



**3508 Greenbank Road**

**Half Moon Bay West Phase 5  
Transportation Impact  
Assessment**

Final Report

July 2, 2019

Prepared for:

Mattamy Homes

Prepared by:

Stantec Consulting Ltd.

## 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 licensed<sup>1</sup> or registered<sup>1</sup> professional in good standing, whose field of expertise is either transportation engineering or transportation planning.

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



Robert Vastag, RPP  
Associate, Senior Transportation Planner  
Project Manager  
400 - 1331 Clyde Avenue  
Ottawa ON K2C 3G4

Phone: (613) 724-4354  
Cell: (613) 853-2837  
Fax: (613) 722-2799  
Robert.Vastag@stantec.com



Lauren O'Grady, P.Eng.  
Transportation Engineer  
400 - 1331 Clyde Avenue  
Ottawa ON K2C 3G4

Phone: (613) 784-2264  
Fax: (613) 722-2799  
Lauren.O'Grady@stantec.com



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## Table of Contents

<b>1.0</b>	<b>SCREENING .....</b>	<b>1</b>
1.1	SUMMARY OF DEVELOPMENT .....	1
1.2	TRIP GENERATION TRIGGER.....	1
1.3	LOCATION TRIGGERS.....	2
1.4	SAFETY TRIGGERS .....	2
1.5	SUMMARY .....	2
<b>2.0</b>	<b>SCOPING .....</b>	<b>3</b>
2.1	EXISTING AND PLANNED CONDITIONS .....	3
2.1.1	Proposed Development .....	3
2.1.2	Existing Conditions .....	7
2.1.3	Planned Conditions .....	10
2.2	STUDY AREA AND TIME PERIODS.....	13
2.2.1	Study Area.....	13
2.2.2	Time Periods .....	13
2.2.3	Horizon Years.....	13
2.3	EXEMPTIONS REVIEW .....	14
<b>3.0</b>	<b>FORECASTING.....</b>	<b>15</b>
3.1	DEVELOPMENT GENERATED TRAVEL DEMAND .....	15
3.1.1	Trip Generation and Mode Shares .....	15
3.1.2	Trip Distribution .....	16
3.1.3	Trip Assignment .....	16
3.2	BACKGROUND NETWORK TRAVEL DEMAND .....	18
3.2.1	Transportation Network Plans .....	18
3.2.2	Background Growth.....	19
3.2.3	Other Developments .....	19
3.3	DEMAND RATIONALIZATION .....	19
<b>4.0</b>	<b>STRATEGY REPORT .....</b>	<b>20</b>
4.1	DEVELOPMENT DESIGN.....	20
4.1.1	Design for Sustainable Modes.....	20
4.1.2	Circulation and Access.....	20
4.1.3	New Street Networks.....	21
4.2	PARKING.....	21
4.2.1	Parking Supply .....	21
4.2.2	Spillover Parking .....	22
4.3	BOUNDARY STREET DESIGN.....	22
4.3.1	Multi-Modal Level of Service .....	22
4.4	ACCESS INTERSECTION DESIGN.....	23
4.4.1	Access Location .....	23
4.4.2	Intersection Control .....	24
4.5	TRANSPORTATION DEMAND MANAGEMENT.....	24
4.6	NEIGHBOURHOOD TRAFFIC MANAGEMENT.....	24
4.7	TRANSIT .....	24
4.8	REVIEW OF NETWORK CONCEPT .....	24
4.9	INTERSECTION DESIGN .....	25
4.9.1	Intersection Control .....	25



# Half Moon Bay West Phase 5 Transportation Impact Assessment

Screening Report

July 2, 2019

4.9.2	Intersection Design.....	25
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<b>5.0</b>	<b>CONCLUSION.....</b>	<b>32</b>
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## List of Tables

Table 1 - Proposed Land Use / Land Use Code .....	6
Table 2 - City of Ottawa Transportation Master Plan Projects .....	10
Table 3 - Background Developments .....	12
Table 4 - Exemptions Review .....	14
Table 5 - Trip Generation .....	15
Table 6 - Trip Distribution .....	16
Table 7 - MMLOS Conditions - Segments.....	23
Table 8 2021 Future Background Intersection Capacity Analysis .....	25
Table 9 2021 Total Future Intersection Capacity Analysis .....	28
Table 10 - 2026 Ultimate Intersection Operations.....	30

## List of Figures

Figure 1 - Site Location .....	4
Figure 2 - Proposed Site Plan .....	5
Figure 3 - Existing Lane Configuration and Traffic Control.....	8
Figure 4 - Study Area Transit Routes and Stops.....	9
Figure 5 - Background Developments.....	11
Figure 6 - Site Traffic (AM Peak Hour).....	17
Figure 7 - Site Traffic (PM Peak Hour) .....	18
Figure 8 - Garbage Truck Turning Template .....	21
Figure 9 - 2021 Future Background Traffic Volumes (AM Peak Hour).....	26
Figure 10 - 2021 Future Background Traffic Volumes (PM Peak Hour).....	27
Figure 11 - 2021 Total Future Traffic Volumes (AM Peak Hour) .....	28
Figure 12 - 2021 Total Future Traffic Volumes (PM Peak Hour).....	29
Figure 13 - 2026 Ultimate Traffic Volumes (AM Peak Hour) .....	30
Figure 14 - 2026 Ultimate Traffic Volumes (PM Peak Hour) .....	31

## List of Appendices

APPENDIX A	TRANSPORTATION DEMAND MANAGEMENT	CHECKLIST .....	A.1
APPENDIX B	INTERSECTION PERFORMANCE WORKSHEETS .....		B.1
B.1	2021 Future Background Conditions .....		B.2
B.2	2021 Total Future Conditions.....		B.3
B.3	2026 Ultimate Conditions.....		B.4





## 1.0 SCREENING

### 1.1 SUMMARY OF DEVELOPMENT

Municipal Address	3508 Greenbank Road
Description of Location	Southwest quadrant of the Watercolours Way at Realigned Greenbank Road intersection
Land Use Classification	Stacked Houses (LUC 231 - Low-rise condominiums)
Development Size (units)	72 Units
Development Size (m <sup>2</sup> )	9,351m <sup>2</sup> (Total Site Area)
Number of Accesses and Locations	1 access on Watercolours Way and 1 access on Aphelion Crescent
Phase of Development	5 of 5 total
Buildout Year	Phase 5: 2021

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

### 1.2 TRIP GENERATION TRIGGER

Considering the development's land use type and size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size	Triggered
Single-family homes	40 units	✗
Townhomes or apartments	90 units	✗
Office	3,500 m <sup>2</sup>	✗
Industrial	5,000 m <sup>2</sup>	✗
Fast-food restaurant or coffee shop	100 m <sup>2</sup>	✗
Destination retail	1,000 m <sup>2</sup>	✗
Gas station or convenience market	75 m <sup>2</sup>	✗
Development is anticipated to generate more than 60 person trips		✓

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

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



## 1.3 LOCATION TRIGGERS

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

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

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

## 1.4 SAFETY TRIGGERS

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

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

## 1.5 SUMMARY

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

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



## 2.0 SCOPING

### 2.1 EXISTING AND PLANNED CONDITIONS

#### 2.1.1 Proposed Development

Mattamy is proceeding with the site plan application of Phase 5 of the Half Moon Bay West (HMBW) residential development. The municipal address of the subject site is 3508 Greenbank Road and it is located at the southwest quadrant of the intersection of Watercolours Way and Realigned Greenbank Road. It is bound by Half Moon Bay West Phase 1 to the west, Watercolours Way to the north, Realigned Greenbank Road to the east, and a future commercial development to the south.

**Figure 1** illustrates the location of Phase 5 of HMBW. The subject site is currently zoned as General Mixed-Use Zone; the purpose of this zone, according to the City of Ottawa's Official Plan, is to:

- "Allow residential, commercial and institutional uses, or mixed-use development in the General Urban Area...";
- "Limit commercial uses to individual occupancies or in groupings in well defined areas such that they do not affect the development of the designated Traditional and Arterial Mainstreets as viable mixed-use areas";
- "Permit uses that are often large and serve or draw from broader areas than the surrounding community and which may generate traffic, noise or other impacts provided the anticipated impacts are adequately mitigated or otherwise addressed"; and
- "Impose development standards that will ensure that the uses are compatible and complement surrounding land uses".

The proposed development consists of 72 apartment units and two accesses to the proposed development will be provided, one along Watercolours Way and one along Aphelion Crescent. Both proposed site accesses will operate as full-movements accesses with no turning restrictions. The proposed site consists of 87 resident parking spaces, 14 visitor parking spaces, and 36 bicycle parking spaces.

Build-out and occupancy of Phase 5 of HMBW is anticipated to occur by 2021.

**Figure 2** illustrates the proposed site plan.



Figure 1 - Site Location

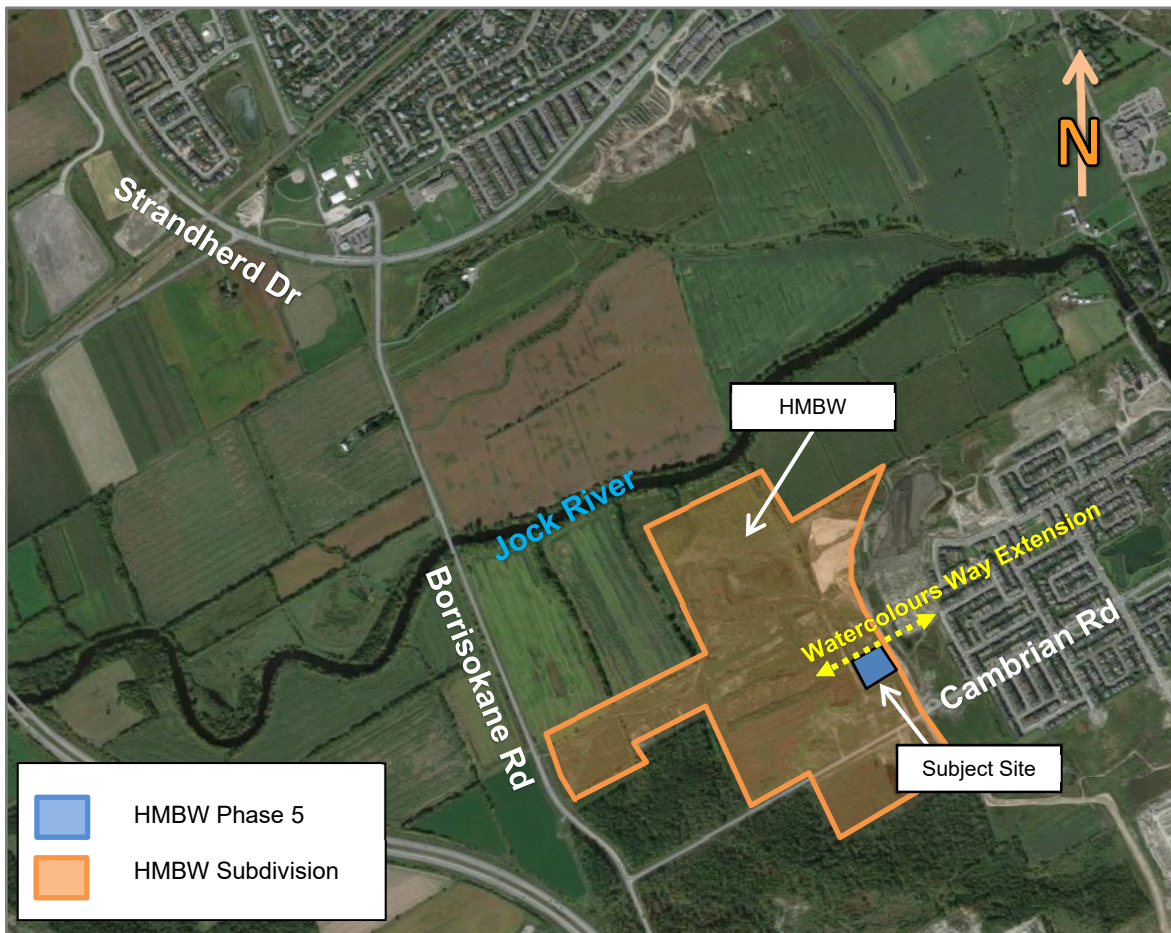
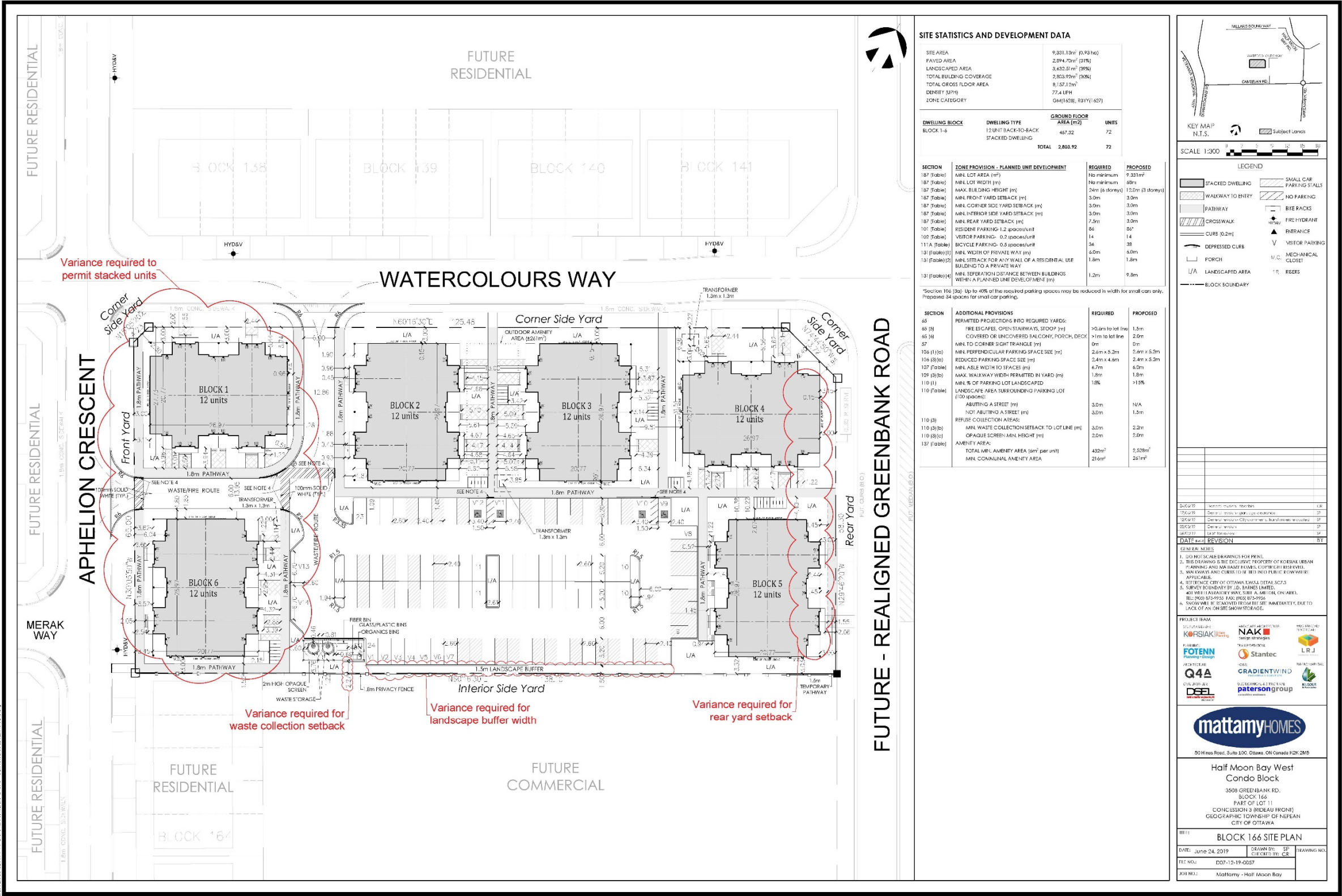




Figure 2 - Proposed Site Plan



## Half Moon Bay West Phase 5 Transportation Impact Assessment

### Forecasting Report

July 2, 2019

The residential portions of HMBW will be constructed in 5 phases. Phase 5, which is the subject of this transportation assessment, will consist of 72 apartment units with build-out and occupancy anticipated to occur in 2021.

Build-out and occupancy of all residential phases of the HMBW development are summarized below.

Development Phase	Buildout Year
Phase 1	2020
Phase 2	2021
Phase 3	2023
Phase 4	2026
Phase 5	2021

**Table 1** outlines the proposed *TRANS Trip Generation Residential Trip Rates Study Report* land uses assumed for the analysis to forecast the trips generated by the proposed development.

**Table 1 - Proposed Land Use / Land Use Code**

Land Use	Land Use Code (LUC)	Size
LUC 231	Low-Rise Condominiums (1 to 2 floors)	72 Apartment Units



## 2.1.2 Existing Conditions

### 2.1.2.1 Roads and Traffic Control

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

**Watercolours Way**      Watercolours Way is a municipally-owned, two-lane local road with a sidewalk along the south side. Given that no posted speed limit is currently provided, the default speed limit is 50km/h. There are no parking restrictions on Watercolours Way

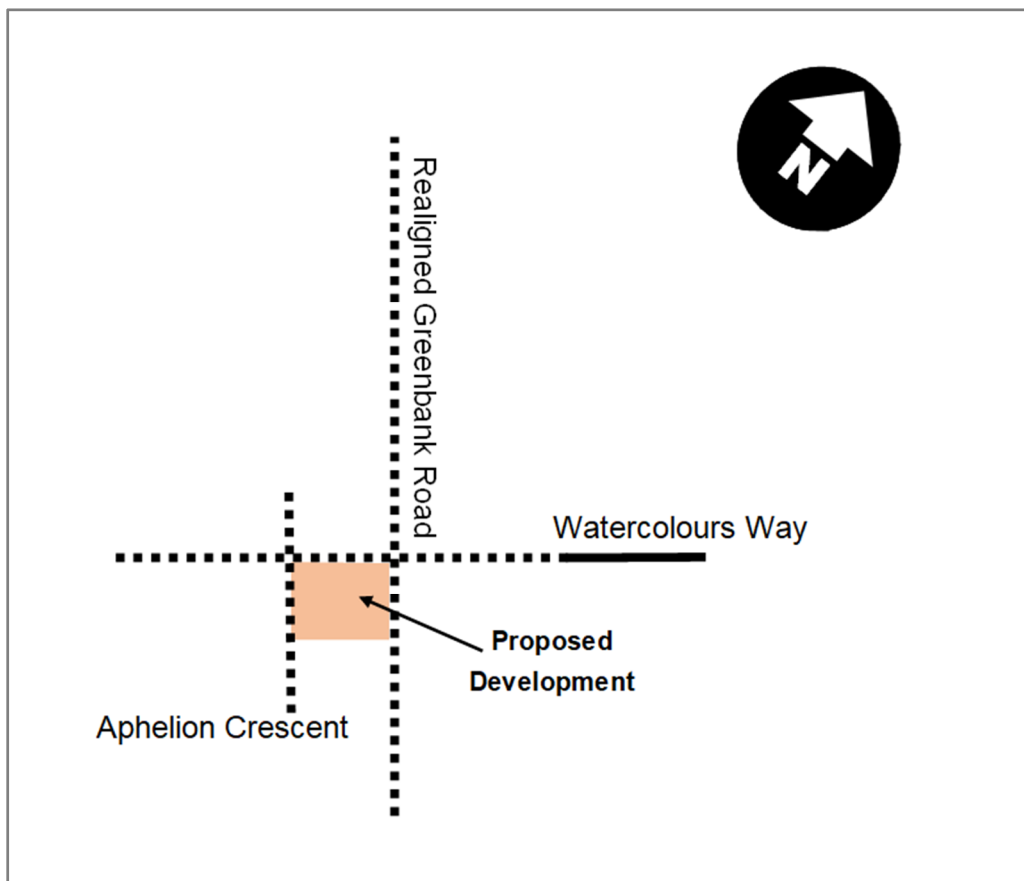
Although the intersection of Realigned Greenbank Road at Watercolours Way will be constructed after the build-out of the subject site, according to the *Greenbank Road from Malvern Drive to Cambrian Road Class Environmental Assessment* (December 2006), this intersection will be signalized and will include auxiliary left turn lanes on all legs. The intersection of Watercolours Way at Aphelion Crescent will be stop-controlled along Aphelion Crescent and will feature reduced curb radii in order to reduce the crossing distances for pedestrians. The intersection of Aphelion Crescent at Merak Way will be stop-controlled along Merak Way.

There are currently no existing adjacent driveways boarding the site within 200m of the proposed site accesses.

**Figure 3** illustrates the existing lane configuration and traffic control.



Figure 3 - Existing Lane Configuration and Traffic Control



### 2.1.2.2 Walking and Cycling

As the proposed development is currently surrounded by greenfield and undeveloped land, there are currently no existing sidewalks or bicycle lanes in the immediate vicinity of the site. There are, however, sidewalks along Cambrian Road, east of Seely's Bay Street, and within Mattamy's Half Moon Bay North community.

### 2.1.2.3 Transit

Transit service is not currently provided in the immediate vicinity of the proposed development; however, it is located nearby at the intersection of Cambrian Road and River Mist Road and is described as follows:

- |           |  |
|-----------|--|
| Route 95  | Route 95 is a regular bus route that runs from the Minto Centre Recreation Complex to Trim Road and operates on a 15-minute headway during the morning peak period northbound and during the afternoon peak period southbound. The closest transit stops to the site are located at the intersection of Cambrian Road and River Mist Road, approximately 900 metres away |
| Route 275 | Route 275 is a peak directional Connexion route that runs from Cambrian Road to Mackenzie King Station. During the morning peak, the route runs from Cambrian Road to Mackenzie King Station   |

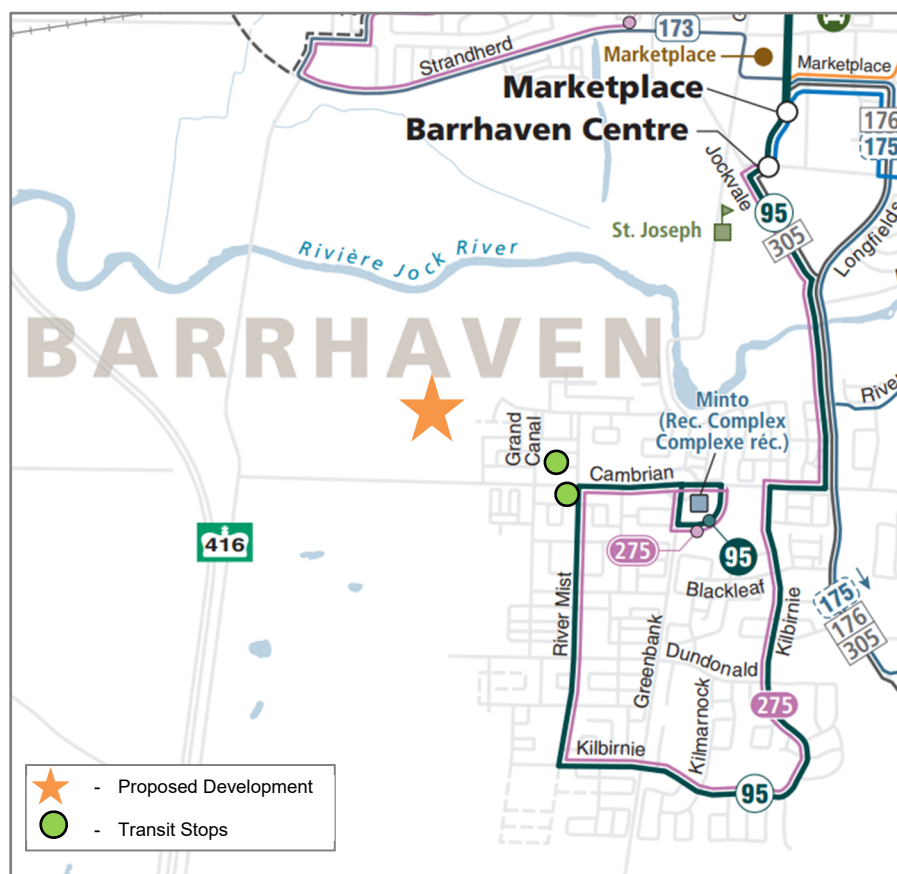




four times, starting at 7AM. During the afternoon peak, the route runs from Mackenzie King Station to Cambrian Road seven times starting at 4PM.

Figure 4 illustrates nearby transit routes and the two bus stop locations that are closest to the subject site.

Figure 4 - Study Area Transit Routes and Stops



(Source: OC Transpo System Map, accessed March 2019)

#### 2.1.2.4 Traffic Management Measures

No traffic management measures are currently provided near the subject site.

#### 2.1.2.5 Traffic Volumes

As the roads in the study area are all future roads (Watercolours Way, Aphelion Crescent, and Realigned Greenbank Road), there are no existing traffic volumes.

#### 2.1.2.6 Collision History

Collision statistics from the City of Ottawa's *Open Data* database were reviewed to determine if the streets or intersections surrounding the subject site exhibited any identifiable collision patterns.



**Borrisokane Road at Cambrian Road** experienced 9 collisions over a four-year period between 2014 and 2017. Out of the 9 recorded collisions, four were classified as rear-end (44%) and five were classified as 'SMV Other' (56%). The recorded collisions involved seven property damage only (78%) and two non-fatal injury (22%).

**Cambrian Road between Borrisokane Road and Grand Canal Road** experienced three collisions over a four-year period between 2014 and 2017. Out of the three recorded collisions, one was classified as approaching, one was classified as 'SMV Unattended Vehicle', and one was classified as 'SMV Other'. The recorded collisions involved one property damage only (33%) and two non-fatal injury (67%).

Given that the available data shows a low frequency of collisions and without any identifiable patterns, there does not appear to be any prevailing safety issues at the streets or intersections surrounding the subject site.

## 2.1.3 Planned Conditions

### 2.1.3.1 Road Network Modifications

**Table 2** identifies the City of Ottawa Transportation Master Plan (TMP) projects located near the study area.

**Table 2 - City of Ottawa Transportation Master Plan Projects**

Project	Description	TMP Phase
Strandherd Drive Widening	Widen from two to four lanes between Fallowfield Road and Maravista Drive	Phase 1 (2014 – 2019)
	Widen from two to four lanes between Maravista Drive and Jockvale Road	Phase 2 (2020 – 2025)
Chapman Mills Drive	New four lane arterial road from Longfields Drive to Strandherd Drive	Phase 2 (2020 – 2025)
Longfields Drive Widening	Widen from two to four lanes between Cambrian Road to Prince of Wales Drive	Phase 3 (2026 – 2031)
Realigned Greenbank Road	New four lane road from near Jockvale Road to Cambrian Road, includes Jock River Bridge	Phase 1 (2014 – 2019)

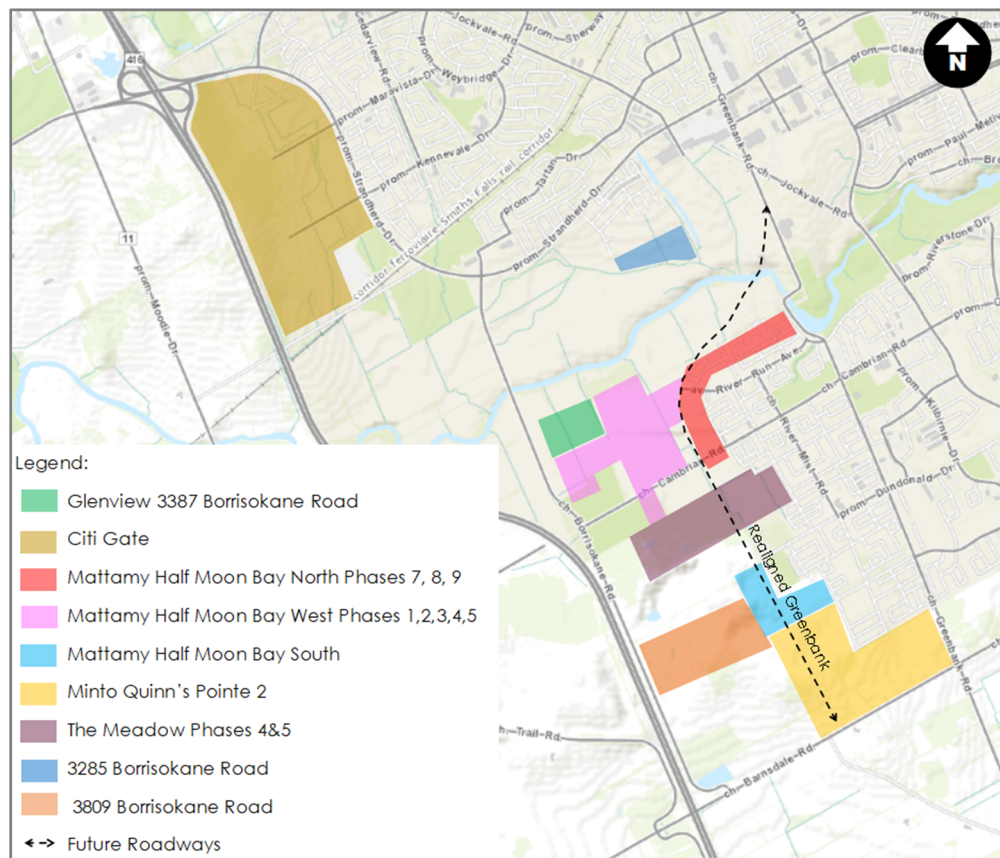
The most noteworthy improvement identified in the above table is the Realigned Greenbank Road project given that it abuts the eastern limits of the subject site. Although the TMP suggests that Realigned Greenbank Road will be constructed during Phase 1 (2014 – 2019) of the TMP, based on the current status of the project, the City of Ottawa has indicated that the timing has been changed and that this section of Realigned Greenbank Road will be constructed and operational by Phase 3 (2026 – 2031).

### 2.1.3.2 Future Background Developments

The Barrhaven South community has experienced substantial growth over the past few years and that growth is anticipated to continue well into the future. There are numerous developments scheduled to occur near the subject site, as illustrated in **Figure 5** and outlined in **Table 3** below.



Figure 5 - Background Developments



# Half Moon Bay West Phase 5 Transportation Impact Assessment

Forecasting Report

July 2, 2019

**Table 3 - Background Developments**

Development	Location	Size	Build-Out
Mattamy's Half Moon Bay North Phases 7, 8, 9	North of Half Moon Bay North Phase 5 and 6, south/east of Realigned Greenbank Road	381 residential units	2020
Glenview's 3387 Borrisokane Road	North of Cambrian Road between Borrisokane Road and Mattamy's Half Moon Bay West	211 residential units	2022
Mattamy's Half Moon Bay West Phases 1,2,3,4	North of Cambrian Road between Borrisokane Road and Realigned Greenbank Road	906 residential units	2026
Citi Gate's Highway 416 Employment Lands	Between Highway 416 and Strandherd Drive, south of Fallowfield, north of the train tracks	350k ft <sup>2</sup> GFA business park	Interim phase: 2019 Ultimate phase: 2029
Mattamy's Half Moon Bay South	South of Half Moon Bay South Phase 4, north of Quinn's Pointe 2, west of Existing Greenbank Road, east of Realigned Greenbank Road	270 residential units and 69k ft <sup>2</sup> GFA specialty retail	Interim: 2025 Ultimate: 2031
Minto's Quinn's Pointe 2	North of Barnsdale, between existing and Realigned Greenbank Road	1,200 residential units 59k ft <sup>2</sup> GFA schools	Interim phase: 2025 Ultimate phase: 2031
The Meadow Phase 4	South of Half Moon Bay North and east of Realigned Greenbank Road	186 residential units	2019
The Meadow Phase 5	South of Mattamy's Half Moon Bay West and west of Realigned Greenbank Road	346 residential units	2022
3285 Borrisokane Road	South of the Future Chapman Mills Extension, north of the Jock River, east of Borrisokane Road	200 residential units	2020
3809 Borrisokane Road	East of Borrisokane Road, west of Quinn's Pointe 2	500 residential units	2025



## 2.2 STUDY AREA AND TIME PERIODS

### 2.2.1 Study Area

The proposed study area is limited to the following intersections:

- Watercolours Way at Aphelion Crescent;
- Watercolours Way at Site Access 1; and
- Aphelion Crescent at Site Access 2.

### 2.2.2 Time Periods

The proposed scope of the transportation assessment includes the following analysis time periods:

- Weekday AM peak hour of roadway; and
- Weekday PM peak hour of roadway.

### 2.2.3 Horizon Years

The scope of the transportation assessment proposes the following horizon years:

- 2018 existing conditions;
- 2021 future background conditions;
- 2021 total future conditions (site build-out); and
- 2026 total future conditions (5 years beyond build-out).



## 2.3 EXEMPTIONS REVIEW

**Table 4** summarizes the Exemptions Review table from the City of Ottawa's *2017 Transportation Impact Assessment Guidelines*.

**Table 4 - Exemptions Review**

Module	Element	Exemption Considerations	Exempted?
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	No
	4.1.3 New Street Networks	Only required for plans of subdivision	Yes
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	No
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Yes
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	No
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	Yes
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	Yes
4.9 Intersection Design	All Elements	Not required if site generation trigger is not met.	No



## 3.0 FORECASTING

### 3.1 DEVELOPMENT GENERATED TRAVEL DEMAND

#### 3.1.1 Trip Generation and Mode Shares

The *TRANS Residential Trip Generation Residential Trip Rates Study* was used to forecast auto trip generation for the proposed development.

**Table 5** outlines the trip generation rates and the person trips for the land use.

As per the City of Ottawa's *2017 TIA Guidelines*, the auto trip generation rates of the residential portion of the development were converted to person trips using the auto mode share rates outlined in Table 3.13 in the *TRANS Residential Trip Generation Residential Trip Rates Study Report (August 2009)*.

Table 3.13 of the aforementioned *TRANS* study also includes transit mode shares for various geographic areas across the City. During the preparation of the *Half Moon Bay West Community Transportation Study (November 2017)*, City staff indicated that the assumed transit mode share of HMBW site trips should be reduced to reflect the fact that Realigned Greenbank Road, including the planned higher order BRT transit lanes, will not be constructed during the horizons of the subject study. As such, the transit modal share assumptions required adjustments and a 10% transit modal share was adopted.

The anticipated trips generated by the proposed Phase 5 development, as outlined in **Table 5** below, are in line with those identified in the *Half Moon Bay West Community Transportation Study (November 2017)*.

**Table 5 - Trip Generation**

Land Use		# Units	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Trip Generation Rates								
231 - Low-rise condominiums		72	30%	70%	0.60	56%	44%	0.66
Conversion to Person Trips								
231 - Low-rise condominiums	Auto Trip Gen		13	30	43	27	21	48
	Auto Mode Share		44%			44%		
	Person Trip Gen		29	69	98	60	48	108
Modal Share Adjustments								
231 - Low-rise condominiums	Auto	70%	20	48	68	42	33	75
	Passenger	20%	6	14	20	12	10	22
	Walk / Bike	0%	0	0	0	0	0	0
	Transit	10%	3	7	10	6	5	11



### 3.1.2 Trip Distribution

The distribution of traffic to / from the proposed development is consistent with the approved *Half Moon Bay West Community Transportation Study* report (November 2017) and the recently submitted *Half Moon Bay West Phase 1 Transportation Impact Assessment* (January 2019).

**Table 6** summarizes the assumed trip distribution.

**Table 6 - Trip Distribution**

Direction		Via (to / from)			
		Borrisokane Road (North)	Borrisokane Road (South)	Cambrian Road (East)	Existing Greenbank Road (North)
North	25%	12.5%			12.5%
East	25%	12.5%		7.5%	5%
South	5%		5%		
West	5%	5%			
Internal *	40%	12%		10%	18%
<b>Total</b>	<b>100%</b>	<b>42%</b>	<b>5%</b>	<b>17.5%</b>	<b>35.5%</b>

\* Refers to trip origins/destinations within the same O-D Ward.

### 3.1.3 Trip Assignment

Site generated trips were assigned to the study area road network based on the trip distribution assumptions outlined above in **Table 6**.

**Figure 6** and **Figure 7** illustrate the site traffic the proposed Phase 5 development is anticipated to generate during the AM and PM peak hours, respectively.





Figure 6 - Site Traffic (AM Peak Hour)

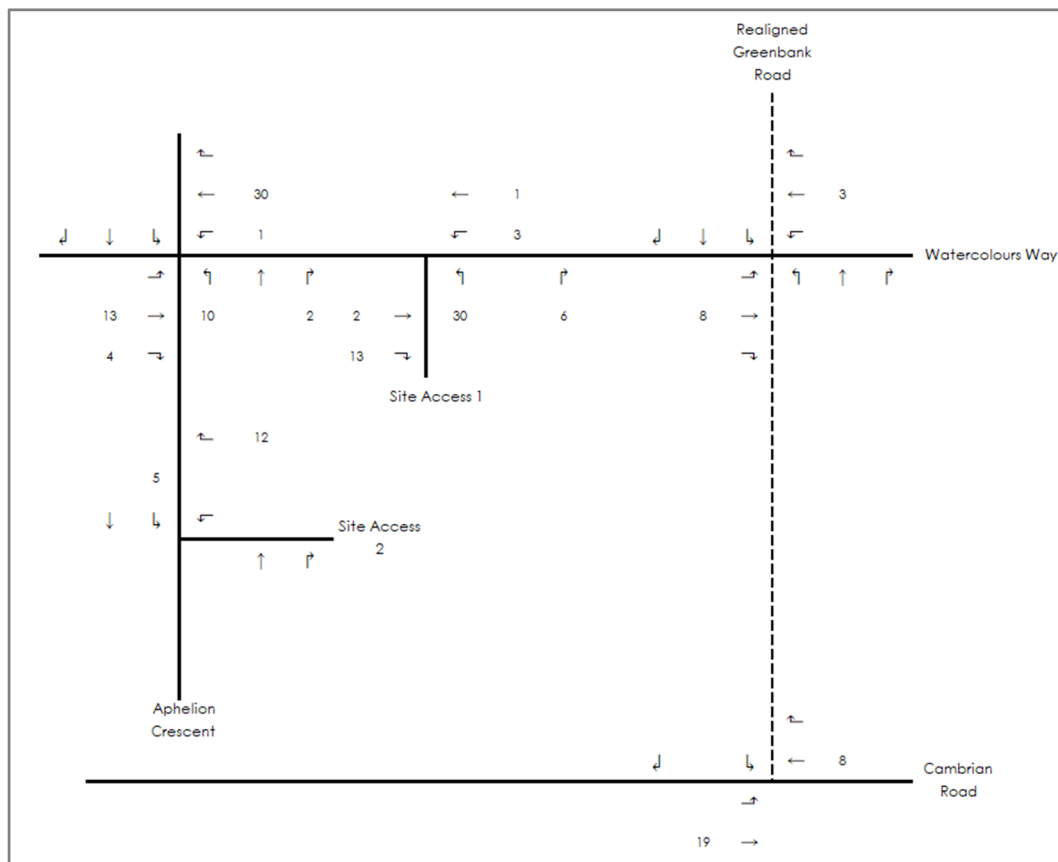
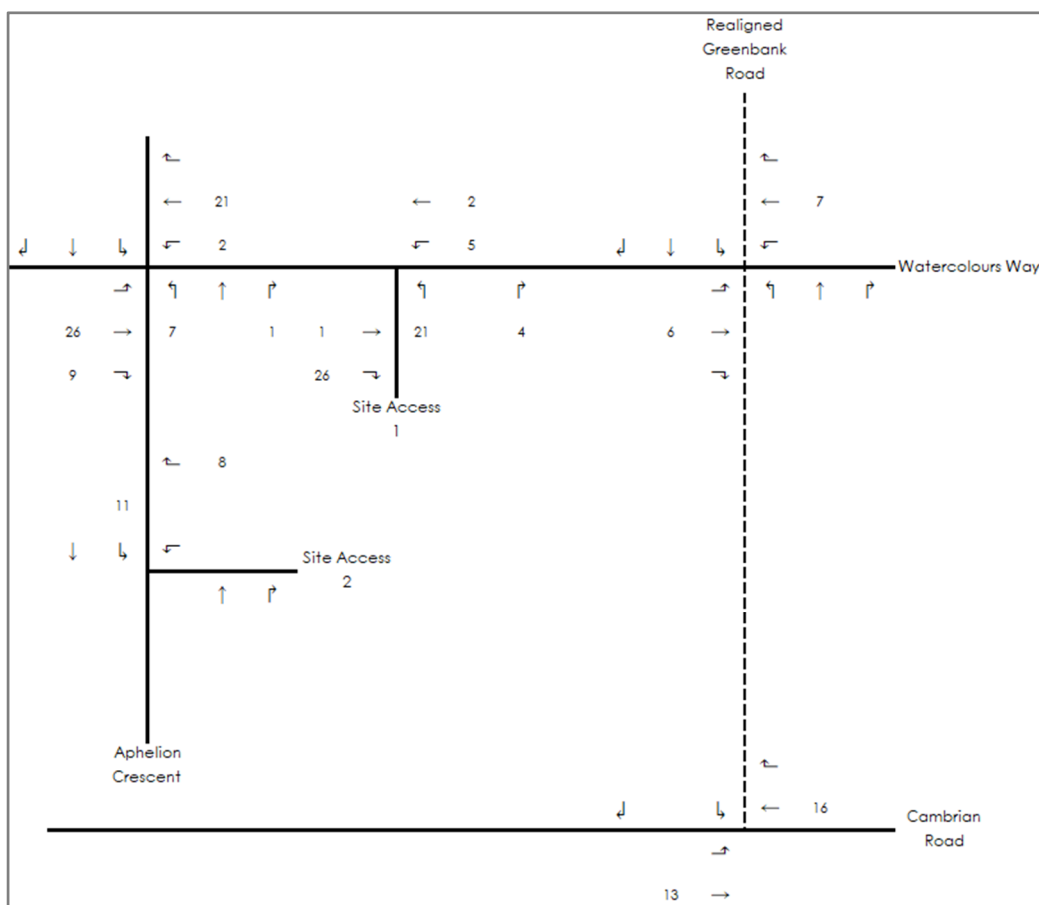


Figure 7 – Site Traffic (PM Peak Hour)



## 3.2 BACKGROUND NETWORK TRAVEL DEMAND

### 3.2.1 Transportation Network Plans

As outlined in **Table 2** in **Section 2.1.3.1**, a number of road network projects are expected to occur near the proposed development.

Despite the timelines identified in the City of Ottawa's *2013 Transportation Master Plan Affordable Network* (outlined in **Table 2**), through discussions with City staff, it has been noted that the Phase 2 projects have been pushed to Phase 3 and the Phase 3 projects have been pushed to post 2031. For this reason, there are no transportation network improvements that will be implemented prior to the 2026 ultimate horizon (i.e. build-out +5).



### **3.2.2 Background Growth**

Existing traffic volumes were grown at a rate of 2% annually, non-compounding, to represent future background traffic volumes. This growth rate is consistent with the previously approved *Half Moon Bay West Community Transportation Study Addendum 1* (November 2017).

### **3.2.3 Other Developments**

In addition to the nominal 2% background growth rate, as outlined in **Section 2.1.3.2**, a number of background developments are anticipated to occur between 2019 and 2026. The site trips were obtained from various completed traffic studies in the Barrhaven South area. The site trips from these background developments are explicitly accounted for in this study.

## **3.3 DEMAND RATIONALIZATION**

The proposed residential development is not anticipated to encounter any capacity restrictions that cannot be resolved through roadway improvements and therefore no demand rationalization is required.



## 4.0 STRATEGY REPORT

### 4.1 DEVELOPMENT DESIGN

#### 4.1.1 Design for Sustainable Modes

**Bicycle facilities:** the bicycle racks are located along the western, northern, and eastern portions of the subject site. The location of the bicycle racks will provide convenient access to Watercolours Way, Aphelion Crescent, and eventually, to future Realigned Greenbank Road. Pedestrian paths are provided between each of the six residential blocks to facilitate pedestrian access to / from the bicycle racks.

**Parking areas:** The parking area is in the interior of the subject site with the six residential blocks along the eastern, northern, and western sides. Pedestrian paths are provided from the parking area to all six residential blocks within the subject site.

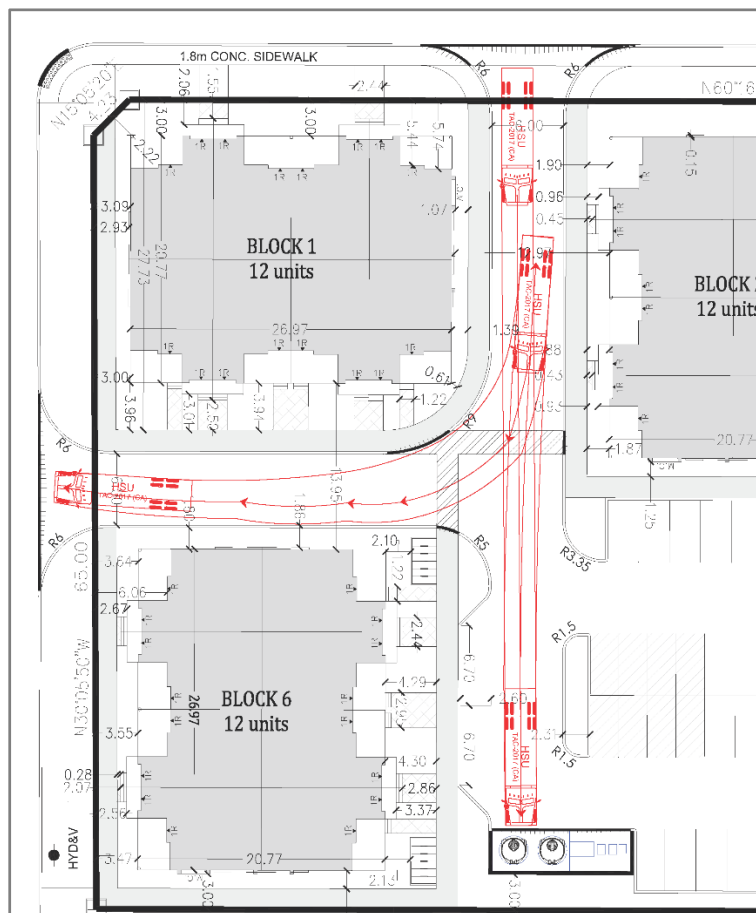
**Transit facilities:** the closest existing transit stop to the proposed subject site is located at the Cambrian Road at River Mist Road intersection. As there are no sidewalks along Cambrian Road, east of Seely's Bay Street, residents wishing to access this transit stop will need to walk along east Watercolours Way to Seely's Bay Street, head south along Seely's Bay Street until Cambrian Road, and then walk east down Cambrian Road to River Mist Road. This route is approximately 800m long. There are two proposed transit stops within the Half Moon Bay West Phase 1 development, which are located approximately 550m away from the subject site. When Realigned Greenbank Road is constructed and the transitway is extended south, the subject site will be well within 400m of the transit stop at the intersection of Realigned Greenbank Road and Watercolours Way.

#### 4.1.2 Circulation and Access

The proposed site will have two accesses; one access to Watercolours Way and one access to Aphelion Crescent. The two accesses connect to the parking area at the centre of the development. The site has been designed to allow for garbage trucks to access the site without driving over curbs or being blocked by parked vehicles. It was assumed that garbage trucks will enter the proposed site via Site Access 1, drive forward to the garbage receptacles for the garbage collection, reverse towards Site Access 1, and then exit the proposed site via Site Access 2. The truck turning template for a heavy single unit vehicle (HSU) is illustrated in **Figure 8** below.



### Figure 8 - Garbage Truck Turning Template



### 4.1.3 New Street Networks

Not applicable; exempted during screening and scoping.

## 4.2 PARKING

#### 4.2.1 Parking Supply

**Auto Parking** - As per City of Ottawa Zoning By-law 2016-249 (Sections 101 and 102), the minimum residential parking space rate and minimum visitor parking space rate is 1.2 and 0.2 parking spaces per dwelling unit, respectively. The proposed site has 72 units and therefore it requires 87 resident parking spaces and 14 visitor parking spaces. The proposed site includes 87 resident parking spaces and 14 visitor parking spaces, which meets the minimum requirements.

**Bicycle Parking** – As per City of Ottawa Zoning By-law 2016-249 (Section 111), the minimum bicycle parking rate is 0.5 bicycle parking spaces per dwelling unit. The proposed site has 72 units and therefore 36 bicycle parking spaces



must be provided. The proposed site includes 36 bicycle parking spaces and therefore the bicycle parking space requirements have been met.

#### 4.2.2 Spillover Parking

Not applicable; exempted during screening and scoping.

### 4.3 BOUNDARY STREET DESIGN

#### 4.3.1 Multi-Modal Level of Service

The multi-modal level of service (MMLOS) was evaluated for the Watercolours Way and Aphelion Crescent roadway segments. Based on the proximity of these two local roads to the future Bus Rapid Transit along Realigned Greenbank Road, it was determined that both Watercolours Way and Aphelion Crescent fall under the 'within 600m of a rapid transit station' Policy Area. In addition, both roads fall under the 'within 300m of a school' Policy Area due to the proximity to the proposed school located on the southwestern quadrant of the Realigned Greenbank Road at Cambrian Road intersection. Both Policy Areas result in the same MMLOS targets for the two subject roadway segments.

The Pedestrian Level of Service (PLOS) for both roads are subject to a PLOS target of A. The Bicycle Level of Service (BLOS) for both roads are subject to a BLOS target of D based on both roads not being designated cycling routes. There will be no transit along both roads, therefore, the Transit Level of Service (TLOS) will not be assessed. Neither road is considered a truck route, therefore, the Truck Level of Service (TkLOS) will also not be assessed.

Watercolours Way and Aphelion Crescent are not currently constructed; however, both roadways will be constructed as part of Mattamy's Half Moon Bay West Phase 1 development, which will be constructed prior to the subject Phase 5 development. As such, the 'existing' MMLOS assessment was completed using the future Phase 1 roadway conditions and the 'build-out' MMLOS assessment implies changes to the roadways once Phase 5 is built.

As outlined in **Table 7** below, both roadway segments do not satisfy the PLOS target of A. The sidewalk widths of 1.8 meters, lack of boulevard, and an operating speed of 60 km/hr does not meet the level of safety, comfort and convince required by pedestrians. Implementing a boulevard along both road segments would allow the PLOS target of A to be met, however, there would be property impacts to this configuration. Reducing the operating speed to 30 km/hr with the current planned configuration for both roadway segments would also allow the PLOS target of A to be met. Cyclists will be incorporated by means of shared-use travel lanes which will allow the BLOS target of D to be met along both Watercolours Way and Aphelion Crescent.

The transit and truck levels of service were not assessed as there are no transit routes nor truck routes along both roadway segments.

**Table 7** outlines the MMLOS assessment for both roadway segments.

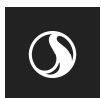


Table 7 - MMLOS Conditions - Segments

Road Segment		Watercolours Way (Local)		Aphelion Crescent (Local)		Target
		Existing	Build-out	Existing	Build-out	
Pedestrian	Sidewalk width (m)	1.8	**	1.8	**	<b>A</b>
	Boulevard width (m)	0	**	0	**	
	Average Daily Traffic (one-way) > 3000?	No	**	No	**	
	On-Street parking	N/A	**	N/A	**	
	Operating speed (kph)	60	**	60	**	
	<b>Level of Service</b>	<b>C</b>	**	<b>C</b>	**	
Bicycle	Type of facility	Mixed	**	Mixed	**	<b>D</b>
	Number of travel lanes	2	**	2	**	
	Bike lane width (m)	N/A	**	N/A	**	
	Operating speed (kph)	50	**	50	**	
	Centreline (yes/no)	No	**	No	**	
	<b>Level of Service</b>	<b>B</b>	**	<b>B</b>	**	
Transit	Type of facility	Not Applicable		Not Applicable		<b>No Target</b>
	Parking/driveway friction					
	<b>Level of Service</b>					
Truck	Curb lane width (m)	Not Applicable		Not Applicable		<b>No Target</b>
	Number of travel lanes					
	<b>Level of Service</b>					

Notes:

Auto LOS is not considered for segments in the MMLOS Guidelines.

"Mixed" means either cyclists or transit operate in a shared lane with general traffic, i.e., they do not have their own dedicated facilities.

The number of travel lanes is two-way, i.e., in both directions.

\*\* means no change between horizons or scenarios.

## 4.4 ACCESS INTERSECTION DESIGN

### 4.4.1 Access Location

The City of Ottawa's Private Approach By-Law No. 2003-447, S.25, M, outlines that the minimum distance between the private approach and the nearest intersecting arterial or major collector road is 30m based on the proposed apartment building having a total of 101 parking spaces. The Transportation Association of Canada's Geometric Design Guide for Canadian Roads outlines that the minimum distance along a local road between a driveway or public lane and a nearby intersection is 15m.

The proposed Watercolours Way at Site Access 1 intersection is located approximately 120m west of the Realigned Greenbank Road at Watercolours Way intersection and 38m east of the Watercolours Way at Aphelion Crescent intersection, therefore, both the By-Law and the TAC guidelines are satisfied for Site Access 1.

The proposed Aphelion Crescent and Site Access 2 intersection is located approximately 35m south of the Watercolours Way at Aphelion Crescent intersection and 18m north of the Aphelion Crescent at Merak Way intersection. The aforementioned By-Law does not apply as neither Watercolours Way nor Aphelion Crescent are



considered arterial or major collector roads. Based on the proposed distances from Watercolours Way and Merak Way, Site Access 2 satisfies the minimum distances outlined in the TAC guidelines.

Based on the City of Ottawa's Private Approach By-Law No. 203-447, S.10, a private approach shall have a minimum width of 2.4m and a maximum width of 9.0m. Both site accesses have a width of six metres which is within the prescribed widths outlined in the By-Law. Both site access intersections will be two-way stop controlled along the minor approaches.

#### **4.4.2 Intersection Control**

The City of Ottawa does not implement all-way stop-control at intersections unless they are warranted. These warrants are taken from the *All Way Stop Policy* (City of Ottawa 2006) and are based on actual traffic data, and not traffic projections. As such, they are installed post development after monitoring has occurred. Based on this, the intersection of Watercolours Way at Aphelion Crescent is recommended to operate as a minor stop-controlled intersection along the Aphelion Crescent approaches. Once the Half Moon Bay West development is built, the City may wish to monitor this intersection to determine if an all-way stop-control is warranted in the future based on actual traffic and pedestrian volumes.

The two site accesses are low-volume driveways located on low-volume local roadways and therefore two-way stop-control is appropriate along the Site Access approaches.

### **4.5 TRANSPORTATION DEMAND MANAGEMENT**

The proposed development is not located in a Design Priority Area (DPA) nor in a Transit-Oriented Development (TOD) zone. City of Ottawa TDM Checklists were used to determine what TDM measures could be implemented based on the available information.

The TDM checklists are contained in **Appendix A**.

As outlined on the checklist contained in **Appendix A**, enhanced public transit service is recommended through an early transit services agreement between the developer and OC Transpo.

### **4.6 NEIGHBOURHOOD TRAFFIC MANAGEMENT**

Not applicable; exempted during screening and scoping.

### **4.7 TRANSIT**

Not applicable; exempted during screening and scoping.

### **4.8 REVIEW OF NETWORK CONCEPT**

Not applicable; exempted during screening and scoping.





## 4.9 INTERSECTION DESIGN

### 4.9.1 Intersection Control

The intersection controls for the three study area intersections were discussed in **Section 4.4.2** and the analysis of the intersections can be seen in **Section 4.9.2**.

### 4.9.2 Intersection Design

An assessment of the study area intersections was undertaken to determine the operational characteristics of the study area intersections under the different horizons identified in the Screening and Scoping report. Intersection operational analysis was facilitated with Synchro 10.0™ software package.

#### 4.9.2.1 2019 Existing Conditions

As none of the study area intersections currently exist, 2019 existing conditions was not assessed as part of this transportation study.

#### 4.9.2.2 2021 Future Background Conditions

**Table 8** summarizes the Synchro results under 2021 future background conditions. The analysis indicates that the intersection of Watercolours Way at Aphelion Crescent will operate acceptably with 2021 future background traffic volumes. As this intersection is not anticipated to be signalized, the multi-modal level of service assessment was not applied.

**Appendix B** contains the intersection performance worksheets.

**Table 8 2021 Future Background Intersection Capacity Analysis**

Intersection	Intersection Control	Approach / Movement		LOS	Delay (s)	Queue 95 <sup>th</sup> (m)
Watercolours Way at Aphelion Crescent	Two-way stop control	EB	Left / Through / Right	A (A)	3.9 (5.0)	0.4 (0.8)
		WB	Left / Through / Right	A (A)	1.3 (1.4)	0.0 (0.1)
		NB	Left / Through / Right	A (B)	9.8 (10.0)	0.7 (0.7)
		SB	Left / Through / Right	A (A)	8.7 (8.9)	1.6 (1.2)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>6.8 (6.2)</b>	-



Figure 9 - 2021 Future Background Traffic Volumes (AM Peak Hour)

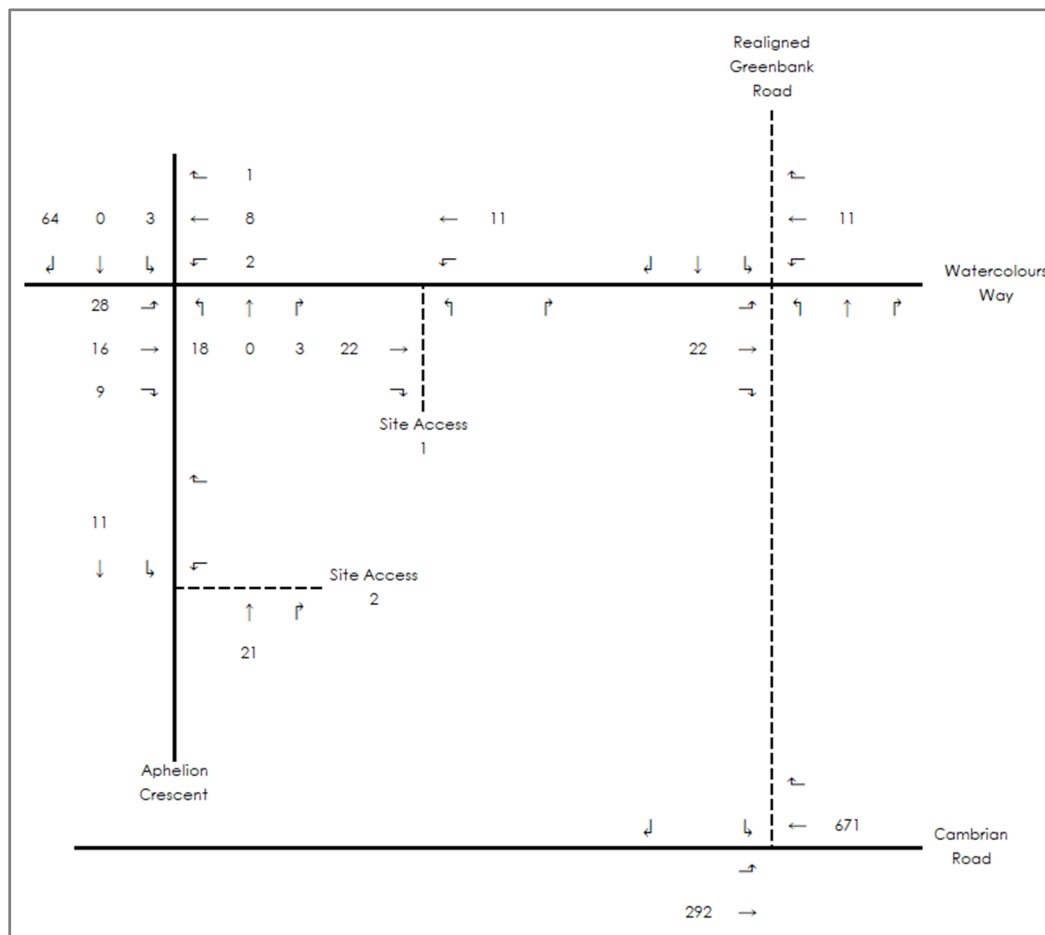
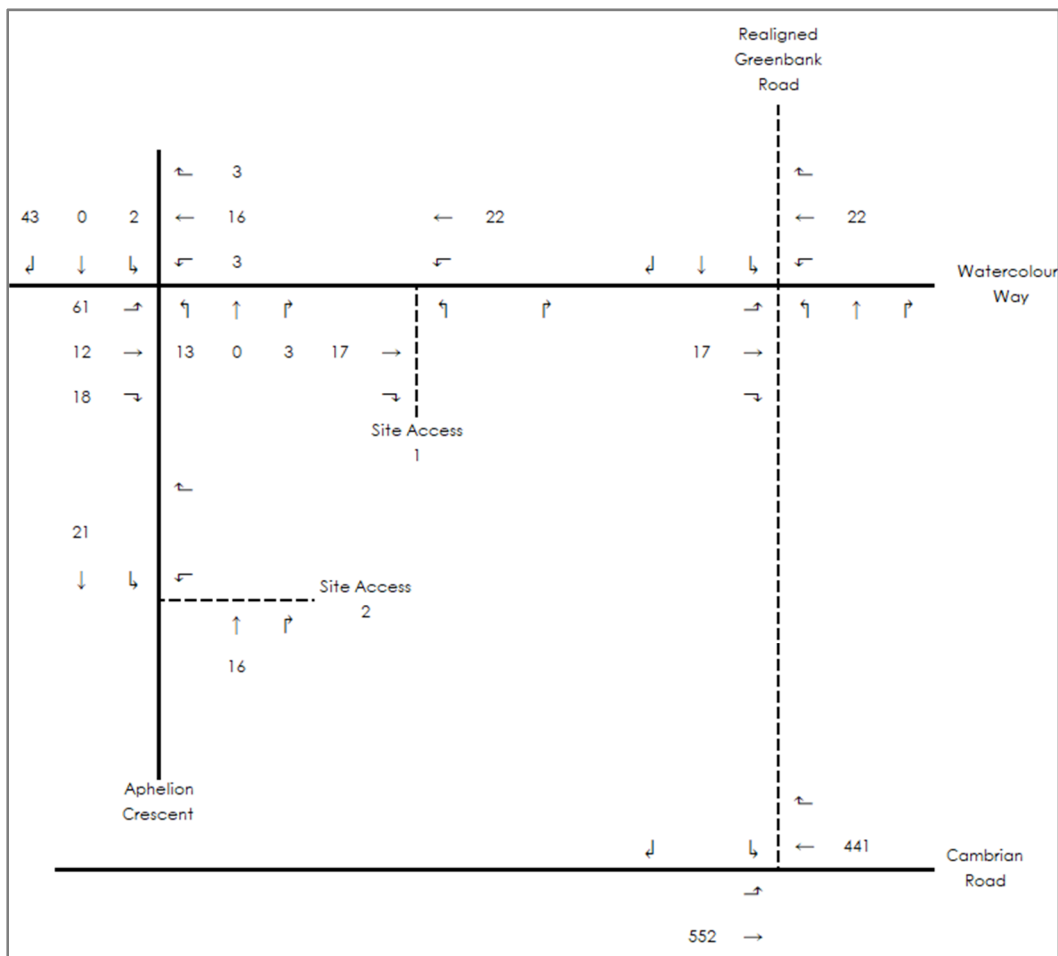


Figure 10 - 2021 Future Background Traffic Volumes (PM Peak Hour)



#### 4.9.2.3 2021 Total Future Conditions

**Table 9** summarizes the Synchro results under 2021 total future conditions. All three study area intersections are anticipated to operate acceptably under 2021 total future conditions.

As the three study area intersections are anticipated to operate with stop-control, they are not subject to the MMLOS analysis.

**Appendix B** contains the intersection performance worksheets.



**Table 9 2021 Total Future Intersection Capacity Analysis**

Intersection	Intersection Control	Approach / Movement		LOS	Delay (s)	Queue 95 <sup>th</sup> (m)
Watercolours Way at Aphelion Crescent	Two-way stop control	EB	Left / Through / Right	A (A)	3.0 (3.7)	0.4 (0.9)
		WB	Left / Through / Right	A (A)	0.8 (0.8)	0.1 (0.1)
		NB	Left / Through / Right	B (B)	10.2 (10.6)	1.2 (1.0)
		SB	Left / Through / Right	A (A)	9.0 (9.1)	1.7 (1.3)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>5.7 (5.1)</b>	<b>-</b>
Watercolours Way at Site Access 1	Two-way stop control	EB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)
		WB	Left / Through	A (A)	2.2 (1.3)	0.1 (0.1)
		NB	Left / Right	A (A)	8.9 (8.9)	0.8 (0.6)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>4.0 (2.7)</b>	<b>-</b>
Aphelion Crescent at Site Access 2	Two-way stop control	WB	Left / Right	A (A)	8.4 (8.4)	0.2 (0.2)
		NB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)
		SB	Left / Through	A (A)	2.3 (2.5)	0.1 (0.1)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>2.8 (2.6)</b>	<b>-</b>

**Figure 11 - 2021 Total Future Traffic Volumes (AM Peak Hour)**

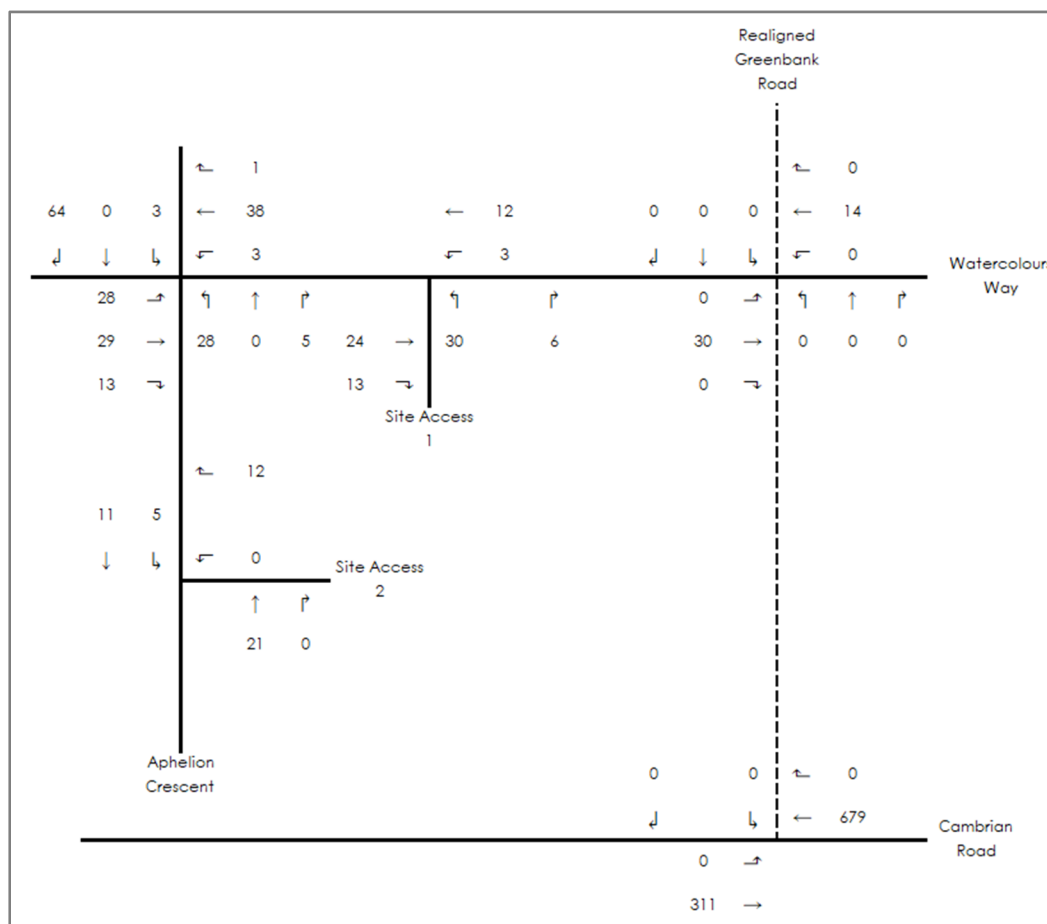
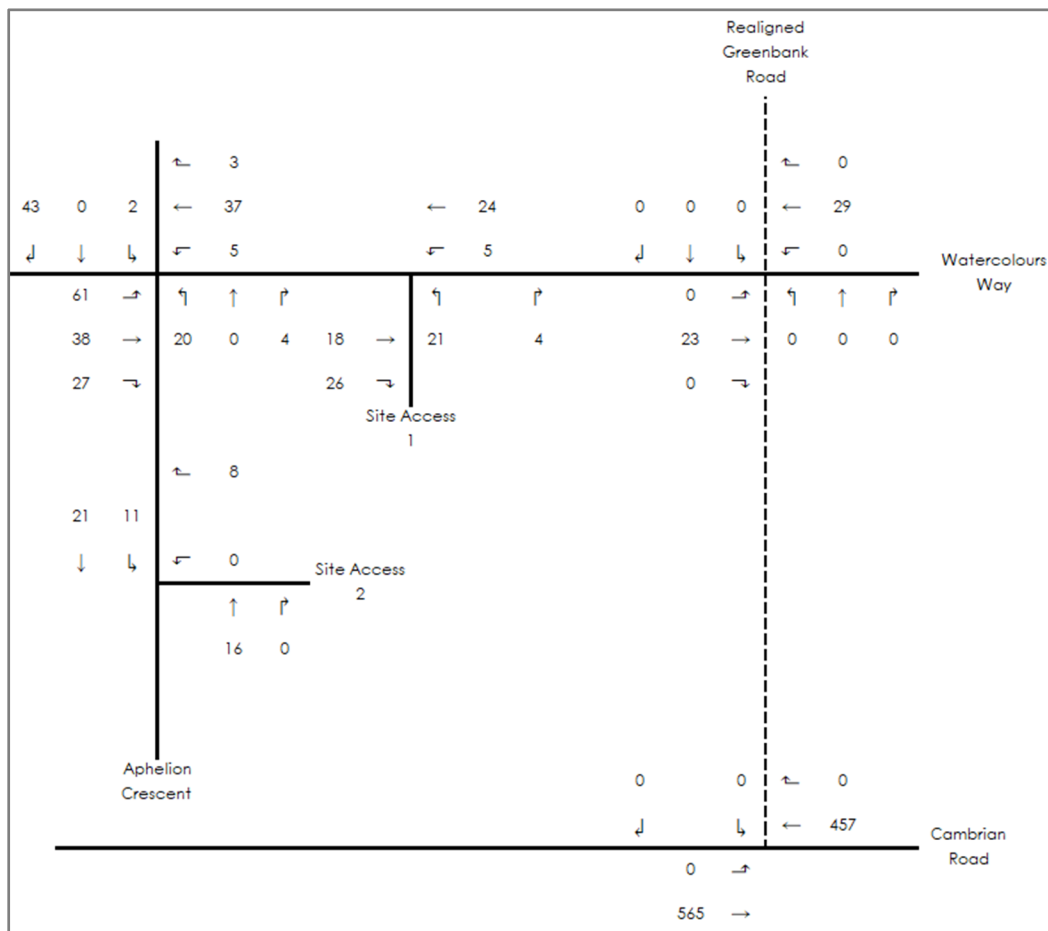


Figure 12 - 2021 Total Future Traffic Volumes (PM Peak Hour)

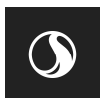


#### 4.9.2.4 2026 Ultimate Conditions

**Table 10** summarizes the Synchro results under 2026 ultimate conditions. All three study area intersections are anticipated to operate acceptably under 2026 ultimate conditions.

As the three study area intersections are anticipated to operate with stop-control, they are not subject to the MMLOS analysis.

**Appendix B** contains the intersection performance worksheets.



**Table 10 - 2026 Ultimate Intersection Operations**

Intersection	Intersection Control	Approach / Movement		LOS	Delay (s)	Queue 95 <sup>th</sup> (m)
Watercolours Way at Aphelion Crescent	Two-way stop control	EB	Left / Through / Right	A (A)	2.9 (3.8)	0.3 (0.9)
		WB	Left / Through / Right	A (A)	0.7 (0.9)	0.1 (0.1)
		NB	Left / Through / Right	B (B)	10.1 (10.6)	0.9 (0.9)
		SB	Left / Through / Right	A (A)	9.0 (9.2)	1.6 (1.3)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>5.3 (5.1)</b>	<b>-</b>
Watercolours Way at Site Access 1	Two-way stop control	EB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)
		WB	Left / Through	A (A)	1.6 (1.4)	0.1 (0.1)
		NB	Left / Right	A (A)	8.9 (8.9)	0.8 (0.7)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>3.7 (2.7)</b>	<b>-</b>
Aphelion Crescent at Site Access 2	Two-way stop control	WB	Left / Right	A (A)	8.4 (8.4)	0.2 (0.2)
		NB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)
		SB	Left / Through	A (A)	2.8 (3.1)	0.1 (0.2)
		<b>Overall Intersection</b>		<b>A (A)</b>	<b>3.4 (3.3)</b>	<b>-</b>

**Figure 13 - 2026 Ultimate Traffic Volumes (AM Peak Hour)**

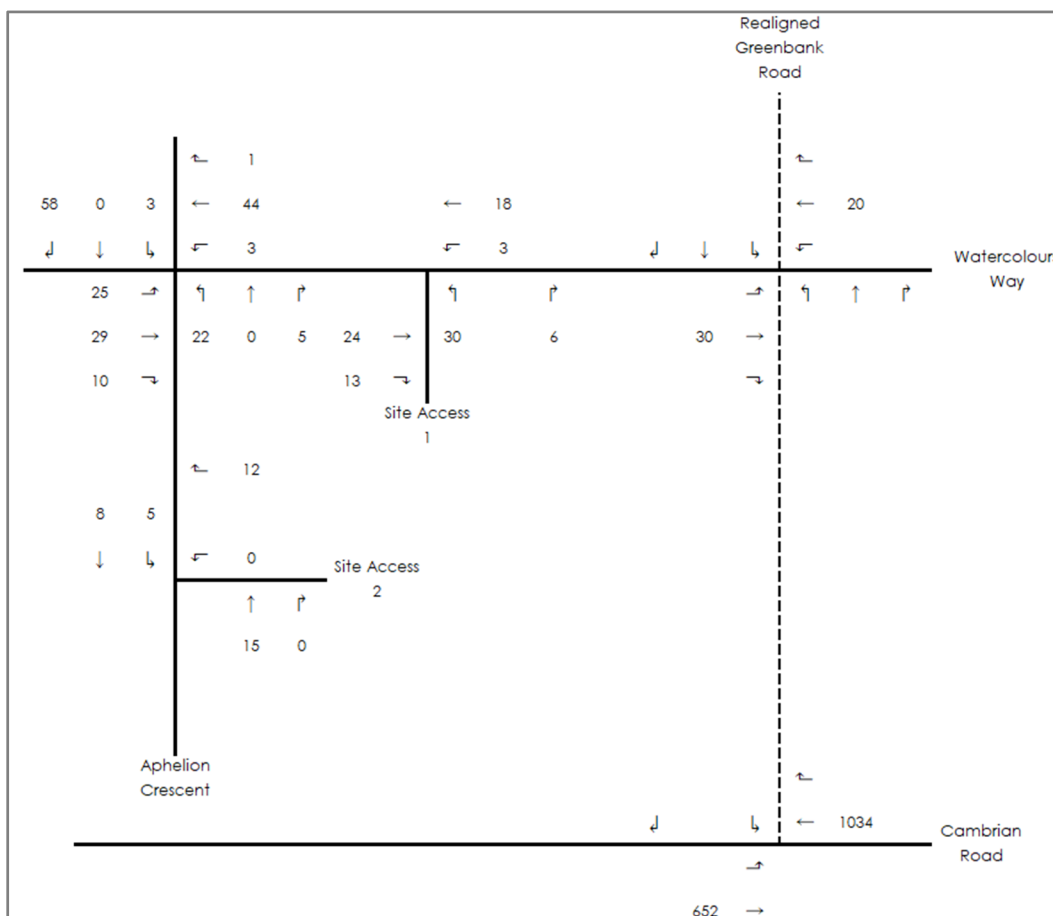
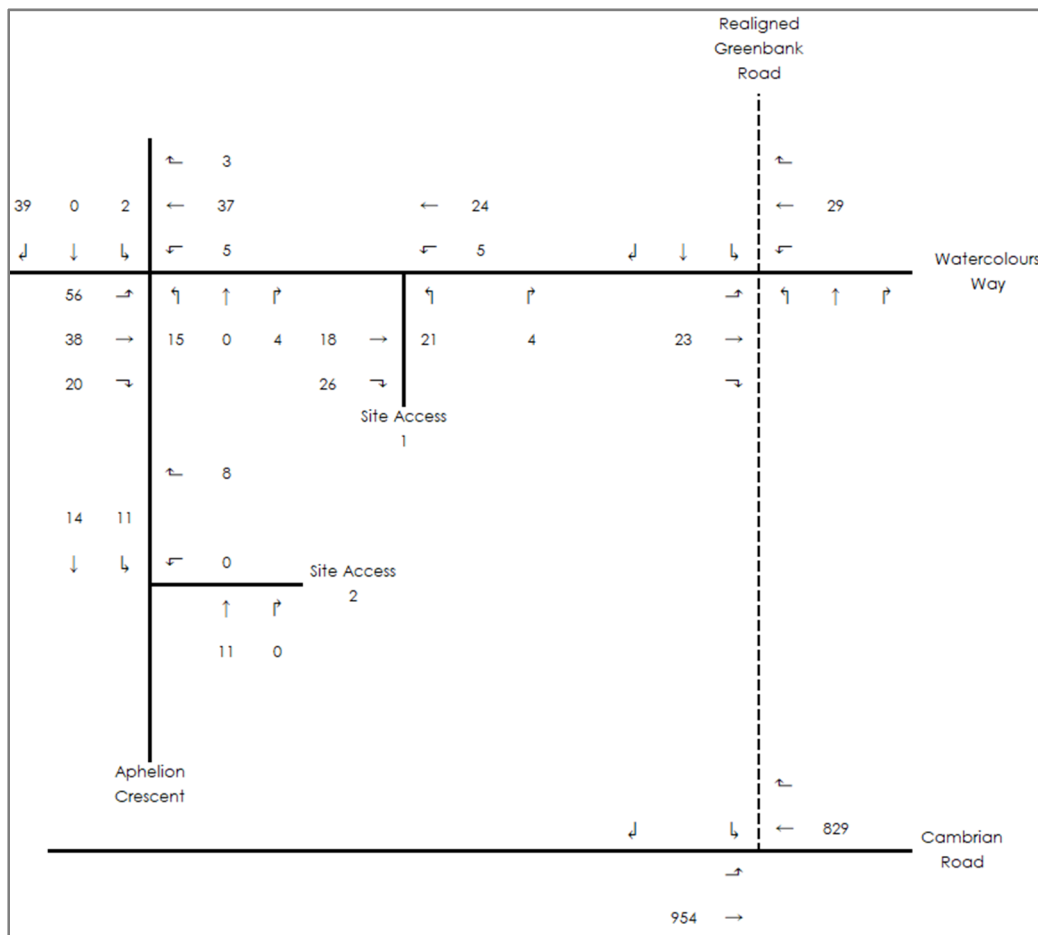


Figure 14 - 2026 Ultimate Traffic Volumes (PM Peak Hour)



## 5.0 CONCLUSION

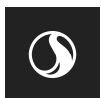
This Transportation Impact Assessment (TIA) was prepared in support of a site plan application for the proposed Phase 5 development, which is part of the larger Half Moon Bay West development by Mattamy Homes. The development is located at 3508 Greenbank Road in the City of Ottawa's Barrhaven South community. The site is located at the southwest quadrant of the Realigned Greenbank Road at Watercolours Way intersection and is bound by future phases of Half Moon Bay West to the north and west, Realigned Greenbank Road to the east, and future commercial to the south.

The proposed Phase 5 development will be accessed via two site accesses: one to Watercolours Way and one to Aphelion Crescent. It includes 6 apartment buildings, which each includes 12 residential dwellings for a total of 72 apartment dwellings. It is anticipated to generate 68 and 75 net new auto trips (two-way) during the AM and PM peak hours, respectively.

Both Watercolours Way and Aphelion Crescent do not meet the Pedestrian Level of Service target of A. The sidewalk widths of 1.8 meters, lack of boulevard, and an operating speed of 60 km/hr does not meet the level of safety, comfort and convince required by pedestrians. Implementing a boulevard along both road segments would allow the PLOS target of A to be met, however, there would be property impacts to this configuration. Reducing the operating speed to 30 km/hr with the current planned configuration for both roadway segments would also allow the PLOS target of A to be met. Cyclists will be incorporated by means of shared-use lanes which will allow the BLOS target of D to be met along both Watercolours Way and Aphelion Crescent.

All three study area intersections are projected to operate acceptably under all horizons.

Based on the transportation evaluation presented in this study, the proposed development located at 3508 Greenbank Road be supported and should be permitted to proceed from a transportation perspective.





## Appendix A      TRANSPORTATION DEMAND MANAGEMENT CHECKLIST



## **TDM-Supportive Development Design and Infrastructure Checklist:** *Residential Developments (multi-family or condominium)*

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

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

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

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
<b>2. WALKING &amp; CYCLING: END-OF-TRIP FACILITIES</b>		
<b>2.1 Bicycle parking</b>		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i> )	<input checked="" type="checkbox"/>
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (see <i>Zoning By-law Section 111</i> )	<input checked="" type="checkbox"/>
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see <i>Zoning By-law Section 111</i> )	<input checked="" type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	<input type="checkbox"/>
<b>2.2 Secure bicycle parking</b>		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i> )	<input type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	<input type="checkbox"/>
<b>2.3 Bicycle repair station</b>		
BETTER	2.3.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	<input type="checkbox"/>
<b>3. TRANSIT</b>		
<b>3.1 Customer amenities</b>		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
<b>4. RIDESHARING</b>		
<b>4.1 Pick-up &amp; drop-off facilities</b>		
<b>BASIC</b>	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	<input type="checkbox"/>
<b>5. CARSHARING &amp; BIKESHARING</b>		
<b>5.1 Carshare parking spaces</b>		
<b>BETTER</b>	5.1.1 Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses (see <i>Zoning By-law Section 94</i> )	<input type="checkbox"/>
<b>5.2 Bikeshare station location</b>		
<b>BETTER</b>	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	<input type="checkbox"/>
<b>6. PARKING</b>		
<b>6.1 Number of parking spaces</b>		
<b>REQUIRED</b>	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	<input checked="" type="checkbox"/>
<b>BASIC</b>	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	<input type="checkbox"/>
<b>BASIC</b>	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (see <i>Zoning By-law Section 104</i> )	<input type="checkbox"/>
<b>BETTER</b>	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (see <i>Zoning By-law Section 111</i> )	<input type="checkbox"/>
<b>6.2 Separate long-term &amp; short-term parking areas</b>		
<b>BETTER</b>	6.2.1 Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	<input type="checkbox"/>

## **TDM Measures Checklist:**

### *Residential Developments (multi-family, condominium or subdivision)*

<b>Legend</b>	
<b>BASIC</b>	The measure is generally feasible and effective, and in most cases would benefit the development and its users
<b>BETTER</b>	The measure could maximize support for users of sustainable modes, and optimize development performance
<b>★</b>	The measure is one of the most dependably effective tools to encourage the use of sustainable modes

<b>TDM measures: <i>Residential developments</i></b>		<b>Check if proposed &amp; add descriptions</b>
<b>1. TDM PROGRAM MANAGEMENT</b>		
<b>1.1 Program coordinator</b>		
<b>BASIC</b> ★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	<input type="checkbox"/>
<b>1.2 Travel surveys</b>		
<b>BETTER</b>	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input type="checkbox"/>
<b>2. WALKING AND CYCLING</b>		
<b>2.1 Information on walking/cycling routes &amp; destinations</b>		
<b>BASIC</b>	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"/>
<b>2.2 Bicycle skills training</b>		
<b>BETTER</b>	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
<b>3. TRANSIT</b>		
<b>3.1 Transit information</b>		
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"/>
<b>3.2 Transit fare incentives</b>		
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 type="checkbox"/>
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	<input type="checkbox"/>
<b>3.3 Enhanced public transit service</b>		
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"/> Transit Service will likely be required as residents move in
<b>3.4 Private transit service</b>		
BETTER	3.4.1 Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	<input type="checkbox"/>
<b>4. CARSHARING &amp; BIKESHARING</b>		
<b>4.1 Bikeshare stations &amp; memberships</b>		
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"/>
<b>4.2 Carshare vehicles &amp; memberships</b>		
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"/>
<b>5. PARKING</b>		
<b>5.1 Priced parking</b>		
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
<b>6. TDM MARKETING &amp; COMMUNICATIONS</b>		
<b>6.1 Multimodal travel information</b>		
<b>BASIC</b> ★	6.1.1 Provide a multimodal travel option information package to new residents	<input type="checkbox"/>
<b>6.2 Personalized trip planning</b>		
<b>BETTER</b> ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>



## **Appendix B   INTERSECTION PERFORMANCE WORKSHEETS**



















## **B.1 2021 FUTURE BACKGROUND CONDITIONS**



HCM Unsignalized Intersection Capacity Analysis  
1: Aphelion Crescent & Watercolours Way


















HMBW Apartment Block  
2021 FBG AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	16	9	2	8	1	18	5	3	3	5	64
Future Volume (Veh/h)	28	16	9	2	8	1	18	5	3	3	5	64
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	28	16	9	2	8	1	18	5	3	3	5	64
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	9			25			156	90	20	94	94	8
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	9			25			156	90	20	94	94	8
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			98	99	100	100	99	94
cM capacity (veh/h)	1611			1589			748	786	1057	869	782	1073
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	53	11	26	72								
Volume Left	28	2	18	3								
Volume Right	9	1	3	64								
cSH	1611	1589	782	1036								
Volume to Capacity	0.02	0.00	0.03	0.07								
Queue Length 95th (m)	0.4	0.0	0.7	1.6								
Control Delay (s)	3.9	1.3	9.8	8.7								
Lane LOS	A	A	A	A								
Approach Delay (s)	3.9	1.3	9.8	8.7								
Approach LOS			A	A								
Intersection Summary												
Average Delay	6.8											
Intersection Capacity Utilization	22.2%			ICU Level of Service						A		
Analysis Period (min)	15											

Synchro 10 Report

HCM Unsignalized Intersection Capacity Analysis  
1: Aphelion Crescent & Watercolours Way

HMBW Apartment Block  
2021 FBG PM

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	61	12	18	5	16	5	13	5	5	5	5	43	
Future Volume (Veh/h)	61	12	18	5	16	5	13	5	5	5	5	43	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	61	12	18	5	16	5	13	5	5	5	5	43	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)													
Median type		None			None								
Median storage (veh)													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	21			30			217	174	21	179	180	18	
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	21			30			217	174	21	179	180	18	
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2	
tC, 2 stage (s)													
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	96			100			98	99	100	99	99	96	
cM capacity (veh/h)	1595			1583			683	690	1056	750	684	1060	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	91	26	23	53									
Volume Left	61	5	13	5									
Volume Right	18	5	5	43									
cSH	1595	1583	742	972									
Volume to Capacity	0.04	0.00	0.03	0.05									
Queue Length 95th (m)	0.8	0.1	0.7	1.2									
Control Delay (s)	5.0	1.4	10.0	8.9									
Lane LOS	A	A	B	A									
Approach Delay (s)	5.0	1.4	10.0	8.9									
Approach LOS			B	A									
Intersection Summary													
Average Delay	6.2												
Intersection Capacity Utilization	23.8%			ICU Level of Service					A				
Analysis Period (min)	15												

















Synchro 10 Report

## **B.2 2021 TOTAL FUTURE CONDITIONS**



# HCM Unsignalized Intersection Capacity Analysis 1: Aphelion Crescent & Watercolours Way




HMBW Apartment Block  
2021 Total Future AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	29	13	5	38	5	28	5	5	5	5	64
Future Volume (Veh/h)	28	29	13	5	38	5	28	5	5	5	5	64
Sign Control		Free			Free		Stop				Stop	
Grade		0%			0%		0%				0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	28	29	13	5	38	5	28	5	5	5	5	64
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	43			42			208	144	36	150	148	40
vc1, stage 1 conf vol												
vc2, stage 2 conf vol												
vCu, unblocked vol	43			42			208	144	36	150	148	40
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			96	99	100	99	99	94
cM capacity (veh/h)	1566			1567			688	731	1037	797	727	1031
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	70	48	38	74								
Volume Left	28	5	28	5								
Volume Right	13	5	5	64								
cSH	1566	1567	725	983								
Volume to Capacity	0.02	0.00	0.05	0.08								
Queue Length 95th (m)	0.4	0.1	1.2	1.7								
Control Delay (s)	3.0	0.8	10.2	9.0								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.0	0.8	10.2	9.0								
Approach LOS	B				A							
Intersection Summary												
Average Delay	5.7											
Intersection Capacity Utilization	26.3%			ICU Level of Service						A		
Analysis Period (min)	15											

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 2: Site Access 1 & Watercolours Way





HMBW Apartment Block  
2021 Total Future AM

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	24	13	5	12	30	6
Future Volume (Veh/h)	24	13	5	12	30	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	24	13	5	12	30	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			37		52	30
IC1, stage 1 conf vol						
vC2, stage 2 conf vol						
ICu, unblocked vol			37		52	30
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	99
cM capacity (veh/h)			1574		953	1044
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	37	17	36			
Volume Left	0	5	30			
Volume Right	13	0	6			
cSH	1700	1574	967			
Volume to Capacity	0.02	0.00	0.04			
Queue Length 95th (m)	0.0	0.1	0.8			
Control Delay (s)	0.0	2.2	8.9			
Lane LOS	A					
Approach Delay (s)	0.0	2.2	8.9			
Approach LOS	A					
Intersection Summary						
Average Delay	4.0					
Intersection Capacity Utilization	15.3%		ICU Level of Service			
Analysis Period (min)	15					
			A			

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 3: Aphelion Crescent & Site Access 2

HMBW Apartment Block  
2021 Total Future AM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	12	21	0	5	11
Future Volume (Veh/h)	0	12	21	0	5	11
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	12	21	0	5	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	42	21			21	
IC1, stage 1 conf vol						
vC2, stage 2 conf vol						
ICu, unblocked vol	42	21			21	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	966	1056			1595	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	12	21	16			
Volume Left	0	0	5			
Volume Right	12	0	0			
cSH	1056	1700	1595			
Volume to Capacity	0.01	0.01	0.00			
Queue Length 95th (m)	0.2	0.0	0.1			
Control Delay (s)	8.4	0.0	2.3			
Lane LOS	A		A			
Approach Delay (s)	8.4	0.0	2.3			
Approach LOS	A					
Intersection Summary						
Average Delay	2.8					
Intersection Capacity Utilization	15.3%		ICU Level of Service			A
Analysis Period (min)	15					

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 1: Aphelion Crescent & Watercolours Way

HMBW Apartment Block  
2021 Total Future PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations		↕			↕			↕			↕			
Traffic Volume (veh/h)	61	38	27	5	37	5	20	5	5	5	5	43		
Future Volume (Veh/h)	61	38	27	5	37	5	20	5	5	5	5	43		
Sign Control	Free			Free			Stop			Stop				
Grade	0%			0%			0%			0%				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Hourly flow rate (vph)	61	38	27	5	37	5	20	5	5	5	5	43		
Pedestrians														
Lane Width (m)														
Walking Speed (m/s)														
Percent Blockage														
Right turn flare (veh)														
Median type	None			None										
Median storage (veh)														
Upstream signal (m)														
pX, platoon unblocked														
vC, conflicting volume	42				65				268	226	52	230	236	40
IC1, stage 2 conf vol														
vC2, stage 2 conf vol														
ICu, unblocked vol	42				65				268	226	52	230	236	40
IC, single (s)	4.1				4.1				7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)														
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96				100				97	99	100	99	99	96
cM capacity (veh/h)	1567				1537				631	645	1016	694	636	1032
Direction, Lane #	EB 1	WB 1	NB 1	SB 1										
Volume Total	126	47	30	53										
Volume Left	61	5	20	5										
Volume Right	27	5	5	43										
cSH	1567	1537	676	934										
Volume to Capacity	0.04	0.00	0.04	0.06										
Queue Length 95th (m)	0.9	0.1	1.0	1.3										
Control Delay (s)	3.7	0.8	10.6	9.1										
Lane LOS	A	A	B	A										
Approach Delay (s)	3.7	0.8	10.6	9.1										
Approach LOS	B			A										
Intersection Summary														
Average Delay	5.1													
Intersection Capacity Utilization	28.4%			ICU Level of Service						A				
Analysis Period (min)	15													

HCM Unsignalized Intersection Capacity Analysis  
2: Site Access 1 & Watercolours Way

HMBW Apartment Block  
2021 Total Future PM

	→	↖	↗	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1	2	1	1	1	1
Traffic Volume (veh/h)	18	26	5	24	21	5
Future Volume (Veh/h)	18	26	5	24	21	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	26	5	24	21	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			44		65	31
IC1, stage 1 conf vol						
IC2, stage 2 conf vol						
ICu, unblocked vol			44		65	31
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1564		938	1043
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	44	29	26			
Volume Left	0	5	21			
Volume Right	26	0	5			
ESH	1700	1564	956			
Volume to Capacity	0.03	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.6			
Control Delay (s)	0.0	1.3	8.9			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.3	8.9			
Approach LOS		A				
Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization		15.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis  
3: Aphelion Crescent & Site Access 2

HMBW Apartment Block  
2021 Total Future PM

















	↖	↗	↑	↖	↗	↓
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	1	1	1	1	1	1
Traffic Volume (veh/h)	0	8	16	0	11	21
Future Volume (Veh/h)	0	8	16	0	11	21
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	8	16	0	11	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume		59	16			16
IC1, stage 1 conf vol						
IC2, stage 2 conf vol						
ICu, unblocked vol		59	16			16
IC, single (s)		6.4	6.2			4.1
IC, 2 stage (s)						
tF (s)		3.5	3.3			2.2
p0 queue free %		100	99			99
cM capacity (veh/h)		941	1063			1602
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	8	16	32			
Volume Left	0	0	11			
Volume Right	8	0	0			
ESH	1063	1700	1602			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (m)	0.2	0.0	0.1			
Control Delay (s)	8.4	0.0	2.5			
Lane LOS		A	A			
Approach Delay (s)	8.4	0.0	2.5			
Approach LOS		A				
Intersection Summary						
Average Delay		2.6				
Intersection Capacity Utilization		18.5%		ICU Level of Service	A	
Analysis Period (min)		15				

## **B.3 2026 ULTIMATE CONDITIONS**



# HCM Unsignalized Intersection Capacity Analysis 1: Aphelion Crescent & Watercolours Way




HMBW Apartment Block  
2026 Ultimate AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	29	10	5	44	5	22	5	5	5	5	58
Future Volume (Veh/h)	25	29	10	5	44	5	22	5	5	5	5	58
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	29	10	5	44	5	22	5	5	5	5	58
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	49			39			201	143	34	148	146	46
vc1, stage 1 conf vol												
vc2, stage 2 conf vol												
vCu, unblocked vol	49			39			201	143	34	148	146	46
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			97	99	100	99	99	94
cM capacity (veh/h)	1558			1571			700	734	1039	800	732	1023
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	64	54	32	68								
Volume Left	25	5	22	5								
Volume Right	10	5	5	58								
cSH	1558	1571	744	974								
Volume to Capacity	0.02	0.00	0.04	0.07								
Queue Length 95th (m)	0.3	0.1	0.9	1.6								
Control Delay (s)	2.9	0.7	10.1	9.0								
Lane LOS	A	A	B	A								
Approach Delay (s)	2.9	0.7	10.1	9.0								
Approach LOS	B				A							
Intersection Summary												
Average Delay	5.3											
Intersection Capacity Utilization	25.5%			ICU Level of Service			A					
Analysis Period (min)	15											

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 2: Site Access 1 & Watercolours Way




HMBW Apartment Block  
2026 Ultimate AM

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	24	13	5	18	30	6
Future Volume (Veh/h)	24	13	5	18	30	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	24	13	5	18	30	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)						
pK, platoon unblocked						
vC, conflicting volume			37		58 30	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
ICu, unblocked vol			37		58 30	
tC, single (s)			4.1		6.4 6.2	
IC, 2 stage (s)						
tF (s)	2.2		3.5		3.3	
p0 queue free %	100		97		99	
cM capacity (veh/h)	1574		946		1044	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	37	23	36			
Volume Left	0	5	30			
Volume Right	13	0	6			
cSH	1700	1574	961			
Volume to Capacity	0.02	0.00	0.04			
Queue Length 95th (m)	0.0	0.1	0.8			
Control Delay (s)	0.0	1.6	8.9			
Lane LOS	A		A			
Approach Delay (s)	0.0	1.6	8.9			
Approach LOS	A					
Intersection Summary						
Average Delay	3.7					
Intersection Capacity Utilization	15.6%		ICU Level of Service		A	
Analysis Period (min)	15					

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 3: Aphelion Crescent & Site Access 2

















HMBW Apartment Block  
2026 Ultimate AM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	12	15	0	5	8
Future Volume (Veh/h)	0	12	15	0	5	8
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	12	15	0	5	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC1, conflicting volume	33	15			15	
vC2, stage 2 conf vol						
vCu, unblocked vol	33	15			15	
IC, single (s)	6.4	6.2			4.1	
IC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	977	1065			1603	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	12	15	13			
Volume Left	0	0	5			
Volume Right	12	0	0			
cSH	1065	1700	1603			
Volume to Capacity	0.01	0.01	0.00			
Queue Length 95th (m)	0.2	0.0	0.1			
Control Delay (s)	8.4	0.0	2.8			
Lane LOS	A	A	A			
Approach Delay (s)	8.4	0.0	2.8			
Approach LOS	A					
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			15.1%	ICU Level of Service	A	
Analysis Period (min)	15					

Synchro 10 Report

# HCM Unsignalized Intersection Capacity Analysis 1: Aphelion Crescent & Watercolours Way

HMBW Apartment Block  
2026 Ultimate PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	38	20	5	37	5	15	5	5	5	5	39
Future Volume (Veh/h)	56	38	20	5	37	5	15	5	5	5	5	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	62	42	22	6	41	6	17	6	6	6	6	43
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pK, platoon unblocked												
vC, conflicting volume	47			64			279	236	53	242	244	44
IC1, stage 1 conf vol												
vC2, stage 2 conf vol												
ICu, unblocked vol	47			64			279	236	53	242	244	44
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			97	99	99	99	99	96
cM capacity (veh/h)	1560			1538			619	636	1014	679	629	1026
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	126	53	29	55								
Volume Left	62	6	17	6								
Volume Right	22	6	6	43								
cSH	1560	1538	677	913								
Volume to Capacity	0.04	0.00	0.04	0.06								
Queue Length 95th (m)	0.9	0.1	0.9	1.3								
Control Delay (s)	3.8	0.9	10.6	9.2								
Lane LOS	A	A	B	A								
Approach Delay (s)	3.8	0.9	10.6	9.2								
Approach LOS		B	A	A								
Intersection Summary												
Average Delay			5.1									
Intersection Capacity Utilization			25.6%		ICU Level of Service				A			
Analysis Period (min)			15									



HCM Unsignalized Intersection Capacity Analysis  
2: Site Access 1 & Watercolours Way

HMBW Apartment Block  
2026 Ultimate PM

	EBT	EBR	WBL	WBT	NBL	NBR
Movement						
Lane Configurations	1	2	3	4	5	6
Traffic Volume (veh/h)	18	26	5	24	21	5
Future Volume (Veh/h)	18	26	5	24	21	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	20	29	6	27	23	6
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			49		74	34
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol			49		74	34
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1558		927	1039
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	49	33	29			
Volume Left	0	6	23			
Volume Right	29	0	6			
ESH	1700	1558	948			
Volume to Capacity	0.03	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.7			
Control Delay (s)	0.0	1.4	8.9			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.4	8.9			
Approach LOS		A				
Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization		15.9%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis  
3: Aphelion Crescent & Site Access 2

HMBW Apartment Block  
2026 Ultimate PM

	WBL	WBR	NBT	NBR	SBL	SBT
Movement						
Lane Configurations	1	2	3	4	5	6
Traffic Volume (veh/h)	0	8	11	0	11	14
Future Volume (Veh/h)	0	8	11	0	11	14
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	9	12	0	12	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume		52	12		12	
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol		52	12		12	
IC, single (s)		6.4	6.2		4.1	
IC, 2 stage (s)						
tF (s)		3.5	3.3		2.2	
p0 queue free %		100	99		99	
cM capacity (veh/h)		949	1069		1607	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	9	12	28			
Volume Left	0	0	12			
Volume Right	9	0	0			
ESH	1069	1700	1607			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (m)	0.2	0.0	0.2			
Control Delay (s)	8.4	0.0	3.1			
Lane LOS		A	A			
Approach Delay (s)	8.4	0.0	3.1			
Approach LOS		A				
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			18.1%		ICU Level of Service	A
Analysis Period (min)			15			