daycare service will accommodate 49 children. In addition, a total of 51 staff, including teachers, custodians, and office staff, are expected to work for the school and daycare.

The development is not located within a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone and the majority of staff (80%) will be auto drivers and the majority of students (85%) will arrive and depart by school bus. Between all school users, approximately 15% are anticipated to be auto passengers, 5% to use active modes (walking and cycling), and less than 1% to take public transit.

The school board (CEPEO) has indicated that operation hours of the elementary school will be from 7:30 AM to 4:00 PM, and the daycare will operate between 6:00 AM to 5:00 PM. The start and end time of the school and daycare service generally align with the peak hours of the adjacent street traffic.

4.5.2 NEED AND OPPORTUNITY

The existing road network has available capacity should the mode share targets not be met, as indicated in Section 4.9.2.

4.5.3 TDM PROGRAM

The TDM Measures Checklist for non-residential developments was completed to allow and encourage travel by sustainable modes to and from the proposed development at the time of occupancy. The completed checklist is provided in **Appendix E**.

The following TDM measures are recommended for the proposed development:

- Display local area maps with walking/cycling access routes and key destinations at major entrances
- Display relevant transit schedules and route maps at entrances

4.6 NEIGHBOURHOOD TRAFFIC MANAGEMENT

4.6.1 ADJACENT NEIGHBOURHOODS

The proposed school is located within a mixed-use community that is part of Quinn's Pointe – Phase 2 and the access routes to and from the proposed development contain local and collector roads. As per the City of Ottawa Area Traffic Management (ATM) guidelines, the thresholds for local roads and collector roads are a maximum of 1,000 vehicles per day or 120 vehicles during the peak hour and a maximum of 2,500 vehicles per day or 300 vehicles during the peak hour, respectively. The 2023 and 2028 total traffic volumes, as shown in Figure 3-4 and Figure 3-5, indicate that the addition of development-related traffic to these access roads (Kilbirnie Drive and Robin Easey Avenue) will be above their road classification threshold during the peak hour. However, the 2023 and 2028 future background volumes, as shown in Figure 3-2 and Figure 3-3, indicate that these thresholds are exceeded for Kilbirnie Drive prior to adding development-generated trips.

Despite the road classification vehicle thresholds being exceeded, the Multi-Modal Level of Service Analysis (MMLOS) and intersection capacity analysis provided in Section 4.9.2 indicate that the Vehicle LOS target for the study area is met and that the study area intersections operate at a LOS of B or better. Based on this, the proposed school is expected to have a minimal impact on the access roads.

In conjunction with the TIA prepared for 989 Kilbirnie Drive by Novatech, no change to the existing road classification is required as Kilbirnie Drive is intended to serve as a collector road for Phase 2 of Quinn's Pointe Subdivision. Therefore, a Neighbourhood Traffic Management plan is not required.

4.7 TRANSIT

Based on Section 3.1.1, the proposed school is anticipated to generate only 3 person trips from the 5% of staff expected to use public transit and the existing transit routes do not coincide with the boundary street segments bordering the proposed site. Therefore, transit service will not be impacted according to development-generated demand.

4.8 REVIEW OF NETWORK CONCEPT

This module has been exempted based on Section 2.7.

4.9 INTERSECTION DESIGN

4.9.1 INTERSECTION CONTROL

Of the three study area intersections analyzed, the intersection of Greenbank Road / Kilbirnie Drive is signalized and the intersections of Kilbirnie Drive / Alex Polowin Avenue and Kilbirnie Drive / Robin Easey Avenue are all-way stop-controlled. The detailed performance analysis provided in Section 4.8.2 below indicates that all three study area intersections and their associated vehicle movements operate at a LOS of B or better for both the AM and PM Peak Hours of all scenarios (i.e., existing, future background and future total). Due to the traffic operations at each intersection performing well below the capacity with the current intersection control, this suggests that there is no need to modify the intersection control to serve the future background and future total traffic demands.

4.9.2 INTERSECTION DESIGN

4.9.2.1 MULTI-MODAL LEVEL OF SERVICE ANALYSIS

A Multi-Modal Level of Service (MMLOS) analysis was carried out in accordance with the methodology outlined in the City of Ottawa's MMLOS Guidelines (2015). The Guidelines state that intersection LOS measures are to be evaluated at signalized intersections. Within the study area, Greenbank Road / Kilbirnie Drive is the only intersection that is signalized. The MMLOS analysis evaluates the existing conditions (2020), future background (2023 and 2028) and future total (2023 and 2028) time horizon to provide a comparison between the baseline and future condition (beyond the development period).

The intersection of Greenbank Road / Kilbirnie Drive was evaluated as an *Arterial within a General Urban Area* with the corresponding LOS targets taken from Exhibit 22 of the MMLOS Guidelines. The intersection MMLOS results are summarized in Table 4-7. It is noted that prior to its completed modification in 2021, the intersection of Greenbank Road / Kilbirnie Drive previously was a two-way stop-controlled intersection.

As there are no additional/planned modifications to the intersection configuration of Greenbank Road / Kilbirnie Drive between the existing conditions and up to and including the 2028 future conditions, there is no change in PLOS, BLOS and TkLOS as they are primarily dependent on road infrastructure elements and additionally the signal timing plan for PLOS. TLOS and VLOS are based on average signal delay and volume to capacity ratio, respectively. Based on the anticipated traffic volumes between the existing conditions and up to and including the 2028 future conditions, there is no change in TLOS and VLOS.

Table 4-7: Summary of Intersection Multi-Modal Level of Service (MMLOS) Analysis – Greenbank Road / Kilbirnie Drive

SCENARIO	PLOS	BLOS	TLOS	TKLOS	VLOS
Target	**C**	**C**	**D**	**E**	**D**
Existing Conditions (2020)	D	E	C	E	A
Future Background (2023)	D	E	C	E	A
Future Background (2028)	D	E	C	E	A
Future Total (2023)	D	E	C	E	A
Future Total (2028)	D	E	C	E	A

The **Pedestrian Level of Service** (PLOS) target of 'C' was not met. The target could be met if the signal timing plan was altered such that the effective walk time is increased to more than 11 seconds. It is noted that the pedestrian volume is currently low at this intersection.

The **Bicycle Level of Service** (BLOS) target of 'C' was not met. The target could be met if cycling facilities such as a curb bike lane or multi-use path were provided on Greenbank Road and Kilbirnie Drive, like the multi-use path that is currently provided from the north approach.

The **Transit Level of Service** (TLOS) target of 'D' was met. The two transit routes (75 and 675) that utilize the intersection only travel eastbound and westbound along Kilbirnie Drive.

The **Truck Level of Service** (TkLOS) target of 'E' was met. Greenbank Road and Kilbirnie Drive are not designated City of Ottawa truck routes, so the LOS target is relatively low.

The **Vehicle Level of Service** (VLOS) target of 'D' was met.

4.9.2.2 *DETAILED PERFORMANCE ANALYSIS*

The existing and future conditions were analyzed based upon the weekday peak hour traffic volumes presented in Sections 2.3.7 and 3.3.3. The City of Ottawa's MMLOS Guidelines assigns the vehicle level of service (VLOS) based on ranges of volume to capacity ratio, as indicated in Table 4-8. The VLOS for the intersection of Greenbank Road and Kilbirnie Drive was evaluated using the volume to capacity ratio.

Table 4-8: City of Ottawa MMLOS Guidelines, LOS Criteria – Signalized Intersections

VLOS	VOLUME TO CAPACITY RATIO
A	0 – 0.60
B	0.61 – 0.70
C	0.71 – 0.80
D	0.80 – 0.90
E	0.91 – 1.00
F	> 1.00

For all-way stop control intersections, VLOS is based on control delay, as indicated in Table 4-9. The VLOS for the intersections of Kilbirnie Drive / Alex Polowin Avenue and Kilbirnie Drive / Robin Easey Avenue were evaluated using the control delay.

Table 4-9: Highway Capacity Manual 2010, LOS Criteria – All-Way Stop Control Intersections

VLOS	CONTROL DELAY (S)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

The following tables present the results of the intersection capacity analysis. All intersections were analyzed using Synchro 11 following the analysis parameters in the TIA Guidelines. **Appendix H** contains the detailed Synchro analysis sheets.

EXISTING CONDITIONS

The existing conditions (2020) intersection operations analysis results are summarized in Table 4-10. The intersection of Greenbank Road / Kilbirnie within the study area and its respective vehicle movements currently operates with an acceptable VLOS (LOS A) that is well below capacity.

Table 4-10: Summary of Traffic Operations Analysis – Existing Conditions (2020)

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR			
	LOS	V/C	Delay (s)	95th %ile Queue (m)	LOS	V/C	Delay (s)	95th %ile Queue (m)
Greenbank Road / Kilbirnie Drive								
EBL	A	0.46	37.1	22.0	A	0.28	33.0	14.1
EBTR	A	0.41	10.5	14.0	A	0.24	12.5	8.9
WBL	A	0.38	34.3	18.5	A	0.14	29.2	8.6
WBTR	A	0.38	10.7	13.1	A	0.29	14.0	10.7
NBL	A	0.32	38.4	16.8	A	0.56	40.4	36.1
NBT	A	0.10	10.8	20.7	A	0.16	13.0	35.6
NBR	A	0.02	0.1	0.0	A	0.08	0.8	1.9
SBL	A	0.20	36.9	11.6	A	0.42	38.8	24.5

SBT	A	0.14	12.5	29.4	A	0.13	14.5	27.7
SBR	A	0.05	0.1	0.0	A	0.09	1.4	3.0
Intersection LOS	**A**				**A**			

Notes:

1. Movement LOS is based on Synchro V/C ratios and the LOS thresholds in Section 6.1 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines for signalized intersections.

2. # - volume for the 95th percentile exceeds capacity, queue may be longer.

3. The overall intersection LOS is based on the V/C ratio from the HCM 2000 Signalized Intersection Capacity Analysis report that is generated from Synchro.

FUTURE BACKGROUND

Compared to the existing conditions, the VLOS for the study area intersections and their respective vehicle movements remain unchanged during the 2023 future background condition. During the 2028 future background condition, the VLOS remains unchanged, except for the eastbound left movement at the intersection of Greenbank Road / Kilbirnie Drive that drops from a VLOS A to a VLOS B. The 2023 and 2028 future background intersection operations analysis results are summarized in Table 4-11 and Table 4-12, respectively.

Table 4-11: Summary of Traffic Operations Analysis – Future Background (2023)

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR			
	LOS	V/C	Delay (s)	95th %ile Queue (m)	LOS	V/C	Delay (s)	95th %ile Queue (m)
Greenbank Road / Kilbirnie Drive								
EBL	A	0.60	41.0	31.8	A	0.43	36.1	21.1
EBTR	A	0.49	9.4	17.2	A	0.37	13.1	13.7
WBL	A	0.35	32.4	17.5	A	0.12	27.7	8.2
WBTR	A	0.40	13.1	16.8	A	0.27	14.3	11.0
NBL	A	0.47	40.3	25.3	A	0.60	39.5	#52.5
NBT	A	0.17	11.5	32.5	A	0.20	14.2	40.4
NBR	A	0.02	0.1	0.0	A	0.09	0.5	0.9
SBL	A	0.19	36.7	10.6	A	0.42	39.5	22.6

SBT	A	0.17	15.9	33.0	A	0.22	17.6	37.2
SBR	A	0.12	1.7	3.6	A	0.19	4.1	9.9
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Alex Polowin Avenue								
EBLTR	A	0.03	7.3	-	A	0.02	7.2	-
WBLTR	A	0.07	7.4	-	A	0.13	7.6	-
NBLTR	A	0.07	6.9	-	A	0.05	7.0	-
SBLTR	A	0.06	7.6	-	A	0.04	7.5	-
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Robin Easey Avenue								
EBTR	-	-	-	-	-	-	-	-
WBLT	A	0.02	7.3	-	A	0.03	7.3	-
NBLR	A	0.03	6.5	-	A	0.02	6.4	-
Intersection LOS	**A**				**A**			

Notes:

1. Movement LOS is based on Synchro V/C ratios and the LOS thresholds in Section 6.1 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines for signalized intersections.

2. # - volume for the 95th percentile exceeds capacity, queue may be longer.

3. The overall intersection LOS is based on the V/C ratio from the HCM 2000 Signalized Intersection Capacity Analysis report that is generated from Synchro.

Table 4-12: Summary of Traffic Operations Analysis – Future Background (2028)

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR			
	LOS	V/C	Delay (s)	95th %ile Queue (m)	LOS	V/C	Delay (s)	95th %ile Queue (m)

Greenbank Road / Kilbirnie Drive								
EBL	B	0.62	41.6	33.5	A	0.45	36.4	22.1
EBTR	A	0.52	9.4	18.3	A	0.39	12.6	14.5
WBL	A	0.38	33.9	17.8	A	0.12	27.5	8.2
WBTR	A	0.40	13.0	16.9	A	0.26	14.1	11.0
NBL	A	0.49	40.6	26.9	A	0.58	37.0	#64.0
NBT	A	0.23	12.1	43.9	A	0.26	14.8	52.5
NBR	A	0.02	0.1	0.0	A	0.09	0.5	0.9
SBL	A	0.19	36.7	10.6	A	0.42	39.5	22.6
SBT	A	0.23	16.7	42.7	A	0.33	20.0	50.9
SBR	A	0.09	0.3	0.6	A	0.21	4.8	11.4
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Alex Polowin Avenue								
EBLTR	A	0.11	7.8	-	A	0.07	7.6	-
WBLTR	A	0.09	7.6	-	A	0.20	8.1	-
NBLTR	A	0.08	7.2	-	A	0.06	7.3	-
SBLTR	A	0.06	7.8	-	A	0.05	7.7	-
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Robin Easey Avenue								
EBTR	A	0.08	7.4	-	A	0.05	7.1	-
WBLT	A	0.11	7.6	-	A	0.04	7.3	-
NBLR	A	0.04	6.9	-	A	0.03	6.8	-

Intersection LOS	**A**	**A**

Notes:

1. Movement LOS is based on Synchro V/C ratios and the LOS thresholds in Section 6.1 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines for signalized intersections.

2. # - volume for the 95th percentile exceeds capacity, queue may be longer.

3. The overall intersection LOS is based on the V/C ratio from the HCM 2000 Signalized Intersection Capacity Analysis report that is generated from Synchro.

FUTURE TOTAL

Compared to the 2023 future background condition, the VLOS for the study area intersections and their respective vehicle movements remain unchanged during the 2023 future total condition (inclusion of vehicle trips generated from the proposed school), except for the eastbound left movement at the intersection of Greenbank Road / Kilbirnie Drive that drops from a VLOS A to a VLOS B. The eastbound left-turn storage lane length is sufficient to accommodate vehicle queues. The 2023 future background intersection operations analysis results are summarized in Table 4-13.

Table 4-13: Summary of Traffic Operations Analysis – Future Total (2023)

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR			
	LOS	V/C	Delay (s)	95th %ile Queue (m)	LOS	V/C	Delay (s)	95th %ile Queue (m)
Greenbank Road / Kilbirnie Drive								
EBL	B	0.70	42.9	42.2	A	0.57	39.5	30.1
EBTR	A	0.50	8.9	19.5	A	0.41	13.0	16.7
WBL	A	0.31	28.5	16.8	A	0.11	26.1	8.2
WBTR	A	0.41	13.3	19.6	A	0.27	14.8	12.7
NBL	A	0.59	44.7	#35.2	A	0.59	38.2	#57.9
NBT	A	0.18	13.5	34.8	A	0.23	15.5	41.2
NBR	A	0.03	0.1	0.0	A	0.10	0.5	0.9
SBL	A	0.19	36.7	10.6	A	0.42	39.5	22.6
SBT	A	0.19	18.3	31.9	A	0.25	20.0	36.8

SBR	A	0.23	4.8	12.8	A	0.26	5.1	12.8
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Alex Polowin Avenue								
EBLTR	A	0.12	8.0	-	A	0.08	7.7	-
WBLTR	A	0.22	8.5	-	A	0.19	8.1	-
NBLTR	A	0.10	7.6	-	A	0.07	7.3	-
SBLTR	A	0.06	8.1	-	A	0.04	7.8	-
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Robin Easey Avenue								
EBTR	A	0.01	7.0	-	A	0.00	6.6	-
WBLT	A	0.16	8.2	-	A	0.08	7.7	-
NBLR	A	0.10	7.1	-	A	0.07	6.8	-
Intersection LOS	**A**				**A**			

Notes:

1. Movement LOS is based on Synchro V/C ratios and the LOS thresholds in Section 6.1 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines for signalized intersections.

2. # - volume for the 95th percentile exceeds capacity, queue may be longer.

3. The overall intersection LOS is based on the V/C ratio from the HCM 2000 Signalized Intersection Capacity Analysis report that is generated from Synchro.

Compared to the 2028 future background condition, the VLOS for the study area intersections and their respective vehicle movements remain unchanged during the 2028 future total condition (inclusion of vehicle trips generated from the proposed school), except for the northbound left movement at the intersection of Greenbank Road / Kilbirnie Drive that drops from a VLOS A to a VLOS B. The northbound left-turn storage lane length is sufficient to accommodate vehicle queues. The 2028 future background intersection operations analysis results are summarized in Table 4-14.

Table 4-14: Summary of Traffic Operations Analysis – Future Total (2028)

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR			
	LOS	V/C	Delay (s)	95th %ile Queue (m)	LOS	V/C	Delay (s)	95th %ile Queue (m)
Greenbank Road / Kilbirnie Drive								
EBL	B	0.70	42.2	42.9	A	0.57	39.7	31.1
EBTR	A	0.53	8.6	20.1	A	0.43	12.4	17.4
WBL	A	0.33	28.7	16.7	A	0.11	26.0	8.2
WBTR	A	0.40	12.9	19.2	A	0.27	14.6	12.7
NBL	B	0.62	47.1	#43.5	A	0.58	36.1	#69.4
NBT	A	0.24	14.4	46.5	A	0.29	16.2	51.9
NBR	A	0.03	0.1	0.0	A	0.10	0.5	0.9
SBL	A	0.19	36.7	10.6	A	0.42	39.5	22.6
SBT	A	0.26	19.7	40.3	A	0.38	23.1	49.2
SBR	A	0.23	5.2	12.0	A	0.29	5.4	13.0
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Alex Polowin Avenue								
EBLTR	A	0.20	8.6	-	A	0.13	8.1	-
WBLTR	A	0.25	8.9	-	A	0.27	8.7	-
NBLTR	A	0.11	7.8	-	A	0.08	7.7	-
SBLTR	A	0.07	8.4	-	A	0.05	8.0	-
Intersection LOS	**A**				**A**			
Kilbirnie Drive / Robin Easey Avenue								

EBTR	A	0.10	7.8	-	A	0.05	7.3	-
WBLT	A	0.26	8.9	-	A	0.10	7.8	-
NBLR	A	0.11	7.6	-	A	0.08	7.0	-
Intersection LOS	**A**				**A**			

Notes:

1. Movement LOS is based on Synchro V/C ratios and the LOS thresholds in Section 6.1 of the City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines for signalized intersections.

2. # - volume for the 95th percentile exceeds capacity, queue may be longer.

3. The overall intersection LOS is based on the V/C ratio from the HCM 2000 Signalized Intersection Capacity Analysis report that is generated from Synchro.

4.10 SUMMARY OF IMPROVEMENTS INDICATED AND MODIFICATION OPTIONS

A summary of transportation improvements proposed as part of this Transportation Impact Assessment carried out and the proposed modifications are presented as follows:

1. **Development Design**
    - Sustainable modes have been accounted for on-site through the provision of internal sidewalks, bicycle parking, and direct connections and access to an existing adjacent transit stop.
    - The site plan was assessed using AutoTurn 11 for various design vehicles (waste removal and school bus) accessing and circulating around the site. The AutoTurn swept paths indicate that the site access on Robin Easey Avenue can accommodate the movements of these design vehicles entering and exiting the site without conflicting with built features but encroach on the opposing vehicle lane. The drop-off area can accommodate the wide turning movements of these design vehicles when circulating around it without conflicting with the curb.
    - While school buses will not be using the drop-off area in the parking lot and will instead be using the boundary street laybys, the drop-off area can accommodate school bus movements if circulation patterns change in the future.
2. **Parking**
    - The 61 auto parking and 50 bicycle parking spaces provided in the site plan meet the minimum requirements of the City of Ottawa's Zoning By-Law.
3. **Boundary Streets Design**
    - Kilbirnie Drive and Robin Easey Avenue do not meet the Pedestrian LOS target of A for a policy area of being within 300m of a school. Pedestrian comfort and safety can be further supplemented by traffic calming measures such as reduced speed zones.

4. **Access Intersections Design**

    - The site access on Robin Easey Avenue meets the requirements set out for driveways in TAC 2017 to be considered as part of good design practice.
    - In accordance with OTM Book 12, the site generated volumes are below the minimum requirements for a traffic signal to be warranted based on Justification 7 – Projected Volumes.
    - Stop-control on the minor road (site access) is sufficient.

5. **Transportation Demand Management**

    - The existing road network has available capacity should the mode share targets not be met.
    - The TDM measures recommended for the proposed development include displaying local area maps with walking/cycling access routes and transit schedules with route maps.

6. **Neighbourhood Traffic Management**

    - Despite the future traffic volumes along the access routes being above the thresholds for local and collector roads during the peak hour, the proposed school will have a minimal impact on the access roads since the traffic operations are well below the capacity (LOS B or better).

7. **Transit**

    - Transit service along Kilbirnie Drive (east of River Mist Road) will not be impacted according to the low development-generated demand estimated of school staff.

8. **Intersection Design**

    - Intersection of Greenbank Road / Kilbirnie Drive (signalized): No proposed modifications. Control type, configuration, and capacity are sufficient.
    - Intersection of Kilbirnie Drive / Alex Polowin Avenue (stop-control): No proposed modifications. Control type, configuration, and capacity are sufficient.
    - Intersection of Kilbirnie Drive / Robin Easey Avenue (stop-control): No proposed modifications. Control type, configuration, and capacity are sufficient.

Based on the results of this Transportation Impact Assessment, the transportation network surrounding the proposed elementary school by CEPEO located at 1045 Kilbirnie Drive can accommodate the development without adverse impacts to future traffic operations during the 2023 built-out year and 2028 planning horizon.

APPENDIX

A SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	N/A - Barrhaven-Sud Elementary School
Description of Location	Located at the south-west corner of Kilbirnie Dr and Robin Easey Ave
Land Use Classification	Institutional - School
Development Size (units)	800 students and staff
Development Size (m^2)	5,455 (building area)
Number of Accesses and Locations	One vehcile access from Robin Easey Avenue
Phase of Development	Single Phase
Buildout Year	2023

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.

800 students and staff will trigger in excess of 60 person trips to the site.

3. Location Triggers

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

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

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

4. Safety Triggers

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

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

5. Summary

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

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

APPENDIX

B DRAFT SITE PLAN

SITE PLAN SYMBOLS LEGEND

- ▼ = ENTRANCE
- ▽ = EXIT
- = MANHOLE, CATCH BASIN, ETC, REFER TO CIVIL
- = LS, LIGHT STANDARD, REFER TO ELECTRICAL AND STRUCTURAL
- = DENOTES SLOPED GRADE, REFER TO CIVIL
- = DENOTES FIRE TRUCK ACCESS ROUTE, REFER TO CIVIL DRAWINGS
- = PROPERTY LINE
- = SURVEY BAR
- UP = UTILITY POLE
- FH = FIRE HYDRANT
- BN = BASKETBALL NET
- = SIDEWALK
- = PEDESTRIAN WALKWAY
- -S- = SWALE. REFER TO CIVIL DRAWINGS
- = SETBACK LINE
- BH = BOREHOLE LOCATION
- BH = BOREHOLE WITH MONITORING WELL INSTALLED LOCATION
- TP = TEST PIT LOCATION (PREVIOUS INVESTIGATION, PG3607, 2015)
- TP = TEST PIT LOCATION (PREVIOUS INVESTIGATION, G91114, 2003)
- SA = SEIVE ANALYSIS SAMPLE LOCATION PREVIOUS INVESTIGATION
- = GRASS
- X—X—X = FENCE LINE
- = LANDSCAPING
- = FIRE ROUTE
- (NP) = NO PARKING - FIRE ROUTE SIGN
- = HEAVY DUTY ASPHALT
- = LIGHT DUTY ASPHALT

GENERAL SITE PLAN NOTES

1. OBC 3.2.5.5.(1) LOCATION OF ACCESS ROUTES

   ACCESS ROUTES REQUIRED BY ARTICLE 3.2.5.4 SHALL BE LOCATED SO THAT THE PRINCIPLE ENTRANCE AND EVERY ACCESS OPENING REQUIRED BY ARTICLE 3.2.5.1 AND 3.2.5.2. ARE LOCATED NOT LESS THAN 3M AND NOT MORE THAN 15M FROM THE CLOSEST PORTION OF THE ACCESS ROUTE REQUIRED FOR FIRE DEPARTMENT USE, MEASURED HORIZONTALLY FROM THE FACE OF THE BUILDING.

2. OBC 3.2.5.6.(1) ACCESS ROUTE DESIGN

   A PORTION OF A ROADWAY OR YARD PROVIDED AS A REQUIRED ACCESS ROUTE FOR FIRE DEPARTMENT USE SHALL, (a) HAVE A CLEAR WIDTH OF NOT LESS THAN 6M, UNLESS IT CAN BE SHOWN THAT LESSER WIDTHS ARE SATISFACTORY, (b) HAVE A CENTERLINE RADIUS NOT LESS THEN 12M, (c) HAVE AN OVERHEAD CLEARANCE OF NOT LESS THAN 5M, (d) HAVE A CHANGE OF GRADIENT NOT MORE THAN 1 IN 12.5 OVER A MINIMUM DISTANCE OF 15M, (e) BE DESIGNED TO SUPPORT THE EXPECTED LOADS IMPOSED BY FIRE FIGHTING EQUIPMENT AND BE SURFACED WITH CONCRETE ASPHALT OR OTHER MATERIAL DESIGNED TO PERMIT ACCESSIBILITY UNDER ALL CLIMATIC CONDITIONS.

3. PROVIDE 75mm THK HI-40 UNDER ALL EXTERIOR CONCRETE SIDEWALK AT ALL ENTRANCES/EXITS. EXTEND RIGID INSULATION MIN 1220 PAST THE EDGE OF CONCRETE SIDEWALKS.

4. FOR CONCRETE SIDEWALK EXPANSION AND CONTRACTION JOINTS, REFER TO CIVIL DETAIL AND SPECIFICATIONS.

5. REFER TO LANDSCAPING PLAN AND CIVIL PLANS FOR LOCATION OF SOD. ALL REMAINING AREAS NOT SLATED FOR SOD TO RECEIVE TOPSOIL AND SEED.

6. REFER TO CIVIL DRAWINGS FOR LOCATIONS OF FIRE ROUTE SIGNAGE.

7. REFER TO CIVIL DRAWINGS FOR TACTILE INDICATORS.

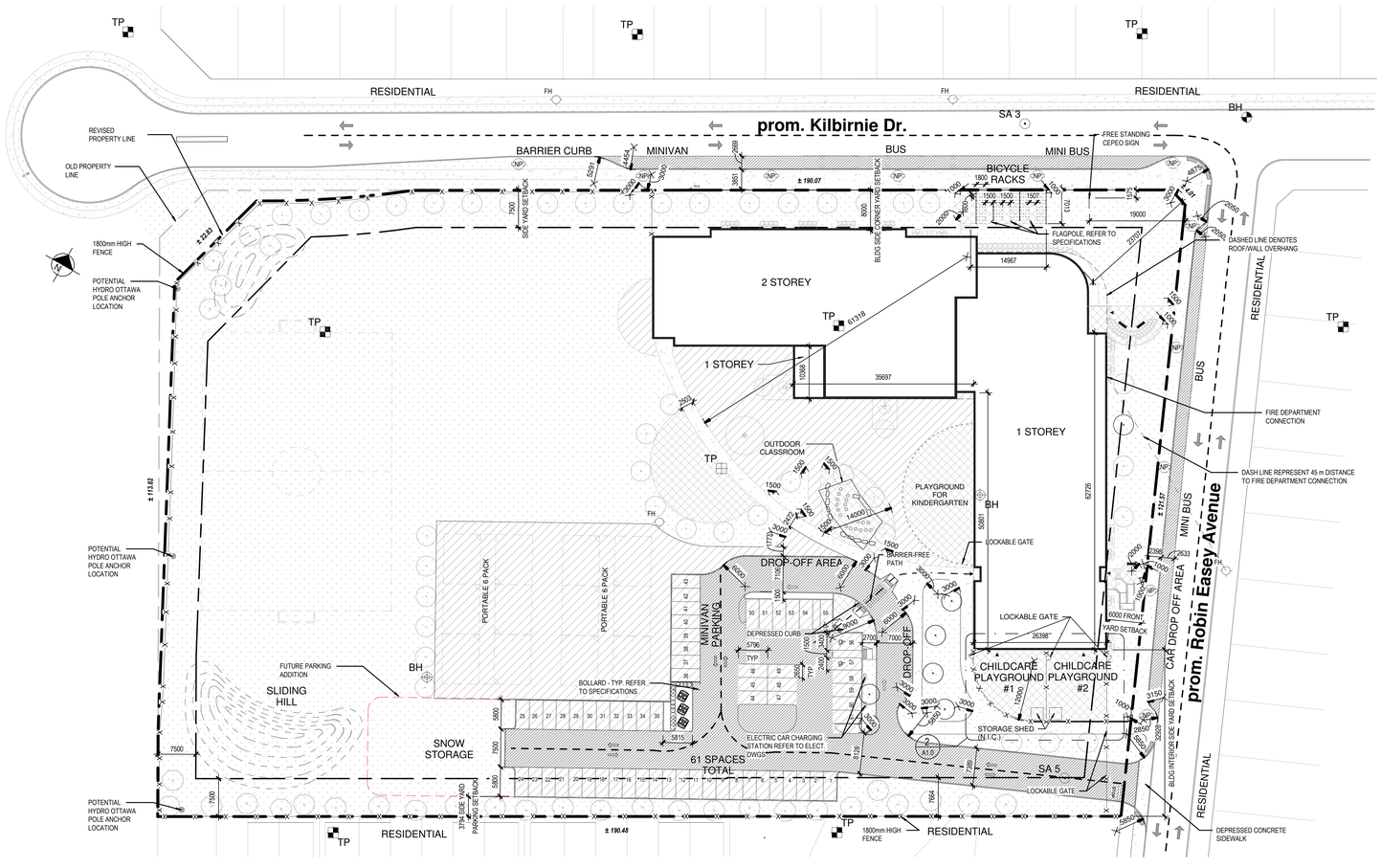
8. ALL CURBS ADJACENT TO PARKING AREAS AND CURBS FORMING PART OF SIDWALKS ADJACENT TO PARKING AREAS TO BE PAINTED YELLOW.

9. ENSURE FINAL PLACEMENT OF FIRE DEPARTMENT CONNECTION IS NOT MORE THAN 45 m FROM THE NEAREST FIRE HYDRANT AS PER OBC 3.2.5.16. (2).

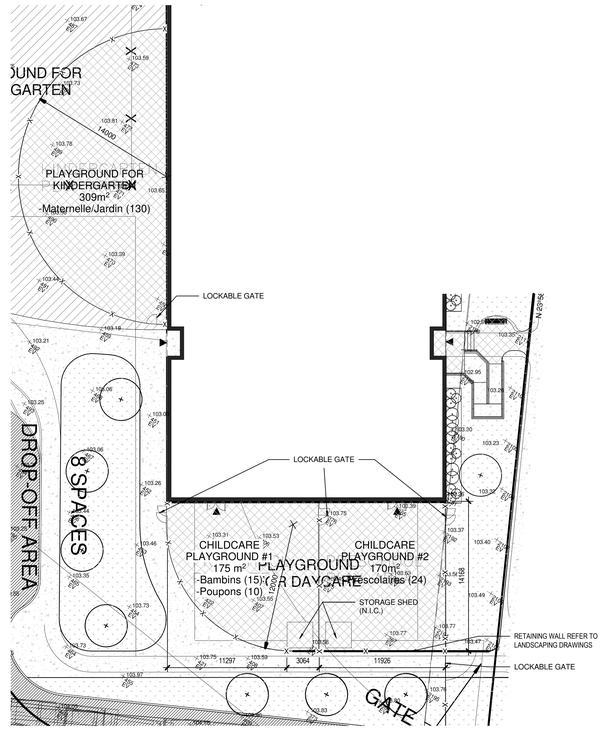
10. LEGAL SURVEY BOUNDARIES AND TOPOGRAPHICAL INFORMATION TAKEN FROM TOPOGRAPHICAL PLAN OF SURVEY, BLOCK 261, REGISTERED PLAN 4M-1656, DATED JULY 16, 2021, FROM THE OFFICE OF ANNIS, O'SULLIVAN, VOLLEBEKK LTD.(OLS), JOB NO. 21607-21

SITE AND PARKING INFORMATION

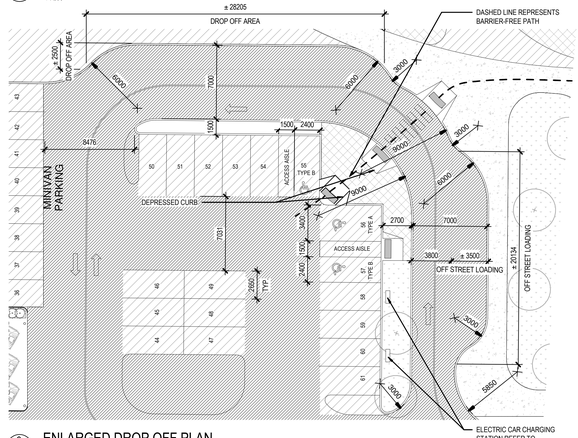
TYPE OF BUILDING OR USE				PARKING CALCULATION
SCHOOL (GROUP A-2 OCCUPANCY)				20 CLASSROOMS X 1.5 = 30 2 PER 100m² OF DAYCARE GROSS FLOOR AREA (360m²) = 7 12 PORTABLES X 1.5 = 18 **TOTAL PARKING REQUIRED = 55** **TOTAL PARKING PROVIDED = 58** BARRIER-FREE PARKING SPACES **REQUIRED** = 3 BARRIER-FREE PARKING SPACES **PROVIDED** = 3 **TOTAL PARKING PROVIDED = 61**
ZONING	**REQUIREMENT**	**PROPOSED**		**BUILDING AREA**
ZONING = I1A / R3YY - MINOR INSTITUTIONAL, SUBZONE A / RESIDENTIAL THIRD DENSITY, SUBZONE YY			FIRE TRUCK ACCESS ROUTE IS FROM COUNTY ROAD KILBIRNIE DRIVE AND SHALL CONFORM TO OBC 2012 - 3.2.5.4, 3.2.5.5 AND 3.2.5.6	THE GFA FOR THE SCHOOL IS AS FOLLOWS: FIRST FLOOR = 3,329 m² (EXCLUDING DAYCARE) DAYCARE = 360 m² TOTAL BUILDING FOOTPRINT = 3,689m² + SECOND FLOOR = 1,092 m² TOTAL AREA = 4,781 m²
MINIMUM LOT AREA: SEC. 170, TABLE 170A (b)	400m²	24, 306m²		**SITE AREA**
MINIMUM LOT FRONTAGE: SEC. 170, TABLE 170A (a)	15.0m	± 121.57m		SITE AREA = 24, 333m²
MINIMUM FRONT YARD: R3YY[2527] IN ACCORDANCE WITH SECTION 269(a)(i)	3.75m	6.0m		**PARCEL IDENTIFICATION NUMBER**
MINIMUM REAR YARD: SEC. 170, TABLE 170A (d)	7.5m	± 97.62m		PIN: 04592-2105,893m²
MINIMUM EXTERIOR SIDE YARD:	NO REQUIREMENT	-		
MINIMUM INTERIOR SIDE YARD: SEC. 170, TABLE 170A (e)	7.5m	32.76m		
MINIMUM CORNER SIDE YARD: SEC. 170, TABLE 170A (f)	4.5m	8.01m		
MINIMUM LANDSCAPED OPEN SPACE	NO REQUIREMENT	5.0% WITH PARKING LOT		
MAXIMUM LOT COVERAGE	NO REQUIREMENT	15.2% LOT COVERAGE		
PERCENTAGE OF TOTAL SITE OCCUPIED BY VEGETATION AND LANDSCAPING	NO REQUIREMENT	76% SITE OCCUPIED		
MAXIMUM BUILDING HEIGHT: SEC. 170, TABLE 170A (g)	15.0m	8.7m		
MINIMUM REQUIRED PARKING: SEC. 101, TABLE 101	1.5 PER CLASSROOM (w/ PORTABLES); DAYCARE - 2 PER 100 m2 OF GFA = 55	58		
MINIMUM REQ. WIDTH OF A LANDSCAPED BUFFER FOR PARKING LOT: SEC. 110, TABLE 110(a)	3.0m	3.1m		
MINIMUM NUMBER OF BARRIER-FREE PARKING SPACES: BY-LAW NO. 2017-301, SECTION 111	NO. OF REGULAR PARKING SPACES - MIN. NO. OF ACCESSIBLE PARKING SPACES - 51 - 75 SPACES: 3	3, INCLUDING: 1 TYPE A SPACE 2 TYPE B SPACES SEE CALCULATION ABOVE		
MINIMUM NUMBER OF BICYCLE PARKING SPACES: SEC. 111, TABLE 111A (d)	SCHOOL: 1 PER 100m² OF GFA OFFICE: 4421 /100 = 44.21 ROUNDED TO 45 DAY CARE: 1 PER 250m² OF GFA = 360 /250 = 1.44 ROUNDED TO 2 **TOTAL: 47**	50		
BICYCLE PARKING DIMENSIONS: SEC. 111, TABLE 11B	HORIZONTAL: 0.6m by 1.8m	HORIZONTAL: 0.6m by 1.8m		



1 A1.0 GENERAL SITE PLAN
1 : 400



2 A1.0 ENLARGED DAYCARE SITE PLAN
1 : 200



3 A1.0 ENLARGED DROP OFF PLAN
1 : 200

D07-12-22-0060
Plan #18739

ARCHITECTURE 49
1345 ROSEMOUNT AVENUE
CORNWALL, ONTARIO, CANADA K6J 3E5
PHONE: 613-933-5604 | FAX: 613-936-0335 | WWW.ARCHITECTURE49.COM

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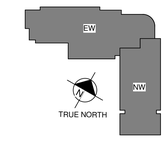
SEAL:

CLIENT:
Conseil des écoles publiques de l'Est de l'Ontario
2445 Boul. St- Laurent, Ottawa, ON, K1G 6C3. Tel: 613-742-8960 Toll-free: 1-888-33CEPEO

CLIENT REF. #:

PROJECT:
CENTRE ÉDUCATIF DE BARRHAVEN-MANOTICK
1045 ROBIN EASEY AVENUE, NEPEAN, ON, K2J 6S3

KEY PLAN:


ISSUED FOR - REVISION:

NO.	BY	DATE	DESCRIPTION
13		02 SEP 2022	UPDATED PER CITY COMMENTS
12		22 JUL 2022	SITE PLAN CONTROL
10		07 JUL 2022	ISSUED FOR SITE PLAN CONTROL
9		16 JUN 2022	A49 ADDENDUM 1
8		31 MAR 2022	ISSUED FOR SITE PLAN CONTROL
7		21 MAR 2022	ISSUED FOR BID AND PERMIT
6		14 JAN 2022	ISSUED FOR 99% CD REVIEW
5		19 NOV 2021	ISSUED FOR 85% CD REVIEW
3		24 SEP 2021	ISSUED FOR 60% CD REVIEW
2		27 AUG 2021	RE-ISSUED FOR 30% CD REVIEW
1		04 AUG 2021	30% CD REVIEW

PROJECT NO: 219-00014-01
DATE: SEP 2022
ORIGINAL SCALE: As indicated
DESIGNED BY: JC
DRAWN BY: NM/ SD/ AS
CHECKED BY: MHG
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE
25mm

DISCIPLINE: ARCHITECTURAL
TITLE: GENERAL SITE PLAN
SHEET NUMBER: A1.0
SHEET #: OF
ISSUE: SPA & PERMIT
SEV.#: 13
DATE OF: 2 SEP 2022

BIM 360:/219-00014-01 - OEPEO Schools - Barrhaven - R21/Barrhaven Arch Site_R21.rvt
9/6/2022 9:49:05 AM

APPENDIX

C TRANS O-D SURVEY

South Nepean

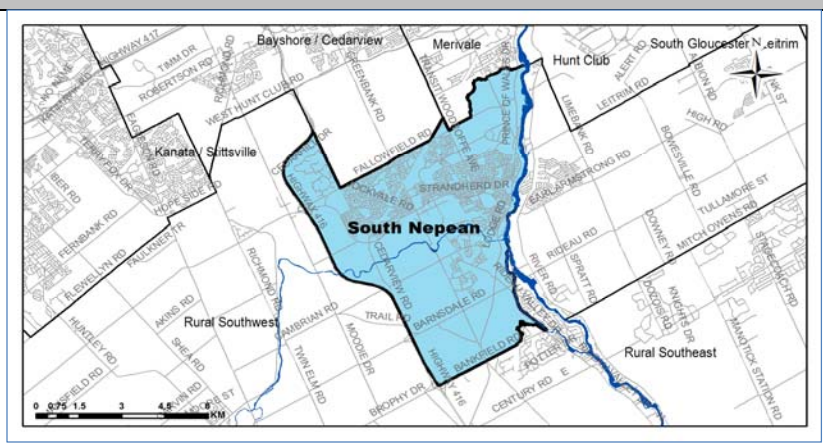
Demographic Characteristics

Population	72,750	Actively Travelled	57,830
Employed Population	35,540	Number of Vehicles	44,130
Households	26,260	Area (km^2)	54.8

Occupation Status (age 5+)	Male	Female	Total
Full Time Employed	17,630	14,730	32,350
Part Time Employed	620	2,570	3,190
Student	9,910	9,420	19,340
Retiree	3,420	4,200	7,620
Unemployed	720	500	1,220
Homemaker	180	2,390	2,570
Other	270	540	810
Total:	32,750	34,350	67,100

Traveller Characteristics	Male	Female	Total
Transit Pass Holders	5,590	6,100	11,700
Licensed Drivers	24,480	25,260	49,740
Telecommuters	60	310	370
Trips made by residents	88,180	97,380	185,550

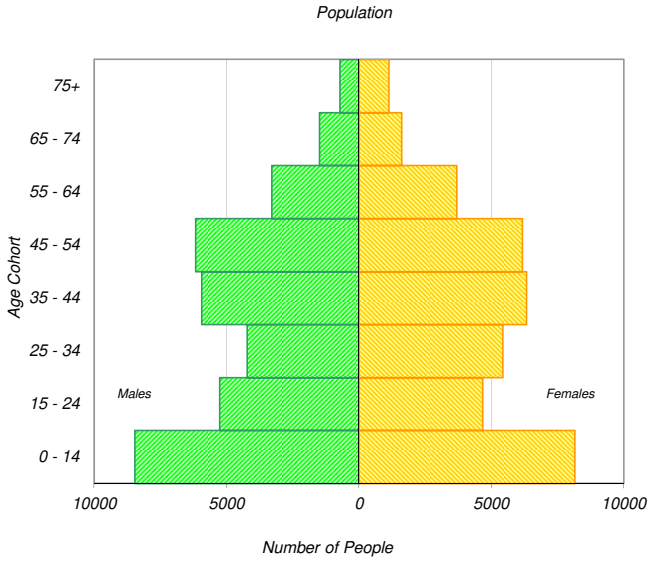
Selected Indicators	
Daily Trips per Person (age 5+)	2.77
Vehicles per Person	0.61
Number of Persons per Household	2.77
Daily Trips per Household	7.07
Vehicles per Household	1.68
Workers per Household	1.35
Population Density (Pop/km2)	1330

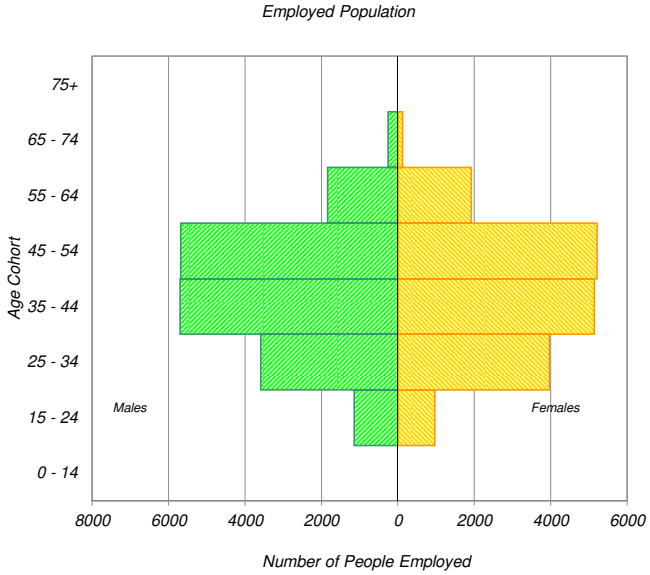


Household Size		
1 person	3,560	14%
2 persons	7,300	28%
3 persons	5,500	21%
4 persons	6,320	24%
5+ persons	3,590	14%
Total:	26,260	100%

Households by Vehicle Availability		
0 vehicles	810	3%
1 vehicle	9,500	36%
2 vehicles	13,800	53%
3 vehicles	1,730	7%
4+ vehicles	410	2%
Total:	26,260	100%

Households by Dwelling Type		
Single-detached	14,530	55%
Semi-detached	3,090	12%
Townhouse	7,770	30%
Apartment/Condo	870	3%
Total:	26,260	100%



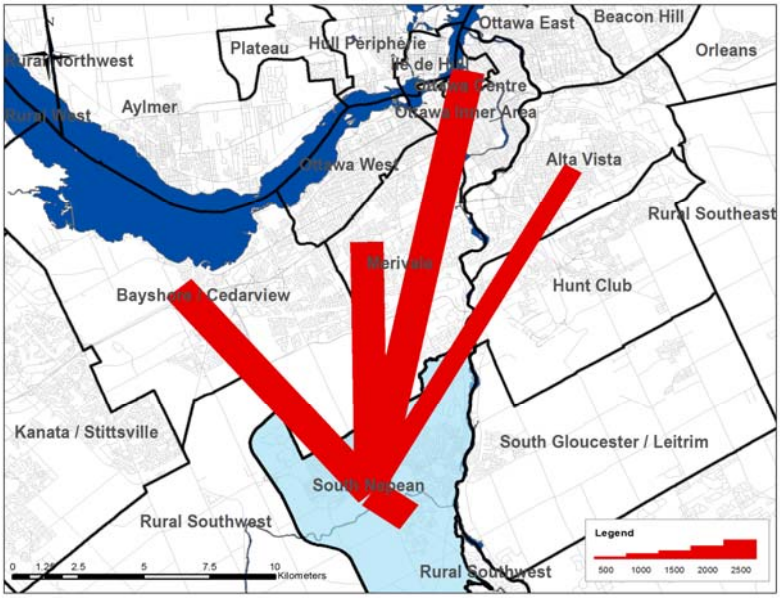


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from South Nepean

AM Peak Period



Summary of Trips to and from South Nepean

AM Peak Period (6:30 - 8:59)	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Districts				
Ottawa Centre	3,820	9%	30	0%
Ottawa Inner Area	2,270	5%	340	1%
Ottawa East	630	2%	50	0%
Beacon Hill	370	1%	50	0%
Alta Vista	2,360	6%	460	2%
Hunt Club	920	2%	440	2%
Merivale	4,310	10%	790	3%
Ottawa West	1,830	4%	160	1%
Bayshore / Cedarview	3,230	8%	700	3%
Orléans	330	1%	200	1%
Rural East	20	0%	60	0%
Rural Southeast	250	1%	580	2%
South Gloucester / Leitrim	100	0%	310	1%
South Nepean	17,260	42%	17,260	74%
Rural Southwest	580	1%	970	4%
Kanata / Stittsvile	1,800	4%	690	3%
Rural West	80	0%	30	0%
Île de Hull	840	2%	50	0%
Hull Périphérie	260	1%	40	0%
Plateau	0	0%	40	0%
Aylmer	60	0%	40	0%
Rural Northwest	40	0%	40	0%
Pointe Gatineau	0	0%	0	0%
Gatineau Est	0	0%	20	0%
Rural Northeast	10	0%	20	0%
Buckingham / Masson-Angers	20	0%	0	0%
Ontario Sub-Total:	40,160	97%	23,120	99%
Québec Sub-Total:	1,230	3%	250	1%
Total:	41,390	100%	23,370	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	25,640	41%	5,290	8%	4,680	6%
School	5,310	8%	1,430	2%	10,610	13%
Shopping	4,940	8%	4,220	7%	12,840	16%
Leisure	6,960	11%	4,020	6%	5,760	7%
Medical	1,720	3%	900	1%	840	1%
Pick-up / drive passenger	4,040	6%	3,920	6%	7,530	9%
Return Home	11,460	18%	40,960	65%	34,630	43%
Other	2,640	4%	2,090	3%	3,020	4%
Total:	62,710	100%	62,830	100%	79,910	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	18,160	75%	2,890	47%	2,120	12%
School	3,280	14%	1,170	19%	9,180	53%
Shopping	180	1%	70	1%	720	4%
Leisure	350	1%	230	4%	220	1%
Medical	400	2%	60	1%	100	1%
Pick-up / drive passenger	1,060	4%	770	13%	2,860	17%
Return Home	210	1%	640	10%	1,070	6%
Other	520	2%	290	5%	990	6%
Total:	24,160	100%	6,120	100%	17,260	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	410	5%	290	1%	410	2%
School	250	3%	0	0%	50	0%
Shopping	900	11%	1,090	5%	2,090	11%
Leisure	1,420	17%	790	3%	1,840	10%
Medical	190	2%	230	1%	90	0%
Pick-up / drive passenger	820	10%	1,700	7%	1,610	9%
Return Home	3,800	47%	18,990	81%	11,810	64%
Other	360	4%	490	2%	540	3%
Total:	8,150	100%	23,580	100%	18,440	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	205,450		39%
AM Peak Period	47,540	23%	36%
PM Peak Period	50,170	24%	37%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	41,340	66%	41,280	66%	39,110	49%
Auto Passenger	9,400	15%	10,030	16%	15,320	19%
Transit	9,990	16%	9,520	15%	2,260	3%
Bicycle	310	0%	320	1%	960	1%
Walk	80	0%	170	0%	13,060	16%
Other	1,600	3%	1,520	2%	9,210	12%
Total:	62,720	100%	62,840	100%	79,920	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	14,570	60%	4,360	71%	5,800	34%
Auto Passenger	1,930	8%	780	13%	3,210	19%
Transit	6,610	27%	330	5%	730	4%
Bicycle	80	0%	50	1%	320	2%
Walk	20	0%	10	0%	3,000	17%
Other	930	4%	590	10%	4,200	24%
Total:	24,140	100%	6,120	100%	17,260	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	5,840	72%	14,640	62%	8,420	46%
Auto Passenger	1,730	21%	2,680	11%	3,930	21%
Transit	350	4%	5,770	24%	650	4%
Bicycle	80	1%	110	0%	150	1%
Walk	30	0%	0	0%	3,680	20%
Other	100	1%	380	2%	1,590	9%
Total:	8,130	100%	23,580	100%	18,420	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.23	1.24	1.39
AM Peak Period	1.13	1.18	1.55
PM Peak Period	1.30	1.18	1.47

Transit Modal Split	From District	To District	Within District
24 Hours	16%	16%	4%
AM Peak Period	29%	6%	7%
PM Peak Period	4%	25%	5%

APPENDIX

D RELATED TIA EXCERPTS

Figure 6: 2022 Background Traffic

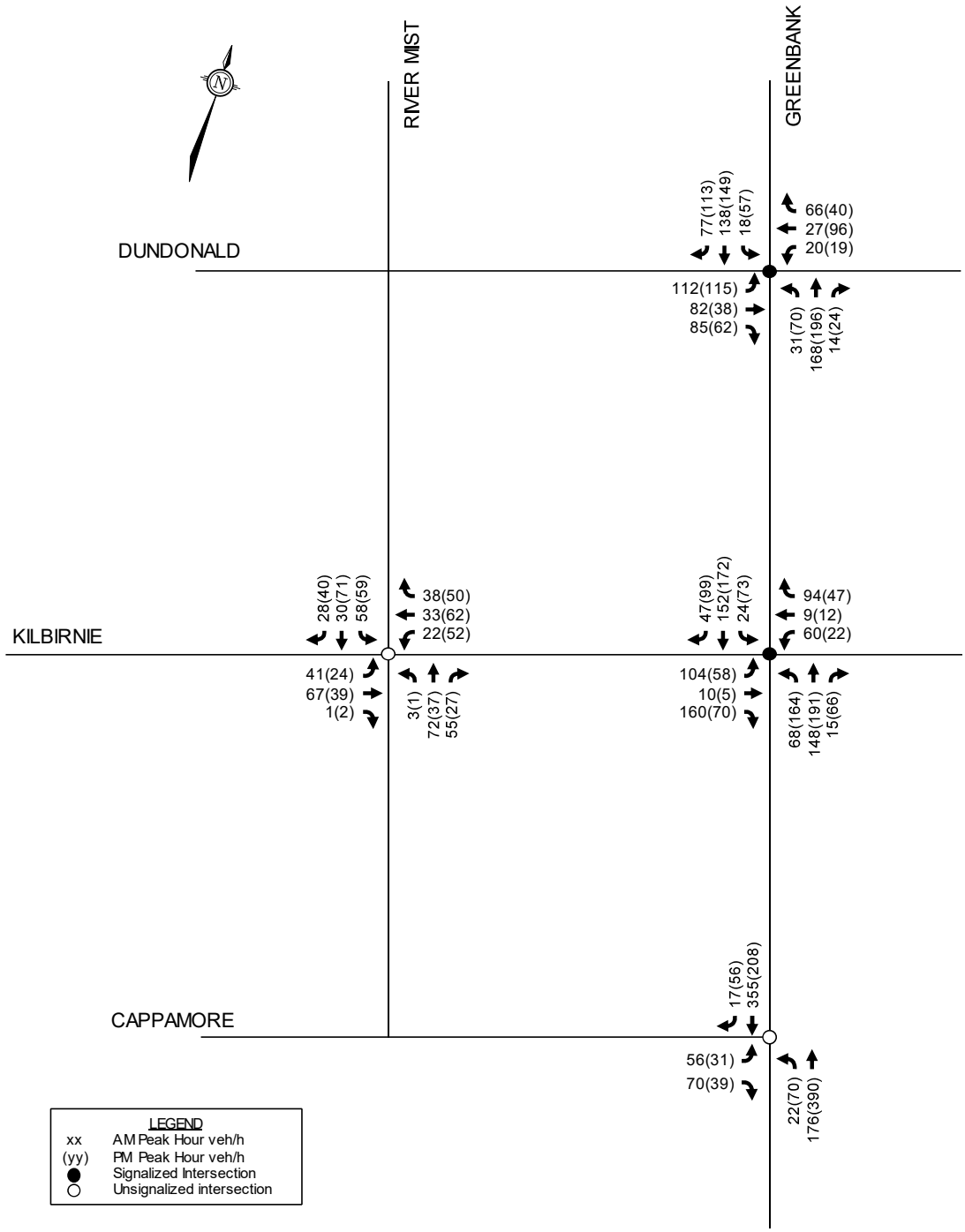


Figure 7: 2027 Background Traffic

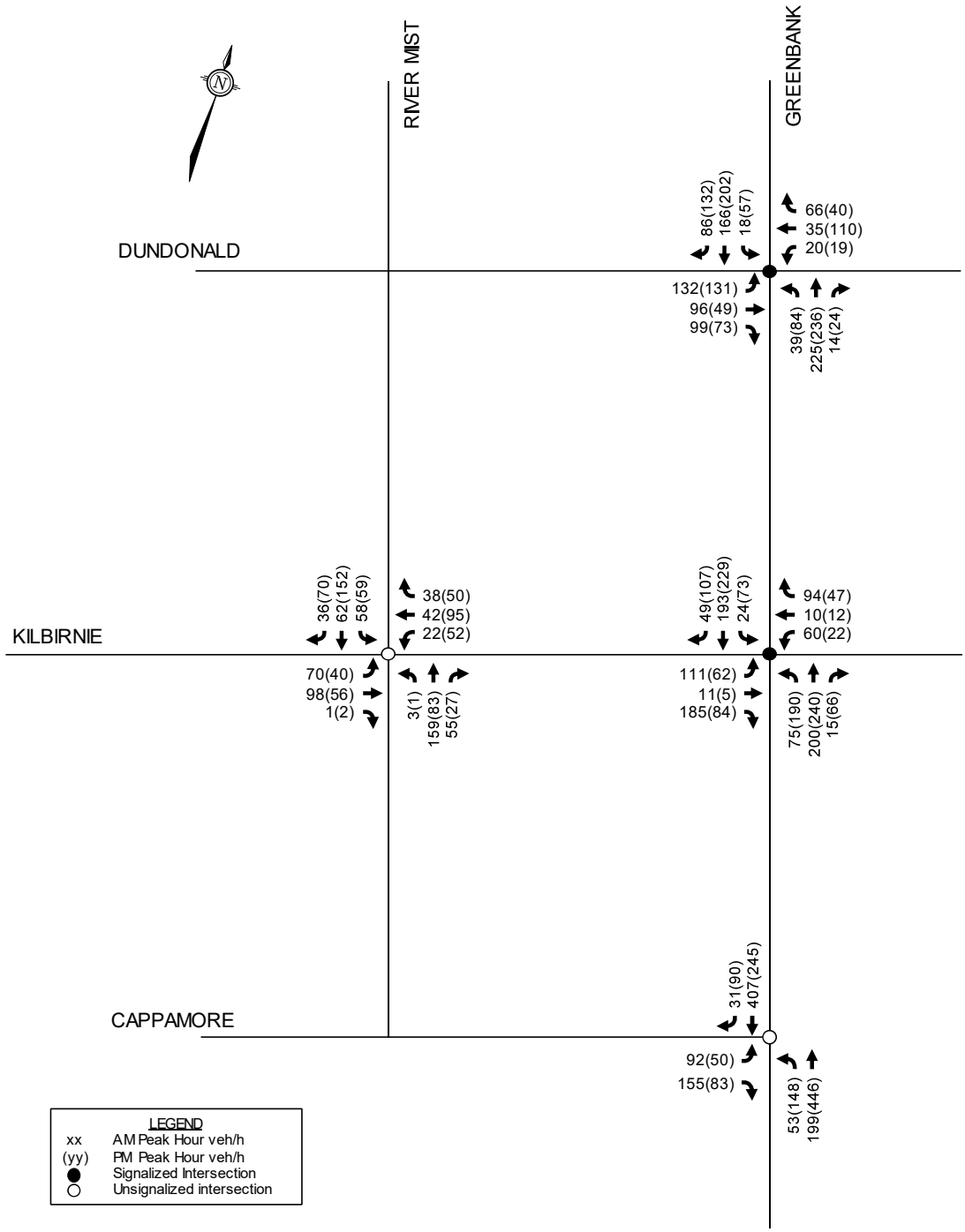


Figure 8: 2022 Total Traffic

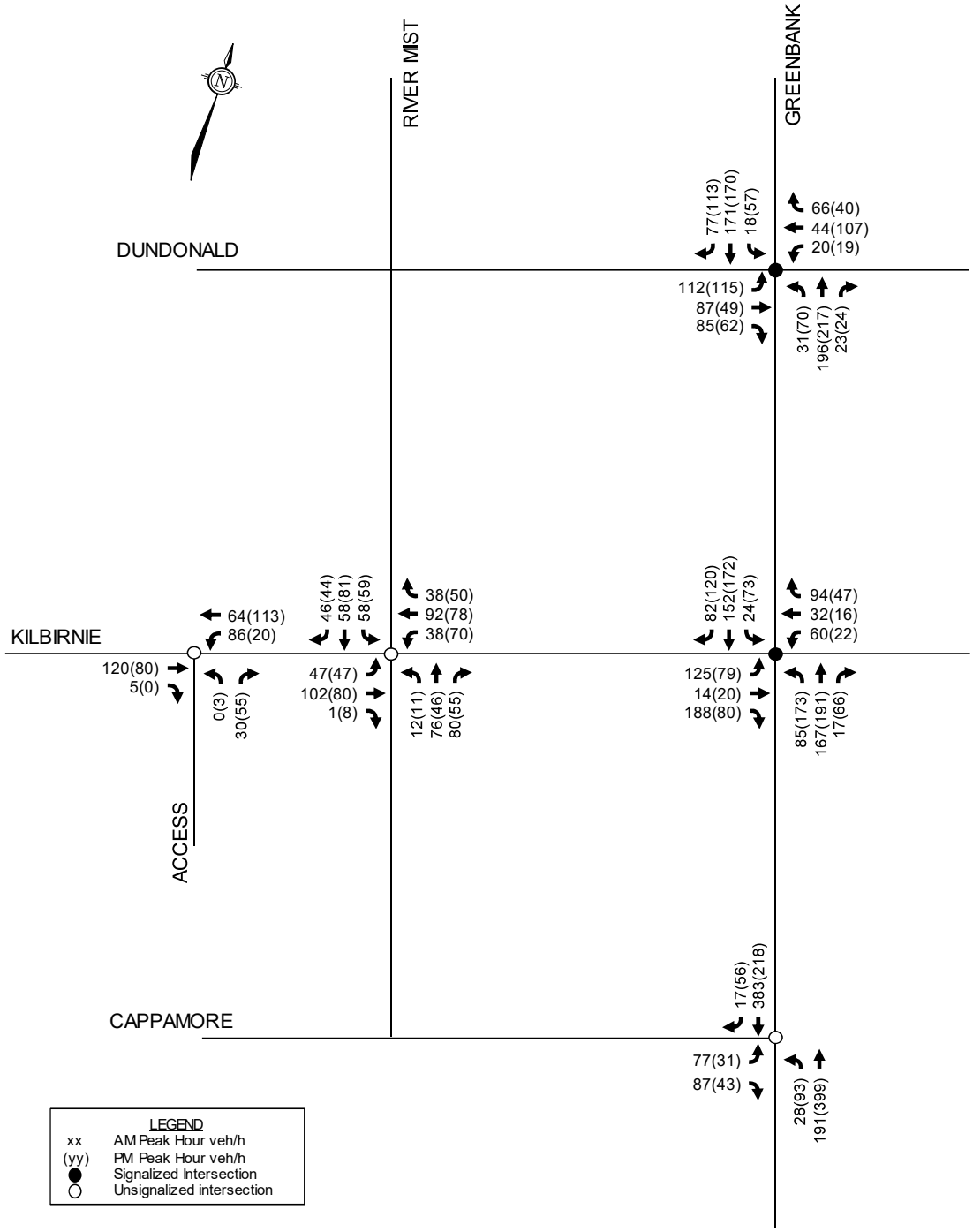
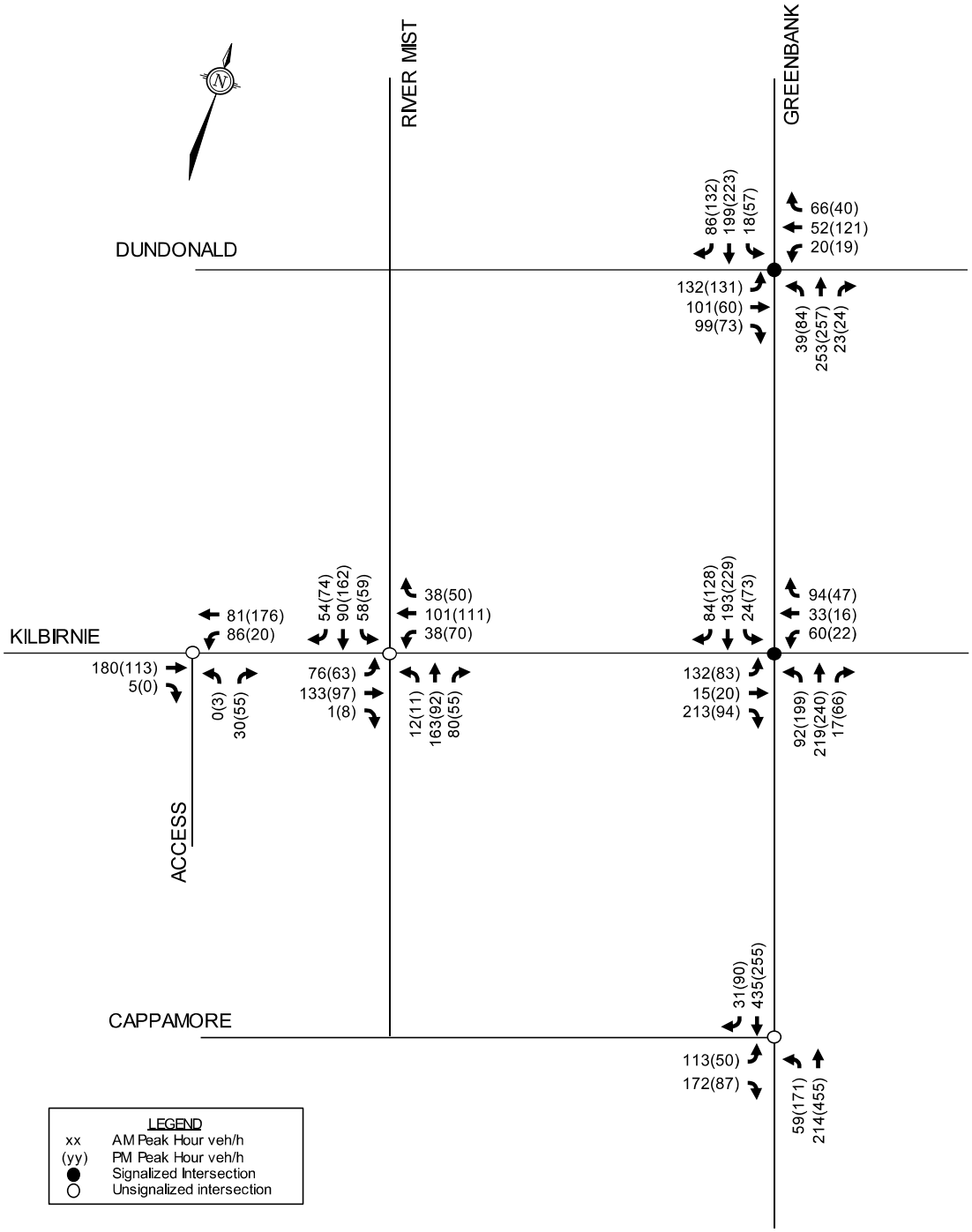


Figure 9: 2027 Total Traffic



APPENDIX

E TDM CHECKLISTS

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

Legend

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

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☑ Bus Stops #2807 and #2808 are located within 400m of site.
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

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

		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)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☑
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐ N/A
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐ N/A
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

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

		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	☐ Parking meets zoning requirements
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐ N/A
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐ N/A
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐ N/A
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐ N/A
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐ N/A

TDM Measures Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

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

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

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

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

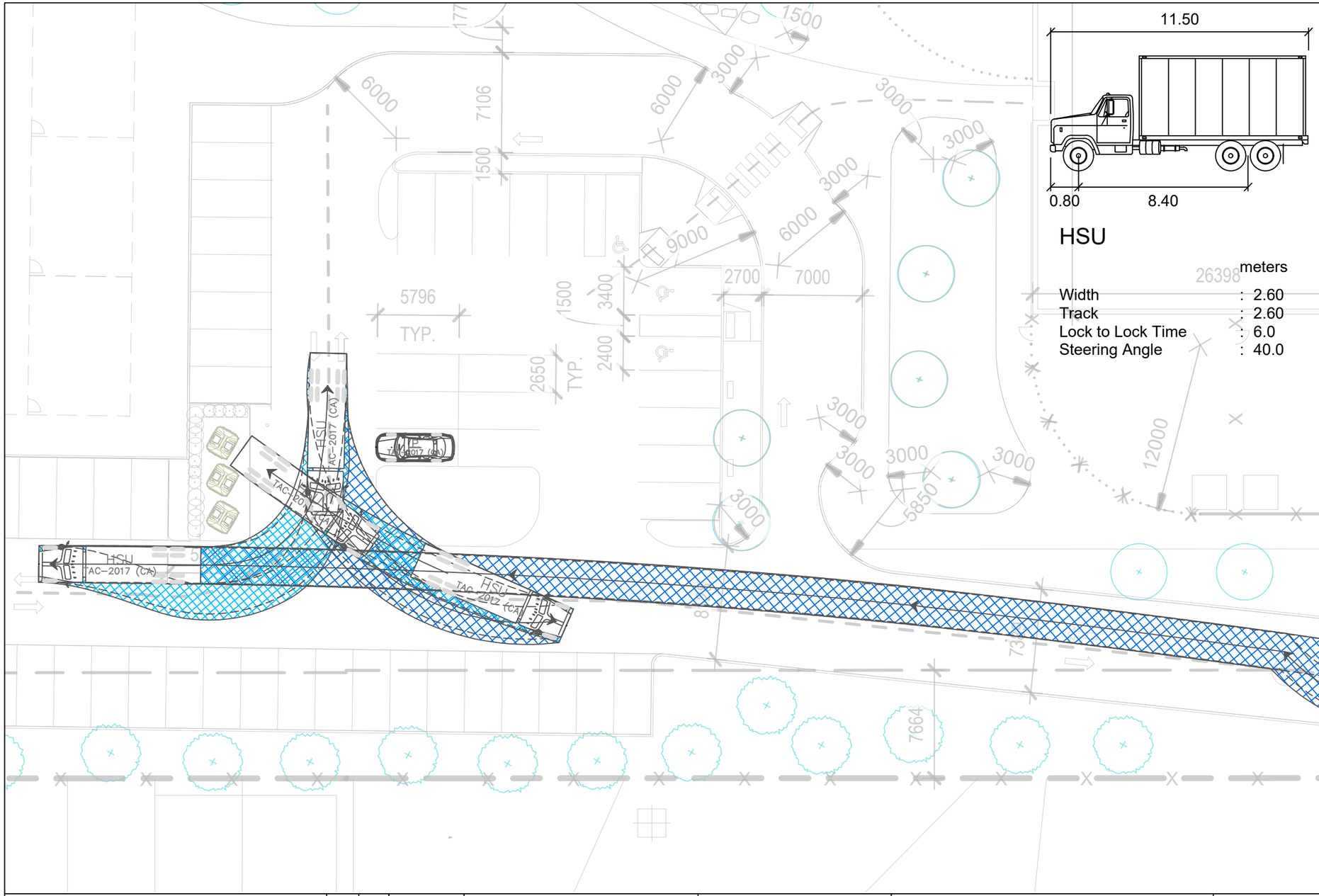
			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances	☑
BASIC		3.1.2	Provide online links to OC Transpo and STO information	☐
BETTER		3.1.3	Provide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

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

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

APPENDIX

F AUTOTURN SWEPT PATHS



HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

wsp

2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 613-829-2800 | WWW.WSP.COM

IS.	RV.	DATE	DESCRIPTION

SEAL:

CLIENT: Conseil des écoles publiques de l'Est de l'Ontario

CLIENT REF. #: --

PROJECT: ÉCOLE BARRHAVEN SUD

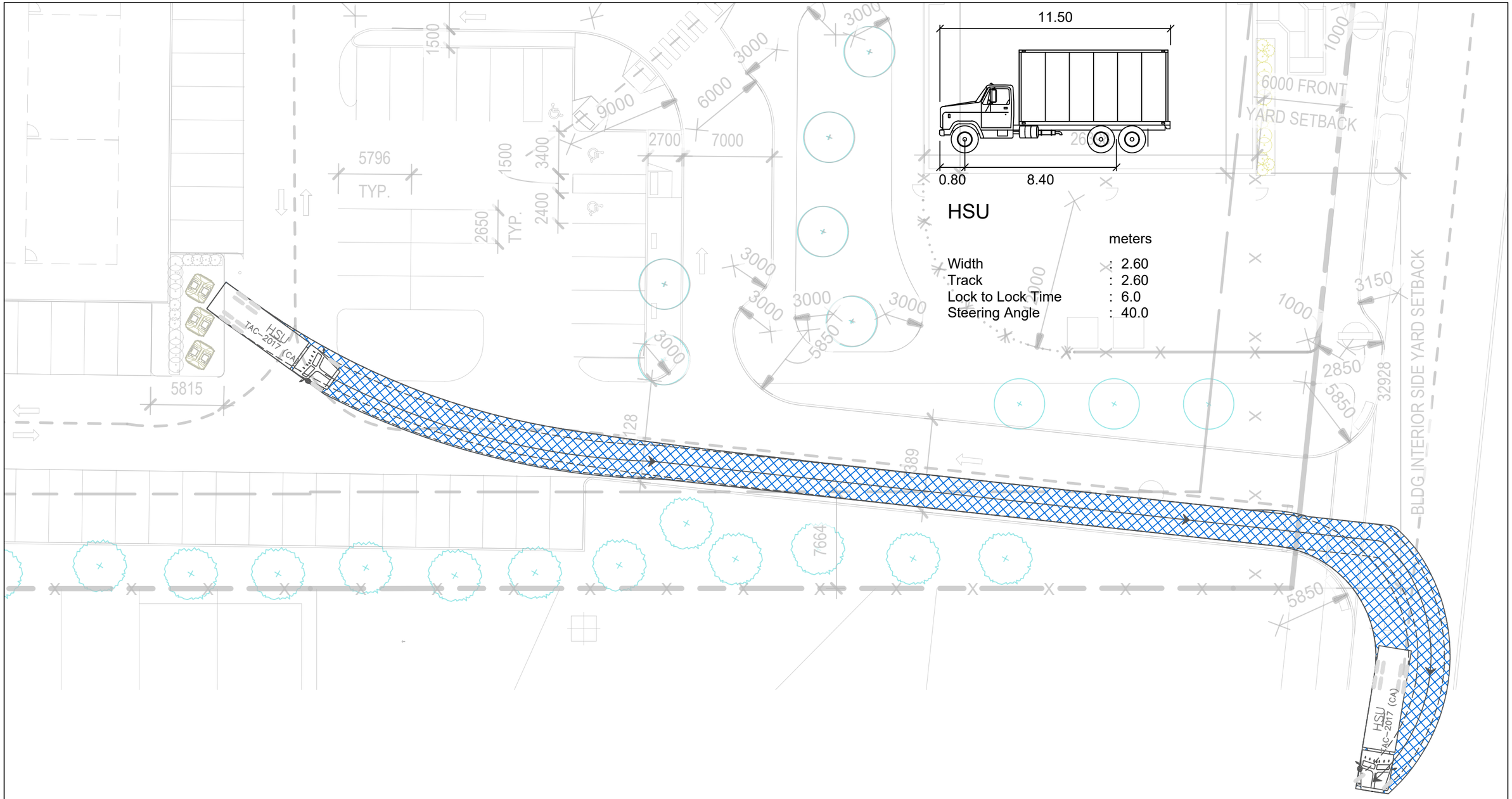
PROJECT NO: 219-00014-01	DATE / DATE: 2022-09-09
DESIGNED BY: NS/NT	
DRAWN BY: NS	
CHECKED BY: AH	
DRAWING NO: 01	SCALE: 1:300

TITLE: **TURNING MOVEMENT GARBAGE TRUCK INBOUND**

DISCIPLINE: **TRANSPORTATION PLANNING**

ISSUE:	RV. #
--	3
DATE OF: 2022-09-09	

Ansi B-SCE, C:\Users\CANS077424\OneDrive - WSP O365_Projects\219-00014-00 01 CEPEO Kanata & Barrhaven\219-00014-01 Barrhaven AutoTurn Analysis.dwg, 2022-09-09 1:31:11 PM



2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 613-829-2800 | WWW.WSP.COM

IS.	RV.	DATE	DESCRIPTION

SEAL:

CLIENT: Conseil des écoles publiques de l'Est de l'Ontario

CLIENT REF. #: --

PROJECT: **ÉCOLE BARRHAVEN SUD**

PROJECT NO: 219-00014-01	DATE / DATE: 2022-09-09
DESIGNED BY: NS/NT	
DRAWN BY: NS	
CHECKED BY: AH	
DRAWING NO: 02	SCALE: 1:300

TITLE: **TURNING MOVEMENT GARBAGE TRUCK OUTBOUND**

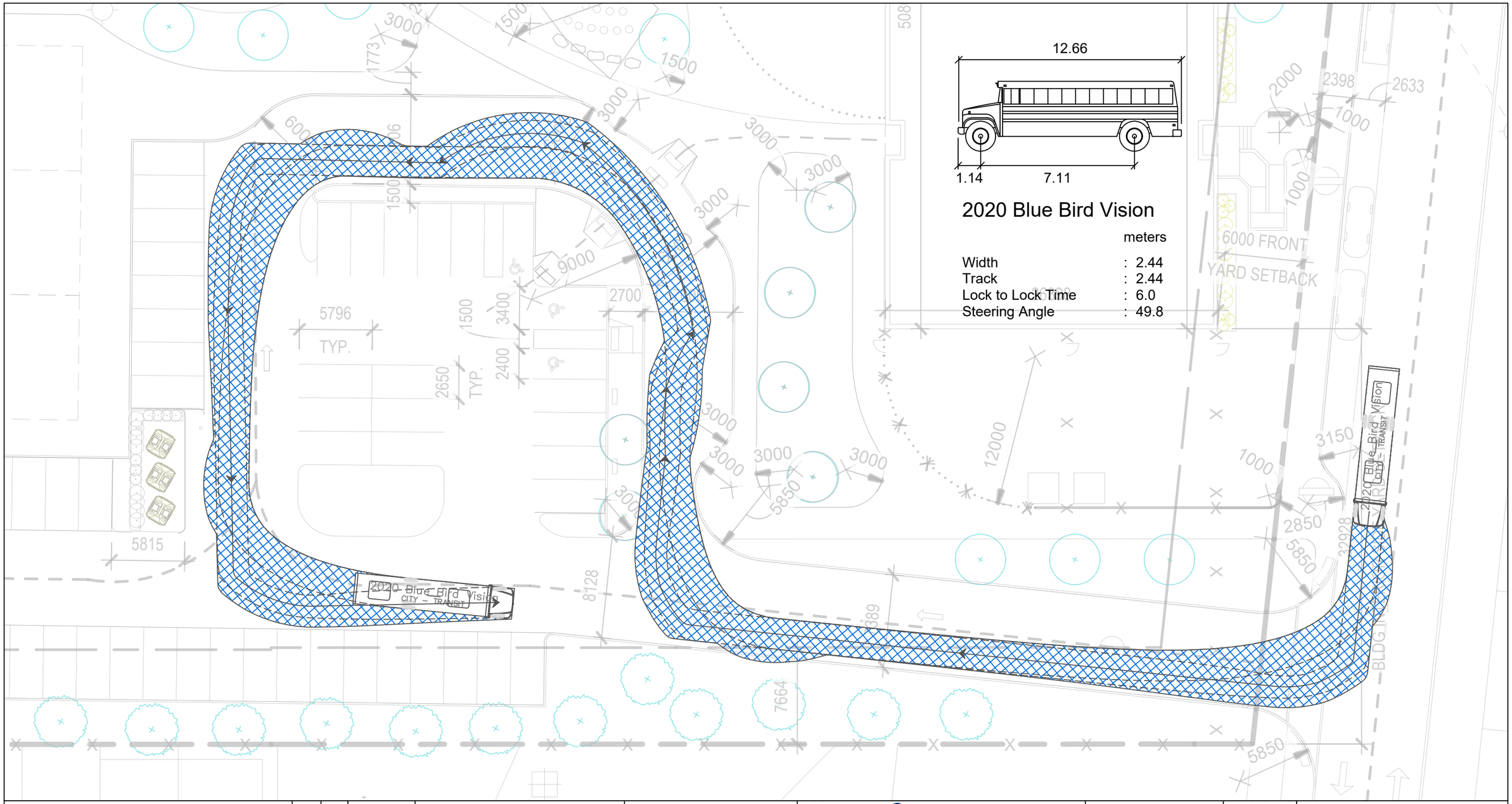
DISCIPLINE: **TRANSPORTATION PLANNING**

ISSUE: --

DATE OF: **2022-09-09**

RV. # **3**

Ansi B-SCE, C:\Users\CANS077424\OneDrive - WSP O365_Projects\219-00014-00 01 CEPEO Kanata & Barrhaven\219-00014-01 Barrhaven AutoTurn Analysis.dwg, 2022-09-09 1:31:11 PM



2611 QUEENSVIEW DRIVE
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TEL.: 613-829-2800 | WWW.WSP.COM

IS.	RV.	DATE	DESCRIPTION

SEAL:

CLIENT: Conseil des écoles publiques de l'Est de l'Ontario

CLIENT REF. #: --

PROJECT: ÉCOLE BARRHAVEN SUD

PROJECT NO: 219-00014-01	DATE / DATE: 2022-09-09
DESIGNED BY: NS/NT	
DRAWN BY: NS	
CHECKED BY: AH	
DRAWING NO: 03	SCALE: 1:300

TITLE: TURNING MOVEMENT SCHOOL BUS

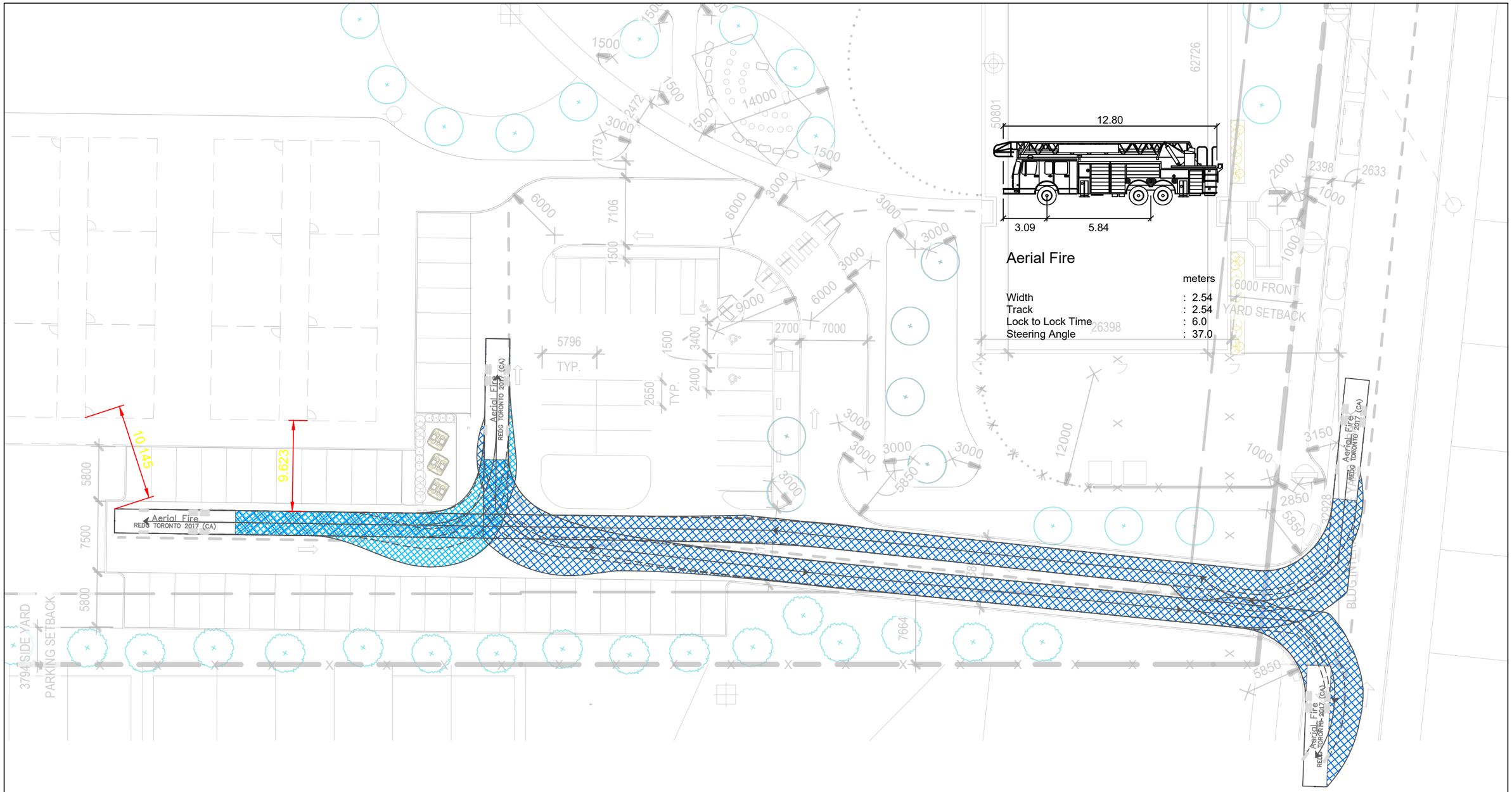
DISCIPLINE: TRANSPORTATION PLANNING

ISSUE: --

RV. # 3

DATE OF: 2022-09-09

Ansi B-SCE, C:\Users\CANS077424\OneDrive - WSP O365_Projects\219-00014-00 01 CEPEO Kanata & Barrhaven\219-00014-01 Barrhaven AutoTurn Analysis.dwg, 2022-09-09 1:31:11 PM



2611 QUEENSVIEW DRIVE
OTTAWA ONTARIO CANADA K2B 8K2
TEL.: 613-829-2800 | WWW.WSP.COM

IS.	RV.	DATE	DESCRIPTION

SEAL:

CLIENT: Conseil des écoles publiques de l'Est de l'Ontario

CLIENT REF. #: --

PROJECT: **ÉCOLE BARRHAVEN SUD**

PROJECT NO: 219-00014-01	DATE / DATE: 2022-09-09
DESIGNED BY: NS/NT	
DRAWN BY: NS	
CHECKED BY: AH	
DRAWING NO: 04	SCALE: 1:300

TITLE: **TURNING MOVEMENT FIRE TRUCK**

DISCIPLINE: **TRANSPORTATION PLANNING**

ISSUE: --

DATE OF: **2022-09-09**

RV. # **3**

Ansi B-SCE, C:\Users\CANS077424\OneDrive - WSP O365_Projects\219-00014-00 01 CEPEO Kanata & Barrhaven\219-00014-01 Barrhaven AutoTurn Analysis.dwg, 2022-09-09 1:31:11 PM

APPENDIX

G MMLOS SHEETS

Multi-Modal Level of Service - Segments Form

Consultant	**WSP Canada Inc.**	**Project**	**219-00014-01**
Scenario	**2023 Future Background AM/PM**	**Date**	**2022-05-16**
Comments	**Boundary Streets - Kilbirnie Drive**		

SEGMENTS		**Kilbirnie Dr.**	Robin Easey Ave to Alex Polowin Ave		Alex Polowin Ave to River Mist Rd		River Mist Rd to Belleek Ln		Belleek Ln to Breakstone Rd		Breakstone Rd to Greenbank Rd		Section	Section
			EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	11	12
Pedestrian	Sidewalk Width Boulevard Width		≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5	≥ 2 m < 0.5		
	Avg Daily Curb Lane Traffic Volume		≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000	≤ 3000		
	Operating Speed On-Street Parking		> 30 to 50 km/h yes	> 30 to 50 km/h yes	> 30 to 50 km/h yes	> 30 to 50 km/h yes	> 30 to 50 km/h yes	> 30 to 50 km/h no	> 30 to 50 km/h yes	> 30 to 50 km/h no	> 30 to 50 km/h yes	> 30 to 50 km/h no		
	Exposure to Traffic PLoS	**B**	B	B	B	B	B	B	B	B	B	B	-	-
	Effective Sidewalk Width		2.0 m	2.0 m	2.0 m	2.0 m	2.0 m	2.0 m	2.0 m	2.0 m	2.0 m	2.0 m		
	Pedestrian Volume		250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr	250 ped/hr		
	Crowding PLoS		B	B	B	B	B	B	B	B	B	B	-	-
	Level of Service		**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**-**	**-**
Bicycle	Type of Cycling Facility		Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic		
	Number of Travel Lanes		≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)		
	Operating Speed		>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h	>40 to <50 km/h		
	# of Lanes & Operating Speed LoS		B	B	B	B	B	B	B	B	B	B	-	-
	Bike Lane (+ Parking Lane) Width													
	Bike Lane Width LoS	**B**	-	-	-	-	-	-	-	-	-	-	-	-
	Bike Lane Blockages													
	Blockage LoS		-	-	-	-	-	-	-	-	-	-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes		
	Sidestreet Operating Speed		≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h		
	Unsignalized Crossing - Lowest LoS		A	A	A	A	A	A	A	A	A	A	-	-
	Level of Service		**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**-**	**-**
Transit	Facility Type		Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic		
	Friction or Ratio Transit:Posted Speed						Vt/Vp ≤ 0.6	Vt/Vp ≤ 0.6	Vt/Vp ≤ 0.6	Vt/Vp ≤ 0.6	Vt/Vp ≤ 0.6	Vt/Vp ≤ 0.6		
	Level of Service	**E**	-	-	-	-	**E**	**E**	**E**	**E**	**E**	**E**	-	-
Truck	Truck Lane Width													
	Travel Lanes per Direction													
	Level of Service	**-**	-	-	-	-	-	-	-	-	-	-	-	-
Auto	**Level of Service**	**Not Applicable**												

Multi-Modal Level of Service - Segments Form

Consultant	**WSP Canada Inc.**	**Project**	**219-00014-01**
Scenario	**2023 Future Background AM/PM**	**Date**	**2022-05-16**
Comments	**Boundary Streets - Robin Easey Avenue**		

SEGMENTS		**Robine Easey Ave.**	Kilbirnie Dr to Proposed Site Access											
			NB	SB										
Pedestrian	Sidewalk Width Boulevard Width	**B**	≥ 2 m < 0.5	≥ 2 m < 0.5										
	Avg Daily Curb Lane Traffic Volume		≤ 3000	≤ 3000										
	Operating Speed On-Street Parking		> 30 to 50 km/h no	> 30 to 50 km/h yes										
	Exposure to Traffic PLoS		**B**	**B**	-	-	-	-	-	-	-	-	-	-
	Effective Sidewalk Width		2.0 m	2.0 m										
	Pedestrian Volume		250 ped/hr	250 ped/hr										
	Crowding PLoS		**B**	**B**	-	-	-	-	-	-	-	-	-	-
	Level of Service		**B**	**B**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Bicycle	Type of Cycling Facility	**B**	Mixed Traffic	Mixed Traffic										
	Number of Travel Lanes		≤ 2 (no centreline)	≤ 2 (no centreline)										
	Operating Speed		>40 to <50 km/h	>40 to <50 km/h										
	# of Lanes & Operating Speed LoS		**B**	**B**	-	-	-	-	-	-	-	-	-	-
	Bike Lane (+ Parking Lane) Width													
	Bike Lane Width LoS		-	-	-	-	-	-	-	-	-	-	-	-
	Bike Lane Blockages													
	Blockage LoS		-	-	-	-	-	-	-	-	-	-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge										
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes										
	Sidestreet Operating Speed		≤ 40 km/h	≤ 40 km/h										
	Unsignalized Crossing - Lowest LoS		**A**	**A**	-	-	-	-	-	-	-	-	-	-
	Level of Service		**B**	**B**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Transit	Facility Type	**-**												
	Friction or Ratio Transit:Posted Speed													
	Level of Service		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Truck	Truck Lane Width	**-**												
	Travel Lanes per Direction													
	Level of Service		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Auto	**Level of Service**	**Not Applicable**												

Multi-Modal Level of Service - Intersections Form

Consultant	WSP Canada Inc.	Project	219-00014-01
Scenario	AM Peak Hour	Date	2022-05-16
Comments	Existing, Future Background and Future Total		

To add intersections
Select columns LMNO, right-click and *Copy;*
Then select column P, right-click and *Insert Copied Cells*

INTERSECTIONS		Greenbank Road / Kilbirnie Drive (Existing 2020)				Greenbank Road / Kilbirnie Drive (Future Background 2023)				Greenbank Road / Kilbirnie Drive (Future Background 2028)				Greenbank Road / Kilbirnie Drive (Future Total 2023)				Greenbank Road / Kilbirnie Drive (Future Total 2028)			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	4	3	3	4	4	3	3	4	4	3	3	4	4	3	3	4	4	3	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**
	Ped. Exposure to Traffic LoS	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**
	Cycle Length	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
	Effective Walk Time	10	10	11	11	10	10	11	11	10	10	11	11	10	10	11	11	10	10	11	11
	Average Pedestrian Delay	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**
	Pedestrian Delay LoS	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
	Level of Service	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
		D				**D**				**D**				**D**				**D**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane		
	Dedicated Right Turning Speed	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h
	Cyclist Through Movement	**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**		
	Separated or Mixed Traffic	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**
	Left Turn Approach	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
	Left Turning Cyclist	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**
	Level of Service	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**
		E				**E**				**E**				**E**				**E**			
Transit	Average Signal Delay			≤ 20 sec	≤ 20 sec			≤ 20 sec	≤ 10 sec			≤ 20 sec	≤ 10 sec			≤ 20 sec	≤ 10 sec			≤ 20 sec	≤ 10 sec
	Level of Service	**-**	**-**	**C**	**C**	**-**	**-**	**C**	**B**	**-**	**-**	**C**	**B**	**-**	**-**	**C**	**B**	**-**	**-**	**C**	**B**
		C				**C**				**C**				**C**				**C**			
Truck	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Level of Service	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
		E				**E**				**E**				**E**				**E**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.0 - 0.60				0.0 - 0.60				0.0 - 0.60				0.0 - 0.60			
	Level of Service	**A**				**A**				**A**				**A**				**A**			

Multi-Modal Level of Service - Intersections Form

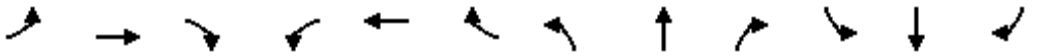
Consultant	WSP Canada Inc.	Project	219-00014-01
Scenario	PM Peak Hour	Date	2022-05-16
Comments	Existing, Future Background and Future Total		

To add intersections
Select columns LMNO, right-click and *Copy;*
Then select column P, right-click and *Insert Copied Cells*

INTERSECTIONS		Greenbank Road / Kilbirnie Drive (Existing 2020)				Greenbank Road / Kilbirnie Drive (Future Background 2023)				Greenbank Road / Kilbirnie Drive (Future Background 2028)				Greenbank Road / Kilbirnie Drive (Future Total 2023)				Greenbank Road / Kilbirnie Drive (Future Total 2028)			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	4	3	3	4	4	3	3	4	4	3	3	4	4	3	3	4	4	3	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Protected	Protected
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**	**53**	**53**	**78**	**78**
	Ped. Exposure to Traffic LoS	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**	**D**	**D**	**B**	**B**
	Cycle Length	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
	Effective Walk Time	10	10	11	11	10	10	11	11	10	10	11	11	10	10	11	11	10	10	11	11
	Average Pedestrian Delay	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**	**31**	**31**	**30**	**30**
	Pedestrian Delay LoS	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
	Level of Service	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
		D				**D**				**D**				**D**				**D**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Pocket Bike Lane	Mixed Traffic	Mixed Traffic
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane			Not Applicable	≤ 50 m Introduced right turn lane		
	Dedicated Right Turning Speed	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h
	Cyclist Through Movement	**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**			**Not Applicable**	**B**		
	Separated or Mixed Traffic	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**
	Left Turn Approach	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed	2-stage, LT box	1 lane crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
	Left Turning Cyclist	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**
	Level of Service	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**	**A**	**E**	**D**	**D**
		E				**E**				**E**				**E**				**E**			
Transit	Average Signal Delay			≤ 20 sec	≤ 20 sec			≤ 20 sec	≤ 20 sec			≤ 20 sec	≤ 20 sec			≤ 20 sec	≤ 20 sec			≤ 20 sec	≤ 20 sec
	Level of Service	**-**	**-**	**C**	**C**	**-**	**-**	**C**	**C**	**-**	**-**	**C**	**C**	**-**	**-**	**C**	**C**	**-**	**-**	**C**	**C**
		C				**C**				**C**				**C**				**C**			
Truck	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Level of Service	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
		E				**E**				**E**				**E**				**E**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.0 - 0.60				0.0 - 0.60				0.0 - 0.60				0.0 - 0.60			
	Level of Service	**A**				**A**				**A**				**A**				**A**			

APPENDIX

H SYNCHRO RESULTS

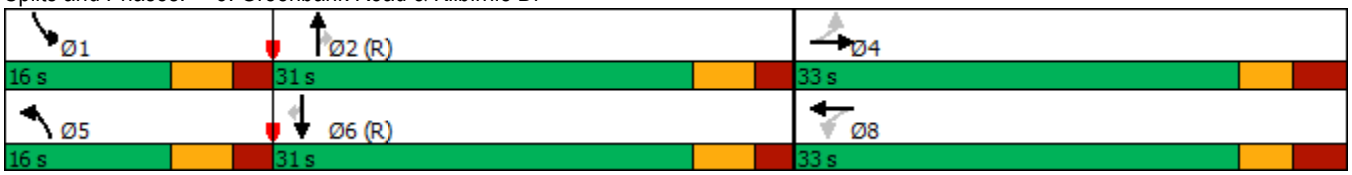


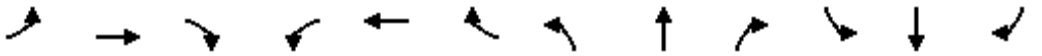
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	10	109	60	9	94	42	89	15	24	130	35
Future Volume (vph)	74	10	109	60	9	94	42	89	15	24	130	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	82	132	0	67	114	0	47	99	17	27	144	39
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.0	12.0		12.0	12.0		8.1	49.5	49.5	7.0	46.0	46.0
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.10	0.62	0.62	0.09	0.58	0.58
v/c Ratio	0.46	0.41		0.38	0.38		0.32	0.10	0.02	0.20	0.14	0.05
Control Delay	37.1	10.5		34.3	10.7		38.4	10.8	0.1	36.9	12.5	0.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	10.5		34.3	10.7		38.4	10.8	0.1	36.9	12.5	0.1
LOS	D	B		C	B		D	B	A	D	B	A
Approach Delay		20.7			19.4			17.6			13.3	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	12.4	1.6		10.0	1.4		7.1	4.1	0.0	4.1	11.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	22.0	14.0		18.5	13.1		16.8	20.7	0.0	11.6	29.4	0.0
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	393	556		389	537		184	1030	740	187	1014	782
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.24		0.17	0.21		0.26	0.10	0.02	0.14	0.14	0.05

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.46	
Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 50.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr



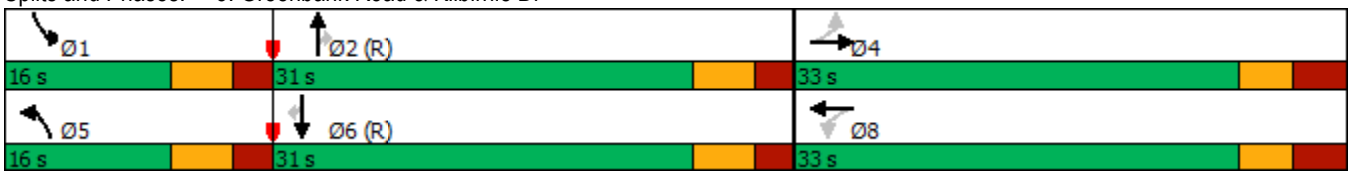


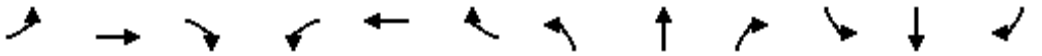
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	5	42	22	12	47	120	154	66	73	112	71
Future Volume (vph)	42	5	42	22	12	47	120	154	66	73	112	71
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	3					3	1		1	1		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	60%	8%	2%	59%	2%	2%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	53	0	24	65	0	133	171	73	81	124	79
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.5	10.5		10.5	10.5		11.4	47.6	47.6	9.1	41.6	41.6
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.14	0.60	0.60	0.11	0.52	0.52
v/c Ratio	0.28	0.24		0.14	0.29		0.56	0.16	0.08	0.42	0.13	0.09
Control Delay	33.0	12.5		29.2	14.0		40.4	13.0	0.8	38.8	14.5	1.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	12.5		29.2	14.0		40.4	13.0	0.8	38.8	14.5	1.4
LOS	C	B		C	B		D	B	A	D	B	A
Approach Delay		22.1			18.1			20.3			17.8	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	7.1	0.9		3.6	1.9		20.0	12.8	0.0	12.3	9.8	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	14.1	8.9		8.6	10.7		36.1	35.6	1.9	24.5	27.7	3.0
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	414	483		420	486		250	1059	943	225	927	842
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.11		0.06	0.13		0.53	0.16	0.08	0.36	0.13	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 19.5		Intersection LOS: B	
Intersection Capacity Utilization 50.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr



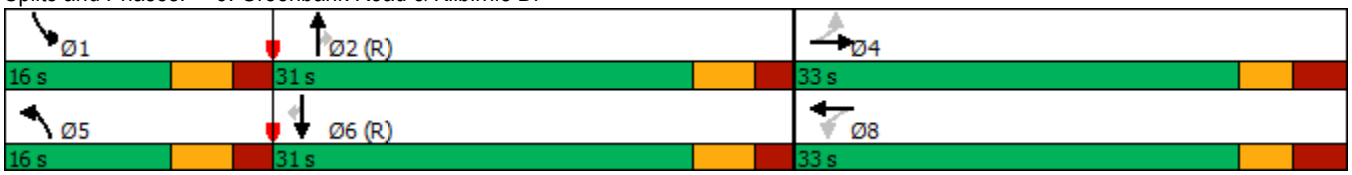


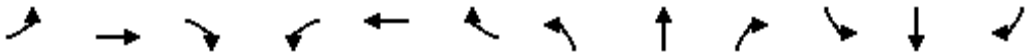
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	14	188	60	32	94	85	167	17	24	152	82
Future Volume (vph)	125	14	188	60	32	94	85	167	17	24	152	82
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	125	202	0	60	126	0	85	167	17	24	152	82
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	14.2	14.2		14.2	14.2		9.9	47.4	47.4	6.9	39.5	39.5
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.12	0.59	0.59	0.09	0.49	0.49
v/c Ratio	0.60	0.49		0.35	0.40		0.47	0.17	0.02	0.19	0.17	0.12
Control Delay	41.0	9.4		32.4	13.1		40.3	11.5	0.1	36.7	15.9	1.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	9.4		32.4	13.1		40.3	11.5	0.1	36.7	15.9	1.7
LOS	D	A		C	B		D	B	A	D	B	A
Approach Delay		21.5			19.3			19.9			13.3	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	18.7	1.9		8.6	4.4		12.9	8.5	0.0	3.7	13.5	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	31.8	17.2		17.5	16.8		25.3	32.5	0.0	10.6	33.0	3.6
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	389	602		321	503		202	988	716	187	871	690
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.34		0.19	0.25		0.42	0.17	0.02	0.13	0.17	0.12

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 62.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	2	25	3	30	10	24	3	5	60	40	5	2
Future Volume (vph)	2	25	3	30	10	24	3	5	60	40	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	25	3	30	10	24	3	5	60	40	5	2

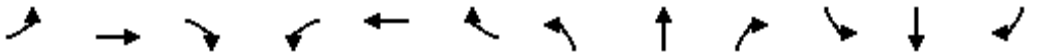
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	30	64	68	47
Volume Left (vph)	2	30	3	40
Volume Right (vph)	3	24	60	2
Hadj (s)	-0.01	-0.10	-0.49	0.18
Departure Headway (s)	4.2	4.1	3.7	4.3
Degree Utilization, x	0.03	0.07	0.07	0.06
Capacity (veh/h)	829	856	945	805
Control Delay (s)	7.3	7.4	6.9	7.6
Approach Delay (s)	7.3	7.4	6.9	7.6
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.3			
Level of Service	A			
Intersection Capacity Utilization	26.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	0	15	0	0	30
Future Volume (vph)	0	0	15	0	0	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	15	0	0	30

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	0	15	30
Volume Left (vph)	0	15	0
Volume Right (vph)	0	0	30
Hadj (s)	0.00	0.23	-0.57
Departure Headway (s)	4.0	4.2	3.4
Degree Utilization, x	0.00	0.02	0.03
Capacity (veh/h)	900	849	1060
Control Delay (s)	7.0	7.3	6.5
Approach Delay (s)	0.0	7.3	6.5
Approach LOS	A	A	A

Intersection Summary			
Delay	6.7		
Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

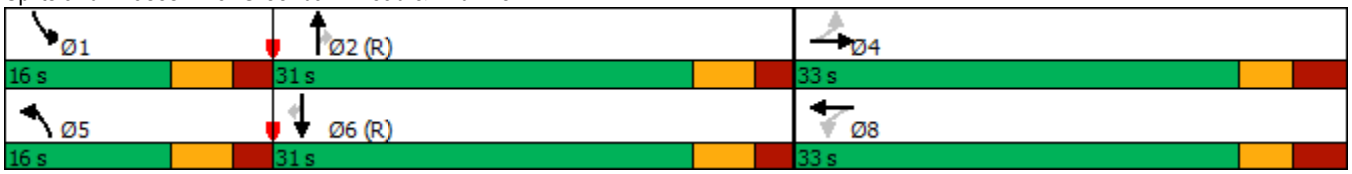


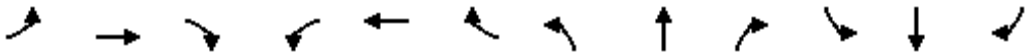
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	20	80	22	16	47	173	191	66	73	172	120
Future Volume (vph)	79	20	80	22	16	47	173	191	66	73	172	120
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	100	0	22	63	0	173	191	66	73	172	120
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	11.8	11.8		11.7	11.7		15.8	46.2	46.2	9.2	36.1	36.1
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.20	0.58	0.58	0.12	0.45	0.45
v/c Ratio	0.43	0.37		0.12	0.27		0.60	0.20	0.09	0.42	0.22	0.19
Control Delay	36.1	13.1		27.7	14.3		39.5	14.2	0.5	39.5	17.6	4.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.1	13.1		27.7	14.3		39.5	14.2	0.5	39.5	17.6	4.1
LOS	D	B		C	B		D	B	A	D	B	A
Approach Delay		23.3			17.7			22.2			17.6	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	11.9	2.9		3.2	2.3		24.8	15.5	0.0	11.1	17.1	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	21.1	13.7		8.2	11.0		#52.5	40.4	0.9	22.6	37.2	9.9
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	412	515		400	472		288	963	701	201	797	643
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.19		0.06	0.13		0.60	0.20	0.09	0.36	0.22	0.19

Intersection Summary		
Area Type:	Other	
Cycle Length: 80		
Actuated Cycle Length: 80		
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green		
Natural Cycle: 80		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.60		
Intersection Signal Delay: 20.4	Intersection LOS: C	
Intersection Capacity Utilization 56.3%	ICU Level of Service B	
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	2	15	3	55	15	46	4	5	40	25	5	3
Future Volume (vph)	2	15	3	55	15	46	4	5	40	25	5	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	15	3	55	15	46	4	5	40	25	5	3

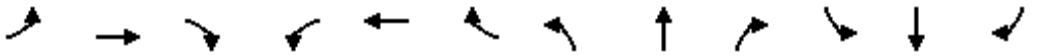
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	20	116	49	33
Volume Left (vph)	2	55	4	25
Volume Right (vph)	3	46	40	3
Hadj (s)	-0.04	-0.11	-0.44	0.13
Departure Headway (s)	4.1	4.0	3.8	4.4
Degree Utilization, x	0.02	0.13	0.05	0.04
Capacity (veh/h)	841	882	907	794
Control Delay (s)	7.2	7.6	7.0	7.5
Approach Delay (s)	7.2	7.6	7.0	7.5
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.4			
Level of Service	A			
Intersection Capacity Utilization	29.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	0	22	0	0	20
Future Volume (vph)	0	0	22	0	0	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	22	0	0	20

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	0	22	20
Volume Left (vph)	0	22	0
Volume Right (vph)	0	0	20
Hadj (s)	0.00	0.23	-0.57
Departure Headway (s)	4.0	4.2	3.4
Degree Utilization, x	0.00	0.03	0.02
Capacity (veh/h)	900	854	1053
Control Delay (s)	7.0	7.3	6.4
Approach Delay (s)	0.0	7.3	6.4
Approach LOS	A	A	A

Intersection Summary			
Delay	6.9		
Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

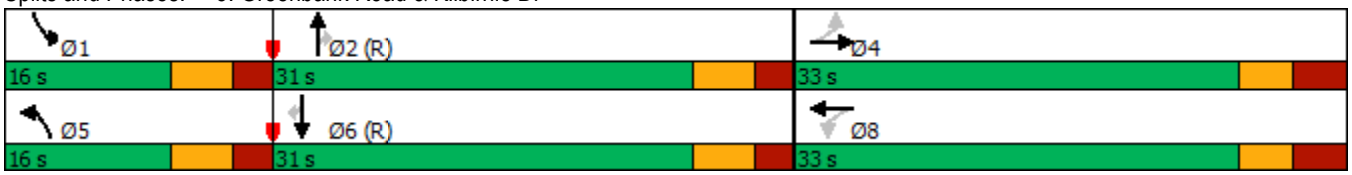


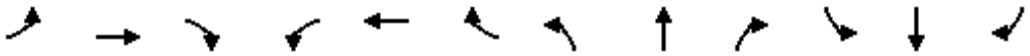
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	15	213	60	33	94	92	228	17	24	200	64
Future Volume (vph)	132	15	213	60	33	94	92	228	17	24	200	64
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	132	228	0	60	127	0	92	228	17	24	200	64
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	14.5	14.5		14.5	14.5		10.2	47.1	47.1	6.9	38.9	38.9
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.13	0.59	0.59	0.09	0.49	0.49
v/c Ratio	0.62	0.52		0.38	0.40		0.49	0.23	0.02	0.19	0.23	0.09
Control Delay	41.6	9.4		33.9	13.0		40.6	12.1	0.1	36.7	16.7	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.6	9.4		33.9	13.0		40.6	12.1	0.1	36.7	16.7	0.3
LOS	D	A		C	B		D	B	A	D	B	A
Approach Delay		21.2			19.7			19.3			14.7	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	19.7	2.0		8.6	4.5		13.9	12.3	0.0	3.7	18.7	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	33.5	18.3		17.8	16.9		26.9	43.9	0.0	10.6	42.7	0.6
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	389	620		285	502		206	981	711	187	857	682
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.37		0.21	0.25		0.45	0.23	0.02	0.13	0.23	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 18.8		Intersection LOS: B	
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	85	5	30	27	24	5	5	60	40	5	5
Future Volume (vph)	5	85	5	30	27	24	5	5	60	40	5	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	85	5	30	27	24	5	5	60	40	5	5

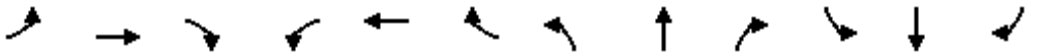
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	95	81	70	50
Volume Left (vph)	5	30	5	40
Volume Right (vph)	5	24	60	5
Hadj (s)	0.01	-0.07	-0.47	0.13
Departure Headway (s)	4.3	4.2	3.9	4.5
Degree Utilization, x	0.11	0.09	0.08	0.06
Capacity (veh/h)	817	818	877	755
Control Delay (s)	7.8	7.6	7.2	7.8
Approach Delay (s)	7.8	7.6	7.2	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.6			
Level of Service	A			
Intersection Capacity Utilization	27.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	65	5	15	78	5	30
Future Volume (vph)	65	5	15	78	5	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	65	5	15	78	5	30

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	70	93	35
Volume Left (vph)	0	15	5
Volume Right (vph)	5	0	30
Hadj (s)	-0.01	0.07	-0.45
Departure Headway (s)	4.1	4.1	3.8
Degree Utilization, x	0.08	0.11	0.04
Capacity (veh/h)	872	863	900
Control Delay (s)	7.4	7.6	6.9
Approach Delay (s)	7.4	7.6	6.9
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	21.9%	ICU Level of Service	A
Analysis Period (min)	15		



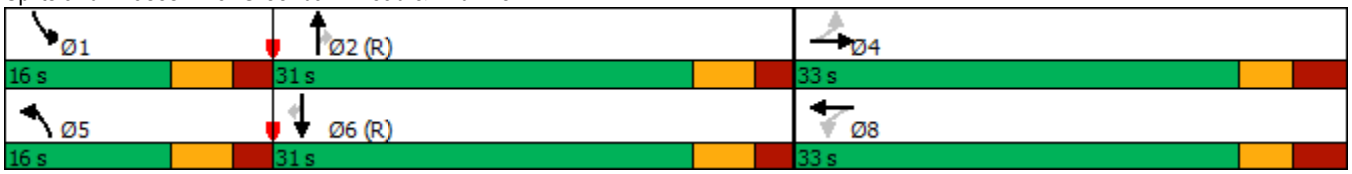
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	20	94	22	16	47	199	250	66	73	239	128
Future Volume (vph)	83	20	94	22	16	47	199	250	66	73	239	128
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	114	0	22	63	0	199	250	66	73	239	128
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.0	12.0		11.9	11.9		18.7	46.1	46.1	9.2	33.0	33.0
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.23	0.58	0.58	0.12	0.41	0.41
v/c Ratio	0.45	0.39		0.12	0.26		0.58	0.26	0.09	0.42	0.33	0.21
Control Delay	36.4	12.6		27.5	14.1		37.0	14.8	0.5	39.5	20.0	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.4	12.6		27.5	14.1		37.0	14.8	0.5	39.5	20.0	4.8
LOS	D	B		C	B		D	B	A	D	C	A
Approach Delay		22.6			17.6			21.5			18.8	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	12.5	2.9		3.2	2.3		27.9	21.4	0.0	11.1	26.4	0.0

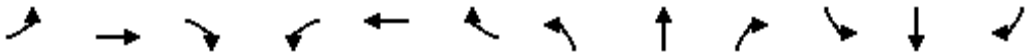
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	22.1	14.5		8.2	11.0		#64.0	52.5	0.9	22.6	50.9	11.4
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	412	527		396	472		341	960	699	201	728	599
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.22		0.06	0.13		0.58	0.26	0.09	0.36	0.33	0.21

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 20.5	Intersection LOS: C
Intersection Capacity Utilization 58.0%	ICU Level of Service B
Analysis Period (min) 15	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	48	5	46	78	55	8	5	40	25	5	7
Future Volume (vph)	5	48	5	46	78	55	8	5	40	25	5	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	48	5	46	78	55	8	5	40	25	5	7

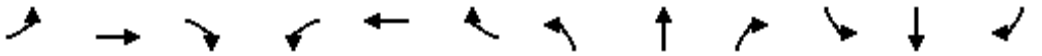
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	58	179	53	37
Volume Left (vph)	5	46	8	25
Volume Right (vph)	5	55	40	7
Hadj (s)	0.00	-0.10	-0.39	0.06
Departure Headway (s)	4.3	4.1	4.1	4.5
Degree Utilization, x	0.07	0.20	0.06	0.05
Capacity (veh/h)	812	864	828	741
Control Delay (s)	7.6	8.1	7.3	7.7
Approach Delay (s)	7.6	8.1	7.3	7.7
Approach LOS	A	A	A	A

Intersection Summary				
Delay		7.8		
Level of Service		A		
Intersection Capacity Utilization		31.1%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	38	5	22	15	5	20
Future Volume (vph)	38	5	22	15	5	20
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	38	5	22	15	5	20

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	43	37	25
Volume Left (vph)	0	22	5
Volume Right (vph)	5	0	20
Hadj (s)	-0.04	0.15	-0.41
Departure Headway (s)	3.9	4.1	3.7
Degree Utilization, x	0.05	0.04	0.03
Capacity (veh/h)	898	858	950
Control Delay (s)	7.1	7.3	6.8
Approach Delay (s)	7.1	7.3	6.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.1		
Level of Service	A		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

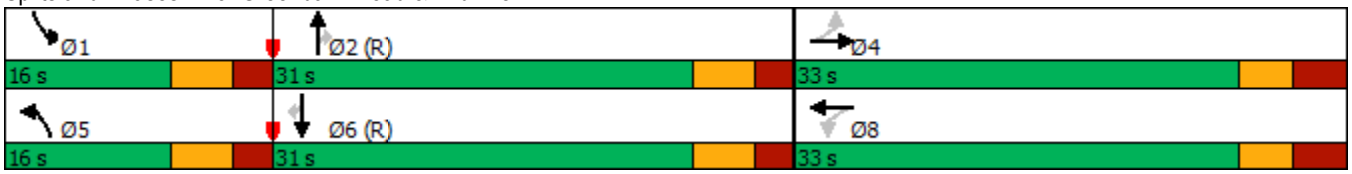


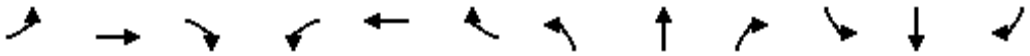
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	28	211	60	51	94	117	168	17	24	146	151
Future Volume (vph)	176	28	211	60	51	94	117	168	17	24	146	151
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	239	0	60	145	0	117	168	17	24	146	151
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.3	17.3		17.3	17.3		10.9	44.3	44.3	6.9	35.6	35.6
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.14	0.55	0.55	0.09	0.44	0.44
v/c Ratio	0.70	0.50		0.31	0.41		0.59	0.18	0.03	0.19	0.19	0.23
Control Delay	42.9	8.9		28.5	13.3		44.7	13.5	0.1	36.7	18.3	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.9	8.9		28.5	13.3		44.7	13.5	0.1	36.7	18.3	4.8
LOS	D	A		C	B		D	B	A	D	B	A
Approach Delay		23.3			17.8			24.8			13.4	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	26.1	3.6		8.1	6.7		17.5	10.0	0.0	3.7	14.9	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	42.2	19.5		16.8	19.6		#35.2	34.8	0.0	10.6	31.9	12.8
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	382	612		292	490		209	922	676	187	785	646
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.39		0.21	0.30		0.56	0.18	0.03	0.13	0.19	0.23

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 20.2	Intersection LOS: C
Intersection Capacity Utilization 66.5%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	2	90	3	30	130	24	3	5	83	40	5	2
Future Volume (vph)	2	90	3	30	130	24	3	5	83	40	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	90	3	30	130	24	3	5	83	40	5	2

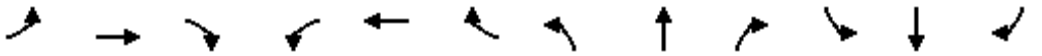
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	95	184	91	47
Volume Left (vph)	2	30	3	40
Volume Right (vph)	3	24	83	2
Hadj (s)	0.02	-0.01	-0.51	0.18
Departure Headway (s)	4.4	4.3	4.1	4.8
Degree Utilization, x	0.12	0.22	0.10	0.06
Capacity (veh/h)	777	798	819	692
Control Delay (s)	8.0	8.5	7.6	8.1
Approach Delay (s)	8.0	8.5	7.6	8.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.2			
Level of Service	A			
Intersection Capacity Utilization	33.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	6	6	129	6	5	89
Future Volume (vph)	6	6	129	6	5	89
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	6	6	129	6	5	89

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	12	135	94
Volume Left (vph)	0	129	5
Volume Right (vph)	6	0	89
Hadj (s)	-0.27	0.23	-0.52
Departure Headway (s)	4.0	4.3	3.7
Degree Utilization, x	0.01	0.16	0.10
Capacity (veh/h)	876	813	927
Control Delay (s)	7.0	8.2	7.1
Approach Delay (s)	7.0	8.2	7.1
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		

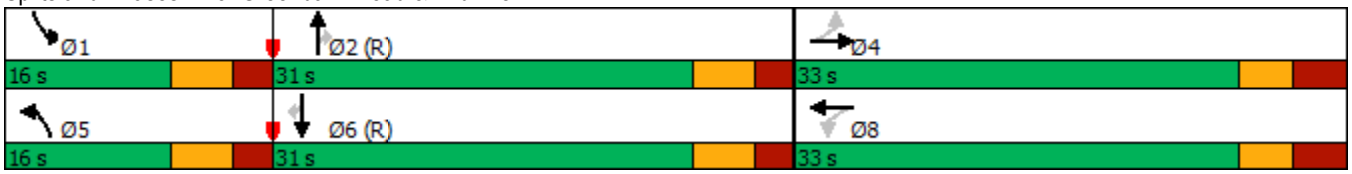


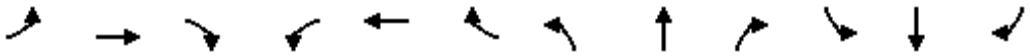
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	31	98	22	24	47	186	196	66	73	170	149
Future Volume (vph)	119	31	98	22	24	47	186	196	66	73	170	149
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	119	129	0	22	71	0	186	196	66	73	170	149
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.6	13.6		13.6	13.6		17.2	40.7	40.7	9.2	30.4	30.4
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.22	0.51	0.51	0.12	0.38	0.38
v/c Ratio	0.57	0.41		0.11	0.27		0.59	0.23	0.10	0.42	0.25	0.26
Control Delay	39.5	13.0		26.1	14.8		38.2	15.5	0.5	39.5	20.0	5.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.5	13.0		26.1	14.8		38.2	15.5	0.5	39.5	20.0	5.1
LOS	D	B		C	B		D	B	A	D	B	A
Approach Delay		25.7			17.5			22.7			18.0	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	17.9	4.3		3.0	3.3		26.4	17.3	0.0	11.1	18.5	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	30.1	16.7		8.2	12.7		#57.9	41.2	0.9	22.6	36.8	12.8
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	409	522		390	460		314	849	633	201	670	572
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.25		0.06	0.15		0.59	0.23	0.10	0.36	0.25	0.26

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 64.2%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	2	65	3	55	64	46	4	5	58	25	5	3
Future Volume (vph)	2	65	3	55	64	46	4	5	58	25	5	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	65	3	55	64	46	4	5	58	25	5	3

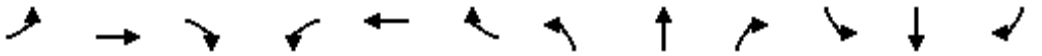
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	70	165	67	33
Volume Left (vph)	2	55	4	25
Volume Right (vph)	3	46	58	3
Hadj (s)	0.01	-0.07	-0.47	0.13
Departure Headway (s)	4.3	4.1	4.0	4.6
Degree Utilization, x	0.08	0.19	0.07	0.04
Capacity (veh/h)	807	849	847	727
Control Delay (s)	7.7	8.1	7.3	7.8
Approach Delay (s)	7.7	8.1	7.3	7.8
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.8			
Level of Service	A			
Intersection Capacity Utilization	31.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	0	3	71	0	4	70
Future Volume (vph)	0	3	71	0	4	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	3	71	0	4	70

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	3	71	74
Volume Left (vph)	0	71	4
Volume Right (vph)	3	0	70
Hadj (s)	-0.57	0.23	-0.52
Departure Headway (s)	3.5	4.3	3.5
Degree Utilization, x	0.00	0.08	0.07
Capacity (veh/h)	983	824	984
Control Delay (s)	6.6	7.7	6.8
Approach Delay (s)	6.6	7.7	6.8
Approach LOS	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		

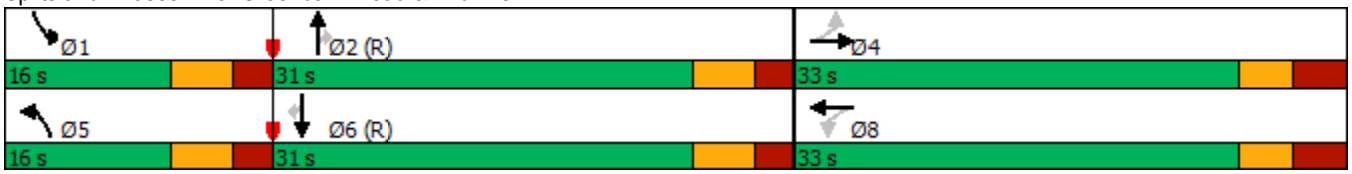


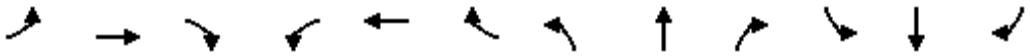
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	183	29	236	60	52	94	124	222	17	24	188	133
Future Volume (vph)	183	29	236	60	52	94	124	222	17	24	188	133
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	183	265	0	60	146	0	124	222	17	24	188	133
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.0	18.0		18.0	18.0		11.0	43.6	43.6	6.9	32.2	32.2
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.14	0.54	0.54	0.09	0.40	0.40
v/c Ratio	0.70	0.53		0.33	0.40		0.62	0.24	0.03	0.19	0.26	0.23
Control Delay	42.2	8.6		28.7	12.9		47.1	14.4	0.1	36.7	19.7	5.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.2	8.6		28.7	12.9		47.1	14.4	0.1	36.7	19.7	5.2
LOS	D	A		C	B		D	B	A	D	B	A
Approach Delay		22.4			17.5			24.9			15.3	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	27.1	3.7		8.1	6.8		18.6	14.0	0.0	3.7	20.2	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	42.9	20.1		16.7	19.2		#43.5	46.5	0.0	10.6	40.3	12.0
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	382	630		266	489		210	909	669	187	710	588
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.42		0.23	0.30		0.59	0.24	0.03	0.13	0.26	0.23

Intersection Summary		
Area Type:	Other	
Cycle Length: 80		
Actuated Cycle Length: 80		
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green		
Natural Cycle: 80		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.70		
Intersection Signal Delay: 20.5	Intersection LOS: C	
Intersection Capacity Utilization 68.4%	ICU Level of Service C	
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	150	5	30	147	24	5	5	83	40	5	5
Future Volume (vph)	5	150	5	30	147	24	5	5	83	40	5	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	150	5	30	147	24	5	5	83	40	5	5

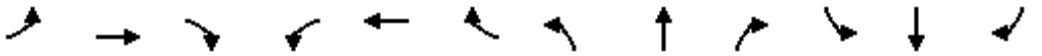
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	160	201	93	50
Volume Left (vph)	5	30	5	40
Volume Right (vph)	5	24	83	5
Hadj (s)	0.02	-0.01	-0.49	0.13
Departure Headway (s)	4.5	4.4	4.3	5.0
Degree Utilization, x	0.20	0.25	0.11	0.07
Capacity (veh/h)	770	778	767	660
Control Delay (s)	8.6	8.9	7.8	8.4
Approach Delay (s)	8.6	8.9	7.8	8.4
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.5			
Level of Service	A			
Intersection Capacity Utilization	40.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	71	11	129	84	10	89
Future Volume (vph)	71	11	129	84	10	89
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	71	11	129	84	10	89

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	82	213	99
Volume Left (vph)	0	129	10
Volume Right (vph)	11	0	89
Hadj (s)	-0.05	0.16	-0.49
Departure Headway (s)	4.3	4.4	4.1
Degree Utilization, x	0.10	0.26	0.11
Capacity (veh/h)	809	797	822
Control Delay (s)	7.8	8.9	7.6
Approach Delay (s)	7.8	8.9	7.6
Approach LOS	A	A	A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

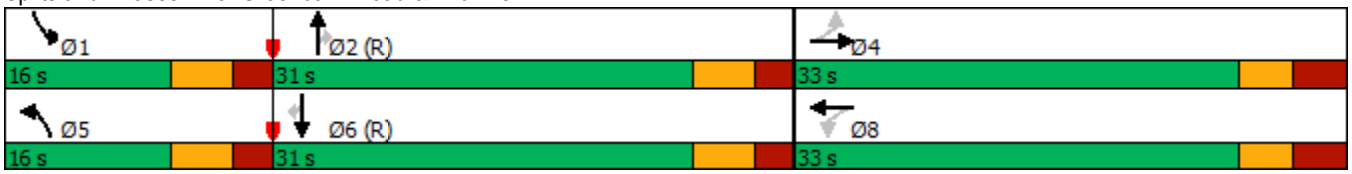


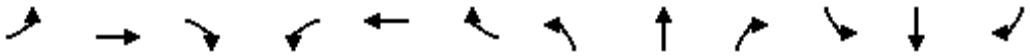
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	31	112	22	24	47	212	247	66	73	231	157
Future Volume (vph)	123	31	112	22	24	47	212	247	66	73	231	157
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	40.0		0.0	40.0		0.0	120.0		70.0	120.0		70.0
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		604.0			83.3			244.0			281.7	
Travel Time (s)		43.5			6.0			14.6			16.9	
Confl. Peds. (#/hr)	1		4	4		1	3		1	1		3
Confl. Bikes (#/hr)												
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	50%	1%	2%	64%	2%	17%	8%	34%	13%	2%	18%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	123	143	0	22	71	0	212	247	66	73	231	157
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (s)	33.0	33.0		33.0	33.0		16.0	31.0	31.0	16.0	31.0	31.0
Total Split (%)	41.3%	41.3%		41.3%	41.3%		20.0%	38.8%	38.8%	20.0%	38.8%	38.8%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3		3.3	3.3		2.4	2.4	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6		6.6	6.6		6.1	6.1	6.1	6.1	6.1	6.1
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.8	13.8		13.8	13.8		20.1	40.5	40.5	9.2	27.3	27.3
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.25	0.51	0.51	0.12	0.34	0.34
v/c Ratio	0.57	0.43		0.11	0.27		0.58	0.29	0.10	0.42	0.38	0.29
Control Delay	39.7	12.4		26.0	14.6		36.1	16.2	0.5	39.5	23.1	5.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.7	12.4		26.0	14.6		36.1	16.2	0.5	39.5	23.1	5.4
LOS	D	B		C	B		D	B	A	D	C	A
Approach Delay		25.0			17.3			22.3			19.7	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	18.4	4.3		3.0	3.3		29.4	22.8	0.0	11.1	27.6	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (m)	31.1	17.4		8.2	12.7		#69.4	51.9	0.9	22.6	49.2	13.0
Internal Link Dist (m)		580.0			59.3			220.0			257.7	
Turn Bay Length (m)	40.0			40.0			120.0		70.0	120.0		70.0
Base Capacity (vph)	409	535		385	460		367	844	630	201	602	534
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.27		0.06	0.15		0.58	0.29	0.10	0.36	0.38	0.29

Intersection Summary		
Area Type:	Other	
Cycle Length: 80		
Actuated Cycle Length: 80		
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green		
Natural Cycle: 80		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.58		
Intersection Signal Delay: 21.6	Intersection LOS: C	
Intersection Capacity Utilization 65.7%	ICU Level of Service C	
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 3: Greenbank Road & Kilbirnie Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	98	5	46	127	55	8	5	58	25	5	7
Future Volume (vph)	5	98	5	46	127	55	8	5	58	25	5	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	98	5	46	127	55	8	5	58	25	5	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	108	228	71	37
Volume Left (vph)	5	46	8	25
Volume Right (vph)	5	55	58	7
Hadj (s)	0.02	-0.07	-0.43	0.06
Departure Headway (s)	4.4	4.2	4.3	4.8
Degree Utilization, x	0.13	0.27	0.08	0.05
Capacity (veh/h)	786	825	778	689
Control Delay (s)	8.1	8.7	7.7	8.0
Approach Delay (s)	8.1	8.7	7.7	8.0
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.3			
Level of Service	A			
Intersection Capacity Utilization	35.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	38	8	71	15	9	70
Future Volume (vph)	38	8	71	15	9	70
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	38	8	71	15	9	70

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	46	86	79
Volume Left (vph)	0	71	9
Volume Right (vph)	8	0	70
Hadj (s)	-0.07	0.20	-0.47
Departure Headway (s)	4.1	4.3	3.7
Degree Utilization, x	0.05	0.10	0.08
Capacity (veh/h)	858	817	928
Control Delay (s)	7.3	7.8	7.0
Approach Delay (s)	7.3	7.8	7.0
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		