

3713 Borrisokane Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

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1 Screening

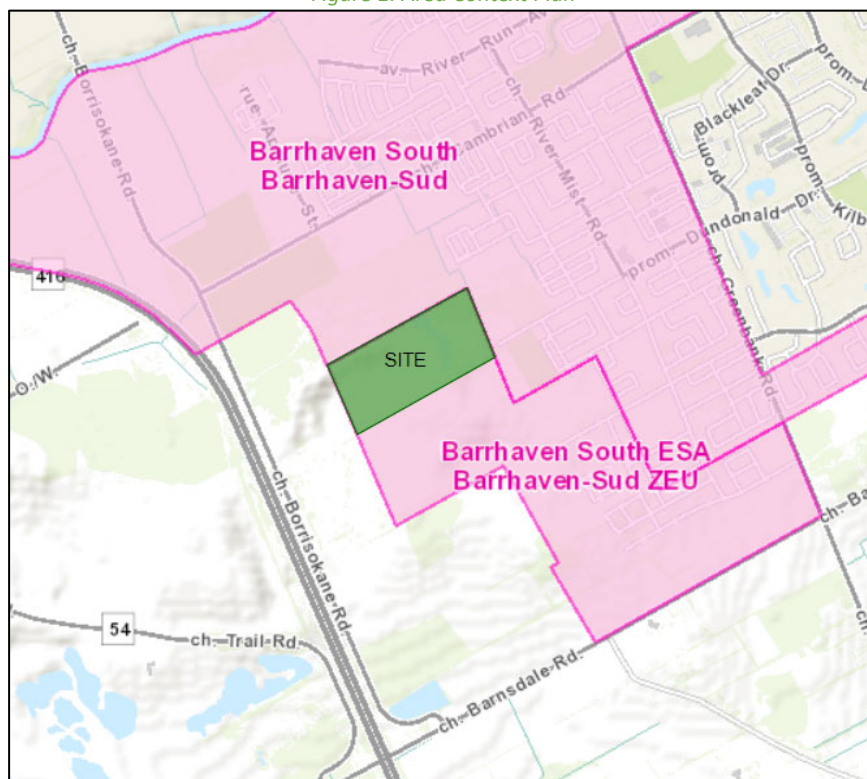
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been completed and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact component. The application is for a zoning bylaw amendment and plan of subdivision.

2 Existing and Planned Conditions

2.1 Proposed Development

The proposed residential development, located at 3713 Borrisokane Road, is currently a surrendered sand and gravel pit within the Barrhaven South Urban Expansion Area (UEA). The site is in an area that is currently zoned as a Mineral Extraction Operation Zone (ME2). The current development application would modify the zoning to allow for low-rise residential uses on the eastern portion of the property. Beyond the Urban Boundary the western portion of the land will not be included in this TIA. The proposed residential development will consist of a mixture of 141 detached homes and 439 townhouses. Access to the development lands will be provided to the east of the proposed development along the east-west collector road extension to Dundonald Drive and through the Re-aligned Greenbank Road corridor, and to the north along the planned north-south collector road (Delphinus Way) to Cambrian Road (at Apolune Way). The development will have active mode connections to the adjacent developments to allow access to shared community services (i.e. parks, schools, etc.). The anticipated full build-out and occupancy horizon is 2024. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: May 14, 2020

2.2 Existing Conditions

2.2.1 Area Road Network

Borrisokane Road: Borrisokane Road is a Ministry of Ontario road with a two-lane rural cross-section and a posted speed limit of 80 km/h along the frontage of the site. No sidewalks are provided. North of Cambrian Road, Borrisokane Road is an Arterial Road, and south of Cambrian Road it is a Collector Road. Borrisokane is part of the Veterans Memorial Highway (Highway 416) corridor to the south of Cambrian Road and has a measured 37.5 metre right of way to the north of Cambrian Road.

Cambrian Road: Cambrian Road is a City of Ottawa collector road with a two-lane rural cross-section and a posted speed limit of 70 km/h for approximately 700 metres east of Borrisokane Road and 50 km/h in the remaining Study Area. To the west of Seeley's Bay Street, Cambrian Road has no sidewalks and to the east of Seeley's Bay Street, Cambrian Road has sidewalks. The Ottawa Official Plan reserves a 37.5 metre right-of-way from Cedarview (now Borrisokane Road) to Jockvale Road.

Dundonald Drive: Dundonald Drive is a City of Ottawa collector road with a two-lane urban cross-section and an unposted speed limit of 50 km/h. Sidewalks are present on both sides of the road within the Study Area. The measured right-of-way is 24 metres.

2.2.2 Existing Intersections

There are no existing signalized intersections within a one-kilometre radius of the proposed development, as the Re-Aligned Greenbank Road corridor has not been constructed and the adjacent developments are in various stages of the planning and development process. Therefore, no intersections will be analyzed for the existing horizon and new and planned intersections will be included in the analysis of future horizons.

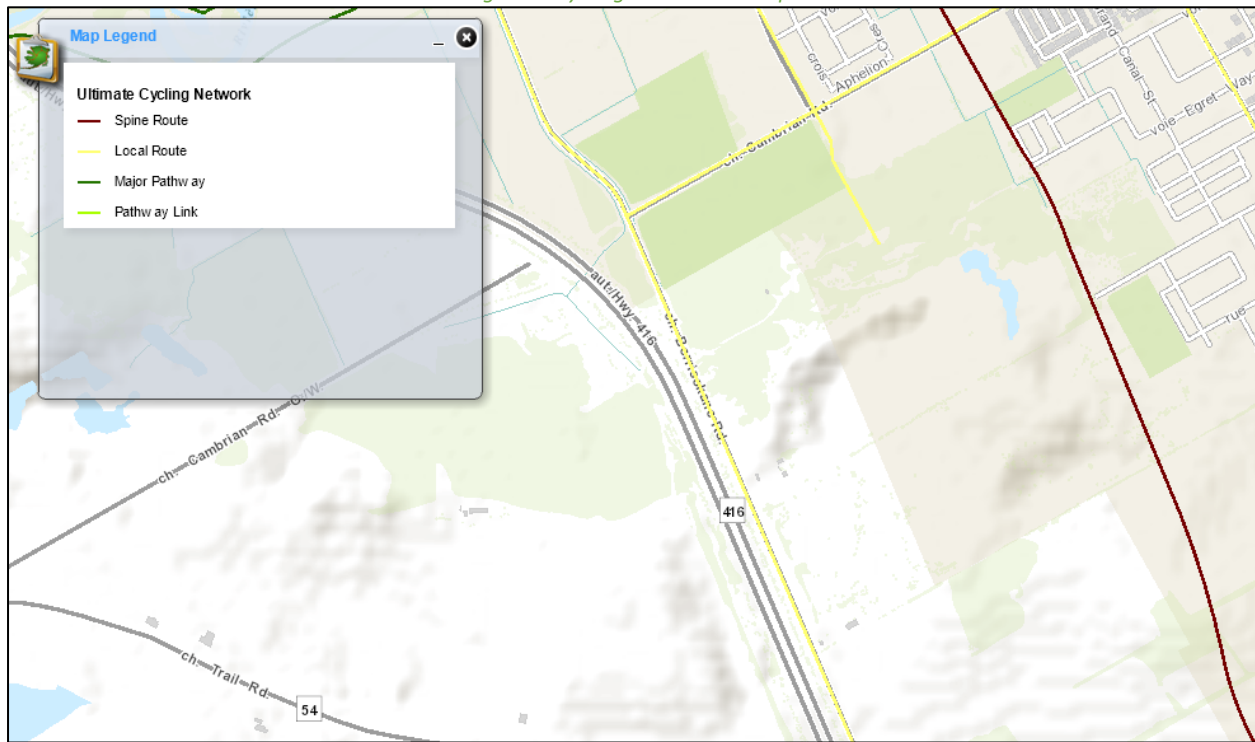
2.2.3 Existing Driveways

There are no existing driveways within 200 metres of the potential future accesses except for residential driveways along Dundonald Drive, east of Re-Aligned Greenbank Road. These driveways are not expected to provide access to significant traffic generators and would therefore have no impact on this TIA.

2.2.4 Cycling and Pedestrian Facilities

No cycling facilities and very limited pedestrian facilities currently exist along Borrisokane Road or Cambrian Road. As Re-Aligned Greenbank Road has not yet been constructed, no cycling or pedestrian facilities currently exist. Approved cycling infrastructure as part of The City of Ottawa's Ultimate Cycling Network includes plans for local cycling routes along Cambrian Road, Borrisokane Road and Apolune Way / north-south development site collector road. A spine route is also planned for the Re-Aligned Greenbank Road. These approved cycling plans are shown in Figure 3.

Figure 3: Cycling Network Concept



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: October 4, 2019

2.2.5 Existing Transit

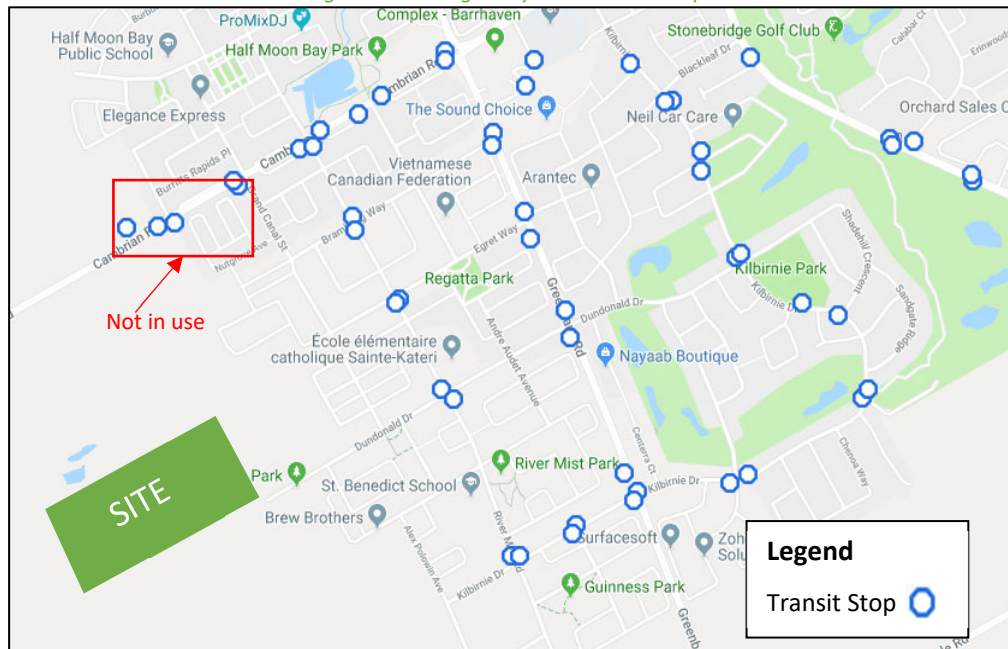
There is no existing transit service along the boundary roads. East of the subject development, Route 75 and Route 275 run along River Mist Road and Cambrian Road. Figure 4 illustrates the existing transit service and Figure 5 illustrates the existing transit stops.

Figure 4: Existing Transit Service



Source: <http://www.octranspo.com/> Accessed: March 24, 2020

Figure 5: Existing Study Area Transit Stops



Source: <http://plan.octranspo.com/plan> Accessed: October 4, 2019

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the Study Area.

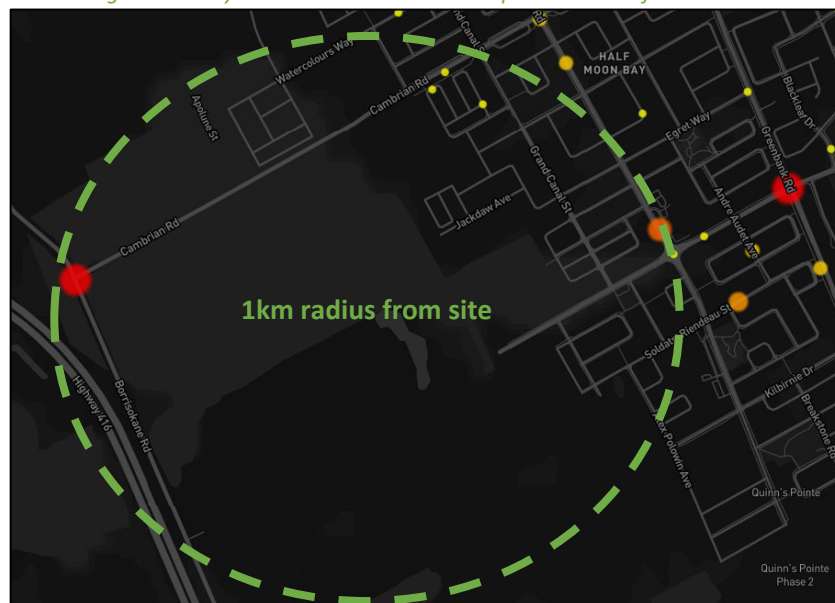
2.2.7 Existing Peak Hour Travel Demand

There are no existing intersections in the Study Area that will be examined as outlined in Section 2.2.2 above.

2.2.8 Collision Analysis

As illustrated in Figure 6, no significant collisions are noted in the vicinity of the study area. Therefore, no collision analysis has been performed.

Figure 6: Study Area Collision Records – Representation of 2014-2016



Source: <https://maps.bikeottawa.ca/collisions/> Accessed: October 3, 2019

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The planned development is subject to policies outlined in the City of Ottawa's Master Plan and the Barrhaven South Community Design Plan (CDP). Additionally, Development Charges (DC) outlined in the 2019 City of Ottawa Intersection Control Measures By-Law will impact the planned development.

Expected changes to the subject development as outlined in the City of Ottawa's Master Plan are:

- The Re-Aligned Greenbank Road extension, south of Cambrian Road, is located on the east side of the proposed development. This will provide Arterial Road connectivity to the site. The timing of this extension is unknown as it is not included in the City of Ottawa's Transportation Master Plan 2031 Affordable Road Network and is only indicated as a 'Conceptual Arterial Extension' in the Network Concept Plan. The proposed cross-section of Re-Aligned Greenbank Road can be seen in Figure 7.
- A 'Conceptual Future Transit Corridor'. This is shown along the Re-Aligned portion of Greenbank Road, south of Cambrian Road in the Rapid Transit and Priority 2031 Network Concept Plan. This is not shown on the 2031 Affordable Rapid Transit and Priority Network.
- A cycling spine route indicated along the Re-Aligned portion of Greenbank Road, south of Cambrian Road in the Primary Urban Cycling Network map.

Intersection Control Measures outlined in the 2019 Ottawa Development Charges By-Law are expected to be implemented at the following intersections:

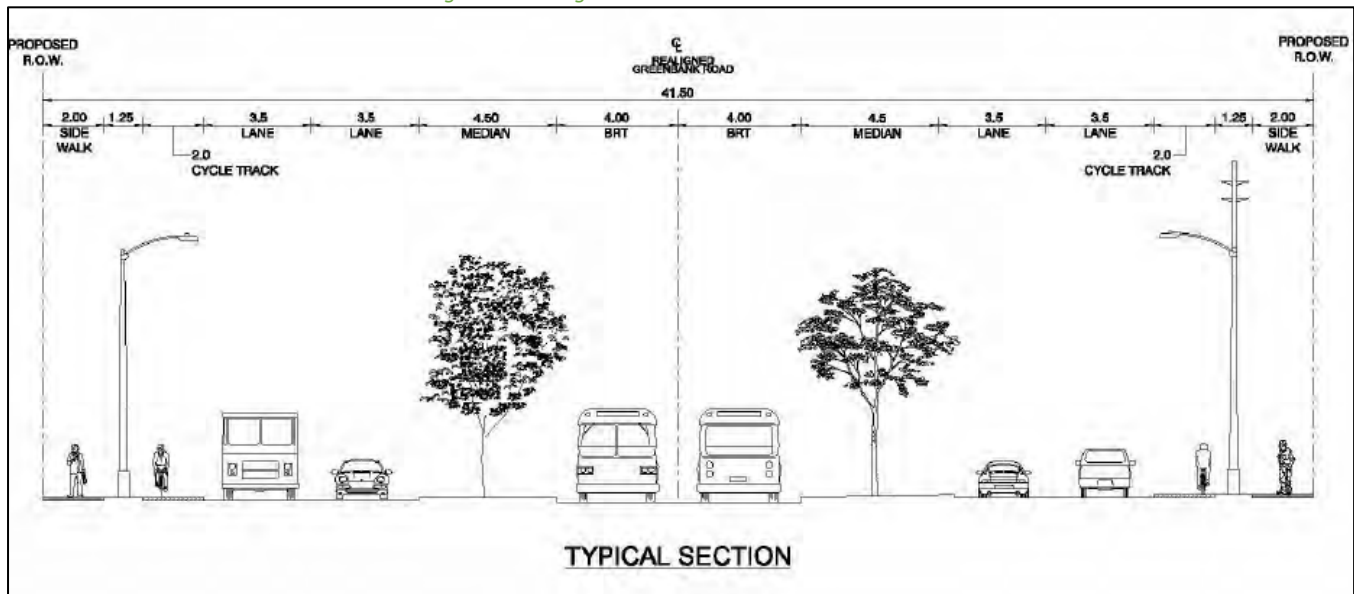
- Cambrian Road and Borrisokane Road
- Cambrian Road and Apolune Way
- Old Greenbank Road and Kilbirnie Drive
- Old Greenbank Road and Barnsdale Road

The intersection modification and signalization at Apolune Way and Cambrian Road is underway and is expected that these changes will be complete prior to the proposed development's build-out year of 2024. The planned intersection design can be seen in Appendix B as an excerpt from the RMA completed at the intersection of Apolune Way and Cambrian Road (Stantec, 2019).

The subject development is within the Barrhaven South CDP Urban Expansion Area. As such, it is subject to the planning policies outlined in the CDP. Some of the expected changes outlined are:

- Road Network:
 - The subject development proposes the addition of a north-south collector road and an east-west collector road within the development area which connect to the two development accesses. These collector roads are subject to the City of Ottawa Road Corridor Planning and Design Guidelines. Both collector roads have cycling facilities, sidewalks and parking facilities and the north-south collector road will also include transit.
 - The Re-Aligned Greenbank Road extension will provide arterial road connection to the site. The proposed cross-section of the Re-Aligned Greenbank Road can be seen in Figure 7

Figure 7: Re-Aligned Greenbank Road Cross-Section



Source: Barrhaven South Urban Expansion Study Area Community Design Plan. Accessed: October 3, 2019

- Pedestrian Network:
 - Future sidewalks are proposed on both sides of the Dundonald Drive extension within the proposed development.
- Cycling Network:
 - A local cycling route is proposed along Dundonald Drive and its connection to the east-west collector road within the proposed development.
 - A cycle track is proposed along Re-Aligned Greenbank Road.
- Transit Network:
 - A BRT route is proposed along Re-Aligned Greenbank Road with a BRT station at the intersection of Dundonald Drive and Re-Aligned Greenbank Road.

2.3.2 Other Study Area Developments

The Meadows Phase 4

Northeast of the proposed development is Phase 4 of the Meadows Tamarack Development and is expected to be built out during 2019. Phase 4 will have 136 townhouse units and 50 single family units. This development is anticipated to produce 142 two-way AM peak period auto trips and 171 two-way PM peak period auto trips. (IBI 2018)

The Meadows Phase 5

North of the proposed development is Phase 5 of the Tamarack Development of the Meadows and is expected to be built-out during 2022. Phase 5 will have 221 townhouse units and 125 single family units. This development is anticipated to produce 294 two-way AM peak period auto trips and 334 two-way PM peak period auto trips. (IBI 2018)

3809 Borrisokane Road

South of the proposed development is the 3809 Borrisokane Road development which is expected to be built-out during 2025. This development will include 590 residential units, split between townhouse units and detached home units. The eastern parcel of 3713 Borrisokane Road will include a connection to 3809 Borrisokane Road and

both developments will share an access to Borrisokane Road as part of an interim phase only. Approximately 300 units will use this connection prior to the full build-out in 2025 at which time the connection to Borrisokane Road will be closed. This development is expected to produce 401 two-way AM peak period auto trips and 457 two-way PM peak period auto trips. (CGH 2019).

Half Moon Bay West

North of the proposed development is the Mattamy Development of Half Moon Bay West which is expected to be built-out during 2024. This development will include 552 single family homes and 464 townhomes. Construction has not yet commenced on this subdivision. This development is expected to produce 786 two-way AM peak period auto trips and 1193 two-way PM peak period auto trips. (Stantec 2016).

Citi Gate's Highway 416 Employment Lands

North of the proposed development is the Citi Gate Corporate Campus. This development will include 32,516 square metres allocated towards a shopping centre, 165,600 square metres allocated towards business parks and 105,000 square metres allocated towards car dealerships. The full build-out year is 2029 with an interim development year of 2019. This development is expected to produce 4267 two-way AM peak period auto trips and 4848 two-way PM peak period auto trips. (Novatech 2012).

Mattamy's Half Moon Bay North Phase 9 (Apartment Block)

North of the proposed development is the Half Moon Bay North Phase 9 development which is expected to be built-out during 2019. This development will consist of 60 stacked townhouses. This development is expected to produce 74 two-way AM peak period auto trips and 80 two-way PM peak period auto trips. (Stantec 2018).

3285 Borrisokane Road

North of the proposed development is 3285 Borrisokane Road which is expected to be built-out during 2020. This development will include 125 single family homes and 75 townhouses. This development is expected to produce 129 two-way AM peak period auto trips and 146 two-way PM peak period auto trips. (Parsons 2018).

3713 Borrisokane Road-Industrial Component

Directly west of the proposed development is the industrial component of 3713 Borrisokane Road which is expected to be built-out during 2022. The development will include approximately 3,250 square metres of general office space and 9,385 square metres of industrial buildings. This development is expected to produce 136 two-way AM peak period auto trips and 188 two-way PM peak period auto trips. (CGH 2019).

Barrhaven South Expansion Lands (Quinn's Pointe 2)

To the southeast of the proposed development is the Minto Development of Quinn's Pointe 2. This development will include 536 single-family dwelling units, 493 townhomes, 100 apartment units, and two elementary schools, anticipated over 2 phases of construction for the horizon years of 2022 and 2025. A total of 749 two-way AM peak period auto trips and 813 two-way PM peak period auto trips are expected from this development (Stantec 2018).

3387 Borrisokane Road

North of Cambrian Road is the Glenview Development of 3387 Borrisokane Road which is expected to be built-out during 2022. The development is expected to have 179 single family units and 109 townhouses. The development is anticipated to produce 137 two-way AM peak period auto trips and 174 two-way PM peak period auto trips. (Stantec 2016)

Half Moon Bay South Phase 5

Southeast of the proposed development is the Mattamy Development of Half Moon Bay South which is expected to be built-out during 2020. The development will consist of 164 single detached home units and 97 townhouse

units. This development is expected to produce 180 two-way AM peak period auto trips and 207 two-way PM peak period auto trips. (CGH 2019)

Mattamy's Half Moon Bay North Phases 7,8

North of the proposed development is the Half Moon Bay North Phase 7 and 8 development and is expected to be built-out during 2019. The development will consist of 471 residential units. No TIA is currently available for this development.

3 Study Area and Time Periods

3.1 Study Area

The subject site does not have any existing boundary roads to consider and Re-Aligned Greenbank Road is beyond the study horizons.

The Study will instead focus on the development access to Cambrian Road and the connection to Dundonald Drive.

3.2 Time Periods

As the proposed development is composed entirely of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2024. As a result, the full build-out plus five years horizon year is 2029.

4 Exemption Review

Table 1 summarizes the exemptions for this TIA.

Table 1: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Exempt
	4.2.3 New Street Networks	Only required for plans of subdivision	Required
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Exempt
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required

Module	Element	Explanation	Exempt/Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Required

5 Development-Generated Travel Demand

5.1 Trip Generation and Mode Shares

This TIA has been prepared using the vehicle and person trips for the retail components using the TRANS Trip Generation Study Report (2009). Table 2 summarizes the person trip rates for the proposed land uses.

Table 2: Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Single-Detached Dwellings	210 (TRANS)	AM	0.70	1.27
		PM	0.90	1.41
Townhouses	224 (TRANS)	AM	0.54	0.98
		PM	0.71	1.16

Using the above Person Trip rates, the total person trip generation has been estimated. Table 3 below illustrates the total person trip generation by dwelling type.

Table 3: Total Person Trip Rates

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single-detached Dwellings	141	52	127	179	121	78	199
Townhouses	439	159	271	430	270	239	509
Total Person Trips		211	398	609	391	317	708

Using the most recent National Capital Region Origin-Destination (OD Survey), the existing mode shares for South Nepean have been summarized in Table 4.

Table 4: Mode Share

Travel Mode	South Nepean Mode Share
Auto Driver	60%
Auto Passenger	15%
Transit	15%
Cyclist	1%
Pedestrian	9%
Total	100%

There are no major transit upgrades (i.e. BRT, transit priority measures, etc.) within the Study Area that are planned to be in place by the study horizons that will be examined in this study. Therefore, the existing mode shares will be carried forward.

Using the above mode shares and the person trip rates, the person trips by mode have been projected. Table 5 summarizes the trip generation by mode.

Table 5: Trip Generation by Mode

Travel Mode	Mode Share	In	Out	Total	In	Out	Total
Auto Driver	60%	126	238	364	234	189	423
Auto Passenger	15%	32	60	92	59	48	107
Transit	15%	32	60	92	59	48	107
Cyclist	1%	2	4	6	4	3	7
Pedestrian	9%	19	36	55	35	29	64
Total	100%	211	398	609	391	317	708

As shown above, 364 AM and 423 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.2 Trip Distribution

To understand the travel patterns of the subject development, the OD survey has been reviewed to determine the existing travel patterns that will be applied to the new vehicle trips. Table 6 below summarizes the distribution for South Nepean.

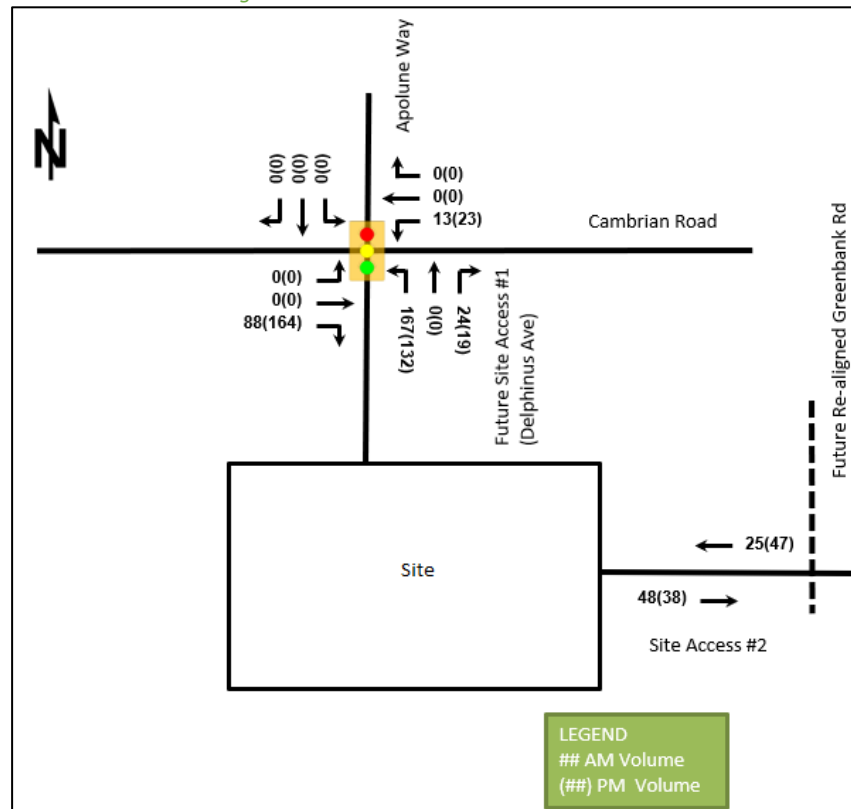
Table 6: OD Survey Existing Mode Share South Nepean

To/From	% of Trips
North	80%
South	5%
East	10%
West	5%
Total	100%

5.3 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the Study Area road network. Figure 8 illustrates the new site generated volumes.

Figure 8: New Site Generation Auto Volumes



6 Background Network Travel Demand

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3.1 and are not anticipated to impact to site, trip generation, or distribution.

6.2 Background Growth

Surrounding development Traffic Impact Assessments have used a 2% traffic growth within the Study Area of this report. As such, an annual background growth of 2% will be used in order to remain consistent with these studies and to capture any growth not already directly considered as discussed in Section 2.3.2.

6.3 Other Developments

The background developments explicitly considered in both the 2024 and 2029 background conditions include the Meadows Phase 4, Meadows Phase 5, Half Moon Bay West, Citi Gate's Highway 416 Employment Lands (Interim-2019), Half Moon Bay North Phase 9, the industrial portion of 3713 Borrisokane Road, 3809 Borrisokane Road, and 3285 Borrisokane Road developments. The Citi Gate's Highway 416 Employment Lands (2029) development is only considered in the 2029 background conditions. All background developments are discussed in Section 2.3.2.

7 Demand Rationalization

7.1 2024 Future Background Intersection Operations

Figure 9 illustrates the 2024 background volumes and Table 7 summarizes the background intersection operations for the study area. The level of service for signalized intersections is based on the TIA Guidelines v/c ratio for the

lane movements and HCM average delay for the overall intersection. The synchro worksheets for the 2024 are provided in Appendix C.

The signal timing at the intersection of Cambrian Road and Apolune Way was optimized and Amber Clearance, All Red Clearance, Walk, and Flash Don't Walk times were calculated using the Methodology provided in OTM Book 12-Traffic Signals. Intersection geometry at Apolune Way and Cambrian Road is based on the RMA prepared by Stantec which has been provided in Appendix B.

Figure 9: 2024 Future Background Volumes

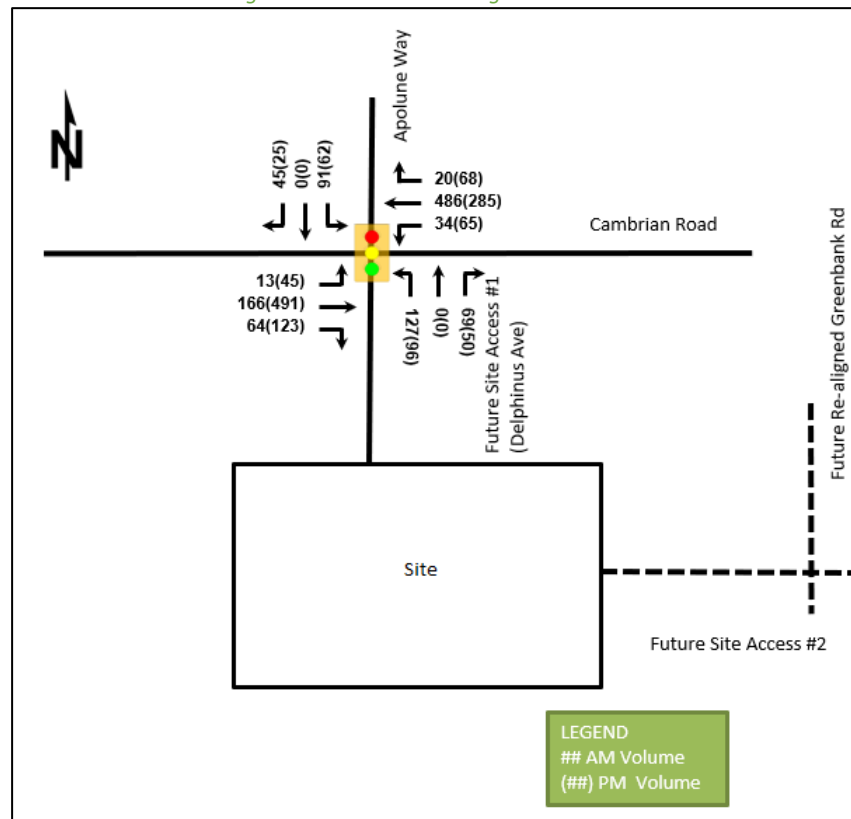


Table 7: 2024 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd	EBL	A	0.08	13.5	4.0	A	0.13	11.6	8.3
	EBT/R	A	0.37	13.8	30.1	D	0.84	27.2	97.6
	WBL	A	0.09	13.1	7.2	A	0.42	21.7	15.0
	WBT/R	C	0.80	28.3	82.6	A	0.48	14.6	45.5
	NBL	A	0.23	14.4	24.2	A	0.20	17.7	22.1
	NBT/R	A	0.06	0.1	0.0	A	0.06	0.1	0.0
	SBL	A	0.17	13.9	18.0	A	0.13	17.0	15.4
	SBT/R	A	0.05	0.1	0.0	A	0.03	0.0	0.0
	Overall	B	-	19.0	-	C	-	20.3	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The intersection operations for the 2024 future background horizon generally operate satisfactorily during the peak hours with all v/c ratios below 1.00 and no high delays noted. No other capacity issues are noted.

7.2 2029 Future Background Intersection Operations

Figure 10 illustrates the 2029 background volumes and Table 8 summarizes the background intersection operations for the study area. The level of service for signalized intersections is based on the TIA Guidelines v/c ratio for the lane movements and HCM average delay for the overall intersection. The synchro worksheets for the 2029 are provided in Appendix D.

The signal timing at the intersection of Cambrian Road and Apolune Way was optimized and Amber Clearance, All Red Clearance, Walk, and Flash Don't Walk times were calculated using the Methodology provided in OTM Book 12-Traffic Signals. The westbound left-turn movement will operate as a protected and permissive turn during the PM peak period. Intersection geometry at Apolune Way and Cambrian Road is based on the RMA prepared by Stantec which has been provided Appendix B.

Figure 10: 2029 Future Background Volumes

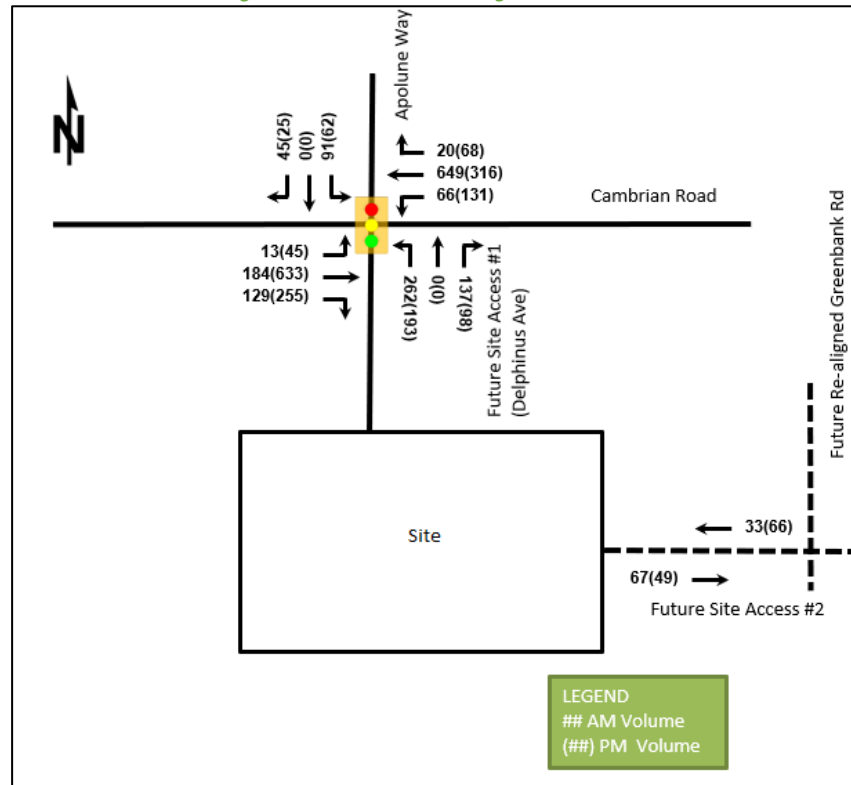


Table 8: 2029 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd	EBL	A	0.10	13.5	4.3	A	0.09	11.2	9.4
	EBT/R	A	0.42	12.9	40.4	E	0.95	42.5	#250.1
	WBL	A	0.17	13.3	12.5	B	0.64	24.7	#27.2
	WBT/R	D	0.88	32.7	126.7	A	0.35	8.7	45.0
	NBL	A	0.54	25.0	63.9	A	0.65	49.2	#68.4
	NBT/R	A	0.13	0.3	0.0	A	0.15	0.5	0.0
	SBL	A	0.20	19.6	22.6	A	0.22	36.9	22.8
	SBT/R	A	0.06	0.2	0.0	A	0.03	0.1	0.0
	Overall	C	-	22.2	-	C	-	31.0	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The intersection operations for the 2029 future background horizon generally operate satisfactorily during the peak hours with all v/c ratios below 1.00 and no high delays noted. During the PM peak, the shared eastbound through/right queue is expected to extend past the eastbound left-turn lane, the shared westbound through / right-turn queue is expected to block the westbound left-turn lane, and the northbound left-turn queue is expected to extend past the northbound left-turn lane. No other capacity issues are noted.

7.3 Future Total Demand

The future total 2024 volumes are illustrated in Figure 11 and the future total 2029 volumes are illustrated in Figure 12.

Figure 11: Future Total 2024 Volumes

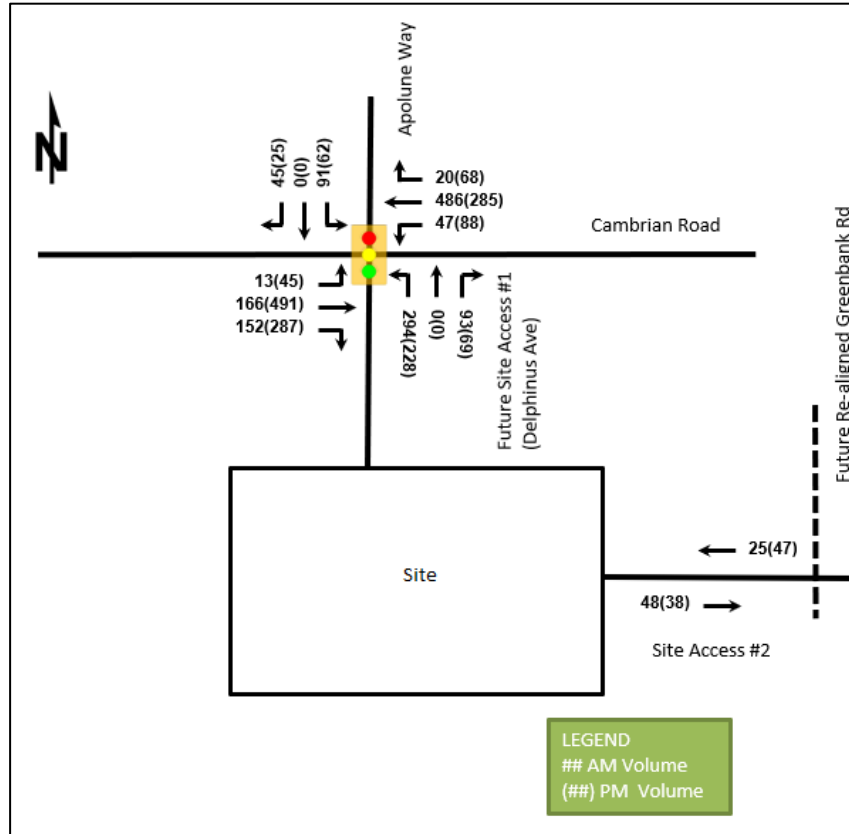
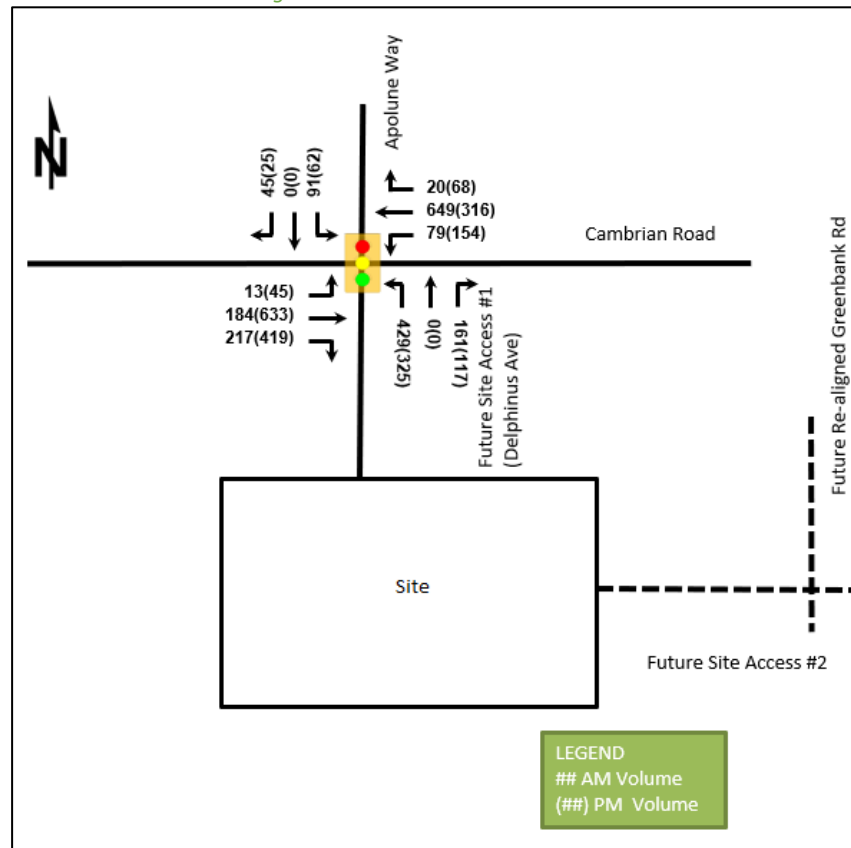


Figure 12: Future Total 2029 Volumes



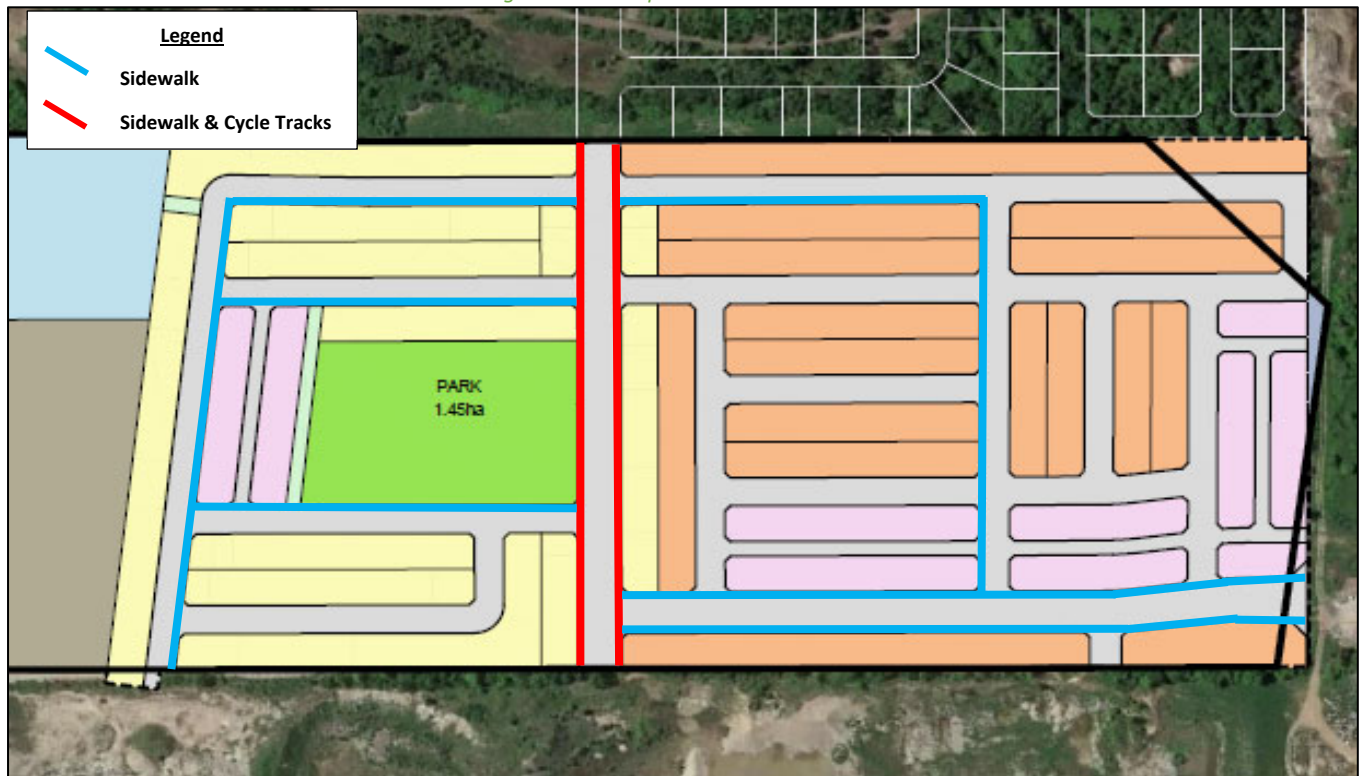
Volumes developed for the future horizons at the intersection of Cambrian Road and Apolune Way / Delphinus Avenue were based on the existing volume conditions at the intersection of Cambrian Road and Borrisokane Road. As such, future horizon volumes were developed using a growth rate of 2%/annum, the background developments listed in Section 6.3, and the proposed development within this report. The trip generation of this development is consistent with the area modal shares as seen in Table 4 and no adjustments are required.

8 Development Design

8.1 Design for Sustainable Modes

The proposed development is a residential subdivision and therefore auto and bicycle parking areas will be within each resident's home. Figure 13 illustrates the concept active mode network. The plan incorporates the adjacent developments, planned routes on geoOttawa, and the extension of the Barrhaven South Urban Expansion Study Area CDP network.

Figure 13: Concept Pedestrian Network

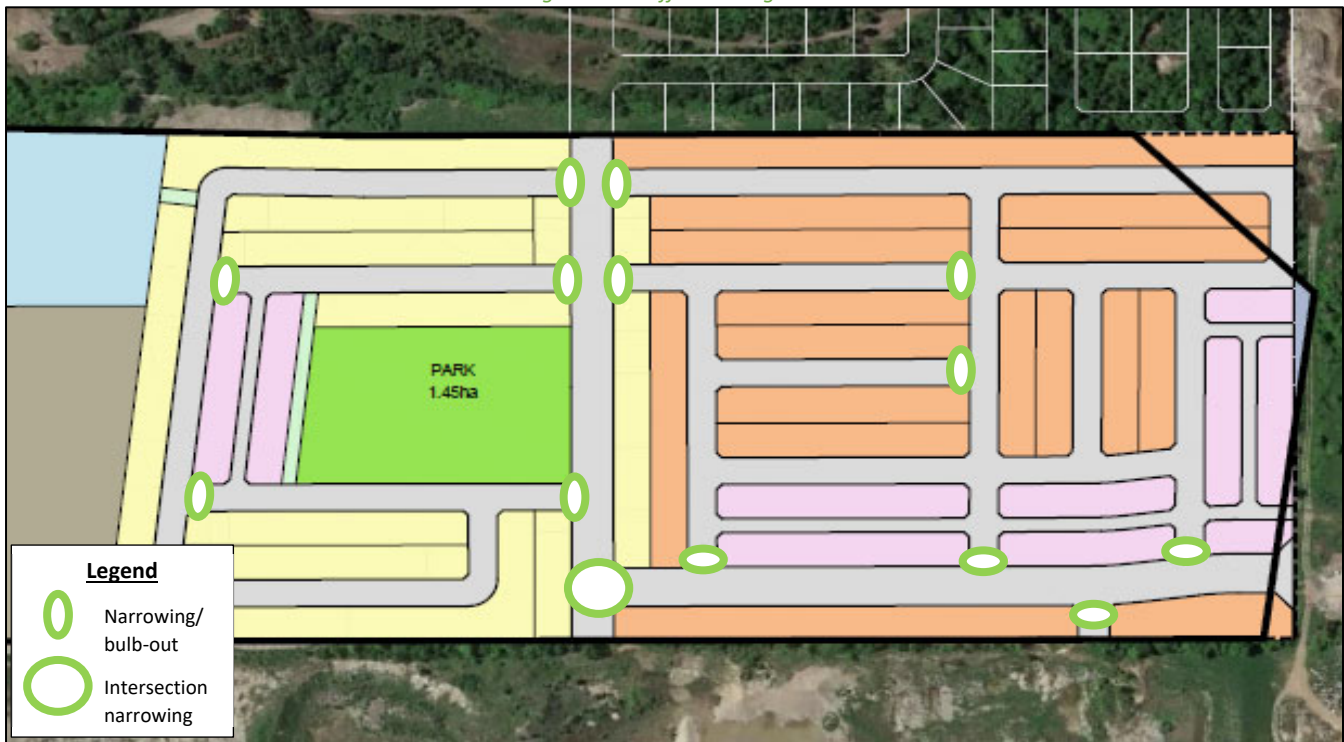


8.2 New Street Networks

The planned street network will include 8.5 metre lanes, 14.0 metre window roads, 16.5 metre local roadways, and 24.0 metre collector roadways. The local and collector roads will provide parking on one side of the roadway. The local roads are proposed to be posted as 40 km/h and the collector roads are proposed to be posted as 50 km/h. The pedestrian and cycling network are provided in Section 8.1.

To support the pedestrian and cycling connectivity within the subdivision, Figure 14 illustrates the concept traffic calming plan. The plan reduces crossing distances for the pedestrian and cycling network, as well as limits the speed of vehicles entering and exiting the local roads from the collector roads.

Figure 14: Traffic Calming Plan



The internal road intersections are recommended to be stop-controlled on the minor approaches of all intersections and the intersection of Dundonald Drive and Delphinus Avenue operate as an all-way stop-controlled intersection.

9 Boundary Street Design

The Re-aligned Greenbank Road corridor will be a future boundary road to the proposed development however its construction is anticipated to occur outside of the future horizons of this TIA. Any MMLOS analysis will be completed as part of the detailed design of the corridor and is beyond the scope of this study.

10 Access Intersections Design

10.1 Location and Design of Access

Access to the development lands will be provided to the east of the proposed development along the east-west collector road extension to Dundonald Drive and through the Re-aligned Greenbank Road corridor, and to the north along the planned north-south collector road to Cambrian Road at Apolune Way / Delphinus Avenue .

The intersection of Cambrian Road and Apolune Way / Delphinus Avenue is considered a study area intersection and is not considered an access intersection.

As the Greenbank corridor is not expected to be re-aligned within the future horizons considered in this study, the MMLOS and capacity analysis will be completed as part of the detailed design of the corridor and is beyond the scope of this study.

10.2 Access Intersection Control

No intersections are located on the boundary of the site and access is provided through collector roadways. Assessment of the network intersections is provided in Section 15.

10.3 Access Intersection Design

No access intersections are considered in this TIA.

11 Transportation Demand Management

11.1 Context for TDM

The mode shares used within the TIA represent this area of the City and have not been altered.

The subject site is not within a design priority or transit-oriented design area.

Total bedrooms within the development is subject to owner purchasing preferences. No age restrictions noted.

11.2 Need and Opportunity

The subject site has been assumed to rely predominately on auto travel and those assumptions have been carried through the analysis. A decrease in the low transit or non-auto mode shares will result in higher volumes along Cambrian Road. Little opportunity is available to shift these modes until major infrastructure projects, such as the Re-aligned Greenbank Road corridor, are complete to increase the transit and active mode network from South Barrhaven to the rest of the City.

11.3 TDM Program

As discussed above, any “suite of post-occupancy TDM measures” are limited in their applicability. It is anticipated that this development will rely predominantly on auto travel and those assumptions have been carried through the analysis. As a result, no TDM measures are recommended at this time beyond those required for zoning and standard subdivision design. The TDM Checklist has been provided in Appendix E.

12 Neighbourhood Traffic Management

Given the developing nature of the area, a higher-level approach was undertaken to perform analysis in this section. As an illustrative process to document the impact of the development on the network concept and the TIA guideline AADT thresholds, the percent area of the development in the total influence area has been compared to the trip generation of the development. The TIA guidelines outline a collector road threshold of 2,500 vehicles per day (AADT), or 300 vehicles in a given peak hour for Neighbourhood Traffic Management review. This will give an indication of whether the road network meets or exceeds the theoretical threshold, discuss the implications of the anticipated traffic within the context of the existing/planned road network and outline if any mitigation measures are required for the adjacent development areas.

12.1 Delphinus Avenue

Table 9 summarizes the AADT in the peak direction on the collector road of Delphinus Avenue in both the AM and PM peak periods.

Table 9: Delphinus Avenue NTM

	Area (Hectares)	Theoretical Threshold		Site Trip Generation	
		Percentage of Area	Equivalent Volume per AADT Threshold	AADT Volume Generated AM(PM)	Percentage of Theoretical Threshold
Proposed Development	16.25	28%	700	1910(1870)	76% (75%)
Area of Influence	58.7	100%	2500	-	-

Note: 1. AADT approximated using 10:1 ratio of peak hour traffic
2. AADT calculated as one-way peak direction volumes

As shown above, using this method the overall trip generation is expected to use 76% (75%) of the theoretical TIA AADT threshold of Delphinus Avenue. This indicates that while the overall theoretical TIA AADT threshold of Delphinus Avenue will not be exceeded within the proposed development, it is likely that it will be exceeded as Delphinus Avenue approaches Cambrian Road.

Within the study area context, the road network planning is consistent with the adjacent collector road and arterial road spacing. As such it is expected to serve as planned for within Barrhaven South, similar to River Mist Road and Kilbirnie Drive. The incorporation of the new collector road guidelines and passive traffic calming measures, as outlined within the TIA guidelines, should ensure that the future Delphinus Avenue will operate as intended. No additional measures are recommended to accommodate the projected volumes along the corridor. Section 15.2 presents the intersection operations at Cambrian Road and potential mitigation for the intersection.

Beyond the horizons of this study, Re-Aligned Greenbank Road will provide the additional capacity and may reduce the reliance on Delphinus Avenue by vehicular traffic. The addition of the BRT component of the corridor would also provide an alternative travel mode and decrease the peak hour demands. South of the site, the future Barnsdale Road interchange at Highway 417 may also have larger regional travel impacts and the subsequent redistribution of trips may balance directional demands along Delphinus Avenue, reducing northbound trips and increasing southbound trips.

12.2 Dundonald Drive

Table 10 summarizes the AADT in the peak direction on the collector road of Dundonald Drive in both the AM and PM peak periods.

Table 10: Dundonald Drive NTM

	Area (Hectares)	Theoretical Threshold		Site Trip Generation	
		Percentage of Area	Equivalent Volume per AADT Threshold	AADT Volume Generated AM(PM)	Percentage of Theoretical Threshold
Proposed Development	4.06	13%	325	480(470)	19% (19%)
Area of Influence	30.79	100%	2500	-	-

Note: 1. AADT approximated using 10:1 ratio of peak hour traffic
2. AADT calculated as one-way peak direction volumes

As shown above, using this method the overall trip generation is expected to use 19% (19%) of the theoretical TIA AADT threshold of Dundonald Drive. This indicates that while the overall theoretical TIA AADT threshold of Dundonald Drive will not be exceeded within the proposed development, it may be exceeded as Dundonald Drive approaches the existing Greenbank Road depending on the travel patterns of the neighbourhoods between Re-Aligned Greenbank Road and Greenbank Road.

Within the study area context, the collector road network serves to distribute traffic to the adjacent arterial roads and facilitate north-south travel beyond Barrhaven South. As Re-Aligned Greenbank Road is beyond the study horizons, Dundonald Drive approaching Greenbank Road will be required to operate near the theoretical TIA AADT threshold. Once Re-Aligned Greenbank Road is constructed, the demands will decrease and likely be within the ascribed threshold. No additional measures are recommended to accommodate the projected volumes along the corridor.

13 Transit

13.1 Route Capacity

Overall, the forecasted new transit trips would result in approximately one bus (single bus, 55-person capacity) being required in the peak direction to accommodate the transit trips generated from the subject site.

While no transit routes currently serve the study area, a transit route along Delphinus Avenue from Cambrian Road to Kilbirnie Drive is anticipated to service the development once Delphinus Avenue is constructed.

13.2 Transit Priority

No transit priority is required/considered for the study area.

14 Review of Network Concept

Cambrian Road may potentially approach or exceed a single lane capacity in the peak direction by the 2029 background and total future conditions. For example, in the PM peak period the west approach volumes in the shared through/right-turn lane in the 2029 future background horizon is 888 and in the PM peak period the west approach volumes in the shared through/right-turn lane in the 2029 total future horizon is 1052. These volume projections are dependent on surrounding development growth being realized, Re-Aligned Greenbank Road being constructed beyond the study horizon, and on growth proceeding at the same rate. The likely impact of the interim condition is extended queues along Cambrian Road, between Borrisokane Road and Greenbank Road.

The network concept, as identified within the City of Ottawa's Transportation Master Plan Map 10, illustrates extensive improvements within Barrhaven South:

- New Re-Aligned Greenbank Road, from Chapman Mills Drive to Cambrian Road
- Re-Aligned Greenbank Road extension south of Cambrian Road
- Widening of Cambrian Road from the Re-Aligned Greenbank Road to the existing Greenbank Road
- Widening of Jockvale Road from Cambrian Road to Prince of Wales Drive
- Widening of Barnsdale Road between Highway 416 and Prince of Wales Drive
- New interchange at Barnsdale Road and Highway 416

These planned improvements are expected to address the high volumes experienced along Cambrian Road, therefore no changes to the network concept are required.

15 Network Intersection Design

15.1 Network Intersection Control

As stated in Section 2.3.1, the network intersection of Cambrian Road and Apolune Way / Delphinus Avenue will be signalized prior to the proposed development's build-out year of 2024.

15.2 Network Intersection Design

15.2.1 2024 Future Total Intersection Operations

The 2024 future total future traffic volumes are illustrated in Figure 9 and the intersection operations are summarized in Table 11. The level of service for signalized intersections is based on the TIA Guidelines v/c ratio for the lane movements and HCM average delay for the overall intersection. The synchro worksheets have been provided in Appendix F.

The signal timing at the intersection of Cambrian Road and Apolune Way was optimized and Amber Clearance, All Red Clearance, Walk, and Flash Don't Walk times were calculated using the Methodology provided in OTM Book 12-Traffic Signals. Intersection geometry at Apolune Way and Cambrian Road is based on the RMA prepared by Stantec which has been provided Appendix B.

Table 11:2024 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
<i>Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd</i>	EBL	A	0.09	16.8	4.7	A	0.11	9.4	7.7
	EBT/R	A	0.52	17.6	47.3	E	0.91	30.5	139.1
	WBL	A	0.17	17.4	11.2	B	0.69	44.1	#33.5
	WBT/R	D	0.82	33.9	97.5	A	0.41	11.7	42.6
	NBL	A	0.50	18.8	63.7	A	0.55	30.0	#62.0
	NBT/R	A	0.08	0.2	0.0	A	0.09	0.2	0.0
	SBL	A	0.16	14.2	19.5	A	0.16	23.0	18.2
	SBT/R	A	0.05	0.1	0.0	A	0.03	0.0	0.0
	Overall	C	-	21.8	-	C	-	24.5	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The intersection operations for the 2024 future total horizon generally operate satisfactorily during the peak hours with all v/c ratios below 1.00 and no high delays noted. This is similar to the 2024 future background conditions. During the PM peak, the shared westbound through/right movement queue is anticipated to extend past the westbound left-turn lane, and the northbound left-turn queue is anticipated to block the northbound through/ right-turn movement. No other capacity issues are noted.

15.2.2 2029 Future Total Intersection Operations

The 2029 future total future traffic volumes are illustrated in Figure 10 and the intersection operations are summarized in Table 12. The level of service for signalized intersections is based on the TIA Guidelines v/c ratio for the lane movements and HCM average delay for the overall intersection. The synchro worksheets have been provided in Appendix G.

The signal timing at the intersection of Cambrian Road and Apolune Way was optimized and Amber Clearance, All Red Clearance, Walk, and Flash Don't Walk times were calculated using the Methodology provided in OTM Book 12-Traffic Signals. The westbound left-turn movement will operate as a protected and permissive turn during the PM peak period. Intersection geometry at Apolune Way and Cambrian Road is based on the RMA prepared by Stantec which has been provided Appendix B.

Table 12: 2029 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd	EBL	A	0.13	17.3	5.1	A	0.09	12.4	10.3
	EBT/R	A	0.54	16.2	60.3	F	1.10	87.4	#356.5
	WBL	A	0.28	18.1	17.9	F	1.02	106.7	#66.1
	WBT/R	D	0.88	36.7	#159.2	A	0.34	9.8	51.8
	NBL	C	0.76	31.2	#113.9	F	1.06	112.4	#139.6
	NBT/R	A	0.15	0.3	0.0	A	0.18	0.6	0.0
	SBL	A	0.18	16.0	18.9	A	0.22	38.3	23.8
	SBT/R	A	0.05	0.1	0.0	A	0.03	0.1	0.0
Overall		C	-	25.2	-	E	-	70.1	-
PM Peak Mitigation Measures-Eastbound Right-turn Lane									
Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd	EBL	A	0.13	18.8	5.3	A	0.12	19.4	12.7
	EBT	A	0.25	16.9	32.5	D	0.89	44.5	166.6
	EBR	A	0.29	3.3	11.6	B	0.62	21.6	79.0
	WBL	A	0.17	16.3	16.6	C	0.78	42.3	#36.6
	WBT/R	E	0.91	43.0	#165.4	A	0.45	18.4	70.2
	NBL	C	0.80	35.8	#118.5	B	0.67	37.3	#109.8
	NBT/R	A	0.15	0.3	0.0	A	0.15	0.4	0.0
	SBL	A	0.19	17.3	19.7	A	0.14	25.2	20.4
	SBT/R	A	0.06	0.1	0.0	A	0.03	0.0	0.0
	Overall	C	-	27.1	-	C	-	30.2	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The intersection operations for the 2029 future total horizon generally operate satisfactorily during the peak hours with all v/c ratios below 1.00 with the exception of the eastbound through/right-turn, westbound left-turn, and northbound left-turn movement in the PM peak period. High delays in the PM peak period are also noted at these movements. During the AM peak, the shared westbound through/right movement queue is anticipated to extend past the westbound left-turn lane and the northbound left-turn queue is anticipated to block the northbound through/ right-turn movement. During the PM peak, the shared eastbound through/right queue is expected to extend past the eastbound left-turn lane, the westbound left-turn queue is anticipated to block the westbound through / right-turn, and the northbound left-turn queue is anticipated to block the northbound through/ right-turn movement. No other capacity issues are noted.

An eastbound right-turn lane will help improve the discussed capacity issues and is shown as a mitigation measure. With the implemented mitigation measure, the intersection operations for the 2029 future total horizon generally operate satisfactorily during the peak hours with all v/c ratios below 1.00 and no high delays noted. During the AM peak, the shared westbound through/right movement queue is anticipated to extend past the westbound left-turn lane and the northbound left-turn queue is anticipated to block the northbound through/ right-turn movement. During the PM peak, the westbound left-turn queue will block the westbound through / right-turn movement and the northbound left-turn queue is anticipated to block the northbound through/ right-turn movement. No other capacity issues are noted.

15.2.3 Network Intersection MMLOS

Table 13 summarizes the MMLOS analysis for the network intersection. The 2024 future, 2029 future and 2029 future with the suggested mitigation measure conditions have been evaluated in three rows. The future configuration of Cambrian Road is based on the RMA plans and the future configuration of Delphinus Avenue is in

line with the collector road guidelines and will have cycle tracks. These cycle tracks are expected to travel through the intersection of Cambrian Road, however as the presence of cycle tracks on Apolune Way is currently unknown it has been assumed that Apolune Way will be mixed traffic. Where applicable, AM and PM peak results have been displayed separately (AM(PM)). The MMLOS worksheets have been provided in Appendix H.

Table 13: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
<i>Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd (2024)</i>	C	C	E	B	E(D)	D	-	No Target	C(C)	D
<i>Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd (2029)</i>	C	C	E	B	E(F)	D	-	No Target	C(F)	D
<i>Delphinus Ave (Site Access#1) / Apolune Way & Cambrian Rd (2029 Mitigation Measure)</i>	D	C	E	B	F(E)	D	-	No Target	C(C)	D

The target levels of service in a developing community were used to evaluate the study area intersection. The pedestrian LOS meets the target for the intersection for both the 2024 and 2029 future horizons. With the addition of the eastbound right-turn lane, the pedestrian LOS does not meet the target due to the resulting increase in pedestrian crossing distance. The bicycle LOS is limited due to mixed traffic conditions on the north approach, and high vehicle operating speeds and bike lane configuration on the east and west approaches and as such, does not meet the target. Transit LOS is limited due to signal delays and does not meet the target except during the PM peak in 2024. Auto LOS meets the outlined target in most cases. As no truck LOS target is provided for developing communities, it was not evaluated.

Given the limitations of the MMLOS framework, the pedestrian LOS cannot be achieved with the proposed addition of an eastbound right-turn lane at the intersection of Cambrian Road and Apolune Way / Delphinus Avenue. The posted speed limit on Cambrian Road would need to be reduced to less than 40km/h and cycle tracks would need to be provided along Cambrian Road in order to meet the bicycle LOS. No mitigation measures are proposed for the transit LOS.

16 Summary of Improvements Indicates and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed site includes a mixture of 141 detached homes and 439 townhouses
- Access to the development will be provided to the east of the proposed development along the east-west collector road extension to Dundonald Drive, and to the north along the planned north-south collector, Delphinus Avenue
- The development is proposed to be completed as a single phase by 2024
- A TIA is required including the Design Review component and the Network Impact Component as determined by the TIA Screening

- The application for the proposed site is for a Zoning By-Law Amendment and plan of subdivision

Existing Conditions

- Cambrian Road and Dundonald Drive are both collector roads
- Cambrian Road does not have sidewalks to the west of Seeley's Bay Street and Dundonald Drive has sidewalks on both sides
- On the study area roadways, cycling conditions are classified as mixed traffic conditions
- The existing transit routes #75 and 275 stop on Cambrian Road, however no existing transit service runs along the boundary roads
- There are no existing intersections in the study area

Development Generated Travel Demand

- The proposed development is forecasted to generate 609 people two-way trips during the AM peak and 708 people two-way trips during the PM peak
- Based on the area mode shares, a total of 349 two-way vehicle trips will be generated during the AM peak and 407 two-way vehicle trips during the PM peak
- The distribution of the site trips is estimated to be 80% to the north, 5% to the south, 10% to the east, and 5% to the west

Background Conditions

- The background developments of The Meadows Phase 4, The Meadows Phase 5, 3809 Borrisokane Road, Half Moon Bay West, Citi Gate's Highway 416 Employment Lands, Mattamy's Half Moon Bay North Phase 9, 3285 Borrisokane Road and the industrial component of 3713 Borrisokane Road were included within the background conditions, including a 2.0% background growth
- Large volumes generated by adjacent developments are noted
- No operational issues are noted in the background horizons of 2024 and 2029 for the intersection of Cambrian Road and Apolune Way/Delphinus Avenue

Development Design

- One collector road is provided in the north-south direction and the other in the east-west direction within the development with 24.0 metre right-of-way and the remaining development roads are 16.5 metre local roads, 14.0 metre window roads, and 8.5 metre lanes
- Sidewalks are proposed on both sides of the collector roads, sidewalk connections are proposed in the vicinity of the park and other primary connections and cycle tracks are proposed on the north-south collector road
- Traffic calming measures are recommended to reduce pedestrian crossing distances where sidewalks are provided and reduce turning speeds from the collector roads to local roads

Boundary Street Design

- The Re-aligned Greenbank Road corridor will be a future boundary road to the proposed development however its construction is anticipated to occur outside of the future horizons of this TIA. As such, there are no existing or future boundary roads that will be considered.

Access Intersection Design

- No access intersections were considered in this TIA

TDM

- The lack of supporting infrastructure limits the potential for TDM measures to reduce the auto reliance anticipated for the proposed development
- Beyond the study horizons, the transit network along Re-Aligned Greenbank Road and the associated cycling and pedestrian networks will begin to produce the connectivity required to see a mode shift from the proposed development
- No TDM measures are recommended at this time beyond those required for zoning and standard subdivision design

Neighbourhood Traffic Management

- The TIA thresholds are met for both Delphinus Avenue and Dundonald Drive
- The Re-Aligned Greenbank Road corridor will provide the additional capacity required

Transit

- No transit service is provided on the boundary road network
- A transit route along Delphinus Avenue from Cambrian Road to Kilbirnie Drive will service this development beginning in the 2024 horizon
- To meet minimum area transit use, approximately one single bus trip, or equivalent capacity, would be required to support the proposed development during the AM and PM peak hours

Network Intersection Design

- Intersection geometry at Apolune Way and Cambrian Road is based on the RMA prepared by Stantec
- The future total intersection operations are similar to the background conditions
- Based on the volumes at the 2029 total future horizon, an eastbound right-turn lane should be considered for the 2029 horizon year
- The existing study area signalized intersections will not meet a combination of pedestrian, bicycle, or transit MMLOS targets due to road widths, mixed traffic conditions, high vehicle operating speeds, and intersection delays
- In order to meet the bicycle LOS, the posted speed limit on Cambrian Road would need to be reduced to less than 40km/h and cycle tracks would need to be proposed on Apolune Way

17 Next Steps

Following the circulation and review of this Strategy Report, any outstanding comments will be addressed within the context of the zoning and plan of subdivision application. Following the completion of the remaining TIA Steps and sign-off has been received from City Transportation Project Manager, a signed and stamped final report will be provided to City staff.

Appendix A

TIA Screening Form and PM Certification Form



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

1. 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;
2. 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;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check ☒ appropriate field(s)] 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 this 20 day of September, 2018.
(City)

Name: Andrew Harte
(Please Print)

Professional Title: Professional Engineer



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

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
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E-Mail Address: Andrew.Harte@CGHTransportation.com



City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 04-May-20
Project Number: 2019-43
Project Reference: Caivan Drummond Lands

1.1 Description of Proposed Development	
Municipal Address	3713 Borrisokane Road
Description of Location	CON 3RF PT LOT 9 RP 5R-6254; PART 2 LESS RP 5R-13374 PTS;9 & 10 RD WIDENING
Land Use Classification	ME2-Mineral Extraction Operation-Pit Only and Urban Expansion Area (Residential Use)
Development Size	437 townhouse units, 141 detached housing units
Accesses	Access provided through adjacent properties, Dundonald Drive and new north-south collector road
Phase of Development	Single Phase
Buildout Year	2024
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Single-family homes
Development Size	141 Units
Trip Generation Trigger	Yes

1.3 Location Triggers	
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?	No
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	No

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	Yes
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
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)?	No
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger	Yes

Appendix B

Apolune Way and Cambrian Road RMA



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Consultants

Legend

Notes

Revised		Issued		Permit-Ready	
No.	Date	No.	Date	No.	Date
1	15/04/20	1	15/04/20	1	15/04/20
2	15/04/20	2	15/04/20	2	15/04/20
3	15/04/20	3	15/04/20	3	15/04/20
4	15/04/20	4	15/04/20	4	15/04/20
5	15/04/20	5	15/04/20	5	15/04/20
6	15/04/20	6	15/04/20	6	15/04/20
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65	15/04/20	65	15/04/20	65	15/04/20
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99	15/04/20	99	15/04/20	99	15/04/20
100	15/04/20	100	15/04/20	100	15/04/20

Permit-Ready

Client/Project
MATTAMY HALF MOON BAY WEST

TAMARACK MEADOWS PHASE 5 AND 6

Ottawa, Ontario

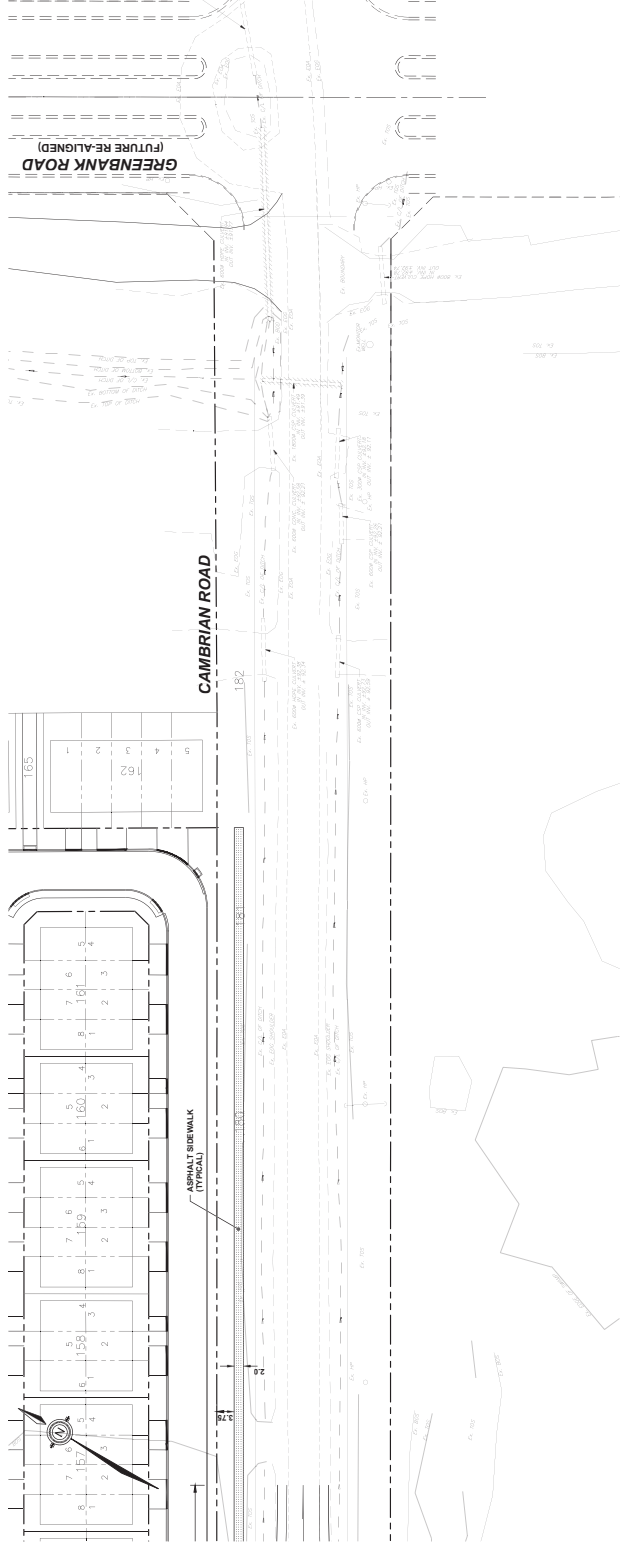
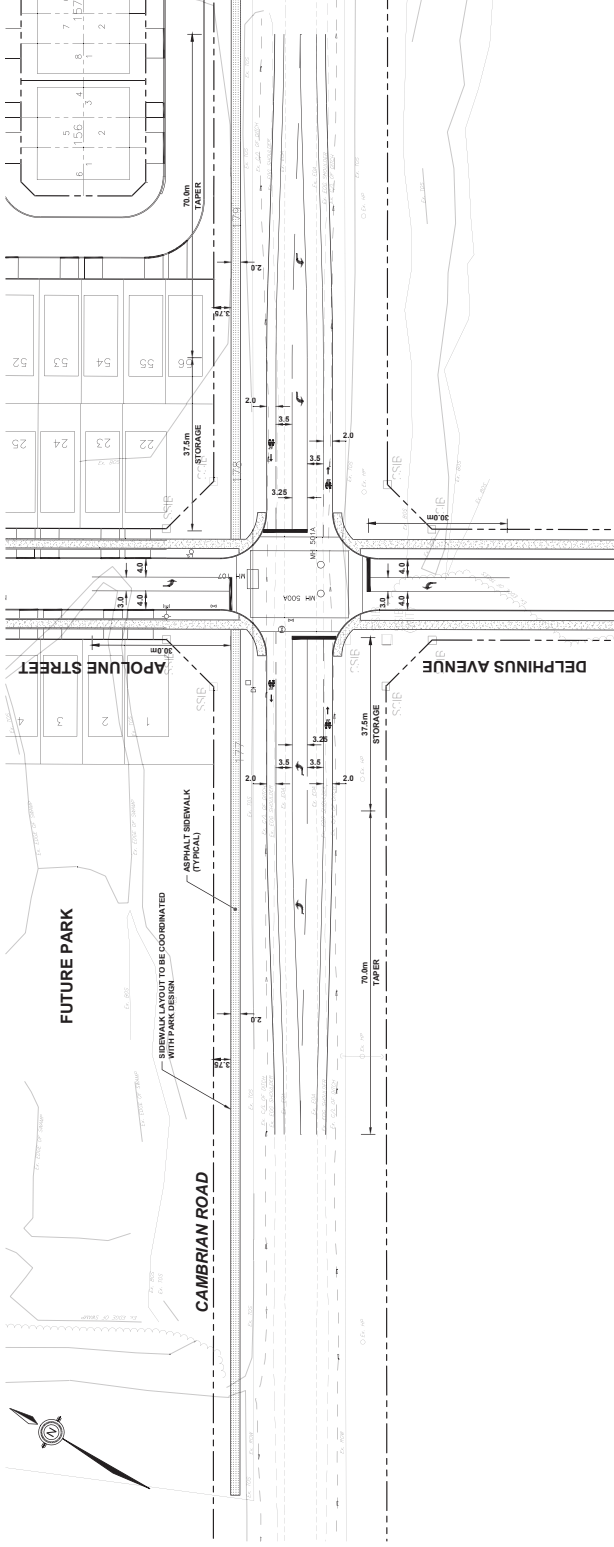
Title
ROADWAY MODIFICATIONS
CAMBRIAN RD. AT APOLINE ST/DELPHINUS AVE.
FUNCTIONAL DESIGN PLAN

Project No.
1-636-01240

Drawing No.
01





















Sheet
1 of 1

Revision



Appendix C

2024 Future Background Synchro Sheets





















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	166	64	34	486	20	127	0	69	91	0	45
Future Volume (vph)	13	166	64	34	486	20	127	0	69	91	0	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.958			0.994			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1672	0	1602	1735	0	1565	1567	0	1565	1567	0
Flt Permitted	0.268			0.607			0.728			0.712		
Satd. Flow (perm)	452	1672	0	1024	1735	0	1199	1567	0	1173	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		34			4			741			345	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	13	166	64	34	486	20	127	0	69	91	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	230	0	34	506	0	127	69	0	91	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	55.0	55.0		55.0	55.0		35.0	35.0		35.0	35.0	
Total Split (%)	61.1%	61.1%		61.1%	61.1%		38.9%	38.9%		38.9%	38.9%	
Maximum Green (s)	49.3	49.3		49.3	49.3		29.1	29.1		29.1	29.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	23.5	23.5		23.5	23.5		29.4	29.4		29.4	29.4	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.46	0.46		0.46	0.46	
v/c Ratio	0.08	0.37		0.09	0.80		0.23	0.06		0.17	0.05	
Control Delay	13.5	13.8		13.1	28.3		14.4	0.1		13.9	0.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.5	13.8		13.1	28.3		14.4	0.1		13.9	0.1	
LOS	B	B		B	C		B	A		B	A	
Approach Delay		13.8			27.3			9.4			9.3	
Approach LOS		B			C			A			A	
Queue Length 50th (m)	1.0	16.3		2.6	52.0		8.6	0.0		6.0	0.0	
Queue Length 95th (m)	4.0	30.1		7.2	82.6		24.2	0.0		18.0	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	348	1296		789	1337		545	1116		533	900	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.18		0.04	0.38		0.23	0.06		0.17	0.05	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 64.6												
Natural Cycle: 60												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.80												
Intersection Signal Delay: 19.0												
Intersection LOS: B												
Intersection Capacity Utilization 53.6%												
ICU Level of Service A												
Analysis Period (min) 15												

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

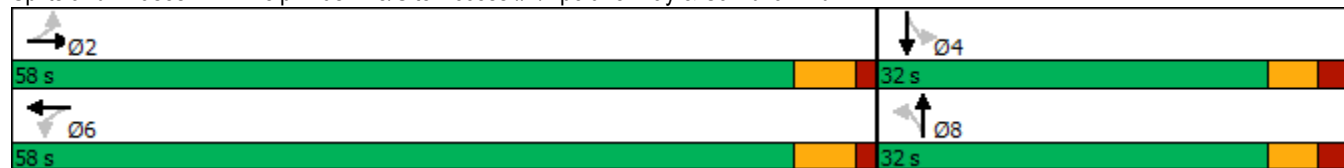


												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	491	123	65	285	68	96	0	50	62	0	25
Future Volume (vph)	45	491	123	65	285	68	96	0	50	62	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.970			0.971			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1693	0	1602	1694	0	1565	1567	0	1565	1567	0
Flt Permitted	0.480			0.217			0.741			0.724		
Satd. Flow (perm)	809	1693	0	366	1694	0	1220	1567	0	1192	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			23			365			582	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	45	491	123	65	285	68	96	0	50	62	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	614	0	65	353	0	96	50	0	62	25	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	























Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	58.0	58.0		58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%		64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Maximum Green (s)	52.3	52.3		52.3	52.3		26.1	26.1		26.1	26.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	28.3	28.3		28.3	28.3		26.5	26.5		26.5	26.5	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.40	0.40		0.40	0.40	
v/c Ratio	0.13	0.84		0.42	0.48		0.20	0.06		0.13	0.03	
Control Delay	11.6	27.2		21.7	14.6		17.7	0.1		17.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.6	27.2		21.7	14.6		17.7	0.1		17.0	0.0	
LOS	B	C		C	B		B	A		B	A	
Approach Delay		26.2			15.7			11.7			12.1	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	3.2	61.5		5.3	27.5		7.3	0.0		4.6	0.0	
Queue Length 95th (m)	8.3	97.6		15.0	45.5		22.1	0.0		15.4	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	646	1357		292	1357		486	844		474	974	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.45		0.22	0.26		0.20	0.06		0.13	0.03	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 66.6												
Natural Cycle: 60												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.84												
Intersection Signal Delay: 20.3						Intersection LOS: C						
Intersection Capacity Utilization 70.2%						ICU Level of Service C						
Analysis Period (min) 15												













Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



Appendix D





















2029 Future Background Synchro Sheets

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	184	129	66	649	20	262	0	137	91	0	45
Future Volume (vph)	13	184	129	66	649	20	262	0	137	91	0	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.938			0.996			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1637	0	1602	1738	0	1565	1567	0	1565	1567	0
Flt Permitted	0.171			0.513			0.728			0.669		
Satd. Flow (perm)	288	1637	0	865	1738	0	1199	1567	0	1102	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		59			3			698			217	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	13	184	129	66	649	20	262	0	137	91	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	313	0	66	669	0	262	137	0	91	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	53.0	53.0		53.0	53.0		37.0	37.0		37.0	37.0	
Total Split (%)	58.9%	58.9%		58.9%	58.9%		41.1%	41.1%		41.1%	41.1%	
Maximum Green (s)	47.3	47.3		47.3	47.3		31.1	31.1		31.1	31.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	33.9	33.9		33.9	33.9		31.5	31.5		31.5	31.5	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.41	0.41		0.41	0.41	
v/c Ratio	0.10	0.42		0.17	0.88		0.54	0.13		0.20	0.06	
Control Delay	13.5	12.9		13.3	32.7		25.0	0.3		19.6	0.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.5	12.9		13.3	32.7		25.0	0.3		19.6	0.2	
LOS	B	B		B	C		C	A		B	A	
Approach Delay		13.0			31.0			16.5			13.2	
Approach LOS		B			C			B			B	
Queue Length 50th (m)	1.1	23.4		5.6	84.0		28.5	0.0		8.4	0.0	
Queue Length 95th (m)	4.3	40.4		12.5	126.7		63.9	0.0		22.6	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	178	1039		537	1080		489	1052		450	768	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.30		0.12	0.62		0.54	0.13		0.20	0.06	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 77.2												
Natural Cycle: 65												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.88												
Intersection Signal Delay: 22.2							Intersection LOS: C					
Intersection Capacity Utilization 88.7%							ICU Level of Service E					
Analysis Period (min) 15												

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	633	255	131	316	68	193	0	98	62	0	25
Future Volume (vph)	45	633	255	131	316	68	193	0	98	62	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.957			0.973			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1670	0	1602	1698	0	1565	1567	0	1565	1567	0
Flt Permitted	0.534			0.096			0.741			0.694		
Satd. Flow (perm)	900	1670	0	162	1698	0	1220	1567	0	1143	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			21			343			595	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	45	633	255	131	316	68	193	0	98	62	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	888	0	131	384	0	193	98	0	62	25	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		9.5	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	69.0	69.0		10.0	79.0		31.0	31.0		31.0	31.0	
Total Split (%)	62.7%	62.7%		9.1%	71.8%		28.2%	28.2%		28.2%	28.2%	
Maximum Green (s)	63.3	63.3		7.0	73.3		25.1	25.1		25.1	25.1	
Yellow Time (s)	4.2	4.2		2.0	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.0	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		3.0	5.7		5.9	5.9		5.9	5.9	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	
Act Effect Green (s)	57.1	57.1		69.7	67.0		25.3	25.3		25.3	25.3	
Actuated g/C Ratio	0.55	0.55		0.67	0.64		0.24	0.24		0.24	0.24	
v/c Ratio	0.09	0.95		0.64	0.35		0.65	0.15		0.22	0.03	
Control Delay	11.2	42.5		24.7	8.7		49.2	0.5		36.9	0.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.2	42.5		24.7	8.7		49.2	0.5		36.9	0.1	
LOS	B	D		C	A		D	A		D	A	
Approach Delay		41.0			12.8			32.8			26.3	
Approach LOS		D			B			C			C	
Queue Length 50th (m)	4.1	156.6		8.5	30.1		38.2	0.0		10.9	0.0	
Queue Length 95th (m)	9.4	#250.1		#27.2	45.0		#68.4	0.0		22.8	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	551	1036		206	1212		296	640		277	831	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	0.86		0.64	0.32		0.65	0.15		0.22	0.03	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 104

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 31.0

Intersection LOS: C

Intersection Capacity Utilization 90.2%

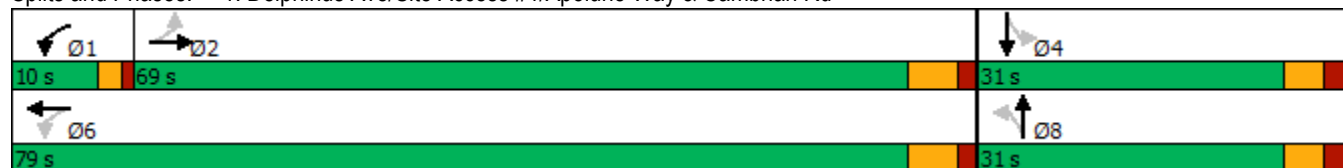
ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



Appendix E

TDM Checklist

TDM Measures Checklist:

Residential Developments (multi-family, condominium or subdivision)

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: <i>Residential developments</i>		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	<input type="checkbox"/>
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input type="checkbox"/>
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 (<i>multi-family, condominium</i>)	<input type="checkbox"/>
2.2 Bicycle skills training		
BETTER	2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	<input type="checkbox"/>

TDM measures: <i>Residential developments</i>		Check if proposed & add descriptions
3. TRANSIT		
3.1 Transit information		
BASIC	3.1.1 Display relevant transit schedules and route maps at entrances (<i>multi-family, condominium</i>)	<input type="checkbox"/>
BETTER	3.1.2 Provide real-time arrival information display at entrances (<i>multi-family, condominium</i>)	<input type="checkbox"/>
3.2 Transit fare incentives		
BASIC ★	3.2.1 Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	<input checked="" type="checkbox"/>
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	<input type="checkbox"/>
3.3 Enhanced public transit service		
BETTER ★	3.3.1 Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (<i>subdivision</i>)	<input checked="" type="checkbox"/>
3.4 Private transit service		
BETTER	3.4.1 Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	<input type="checkbox"/>
4. CARSHARING & BIKESHARING		
4.1 Bikeshare stations & memberships		
BETTER	4.1.1 Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	<input type="checkbox"/>
BETTER	4.1.2 Provide residents with bikeshare memberships, either free or subsidized (<i>multi-family</i>)	<input type="checkbox"/>
4.2 Carshare vehicles & memberships		
BETTER	4.2.1 Contract with provider to install on-site carshare vehicles and promote their use by residents	<input type="checkbox"/>
BETTER	4.2.2 Provide residents with carshare memberships, either free or subsidized	<input type="checkbox"/>
5. PARKING		
5.1 Priced parking		
BASIC ★	5.1.1 Unbundle parking cost from purchase price (<i>condominium</i>)	<input type="checkbox"/>
BASIC ★	5.1.2 Unbundle parking cost from monthly rent (<i>multi-family</i>)	<input type="checkbox"/>

TDM measures: <i>Residential developments</i>		Check if proposed & add descriptions
6. TDM MARKETING & COMMUNICATIONS		
6.1 Multimodal travel information		
BASIC ★	6.1.1 Provide a multimodal travel option information package to new residents	<input checked="" type="checkbox"/>
6.2 Personalized trip planning		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>

Appendix F

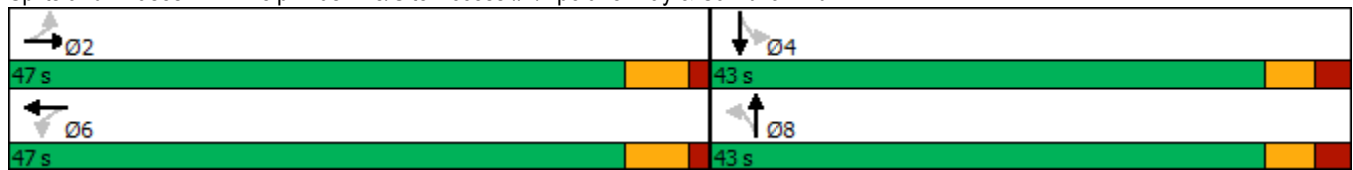
2024 Future Total Synchro Sheets





















												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	166	152	47	486	20	294	0	93	91	0	45
Future Volume (vph)	13	166	152	47	486	20	294	0	93	91	0	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.928			0.994			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1619	0	1602	1735	0	1565	1567	0	1565	1567	0
Flt Permitted	0.238			0.466			0.728			0.697		
Satd. Flow (perm)	401	1619	0	786	1735	0	1199	1567	0	1148	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		68			3			687			275	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	13	166	152	47	486	20	294	0	93	91	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	318	0	47	506	0	294	93	0	91	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	47.0	47.0		47.0	47.0		43.0	43.0		43.0	43.0	
Total Split (%)	52.2%	52.2%		52.2%	52.2%		47.8%	47.8%		47.8%	47.8%	
Maximum Green (s)	41.3	41.3		41.3	41.3		37.1	37.1		37.1	37.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	26.9	26.9		26.9	26.9		37.5	37.5		37.5	37.5	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.49	0.49		0.49	0.49	
v/c Ratio	0.09	0.52		0.17	0.82		0.50	0.08		0.16	0.05	
Control Delay	16.8	17.6		17.4	33.9		18.8	0.2		14.2	0.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.8	17.6		17.4	33.9		18.8	0.2		14.2	0.1	
LOS	B	B		B	C		B	A		B	A	
Approach Delay		17.5			32.5			14.3			9.5	
Approach LOS		B			C			B			A	
Queue Length 50th (m)	1.2	27.0		4.5	64.1		26.4	0.0		6.7	0.0	
Queue Length 95th (m)	4.7	47.3		11.2	97.5		63.7	0.0		19.5	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	219	918		431	953		591	1120		565	911	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.35		0.11	0.53		0.50	0.08		0.16	0.05	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 76.1												
Natural Cycle: 60												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.82												
Intersection Signal Delay: 21.8												
Intersection LOS: C												
Intersection Capacity Utilization 74.8%												
ICU Level of Service D												
Analysis Period (min) 15												

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	491	287	88	285	68	228	0	69	62	0	25
Future Volume (vph)	45	491	287	88	285	68	228	0	69	62	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.945			0.971			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1649	0	1602	1694	0	1565	1567	0	1565	1567	0
Flt Permitted	0.501			0.150			0.741			0.712		
Satd. Flow (perm)	845	1649	0	253	1694	0	1220	1567	0	1173	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		57			23			373			589	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	45	491	287	88	285	68	228	0	69	62	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	778	0	88	353	0	228	69	0	62	25	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Total Split (%)	65.6%	65.6%		65.6%	65.6%		34.4%	34.4%		34.4%	34.4%	
Maximum Green (s)	53.3	53.3		53.3	53.3		25.1	25.1		25.1	25.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)	38.0	38.0		38.0	38.0		25.6	25.6		25.6	25.6	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.34	0.34		0.34	0.34	
v/c Ratio	0.11	0.91		0.69	0.41		0.55	0.09		0.16	0.03	
Control Delay	9.4	30.5		44.1	11.7		30.0	0.2		23.0	0.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.4	30.5		44.1	11.7		30.0	0.2		23.0	0.0	
LOS	A	C		D	B		C	A		C	A	
Approach Delay		29.4			18.1			23.1			16.4	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	3.1	87.2		8.8	26.7		26.4	0.0		6.2	0.0	
Queue Length 95th (m)	7.7	139.1		#33.5	42.6		#62.0	0.0		18.2	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	609	1204		182	1227		414	778		398	921	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.65		0.48	0.29		0.55	0.09		0.16	0.03	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 75.5

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 24.5

Intersection LOS: C

Intersection Capacity Utilization 88.5%

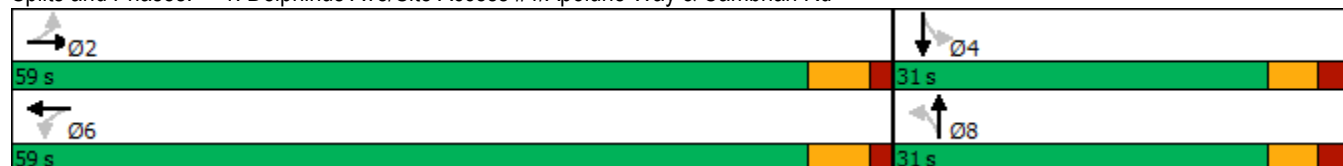
ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.





















Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



Appendix G

2029 Future Total Synchro Sheets

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Future Volume (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		0.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Frt		0.919			0.996			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1604	0	1602	1738	0	1565	1567	0	1565	1567	0
Flt Permitted	0.141			0.388			0.728			0.648		
Satd. Flow (perm)	238	1604	0	654	1738	0	1199	1567	0	1067	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		88			2			659			176	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	401	0	79	669	0	429	161	0	91	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	1		1	1		1	1		1	1	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		23.7	23.7		30.4	30.4		30.4	30.4	

Lanes, Volumes, Timings

2029 FT AM

1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

3713 Borrisokane Rd-Residential



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	46.0	46.0		46.0	46.0		44.0	44.0		44.0	44.0	
Total Split (%)	51.1%	51.1%		51.1%	51.1%		48.9%	48.9%		48.9%	48.9%	
Maximum Green (s)	40.3	40.3		40.3	40.3		38.1	38.1		38.1	38.1	
Yellow Time (s)	4.2	4.2		4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	-1.7	-1.7		-1.7	-1.7		-1.9	-1.9		-1.9	-1.9	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)	37.3	37.3		37.3	37.3		40.2	40.2		40.2	40.2	
Actuated g/C Ratio	0.44	0.44		0.44	0.44		0.47	0.47		0.47	0.47	
v/c Ratio	0.13	0.54		0.28	0.88		0.76	0.15		0.18	0.05	
Control Delay	17.3	16.2		18.1	36.7		31.2	0.3		16.0	0.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.3	16.2		18.1	36.7		31.2	0.3		16.0	0.1	
LOS	B	B		B	D		C	A		B	A	
Approach Delay		16.2			34.7			22.8			10.8	
Approach LOS		B			C			C			B	
Queue Length 50th (m)	1.2	35.5		8.0	96.2		62.1	0.0		9.3	0.0	
Queue Length 95th (m)	5.1	60.3		17.9	#159.2		#113.9	0.0		18.9	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	117	836		323	859		563	1085		501	829	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.48		0.24	0.78		0.76	0.15		0.18	0.05	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 85.5

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 25.2

Intersection LOS: C

Intersection Capacity Utilization 92.4%

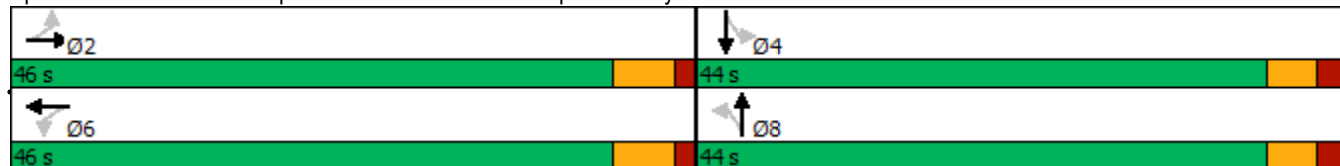
ICU Level of Service F





















Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Future Volume (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		15.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Frt		0.940			0.973			0.850			0.850	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1640	0	1602	1698	0	1565	1567	0	1565	1567	0
Flt Permitted	0.534			0.056			0.741			0.674		
Satd. Flow (perm)	900	1640	0	94	1698	0	1220	1567	0	1110	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		46			19			334			586	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	1052	0	154	384	0	325	117	0	62	25	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7		8.0	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	74.0	74.0		10.0	84.0		36.0	36.0		36.0	36.0	
Total Split (%)	61.7%	61.7%		8.3%	70.0%		30.0%	30.0%		30.0%	30.0%	
Maximum Green (s)	68.3	68.3		7.0	78.3		30.1	30.1		30.1	30.1	
Yellow Time (s)	4.2	4.2		2.0	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5		1.0	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7		3.0	5.7		5.9	5.9		5.9	5.9	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	
Act Effect Green (s)	68.3	68.3		81.0	78.3		30.1	30.1		30.1	30.1	
Actuated g/C Ratio	0.57	0.57		0.68	0.65		0.25	0.25		0.25	0.25	
v/c Ratio	0.09	1.10		1.02	0.34		1.06	0.18		0.22	0.03	
Control Delay	12.4	87.4		106.7	9.8		112.4	0.6		38.3	0.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.4	87.4		106.7	9.8		112.4	0.6		38.3	0.1	
LOS	B	F		F	A		F	A		D	A	
Approach Delay		84.3			37.6			82.8			27.3	
Approach LOS		F			D			F			C	
Queue Length 50th (m)	4.6	~277.7		~23.0	35.3		~84.3	0.0		11.6	0.0	
Queue Length 95th (m)	10.3	#356.5		#66.1	51.8		#139.6	0.0		23.8	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5			37.5			30.0			30.0		
Base Capacity (vph)	512	953		151	1114		306	643		278	832	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.09	1.10		1.02	0.34		1.06	0.18		0.22	0.03	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 70.1

Intersection LOS: E

Intersection Capacity Utilization 109.8%

ICU Level of Service H

Analysis Period (min) 15

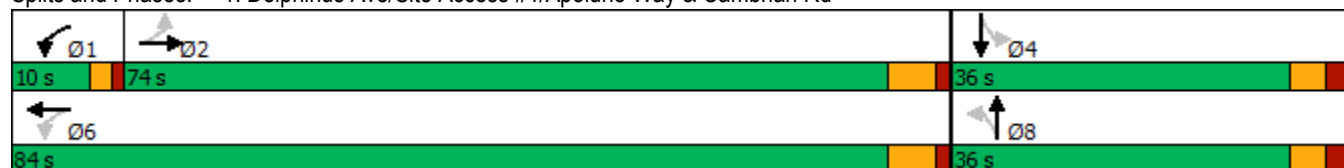
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

























Lanes, Volumes, Timings

1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

2029 FT AM-Mitigation

3713 Borrisokane Rd-Residential

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Future Volume (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		30.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Fr _t			0.850		0.996			0.850			0.850	
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1745	1483	1602	1738	0	1565	1567	0	1565	1567	0
Fl _t Permitted	0.138			0.641			0.728			0.655		
Satd. Flow (perm)	233	1745	1483	1081	1738	0	1199	1567	0	1079	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217		2			645			162	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	13	184	217	79	649	20	429	0	161	91	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	184	217	79	669	0	429	161	0	91	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	

Lanes, Volumes, Timings

1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

2029 FT AM-Mitigation

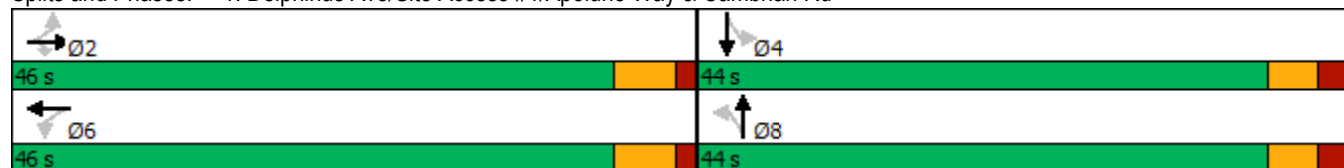
3713 Borrisokane Rd-Residential



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7	23.7	23.7	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	46.0	46.0	46.0	46.0	46.0		44.0	44.0		44.0	44.0	
Total Split (%)	51.1%	51.1%	51.1%	51.1%	51.1%		48.9%	48.9%		48.9%	48.9%	
Maximum Green (s)	40.3	40.3	40.3	40.3	40.3		38.1	38.1		38.1	38.1	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7	5.7	5.7	5.7		5.9	5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	35.9	35.9	35.9	35.9	35.9		38.3	38.3		38.3	38.3	
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42		0.45	0.45		0.45	0.45	
v/c Ratio	0.13	0.25	0.29	0.17	0.92		0.80	0.15		0.19	0.06	
Control Delay	18.8	16.9	3.3	16.3	43.0		35.8	0.3		17.3	0.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.8	16.9	3.3	16.3	43.0		35.8	0.3		17.3	0.1	
LOS	B	B	A	B	D		D	A		B	A	
Approach Delay		9.8			40.2			26.1			11.6	
Approach LOS		A			D			C			B	
Queue Length 50th (m)	1.3	19.0	0.0	7.9	100.1		64.8	0.0		9.6	0.0	
Queue Length 95th (m)	5.3	32.5	11.6	16.6	#165.4		#118.5	0.0		19.7	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5		30.0	37.5			30.0			30.0		
Base Capacity (vph)	110	823	814	510	821		534	1056		481	788	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.22	0.27	0.15	0.81		0.80	0.15		0.19	0.06	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 85.8												
Natural Cycle: 75												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.92												
Intersection Signal Delay: 27.1					Intersection LOS: C							
Intersection Capacity Utilization 98.4%					ICU Level of Service F							
Analysis Period (min) 15												
# 95th percentile volume exceeds capacity, queue may be longer.												

Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

























Lanes, Volumes, Timings

1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

2029 FT PM-Mitigation

3713 Borrisokane Rd-Residential













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Future Volume (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (m)	3.2	3.5	3.5	3.2	3.5	3.5	3.0	4.0	4.0	3.0	4.0	4.0
Storage Length (m)	37.5		15.0	37.5		0.0	30.0		0.0	30.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	70.0			70.0			15.0			15.0		
Lane Util. 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
Fr _t			0.850		0.973			0.850			0.850	
Fl _t Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1602	1745	1483	1602	1698	0	1565	1567	0	1565	1567	0
Fl _t Permitted	0.534			0.137			0.741			0.682		
Satd. Flow (perm)	900	1745	1483	231	1698	0	1220	1567	0	1123	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			113		14			277			523	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		543.1			378.3			439.4			407.2	
Travel Time (s)		27.9			19.5			31.6			29.3	
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
Adj. Flow (vph)	45	633	419	154	316	68	325	0	117	62	0	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	633	419	154	384	0	325	117	0	62	25	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.0			3.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.14	1.09	1.09	1.14	1.09	1.09	1.17	1.01	1.01	1.17	1.01	1.01
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	

Lanes, Volumes, Timings

1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd

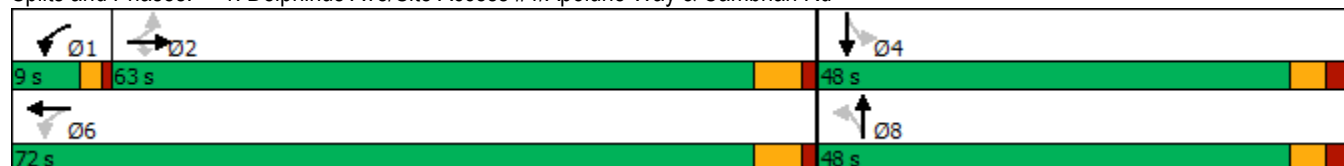
2029 FT PM-Mitigation

3713 Borrisokane Rd-Residential

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.7	23.7	23.7	8.0	23.7		30.4	30.4		30.4	30.4	
Total Split (s)	63.0	63.0	63.0	9.0	72.0		48.0	48.0		48.0	48.0	
Total Split (%)	52.5%	52.5%	52.5%	7.5%	60.0%		40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	57.3	57.3	57.3	6.0	66.3		42.1	42.1		42.1	42.1	
Yellow Time (s)	4.2	4.2	4.2	2.0	4.2		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.5	1.5	1.5	1.0	1.5		2.6	2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.7	5.7	5.7	3.0	5.7		5.9	5.9		5.9	5.9	
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0		17.5	17.5		17.5	17.5	
Pedestrian Calls (#/hr)	0	0	0		0		0	0		0	0	
Act Effct Green (s)	43.7	43.7	43.7	55.5	52.8		42.5	42.5		42.5	42.5	
Actuated g/C Ratio	0.41	0.41	0.41	0.52	0.49		0.40	0.40		0.40	0.40	
v/c Ratio	0.12	0.89	0.62	0.78	0.45		0.67	0.15		0.14	0.03	
Control Delay	19.4	44.5	21.6	42.3	18.4		37.3	0.4		25.2	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.4	44.5	21.6	42.3	18.4		37.3	0.4		25.2	0.0	
LOS	B	D	C	D	B		D	A		C	A	
Approach Delay		34.8			25.2			27.5			17.9	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	5.7	118.9	49.1	16.2	48.0		55.4	0.0		8.2	0.0	
Queue Length 95th (m)	12.7	166.6	79.0	#36.6	70.2		#109.8	0.0		20.4	0.0	
Internal Link Dist (m)		519.1			354.3			415.4			383.2	
Turn Bay Length (m)	37.5		15.0	37.5			30.0			30.0		
Base Capacity (vph)	486	943	853	197	1067		484	789		445	937	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.09	0.67	0.49	0.78	0.36		0.67	0.15		0.14	0.03	
Intersection Summary												
Area Type:	Other											
Cycle Length: 120												
Actuated Cycle Length: 107												
Natural Cycle: 80												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.89												
Intersection Signal Delay: 30.2						Intersection LOS: C						
Intersection Capacity Utilization 82.8%						ICU Level of Service E						
Analysis Period (min) 15												
# 95th percentile volume exceeds capacity, queue may be longer.												

Queue shown is maximum after two cycles.

Splits and Phases: 1: Delphinus Ave/Site Access #1/Apolune Way & Cambrian Rd



Appendix H

MMLOS Worksheets

Multi-Modal Level of Service - Intersections Form

Consultant

CGH Transportation

Scenario

All horizons

Comments

Project Date

2019-43
05-04-2020

INTERSECTIONS		Cambrian Road and Apolune Way / Delphinus Ave (2024 AM)				(2024 PM)				Cambrian Road and Apolune Way / Delphinus Ave (2029 AM)			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	3	3	3	3					3	3	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
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive					Permissive	Protected/ Permissive	Permissive	Permissive
	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
	Right Turns on Red (RTor) ?	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
	Right Turn 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
	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
	PETSI Score	70	70	70	70					70	70	70	70
	Ped. Exposure to Traffic LoS	C	C	C	C	-	-	-	-	C	C	C	C
	Cycle Length												
	Effective Walk Time												
	Average Pedestrian Delay												
Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	
Level of Service	C	C	C	C	-	-	-	-	C	C	C	C	
	C				-				C				
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP					Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration	≤ 50 m	Not Applicable	Not Applicable	Not Applicable					≤ 50 m	Not Applicable	Not Applicable	Not Applicable
	Right Turning Speed	≤ 25 km/h	Not Applicable	Not Applicable	Not Applicable					≤ 25 km/h	Not Applicable	Not Applicable	Not Applicable
	Cyclist relative to RT motorists	D	Not Applicable	Not Applicable	Not Applicable	-	-	-	-	D	Not Applicable	Not Applicable	Not Applicable
	Separated or Mixed Traffic	Mixed Traffic	Separated	Separated	Separated	-	-	-	-	Mixed Traffic	Separated	Separated	Separated
	Left Turn Approach	No lane crossed	No lane crossed	1 lane crossed	1 lane crossed					No lane crossed	No lane crossed	1 lane crossed	1 lane crossed
	Operating Speed	> 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
	Left Turning Cyclist	B	B	E	E	-	-	-	-	B	B	E	E
	Level of Service	D	B	E	E	-	-	-	-	D	B	E	E
E				-				E					
Transit	Average Signal Delay	≤ 10 sec	≤ 20 sec	≤ 40 sec	≤ 20 sec	≤ 20 sec	≤ 30 sec	≤ 20 sec	≤ 30 sec	≤ 20 sec	≤ 30 sec	≤ 40 sec	≤ 20 sec
	Level of Service	B	C	E	C	C	D	C	D	C	D	E	C
		E				D				E			
Truck	Effective Corner Radius												
	Number of Receiving Lanes on Departure from Intersection												
	Level of Service	-	-	-	-	-	-	-	-	-	-	-	-
-				-				-					
Auto	Volume to Capacity Ratio	0.71 - 0.80				0.71 - 0.80				0.71 - 0.80			
	Level of Service	C				C				C			

INTERSECTIONS		(2029 PM)				Cambrian Road and Apolune Way / Delphinus Ave (2029 AM Mitigated)				(2029 PM Mitigated)			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes					3	3	3	4				
	Median					No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m				
	Conflicting Left Turns					Permissive	Protected/ Permissive	Permissive	Permissive				
	Conflicting Right Turns					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				
	Ped Signal Leading Interval?					No	No	No	No				
	Right Turn Channel					No Channel	No Channel	No Channel	No Channel				
	Corner Radius					10-15m	10-15m	10-15m	10-15m				
	Crosswalk Type					Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings				
	PETSI Score					70	70	70	53				
	Ped. Exposure to Traffic LoS	-	-	-	-	C	C	C	D	-	-	-	-
Cycle Length													
Effective Walk Time													
Average Pedestrian Delay													
Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	
Level of Service	-	-	-	-	C	C	C	D	-	-	-	-	
	-				D				-				
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach					Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP				
	Right Turn Lane Configuration					≤ 50 m	Not Applicable	Not Applicable	Not Applicable				
	Right Turning Speed					≤ 25 km/h	Not Applicable	Not Applicable	Not Applicable				
	Cyclist relative to RT motorists	-	-	-	-	D	Not Applicable	Not Applicable	Not Applicable	-	-	-	-
	Separated or Mixed Traffic	-	-	-	-	Mixed Traffic	Separated	Separated	Separated	-	-	-	-
	Left Turn Approach					No lane crossed	No lane crossed	1 lane crossed	1 lane crossed				
	Operating Speed					> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h				
	Left Turning Cyclist	-	-	-	-	B	B	E	E	-	-	-	-
	Level of Service	-	-	-	-	D	B	E	E	-	-	-	-
-				E				-					
Transit	Average Signal Delay	≤ 30 sec	> 40 sec	≤ 40 sec	> 40 sec	≤ 20 sec	≤ 30 sec	> 40 sec	≤ 10 sec	≤ 20 sec	≤ 30 sec	≤ 30 sec	≤ 40 sec
	Level of Service	D	F	E	F	C	D	F	B	C	D	D	E
		F				F				E			
Truck	Effective Corner Radius												
	Number of Receiving Lanes on Departure from Intersection												
	Level of Service	-	-	-	-	-	-	-	-	-	-	-	-
-				-				-					
Auto	Volume to Capacity Ratio	> 1.00				0.71 - 0.80				0.71 - 0.80			
	Level of Service	F				C				C			