Stantec

Designing Neighborhood Collector Streets

927 March Road

Transportation Impact Assessment

Strategy Report

19 December 2023

Prepared for:

Brigil

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[1] or registered[1] professional in good standing, whose field of expertise is either transportation engineering or transportation planning.

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

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Senior Associate

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Transportation Planner

[1] 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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1.0 SCREENING

1.1 SUMMARY OF DEVELOPMENT

Municipal Address	**927 March Road**
Description of Location	Kanata North Urban Expansion Area – Southwest Quadrant
Land Use Classification	Residential, Commercial, Institutional
Development Size (units)	19 Single Family Homes, 32 townhomes, and 1,857 Apartment Units
Development Size (m^2)	Commercial: 4,253m^2
Number of Accesses and Locations	3 Access points: Street No.2 to March Road (North), Street No.2 to March Road (South), and Street No.3 to March Road
Phase of Development	7 Phases Total
Buildout Year	2034

If available, <u>please attach a sketch of the development or site plan</u> 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^2	✘
Industrial	5,000 m^2	✘
Fast-food restaurant or coffee shop	100 m^2	✘
Destination retail	1,000 m^2	✓
Gas station or convenience market	75 m^2	✘

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

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

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?	✓	
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?	✓	
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		✗
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		✗
Is the proposed driveway within auxiliary lanes of an intersection?		✗
Does the proposed driveway make use of an existing median break that serves an existing site?		✗
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		✗
Does the development include a drive-thru facility?		✗

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

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

Brigil is proceeding with an application for Plan of Subdivision and Zoning By-Law Amendment for their proposed development located at 927 March Road in the City of Ottawa's Kanata North community. The subject development encompasses the southwest quadrant of the Kanata North Urban Expansion Area (KNUEA). It is bound by existing residential dwellings to the west, undeveloped land to the north (future Claridge residential development), March Road to the east, and undeveloped land / Old Carp Road to the south.

Figure 1 illustrates the location the subject development in relation to the KNUEA boundary.

The subject site is currently zoned as Rural Countryside (RU) Zone; the purpose of the RU Zone, according to the City of Ottawa Official Plan, is to:

- "Accommodate agricultural, forestry, country residential lots created by severance and other land use characteristics of Ottawa's countryside, in areas designated as General Rural Area, Rural Natural Features and Greenbelt Rural in the Official Plan;
- Recognize and permit this range of rural-based land uses which often have large lot or distance separation requirements; and
- Regulate various types of development in manners that ensure compatibility with adjacent land uses and respect the rural context."

As part of the Zoning By-Law Amendment, the subject lands are proposed to be rezoned to permit the proposed land uses illustrated in the concept plan in **Figure 2** below.

The subdivision is proposed to include 19 single family homes, 32 townhomes, 1,857 apartment units, and 4,253m^2 of commercial space. The development is currently planned to be constructed in seven phases, starting with the mixed-use component along March Road. The proposed phasing plan and number of units can be seen in **Figure 3** below.

<u>Note:</u> The purpose of **Figure 2** is to illustrate the tributary areas in the subject site (for information only), and the figure does not reflect the proposed total number of units. The total number of proposed units is illustrated in **Figure 3**.

Figure 1 - Site Location

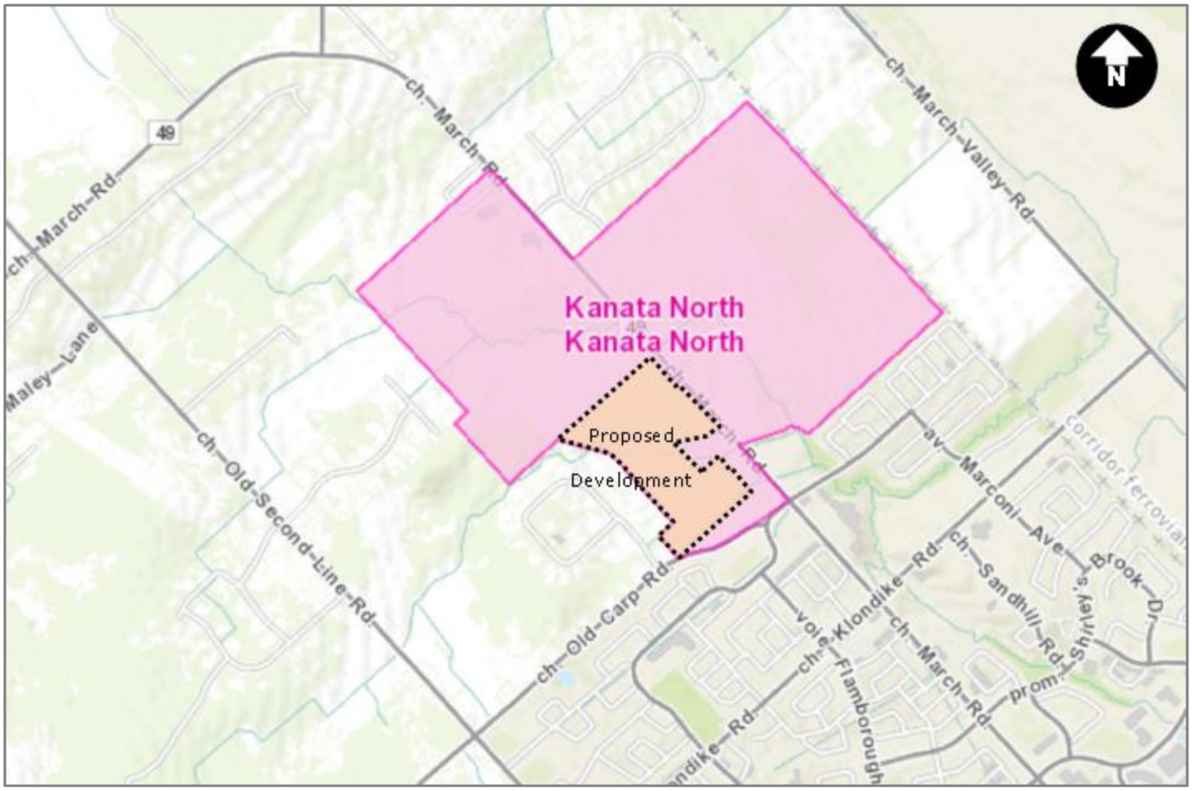


Figure 2 - Proposed Concept Plan (for information)

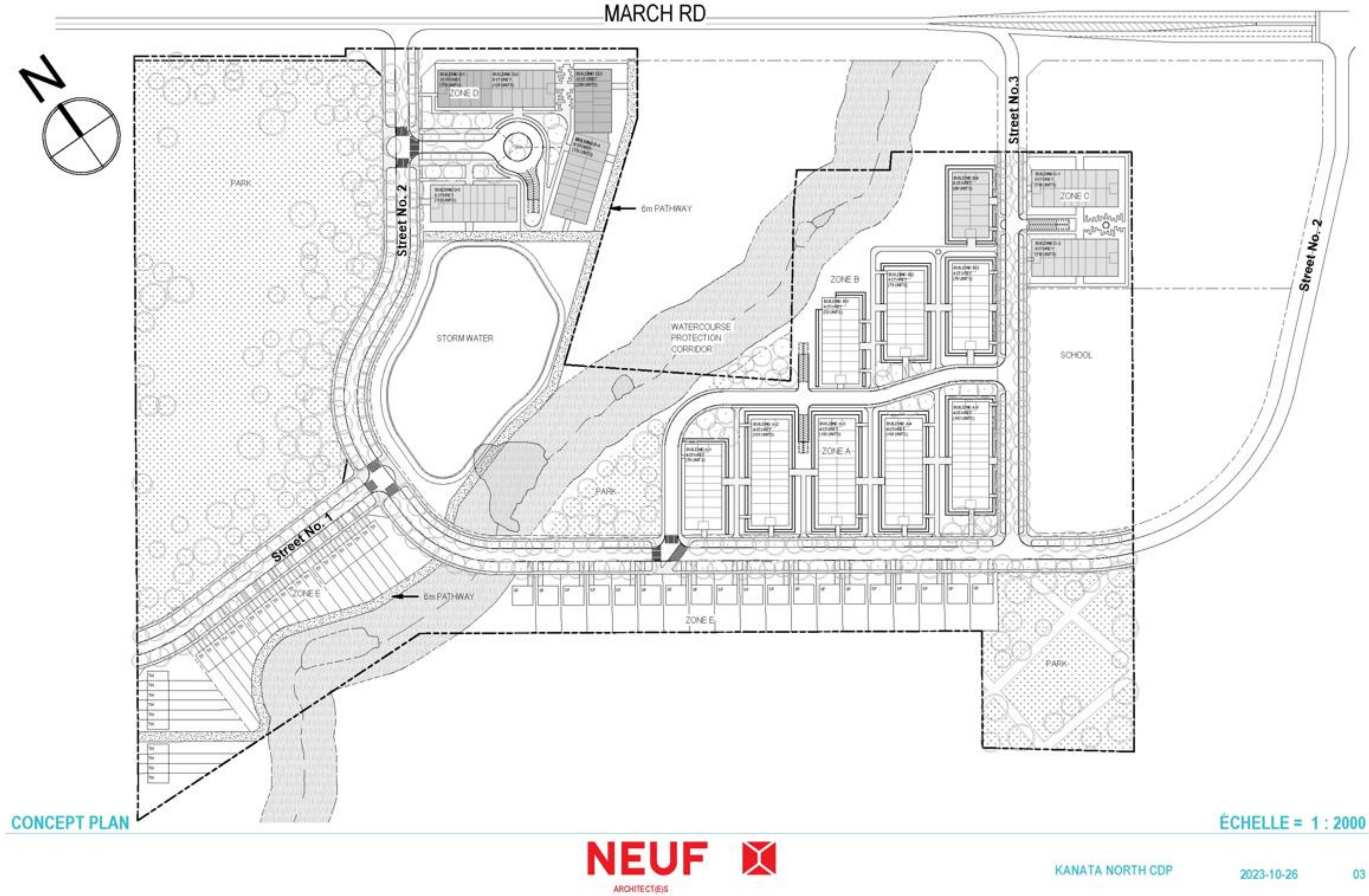
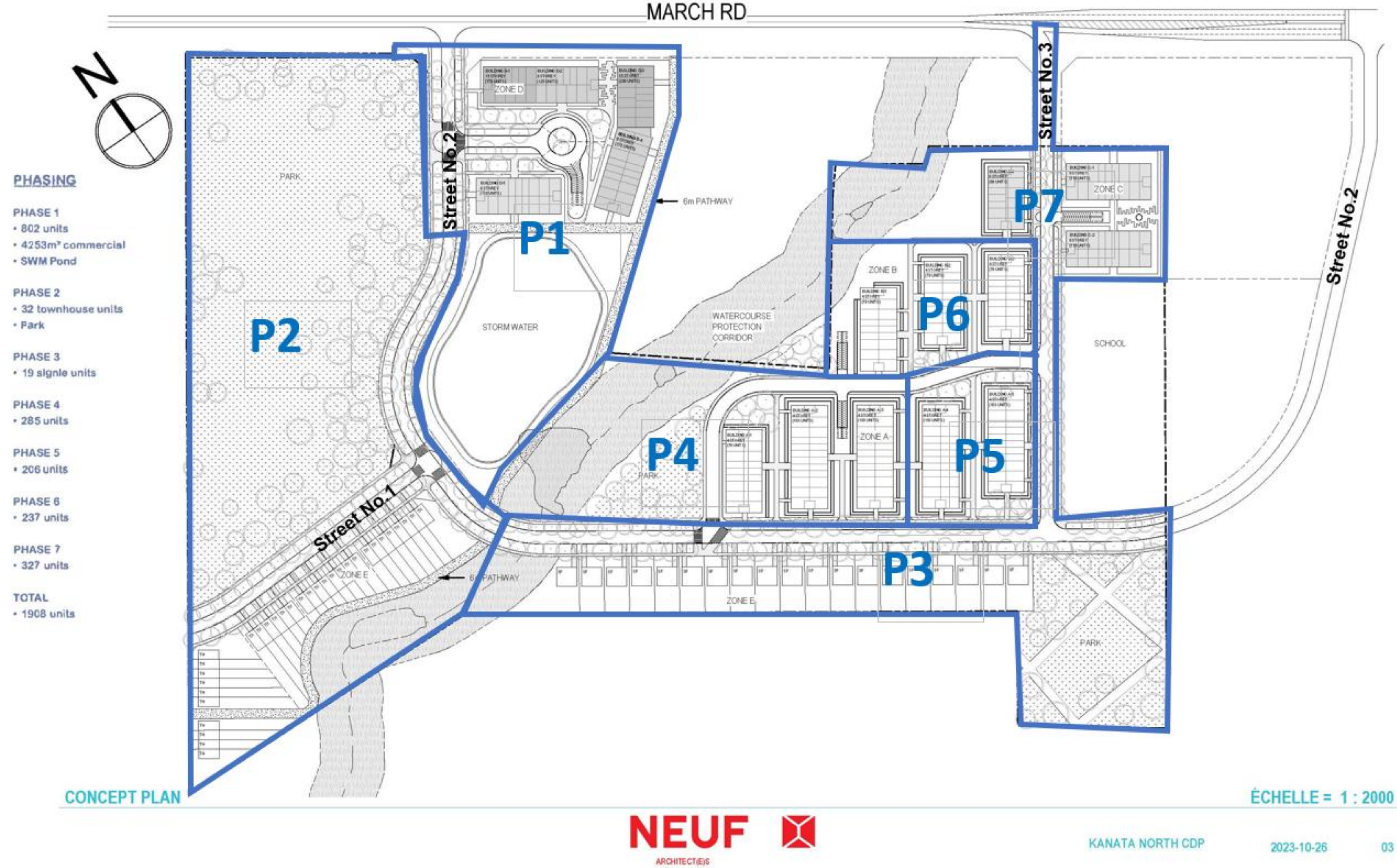


Figure 3 - Proposed Phasing Plan



The build-out years for each phase is outlined in **Table 1** below. The entire development is anticipated to be fully built and occupied by 2034.

Table 1 - Build-Out Per Phase

Phase	Size	Build-Out Year
1	Mixed-Use Block (3 mid-rise residential buildings (414 units), 2 high-rise residential buildings (388 units), SWM Pond Block, Commercial)	2024
2	Park Block, Townhouses (32 units)	2025
3	Singles Block (19 units)	2026
4	Condo Block Part 1 (3 low-rise residential apartment buildings, 285 units)	2028
5	Condo Block Part 2 (2 low-rise residential apartment buildings, 206 units)	2030
6	Condo Block Part 3 (2 low-rise residential apartment buildings, 237 units)	2032
7	Condo Block Part 4 (2 low-rise residential apartment buildings, 327 units)	2034

Table 2 outlines the proposed land uses assumed for the analysis to forecast the trips generated by the proposed development which were obtained from the *Institute of Transportation Engineers Trip Generation Manual, 9th Edition*. These land use codes are consistent with those used in the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016).

Table 2 - Proposed Land Uses / Land Use Codes

Land Use	Size	Land Use Code (LUC)
LUC 210	19 units	Single-Family Detached Housing
LUC 215	32 units	Single-Family Attached Housing
LUC 221	1,469 Units	Multifamily Housing (Mid-Rise)
LUC 222	388 units	Multifamily Housing (High-Rise)
LUC 821	4,253 m^2	Shopping Plaza

Primary access to the proposed development will be achieved via three new connections. Street No.2 will connect to both March Road and Halton Terrace and Street No.3 will connect to March Road. These new connections are illustrated in **Figure 2** above.

As illustrated in the *Kanata North Community Design Plan Transportation Master Plan* (Novatech 2016), the intersection of March Road at Street No.2 will be signalized and the intersection with March Road at Street No.3 will operate as a stop-controlled along the Street No.3 approach.

No turning restrictions are proposed at any of the access locations and the type of traffic control at intersections will be determined during subsequent steps of the TIA process.

2.1.2 Existing Conditions

2.1.2.1 Roads and Traffic Control

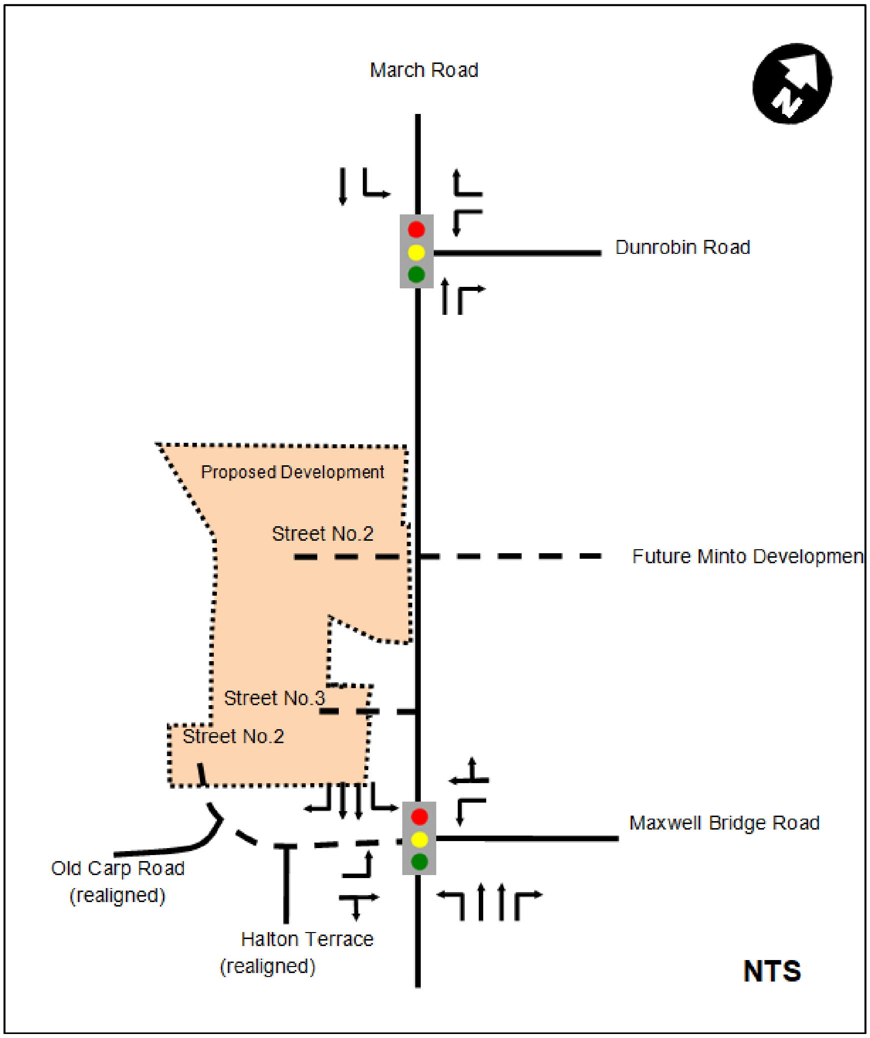
The roadways under consideration in the study area are described as follows:

March Road	Across the frontage of the subject development, March Road is a municipal two-lane arterial road that transitions from an urban cross-section south of the development to a rural cross-section heading north. Gravel shoulders are provided along both sides of the road. For the most part, March Road across the frontage of the proposed development has a posted speed limit of 80 km/h, however, in front of St. Isidore School, just north of the proposed development, the speed limit drops to 60km/h when the flashing lights are on, likely during school drop off and pick up.
Dunrobin Road	Dunrobin Road is a municipal two-lane arterial road with a rural cross-section and a posted speed limit of 60 km/h. Paved shoulders are provided along both sides of the road. The intersection with March Road is signalized and auxiliary turning lanes are provided in all directions.
Maxwell Bridge Road	Maxwell Bridge Road is a municipal two-lane collector road with an urban cross-section. In the absence of a posted speed limit, the default speed limit along this road is 50 km/h. Sidewalks and boulevards are provided along both sides of the Road. Maxwell Bridge Road makes up the east leg of the March Road at Maxwell Bridge Road / Halton Terrace intersection. The intersection with March Road is signalized. Left turn auxiliary lanes are provided in all directions and right turn auxiliary lanes are provided along March Road.
Halton Terrace	Halton Terrace is a municipal two-lane collector road with an urban cross-section and a posted speed limit of 40 km/h. Sidewalks are provided along both sides of the road. Halton Terrace makes up the west leg of the March Road at Maxwell Bridge Road / Halton Terrace intersection.
Old Carp Road	Old Carp Road is a two-lane collector road with a rural cross-section and a posted speed limit of 40 km/h. Gravel shoulders are provided along both sides of the road. The intersection with Halton Terrace is stop-controlled along the Old Carp Road approach.

There are a few existing residential and commercial driveways along March Road within 200m of the proposed site accesses. Just south of the intersection with Halton Terrace, March Road connects to commercial driveways on the east side of the roadway. North of the intersection, there are numerous commercial and residential driveways on the east and west sides of the roadway.

Figure 4 illustrates the existing lane configuration and traffic control.

Figure 4 - Existing Lane Configuration and Traffic Control



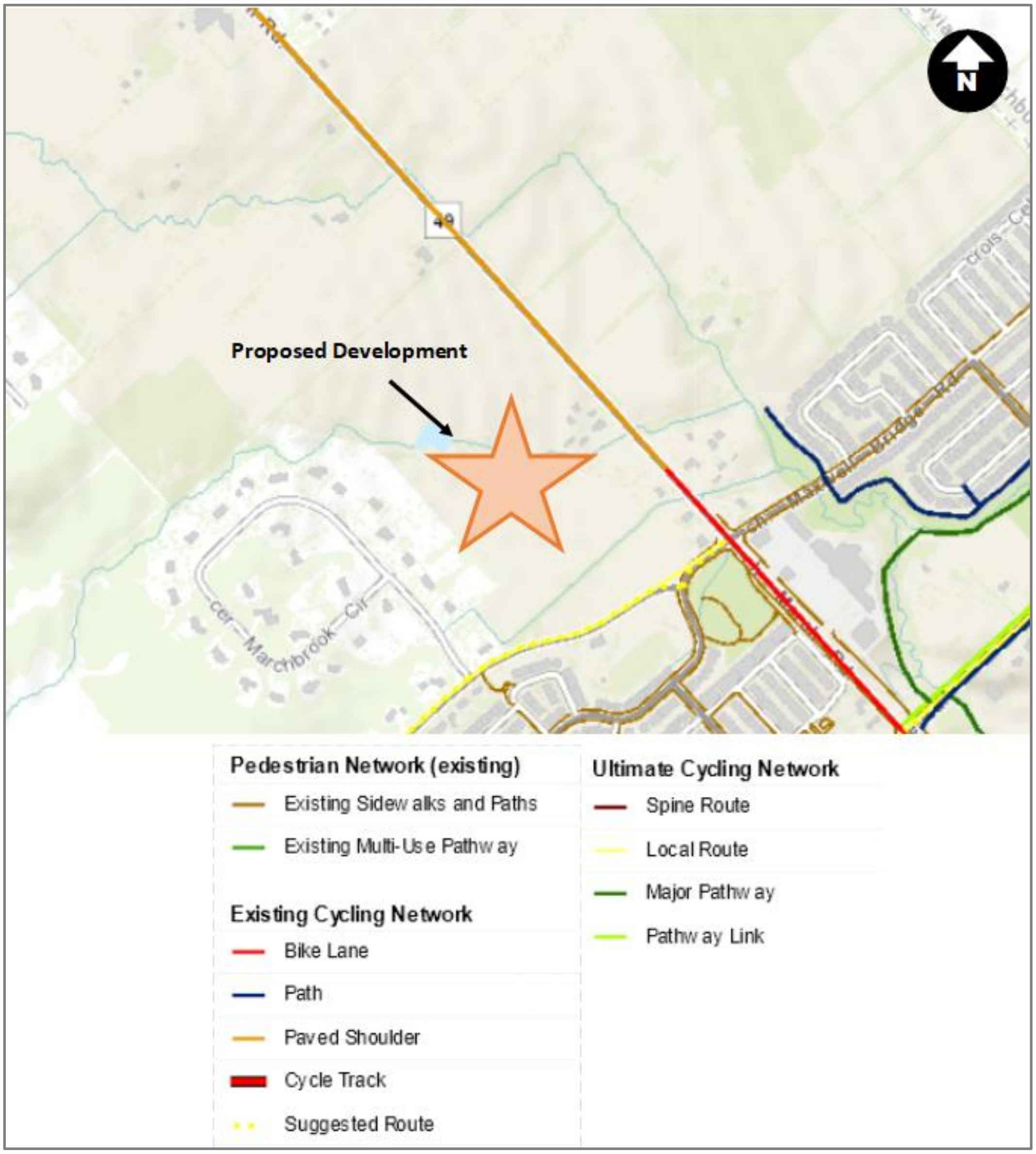
2.1.2.2 Walking and Cycling

March Road currently includes sidewalks along both sides of the road, starting approximately 100m north of the Halton Terrace intersection extending south. Halton Terrace currently includes sidewalks along both sides of the road in the vicinity of the subject development.

In terms of cycling facilities, March Road currently includes on-street bicycle lanes along both sides of the road starting approximately 100m north of the Halton Terrace intersection extending south. At the termination of the bicycle lanes, the cycling facilities transition to paved shoulders. Old Carp Road/Halton Terrace are suggested cycling routes and are also identified in the Ultimate Cycling Plan as local cycling routes. There are no existing dedicated cycling facilities along either roadway.

Figure 5 illustrates the existing cycling infrastructure within the vicinity of the study area.

Figure 5 – Existing Cycling Infrastructure



Source: Geo Ottawa Maps, accessed April 2020

2.1.2.3 Transit

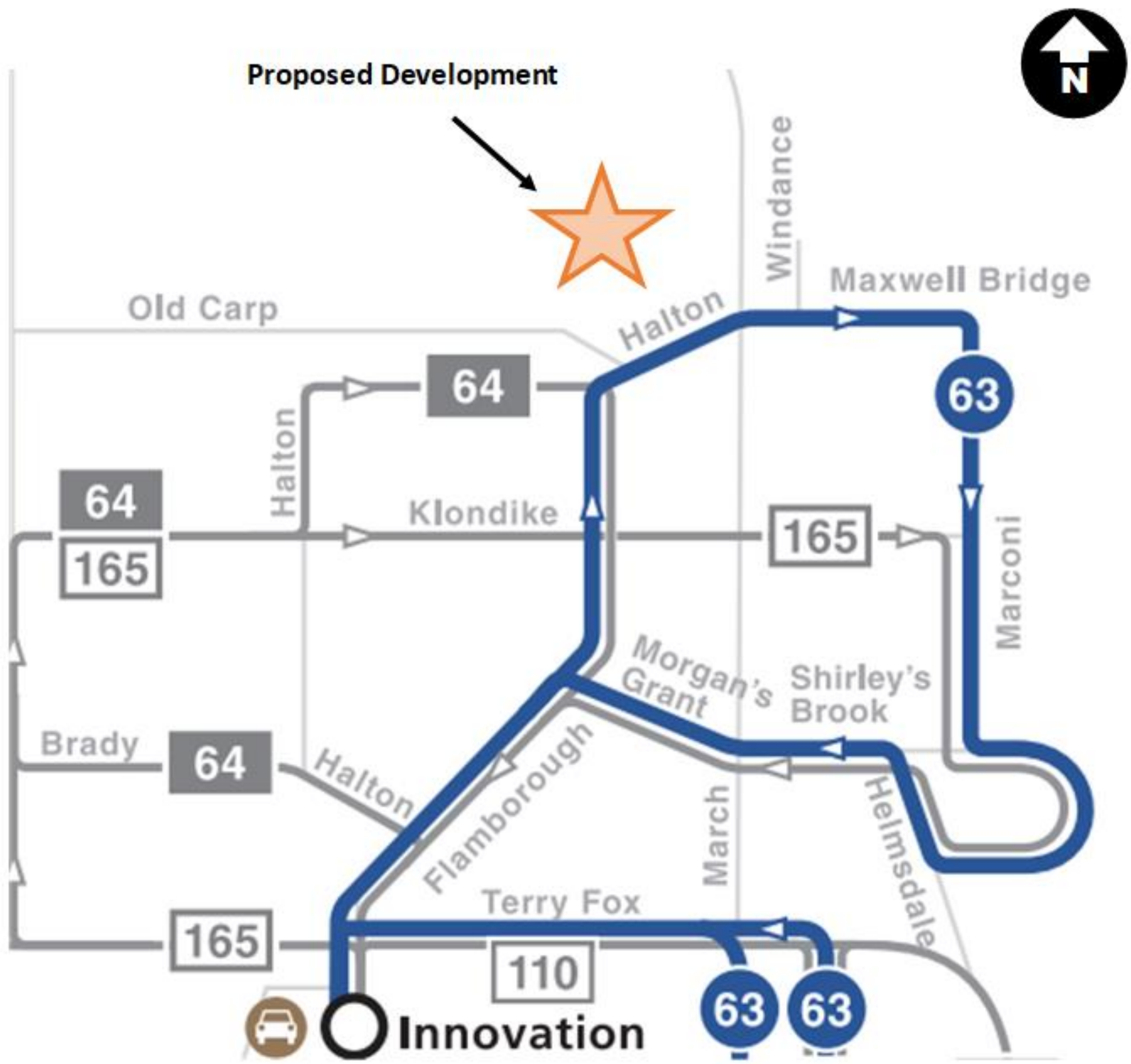
The northern limit of the current transit system currently terminates at the March Road at Halton Terrace / Maxwell Bridge Road intersection, which is approximately 350m away from the subject development. Transit routes 63 and 64 are currently serviced at this intersection.

Route 63 is a Rapid route that runs seven days per week between Kanata North and Tunney's Pasture Station. During the peak hours, it runs with approximate 15-minute headways.

Route 64 is a Local route that runs from Monday to Friday between Morgan's Grant and Tunney's Pasture Station. During the peak hours, it runs with approximate 15-minute headways.

Figure 6 illustrates nearby transit routes and closest transit stops.

Figure 6 - Study Area Transit Routes and Stops



Source: OC Transpo System Map, accessed December 2023

2.1.2.4 Traffic Management Measures

There are flex stakes in the median along Halton Terrace and Maxwell Bridge Road intended as traffic calming measures.

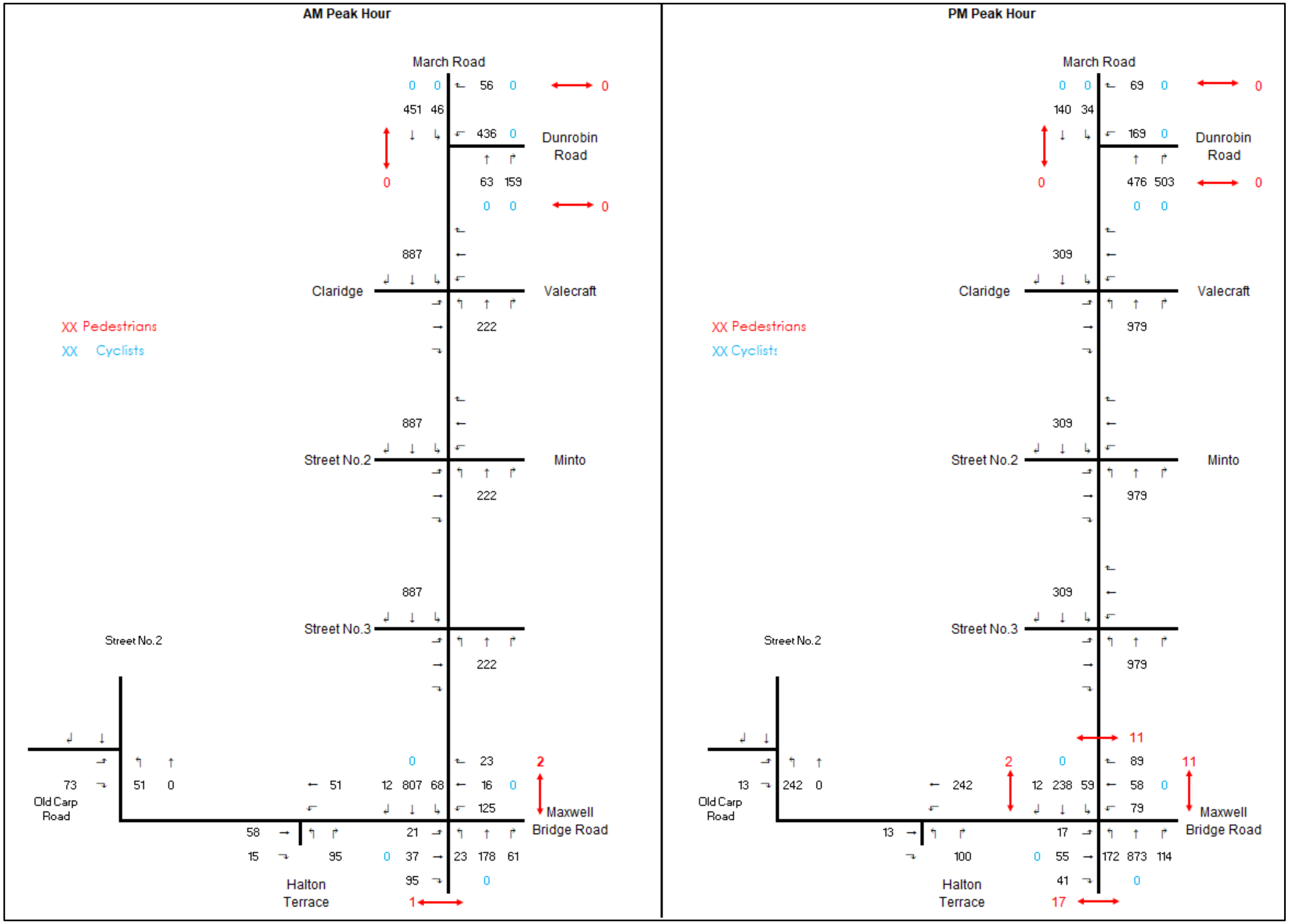
2.1.2.5 Traffic Volumes

Turning movement counts at the March Road at Dunrobin Road and March Road at Maxwell Bridge Road / Halton Terrace intersections were obtained from the City of Ottawa. These traffic counts were collected in January and March 2020, respectively. A count collected in 2019 was also obtained at the Halton Terrance and Flamborough Way intersection. The 2019 count was adjusted to 2020 volumes using a background growth rate of 0.5%. This background growth rate was obtained from the recently approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016).

Figure 7 illustrates the existing 2020 traffic volumes during the AM and PM peak hours.

Appendix A contains the traffic data and is provided for reference.

Figure 7 - 2020 Existing Traffic Volumes



2.1.2.6 Collision History

Collision data was provided by the City of Ottawa for the period January 2014 to December 2018 in the vicinity of the subject site. The data was reviewed to determine if any intersections or road segments exhibited an identifiable collision pattern during the five (5) year period.

Table 3 summarizes the collision class and impact types for each road segment and intersection within the study area.

Table 3 – Collision Summary

		Dunrobin Road at March Road	March Road at Maxwell Bridge Road	March Road between Maxwell Bridge Road and Dunrobin Road
Classification	Property Damage Only	16	8	43
	Non-Fatal Injury	2	4	12
Collision Type	Sideswipe	3	3	0
	Angle / Turning	9	6	1
	Rear End	4	0	1
	Single Motor Vehicle	2	2	0
	Other	0	1	0
Event	Speeding / Following too Close	3	9	7
	Improper Turn / Improper Lane Change	5	0	2
	Disobeyed Traffic Control / Failed to Yield ROW	4	0	7
	Lost Control	3	1	7
	Driving Properly	0	0	30
	Other / Unknown	3	0	2

Based on the collision data summarized in **Table 3** above, it was found that the majority of the collisions resulted in property damage only (79%), which suggests that the collisions were low enough speeds to not cause injury to people.

2.1.3 Planned Conditions

2.1.3.1 Road Network Modifications

Table 4 identifies the City of Ottawa Transportation Master Plan (TMP) projects located in the vicinity of the study area.

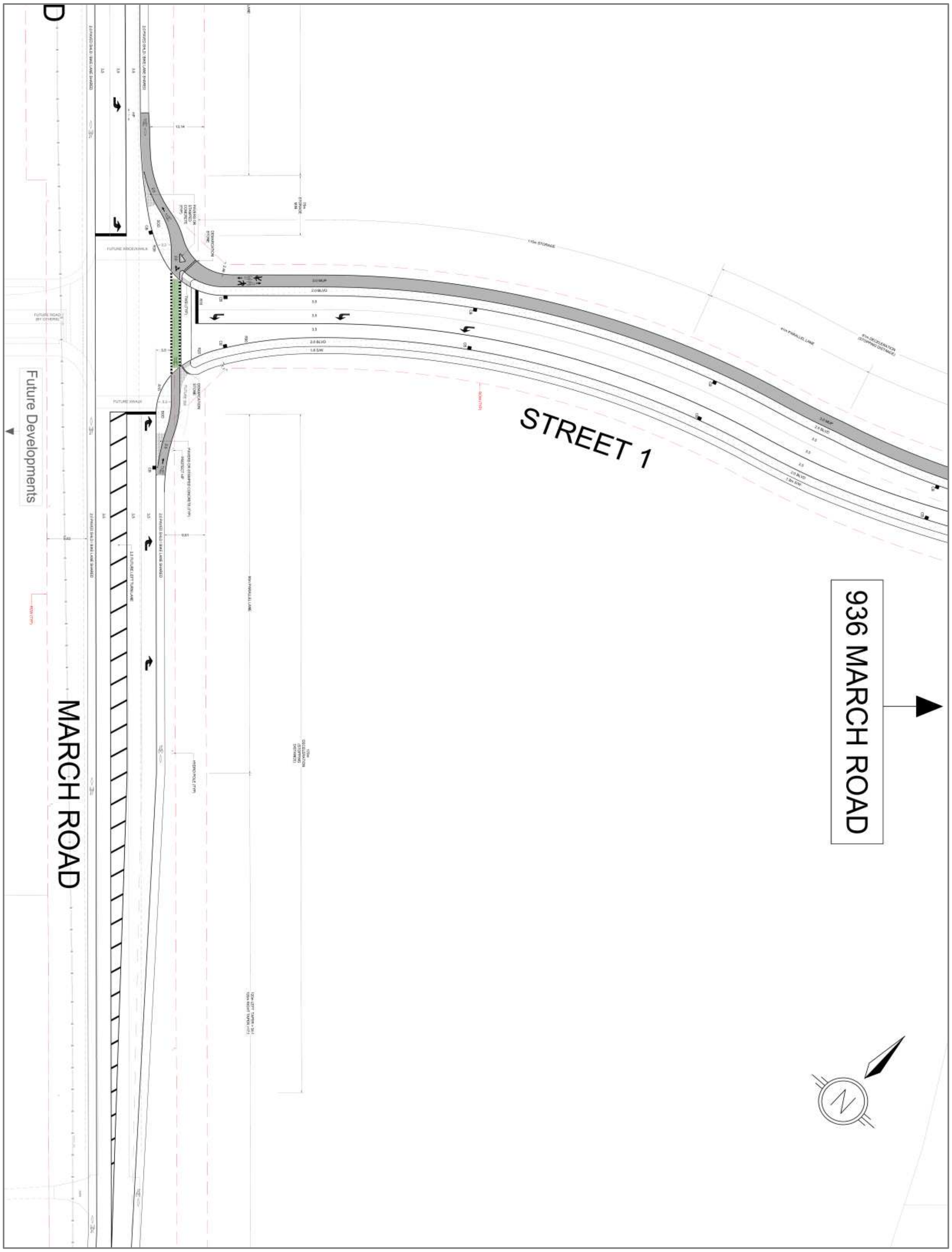
Table 4 - City of Ottawa Transportation Master Plan Projects

Project	Description	TMP Phase
March Road Widening	Widen from two to four lanes between Old Carp Road (Halton Terrace) and Dunrobin Road.	Network Concept (i.e. beyond 2031) (assumed implementation by the 2039 ultimate horizon year)
March Road Transit	Transit signal priority and queue jump lanes between Maxwell Bridge Road and Carling Avenue. Allows for future conversion to BRT at a later time to connect with planned BRT south of Carling Avenue.	Affordable Network (assumed implementation by the 2034 buildout horizon year)
	At-grade BRT between Solandt Road and Highway 417.	Affordable Network (assumed implementation beyond the 2034 buildout horizon year)
	At-grade BRT between Maxwell Bridge Road and Highway 417 with a potential northward expansion to Dunrobin Road.	Network Concept (i.e beyond 2031) (assumed implementation after the 2039 ultimate horizon year)

The transportation projects listed in **Table 4** above have undefined timelines. For the purpose of analysis, and per communications with the City of Ottawa, the at-grade BRT system between Maxwell Bridge Road/Dunrobin and Highway 417 was not assumed to be in place for the subject transportation impact study (i.e., it is assumed it will not be in place by the 2039 horizon time period). It was assumed that the transit signal priority lanes between Maxwell Bridge Road (future Street No.2) and Carling Avenue to the south would be in place by 2034, while the widening of March Road between Halton Terrace/Maxwell Bridge Road (future Street No.2) and Dunrobin Road was assumed to be in place by the 2039 ultimate horizon year (per communications with the City of Ottawa). These works were assumed to be necessitated by the increasing population in the area synonymous with the construction of all four KNUEA quadrants. The transit priority lanes and road widening projects are thought to complement the future Park and Ride lot in the northwest quadrant of the KNUEA lands by providing extended and more reliable transit service in the area.

For the intersection of March Road with Street No.2 (north), the preliminary geometry was discerned using the RMA provided by the City of Ottawa (as shown in **Figure 8**) for the intersection of March Road with Street No.2.

Figure 8 - March Road at Street No.2 / Street 1 (north) RMA



2.1.3.2 Future Background Developments

The Kanata North 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 9** and outlined in **Table 5** below.

Figure 9 - Background Developments

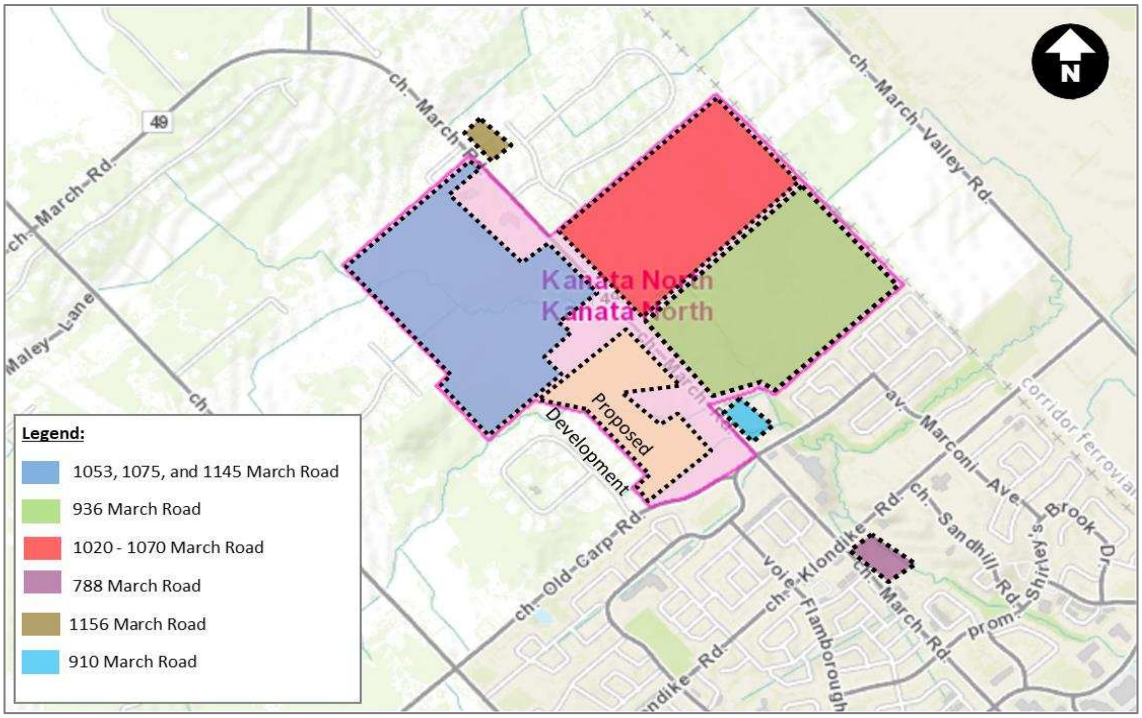


Table 5 - Background Developments

Development	Location	Size	Build-Out
1053, 1075, and 1145 March Road	Northwestern quadrant of the Kanata North Urban Expansion Area	825 residential units	2026
936 March Road TIA	Southeastern quadrant of the Kanata North Urban Expansion Area	856 residential units	2023
1020 and 1070 March Road	Northeastern quadrant of the Kanata North Urban Expansion Area	730 residential units	2031
788 March Road	Southeastern quadrant of the March Road at Klondike Road intersection	196 residential units	2023
1156 March Road	East side of March Road between the intersections with Murphy Court	Gasoline service center with 8 fueling positions	2021
910 March Road	East Side of March Road approximately 215m north of the intersection with Maxwell Bridge Road	390 residential units and 501m^2 of ground floor commercial space	2028

2.2 STUDY AREA AND TIME PERIODS

2.2.1 Study Area

The proposed study area is limited to the following intersections:

- March Road at Dunrobin Road;
- March Road at Street No.2;
- March Road at Street No.3;
- March Road at Halton Terrace / Maxwell Bridge Road;
- Street No.2 at Old Carp Road; and
- Street No.2 at Halton Terrace.

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:

- 2020 existing conditions;
- 2034 future background conditions;
- 2034 total future conditions (build-out);
- 2039 total future conditions (5 years beyond build-out); and
- The required development intensity to trigger intersection improvements, prior to full buildout.

2.3 EXEMPTIONS REVIEW

Table 6 summarizes the Exemptions Review table from the City of Ottawa's *2017 Transportation Impact Assessment Guidelines*.

Table 6 - 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	Yes
	4.1.3 New Street Networks	Only required for plans of subdivision	No
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Yes
	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	No
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 *Institute of Transportation Engineers (ITE) Trip Generation Manual* (11^{th} Edition) was used to forecast auto trip generation for the proposed development. Land use codes 210 - Single-Family Detached Housing, 215 - Single-Family Attached Housing, 221 – Multifamily Housing (Mid-Rise), 222 – Multifamily Housing (High-Rise), and 821 – Shopping Plaza were used as the most representative categories for the proposed land uses.

Table 7 outlines the assumed land uses and the trip generation rates for each land use.

Table 7 - Land Uses and Trip Generation Rates

LUC	Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
210	Single-Family Detached Housing	19 units	25%	75%	0.70	63%	37%	0.94
215	Single-Family Attached Housing	32 units	25%	75%	0.48	59%	41%	0.57
221	Multifamily Housing (Mid-Rise)	1,469 units	23%	77%	0.37	61%	39%	0.39
222	Multifamily Housing (High-Rise)	388 units	26%	74%	0.27	62%	38%	0.32
821	Shopping Plaza	4,253 m^2 GFA	62%	38%	1.73	49%	51%	5.19

To remain consistent with the *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016), the auto trip generation rates of the proposed land uses were converted to person trips using a conversion factor of 1.42.

Table 8 outlines development-generated person trips for each land use.

Table 8 – Person Trips Generated by Land Use

LUC	Land Use	Trip Conversion	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
210	Single-Family Detached Housing	Auto Trips	3	10	13	11	7	18
		Person Trip Factor	1.42	1.42	1.42	1.42	1.42	1.42
		Person Trips	4	14	18	16	10	26
215	Single-Family Attached Housing	Auto Trips	4	11	15	11	7	18
		Person Trip Factor	1.42	1.42	1.42	1.42	1.42	1.42
		Person Trips	6	15	21	16	10	26
221	Multifamily Housing (Mid-Rise)	Auto Trips	125	419	544	350	223	573
		Person Trip Factor	1.42	1.42	1.42	1.42	1.42	1.42
		Person Trips	178	594	772	497	317	814
222	Multifamily Housing (High-Rise)	Auto Trips	27	78	105	77	47	124
		Person Trip Factor	1.42	1.42	1.42	1.42	1.42	1.42
		Person Trips	38	111	149	109	67	176
821	Shopping Plaza	Auto Trips	49	30	79	117	121	238
		Person Trip Factor	1.42	1.42	1.42	1.42	1.42	1.42
		Person Trips	70	42	112	166	172	338
Total Development		**Auto Trips**	**208**	**548**	**756**	**566**	**405**	**971**
		Person Trip Factor	**1.42**	**1.42**	**1.42**	**1.42**	**1.42**	**1.42**
		Person Trips	**296**	**776**	**1072**	**804**	**576**	**1380**

The modal shares outlined in the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016) were used for the subject development and the modal shares for each land use (residential and commercial) are outlined in **Table 9** below. The KNUEA TMP assumed a 20% transit mode share due to the implementation of transit facilities outlined in the Affordable Network of the City of Ottawa TMP. Following correspondence with and confirmation from the City of Ottawa, it is anticipated that the transit modal share of 20% will be met by the year 2026 due to several external factors including:

1. Early transit agreements between Brigil and OC Transpo that will extend transit connectivity to the proposed development during the early phases (beginning in 2024);

2. The construction of the Park and Ride lot in the northwest quadrant of the KNUEA lands (estimated by 2026);

3. The completion of the westward Confederation Line expansion, which will enhance overall transit connectivity with the Ottawa West and Kanata zones (by 2025); and

4. The implementation of supplemental Transportation Demand Management measures by the developer.

As the City of Ottawa's transit improvement projects (transit signal priority) in the vicinity of the development are finalized (by the year 2034 or beyond), the aforementioned supplemental transportation demand management measures can be phased out as the transit reliability and coverage in the area is anticipated to be sufficient to meet a 20% transit modal share.

It is noted that phases 1 and 2 of the development as shown in **Table 1** are anticipated to be completed prior to the construction of the KNUEA park and ride facility and the completion of the westward confederation line expansion. In light of this, and for the purpose of early phase analysis, the transit mode share was assumed to be 10%, which is reflective of the transit modal share in the Kanata North area just northwest of the proposed development. To ensure that the initial 10% transit modal share is met between phase 1 buildout (2024) and the transit improvements finalization timeline (2026), basic TDM measures will be provided by the developer (by 2024) in addition to an early transit service agreement with OC Transpo. **Table 9** reflects the buildout year (2034) modal shares for which a 20% transit modal share is expected.

Table 10 reflects the trip generation of phase 1 (2024), which reflects a transit modal share of 10% prior to the 2026 horizon year.

Table 9 – Trip Generation by Mode

LUC	Land Use	Trip Conversion		Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
210	Single-Family Detached Housing	Auto	60%	2	8	10	10	6	16
		Passenger	15%	1	2	3	2	2	4
		Walk / Bike	5%	0	1	1	1	0	1
		Transit	20%	1	3	4	3	2	5
215	Single-Family Attached Housing	Auto	60%	4	9	13	10	6	16
		Passenger	15%	1	2	3	2	2	4
		Walk / Bike	5%	0	1	1	1	0	1
		Transit	20%	1	3	4	3	2	5
221	Multifamily Housing (Mid-Rise)	Auto	60%	106	357	463	298	190	488
		Passenger	15%	27	89	116	75	47	122
		Walk / Bike	5%	9	30	39	25	16	41
		Transit	20%	36	118	154	99	64	163
222	Multifamily Housing (High-Rise)	Auto	60%	22	68	90	66	40	106
		Passenger	15%	6	16	22	16	10	26
		Walk / Bike	5%	2	5	7	5	4	9
		Transit	20%	8	22	30	22	13	35
821	Shopping Plaza	Auto	60%	41	26	67	100	102	202
		Passenger	15%	11	6	17	25	26	51
		Walk / Bike	5%	4	2	6	8	9	17
		Transit	20%	14	8	22	33	35	68
Total Development		**Auto Trips**		**175**	**468**	**643**	**484**	**344**	**828**
		Passenger		**46**	**115**	**161**	**120**	**87**	**207**
		Walk / Bike		**15**	**39**	**54**	**40**	**29**	**69**
		Transit		**60**	**154**	**214**	**160**	**116**	**276**

Table 10 – Phase 1 Buildout (2024) Modal Shares and Auto Trip Generation

Land Use	Size		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Trip Generation Rates								
221 – Multifamily Housing (Mid-Rise)	414	units	23%	77%	0.37	61%	39%	0.39
222 – Multifamily Housing (High-Rise)	388	units	26%	74%	0.27	62%	38%	0.32
821 – Shopping Plaza	45.779	1,000’s GFA	62%	38%	1.73	49%	51%	5.19
Conversion to Person Trips								
221 – Multifamily Housing (Mid-Rise)	Auto Trip Gen		35	118	153	98	63	161
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	50	167	217	139	90	229
222 – Multifamily Housing (High-Rise)	Auto Trip Gen		27	78	105	77	47	124
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	38	111	149	109	67	176
821 – Shopping Plaza	Auto Trip Gen		49	30	79	117	121	238
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	70	42	112	166	172	338
Total Development	Auto Trip Gen		84	148	232	215	184	399
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	158	320	478	414	329	743
Modal Share Adjustments								
221 – Multifamily Housing (Mid-Rise)	Auto	70%	34	117	151	97	64	161
	Passenger	15%	8	25	33	21	13	34
	Walk / Bike	5%	3	8	11	7	4	11
	Transit	10%	5	17	22	14	9	23
222 – Multifamily Housing (High-Rise)	Auto	70%	26	79	105	76	47	123
	Passenger	15%	6	16	22	16	10	26
	Walk / Bike	5%	2	5	7	6	3	9
	Transit	10%	4	11	15	11	7	18
821 – Shopping Plaza	Auto	70%	48	30	78	116	120	236
	Passenger	15%	11	6	17	25	26	51
	Walk / Bike	5%	4	2	6	8	9	17
	Transit	10%	7	4	11	17	17	34
Total Development		**Auto Trips**	**108**	**226**	**334**	**289**	**231**	**520**
		Passenger Trips	**25**	**47**	**72**	**62**	**49**	**111**
		Walk / Bike Trips	**9**	**15**	**24**	**21**	**16**	**37**
		Transit Trips	**16**	**32**	**48**	**42**	**33**	**75**
Internal Capture								
821 – Shopping Plaza	Auto Trips		48	30	78	116	120	236
	Internal Capture	20%	10	6	16	23	24	47
		Net Auto Trips	38	24	62	93	96	189
Pass-By								
821 – Shopping Plaza	Auto Trips		38	24	62	93	96	189
	Pass-By	40%	0	0	0	38	38	76
		Net Auto Trips	38	24	62	55	58	113
Net New Auto Trips								
		221 – Multifamily Housing (Mid-Rise)	34	117	151	97	64	161
		222 – Multifamily Housing (High-Rise)	26	79	105	76	47	123
		821 – Shopping Plaza	38	24	62	55	58	113
Total Development								
Total Development		**Net New Auto Trips**	**98**	**220**	**318**	**228**	**169**	**397**

3.1.2 Internal Capture and Pass-By

When predicting trips that are associated with different land use types, the interaction between those land use types must be accounted for by applying the principals of internal capture adjustments. Internal capture trips are trips which are shared between two or more uses on the same site. A portion of the generated trips for each individual land use is therefore drawn from the adjacent land uses. Internal capture adjustments were made to account for vehicles that visit more than one land use within the subject development. Since these trips are contained within the subject site, accounting for each trip separately on the roadway network would result in “double-counting”. For this reason, land uses that may have associated internal capture trips between one another ultimately had their net new trips adjusted consistent with typical industry standards. In the subject development, the land uses that are subject to internal capture reductions are the commercial land uses. It is safe to assume that there will be a percentage of trips destined to the subject commercial parcels that will originate from the subject residential land uses.

In addition, a portion of the auto trips generated by the proposed commercial land uses will be ‘pass-by’ in nature. Pass-by trips are considered intermediate stops between an origin and a destination. They are site trips that are drawn from existing traffic volumes on the road network that are “passing-by” the site. While the total number of trips generated by a given development remains the same, the turning movements at study area intersections and site accesses require adjustments to reflect pass-by traffic. The rate of pass-by traffic is based on the specific land use which was obtained from the *ITE Trip Generation Manual*. A pass-by rate of 40% was used for the commercial land use during PM peak hours.

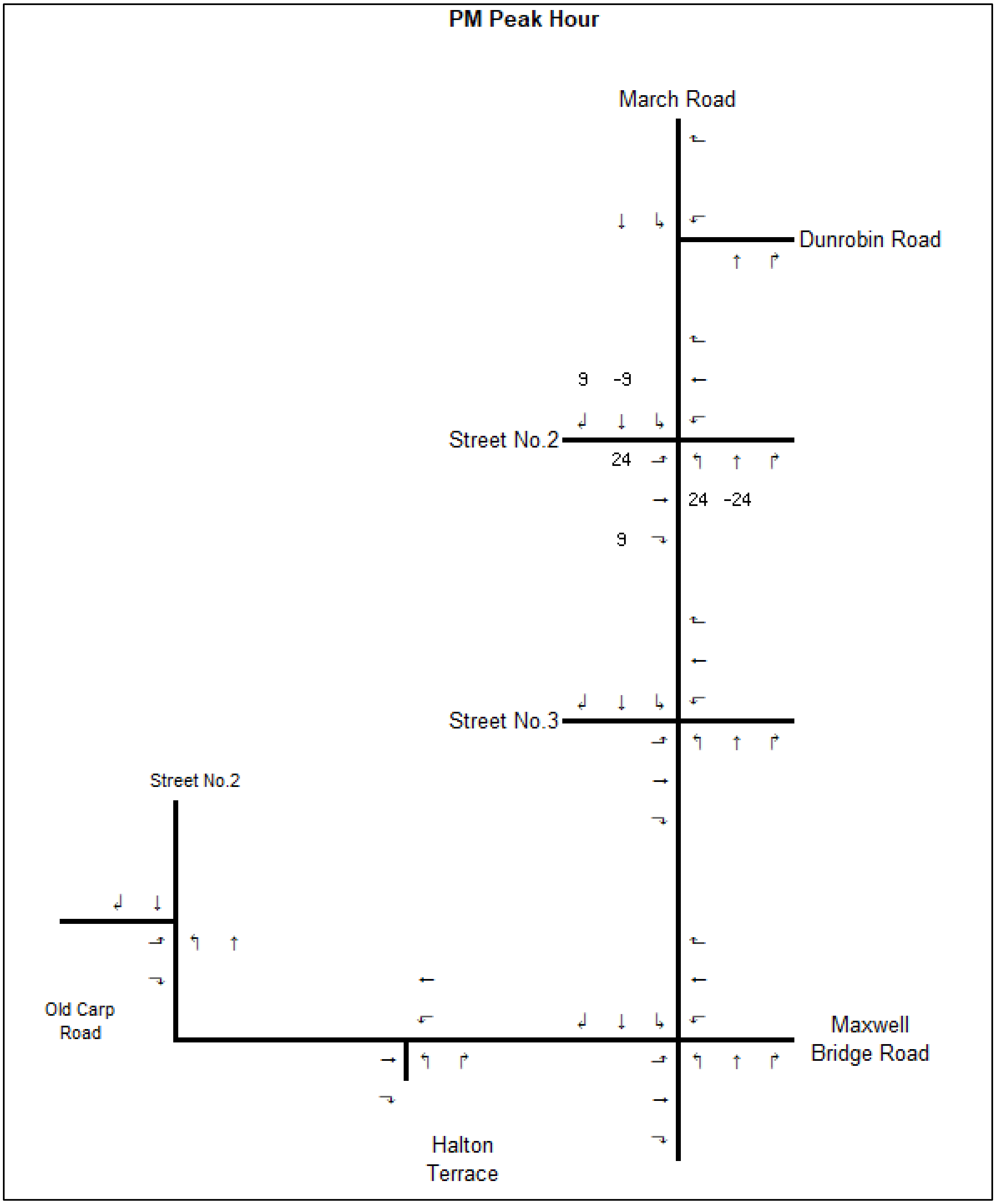
Table 11 outlines the pass-by, internal capture, and net new trips anticipated for the proposed development.

Figure 10 illustrates the pass-by trips the proposed development is anticipated to generate in the PM peak hour for the proposed development under ultimate conditions.

Table 11 – Pass-By and Internal Capture Trips

LUC	Land Use	Trip Conversion		Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
210	Single-Family Detached Housing	Auto Trips		2	8	10	10	6	16
		Internal Capture	0%	0	0	0	0	0	0
		Net Auto Trips		2	8	10	10	6	16
		Pass-By	0%	0	0	0	0	0	0
		Net New Auto Trips		2	8	10	10	6	16
215	Single-Family Attached Housing	Auto Trips		4	9	13	10	6	16
		Internal Capture	0%	0	0	0	0	0	0
		Net Auto Trips		4	9	13	10	6	16
		Pass-By	0%	0	0	0	0	0	0
		Net New Auto Trips		4	9	13	10	6	16
221	Multifamily Housing (Mid-Rise)	Auto Trips		106	357	463	298	190	488
		Pass-By	0%	0	0	0	0	0	0
		Net Auto Trips		106	357	463	298	190	488
		Pass-By	0%	0	0	0	0	0	0
		Net New Auto Trips		106	357	463	298	190	488
222	Multifamily Housing (High-Rise)	Auto Trips		22	68	90	66	40	106
		Internal Capture	0%	0	0	0	0	0	0
		Net Auto Trips		22	68	90	66	40	106
		Pass-By	0%	0	0	0	0	0	0
		Net New Auto Trips		22	68	90	66	40	106
821	Shopping Plaza	Auto Trips		41	26	67	100	102	202
		Internal Capture	20%	8	5	13	20	20	40
		Net Auto Trips		33	21	54	80	82	162
		Pass-By (PM Only)	40%	0	0	0	32	33	65
		Net New Auto Trips		33	21	54	48	49	97
Total Development		**Auto Trips**		**175**	**468**	**643**	**484**	**344**	**828**
		Internal Capture		**8**	**5**	**13**	**20**	**20**	**40**
		Net Auto Trips		**167**	**463**	**630**	**464**	**324**	**788**
		Pass-By		**0**	**0**	**0**	**33**	**33**	**66**
		Net New Auto Trips		**167**	**463**	**630**	**431**	**291**	**722**

Figure 10 – Pass-By Volumes (PM Peak Hour)



3.1.3 Trip Distribution

The distribution of traffic to/from the proposed development follows the distribution outlined in the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016). It is noteworthy that for residential land uses within the subject development, a total of 5% trips to/from the north during peak periods was assumed given the surrounding employment environment and the trip summary for the Kanata / Stittsville TAZ in the 2011 Trans O-D Survey. It is likely that 5% of the subject development's residents or less would be destined to Dunrobin during the AM and PM peak periods to/from their respective employers. However, for the commercial / specialty retail component of the development, it was assumed that 15% of the trips would be destined to/from the north (Dunrobin communities) on the basis that a specialty retail store in the subject development would likely attract some customers from Dunrobin during the peak periods. Given the number of generated trips associated with each land use, the weighted site trips to/from the north was found to be **6%**.

Table 12 summarizes the assumed trip distribution for the proposed development.

Table 12 – Trip Distribution

Direction		Via (to / from)	
		March Road (North)	March Road (South)
North	6%	6%	-
East	39%	-	39%
South	5%	-	5%
West	0%	-	-
Internal[1]	50%		50%
Total	**100%**	**6%**	**94%**

Notes:
18. Refers to trip origins/destinations within the same O-D Ward.

3.1.4 Trip Assignment

Site generated trips were assigned to the study area road network based on the trip distribution assumptions outlined above in **Table 12.**

Figure 11 illustrates the site traffic distribution under ultimate conditions; traffic distribution under the 2024 and 2026 horizon years are discussed under **Section 4.9.9.2** and **Section 4.9.9.3**.

Figure 12 illustrates new site generated trips during the AM and PM peak hours. Traffic assignment under the 2026 horizon year is discussed under **Section 4.9.9.2** and **Section 4.9.9.3**.

Figure 11 – Site Traffic Assignment | Site build Out (2034)

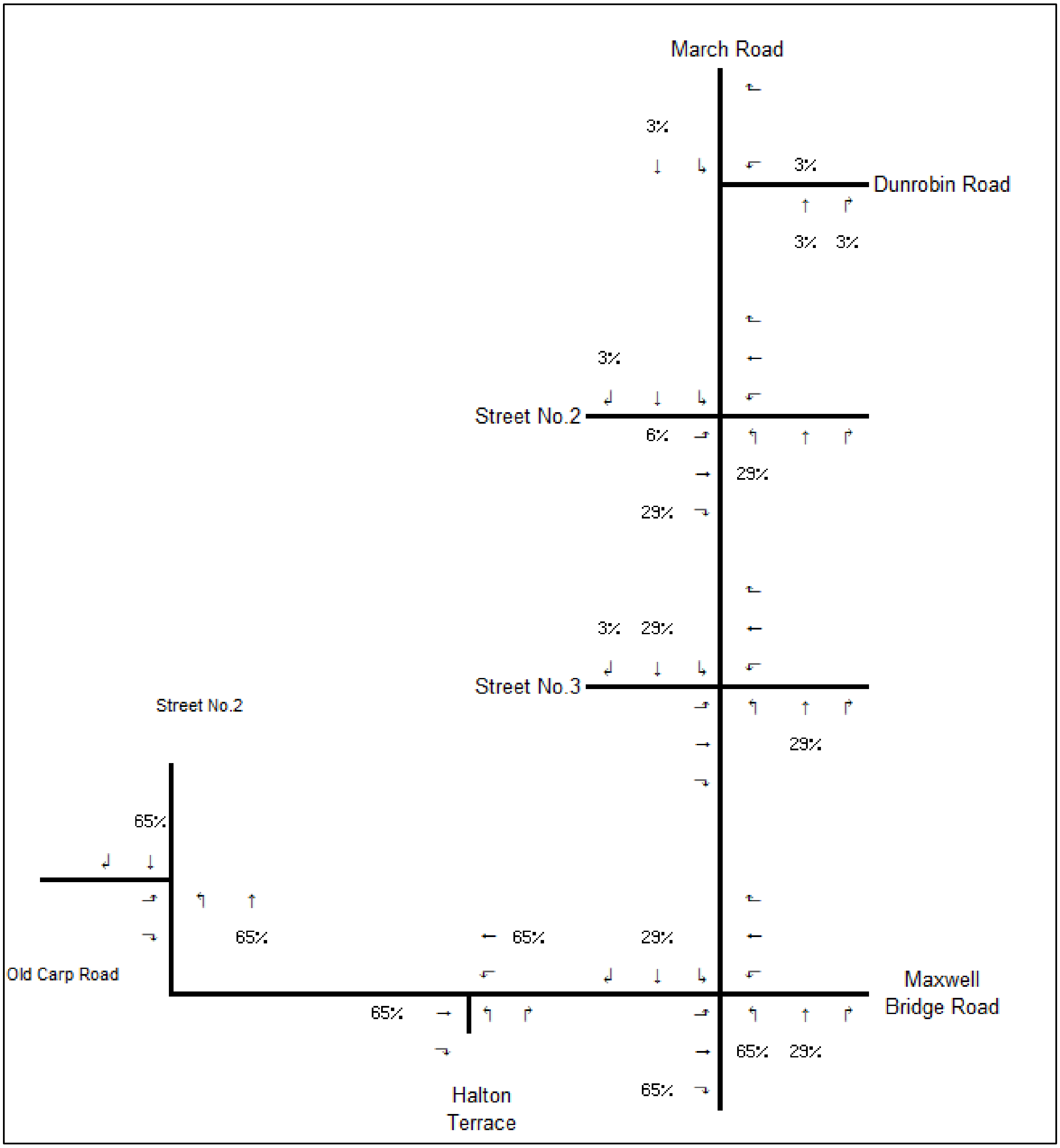
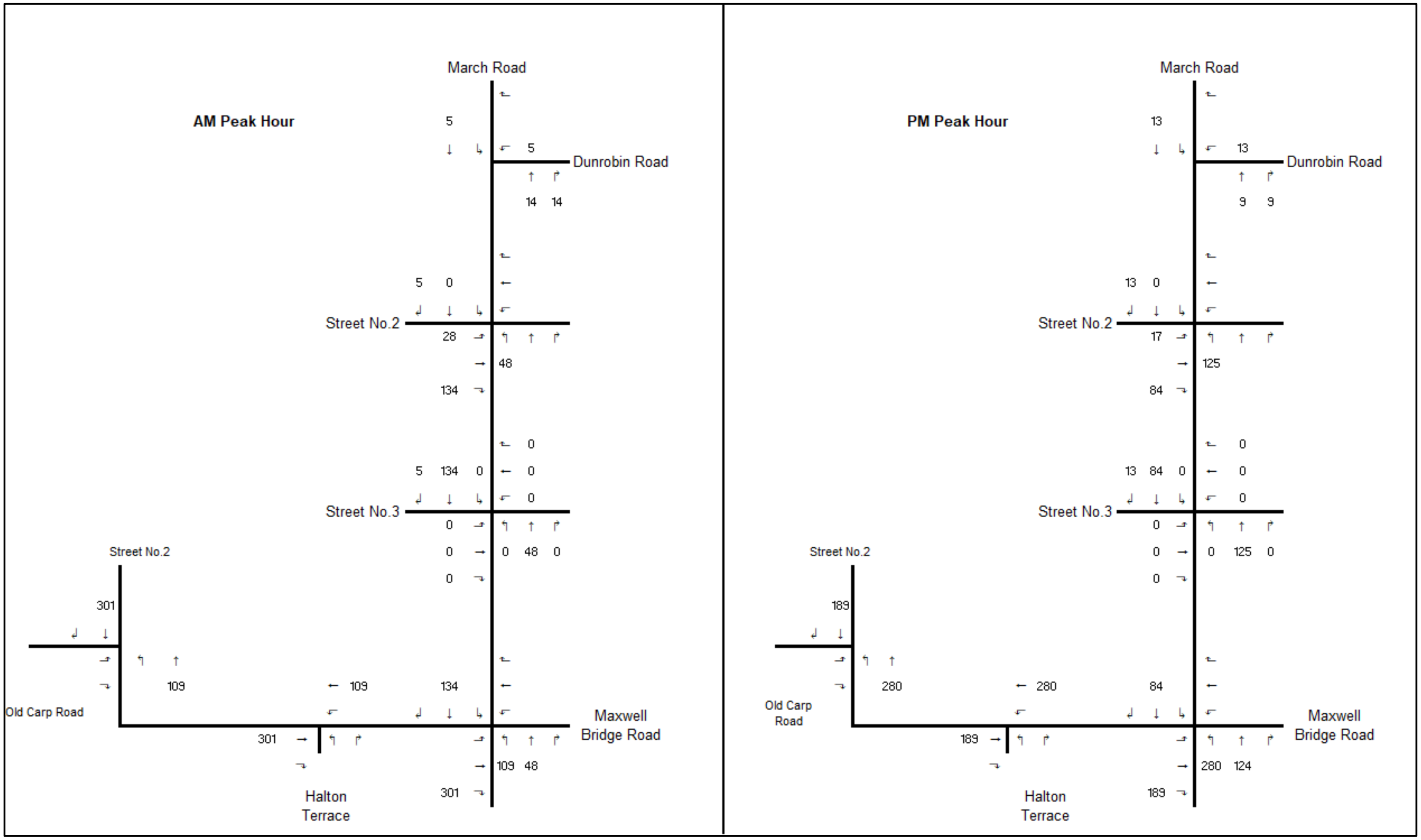


Figure 12 - Site Traffic Volumes| Site build Out (2034)



3.2 BACKGROUND NETWORK TRAVEL DEMAND

3.2.1 Transportation Network Plans

As outlined in **Table 4** in **Section 2.1.3.1**, the Transit Signal Priority measures along March Road between Maxwell Bridge Road and Carling Avenue are anticipated to be in place by the 2034 buildout horizon year, and the widening of March Road to Dunrobin Road is anticipated to be in place by the 2039 ultimate horizon year.

3.2.2 Background Growth

Existing traffic volumes were grown at a rate of 0.5% annually, non-compounding, to represent 2034 and 2039 background traffic volumes. This rate of growth is consistent with the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016).

3.2.3 Other Developments

As outlined in **Table 5** in **Section 2.1.3.2**, the remaining portion of the Kanata North Urban Expansion Area lands and the proposed developments at 788 March Road and 1156 March Road are planned to be fully built and occupied by the buildout year of the subject development (2034). The traffic volumes that these lands will generate were obtained from the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016), the 1053 March Road TIA report (by Novatech), the 936 March Road TIA Report and the 910 March Road TIA Report (by CGH), the 1020 March Road TIA (by Stantec), the *788 March Road TIA Strategy Report* (Parsons, August 2018), and the 1156 March Road Transportation Brief (D.J Halpenny & Associates). These were added to the transportation network as background traffic. For the KNUEA TIA studies, due to the inconsistencies observed in the trip generation methodology, the person trip conversion factor, and the modal splits, the forecasting was redone using the ITE Trip Generation Manual (9th edition), a person trip conversion factor of 1.42, and consistent modal shares.

Further to the background developments in the area, and through communication with CGH Consultants, it was found that the westbound left turn at the intersection of March Road and Street No.2 is planned to be converted to a dual westbound left movement to accommodate traffic from planned commercial developments within the 936 March Road development. The conversion is planned to occur after March Road has been widened to feature a 4-lane cross section (2039). This configuration is analyzed in the ultimate horizon (2039) to capture the impact associated with providing a fully protected westbound left movement at the intersection of March Road and Street No.2.

3.3 DEMAND RATIONALIZATION

The traffic forecasts indicate that the under the existing conditions and intersection geometry, the demand along March Road is anticipated to exceed the available capacity. This will be the case until March Road is widened and additional capacity is added to the network. As indicated above, March Road is assumed to be widened to a four-lane cross section by the 2039 horizon year to accommodate the projected background growth in the study area. Maintaining the storage lane lengths shown in the RMA in **Figure 8**, analysis was performed assuming a widened March Road (4 lanes) between Maxwell Bridge and Dunrobin Road under the ultimate future conditions (year 2039) in tandem with signal timing plan and offset optimizations (discussed in detail under **Section 4.9**) at the signalized study area intersections. The projected operations are shown in **Table 13**, with the critical movements highlighted.

<u>During the weekday AM peak hour:</u>

- The westbound left movement is anticipated to operate with a delay of 115s at the intersection of March Road and Street No.2/Maxwell Bridge Road, which is considered to be acceptable for side streets, especially given the heavy traffic volumes on the mainline.
- The southbound through movement is anticipated to operate with a V/C ratio of 1.04 at the intersection of March Road and Street No.2/Maxwell Bridge Road. which is slightly over the critical capacity.

<u>During the weekday PM peak hour:</u>

- The timing plan was optimized by assigning a protected/permissive operation to the westbound left movement during the PM peak hour to mitigate the conflict with the eastbound right volumes. With this improvement, the westbound left operation during the PM peak hour is projected to improve, such that it operates with a v/c ratio of 0.65 and a delay of 57s.

The results indicate that the future widened cross section along March Road is sufficient in accommodating the traffic demands at the year 2039 as the LOS for signalized intersections is projected to be E or better, which falls within the vehicular LOS targets set out by the City of Ottawa for an arterial road in close proximity to a school except the southbound through movement at March Road and Street No.2/Maxwell Bridge Road intersection. As such, the traffic demand was not rationalized. Traffic at all other study area intersections operates with acceptable levels of service. It is also noted that the implementation of a median BRT system along March Road beyond the 2039 horizon year would result in increased transit modal shares, which is anticipated to have a direct improvement on traffic operations in the area by reducing personal vehicles on the road.

Additional horizon years analysis is discussed in detail in **Section 4.9.2**. The detailed analysis reports are shown in **Appendix C**.

Table 13 – Ultimate Horizon Year (2039) – Widened March Road

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement: Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	D	53	1.01	EBL	D	37	0.08	12
				EBTR	D	46	0.61	82
				WBL	F	115	0.97	76
				WBTR	D	37	0.06	13
				NBL	E	79	0.88	59
				NBT	B	18	0.37	61
				NBR	B	14	0.05	4
				SBL	B	13	0.17	13
				SBT	E	63	1.04	311
				SBR	B	15	0.01	-
March Road & Street No.2 (Signalized)	C	28.9	0.68	EBL	E	65	0.52	16
				EBTR	D	52	0.35	28
				WBL	F	92	0.96	65
				WBTR	D	43	0.07	11
				NBL	B	13	0.26	8
				NBT	A	9	0.25	35

				NBR	A	8	0.06	3
				SBL	B	11	0.01	3
				SBTR	C	21	0.72	167
March Road & Dunrobin Road (Signalized)	B	18	0.59	WBLR	C	33	0.75	62
				NBT	A	7	0.08	11
				NBR	A	8	0.18	10
				SBL	A	7	0.08	9
				SBT	B	11	0.52	90
PM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	C	34.3	0.93	EBL	D	51	0.14	13
				EBT	E	63	0.68	55
				WBL	E	57	0.65	30
				WBT	D	45	0.34	40
				NBL	D	48	0.93	165
				NBT	C	31	0.90	314
				NBR	B	12	0.08	9
				SBL	C	26	0.51	18
				SBT	C	27	0.56	104
				SBR	B	19	0.01	-
March Road & Street No.2 (Signalized)	B	18	0.62	EBL	E	57	0.40	24
				EBTR	D	51	0.21	23
				WBL	E	63	0.70	35
				WBTR	D	47	0.07	10
				NBL	A	8	0.30	20
				NBT	B	12	0.62	116
				NBR	A	8	0.20	9
				SBL	B	15	0.09	6
				SBTR	B	16	0.35	60
March Road & Dunrobin Road (Signalized)	B	15	0.45	WBLR	D	45	0.67	42
				NBT	A	9	0.28	42
				NBR	B	11	0.40	14
				SBL	A	4	0.07	5
				SBT	A	5	0.18	24

Figure 13, Figure 14, and **Figure 15** illustrate the future traffic volumes under the 2034 and 2039 horizon years.

It should be noted that under 2034 total future conditions with a two-lane cross section for March Riad, the analysis presented in **Section 4.9.2.5** found that the highest V/C ratio is projected to be in the southbound through direction (V/C ratio of 1.24) at the intersection of March Road and Street No.2 during the AM peak hour. Further investigation of this movement found that a V/C ratio of 1.0 can be achieved by reducing the vehicular volumes on the mainline (March Road) from 1,373 vph to 1,090 vph, which represents a 21% reduction in vehicular volumes.

However, a 21% reduction in vehicular volumes is not thought to be achievable due to geographical location of the proposed development and the existing roadway connectivity. Residents traveling N-S on March Road wishing to circumnavigate the congestion between Street No.2 (north) and Street No.2 (south) by diverting to a less congested roadway would only have the more circuitous option of traveling on Old Carp Road, Old Second Line Road, Klondike Road, or Terry Fox Drive, resulting in the addition of approximately 4km to their travel distance.

Figure 13 – 2034 Future Background Traffic Volumes

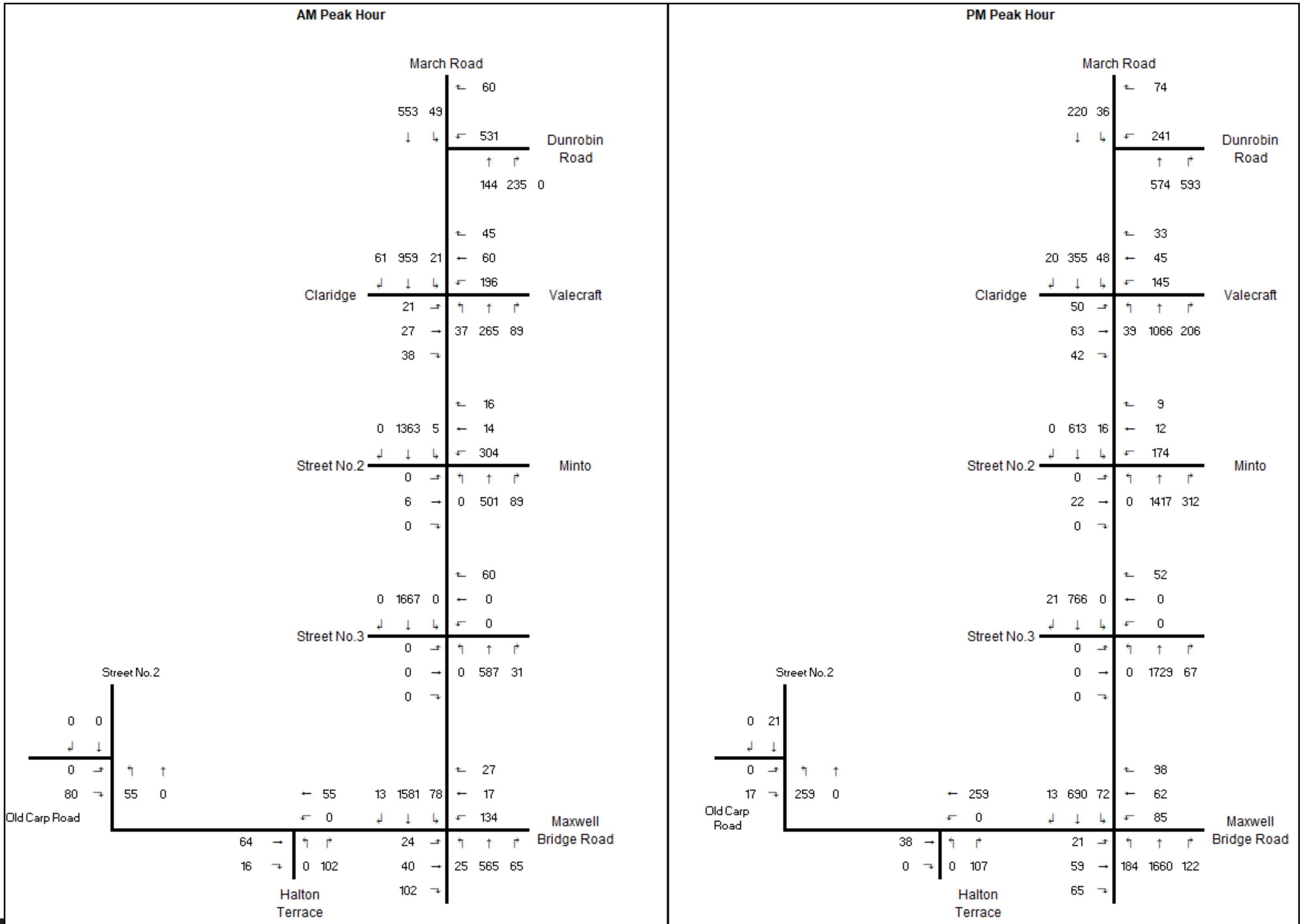


Figure 14 – 2034 Total Future Traffic Volumes

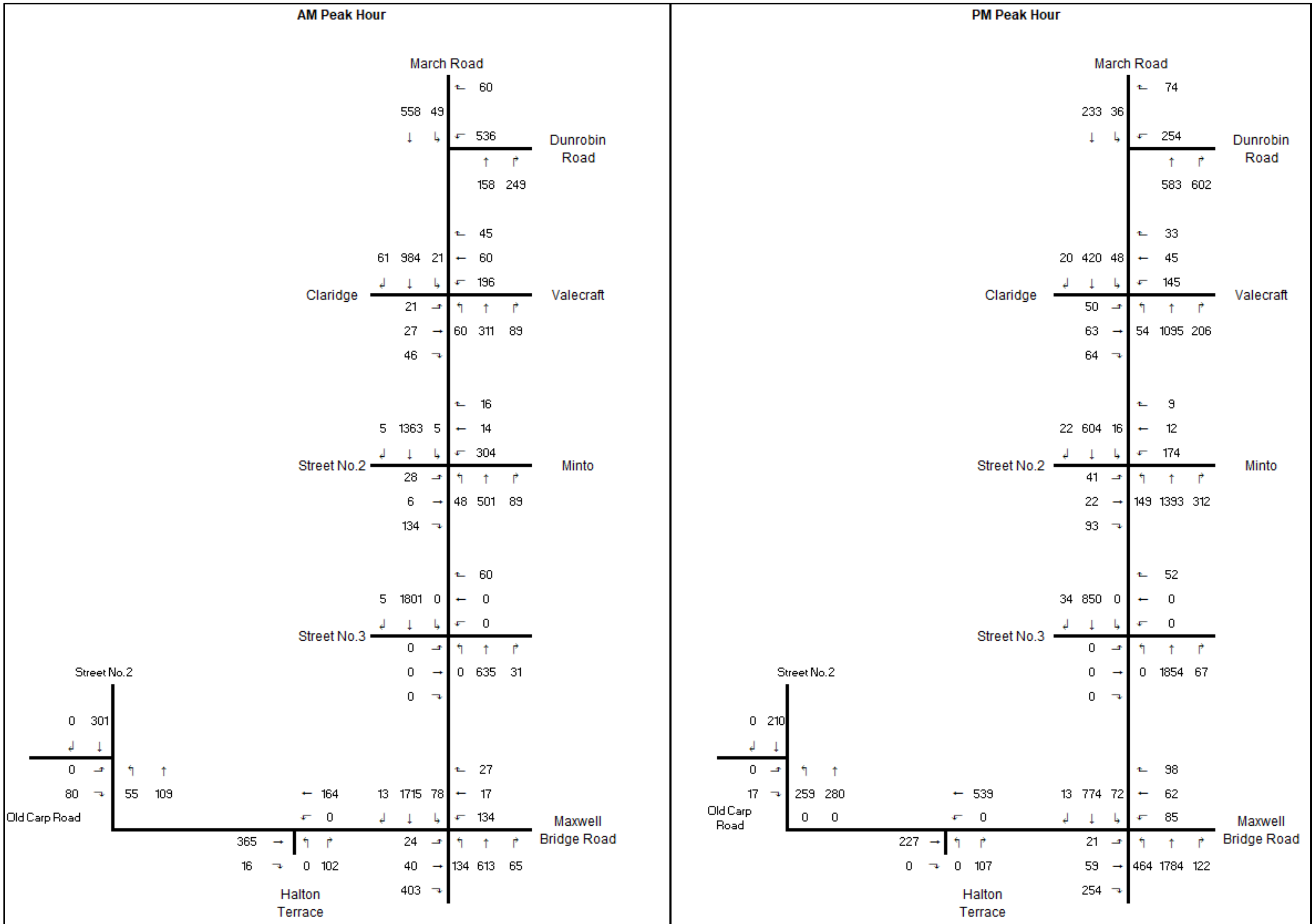
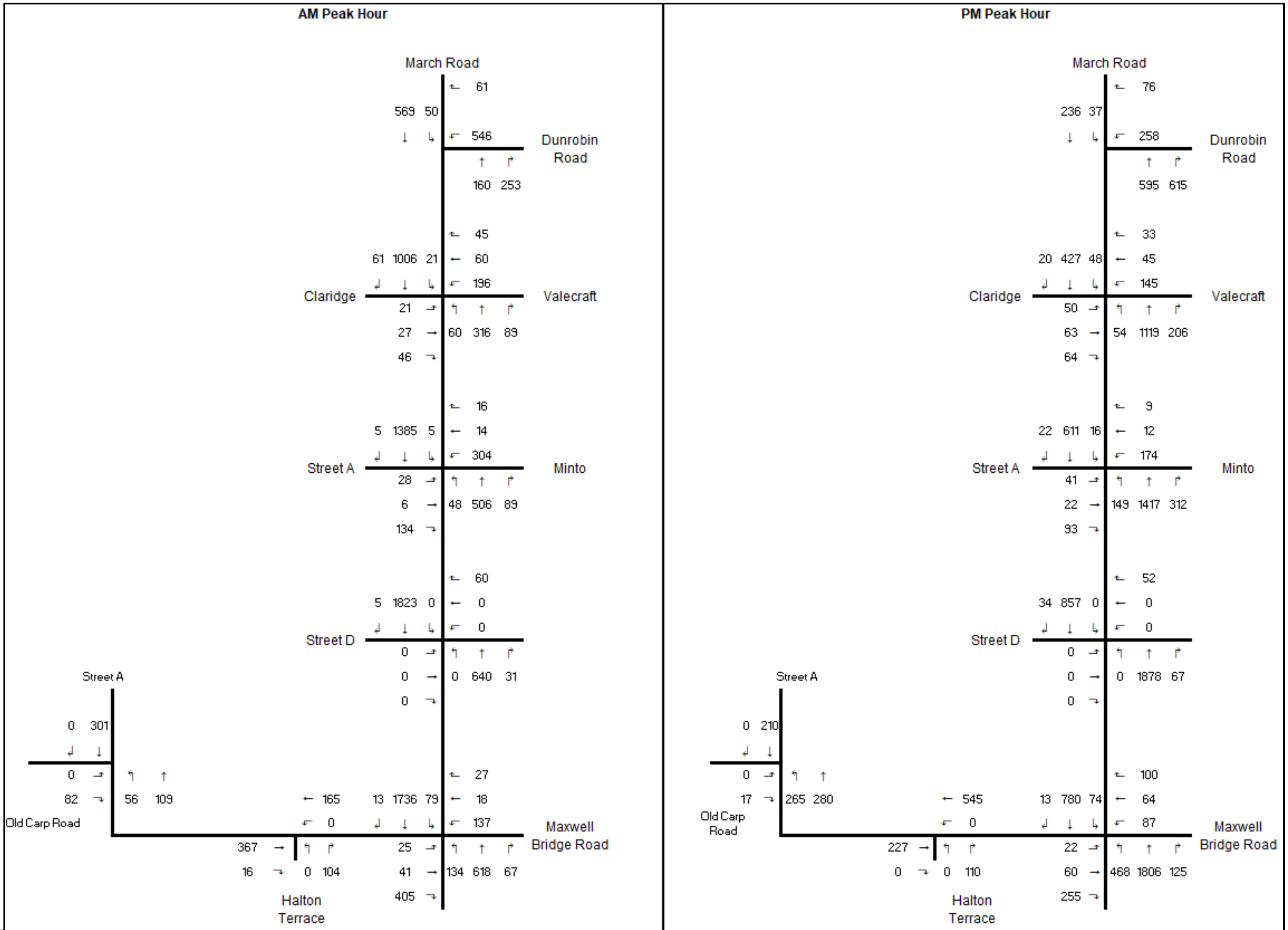


Figure 15 – 2039 Ultimate Traffic Volumes



4.0 STRATEGY REPORT

4.1 DEVELOPMENT DESIGN

4.1.1 Design for Sustainable Modes

Several features have been included within the subject development that help promote non-auto modes within the community. In reference to the Designing Neighborhood Collector Streets Guidelines published in December 2019, all collector roads within the subject development are planned to feature continuous uni-directional cycling areas adjacent to walking areas that are separated from the roadway by inner boulevards on both sides to improve circulation and safety for all road users. The neighborhood collector roads will feature periodic bulb-outs that are conducive to meeting the operating speed target of 40 km/h. The guidelines are applicable to Street No.2, which runs across the entire development and forms the E-W roadway at the new northern intersection (March Road and Street No.2) as shown in the site plan, and are also applicable to Street No.1, which is planned to connect the proposed development with the northwest KNUEA lands.

The development also encompasses one local road (Street No.3) which is situated just north of the intersection of March Road and Maxwell Bridge Road. Street No.3 is planned to connect to Street No.2 approximately midway through the development to provide direct access for phases 6 and 7 of the development as shown in **Figure 3**. As a local road, the City of Ottawa operating speed target is 30 km/h. The roadway is planned to feature a sidewalk on the south side of the road as per excerpts from the KNUEA TMP.

4.1.2 Circulation and Access

Not applicable; exempted during screening and scoping.

4.1.3 New Street Networks

There are three new proposed roadways within the subject development, Streets A, B, and D. Street No.2 is a collector road that is in the shape of a crescent and intersects March Road at two locations. Street No.2 will displace the existing Halton Terrace Roadway and intersect with March Road, forming the southern access of the development. Street No.2 is planned to continue through the development and intersect with March Road again, forming the northern access of the development. The intersection of Street No.2 at March Road is anticipated to be signalized. Street No.1 is a collector road that is planned to connect the southwest and northwest quadrants of the KNUEA lands (the Brigil and Claridge developments) and is envisioned to intersect with Street No.2 under an all-way stop controlled configuration. Street No.3 is a local roadway envisioned to intersect March Road on the eastern end and Street No.2 on the western end.

As per the neighborhood collector roads design guidelines, traffic calming measures are required to be included as a means to proactively calm traffic that is anticipated to travel along the Street No.2 collector. Measures include but are not limited to periodic bulb-outs or intersection narrowing to help reduce the crossing distances for pedestrians as well as slow vehicular traffic down as motorists are traveling through the community and achieve an operating speed of 40 km/h. On-street parking was assumed to be allowed as a traffic calming measure for Streets A, B, and D.

However, it is noted that final roadway layout is unknown at this time and will be progressed at a later stage of the design.

4.2 PARKING

4.2.1 Parking Supply

Not applicable; exempted during screening and scoping.

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 roadway segments of March Road, Streets A / B, and Street No.3 to assist with developing a design concept that maximizes the achievement of the MMLOS objectives. Based on the proximity of these three roads to the surrounding community, it was determined that:

- For existing 2020 conditions, March Road across the frontage of the subject development is an arterial roadway that falls under the "General Urban Area" policy. It is a designated spine route under the City of Ottawa's Ultimate Cycling Plan, assumed to support transit service as the City of Ottawa will likely extend the bus service to the area to accommodate the new developments, and is also a designated truck route.

- At the 2034 buildout year, March Road across the frontage of the subject development falls under the 'within 300m of a school' Policy Area due to a school located within the planned development.

- The existing road geometry and configuration of Old Carp Road will be considered under the analysis of existing conditions as the development's southern boundary and falls under the "General Urban Area" policy as a collector road. Old Carp Road is currently a suggested cycling route without facilities and will be evaluated as a local route as per the City of Ottawa's Ultimate Cycling Plan.

- At the buildout year, the new re-aligned Street No.2 will replace Old Carp Road as the development's southern boundary and will be classified as a collector road and is anticipated to support transit service. The cross section is extrapolated from the new neighborhood collector road guidelines published in 2019 and is not assumed to be designated as a local cycling route (assumed to be for Old Carp Road only) nor a truck route. Street No.1 will be classified as a collector road and is envisioned to support transit service. Street No.1 is anticipated to have a similar/identical cross section to Street No.2 given its classification, proximity, and the similar proposed land uses in the vicinity of both roadways.

- At the buildout year, Street No.3 will fall under the "within 300m of a school" policy and is classified as a local road. The cross section will be extrapolated form the KNUEA TMP. The roadway is not anticipated to support transit service, cycling, nor trucks. On-street parking on one side of the roadway has been assumed as a mean to reduce operating speeds.

- By the year 2039, the speed limit on March Road is assumed to be lowered to 60 km/h as discussed in the KNUEA TMP.

The aforementioned land-use designation and policy areas dictate the MMLOS targets that will be applied to the three roadways.

For the existing conditions analysis, segments along March Road have a Pedestrian Level of Service (PLOS) target of C, a Bicycle Level of Service (BLOS) target of C (Spine Route under the City of Ottawa's Cycling Plan), a Transit Level of Service (TLOS) target of D as it is assumed that OC Transpo will be extending their bus service to the subject development to accommodate the projected number of transit users, and a Truck Level of Service (TkLOS) target of D as March Road is designated as a full truck route. Segments along Old Carp Road and Halton Terrace will have a PLOS target of C, a BLOS target of B (local route cycling designation), a TLOS target of D, and no TkLOS target as Old Carp Road is not classified as a truck route.

For the buildout year (2034) analysis, segments along March Road have a PLOS target of A, a BLOS target of C, a TLOS target of D, and a TkLOS target of D. Streets A / B have a PLOS target of A, a BLOS target of D (no formal cycling designation), and a TLOS target of D (assuming OC Transpo bus service will be extended to the subject development). There is no defined TkLOS target as Streets A / B are not anticipated to be classified as truck routes. Street No.3 will have a PLOS target of A, a BLOS target of D, and no TLOS or TkLOS targets as the roadway is not assumed to support transit service nor full-size trucks.

Table 14 and **Table 15** located at the end of this section showcase the segment MMLOS for Arterials and Collector / Local roads, respectively.

Appendix D contains detailed segment MMLOS evaluation results for all evaluated roadway segments and intersections.

Existing Conditions (2020)

March Road Southbound (between Halton Terrace and future Street No.3)

March Road currently does not meet the PLOS target of C as it operates with PLOS F. This operation is attributed to the high average daily traffic volumes, high operating speed (>60 km/h), and the lack of boulevards to provide a greater buffer between pedestrians and road users. Measures to meet the PLOS target would be to lower the posted speed limit to 50 km/h and to provide a 2m boulevard to increase the buffer zone between pedestrians and the curbside lane traffic. However, lowering the speed to 50 km/h may be challenging due to the functional classification of March Road.

The roadway segment does not meet the BLOS target of C as it operates with BLOS E due to the high posted speed limit (> 70 km/h). For a curbside bike lane, lowering the speed limit to 60 km/h would allow the BLOS target to be met. An alternative measure would be to upgrade cycling facilities to physically separated infrastructure, which may pose right-of-way constraints.

The road segment currently meets the TLOS and TkLOS targets of D.

March Road Southbound (Between future Street No.2 north and future Street No.3)

The road segment does not meet the PLOS target of C as it operates with PLOS F. This is attributed to the lack of sidewalks (only paved shoulders provided as indicated in the RMA shown in **Figure 8**), high vehicular volumes, and high operating speeds (80 km/h). Given the posted speed limit and vehicular volumes, the roadway segment would operate with PLOS D if the maximum effective sidewalk/boulevard width is provided (2m sidewalk and 2m boulevard). Furthermore, the speed limit would have to be lowered to under 60 km/h to meet the PLOS target of C. It is noted that reducing the curbside lane traffic volumes is not a feasible measure, especially for a high-speed arterial roadway like March Road.

The roadway segment does not meet the BLOS target of C as it operates with BLOS F due to the lack of cycling facilities as there are currently only paved shoulders for cyclists. To meet the BLOS target of C, a curbside bike lane would have to be provided and the speed limit would have to be lowered to less than 70 km/h. Alternatively, physically separated cycling infrastructure such as a multi-use pathway could be provided, although that may pose right-of-way constraints.

The road segment currently meets the TLOS and TkLOS targets of D.

Halton Terrace (between March Road and Old Carp Road)

The roadway segment meets the PLOS target of C as it operates with PLOS B. This is attributed to the low posted speed limit (40 km/hr) and moderate curbside lane vehicular volumes along the roadway along with the presence of a 1.8m wide sidewalk.

Despite mixed traffic operations, the segment meets the BLOS target of B given the low posted speed of 40 km/h.

The road segment meets the TLOS target of D. The TkLOS evaluation is not required as Halton Terrace is not classified as a truck route by the City of Ottawa.

Old Carp Road (between Halton Terrace and east of Marchbrook Circle)

The roadway segment does not meet the PLOS target of C as it operates with PLOS F. This is attributed to the lack of pedestrian facilities along the segment as there are only paved shoulders on the sides of the roadway. One measure to meet the PLOS target would be to install a 1.5m sidewalk with a 0.5m boulevard to provide a total buffer of 2m between pedestrians and vehicles.

Despite mixed traffic operations, the segment meets the BLOS target of B given the low posted speed limit of 40 km/h.

The road segment meets the TLOS target of D. Old Carp is not classified as a truck route and the TkLOS evaluation is not required.

Buildout Year (2034)

March Road Southbound (between Street No.2 south and Street No.3)

There are no anticipated geometry changes along this segment of March Road for the buildout year horizon. However, due to the construction of a school, the roadway will be designated as “within 300m of a school”. As such, the new PLOS target is A.

At the year 2034, the segment of March Road (just south of the intersection with Maxwell Bridge Road) is anticipated to operate with PLOS F, akin to the existing 2020 operation, which does not meet the desired PLOS target of A. To meet the PLOS target, a 2m wide boulevard is necessitated along March Road, which, in tandem with the existing 2m sidewalk, would provide the maximum effective buffer (4m) between pedestrians and road users, allowing for a PLOS of B. Furthermore, the speed limit would have to be lowered to under 30 km/h to meet the PLOS target of A. However, lowering the speed limit is not feasible due to the functional classification of March Road. The implementation of sidewalks and boulevards is also subject to the availability of Right of Way (ROW).

BLOS, TLOS, and TkLOS operations and targets are not anticipated to change from the existing 2020 analysis.

March Road Southbound (between Street No.2 north and Street No.3)

In reference to the RMA in **Figure 8** provided by the City of Ottawa, the southbound segment of March Road in the vicinity of the intersection with Street No.2 is not anticipated to feature pedestrian infrastructure. Since this segment is also anticipated to be within 300m of a school, the PLOS target is A. The PLOS target is not expected to be met as the segment will operate with PLOS F due to the lack of sidewalks (no change from existing conditions). To meet the PLOS target of A, a 2m sidewalk and a 2m boulevard are necessitated to provide a buffer between pedestrians and vehicular traffic, which would allow for PLOS D operations. This is attributed to the high curbside lane traffic (southbound through lane) exceeding 3,000 veh/day. Accordingly, and in combination with a 4m buffer, the posted speed would have to be lowered to under 30 km/h to achieve a PLOS target of A, which is not a feasible measure given the functional classification of March Road. A PLOS target of A is unattainable for this segment.

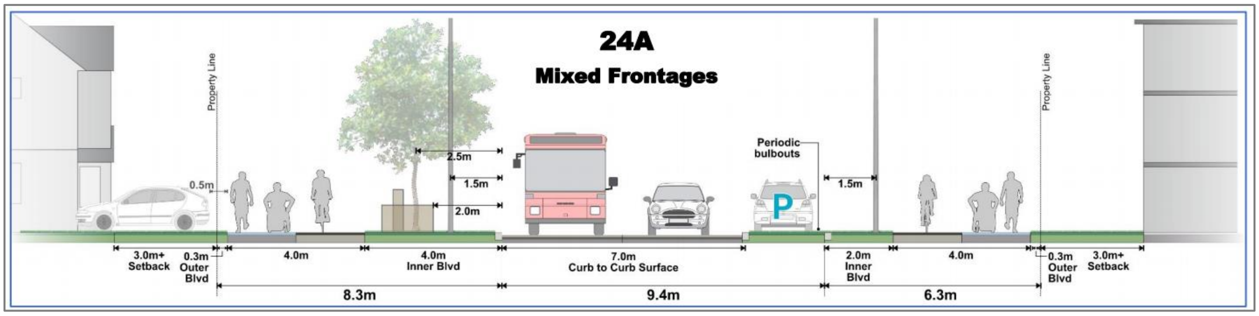
The RMA is indicative of curbside cycling lanes along the target segment in the future. With these facilities, the segment is expected to operate with BLOS E, which does not meet the target BLOS of C. To meet the aforementioned target, the speed limit would have to be lowered to under 70 km/h. Alternatively, cycling facilities can be upgraded to physically separated multi-use pathways to achieve the BLOS target.

For TLOS operations, it is anticipated that the delays to transit would result in a transit operating to posted speed ratio of 0.6 or less, thus translating to a reduced TLOS of E, which does not meet the target of D. The delays are attributed to the high north-south traffic with only one available through lane in each direction. The TkLOS operations and target are not expected to change from the 2020 analysis.

Street No.2 south (between Old Carp Road and March Road Intersection)

In reference to the new neighborhood collector streets design guidelines published in 2019, new collector roads are expected to have a similar layout to **Figure 16** below.

Figure 16 – Typical Neighborhood Collector Road Cross Section (Source: City of Ottawa Neighborhood Collector Roads Design Guidelines)



Street No.2 is anticipated to operate with PLOS A and thus meet the target of PLOS A. The operation is the result of the reduced operating speed (retained at 40 km/h using traffic calming measures such as periodic bulb-outs) and vehicular volumes as well as the installation of a 2m sidewalk and a >2m boulevard resulting in a wide buffer between pedestrians and road users.

The BLOS target of D is anticipated to be met as the segment is found to operate with BLOS A given the physically separated cycling facilities.

The TLOS target of D is also anticipated to be met as the roadway was found to operate with TLOS D. There is no TkLOS target as the segment is not a truck route.

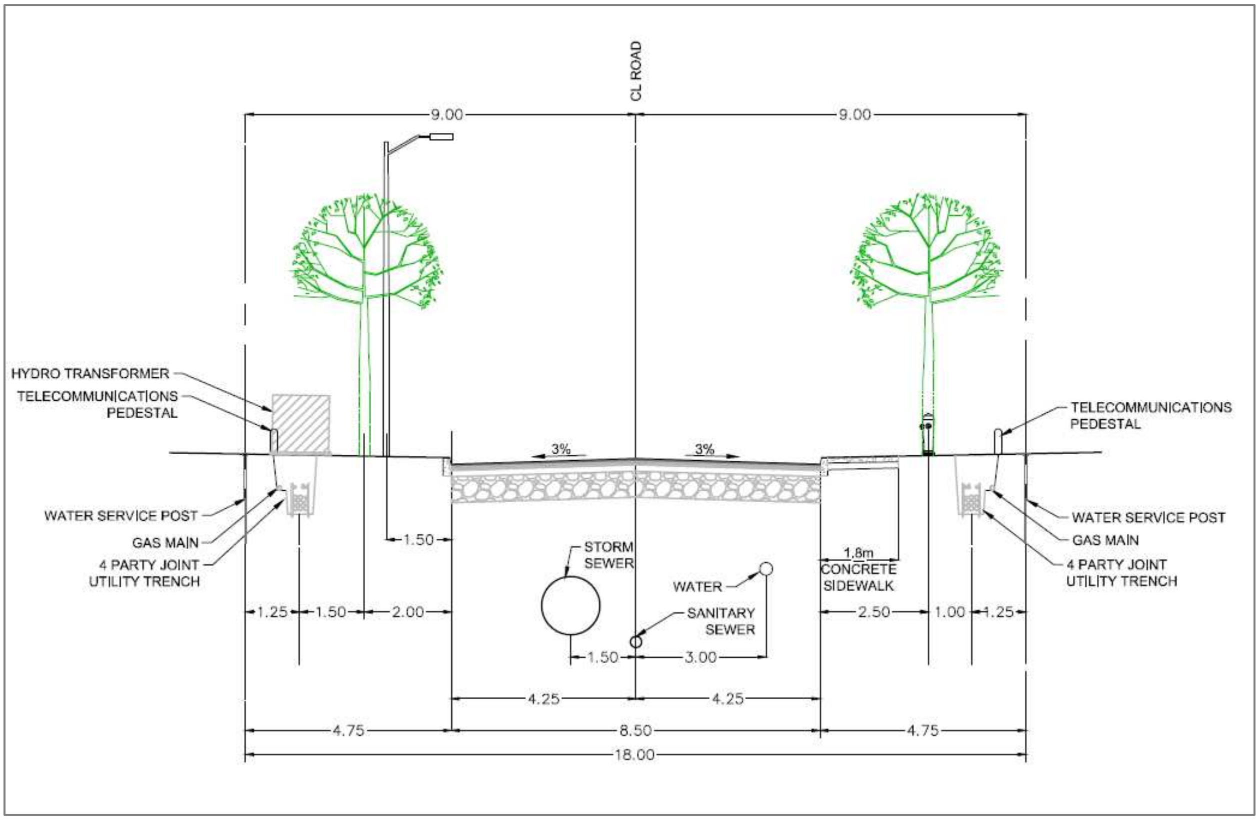
With the envisioned cross-section illustrated in **Figure 16**, the periodic on-street parking bulbouts are expected to bring positive characteristics to the new roadway by providing parking, especially in the vicinity of the school area, which can be utilized for school pick-up/drop-off activities, and by aiding in slowing traffic on the roadway to meet the 40 km/h operating speed target.

Appendix D contains detailed segment MMLOS evaluation results.

Street No.3 (between March Road and Street No.2)

The proposed local road cross section as detailed in the *Kanata North Community Design Plan* is shown in **Figure 17** below.

Figure 17 – Typical Local Road Cross Section (Source: KNUEA TMP)



Street No.3 is anticipated to operate with PLOS A thereby achieving the PLOS target of A. The typical cross section in the CDP alludes to a 1.8m sidewalk, which, in combination with the low operating speed (30 km/h) and traffic volumes, provides ample separation between pedestrians and vehicles. It is anticipated that Street No.3 would allow parking on one side of the roadway.

The BLOS target of D (assumed no cycling designation) is anticipated to be met as the segment is expected to operate with BLOS A. Despite mixed traffic operations, the high BLOS is attributed to the low operating speeds. Street No.3 is not planned as a transit or truck route, and, as such, the TLOS and TkLOS evaluations are not required.

Street No.1

Street No.1 is anticipated to have the same classification, MMLOS targets/operations as Street No.2. As such, it is expected to operate with PLOS and BLOS A (meeting the targets) due to the wide pedestrian facilities, low operating speed (40 km/h), and the provision of segregated multi-use pathways for cyclists. The TLOS level is projected to be D due to the mixed traffic operations. The cross section is envisioned to be similar to the cross section presented under **Figure 16**, featuring periodic bulbouts with on-street parking areas to slow down traffic and aid in achieving the 40 km/h operating speed target for neighborhood collector roadways.

Ultimate Horizon Year (2039)

The operations described at the buildout year are anticipated to carry over to the ultimate horizon year (2039) as no changes to the facilities are anticipated to take place after the development's buildout. However, it is noted that the transit operations along the segment of March Road just south of the intersection with Street No.2 is expected to improve given a widened March Road to 4-lanes.

Appendix D contains detailed segment MMLOS evaluation results.

Table 14 – Segment MMLOS Operations – Arterials (March Road)

Road Segment / Level of Service	March Road (between Halton Terrace/Street No.2 south and Street No.3				March Road (Between Street No.2 north and Street No.3)			
	2020 Existing	2034 Build-Out	2039 Ultimate	Target	2020 Existing	2034 Build-Out	2039 Ultimate	Target
PLOS	F	**	**	(A Future) (C Existing)	F	**	**	(A Future) (C Existing)
BLOS	E	**	**	C	F	E	**	C
TLOS	D	**	**	D	D	E	D	D
TkLOS	A	**	**	D	B	**	**	D

Note: ** indicates no change in operations

Table 15 – Segment MMLOS Operations – Collector / Local Roadways

Road Segment / Level of Service	Halton Terrace (btwn March Road and Old Carp Road)				Existing Old Carp Road (across site frontage)				Street No.2 Crescent				Street No.3				Street No.1			
	2020	2034	2039	Target	2020	2034	2039	Target	2020	2034	2039	Target	2020	2034	2039	Target	2020	2034	2039	Target
PLOS	B	--	--	C	F	--	--	C	--	A	A	A	--	A	A	A	--	A	A	A
BLOS	B	--	--	B	B	--	--	B	--	A	A	D	--	A	A	D	--	A	A	D
TLOS	D	--	--	D	D	--	--	D	--	D	D	D	--	N/A	N/A	D	--	D	D	D
TkLOS	N/A	--	--	N/A	N/A	--	--	N/A	--	N/A	N/A	N/A	--	N/A	N/A	D	--	N/A	N/A	N/A

Note: -- indicates that the operation is no longer evaluated due to the road re-alignments in the area

4.4 ACCESS INTERSECTION DESIGN

4.4.1 Access Location

The proposed development will be accessed from municipal roads and intersections and not from private driveways or private accesses given that it is a plan of subdivision. **Module 4.4.1** is, therefore, not applicable and all the study area intersections will be assessed in **Section 4.9.2.**

4.4.2 Intersection Control

March Road at Street No.2

The intersection of March Road at Street No.2 is one of the primary access points for the subject Brigil development and the future Minto development on the east side of March Road. As outlined in the RMA shown in **Figure 8**, the intersection is envisioned to be signalized with auxiliary right and left turn lanes on the northbound approach, an auxiliary left lane on the southbound approach, and auxiliary left turn lanes on the east and west approaches. The north-south approaches are assumed to be widened by the year 2039 to include 4 lanes for the purpose of this analysis. The intersection is planned to be constructed by the year 2024 to support the early phases of the proposed development and is expected to remain as the singular access to the development until Old Carp Road on the south end of the development is re-aligned in 2026.

March Road at Maxwell Bridge / Street No.2

No changes are planned for this existing signalized intersection which features auxiliary right and left turn lanes on the north and south approaches and auxiliary left turn lanes on the east and west approaches.

March Road at Dunrobin Road

No changes are planned for this existing signalized intersection which features an auxiliary right turn lane on the west approach and an auxiliary right turn lane on the east approach. The assumed widening of March Road in 2039 would see an additional through lane on the westbound approach.

March Road at Street No.3

The east leg of the March Road at Street No.3 intersection is planned to be constructed in 2028 as a right-in/right-out (RIRO) access in support of the background development at 910 March Road. However, the west leg of the March Road at Street No.3 intersection is not anticipated to be constructed until the 2032 horizon year in conjunction with the completion of phase 6 of the proposed development, leading to the final roadway configuration.

Street No.2 at Old Carp Road Realignment

This new intersection would see a stop controlled and re-aligned Old Carp Road intersecting with the new collector road designated as Street No.2. Upon communication with the developer, the re-alignment of Old Carp Road and the conversion of Maxwell Bridge Road to Street No.2 is planned to occur by the year 2026.

Street No.2 at Halton Terrace (Post Old Carp Road Realignment)

This new intersection would see a minor stop controlled and re-aligned (N-S) Halton Terrace intersecting with the new collector road designated as Street No.2. This conversion is planned to occur as part of the Old Carp Road re-alignment in 2026.

Street No.2 and Street No.1

The internal intersection layout is unknown, but it is envisioned to feature an all-way stop, which is suitable for a low operating speed of 40 km/h with up to 9m curbs radii at the intersection as a traffic calming feature.

Street No.2 and Street No.3

The internal intersection layout is unknown, but it is envisioned to feature a minor stop control along Street No.3, thus preserving free flow on Street No.2, which is anticipated to carry more traffic, including OC Transpo buses. The intersection is anticipated to feature 5m curbs radii at the intersection as a traffic calming feature.

4.5 TRANSPORTATION DEMAND MANAGEMENT

The proposed development is not located in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. In addition to the mandatory TDM-Supportive Design and Infrastructure Checklist available in Appendix E, City of Ottawa TDM Checklists were used to determine what TDM measures could be implemented based on the available information.

As discussed, the KNUEA TMP assumed a 20% transit mode share due to the implementation of transit facilities outlined in the Affordable Network of the City of Ottawa TMP. It is anticipated that the transit modal share of 20% will be met by the year 2026 given the external factors listed below:

1. Early transit agreements between Brigil and OC Transpo that will extend transit connectivity to the proposed development during the early phases (beginning in 2024);
2. The construction of the Park and Ride lot in the northwest quadrant of the KNUEA lands (estimated by 2026);
3. The completion of the westward Confederation Line expansion, which will enhance overall transit connectivity with the Ottawa West and Kanata zones (by 2025); and
4. The implementation of supplemental Transportation Demand Management measures by the developer.

The external factors are independent of the transit improvement projects listed in the Affordable and Concept Networks in the City of Ottawa TMP.

As the City of Ottawa's transit improvement projects (transit signal priority, median BRT system) in the vicinity of the development are finalized (by the year 2034 or beyond), the supplemental transportation demand management measures can be phased out as the transit reliability and coverage in the area is anticipated to be sufficient to meet a 20% transit modal share.

The following TDM measures are anticipated for Phase 1 and 2 of the development in support of a 10% transit modal share:

- Display local area maps with walking/cycling access routes and key destinations at major entrances;

- Display relevant transit schedules and route maps at entrances;
- Contact OC Transpo to provide early transit service until regular services are warranted by occupancy levels; and
- Unbundle parking cost from lease/purchase.

Phase 3 and the remainder of the development is anticipated to introduce the above measures in support of a 20% transit modal share in addition to:

- Providing a multi-modal travel option information package to new residents; and
- Offer a one-month pre-loaded PRESTO card on residence purchase move-in to apartment units.

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

4.6 NEIGHBHOURHOOD TRAFFIC MANAGEMENT

Not applicable; exempted during screening and scoping.

4.7 TRANSIT

4.7.1 Route Capacity

In light of the assumption that the March Road Bus Rapid Transit and Transit Improvement Projects in **Table 4** will take place beyond the buildout horizon year (2034), the transit modal share for the subject development was assumed to be 10% between the years 2024 and 2025 and 20% from the year 2026 and beyond as discussed in **Section 3.1**. In both cases, the transit modal shares are anticipated to be supported by supplemental TDM measures and early transit agreements between OC Transpo and Brigil. Based on the ultimate transit modal share of 20%, the subject development is anticipated to generate 168 and 266 total transit trips during the AM and PM peak hours, respectively. Articulated buses and double-decker buses have seated capacities of 70 and 90 passengers, respectively. If OC Transpo provides one bus to subject development operating at a 15-minute headway during the morning and afternoon peak hours, the hourly transit capacity will be 280 – 360 persons per hour, which is sufficient to absorb the increased number of passengers generated by the subject development. Post the 2039 horizon year, if BRT is introduced at peak frequency of 10-minute headways, the transit capacity would be forecasted between 420 and 540 person trips per hour during the peak, which is sufficient to meet the new demand.

It is noted that future transit service frequency and routing will be decided by OC Transpo in coordination with the developer as well as the surrounding KNUEA developments. The location of bus stops on Street No.2 is unknown and is anticipated to be determined through discussions between Brigil and OC Transpo.

4.8 REVIEW OF NETWORK CONCEPT

This was addressed as part of the approved *Kanata North Community Design Plan Transportation Master Plan* (Novatech, June 2016).

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 under the various horizons identified in the Screening and Scoping report as well as the road improvement timelines. Intersection operational analysis was facilitated with Synchro 10.0™ software package (HCM 2000 method to remain consistent with other KNUEA TIA's and the TMP) and the MMLOS analysis was completed for all modes and compared against the City of Ottawa's MMLOS targets.

4.9.2.1 2020 Existing Conditions

Figure 7 illustrates 2020 existing traffic volumes at the study area intersection during the AM and PM peak hours, respectively.

Note: For the analysis of existing conditions, the final Old Carp Road/Street No.2 alignment was considered for analysis, as opposed to the existing alignment of Old Carp Road and Halton Terrace. This is to showcase the difference in operations with the buildout year, and because the development generated traffic will not have access to the development from the existing Old Carp Road until 2026, after it has been re-aligned and displaced by Street No.2.

Intersection Capacity Analysis

Table 16 summarizes the results of the Synchro analysis for 2020 existing intersection operations.

All existing study area intersections are currently operating satisfactorily, and as such, no improvements are required to supplement existing conditions.

Appendix C contains detailed intersection performance worksheets.

Table 16 – 2020 Existing Traffic Conditions –Intersection Operations

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement				
				Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	C	21	0.48	EBL	D	47	0.11	12
				EBTR	D	48	0.27	29
				WBL	E	76	0.81	54
				WBTR	D	46	0.09	14
				NBL	A	8	0.07	5
				NBT	A	10	0.10	19
				NBR	A	9	0.05	4
				SBL	A	6	0.10	12
				SBT	B	12	0.41	86
				SBR	A	8	0.01	-
March Road & Dunrobin Road (Signalized)	B	19	0.53	WBLR	C	33	0.74	56
				NBT	A	6	0.06	10
				NBR	A	7	0.12	8
				SBL	A	7	0.08	8
				SBT	A	10	0.45	70
Halton Terrace & Street No.2 (Unsignalized)	-	4	-	NBLR	A	9	0.11	3
Street No.2 & Old Carp Road (Unsignalized)	-	8	-	EBLR	A	9	0.07	2
				NBL	A	7	0.04	1
PM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	B	18	0.44	EBL	D	53	0.19	12
				EBTR	E	55	0.44	36
				WBL	E	63	0.63	38
				WBTR	E	59	0.59	47
				NBL	A	5	0.23	21
				NBT	A	10	0.42	82
				NBR	A	7	0.08	8
				SBL	A	7	0.16	8
				SBT	A	9	0.12	22
				SBR	A	8	0.01	-
March Road & Dunrobin Road (Signalized)	B	15	0.46	WBLR	D	43	0.56	31
				NBT	A	10	0.45	82
				NBR	A	9	0.37	13
				SBL	A	4	0.07	4
				SBT	A	4	0.12	14
Halton Terrace & Street No.2 (Unsignalized)	-	3	-	NBLR	A	9	0.10	3
Street No.2 & Old Carp Road (Unsignalized)	-	8	-	EBLR	A	8	0.01	0
				NBL	A	8	0.17	5

Multi-Modal Level of Service Assessment

<u>March Road at Maxwell Bridge Road / Street No.2</u>

Based on the 'General Urban Area' land-use designation for the March Road at Maxwell Bridge Road intersection, the Pedestrian Level of Service (PLOS) target is C. The Ultimate Cycling Network from the City of Ottawa's *Cycling Plan* (2013) designates March Road as a spine cycling route and Halton Terrace as a local cycling route. The intersection is therefore subject to a Bicycle Level of Service (BLOS) target of C. The transit (TLOS) and truck (TkLOS) level of service targets for this intersection are both D.

The intersection of March Road at Maxwell Bridge Road / Halton Terrace currently operates with a PLOS of F, which does not meet the target of C. Reducing the cycle length and the number of lanes on March Road, protecting left and right turn phases, and incorporating raised crosswalks at this intersection would improve the PLOS based on the PETSI score. To improve the PLOS based on the pedestrian delay, the cycle length would need to be greatly reduced. Although these methods would improve the PLOS at this intersection, they are not feasible options as they would have significant impacts to vehicular and transit operations.

The Bicycle Level of Service at the intersection of March Road at Maxwell Bridge Road / Halton Terrace currently operates with a BLOS of F due to the number of lanes crossed for making left turns along and north-south approaches and the high operating speed, and therefore does not meet the BLOS target of C. Methods for improving the BLOS at this intersection include reducing the speed limit and number of lanes along March Road in addition to introducing the northbound right turn lane to the right of the northbound bike lane. Although these methods would improve the BLOS at this intersection, they are not feasible options as they would be to the detriment of the vehicles and transit. An alternative measure would be to upgrade the cycling facilities to feature segregated multi-use pathways and provide left turn treatments including 2-stage bike-boxes at the intersection. This improvement is subject to ROW availability.

The Transit Level of Service at the intersection of March Road at Maxwell Bridge Road / Halton Terrace currently operates with a TLOS of F. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Most measures which are aimed towards reducing transit delay would come at the expense of the LOS for pedestrians and / or cyclists. For example, while adding additional northbound and southbound through lanes would improve the TLOS, it would increase the crossing distance for pedestrians and the number of lanes cyclists must cross to make a left turn, and therefore, reduce the PLOS and BLOS. Therefore, no mitigation measures are proposed to improve TLOS.

The Truck Level of Service at the intersection of March Road at Maxwell Bridge Road / Halton Terrace currently operates with a TkLOS of E, which is due to the side streets only having one receiving lane. As Maxwell Bridge Road and Halton Terrace are not designated truck routes, trucks will likely proceed along March Road in the northbound and southbound directions and will not likely turn onto the side streets. A TkLOS of E is therefore acceptable at this intersection.

Once March Road is widened with the Bus Rapid Transit in place, the operations at this intersection will change substantially. It is therefore not recommended to address the MMLOS at this time. Consideration should be given to incorporating multi-modal aspects into the design of March Road to achieve the MMLOS targets.

Appendix D contains detailed intersection MMLOS evaluation results.

<u>March Road at Dunrobin Road</u>

Based on the ‘General Rural Area’ land-use designation for the March Road at Dunrobin Road intersection, there is no Pedestrian Level of Service (PLOS) nor Transit Level of Service (TLOS) targets. The Ultimate Cycling Network from the City of Ottawa’s *Cycling Plan* (2013) designates both March Road and Dunrobin Road as spine cycling routes, and as such, the intersection is subject to a Bicycle Level of Service (BLOS) target of D. Both March Road and Dunrobin Road are designated truck routes, therefore, the Truck Level of Service (TkLOS) target for this intersection is C.

The Bicycle Level of Service at the intersection of March Road at Dunrobin Road currently operates with a BLOS of F. Methods for improving the BLOS at this intersection include reducing the speed limit along March Road and reducing the length of the northbound right turn lane. Although these methods would improve the BLOS at this intersection, they are not feasible options as they would be to the detriment of the vehicles. An alternative measure is to upgrade the cycling facilities to feature multi-use pathways with left turn treatments at the intersection.

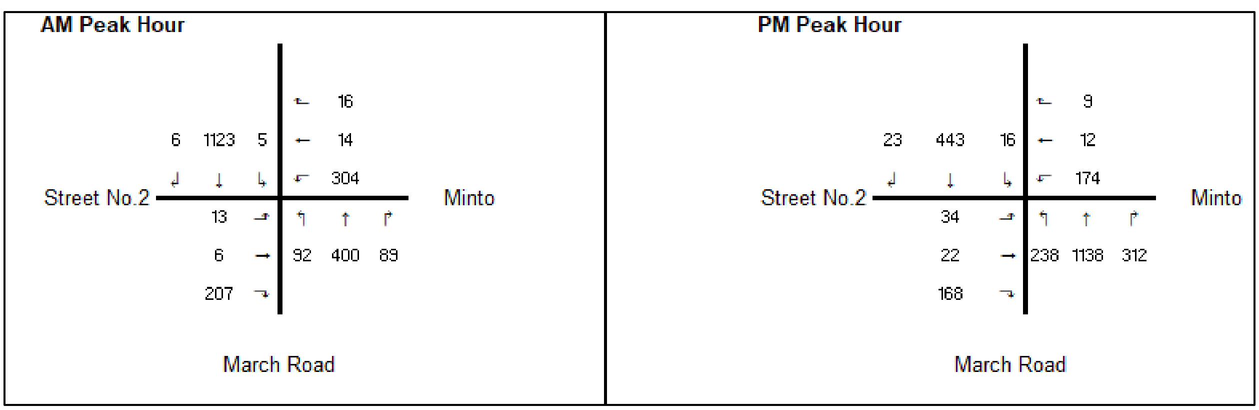
The Truck Level of Service at the intersection of March Road at Dunrobin Road currently operates with a TkLOS of E, which is attributed to only having one receiving lane on all legs of the intersection with the exception of the eastbound direction. Increasing the number of lanes along both March Road and Dunrobin Road or increasing the corner radii on all quadrants would improve the TkLOS at this intersection.

Appendix D contains detailed intersection MMLOS evaluation results.

4.9.2.2 2024 – First Phase Buildout

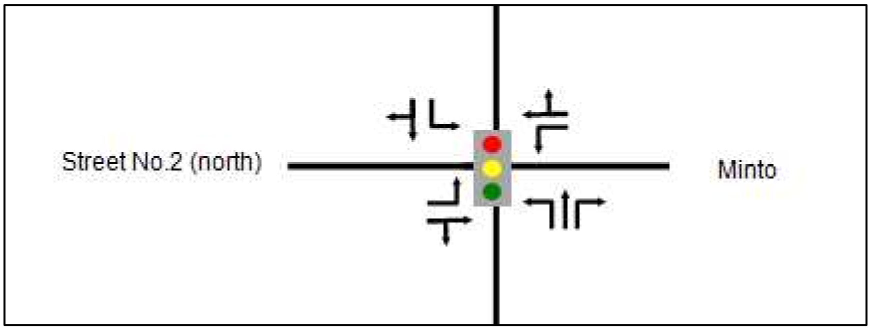
By the year 2024, it is anticipated that 936 March Road (Minto), 788 March Road, and 1156 March Road background developments would be completed. The first phase of the development is planned to be constructed by the year 2024 and includes 414 mid-rise apartments, 388 high-rise apartments and the proposed commercial component. Within the proposed development, the first phase apartments will be situated in the southwest quadrant of the intersection of March Road and Street No.2. As the re-alignment of Old Carp Road is not expected to be completed by the year 2024, the intersection of March Road and Street No.2 will form the only access to the development. **Figure 18** showcases the total traffic volumes at the intersections of March Road and Street No.2 in the year 2024, inclusive of phase 1 traffic, assuming a 10% transit modal share. The volumes encompass background growth in addition to all background developments shown in **Table 5** that are projected to be completed by 2024. The trip generation is shown in **Table 10**, wherein an internal capture rate of 20% and a pass-by rate of 40% (PM Only) were used for the commercial component.

Figure 18 – 2024 Total Traffic – March Road @ Street No.2 intersections



**Note: The intersection of March Street No.2t Halton Terrace was found to operate satisfactory under existing and 2034 conditions and therefore has been omitted from the 2024 horizon year analyses for simplicity.*

Figure 19 – 2024 Lane Configuration



Intersection Capacity Analysis

For analysis purposes, a 120s signal timing plan was adopted for the intersection of March Road at Street No.2 for this scenario. In 2024, at the intersection of March Road and Street No.2, it is assumed that the westbound left storage lane and the westbound through / right, eastbound left storage lane and the eastbound through / right, and the northbound left auxiliary lanes would be in place to support phase 1 of the subject development. **Table 17** showcases the traffic operations.

The Synchro analysis results are described further below:

<u>During the weekday AM peak hour:</u>

- The northbound left movement is anticipated to operate with a V/C ratio of 1.56 and a delay of 340s at the intersection of March Road and Street No.2 due to the high impeding traffic volumes on southbound of March Road. This issue will be improved when the re-alignment of Old Carp Road is completed by the year 2026 and a second access is provided for the subject lands.

- The westbound left movement is anticipated to operate with a V/C ratio of 1.45 and a delay of 272s at the intersection of March Road and Street No.2. This is attributed to the high westbound left volumes from the Minto Development.

<u>During the weekday PM peak hour:</u>

- The westbound left movement is anticipated to operate with a delay of 86s at the intersection of March Road and Street No.2. This is attributed to the high westbound left volumes from the Minto Development.

Based on the traffic operations findings, it is concluded that the background traffic along March Road would <u>trigger road improvements in the form of widening shortly after the year 2024.</u>

Appendix C contains detailed intersection performance worksheets.

Table 17 – 2024 Total Traffic Conditions –March Road @ Street No.2 Intersection Operations

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement: Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2 (Signalized)	E	74	1.52	EBL	D	36	0.04	8
				EBTR	D	39	0.36	44
				WBL	F	272	1.45	152
				WBTR	D	36	0.05	10
				NBL	F	340	1.56	50
				NBT	B	11	0.37	57
				NBR	A	8	0.06	5
				SBL	A	7	0.01	2
				SBTR	D	40	0.97	346
PM Peak Hour								
March Road & Street No.2 (Signalized)	C	26.3	0.92	EBL	D	39	0.13	15
				EBTR	D	40	0.18	23
				WBL	F	86	0.91	76
				WBTR	D	39	0.04	9
				NBL	B	11	0.43	44
				NBT	C	30	0.93	348
				NBR	A	8	0.21	10
				SBL	B	11	0.18	6
				SBTR	A	9	0.39	67

**Note: The intersection of March Street No.2t Halton Terrace was found to operate satisfactory under existing and 2034 conditions and therefore has been omitted from the 2024 horizon year analyses for simplicity.*

Northbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

As per the City of Ottawa guidelines, the minimum required auxiliary lane storage length for new roads is 37.5m. The traffic operations analysis after the completion of phase 1 of the subject development found that the northbound left auxiliary lane is projected to see a 95th percentile queue length of 50m during the AM peak hour. As such, the 50m dimension would govern.

For the taper/parallel lane length, equation 2.5.1 from the *Transportation Association of Canada (TAC)* guideline was utilized, such that:

Braking Distance (m) = 0.039 x (v^2 / a); wherein:

V = design speed (km/h)
a = 3.4 m/s^2, which is determined as the optimal deceleration rate

Due to the high operating speeds along March Road, it is recommended to provide sufficient distance for vehicles to decelerate through the storage lane. This is recommended as March Road has a posted speed limit of 80km/h requiring sufficient separation between diverging traffic with a significant speed differential; i.e., separating the slowing northbound left turners from northbound through traffic. For an assumed design speed of 90 km/h, the resulting parallel lane and taper length equals approximately 95m. Combined with the minimum storage length of 50m, the total auxiliary lane length is calculated to be **145m**.

Eastbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

As per the City of Ottawa guidelines, the minimum required auxiliary lane storage length for new roads is 37.5m. The traffic operations analysis after the completion of phase 1 of the subject development found that the northbound left auxiliary lane is projected to see a 95th percentile queue length of 15m during the AM/PM peak hours. As such, the minimum 37.5m dimension would govern.

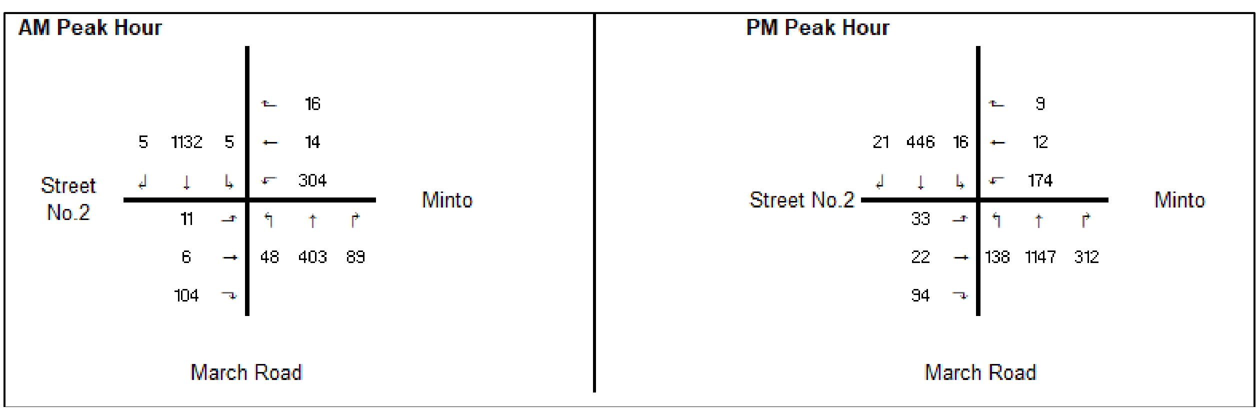
Appendix C contains detailed intersection performance worksheets.

4.9.2.3 2026 – Claridge Site Buildout

By the year 2026, it is anticipated that all the background developments considered in this study (with the exception of the northeast quadrant of the KNUEA lands – Valecraft Homes and 910 March Road) would be completed. Furthermore, the subject development is expected to have its 3rd phase completed as shown in **Table 1**. This comprises the commercial component, 414 mid-rise apartment units, 388 high-rise apartment units, 19 single family homes, and 32 townhomes. In addition, it is expected that the re-alignment of Old Carp Road would be completed by the year 2026, thus providing a second access for the subject lands. The Park and Ride lot in the northwest quadrant of the KNUEA lands is also expected to be completed. The latter, in combination with the supplemental TDM measures discussed under **Section 4.5** is expected to support achieving a transit modal share of 20%. Utilizing the trip distribution shown in **Figure 11**, the total traffic in the year 2026 at the intersection of March Road and Street No.2 and March Road and Street No.3 is shown in **Figure 20**. The lane configuration is unchanged from the one illustrated in **Figure 19.**

Given that the majority of the constructed units by 2026 are located in the northern half of the development, a greater emphasis was placed on the northern access at the intersection of March Road and Street No.2. 60% of the site generated trips to/from March Road south are distributed to the March Road and Street No.2 while 40% of the site generated trips to/from March Road south are distributed to the intersection of March Road and Maxwell Bridge Road.

Figure 20 – 2026 Total Traffic Volumes – March Road @ Street No.2 intersections



**Note: The intersection of March Street No.2t Halton Terrace was found to operate satisfactory under existing and 2034 conditions and therefore has been omitted from the 2026 horizon year analyses for simplicity.*

Table 18 below reflects the trip generation and projected modal shares in the study area by the 2026 analysis year.

Table 18 – Phases 1-3 Trip Generation and Modal Shares (year 2026)

Land Use	Size		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Trip Generation Rates								
210 - Single-Family Detached Housing	19	units	25%	75%	0.70	63%	37%	0.94
215 - Single-Family Attached Housing	32	units	25%	75%	0.48	59%	41%	0.57
221 – Multifamily Housing (Mid-Rise)	414	units	23%	77%	0.37	61%	39%	0.39
222 – Multifamily Housing (High-Rise)	388	units	26%	74%	0.27	62%	38%	0.32
821 – Shopping Plaza	45.779	1,000's GFA	62%	38%	1.73	49%	51%	5.19
Conversion to Person Trips								
210 - Single-Family Detached Housing	Auto Trip Gen		3	10	13	11	7	18
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	4	14	18	16	10	26
215 - Single-Family Attached Housing	Auto Trip Gen		4	11	15	11	7	18
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	6	15	21	16	10	26
221 – Multifamily Housing (Mid-Rise)	Auto Trip Gen		35	118	153	98	63	161
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	50	167	217	139	89	229
222 – Multifamily Housing (High-Rise)	Auto Trip Gen		27	78	105	77	47	124
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	38	111	149	109	67	176
821 – Shopping Plaza	Auto Trip Gen		49	30	79	117	121	238
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	70	42	112	166	172	338
Total Development	Auto Trip Gen		118	247	365	314	245	559
	Person Trip Factor		1.42	1.42	1.42	1.42	1.42	1.42
		Total Person Trips	168	349	517	446	348	795
Modal Share Adjustments								
210 - Single-Family Detached Housing	Auto	60%	2	8	10	10	6	16
	Passenger	15%	1	2	3	2	2	4
	Walk / Bike	5%	0	1	1	1	0	1
	Transit	20%	1	3	4	3	2	5
215 - Single-Family Attached Housing	Auto	60%	4	9	13	10	6	16
	Passenger	15%	1	2	3	2	2	4
	Walk / Bike	5%	0	1	1	1	0	1
	Transit	20%	1	3	4	3	2	5
221 – Multifamily Housing (Mid-Rise)	Auto	60%	29	101	130	83	55	138
	Passenger	15%	8	25	33	21	13	34
	Walk / Bike	5%	3	8	11	7	4	11
	Transit	20%	10	33	43	28	18	46
222 – Multifamily Housing (High-Rise)	Auto	60%	17	45	62	53	32	85
	Passenger	15%	8	25	33	21	13	34
	Walk / Bike	5%	3	8	11	7	4	11
	Transit	20%	10	33	43	28	18	46
821 – Shopping Plaza	Auto	60%	41	26	67	100	102	202
	Passenger	15%	11	6	17	25	26	51
	Walk / Bike	5%	4	2	6	8	9	17
	Transit	20%	14	8	22	33	35	68
Total Development		**Auto Trips**	**76**	**144**	**220**	**203**	**169**	**372**
Internal Capture								
821 – Shopping Plaza	Auto Trips		41	26	67	100	102	202
	Internal Capture	20%	8	5	13	20	20	40
		Net Auto Trips	33	21	54	80	82	162
Pass-By								
821 – Shopping Plaza	Auto Trips		33	21	54	80	82	162
	Pass-By	40%	0	0	0	33	33	66
		Net Auto Trips	33	21	54	47	49	96
Net New Auto Trips								
		210 - Single-Family Detached Housing	2	8	10	10	6	16

Land Use	Size	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
	215 - Single-Family Attached Housing	4	9	13	10	6	16
	221 – Multifamily Housing (Mid-Rise)	29	101	130	83	55	138
	222 – Multifamily Housing (High-Rise)	17	45	62	53	32	85
	821 – Shopping Plaza	33	21	54	47	49	96
Total Development							
Total Development	**Net New Auto Trips**	**85**	**184**	**269**	**203**	**148**	**351**

The Synchro analysis results are described further below:

<u>During the weekday AM peak hour:</u>

- The westbound left movement is anticipated to operate with a V/C ratio of 1.04 and a delay of 109s at the intersection of March Road and Street No.2. This is attributed to the high westbound left volumes from the Minto Development.

- The northbound left movement is anticipated to operate with a delay of 88s at the intersection of March Road and Street No.2 due to the high southbound traffic volumes on March Road. This operation is considered acceptable for left turn and the queue length is not expected to affect the northbound through traffic.

<u>During the weekday PM peak hour:</u>

- No traffic operational concerns were identified.

Appendix C contains detailed intersection performance worksheets.

Table 19 - 2026 Total Traffic Conditions –March Road @ Street No.2 Intersection Operations

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Movement	Critical Movement LOS	Critical Movement Delay (s)	Critical Movement V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2 (Signalized)	D	46	1	EBL	D	35	0.04	7
				EBTR	D	36	0.08	15
				WBL	F	109	1.04	132
				WBTR	D	35	0.05	10
				NBL	F	88	0.81	20
				NBT	B	11	0.38	60
				NBR	A	8	0.06	6
				SBL	A	8	0.01	2
				SBTR	D	45	0.99	354
PM Peak Hour								
March Road & Street No.2 (Signalized)	C	22	0.88	EBL	D	42	0.14	15
				EBTR	D	42	0.14	19
				WBL	E	65	0.79	62
				WBTR	D	41	0.05	9
				NBL	A	7	0.24	23
				NBT	C	25	0.90	352
				NBR	A	7	0.21	10
				SBL	A	9	0.14	5
				SBTR	A	8	0.37	67

**Note: The intersection of March Street No.2t Halton Terrace was found to operate satisfactory under existing and 2034 conditions and therefore has been omitted from the 2026 horizon year analyses for simplicity.*

Northbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

The projected 95th percentile queue is 23m during the AM peak hour, which does not exceed the minimum City of Ottawa storage length requirement of 37.5m. Combined with the parallel lane and taper length of 95m, the total auxiliary lane length is calculated to be **132.5m**.

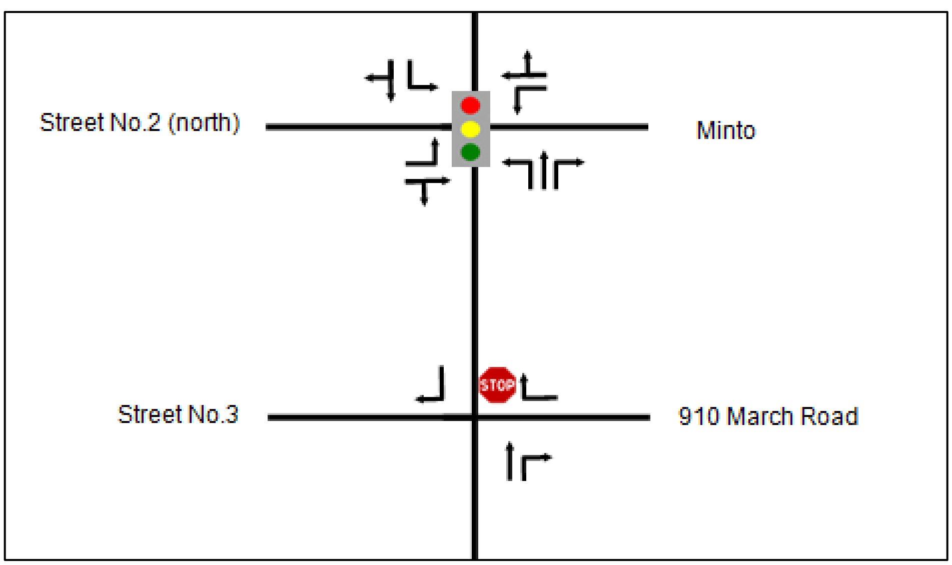
Eastbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

The projected 95th percentile queue is 15m during the AM peak hour, which does not exceed the minimum City of Ottawa storage length. As such, the same total auxiliary lane length from the 2024 horizon can be used with a total length of 37.5m.

4.9.2.4 2034 Future Background Conditions

The future background traffic coinciding with the subject development's buildout year was analyzed to determine traffic operations at the study area intersections. By the year 2034, a right-in only access is proposed at the west of the Street No.3 and March Road intersection. On the east of the Street No.3 and March Road intersection, a RIRO access is proposed by the 910 March Road Development. The road configuration is illustrated in **Figure 21** below. The volumes are shown in **Figure 13**. The results are shown in **Table 20**.

Figure 21 - Year 2034 Lane Configuration - March Road / Street No.2 and March Road / Street No.3 Intersections



<u>During the weekday AM peak hour:</u>

- The southbound through movement is anticipated to operate with a V/C ratio of 1.20 and a delay of 122s at the intersection of March Road and Street No.2. Southbound vehicles were also found to generate a 95th queue totaling approximately 480m upstream, which is anticipated to affect operations at the shared Claridge/Valecraft (Street G) access as shown on the KNUEA TMP.

During the weekday PM peak hour:

- The northbound through movement is anticipated to operate with a V/C ratio of 1.12 and a delay of 81s at the intersection of March Road and Street No.2. Northbound vehicles were also found to generate a 95th queue totaling approximately 494m upstream. This is attributed to the high traffic volumes (>1,500 vph) in the study area utilizing single through lanes in the northbound direction.
- The westbound left movement is anticipated to operate with a V/C ratio of 2.87 and a delay of 1282s at the intersection of March Road and Street No.3. However, the HCM 2000 methodology for unsignalized intersection analysis is observed to be conservative when estimating the gap acceptance of the turning vehicles and also cannot consider the gaps in traffic causes by intersections upstream of a subject intersection. In the real world, drivers will proceed with gaps in traffic flow mainly caused by upstream intersection control and take smaller gaps especially when waiting time is long.

Appendix C contains detailed intersection performance worksheets.

Table 20 - 2034 Future Background Traffic Conditions - Intersection Operations

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement: Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	C	20	0.71	EBL	D	47	0.12	12
				EBTR	D	49	0.26	28
				WBL	E	75	0.80	53
				WBTR	D	47	0.09	13
				NBL	B	12	0.16	5
				NBT	B	11	0.29	52
				NBR	A	9	0.04	3
				SBL	A	6	0.14	12
				SBT	B	17	0.71	199
				SBR	A	8	0.01	-
March Road & Street No.2 (Signalized)	F	85	1.12	EBT	C	34	0.02	4
				WBL	E	69	0.90	113
				WBTR	C	34	0.05	10
				NBT	B	13	0.49	89
				NBR	A	8	0.06	6
				SBL	A	8	0.01	2
				SBT	F	122	1.20	480
March Road & Dunrobin Road (Signalized)	B	18	0.57	WBLR	C	33	0.75	60
				NBT	A	7	0.14	20
				NBR	A	8	0.17	10
				SBL	A	7	0.08	9
				SBT	B	11	0.51	85
Halton Terrace & Street No.2 (Unsignalized)	-	4	-	NBLR	A	9	0.10	3
Street No.2 & Old Carp Road (Unsignalized)	-	8	-	EBLR	A	9	0.07	2
				NBL	A	7	0.03	1
March Road & Street No.3	-	0	-	WBR	B	13	0.11	3

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement: Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
(Unsignalized)								
PM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	B	18	0.69	EBL	D	53	0.21	13
				EBTR	E	55	0.43	35
				WBL	E	63	0.62	37
				WBTR	E	59	0.58	46
				NBL	A	5	0.34	20
				NBT	B	15	0.72	199
				NBR	A	8	0.09	11
				SBL	B	12	0.36	9
				SBT	B	10	0.32	60
				SBR	A	8	0.01	-
Street No.2 & March Road (Signalized)	D	53	1.04	EBT	D	41	0.07	11
				WBL	E	60	0.76	59
				WBTR	D	41	0.04	8
				NBT	F	81	1.12	494
				NBR	A	7	0.23	19
				SBL	B	17	0.27	8
				SBT	A	9	0.49	104
March Road & Dunrobin Road (Signalized)	B	16	0.52	WBLR	D	45	0.66	40
				NBT	B	11	0.5	99
				NBR	B	10	0.39	14
				SBL	A	5	0.07	5
				SBT	A	4	0.17	21
Halton Terrace & Street No.2 (Unsignalized)	-	2	-	NBLR	A	9	0.10	3
Street No.2 & Old Carp Road (Unsignalized)	-	7	-	EBLR	A	9	0.02	0
				NBL	A	8	0.16	4
March Road & Street No.3 (Unsignalized)	-	25	-	WBR	F	1282	2.87	53

Multi-Modal Level of Service Assessment

March Road at Maxwell Bridge Road / Street No.2

No changes from the 2020 existing intersection MMLOS operations. In 2034, it is noted that a school is expected to be constructed in the southwest quadrant of the KNUEA lands. As such, March Road's designation will change to "within 300m of a school", and the PLOS target will shift to A. It is noted that the location of the school in the vicinity of this intersection has established unreasonably high PLOS targets for the area considering March Road is an arterial roadway with high speeds and high volumes. The PLOS target of A is unattainable at the intersection of March Road at Maxwell Bridge Road / Street No.2.

Appendix D contains detailed intersection MMLOS evaluation results.

March Road at Dunrobin Road

No changes from the 2020 existing intersection MMLOS operations.

Appendix D contains detailed intersection MMLOS evaluation results.

March Road at Street No.2

Due to the school construction in the southwest quadrant of the KNUEA lands, the Policy Area for the March Road at Street No.2 intersection can be classified as 'within 300m of a school'. Based on this classification, the Pedestrian Level of Service (PLOS) target is A. The Ultimate Cycling Network from the City of Ottawa's *Cycling Plan* (2013) designates March Road as a spine cycling route, therefore it is subject to a Bicycle Level of Service (BLOS) target of C. The transit (TLOS) and truck (TkLOS) level of service targets for this intersection are both D.

The design of the March Road at Street No.2 intersection was taken from the RMA provided by the City of Ottawa as shown in **Figure 8**.

The Pedestrian Level of Service at the intersection of March Road at Street No.2 is projected to operate with a PLOS of E, which does not meet the target of A. Reducing the cycle length, protecting left and right turn phases, and incorporating raised crosswalks at this intersection would allow the PLOS target of A to be met based on the PETSI score. To achieve the desired PLOS based on the pedestrian delay, the cycle length would need to be greatly reduced. Although these methods would improve the PLOS at the intersection, they are not feasible as they would be to the detriment of the vehicular and transit operations. It is noted that the location of the school in the vicinity of this intersection has established unachievable PLOS targets for the area considering March Road is an arterial roadway with high speeds and high volumes.

The Bicycle Level of Service at the intersection of March Road at Street No.2 is projected to operate with a BLOS of C, thereby meeting the desired target of C. This is attributed to the planned presence of curbside bicycle lanes with transitions along the north-south approaches as illustrated in the RMA provided by the City of Ottawa. In addition, the presence of segregated cycling facilities along the east and west approaches of the intersection (as per the neighborhood collector road design guidelines) will likely encourage cyclists to make left turns by using designated crosswalks and/or cross-rides. As such, it is not anticipated for cyclists to cross any lanes performing left turns, thus improving the overall BLOS operations. It is noted that for this intersection, north-south cycle cross-rides will be provided by the build-out year 2034, while the east-west cycle cross-rides will be completed with the widening of March Road. Under the 2034 configuration, cyclists will not cross any lanes to make left turns. Once all cross rides are provided by 2039 (when March Road is assumed to be widened), the left turns can be treated as 2-stage with bike boxes.

The Transit Level of Service at the intersection of March Road at Street No.2 is projected to operate with a TLOS of F, which does not meet the desired target of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Most measures which are aimed towards reducing transit delay would come at the expense of the LOS for pedestrians and / or cyclists. For example, while adding additional northbound and southbound through lanes would reduce overall intersection delay, it would increase the crossing distance for pedestrians and the number of lanes cyclists must cross to make a left turn, and therefore, reduce the PLOS and BLOS.

The Truck Level of Service at the intersection of March Road at Street 1 is projected to operate with a TkLOS of E, which does not meet the desired target of D. This is due to the three legs of the intersection only having one receiving lane. As Street No.2 will likely not be a designated truck route, trucks will likely proceed along March Road in the northbound and southbound directions and will not likely turn onto Street No.2. A TkLOS of E is therefore acceptable at this intersection.

Once March Road is widened with the Bus Rapid Transit in place, the operations at this intersection will change substantially. It is therefore not recommended to address the MMLOS at this time. Consideration should be given to incorporating multi-modal aspects into the design of March Road to achieve the MMLOS targets.

Appendix D contains detailed intersection MMLOS evaluation results.

4.9.2.5 2034 Future Total Conditions

The traffic conditions at the total buildout year (2034) were analyzed to determine the impact of the subject development's traffic on the study area intersections. The geometric assumptions from the 2034 future background conditions scenario are carried over for the analysis of total future conditions at the buildout year. The traffic volumes are shown in **Figure 14**. The analysis results are shown in **Table 21**.

<u>During the weekday AM peak hour:</u>

- The westbound left movement is anticipated to operate with a V/C ratio of 2.35 and a delay of 707s at the intersection of March Road and Street No.2/Maxwell Bridge Road due to the increase in conflicting eastbound traffic originating from the Brigil development. It is recommended to convert the west leg of the March Road and Street No.2/Maxwell Bridge Road intersection from right-in only access to RIRO access to divert the heavy eastbound traffic at the intersection of March Road and Street No.2/Maxwell Bridge Road.
- The southbound through movement is anticipated to operate with a V/C ratio of 1.25 and a delay of 142s at the intersection of March Road and Street No.2. Southbound vehicles were also found to generate a 95th queue totaling approximately 489m upstream, which is anticipated to affect operations at the shared Claridge/Valecraft (Street G) access as shown on the KNUEA TMP. The deteriorated operations can be attributed to the high through volumes on March Road utilizing one lane.
- The westbound left movement is anticipated to operate with a delay of 82s at the intersection of March Road and Street No.2 due to the high westbound left volumes from the Minto Development. This operation is considered acceptable for side streets given the high volumes on March Road.
- The northbound left movement is anticipated to operate with a delay of 107s at the intersection of March Road and Street No.2 due to the high southbound traffic volumes on March Road. This operation is considered acceptable for left turn and the queue length is not expected to affect the northbound through traffic.

<u>During the weekday PM peak hour:</u>

- The westbound left movement is anticipated to operate with a V/C ratio of 1.44 and a delay of 325s at the intersection of March Road and Street No.2/Maxwell Bridge Road due to the increase in conflicting eastbound traffic originating from the Brigil development. Based on the results, it is projected that side street failure at the intersection of March Road and Street No.2/Maxwell Bridge Road will occur under 2034 total future conditions. For the side street (westbound left) traffic, a V/C ratio of 1.44 with a delay of approximately 2 minutes is assumed to be acceptable for minor roads, given the expected congestion on March Road and a 130s City of Ottawa timing plan prioritizing the north-south corridor.

- The northbound through movement is anticipated to operate with a V/C ratio of 1.12 and a delay of 82s at the intersection of March Road and Street No.2. Northbound vehicles were also found to generate a 95th queue totaling approximately 489m upstream. This is attributed to the high traffic volumes (>1,500 vph) in the study area utilizing single through lanes in the northbound direction.

- The traffic operation analysis for the westbound left movement at the intersection of March Road and Street No.3 exceed the Synchro analysis capacity. However, the HCM 2000 methodology for unsignalized intersection analysis is observed to be conservative when estimating the gap acceptance of the turning vehicles and also cannot consider the gaps in traffic causes by intersections upstream of a subject intersection. In the real world, drivers will proceed with gaps in traffic flow mainly caused by upstream intersection control and take smaller gaps especially when waiting time is long. In addition, the future March Road widening will solve this issue.

All other study area intersections are anticipated to operate with acceptable levels of service.

Appendix C contains detailed intersection performance worksheets.

Table 21 - 2034 Total Traffic Conditions - Intersection Operations

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement				
				Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	E	70	1.36	EBL	D	37	0.07	12
				EBTR	E	71	0.90	146
				WBL	F	707	2.35	97
				WBTR	D	37	0.06	13
				NBL	E	77	0.88	59
				NBT	B	18	0.37	61
				NBR	B	14	0.04	4
				SBL	B	13	0.17	13
				SBT	D	44	0.96	273
				SBR	B	15	0.01	-
March Road & Street No.2 (Signalized)	F	94	1.15	EBL	C	33	0.08	12
				EBTR	C	35	0.25	33
				WBL	F	82	0.96	123
				WBTR	C	33	0.04	10
				NBL	F	107	0.87	22
				NBT	B	14	0.50	89
				NBR	A	9	0.06	6
				SBL	A	9	0.01	2
				SBTR	F	139	1.24	483
March Road & Dunrobin Road (Signalized)	B	18	0.58	WBLR	C	33	0.75	61
				NBT	A	7	0.15	22
				NBR	A	8	0.18	10
				SBL	A	7	0.08	9
				SBT	B	11	0.51	87
Halton Terrace & Street No.2 (Unsignalized)	-	2	-	NBLR	A	10	0.12	3
Street No.2 & Old Carp Road (Unsignalized)	-	4	-	EBLR	B	11	0.12	3
				NBL	A	4	0.05	1
March Road & Street No.3	-	0	-	WBR	B	14	0.13	3

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement				
				Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
(Unsignalized)								
PM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	D	37	1.07	EBL	D	45	0.12	11
				EBTR	E	57	0.68	67
				WBL	F	325	1.44	57
				WBTR	D	48	0.39	41
				NBL	C	30	0.90	157
				NBT	C	24	0.84	290
				NBR	B	10	0.09	13
				SBL	C	23	0.51	17
				SBT	B	20	0.45	80
				SBR	B	15	0.01	-
Street No.2 & March Road (Signalized)	D	34	1.04	EBL	D	41	0.16	17
				EBTR	D	41	0.14	18
				WBL	E	61	0.77	59
				WBTR	D	40	0.04	8
				NBL	A	9	0.33	30
				NBT	F	82	1.12	489
				NBR	A	7	0.23	20
				SBL	B	17	0.26	9
				SBTR	B	10	0.51	113
March Road & Dunrobin Road (Signalized)	B	16	0.53	WBLR	D	45	0.67	42
				NBT	B	12	0.51	103
				NBR	B	10	0.39	14
				SBL	A	6	0.08	5
				SBT	A	5	0.18	23
Halton TRerrace & Street No.2 (Unsignalized)	-	1	-	NBLR	B	10	0.13	3
Street No.2 & Old Carp Road (Unsignalized)	-	4	-	EBLR	A	9	0.02	1
				NBL	A	5	0.19	5
March Road & Street No.3 (Unsignalized)	-	182	-	WBR	F	Err	4.29	Err

Right-in/right out Access at Street No.3 and March Road Intersection

Since the increase in conflicting eastbound traffic originating from the Brigil development will impact the traffic operation of the westbound left turn at the intersection of March Road and Street No.2/Maxwell Bridge Road, it is recommended to convert the west leg of the March Road and Street No.2/Maxwell Bridge Road intersection from right-in only access to RIRO access to divert the heavy eastbound traffic at the intersection of March Road and Street No.2/Maxwell Bridge Road. The site traffic assignment, site traffic volume, and 2024 future total traffic volume with RIRO Access at west leg of Street No.3 and March Road Intersection are illustrated in **Figure 22**, **Figure 23**, and Error! Reference source not found..

The 2034 future total traffic conditions analysis results comparison between right-in only access and RIRO access at Street No.3 are shown in **Table 22**.

Figure 22 – Site Traffic Assignment | Site build Out (2034) - RIRO at Street No.3

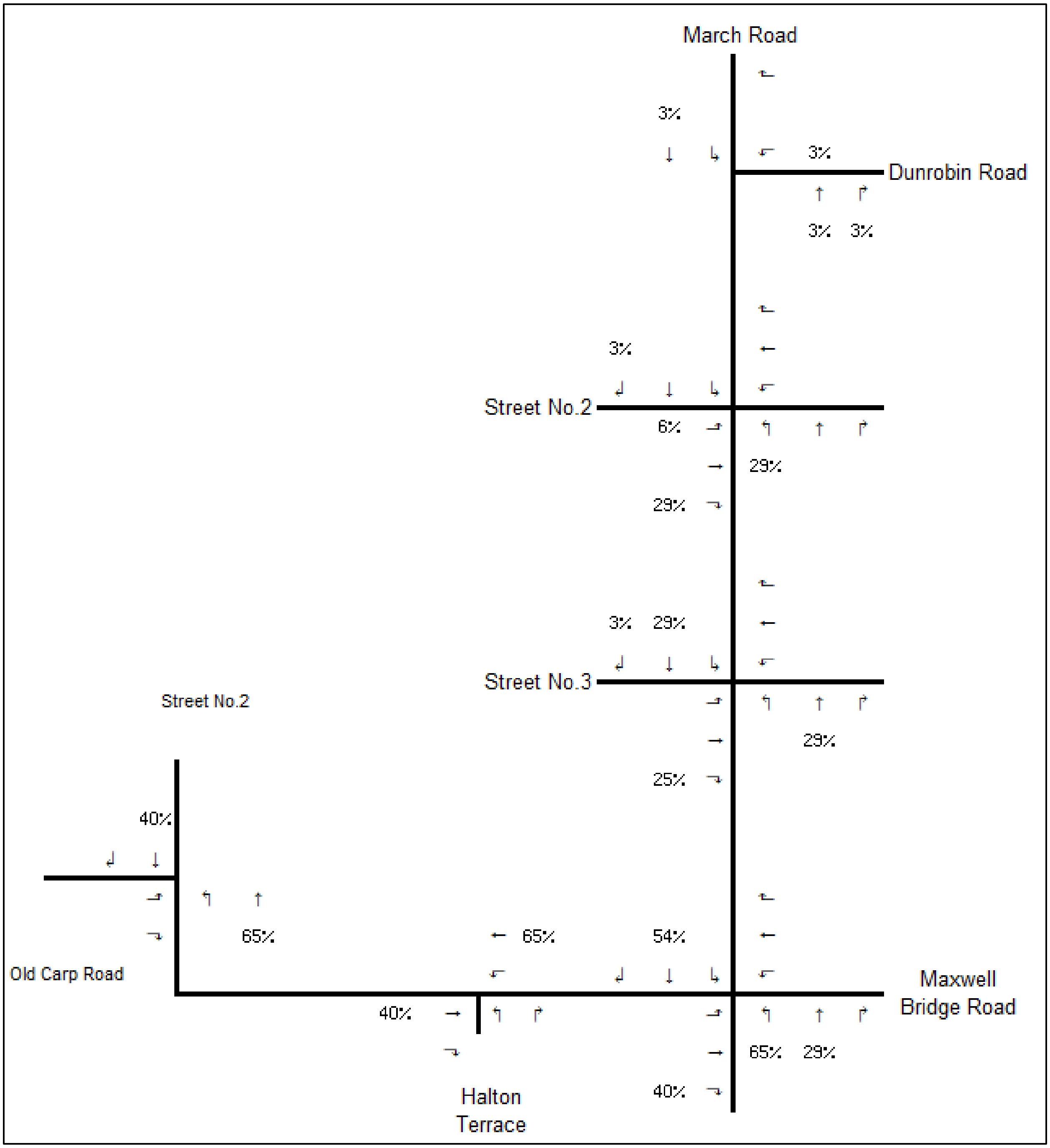


Figure 23 - Site Traffic Volumes| Site build Out (2034) - RIRO at Street No.3

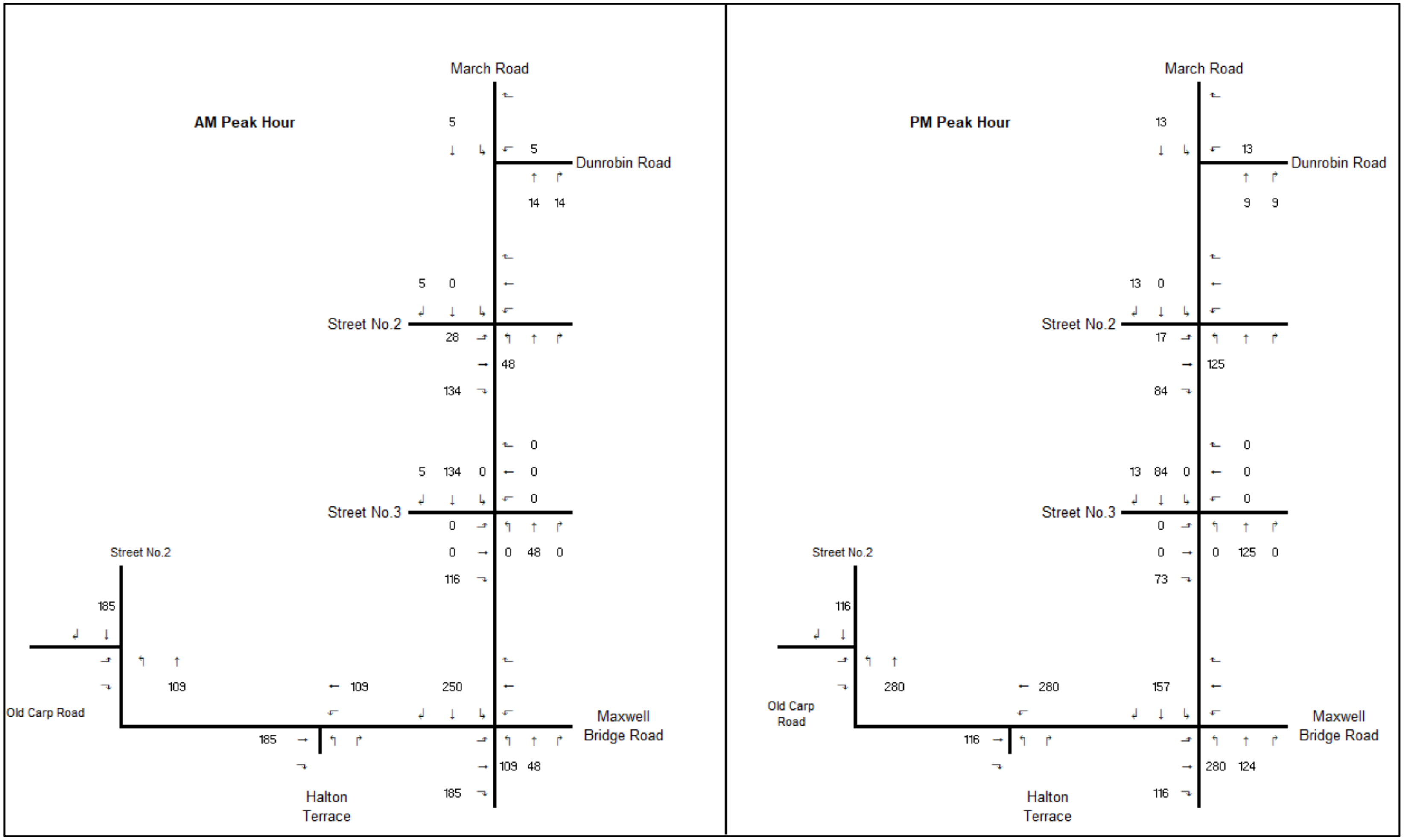


Figure 24 – 2034 Future Total Traffic Volumes - RIRO at Street No.3

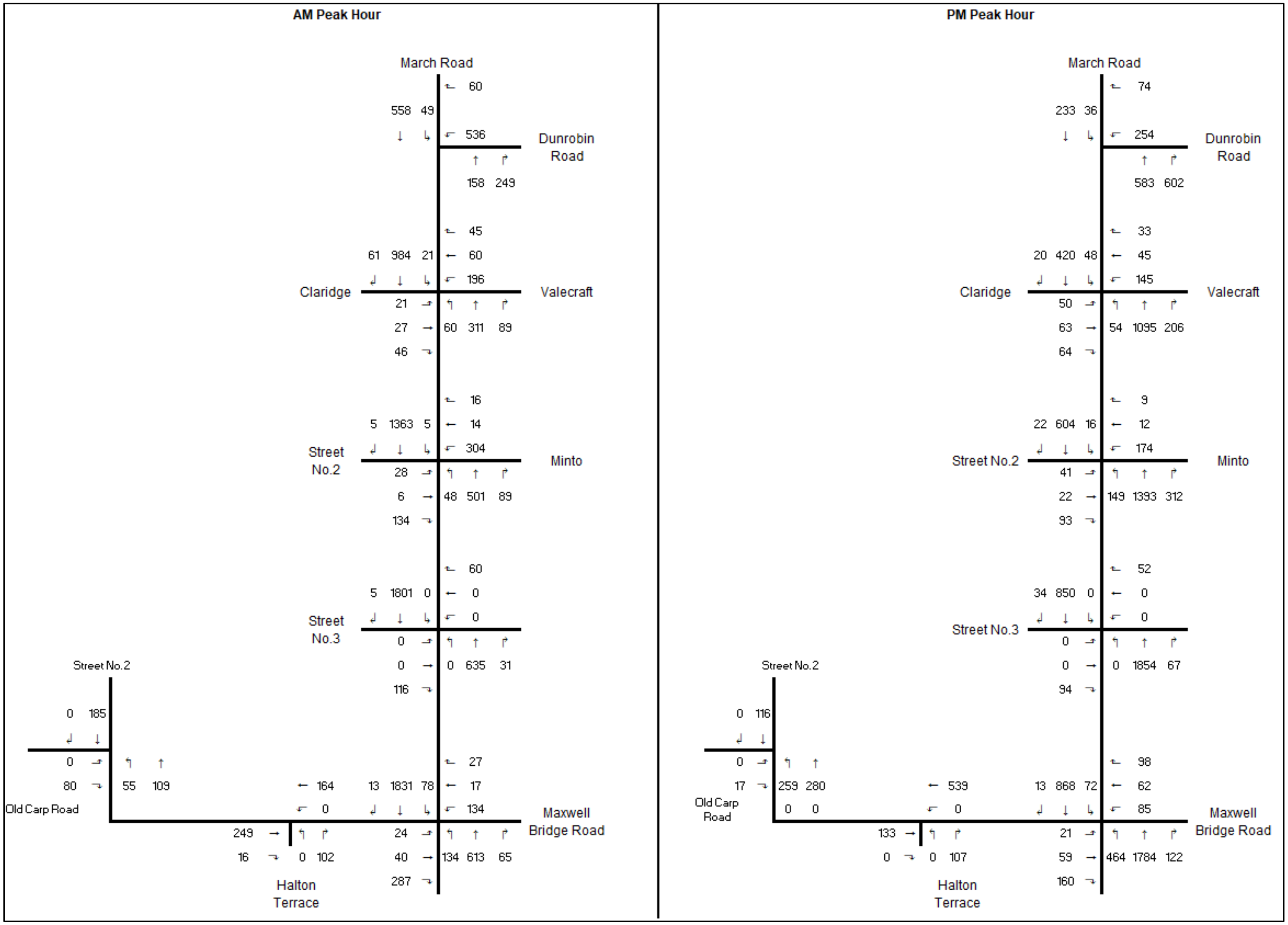


Table 22: 2024 Future Total Traffic Operation – Right-in Only vs. RIRO at Street No.3

Intersection	Movement	Right-in Only		RIRO	
		LOS	V/C Ratio	LOS	V/C Ratio
AM Peak Hour					
March Road & Street No.2/Maxwell Bridge Road (Signalized)	EBL	D	0.07	D	0.07
	EBTR	E	0.9	D	0.65
	WBL	F	2.35	F	0.99
	WBTR	D	0.06	D	0.06
	NBL	E	0.88	F	0.94
	NBT	B	0.37	B	0.36
	NBR	B	0.04	B	0.04
	SBL	B	0.17	B	0.17
	SBT	D	0.96	D	1.00
	SBR	B	0.01	B	0.01
March Road & Street No.2 (Signalized)	EBL	C	0.08	C	0.08
	EBTR	C	0.25	C	0.25
	WBL	F	0.96	F	0.96
	WBTR	C	0.04	C	0.04
	NBL	F	0.87	F	0.87
	NBT	B	0.5	B	0.5
	NBR	A	0.06	A	0.06
	SBL	A	0.01	A	0.01
	SBTR	F	1.24	F	1.24
March Road & Dunrobin Road (Signalized)	WBLR	C	0.75	C	0.75
	NBT	A	0.15	A	0.15
	NBR	A	0.18	A	0.18
	SBL	A	0.08	A	0.08
	SBT	B	0.51	B	0.51
Halton Terrace & Street No.2 (Unsignalized)	NBLR	A	0.12	B	0.15
Street No.2 & Old Carp Road (Unsignalized)	EBLR	B	0.12	B	0.15
	NBL	A	0.05	A	0.06
March Road & Street No.3 (Unsignalized)	EBR	-	-	F	1.18
	WBR	B	0.13	B	0.12
PM Peak Hour					
March Road & Street No.2/Maxwell Bridge Road (Signalized)	EBL	D	0.12	D	0.16
	EBTR	E	0.68	E	0.62
	WBL	F	1.44	F	1.02
	WBTR	D	0.39	D	0.48
	NBL	C	0.9	C	0.84
	NBT	C	0.84	B	0.8
	NBR	B	0.09	A	0.09
	SBL	C	0.51	B	0.44
	SBT	B	0.45	C	0.49
	SBR	B	0.01	B	0.01
March Road & Street No.2 (Signalized)	EBL	D	0.16	D	0.16
	EBTR	D	0.14	D	0.14
	WBL	E	0.77	E	0.77
	WBTR	D	0.04	D	0.04
	NBL	A	0.33	A	0.33
	NBT	F	1.12	F	1.12
	NBR	A	0.23	A	0.23
	SBL	B	0.26	B	0.26
	SBTR	B	0.51	B	0.51

Intersection	Movement	Right-in Only		RIRO	
		LOS	V/C Ratio	LOS	V/C Ratio
March Road & Dunrobin Road (Signalized)	WBLR	D	0.67	D	0.67
	NBT	B	0.51	B	0.51
	NBR	B	0.39	B	0.39
	SBL	A	0.08	A	0.08
	SBT	A	0.18	A	0.18
Halton Terrace & Street No.2 (Unsignalized)	NBLR	B	0.13	A	0.12
Street No.2 & Old Carp Road (Unsignalized)	EBLR	A	0.02	A	0.02
	NBL	A	0.19	A	0.18
March Road & Street No.3 (Unsignalized)	EBR	-	-	C	0.27
	WBR	F	3.40	F	4.23

According to the results shown in **Table 22**, converting the west leg of the March Road and Street No.2/Maxwell Bridge Road intersection from right-in only access to RIRO access will resolve the operation issue at the westbound left turn movement. Meanwhile, the impact to the other intersections and movements are minimal.

March Road Corridor Optimization

The signalized intersections with March Road and Street No.2 (north and south) were optimized by increasing the cycle lengths to 130s and recalculating the offsets to measure the capacity of timing improvements to alleviate queueing and travel time delays projected on the buildout year. The analysis of the optimized corridor can be found in **Appendix C**.

The analysis of the optimized March Road corridor under the 2034 total future conditions found that during the AM peak, the southbound through movement at the intersection of March Road and Street No.2 (north) is projected to generate 95th percentile queues exceeding 500m and operate with a V/C ratio of 1.20 and a delay of 121s, which is only a mild reduction from the operations shown in **Table 21**.

During the PM peak hour, the northbound through movement at the intersection of March Road and Street No.2 (north) is projected to generate 95th percentile queues exceeding 525m and is projected to operate with a V/C ratio of 1.09 and a delay of 62s.

Based on the analysis results, it was found that signal timing and offset improvements along March Road are not sufficient to produce substantial reductions in queues, delays, and V/C ratios.

Northbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

The projected 95th percentile queue is 30m during the PM peak hour, which does not exceed the minimum City of Ottawa storage length. As such, the total auxiliary lane length from the 2026 horizon can be used with a total length of **132.5m**.

Eastbound Left Auxiliary Lane Required Length – March Road and Street No.2 (north)

The projected 95th percentile queue is 17m during the PM peak hour, which does not exceed the minimum City of Ottawa storage length. As such, the same total auxiliary lane length from the 2026 horizon can be used with a total length of **37.5m**.

4.9.2.6 March Road Widening Demand Triggers

Under 2034 total future conditions, the analysis found that the highest V/C ratio on March Road corridor is projected to be in the southbound through direction (V/C ratio of 1.24) at the intersection of March Road and Street No.2 during the AM peak hour. Further investigation of this movement found that a V/C ratio of 1.0 can be achieved by reducing the vehicular volumes on the mainline (March Road) from 1,373 vph to 1,090 vph, which represents a 21% reduction in vehicular volumes.

However, a 21% reduction in vehicular volumes is not thought to be achievable due to geographical location of the proposed development and the existing roadway connectivity. Residents traveling N-S on March Road wishing to circumnavigate the congestion between Street No.2 (north) and Street No.2 (south) by diverting to a less congested roadway would only have the more circuitous option of traveling on Old Carp Road, Old Second Line Road, Klondike Road, or Terry Fox Drive, resulting in the addition of approximately 4km to their travel distance.

Appendix C contains detailed intersection performance worksheets.

Multi-Modal Level of Service Assessment

March Road at Maxwell Bridge Road / Street No.2

No changes anticipated from the 2034 FBG intersection MMLOS analysis above. **Appendix D** contains detailed intersection MMLOS evaluation results.

March Road at Dunrobin Road

No changes anticipated from the 2034 FBG intersection MMLOS analysis above. **Appendix D** contains detailed intersection MMLOS evaluation results.

March Road at Street No.2

No changes anticipated from the 2034 FBG intersection MMLOS analysis above. **Appendix D** contains detailed intersection MMLOS evaluation results.

March Road at Street No.3

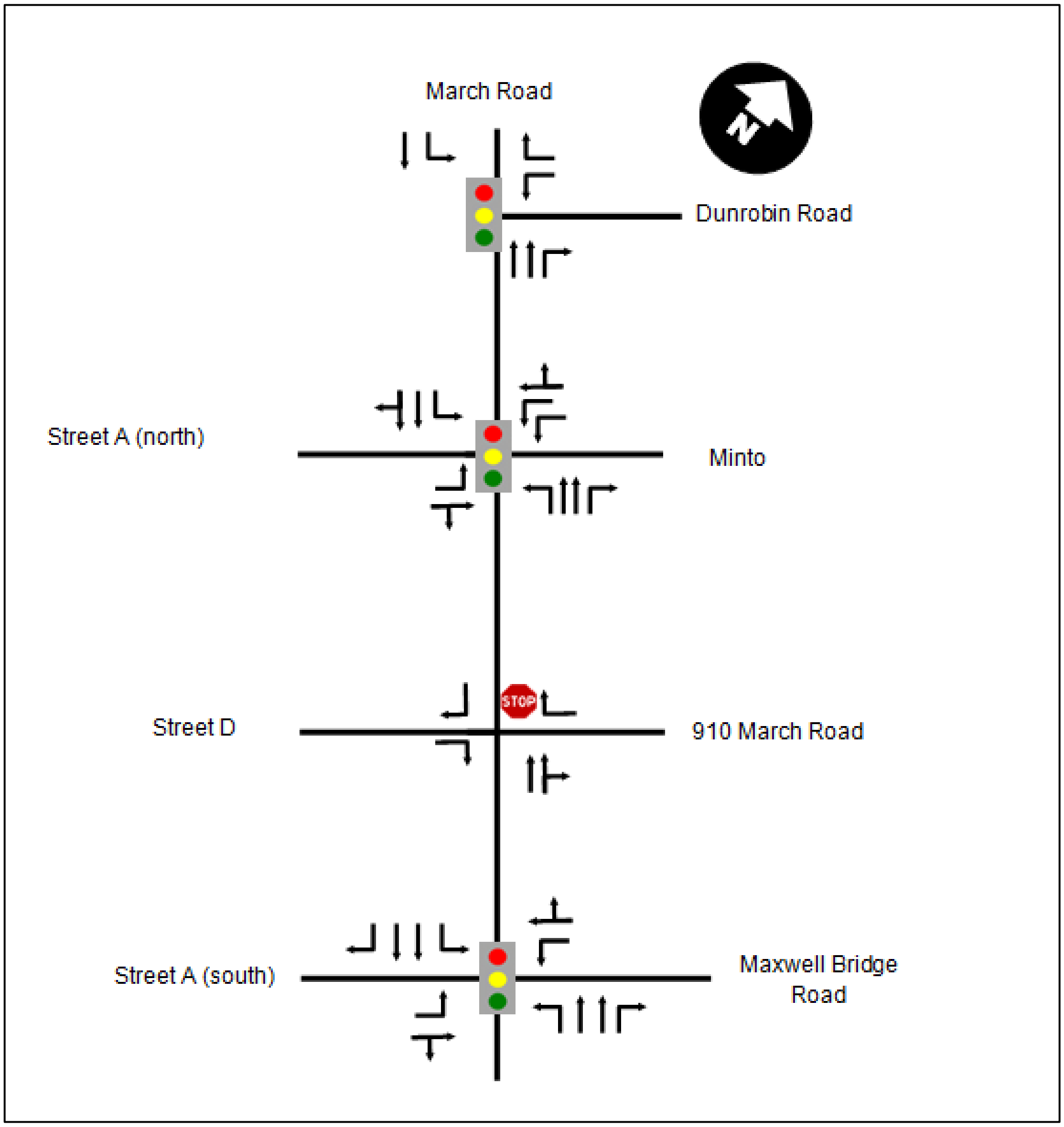
No changes anticipated from the 2034 FBG intersection MMLOS analysis above. **Appendix D** contains detailed intersection MMLOS evaluation results.

4.9.2.7 2039 Ultimate Conditions

For the 2039 ultimate horizon year, and as per communication with the City of Ottawa, it is assumed that March Road would be widened from 2 lanes to 4 lanes between Maxwell Bridge Road and Dunrobin Road. This improvement is expected to have a profound impact on the traffic operations along March Road, especially at the intersection with Street No.2 and with Street No.3. As per the KNUEA TMP, the speed limit on March Road is assumed to be reduced to 60 km/h.

At the intersection of March Road with Street No.2, a protected portion was added to the northbound left turning movements due to the widened road configuration. Through communication with CGH consultants, it was found that the westbound left turn at the intersection of March Road and Street No.2 (north) is planned to be converted to a dual left turn to accommodate traffic volumes. This is factored into the analysis to investigate the impact of protected E-W movements on the operations at the intersection. The envisioned configuration at the intersections of March Road with Street No.2 and Street No.3 under the 2039 ultimate future horizon are illustrated in **Figure 24** below.

Figure 24 - Lane Configurations - 2039 Horizon year



The traffic volumes are shown in **Figure 15**. The analysis results are shown in **Table 23**.

<u>During the weekday AM peak hour:</u>

- The westbound left movement is anticipated to operate with a delay of 115s at the intersection of March Road and Street No.2/Maxwell Bridge Road, which is considered to be acceptable for side streets, especially given the heavy traffic volumes on the mainline.
- The southbound through movement is anticipated to operate with a V/C ratio of 1.04 at the intersection of March Road and Street No.2/Maxwell Bridge Road. which is slightly over the critical capacity.

<u>During the weekday PM peak hour:</u>

- The timing plan was optimized by assigning a protected/permissive operation to the westbound left movement during the PM peak hour to mitigate the conflict with the eastbound right volumes. With this improvement, the westbound left operation during the PM peak hour is projected to improve, such that it operates with a v/c ratio of 0.65 and a delay of 57s.

All other movements at the study area intersections are projected to operate satisfactorily under the 2039 ultimate future horizon given a widened March Road.

Appendix C contains detailed intersection performance worksheets.

Table 23 - 2039 Total Traffic Conditions - Intersection Analysis Results

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement: Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
AM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	D	53	1.01	EBL	D	37	0.08	12
				EBTR	D	46	0.61	82
				WBL	F	115	0.97	76
				WBTR	D	37	0.06	13
				NBL	E	79	0.88	59
				NBT	B	18	0.37	61
				NBR	B	14	0.05	4
				SBL	B	13	0.17	13
				SBT	E	63	1.04	311
				SBR	B	15	0.01	-
March Road & Street No.2 (Signalized)	C	28.9	0.68	EBL	E	65	0.52	16
				EBTR	D	52	0.35	28
				WBL	F	92	0.96	65
				WBTR	D	43	0.07	11
				NBL	B	13	0.26	8
				NBT	A	9	0.25	35
				NBR	A	8	0.06	3
				SBL	B	11	0.01	3
				SBTR	C	21	0.72	167
March Road & Dunrobin Road (Signalized)	B	18	0.59	WBLR	C	33	0.75	62
				NBT	A	7	0.08	11
				NBR	A	8	0.18	10
				SBL	A	7	0.08	9
				SBT	B	11	0.52	90
Halton Terrace & Street No.2 (Unsignalized)	-	2	-	NBLR	B	10	0.13	4
Street No.2 & Old Carp Road (Unsignalized)	-	3	-	EBLR	A	10	0.1	2
				NBL	A	3	0.04	1
March Road & Street No.3	-	1	-	EBR	D	27	0.42	15

Intersection	Intersection LOS	Intersection Delay	Intersection V/C Ratio	Critical Movement				
				Movement	LOS	Delay (s)	V/C Ratio	95th Percentile Queue (m)
(Unsignalized)				WBR	A	9	0.06	2
PM Peak Hour								
March Road & Street No.2/Maxwell Bridge Road (Signalized)	C	28	0.92	EBL	D	50	0.16	12
				EBTR	E	58	0.62	54
				WBL	F	160	1.02	47
				WBTR	D	53	0.49	45
				NBL	C	29	0.86	133
				NBT	C	21	0.82	287
				NBR	A	9	0.09	13
				SBL	B	19	0.47	14
				SBT	C	21	0.49	90
				SBR	B	15	0.01	-
March Road & Street No.2/Maxwell Bridge Road (Signalized) Optimized with protected WBL	C	34.3	0.93	EBL	D	51	0.14	13
				EBT	E	63	0.68	55
				WBL	E	57	0.65	30
				WBT	D	45	0.34	40
				NBL	D	48	0.93	165
				NBT	C	31	0.90	314
				NBR	B	12	0.08	9
				SBL	C	26	0.51	18
				SBT	C	27	0.56	104
				SBR	B	19	0.01	-
March Road & Street No.2 (Signalized)	B	18	0.62	EBL	E	57	0.40	24
				EBTR	D	51	0.21	23
				WBL	E	63	0.70	35
				WBTR	D	47	0.07	10
				NBL	A	8	0.30	20
				NBT	B	12	0.62	116
				NBR	A	8	0.20	9
				SBL	B	15	0.09	6
				SBTR	B	16	0.35	60
March Road & Dunrobin Road (Signalized)	B	15	0.45	WBLR	D	45	0.67	42
				NBT	A	9	0.28	42
				NBR	B	11	0.40	14
				SBL	A	4	0.07	5
				SBT	A	5	0.18	24
Halton Terrace & Street No.2 (Unsignalized)	-	1	-	NBLR	A	10	0.12	3
Street No.2 & Old Carp Road (Unsignalized)	-	4	-	EBLR	A	9	0.02	0
				NBL	A	5	0.18	5
March Road & Street No.3 (Unsignalized)	-	1	-	EBR	B	13	0.17	5
				WBR	B	11	0.08	2

Storage Length Requirements

Based on the analysis of the 2024, 2026, 2034, and 2039 horizon years, the following storage lane lengths are recommended:

Table 24 - Storage Length Requirements

Required Lengths (m)	March Road and Street No.2 (north)	
	NBL	EBL
Storage Lane	50	37.5
Parallel Lane (m) **– 2/3 of deceleration distance**	63	--
Taper (m) **– 1/3 of deceleration distance**	32	--
Total Lane Length (m)	**145**	**37.5**
Assumed Design Speed		
March Road	90 km/h	
Street No.2	50 km/h	

Note: March Street storage lengths considered deceleration requirements due to the high operating speeds and traffic volumes.

Multi-Modal Level of Service Assessment

March Road at Maxwell Bridge Road / Street No.2

No changes anticipated from the 2034 TF intersection MMLOS analysis above. **Appendix D** contains detailed intersection MMLOS evaluation results.

March Road at Dunrobin Road

No changes anticipated from the 2034 TF intersection MMLOS analysis above. The widening of March Road to 4 lanes is not anticipated to have an impact on the PLOS operations at this intersection because there is no pedestrian crossing perpendicular to the westbound movement**. Appendix D** contains detailed intersection MMLOS evaluation results.

March Road at Street No.2

With March Road assumed to be widened to 4-lanes from Maxwell Bridge Road to Dunrobin Road, the intersection's PLOS level is anticipated to deteriorate from E to F. The PLOS operations are expected to be similar to the operations observed at the intersection of March Road and Maxwell Bridge Road / Street No.2. It is noted that the location of the school in the vicinity of this intersection has established unreasonably high PLOS targets for the area considering March Road is an arterial roadway with high speeds and high volumes. The PLOS target of A is unattainable at the intersection of March Road at Street No.2.

The Bicycle Level of Service at the intersection of March Road at Street No.2 is projected to operate with a BLOS of A, which exceeds the desired target of C. With the widening of March Road to 4-lanes, cross-rides will be provided in all directions, significantly improving BLOS operations. All left turns are anticipated to feature a 2-stage treatment with bike boxes.

The Transit Level of Service at the intersection of March Road at Street No.2 is projected to operate with a TLOS of F, which does not meet the desired target of D. Given the widening of March Road, the transit delays in the north and south approaches will significantly improve and operate with TLOS D or better. However, due to a 120s cycle length, the east and west approaches experience average delays exceeding 40s, thereby deteriorating the overall TLOS to F. Since the east-west movement is minor, the TLOS operations are assumed to be acceptable for this intersection.

The Truck Level of Service at the intersection of March Road at Street No.2 is projected to operate with a TkLOS of E, which does not meet the desired target of D. This is due to the east and west legs of the intersection only having one receiving lane. As Street No.2 will likely not be a designated truck route, trucks will likely proceed along March Road in the northbound and southbound directions and will not likely turn onto the Street No.2. A TkLOS of E is therefore acceptable at this intersection.

Once March Road is widened with the Bus Rapid Transit in place, the operations at this intersection will change substantially. It is therefore not recommended to address the MMLOS at this time. Consideration should be given to incorporating multi-modal aspects into the design of March Road to achieve the MMLOS targets.

March Road at Street No.3

With March Road assumed to be widened to 4-lanes from Maxwell Bridge Road to Dunrobin Road, the intersection's PLOS level is anticipated to remain as E. It is noted that the location of the school in the vicinity of this intersection has established unreasonably high PLOS targets for the area considering March Road is an arterial roadway with high speeds and high volumes. The PLOS target of A is unattainable at the intersection of March Road at Street No.2.

The Bicycle Level of Service at the intersection of March Road at Street No.3 is projected to operate with a BLOS of F, which does not meet the desired target of C. This is attributable to mixed traffic operations. The BLOS target can be met via the implementation of segregated cycling facilities and left turn bike boxes to eliminate conflicts between left turning cyclists and vehicles.

The Transit Level of Service at the intersection of March Road at Street No.3 is projected to operate with a TLOS of F, which does not meet the desired target of D. Given the widening of March Road, the transit delays in the north and south approaches will significantly improve and operate with TLOS D or better. However, due to a 120s cycle length, the east and west approaches experience average delays exceeding 40s, thereby deteriorating the overall TLOS to F. Since the east-west movement is minor, the TLOS operations are assumed to be acceptable for this intersection. The introduction of a median BRT system in the future will also substantially alter the transit operations in the area.

The Truck Level of Service at the intersection of March Road at Street No.3 is projected to operate with a TkLOS of E, which does not meet the desired target of D. This is due to the east and west legs of the intersection only having one receiving lane. As Street No.3 will likely not be a designated truck route, trucks will likely proceed along March Road in the northbound and southbound directions. TkLOS E is therefore acceptable at this intersection.

Once March Road is widened with the Bus Rapid Transit in place, the operations at this intersection will change substantially. It is therefore not recommended to address the MMLOS at this time. Consideration should be given to incorporating multi-modal aspects into the design of March Road to achieve the MMLOS targets.

4.9.3 Summary of Required Road Improvements

Table 25 provides a summary of the road improvements required in each horizon to accommodate the proposed development.

Table 25 - Summary of Required Road Improvements

Intersection / Road Segment	2020 Existing	2024	2026	2034 Future Background	2034 Total Future	2039 Ultimate
March Road at Dunrobin Road	Traffic Signals	--	--	--	--	--
March Road at Maxwell Bridge Road / Halton Terrace	Traffic Signals	--	--	--	--	Signal Timing Improvements – PM Peak – Introduce protected/permissive phasing for the WBL movement.
March Road at Street No.2	--	Traffic Signals - 120s Signal Timing Plan	-	--	--	Introduce protected/permissive phasing for the NBL movement and protected phasing for the EBL and WBL movements to accommodate the dual westbound left turning lanes.
March Road at Street No.3	--	-	-	--	Convert west leg to RIRO	-
March Road	Two-Lane Roadway	--	Consider early road widening	Consider early road widening	Consider early road widening	Widened Four-Lane Roadway

It is also noted that a dedicated southbound right storage lane at the intersection of March Road and Street No.2 is not required due to the minimal southbound right turning traffic into the proposed development, which equates to less than 10% of the total southbound approach volume.

5.0 SUMMARY AND CONCLUSIONS

This Transportation Impact Assessment (TIA) was prepared in support of a Draft Plan of Subdivision and Zoning By-Law Amendment application for the proposed Brigil Development. The subject development is located at 927 March Road in the City of Ottawa's Kanata North community. The site is located in the southwest quadrant of the Kanata North Urban Expansion Area Lands. It is bound by March Road to the east, future developments to the north, existing developments to the south, and largely undeveloped land in the west.

The subdivision is proposed to include 19 single family homes, 32 townhomes, 1,857 apartment units, and retail stores. Build-out and occupancy is anticipated to occur by 2034.

Primary access to the proposed development will be achieved via a new Street No.2 connection to March Road at two locations. The north access will be a shared access with the proposed future Minto development on the east side of March Road. The south access is located at the existing intersection of March Road and Maxwell Bridge Road, whereby a redesigned crescent shaped Street No.2 is envisioned to extend to March Road and replace Maxwell Bridge Road. As a result of this, Old Carp Road and Halton Terrace are envisioned to be realigned as per the KNUEA TMP. This alignment is anticipated to occur in 2026. A secondary access to the development will also be provided at the unsignalized intersection of March Road and Street No.3 via the west leg, which is anticipated to be completed by 2032 (phase 6 construction). The proposed development is anticipated to generate 630 and 722 net new auto trips (two-way) during the AM and PM peak hours, respectively.

As per the recommended cross-section in the recently published neighborhood collector roads design guidelines, Streets A and B (collector roads) are envisioned to feature dedicated cycling and walking areas along both travel directions that are separated from the roadway by boulevards to improve the connectivity for pedestrians as they navigate through the community. Furthermore, road cross sectional narrowings are planned along Streets A and B to provide on-street parking (in the vicinity of the proposed school) and facilitate maintaining a 40 km/h operating speed by slowing vehicular traffic. With the aforementioned facilities in place, Streets A and B are expected to meet the Pedestrian, Cycling, and Transit Level of Service targets. As neither street will be a designated truck route, the Truck Level of Service does not apply. Street No.3 (local) is anticipated to feature a similar cross section to the one proposed in the KNUEA TMP, which envisions a sidewalk on one side of the roadway only and on-street parking on one side to facilitate meeting the 30 km/h operating speed target. Given the City's target operating speed of 30 km/h and the short segment length, Street No.3 is also expected to meet the Pedestrian and Cycling Level of Service Targets. Street No.3 is not expected to support transit or trucks.

The study area signalized intersections do not meet the MMLOS targets due to the high speed on March Road and the unrealistically high PLOS target of A due to the presence of a school in the vicinity of the intersections (to be built out in 2034). Overall, it is not recommended to implement road modifications due to MMLOS levels as the cross section along March Road will see significant changes in the future. More details can be found in **Appendix D**.

For traffic operations during the existing year (2020), all study area intersections are projected to operate acceptably.

During the year 2024, the first phase of the subject development (414 mid-rise apartments, 388 high-rise apartments and the proposed commercial component) is expected to be built-out in the southwest quadrant of the intersection of March Road with Street No.2. Subsequently, it is recommended for the proposed northbound left turn storage lane (as shown in the City of Ottawa's draft RMA) to be installed during the same year to maintain consistency along the high-speed March Road by providing a storage area for the decelerating left turning vehicles, thus allowing less restricted flow for the northbound through movement that is utilizing only one travel lane on March Road. A 120s timing plan was developed and adopted at the intersection of March Road and Street No.2 for the purpose of analysis. All study area intersections are projected to operate acceptably.

During the year 2026, the Minto and Claridge developments in the northwest and southeast quadrants of the KNUEA lands are expected to be built-out. It was found that during the AM peak, the southbound through movement at the intersection of March Road and Street No.2 will operate near capacity with a V/C ratio of 0.99. This is attributed to the increase in the southbound through traffic generated by the Claridge development, totaling 213 vph. The net southbound through traffic was calculated to be 1,132 vph at the intersection, which exceeds the theoretical capacity for a two-lane roadway. It was found that roadway improvements along March Road will theoretically be triggered in 2026 or shortly after.

During the buildout year (2034), and under background traffic conditions, the intersection of March Road and Street No.2 is projected to operate above capacity. During the AM peak, the southbound through movement was found to operate with a V/C ratio of 1.20, and during the PM peak, the northbound through movement was found to operate with a V/C ratio of 1.12. Both movements are projected to have 95th queues of approximately 500m upstream of the intersection, with the potential to impact traffic operations at other intersections in close proximity.

During the buildout year (2034), and under total future traffic conditions, the intersection of March Road and Street No.2 is projected to see deteriorated traffic operations with the addition of the site generated traffic. During the PM peak, the northbound through movement was found to operate with a V/C ratio of 1.12, and during the AM peak, the southbound through movement was found to operate with a V/C ratio of 1.24 and a delay exceeding 2 minutes. At the intersection of March Road and Maxwell Bridge Road, the westbound left movement was found to deteriorate from a traffic operations standpoint, more notably during the PM peak, due to the conflicting eastbound right turning traffic generated by the subject development. After the RIRO access is introduced at the west leg of March Road and Street No.3 intersection, the westbound left movement was found to operate with a V/C ratio of 1.02 during the PM peak with a delay of 161s, which is considered acceptable for minor movements.

During the ultimate horizon year (2039), and with an envisioned 4-lane cross section on March Road, all study area intersections were found to operate acceptably. At the intersection of March Road and Street No.2, the timing plan was modified in the PM peak hour to include a protected/permissive phase for the westbound left movement, resulting in acceptable operations. During the AM peak hour, the westbound left movement operates just at capacity with a V/C ratio of 0.97 and a delay of 115s, which is acceptable for a minor movement, especially given the high vehicular volumes on March Road. The dual westbound left movement at the intersection of March Road and Street No.2 (north) was found to operate acceptably with a V/C ratio 0.96.

The planned median BRT system on March Road in addition to the transit improvements in the vicinity of the study area including queue jump lanes and transit priority signaling are expected to enhance transit coverage and reliability in the area and increase ridership figures, which is conducive to vehicular traffic reduction in the study area, resulting in improved traffic operations along the March Road corridor.

In conclusion, the development on 927 March Road is can be supported from a transportation perspective. It is noted that the following improvements are recommended:

- By the year 2024, introduce northbound and eastbound left turn storage lanes at the intersection of March Road and Street No.2 (north) with a total length of 145m (including storage, parallel lane, and taper) for the northbound left and a total length of 37.5 for the eastbound left turn.
- By the year 2034, the west leg at the intersection of March Road and Street No.3 is envisioned to be constructed (analyzed under the 2034 background and total future conditions). A RIRO access at the west leg is recommended.
- By the year 2026 horizon year, March Road under a two-lane cross section is anticipated to operate close to capacity; consideration for early twinning is recommended between the 2026 and the 2034 horizon year. As a two-lane March Road operates close to capacity by the 2026 horizon year, the most significant developments due to the development's phasing or background developments happen between the 2028 and 2031 horizon year. Therefore, the recommended timeline to consider early twinning is prior to the 2031 horizon year.
- By the year 2039, March Road is planned to be widened; Introduce a protected portion to the westbound left turn at the intersection of March Road and Maxwell Bridge Road/Street No.2 (south) and a protected portion to the northbound left turn, eastbound left turn. and westbound left turn at the intersection of March Road and Street No.2 (north).

Appendix A TRAFFIC DATA

Transportation Services - Traffic Services

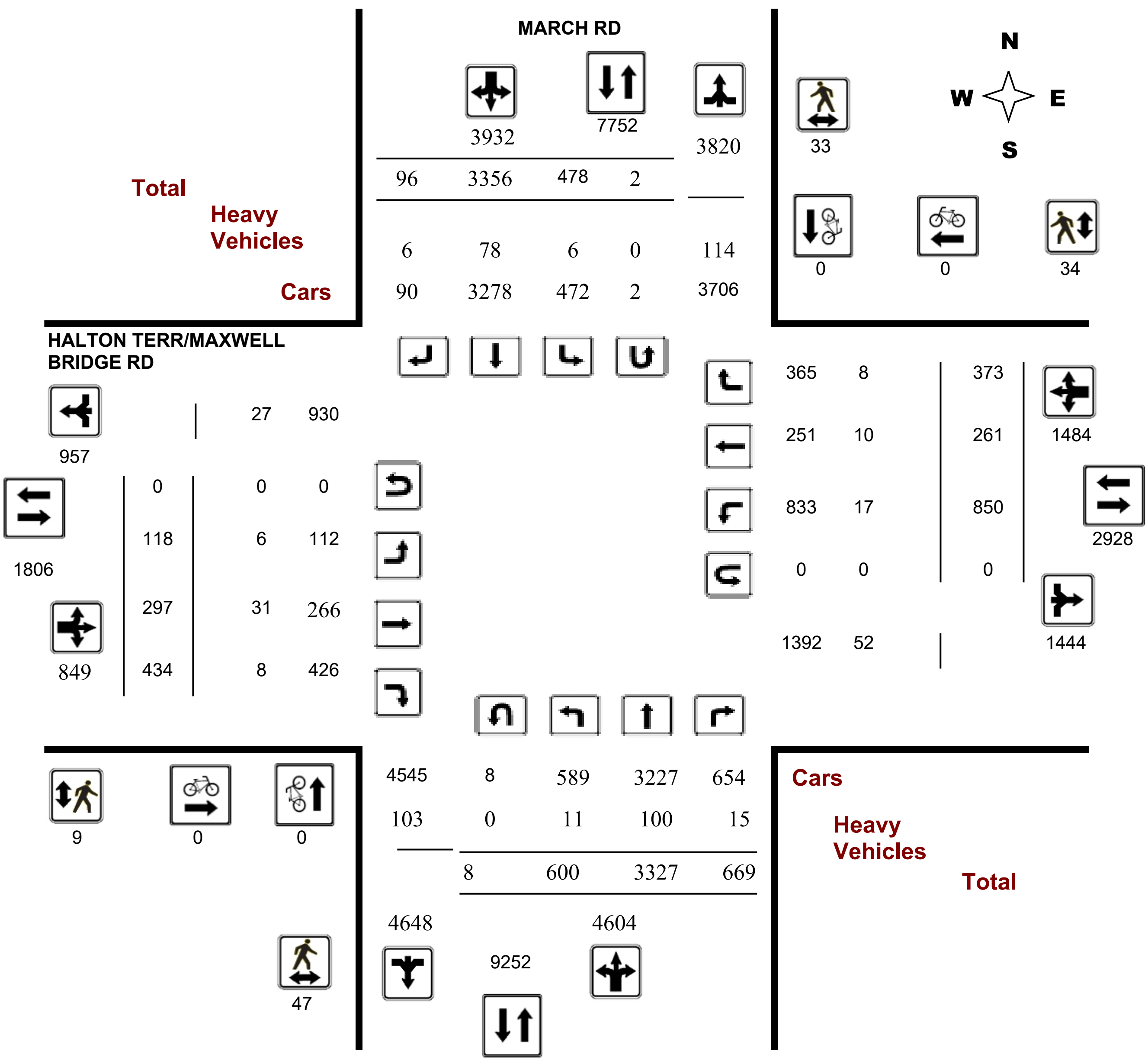
Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

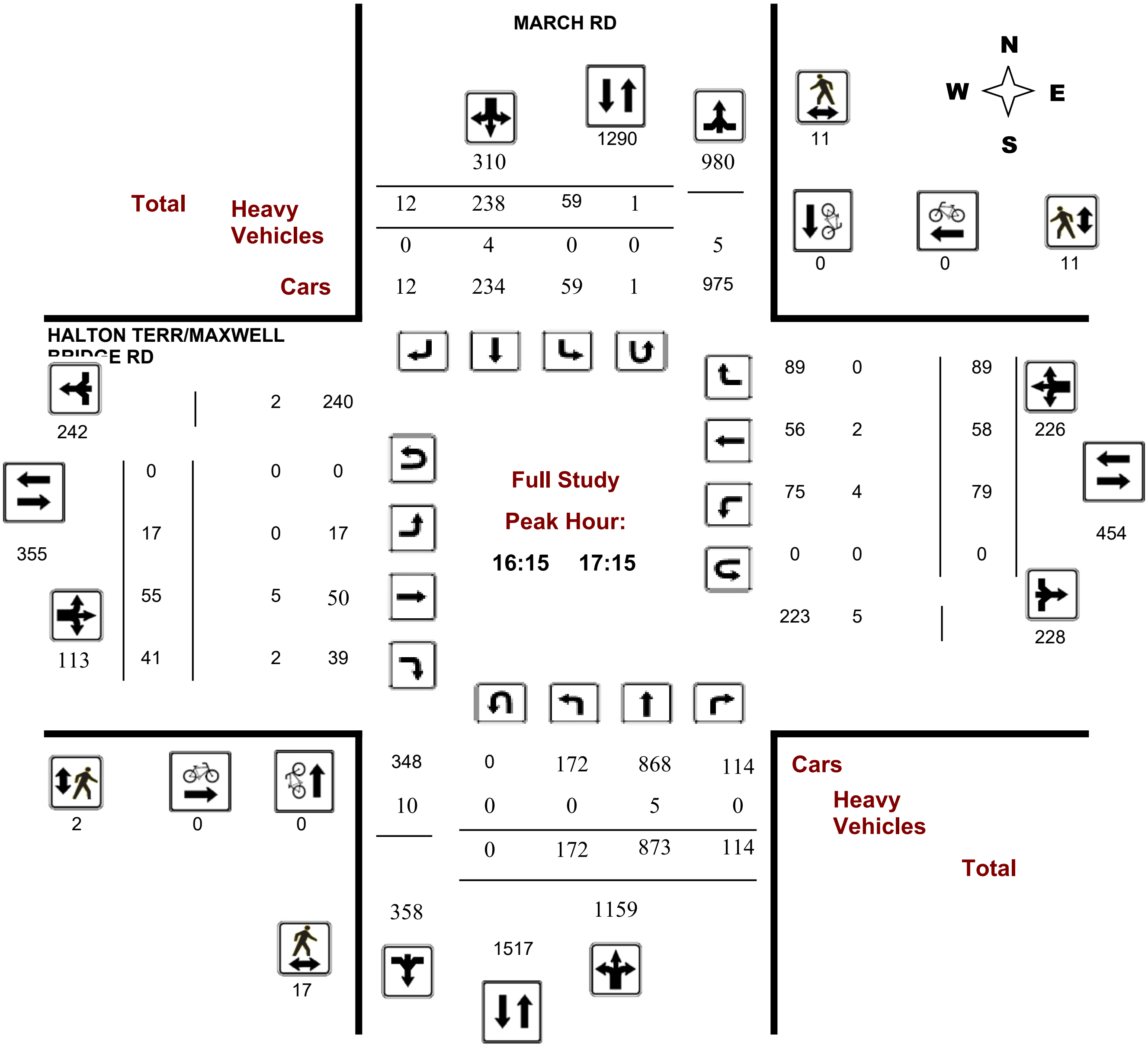
Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

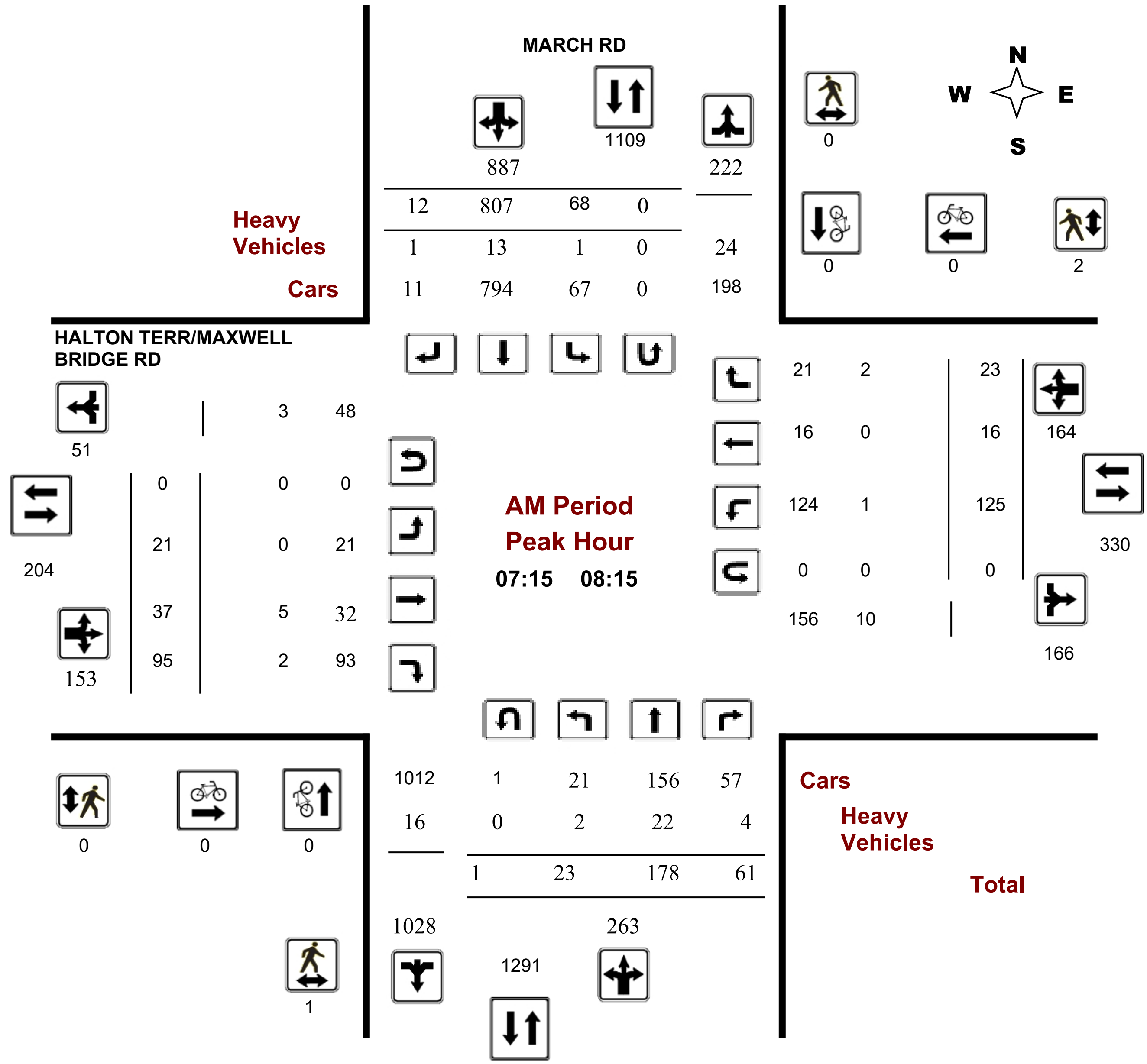
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision



Comments 5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

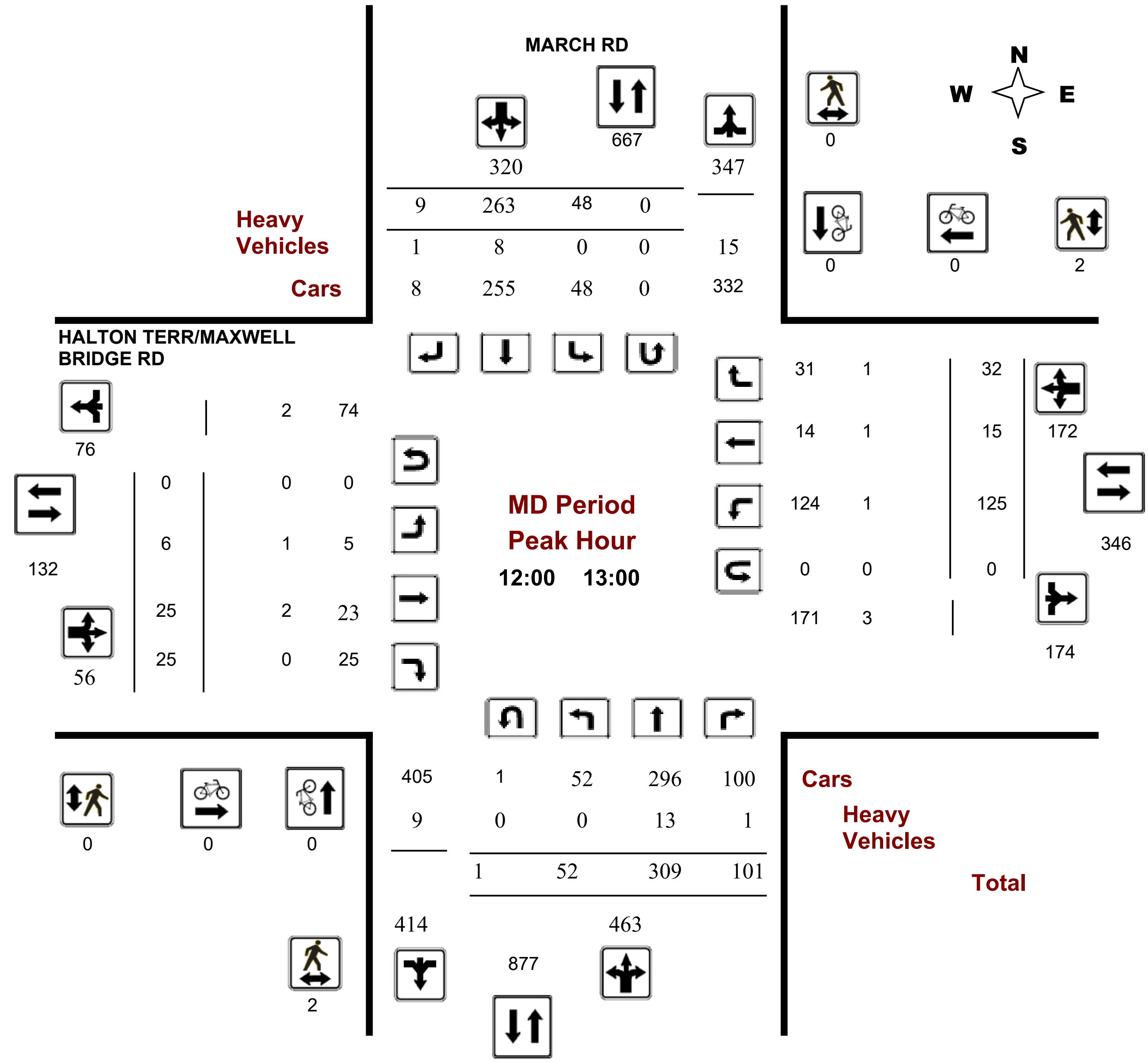
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision



Comments 5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

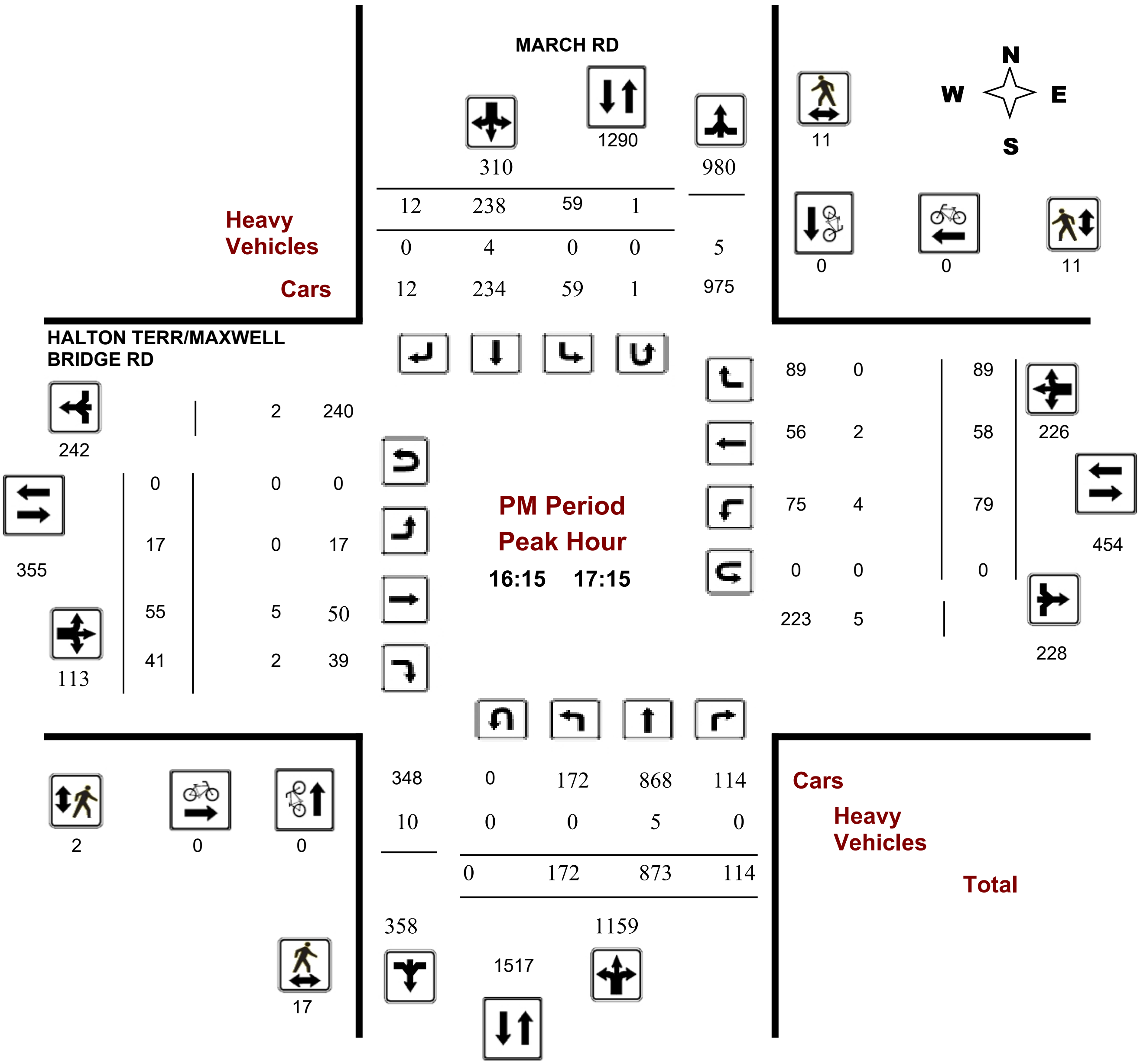
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision



Comments 5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, March 04, 2020

Total Observed U-Turns

Northbound: 8 Southbound: 2

Eastbound: 0 Westbound: 0

AADT Factor

1.00

	MARCH RD									HALTON TERR/MAXWELL BRIDGE RD									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	21	180	50	**251**	56	785	10	**851**	**1102**	18	36	90	**144**	122	16	23	**161**	**305**	**1407**
08:00 09:00	35	152	76	**263**	78	758	10	**846**	**1109**	21	32	83	**136**	141	24	19	**184**	**320**	**1429**
09:00 10:00	28	208	62	**298**	69	517	13	**599**	**897**	21	42	87	**150**	120	28	29	**177**	**327**	**1224**
11:30 12:30	58	268	85	**411**	52	283	9	**344**	**755**	3	24	28	**55**	115	18	27	**160**	**215**	**970**
12:30 13:30	47	287	86	**420**	43	266	7	**316**	**736**	8	21	34	**63**	109	15	28	**152**	**215**	**951**
15:00 16:00	96	608	104	**808**	58	265	19	**342**	**1150**	18	41	36	**95**	59	50	73	**182**	**277**	**1427**
16:00 17:00	156	867	101	**1124**	63	246	11	**320**	**1444**	18	51	39	**108**	70	52	88	**210**	**318**	**1762**
17:00 18:00	159	757	105	**1021**	59	236	17	**312**	**1333**	11	50	37	**98**	114	58	86	**258**	**356**	**1689**
Sub Total	600	3327	669	**4596**	478	3356	96	**3930**	**8526**	118	297	434	**849**	850	261	373	**1484**	**2333**	**10859**
U Turns				**8**				**2**	**10**				**0**				**0**	**0**	**10**
Total	600	3327	669	**4604**	478	3356	96	**3932**	**8536**	118	297	434	**849**	850	261	373	**1484**	**2333**	**10869**
EQ 12Hr	834	4625	930	**6400**	664	4665	133	**5465**	**11865**	164	413	603	**1180**	1182	363	518	**2063**	**3243**	**15108**
AVG 12Hr	786	4358	876	**6031**	626	4396	126	**5151**	**11865**	155	389	569	**1112**	1114	342	489	**1944**	**3243**	**15108**
AVG 24Hr	1030	5709	1148	**7901**	820	5759	165	**6748**	**14649**	202	510	745	**1457**	1459	448	640	**2547**	**4004**	**18653**

Note (EQ 12Hr): These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

Note (AVG 12Hr): These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **1**

Note (AVG 24Hr): These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

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

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		MARCH RD									HALTON TERR/MAXWELL BRIDGE RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	6	45	14	65	9	179	0	188	15	2	8	19	29	36	4	6	46	15	328
07:15	07:30	8	54	12	74	14	224	1	239	17	5	6	27	38	29	4	3	36	17	387
07:30	07:45	4	54	16	75	12	183	5	200	7	8	10	25	43	25	3	4	32	7	350
07:45	08:00	3	27	8	38	21	199	4	224	7	3	12	19	34	32	5	10	47	7	343
08:00	08:15	8	43	25	76	21	201	2	224	12	5	9	24	38	39	4	6	49	12	387
08:15	08:30	6	32	18	56	20	182	1	203	5	5	8	18	31	37	3	5	45	5	335
08:30	08:45	11	42	22	76	15	189	3	207	9	7	7	27	41	26	6	5	37	9	361
08:45	09:00	10	35	11	56	22	186	4	212	6	4	8	14	26	39	11	3	53	6	347
09:00	09:15	7	52	23	82	23	166	8	197	16	8	18	37	63	40	10	9	59	16	401
09:15	09:30	8	54	17	79	17	126	1	144	10	7	9	33	49	30	10	10	50	10	322
09:30	09:45	7	55	11	74	17	125	2	144	5	4	6	13	23	27	3	4	34	5	275
09:45	10:00	6	47	11	65	12	100	2	114	4	2	9	4	15	23	5	6	34	4	228
11:30	11:45	17	55	19	92	14	77	4	95	5	1	6	10	17	35	5	8	48	5	252
11:45	12:00	15	57	20	94	10	70	1	81	10	2	6	10	18	25	6	3	34	10	227
12:00	12:15	16	84	26	126	12	70	3	85	3	0	4	3	7	30	2	8	40	3	258
12:15	12:30	10	72	20	103	16	66	1	83	3	0	8	5	13	25	5	8	38	3	237
12:30	12:45	15	79	28	122	8	56	2	66	7	3	6	8	17	37	5	9	51	7	256
12:45	13:00	11	74	27	112	12	71	3	86	10	3	7	9	19	33	3	7	43	10	260
13:00	13:15	11	83	10	104	8	71	1	80	4	1	6	13	20	18	2	6	26	4	230
13:15	13:30	10	51	21	82	15	68	1	85	6	1	2	4	7	21	5	6	32	6	206
15:00	15:15	13	130	25	168	10	63	4	77	1	2	5	7	14	15	9	19	43	1	302
15:15	15:30	29	129	33	191	13	56	6	75	9	2	11	8	21	16	15	15	46	9	333
15:30	15:45	24	163	16	203	13	65	4	82	10	7	9	5	21	13	16	23	52	10	358
15:45	16:00	30	186	30	246	22	81	5	108	9	7	16	16	39	15	10	16	41	9	434
16:00	16:15	27	202	22	251	17	62	3	82	7	4	12	11	27	17	9	25	51	7	411
16:15	16:30	40	251	17	308	16	64	1	81	3	6	13	11	30	14	11	18	43	3	462
16:30	16:45	43	214	32	289	10	50	4	65	1	2	11	8	21	20	14	27	61	1	436
16:45	17:00	46	200	30	276	20	70	3	93	3	6	15	9	30	19	18	18	55	3	454
17:00	17:15	43	208	35	286	13	54	4	71	2	3	16	13	32	26	15	26	67	2	456
17:15	17:30	32	217	18	267	17	65	1	83	1	3	10	5	18	30	14	21	65	1	433
17:30	17:45	37	173	26	236	21	50	3	74	9	5	15	7	27	37	11	27	75	9	412
17:45	18:00	47	159	26	232	8	67	9	84	0	0	9	12	21	21	18	12	51	0	388
Total:		600	3327	669	4604	478	3356	96	3932	216	118	297	434	849	850	261	373	1484	216	10,869

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		MARCH RD Northbound	MARCH RD Southbound	MARCH RD Street Total	HALTON TERR/MAXWELL BRIDGE RD Eastbound	HALTON TERR/MAXWELL BRIDGE RD Westbound	HALTON TERR/MAXWELL BRIDGE RD Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		0	0	**0**	0	0	0	0

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period	MARCH RD NB Approach (E or W Crossing)	MARCH RD SB Approach (E or W Crossing)	Total	HALTON TERR/MAXWELL BRIDGE RD EB Approach (N or S Crossing)	HALTON TERR/MAXWELL BRIDGE RD WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	0	1	**1**	0	0	**0**	**1**
07:15 07:30	0	0	**0**	0	1	**1**	**1**
07:30 07:45	0	0	**0**	0	0	**0**	**0**
07:45 08:00	1	0	**1**	0	1	**1**	**2**
08:00 08:15	0	0	**0**	0	0	**0**	**0**
08:15 08:30	0	0	**0**	0	0	**0**	**0**
08:30 08:45	0	0	**0**	0	1	**1**	**1**
08:45 09:00	1	2	**3**	0	1	**1**	**4**
09:00 09:15	1	0	**1**	0	0	**0**	**1**
09:15 09:30	0	1	**1**	1	1	**2**	**3**
09:30 09:45	0	0	**0**	0	0	**0**	**0**
09:45 10:00	0	0	**0**	1	0	**1**	**1**
11:30 11:45	2	0	**2**	0	1	**1**	**3**
11:45 12:00	2	0	**2**	0	0	**0**	**2**
12:00 12:15	0	0	**0**	0	2	**2**	**2**
12:15 12:30	1	0	**1**	0	0	**0**	**1**
12:30 12:45	1	0	**1**	0	0	**0**	**1**
12:45 13:00	0	0	**0**	0	0	**0**	**0**
13:00 13:15	2	0	**2**	0	0	**0**	**2**
13:15 13:30	2	0	**2**	0	0	**0**	**2**
15:00 15:15	0	5	**5**	0	4	**4**	**9**
15:15 15:30	4	2	**6**	0	6	**6**	**12**
15:30 15:45	1	0	**1**	0	0	**0**	**1**
15:45 16:00	0	1	**1**	1	0	**1**	**2**
16:00 16:15	3	5	**8**	1	1	**2**	**10**
16:15 16:30	6	0	**6**	1	6	**7**	**13**
16:30 16:45	4	8	**12**	0	1	**1**	**13**
16:45 17:00	6	2	**8**	1	2	**3**	**11**
17:00 17:15	1	1	**2**	0	2	**2**	**4**
17:15 17:30	3	1	**4**	0	1	**1**	**5**
17:30 17:45	3	4	**7**	0	3	**3**	**10**
17:45 18:00	3	0	**3**	3	0	**3**	**6**
Total	47	33	**80**	9	34	**43**	**123**

5472187 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		MARCH RD									HALTON TERR/MAXWELL BRIDGE RD										
		Northbound				Southbound					Eastbound				Westbound						
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	1	5	3	**9**	0	6	0	**6**	**15**	0	2	0	**2**	0	0	0	**0**	**2**	**17**
07:15	07:30	2	9	2	**13**	1	3	0	**4**	**17**	0	1	2	**3**	0	0	2	**2**	**5**	**22**
07:30	07:45	0	3	1	**4**	0	3	0	**3**	**7**	0	1	0	**1**	0	0	0	**0**	**1**	**8**
07:45	08:00	0	2	0	**2**	0	4	1	**5**	**7**	0	1	0	**1**	1	0	0	**1**	**2**	**9**
08:00	08:15	0	8	1	**9**	0	3	0	**3**	**12**	0	2	0	**2**	0	0	0	**0**	**2**	**14**
08:15	08:30	0	2	0	**2**	1	2	0	**3**	**5**	0	1	0	**1**	0	0	0	**0**	**1**	**6**
08:30	08:45	0	5	1	**6**	0	3	0	**3**	**9**	0	0	0	**0**	0	1	0	**1**	**1**	**10**
08:45	09:00	0	2	0	**2**	1	3	0	**4**	**6**	0	1	0	**1**	1	1	0	**2**	**3**	**9**
09:00	09:15	2	6	0	**8**	0	7	1	**8**	**16**	1	2	2	**5**	0	1	1	**2**	**7**	**23**
09:15	09:30	1	6	1	**8**	0	2	0	**2**	**10**	1	2	2	**5**	0	0	1	**1**	**6**	**16**
09:30	09:45	0	2	0	**2**	0	3	0	**3**	**5**	0	0	0	**0**	0	0	0	**0**	**0**	**5**
09:45	10:00	0	2	0	**2**	0	2	0	**2**	**4**	0	2	0	**2**	0	0	0	**0**	**2**	**6**
11:30	11:45	0	2	0	**2**	2	1	0	**3**	**5**	0	1	0	**1**	0	1	1	**2**	**3**	**8**
11:45	12:00	0	7	1	**8**	0	2	0	**2**	**10**	0	0	0	**0**	1	0	0	**1**	**1**	**11**
12:00	12:15	0	0	0	**0**	0	3	0	**3**	**3**	0	0	0	**0**	0	0	0	**0**	**0**	**3**
12:15	12:30	0	2	0	**2**	0	1	0	**1**	**3**	0	1	0	**1**	1	0	0	**1**	**2**	**5**
12:30	12:45	0	4	1	**5**	0	2	0	**2**	**7**	0	1	0	**1**	0	1	1	**2**	**3**	**10**
12:45	13:00	0	7	0	**7**	0	2	1	**3**	**10**	1	0	0	**1**	0	0	0	**0**	**1**	**11**
13:00	13:15	1	1	0	**2**	0	2	0	**2**	**4**	1	1	0	**2**	0	0	0	**0**	**2**	**6**
13:15	13:30	1	2	0	**3**	0	2	1	**3**	**6**	0	1	0	**1**	0	0	0	**0**	**1**	**7**
15:00	15:15	0	0	0	**0**	0	1	0	**1**	**1**	0	0	0	**0**	2	0	0	**2**	**2**	**3**
15:15	15:30	0	3	1	**4**	0	5	0	**5**	**9**	0	1	0	**1**	0	1	0	**1**	**2**	**11**
15:30	15:45	1	5	1	**7**	0	3	0	**3**	**10**	1	1	0	**2**	1	1	0	**2**	**4**	**14**
15:45	16:00	1	2	1	**4**	1	2	2	**5**	**9**	0	1	0	**1**	0	0	0	**0**	**1**	**10**
16:00	16:15	1	3	0	**4**	0	3	0	**3**	**7**	1	1	0	**2**	1	1	2	**4**	**6**	**13**
16:15	16:30	0	3	0	**3**	0	0	0	**0**	**3**	0	1	0	**1**	2	2	0	**4**	**5**	**8**
16:30	16:45	0	0	0	**0**	0	1	0	**1**	**1**	0	2	1	**3**	0	0	0	**0**	**3**	**4**
16:45	17:00	0	0	0	**0**	0	3	0	**3**	**3**	0	1	0	**1**	1	0	0	**1**	**2**	**5**
17:00	17:15	0	2	0	**2**	0	0	0	**0**	**2**	0	1	1	**2**	1	0	0	**1**	**3**	**5**
17:15	17:30	0	1	0	**1**	0	0	0	**0**	**1**	0	1	0	**1**	1	0	0	**1**	**2**	**3**
17:30	17:45	0	4	1	**5**	0	4	0	**4**	**9**	0	0	0	**0**	3	0	0	**3**	**3**	**12**
17:45	18:00	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	1	0	0	**1**	**2**	**2**
Total:	None	11	100	15	**126**	6	78	6	**90**	**216**	6	31	8	**45**	17	10	8	**35**	**80**	**296**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Survey Date: Wednesday, March 04, 2020 **WO No:** 39372

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		MARCH RD Northbound U-Turn Total	MARCH RD Southbound U-Turn Total	HALTON TERR/MAXWELL BRIDGE RD Eastbound U-Turn Total	HALTON TERR/MAXWELL BRIDGE RD Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	1	0	0	0	1
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	1	0	0	0	1
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	1	0	0	0	1
09:45	10:00	1	0	0	0	1
11:30	11:45	1	0	0	0	1
11:45	12:00	2	0	0	0	2
12:00	12:15	0	0	0	0	0
12:15	12:30	1	0	0	0	1
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	1	0	0	1
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	1	0	0	1
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		8	2	0	0	10

Transportation Services - Traffic Services

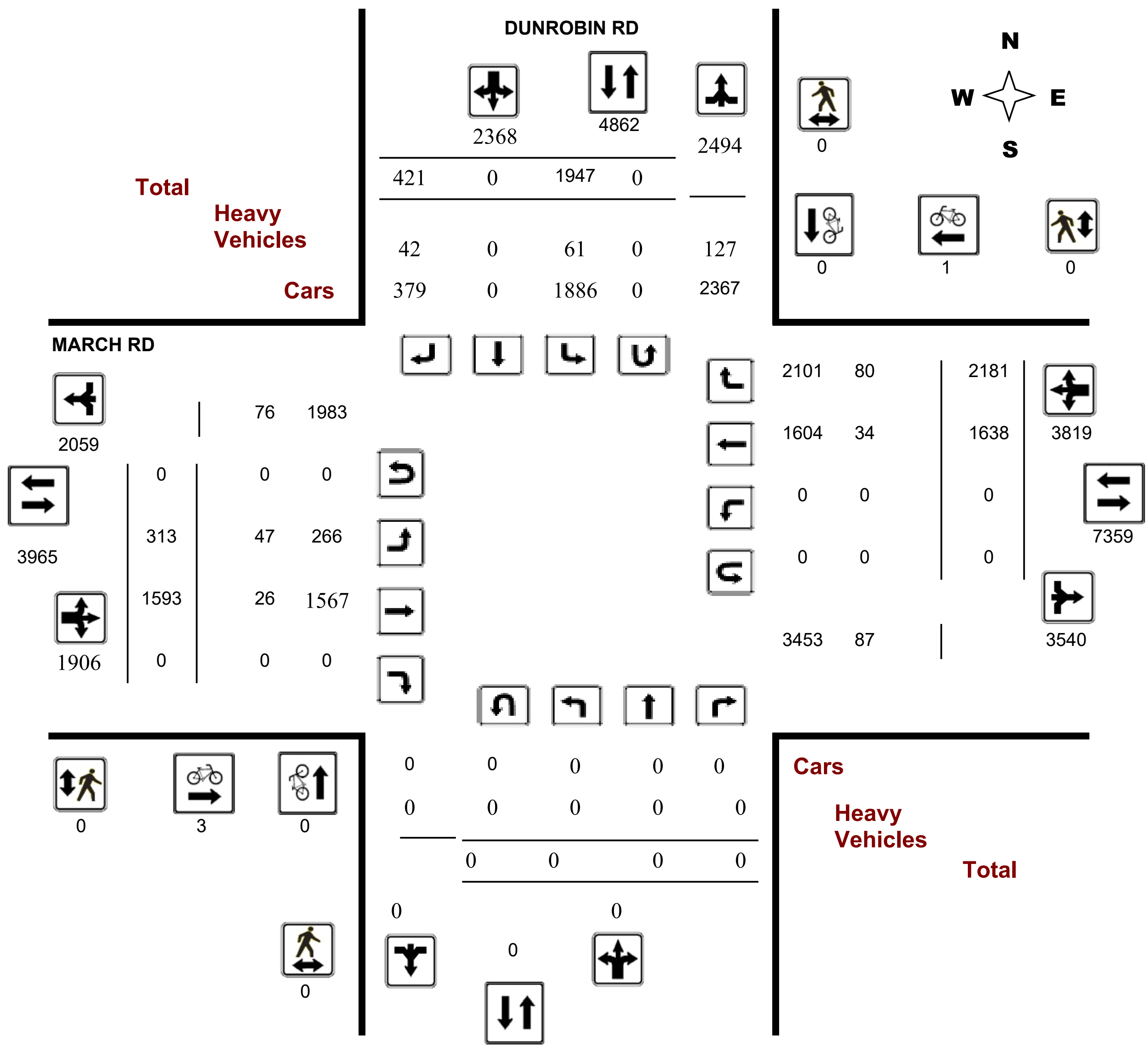
Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

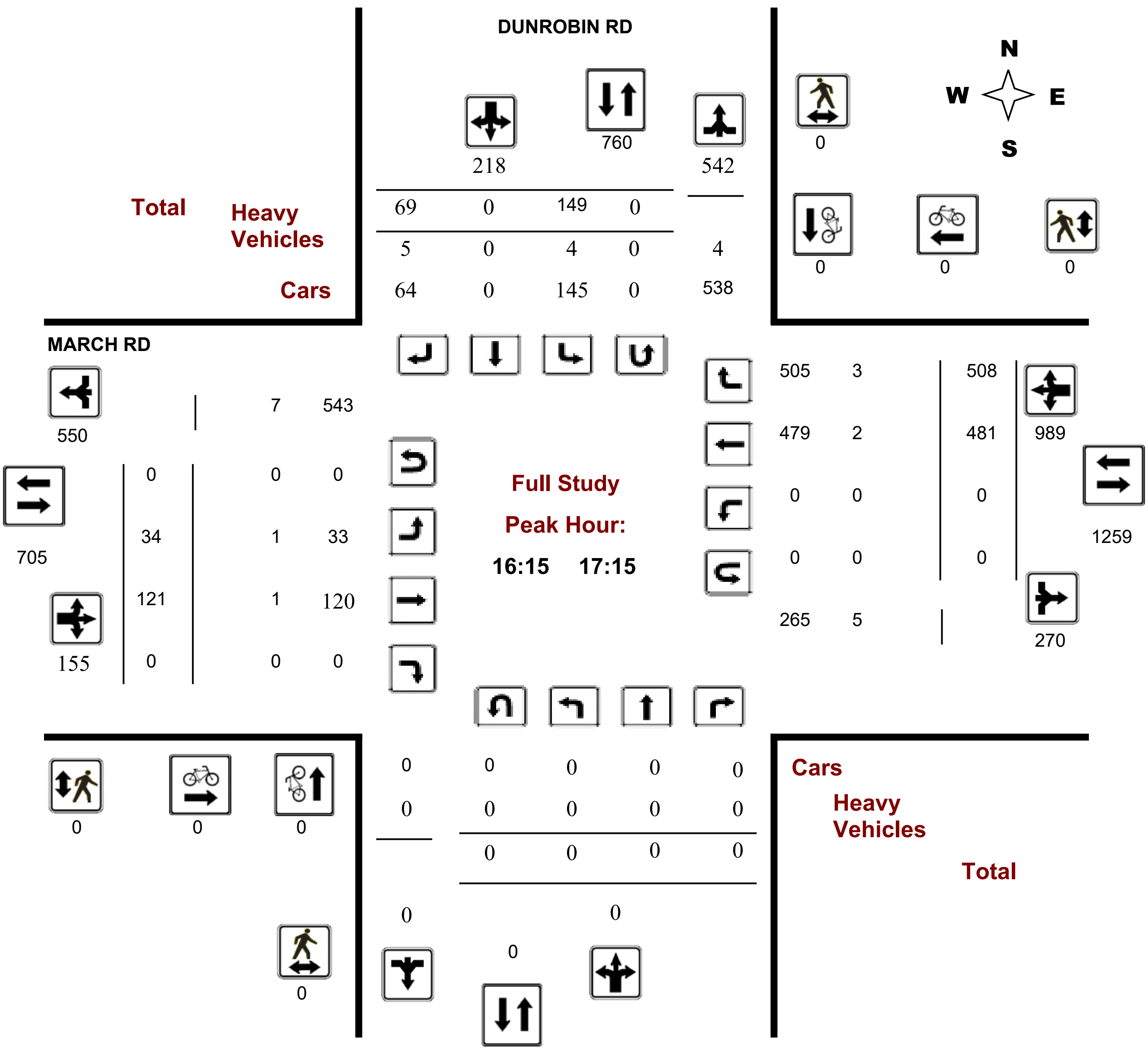
Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

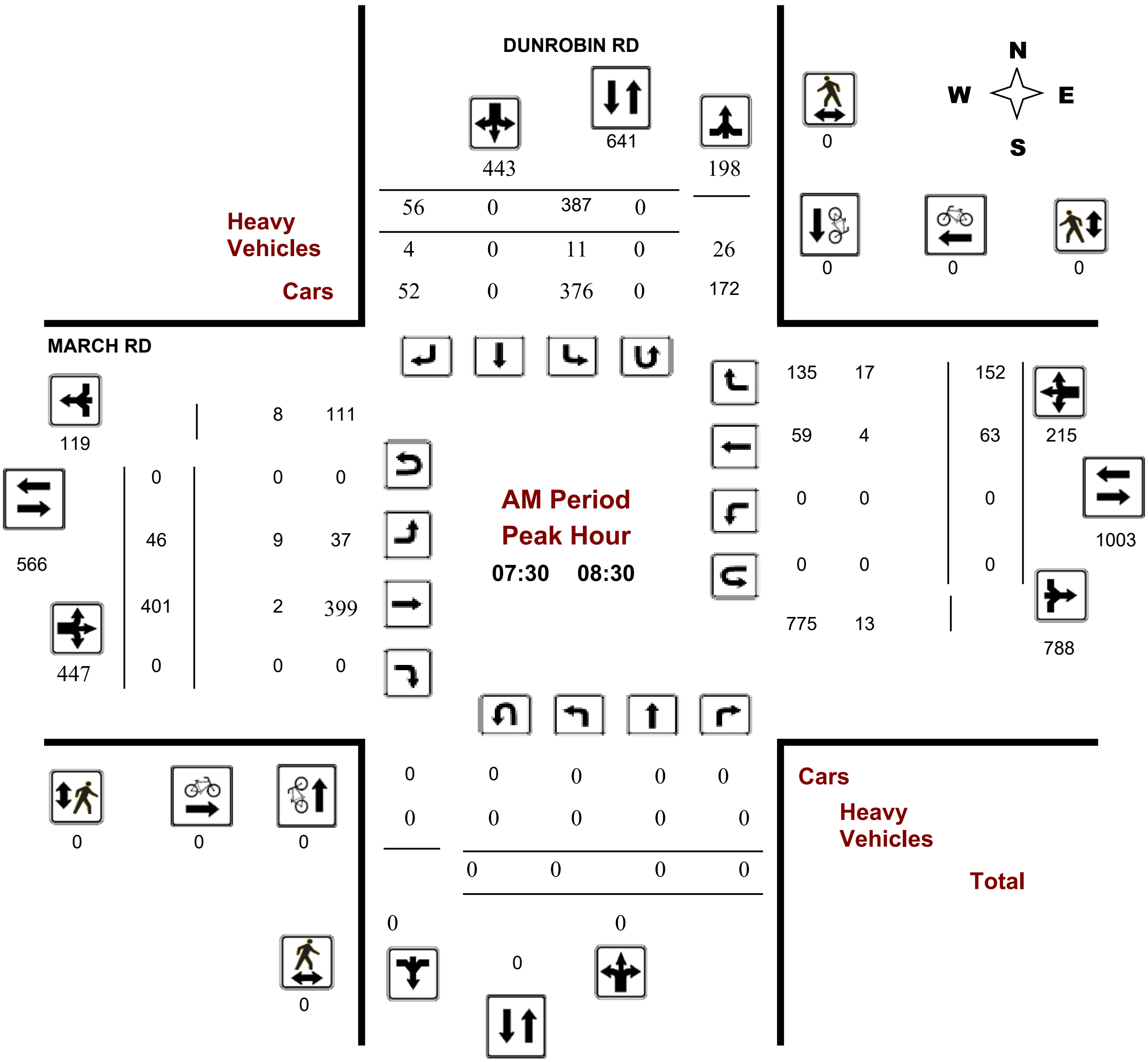
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision



Comments 5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

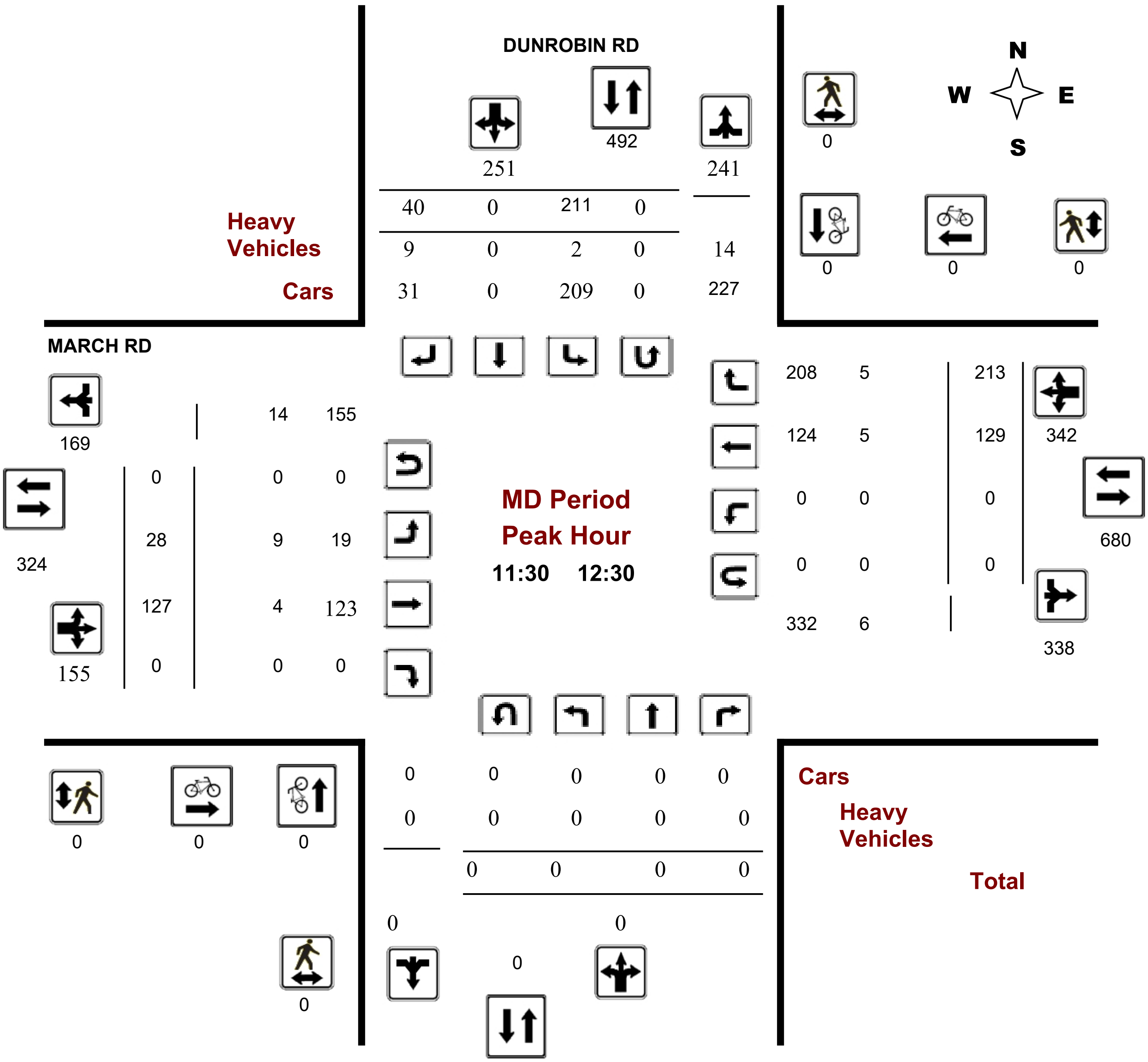
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision



Comments 5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

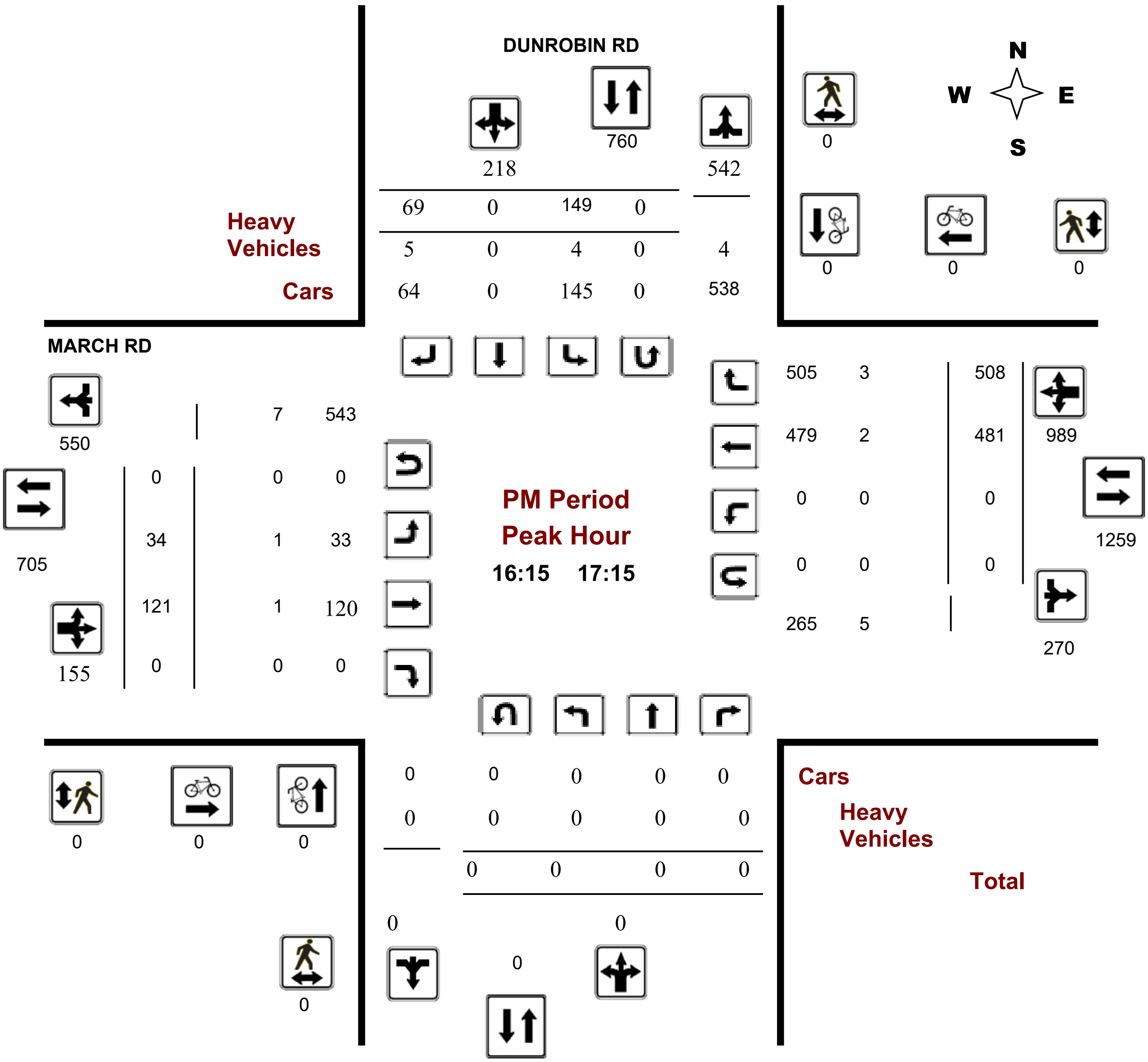
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision



Comments 5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, January 22, 202

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

1.00

	DUNROBIN RD										MARCH RD									
	Northbound				Southbound						Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT		LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	0	0	**0**	405	0	51	**456**	**456**		41	364	0	**405**	0	47	173	**220**	**625**	**1081**
08:00 09:00	0	0	0	**0**	369	0	62	**431**	**431**		35	422	0	**457**	0	72	116	**188**	**645**	**1076**
09:00 10:00	0	0	0	**0**	292	0	49	**341**	**341**		39	243	0	**282**	0	94	144	**238**	**520**	**861**
11:30 12:30	0	0	0	**0**	211	0	40	**251**	**251**		28	127	0	**155**	0	129	213	**342**	**497**	**748**
12:30 13:30	0	0	0	**0**	180	0	55	**235**	**235**		33	112	0	**145**	0	121	173	**294**	**439**	**674**
15:00 16:00	0	0	0	**0**	180	0	55	**235**	**235**		56	113	0	**169**	0	303	402	**705**	**874**	**1109**
16:00 17:00	0	0	0	**0**	156	0	69	**225**	**225**		38	107	0	**145**	0	473	508	**981**	**1126**	**1351**
17:00 18:00	0	0	0	**0**	154	0	40	**194**	**194**		43	105	0	**148**	0	399	452	**851**	**999**	**1193**
Sub Total	0	0	0	**0**	1947	0	421	**2368**	**2368**		313	1593	0	**1906**	0	1638	2181	**3819**	**5725**	**8093**
U Turns				**0**				**0**	**0**					**0**				**0**	**0**	**0**
Total	0	0	0	**0**	1947	0	421	**2368**	**2368**		313	1593	0	**1906**	0	1638	2181	**3819**	**5725**	**8093**
EQ 12Hr	0	0	0	**0**	2706	0	585	**3292**	**3292**		435	2214	0	**2649**	0	2277	3032	**5308**	**7958**	**11249**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

AVG 12Hr	0	0	0	**0**	2551	0	552	**3102**	**3292**	410	2087	0	**2497**	0	2146	2857	**5003**	**7958**	**11249**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **1**

AVG 24Hr	0	0	0	**0**	3341	0	722	**4064**	**4064**	537	2734	0	**3271**	0	2811	3743	**6554**	**9825**	**13889**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

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

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		DUNROBIN RD									MARCH RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	0	106	0	11	117	8	8	99	0	107	0	12	30	42	8	266
07:15	07:30	0	0	0	0	96	0	12	108	1	7	76	0	83	0	16	55	71	1	262
07:30	07:45	0	0	0	0	106	0	10	116	5	10	76	0	86	0	14	45	59	5	261
07:45	08:00	0	0	0	0	97	0	18	115	7	16	113	0	129	0	5	43	48	7	292
08:00	08:15	0	0	0	0	101	0	13	114	1	8	93	0	101	0	22	30	52	1	267
08:15	08:30	0	0	0	0	83	0	15	98	2	12	119	0	131	0	22	34	56	2	285
08:30	08:45	0	0	0	0	93	0	18	111	5	4	100	0	104	0	15	30	45	5	260
08:45	09:00	0	0	0	0	92	0	16	108	10	11	110	0	121	0	13	22	35	10	264
09:00	09:15	0	0	0	0	91	0	10	101	6	7	99	0	106	0	17	25	42	6	249
09:15	09:30	0	0	0	0	78	0	14	92	2	8	55	0	63	0	26	54	80	2	235
09:30	09:45	0	0	0	0	71	0	14	85	2	13	54	0	67	0	30	35	65	2	217
09:45	10:00	0	0	0	0	52	0	11	63	1	11	35	0	46	0	21	30	51	1	160
11:30	11:45	0	0	0	0	62	0	14	76	3	9	33	0	42	0	33	48	81	3	199
11:45	12:00	0	0	0	0	52	0	9	61	3	6	33	0	39	0	26	58	84	3	184
12:00	12:15	0	0	0	0	38	0	9	47	1	6	31	0	37	0	33	59	92	1	176
12:15	12:30	0	0	0	0	59	0	8	67	4	7	30	0	37	0	37	48	85	4	189
12:30	12:45	0	0	0	0	40	0	11	51	3	6	33	0	39	0	29	41	70	3	160
12:45	13:00	0	0	0	0	57	0	14	71	4	12	30	0	42	0	34	41	75	4	188
13:15	13:30	0	0	0	0	40	0	18	58	2	11	23	0	34	0	30	42	72	2	164
15:00	15:15	0	0	0	0	50	0	9	59	2	10	31	0	41	0	64	80	144	2	244
15:15	15:30	0	0	0	0	37	0	20	57	5	12	32	0	44	0	74	110	184	5	285
15:30	15:45	0	0	0	0	48	0	9	57	4	14	26	0	40	0	78	103	181	4	278
15:45	16:00	0	0	0	0	45	0	17	62	3	20	24	0	44	0	87	109	196	3	302
16:00	16:15	0	0	0	0	41	0	10	51	4	10	20	0	30	0	99	118	217	4	298
16:15	16:30	0	0	0	0	36	0	20	56	1	10	17	0	27	0	140	142	282	1	365
16:30	16:45	0	0	0	0	36	0	21	57	3	9	41	0	50	0	139	123	262	3	369
16:45	17:00	0	0	0	0	43	0	18	61	4	9	29	0	38	0	95	125	220	4	319
17:00	17:15	0	0	0	0	34	0	10	44	1	6	34	0	40	0	107	118	225	1	309
17:15	17:30	0	0	0	0	36	0	6	42	0	8	22	0	30	0	109	111	220	0	292
17:30	17:45	0	0	0	0	50	0	13	63	1	15	26	0	41	0	77	113	190	1	294
17:45	18:00	0	0	0	0	34	0	11	45	1	14	23	0	37	0	106	110	216	1	298
13:00	13:15	0	0	0	0	43	0	12	55	4	4	26	0	30	0	28	49	77	4	162
Total:		0	0	0	0	1947	0	421	2368	103	313	1593	0	1906	0	1638	2181	3819	103	8,093

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		DUNROBIN RD Northbound	DUNROBIN RD Southbound	DUNROBIN RD Street Total	MARCH RD Eastbound	MARCH RD Westbound	MARCH RD Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	3	1	4	4
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
Total		0	0	**0**	3	1	4	4

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

	DUNROBIN RD			MARCH RD			
Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	**Total**	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	**Total**	**Grand Total**
07:00 07:15	0	0	**0**	0	0	**0**	**0**
07:15 07:30	0	0	**0**	0	0	**0**	**0**
07:30 07:45	0	0	**0**	0	0	**0**	**0**
07:45 08:00	0	0	**0**	0	0	**0**	**0**
08:00 08:15	0	0	**0**	0	0	**0**	**0**
08:15 08:30	0	0	**0**	0	0	**0**	**0**
08:30 08:45	0	0	**0**	0	0	**0**	**0**
08:45 09:00	0	0	**0**	0	0	**0**	**0**
09:00 09:15	0	0	**0**	0	0	**0**	**0**
09:15 09:30	0	0	**0**	0	0	**0**	**0**
09:30 09:45	0	0	**0**	0	0	**0**	**0**
09:45 10:00	0	0	**0**	0	0	**0**	**0**
11:30 11:45	0	0	**0**	0	0	**0**	**0**
11:45 12:00	0	0	**0**	0	0	**0**	**0**
12:00 12:15	0	0	**0**	0	0	**0**	**0**
12:15 12:30	0	0	**0**	0	0	**0**	**0**
12:30 12:45	0	0	**0**	0	0	**0**	**0**
12:45 13:00	0	0	**0**	0	0	**0**	**0**
13:15 13:30	0	0	**0**	0	0	**0**	**0**
15:00 15:15	0	0	**0**	0	0	**0**	**0**
15:15 15:30	0	0	**0**	0	0	**0**	**0**
15:30 15:45	0	0	**0**	0	0	**0**	**0**
15:45 16:00	0	0	**0**	0	0	**0**	**0**
16:00 16:15	0	0	**0**	0	0	**0**	**0**
16:15 16:30	0	0	**0**	0	0	**0**	**0**
16:30 16:45	0	0	**0**	0	0	**0**	**0**
16:45 17:00	0	0	**0**	0	0	**0**	**0**
17:00 17:15	0	0	**0**	0	0	**0**	**0**
17:15 17:30	0	0	**0**	0	0	**0**	**0**
17:30 17:45	0	0	**0**	0	0	**0**	**0**
17:45 18:00	0	0	**0**	0	0	**0**	**0**
13:00 13:15	0	0	**0**	0	0	**0**	**0**
Total	0	0	**0**	0	0	**0**	**0**

5472188 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		DUNROBIN RD									MARCH RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	**N TOT**	LT	ST	RT	**S TOT**	**STR TOT**	LT	ST	RT	**E TOT**	LT	ST	RT	**W TOT**	**STR TOT**	**Grand Total**
07:00	07:15	0	0	0	**0**	8	0	0	**8**	**8**	0	2	0	**2**	0	0	1	**1**	**3**	**11**
07:15	07:30	0	0	0	**0**	1	0	0	**1**	**1**	2	0	0	**2**	0	1	10	**11**	**13**	**14**
07:30	07:45	0	0	0	**0**	3	0	2	**5**	**5**	2	0	0	**2**	0	1	4	**5**	**7**	**12**
07:45	08:00	0	0	0	**0**	6	0	1	**7**	**7**	2	0	0	**2**	0	1	7	**8**	**10**	**17**
08:00	08:15	0	0	0	**0**	1	0	0	**1**	**1**	0	1	0	**1**	0	0	3	**3**	**4**	**5**
08:15	08:30	0	0	0	**0**	1	0	1	**2**	**2**	5	1	0	**6**	0	2	3	**5**	**11**	**13**
08:30	08:45	0	0	0	**0**	3	0	2	**5**	**5**	0	0	0	**0**	0	1	3	**4**	**4**	**9**
08:45	09:00	0	0	0	**0**	5	0	5	**10**	**10**	2	3	0	**5**	0	0	1	**1**	**6**	**16**
09:00	09:15	0	0	0	**0**	4	0	2	**6**	**6**	2	1	0	**3**	0	1	5	**6**	**9**	**15**
09:15	09:30	0	0	0	**0**	2	0	0	**2**	**2**	2	1	0	**3**	0	6	4	**10**	**13**	**15**
09:30	09:45	0	0	0	**0**	1	0	1	**2**	**2**	3	1	0	**4**	0	2	2	**4**	**8**	**10**
09:45	10:00	0	0	0	**0**	0	0	1	**1**	**1**	1	1	0	**2**	0	2	2	**4**	**6**	**7**
11:30	11:45	0	0	0	**0**	0	0	3	**3**	**3**	3	0	0	**3**	0	1	0	**1**	**4**	**7**
11:45	12:00	0	0	0	**0**	0	0	3	**3**	**3**	1	3	0	**4**	0	0	2	**2**	**6**	**9**
12:00	12:15	0	0	0	**0**	0	0	1	**1**	**1**	4	1	0	**5**	0	3	2	**5**	**10**	**11**
12:15	12:30	0	0	0	**0**	2	0	2	**4**	**4**	1	0	0	**1**	0	1	1	**2**	**3**	**7**
12:30	12:45	0	0	0	**0**	1	0	2	**3**	**3**	1	0	0	**1**	0	0	2	**2**	**3**	**6**
12:45	13:00	0	0	0	**0**	2	0	2	**4**	**4**	3	1	0	**4**	0	1	2	**3**	**7**	**11**
13:15	13:30	0	0	0	**0**	1	0	1	**2**	**2**	5	2	0	**7**	0	0	0	**0**	**7**	**9**
15:00	15:15	0	0	0	**0**	1	0	1	**2**	**2**	2	0	0	**2**	0	1	2	**3**	**5**	**7**
15:15	15:30	0	0	0	**0**	4	0	1	**5**	**5**	2	3	0	**5**	0	2	2	**4**	**9**	**14**
15:30	15:45	0	0	0	**0**	2	0	2	**4**	**4**	1	2	0	**3**	0	1	2	**3**	**6**	**10**
15:45	16:00	0	0	0	**0**	1	0	2	**3**	**3**	1	1	0	**2**	0	1	7	**8**	**10**	**13**
16:00	16:15	0	0	0	**0**	3	0	1	**4**	**4**	0	0	0	**0**	0	2	7	**9**	**9**	**13**
16:15	16:30	0	0	0	**0**	0	0	1	**1**	**1**	0	0	0	**0**	0	2	1	**3**	**3**	**4**
16:30	16:45	0	0	0	**0**	0	0	3	**3**	**3**	1	1	0	**2**	0	0	0	**0**	**2**	**5**
16:45	17:00	0	0	0	**0**	3	0	1	**4**	**4**	0	0	0	**0**	0	0	0	**0**	**0**	**4**
17:00	17:15	0	0	0	**0**	1	0	0	**1**	**1**	0	0	0	**0**	0	0	2	**2**	**2**	**3**
17:15	17:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
17:30	17:45	0	0	0	**0**	1	0	0	**1**	**1**	0	0	0	**0**	0	0	0	**0**	**0**	**1**
17:45	18:00	0	0	0	**0**	1	0	0	**1**	**1**	0	0	0	**0**	0	0	0	**0**	**0**	**1**
13:00	13:15	0	0	0	**0**	3	0	1	**4**	**4**	1	1	0	**2**	0	2	3	**5**	**7**	**11**
Total:	None	0	0	0	**0**	61	0	42	**103**	**103**	47	26	0	**73**	0	34	80	**114**	**187**	**290**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

DUNROBIN RD @ MARCH RD

Survey Date: Wednesday, January 22, 2020 **WO No:** 39373

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		DUNROBIN RD Northbound U-Turn Total	DUNROBIN RD Southbound U-Turn Total	MARCH RD Eastbound U-Turn Total	MARCH RD Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
Total		0	0	0	0	0

Transportation Services - Traffic Services

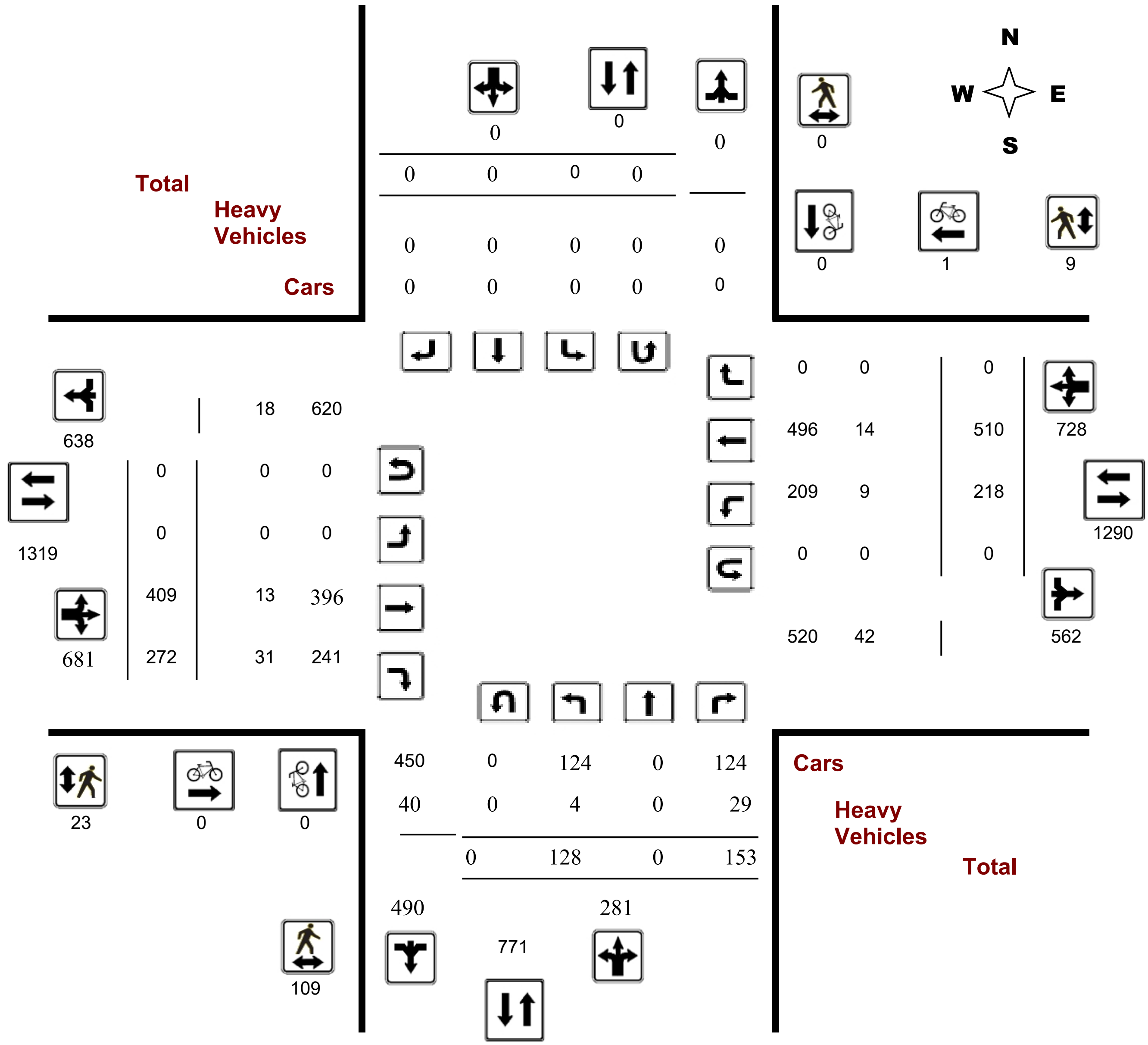
Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

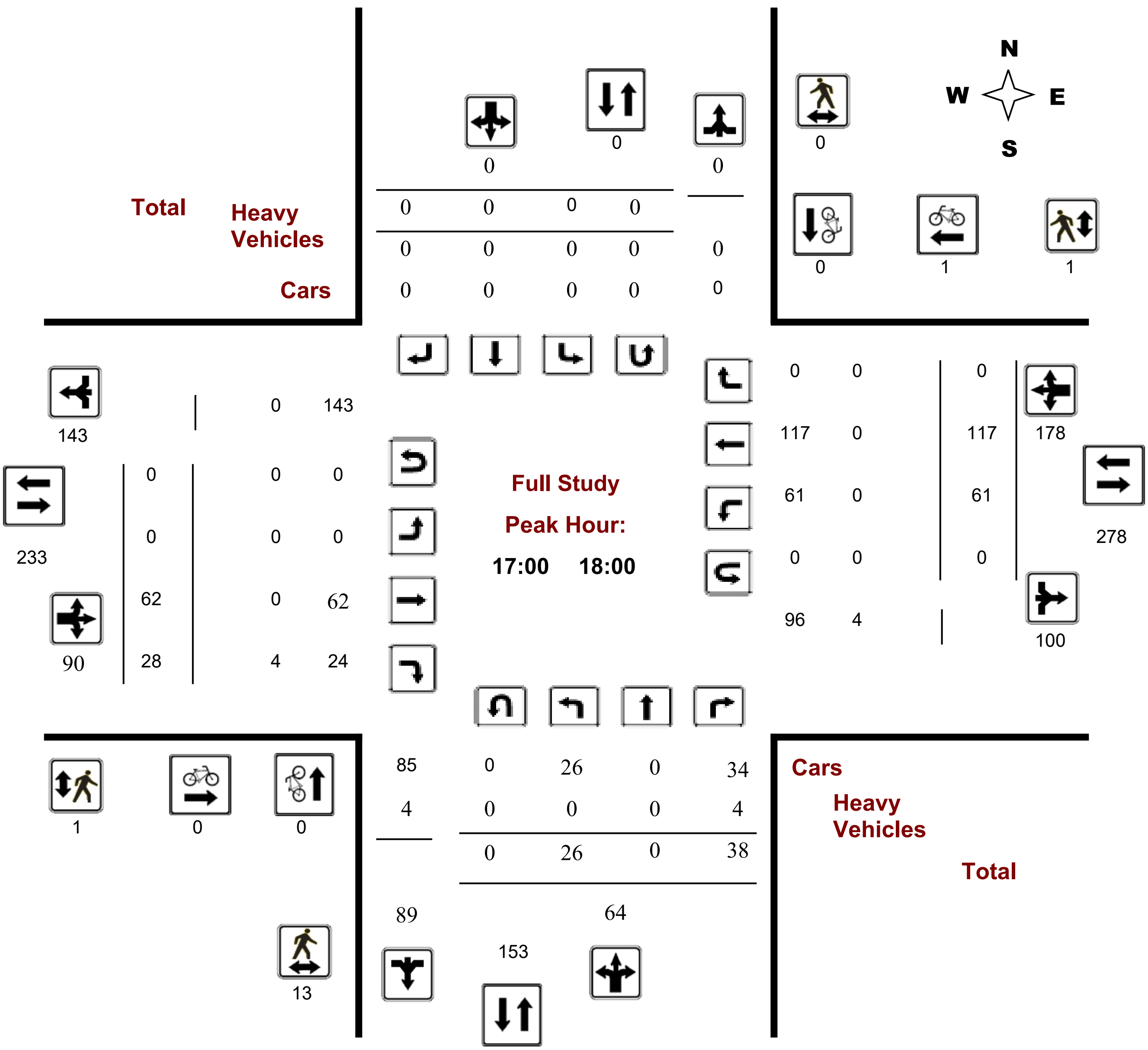
Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



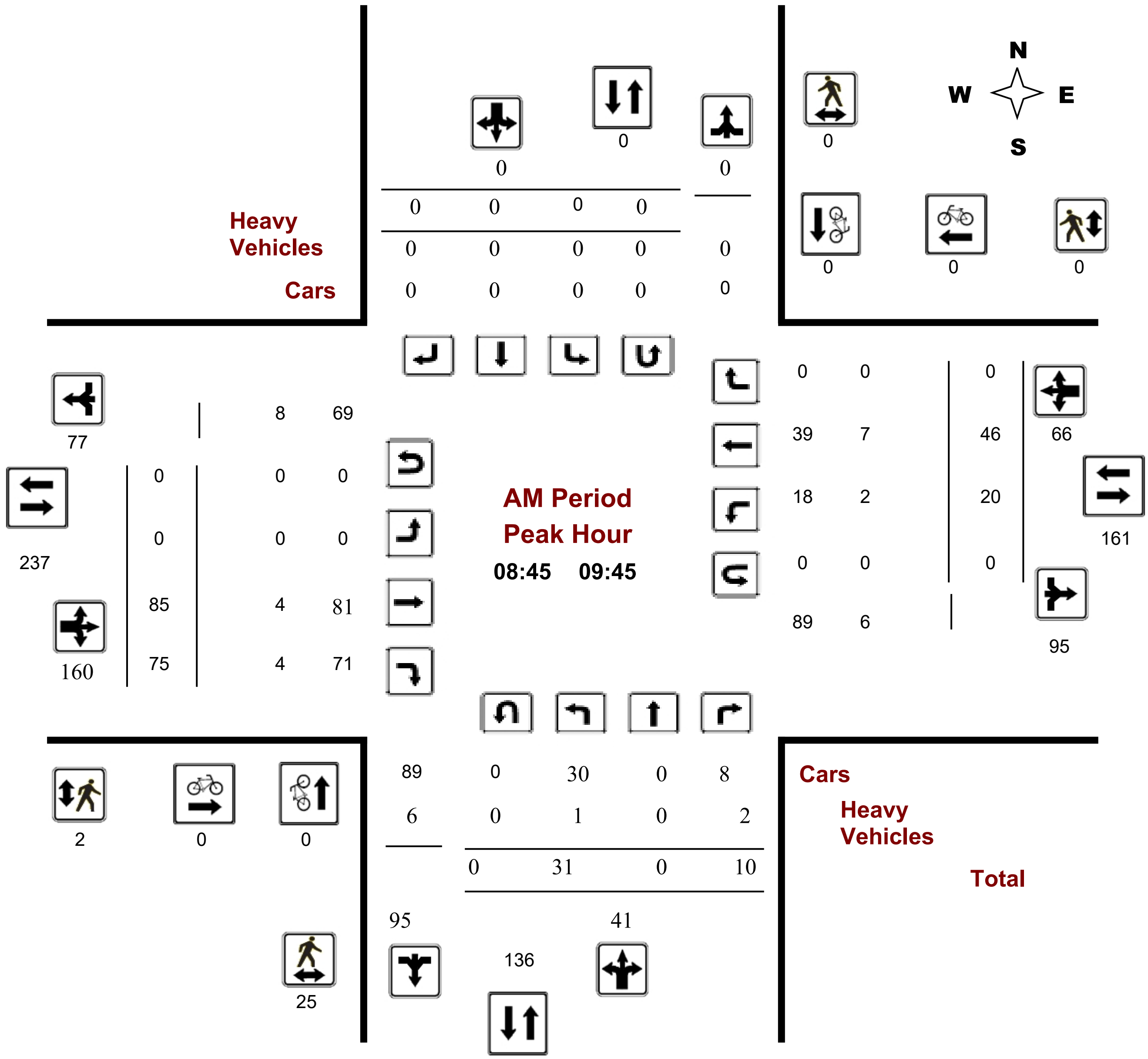
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision



Comments

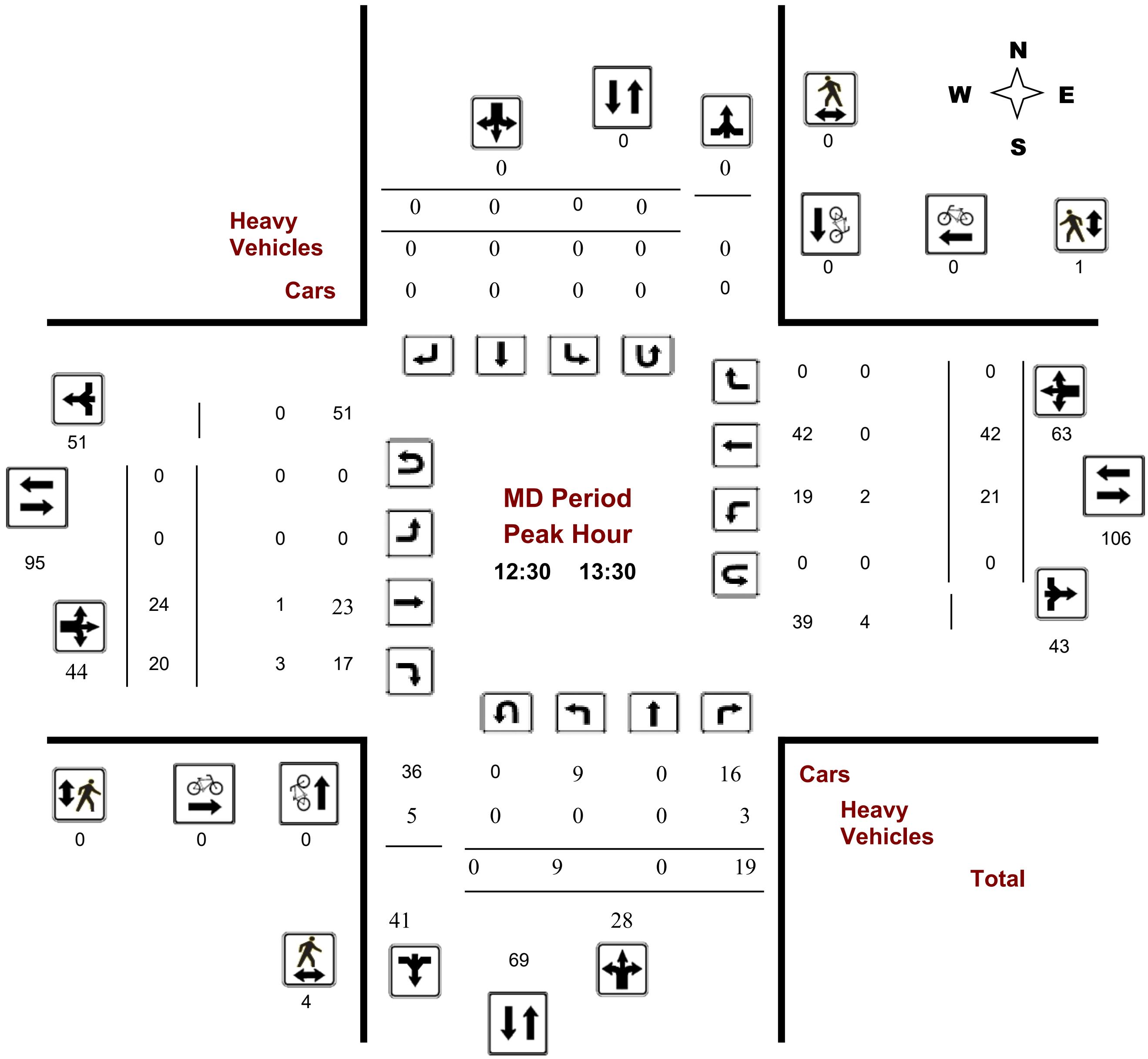
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision



Comments

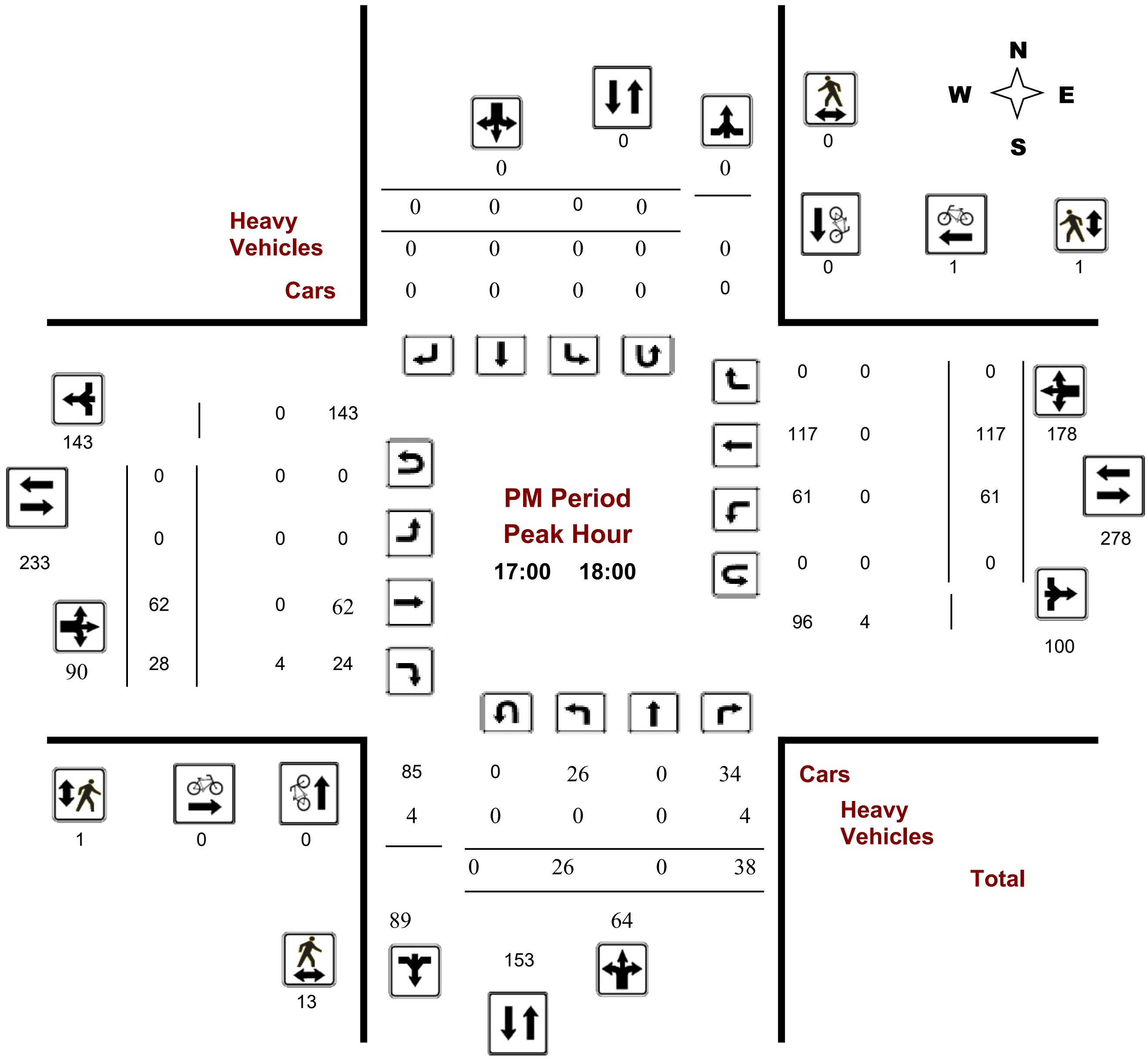
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, November 13, 2019

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

.90

	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	7	0	15	**22**	0	0	0	**0**	**22**	0	65	53	**118**	7	29	0	**36**	**154**	**176**
08:00 09:00	14	0	18	**32**	0	0	0	**0**	**32**	0	56	23	**79**	15	38	0	**53**	**132**	**164**
09:00 10:00	21	0	7	**28**	0	0	0	**0**	**28**	0	78	72	**150**	19	39	0	**58**	**208**	**236**
11:30 12:30	9	0	13	**22**	0	0	0	**0**	**22**	0	20	15	**35**	20	29	0	**49**	**84**	**106**
12:30 13:30	9	0	19	**28**	0	0	0	**0**	**28**	0	24	20	**44**	21	42	0	**63**	**107**	**135**
15:00 16:00	25	0	15	**40**	0	0	0	**0**	**40**	0	46	33	**79**	28	86	0	**114**	**193**	**233**
16:00 17:00	17	0	28	**45**	0	0	0	**0**	**45**	0	58	28	**86**	47	130	0	**177**	**263**	**308**
17:00 18:00	26	0	38	**64**	0	0	0	**0**	**64**	0	62	28	**90**	61	117	0	**178**	**268**	**332**
Sub Total	128	0	153	**281**	0	0	0	**0**	**281**	0	409	272	**681**	218	510	0	**728**	**1409**	**1690**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	128	0	153	**281**	0	0	0	**0**	**281**	0	409	272	**681**	218	510	0	**728**	**1409**	**1690**
EQ 12Hr	178	0	213	**391**	0	0	0	**0**	**391**	0	569	378	**947**	303	709	0	**1012**	**1959**	**2349**

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. **1.39**

	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
AVG 12Hr	151	0	180	**331**	0	0	0	**0**	**352**	0	482	321	**803**	257	601	0	**858**	**1763**	**2114**

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. **0.9**

	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
AVG 24Hr	198	0	236	**434**	0	0	0	**0**	**434**	0	632	420	**1052**	337	788	0	**1124**	**2176**	**2610**

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. **1.31**

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

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

		Northbound				Southbound					Eastbound				Westbound					
Time Period		**LT**	**ST**	**RT**	**N TOT**	**LT**	**ST**	**RT**	**S TOT**	**STR TOT**	**LT**	**ST**	**RT**	**E TOT**	**LT**	**ST**	**RT**	**W TOT**	**STR TOT**	**Grand Total**
07:00	07:15	2	0	2	4	0	0	0	0	1	0	12	12	24	0	4	0	4	1	32
07:15	07:30	2	0	4	6	0	0	0	0	2	0	15	15	30	2	7	0	9	2	45
07:30	07:45	1	0	2	3	0	0	0	0	1	0	25	13	38	4	8	0	12	1	53
07:45	08:00	2	0	7	9	0	0	0	0	2	0	13	13	26	1	10	0	11	2	46
08:00	08:15	3	0	6	9	0	0	0	0	1	0	16	5	21	5	6	0	11	1	41
08:15	08:30	0	0	3	3	0	0	0	0	0	0	18	5	23	2	9	0	11	0	37
08:30	08:45	1	0	5	6	0	0	0	0	3	0	7	4	11	3	9	0	12	3	29
08:45	09:00	10	0	4	14	0	0	0	0	1	0	15	9	24	5	14	0	19	1	57
09:00	09:15	15	0	2	17	0	0	0	0	1	0	38	44	82	1	20	0	21	1	120
09:15	09:30	4	0	1	5	0	0	0	0	0	0	25	17	42	7	5	0	12	0	59
09:30	09:45	2	0	3	5	0	0	0	0	1	0	7	5	12	7	7	0	14	1	31
09:45	10:00	0	0	1	1	0	0	0	0	0	0	8	6	14	4	7	0	11	0	26
11:30	11:45	4	0	3	7	0	0	0	0	1	0	3	4	7	5	5	0	10	1	24
11:45	12:00	5	0	2	7	0	0	0	0	1	0	3	4	7	10	5	0	15	1	29
12:00	12:15	0	0	3	3	0	0	0	0	1	0	6	2	8	5	9	0	14	1	25
12:15	12:30	0	0	5	5	0	0	0	0	0	0	8	5	13	0	10	0	10	0	28
12:30	12:45	5	0	4	9	0	0	0	0	1	0	8	6	14	5	9	0	14	1	37
12:45	13:00	1	0	8	9	0	0	0	0	1	0	2	3	5	6	13	0	19	1	33
13:00	13:15	2	0	4	6	0	0	0	0	1	0	8	4	12	6	13	0	19	1	37
13:15	13:30	1	0	3	4	0	0	0	0	0	0	6	7	13	4	7	0	11	0	28
15:00	15:15	0	0	3	3	0	0	0	0	0	0	7	2	9	2	19	0	21	0	33
15:15	15:30	5	0	4	9	0	0	0	0	0	0	8	4	12	12	21	0	33	0	54
15:30	15:45	11	0	2	13	0	0	0	0	2	0	9	3	12	9	27	0	36	2	61
15:45	16:00	9	0	6	15	0	0	0	0	3	0	22	24	46	5	19	0	24	3	85
16:00	16:15	4	0	6	10	0	0	0	0	1	0	19	10	29	15	29	0	44	1	83
16:15	16:30	3	0	6	9	0	0	0	0	3	0	15	5	20	7	23	0	30	3	59
16:30	16:45	4	0	8	12	0	0	0	0	0	0	10	4	14	11	49	0	60	0	86
16:45	17:00	6	0	8	14	0	0	0	0	1	0	14	9	23	14	29	0	43	1	80
17:00	17:15	8	0	11	19	0	0	0	0	0	0	17	5	22	13	28	0	41	0	82
17:15	17:30	3	0	10	13	0	0	0	0	3	0	11	9	20	18	29	0	47	3	80
17:30	17:45	7	0	7	14	0	0	0	0	0	0	20	8	28	14	33	0	47	0	89
17:45	18:00	8	0	10	18	0	0	0	0	1	0	14	6	20	16	27	0	43	1	81
Total:		128	0	153	281	0	0	0	0	33	0	409	272	681	218	510	0	728	33	1,690

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	1	1	1
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		0	0	**0**	0	1	1	1

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	2	0	**2**	2	0	**2**	**4**
07:15 07:30	1	0	**1**	4	0	**4**	**5**
07:30 07:45	3	0	**3**	1	0	**1**	**4**
07:45 08:00	0	0	**0**	0	0	**0**	**0**
08:00 08:15	1	0	**1**	1	0	**1**	**2**
08:15 08:30	2	0	**2**	0	0	**0**	**2**
08:30 08:45	1	0	**1**	6	0	**6**	**7**
08:45 09:00	8	0	**8**	2	0	**2**	**10**
09:00 09:15	14	0	**14**	0	0	**0**	**14**
09:15 09:30	3	0	**3**	0	0	**0**	**3**
09:30 09:45	0	0	**0**	0	0	**0**	**0**
09:45 10:00	1	0	**1**	0	0	**0**	**1**
11:30 11:45	0	0	**0**	0	0	**0**	**0**
11:45 12:00	0	0	**0**	0	0	**0**	**0**
12:00 12:15	2	0	**2**	0	0	**0**	**2**
12:15 12:30	0	0	**0**	0	0	**0**	**0**
12:30 12:45	1	0	**1**	0	1	**1**	**2**
12:45 13:00	1	0	**1**	0	0	**0**	**1**
13:00 13:15	2	0	**2**	0	0	**0**	**2**
13:15 13:30	0	0	**0**	0	0	**0**	**0**
15:00 15:15	2	0	**2**	0	0	**0**	**2**
15:15 15:30	4	0	**4**	0	0	**0**	**4**
15:30 15:45	7	0	**7**	1	0	**1**	**8**
15:45 16:00	12	0	**12**	1	0	**1**	**13**
16:00 16:15	14	0	**14**	3	2	**5**	**19**
16:15 16:30	7	0	**7**	0	2	**2**	**9**
16:30 16:45	5	0	**5**	0	3	**3**	**8**
16:45 17:00	3	0	**3**	1	0	**1**	**4**
17:00 17:15	1	0	**1**	0	1	**1**	**2**
17:15 17:30	6	0	**6**	0	0	**0**	**6**
17:30 17:45	1	0	**1**	1	0	**1**	**2**
17:45 18:00	5	0	**5**	0	0	**0**	**5**
Total	109	0	**109**	23	9	**32**	**141**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

Time Period		Northbound LT	Northbound ST	Northbound RT	N TOT	Southbound LT	Southbound ST	Southbound RT	S TOT	STR TOT	Eastbound LT	Eastbound ST	Eastbound RT	E TOT	Westbound LT	Westbound ST	Westbound RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	1	**1**	0	0	0	**0**	**1**	0	0	2	**2**	0	0	0	**0**	**2**	**3**
07:15	07:30	1	0	1	**2**	0	0	0	**0**	**2**	0	0	1	**1**	1	1	0	**2**	**3**	**5**
07:30	07:45	0	0	1	**1**	0	0	0	**0**	**1**	0	0	2	**2**	0	1	0	**1**	**3**	**4**
07:45	08:00	0	0	2	**2**	0	0	0	**0**	**2**	0	0	0	**0**	0	0	0	**0**	**0**	**2**
08:00	08:15	0	0	1	**1**	0	0	0	**0**	**1**	0	1	1	**2**	0	0	0	**0**	**2**	**3**
08:15	08:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	1	**1**	0	0	0	**0**	**1**	**1**
08:30	08:45	0	0	3	**3**	0	0	0	**0**	**3**	0	0	2	**2**	0	1	0	**1**	**3**	**6**
08:45	09:00	1	0	0	**1**	0	0	0	**0**	**1**	0	0	0	**0**	2	1	0	**3**	**3**	**4**
09:00	09:15	0	0	1	**1**	0	0	0	**0**	**1**	0	3	2	**5**	0	5	0	**5**	**10**	**11**
09:15	09:30	0	0	0	**0**	0	0	0	**0**	**0**	0	1	1	**2**	0	0	0	**0**	**2**	**2**
09:30	09:45	0	0	1	**1**	0	0	0	**0**	**1**	0	0	1	**1**	0	1	0	**1**	**2**	**3**
09:45	10:00	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	1	0	**1**	**1**	**1**
11:30	11:45	0	0	1	**1**	0	0	0	**0**	**1**	0	0	1	**1**	0	0	0	**0**	**1**	**2**
11:45	12:00	1	0	0	**1**	0	0	0	**0**	**1**	0	0	2	**2**	0	0	0	**0**	**2**	**3**
12:00	12:15	0	0	1	**1**	0	0	0	**0**	**1**	0	0	0	**0**	0	0	0	**0**	**0**	**1**
12:15	12:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	1	0	**1**	**1**	**1**
12:30	12:45	0	0	1	**1**	0	0	0	**0**	**1**	0	0	1	**1**	1	0	0	**1**	**2**	**3**
12:45	13:00	0	0	1	**1**	0	0	0	**0**	**1**	0	1	0	**1**	0	0	0	**0**	**1**	**2**
13:00	13:15	0	0	1	**1**	0	0	0	**0**	**1**	0	0	0	**0**	1	0	0	**1**	**1**	**2**
13:15	13:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	2	**2**	0	0	0	**0**	**2**	**2**
15:00	15:15	0	0	0	**0**	0	0	0	**0**	**0**	0	1	2	**3**	0	0	0	**0**	**3**	**3**
15:15	15:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	1	**1**	2	0	0	**2**	**3**	**3**
15:30	15:45	0	0	2	**2**	0	0	0	**0**	**2**	0	1	0	**1**	0	0	0	**0**	**1**	**3**
15:45	16:00	1	0	2	**3**	0	0	0	**0**	**3**	0	2	1	**3**	0	1	0	**1**	**4**	**7**
16:00	16:15	0	0	1	**1**	0	0	0	**0**	**1**	0	1	0	**1**	0	1	0	**1**	**2**	**3**
16:15	16:30	0	0	3	**3**	0	0	0	**0**	**3**	0	1	2	**3**	1	0	0	**1**	**4**	**7**
16:30	16:45	0	0	0	**0**	0	0	0	**0**	**0**	0	0	1	**1**	1	0	0	**1**	**2**	**2**
16:45	17:00	0	0	1	**1**	0	0	0	**0**	**1**	0	1	1	**2**	0	0	0	**0**	**2**	**3**
17:00	17:15	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
17:15	17:30	0	0	3	**3**	0	0	0	**0**	**3**	0	0	2	**2**	0	0	0	**0**	**2**	**5**
17:30	17:45	0	0	0	**0**	0	0	0	**0**	**0**	0	0	1	**1**	0	0	0	**0**	**1**	**1**
17:45	18:00	0	0	1	**1**	0	0	0	**0**	**1**	0	0	1	**1**	0	0	0	**0**	**1**	**2**
Total:	None	4	0	29	**33**	0	0	0	**0**	**33**	0	13	31	**44**	9	14	0	**23**	**67**	**100**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

FLAMBOROUGH WAY @ HALTON TER

Survey Date: Wednesday, November 13, 2019 **WO No:** 38974

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	0	0	0
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: DUNROBIN RD @ MARCH RD

Traffic Control: Traffic signal **Total Collisions:** 18

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-12, Sun,13:30	Clear	Rear end	P.D. only	Wet	South	Going ahead	Truck-other	Other motor vehicle	
					South	Stopped	Passenger van	Other motor vehicle	
2014-Nov-09, Sun,23:53	Clear	SMV other	P.D. only	Wet	West	Going ahead	Passenger van	Ran off road	
2014-Feb-06, Thu,18:20	Clear	Turning movement	Non-fatal injury	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2014-Dec-17, Wed,17:30	Snow	Turning movement	Non-fatal injury	Wet	East	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Mar-29, Sun,18:00	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Passenger van	Other motor vehicle	
2015-Jul-07, Tue,16:20	Clear	Rear end	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Passenger van	Other motor vehicle	

					South	Turning left	Automobile, station wagon	Other motor vehicle
2015-Nov-12, Thu,11:33	Rain	Angle	P.D. only	Wet	West	Turning right	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2015-Nov-26, Thu,07:45	Clear	Sideswipe	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					South	Turning left	School bus	Other motor vehicle
2015-Dec-20, Sun,02:41	Clear	SMV other	P.D. only	Ice	West	Going ahead	Automobile, station wagon	Ran off road
2016-May-05, Thu,19:29	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Mar-29, Tue,17:17	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2016-Jul-02, Sat,00:45	Rain	Sideswipe	P.D. only	Wet	South	Overtaking	Unknown	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jun-08, Thu,17:57	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Pick-up truck	Other motor vehicle

2017-Apr-11, Tue,18:59	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Oct-11, Wed,19:21	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Truck - open	Other motor vehicle	
2017-Dec-15, Fri,16:50	Snow	Turning movement	P.D. only	Loose snow	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Skidding/sliding	
2018-Jun-23, Sat,11:41	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Nov-01, Thu,06:30	Clear	Sideswipe	P.D. only	Dry	East	Merging	Unknown	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: HALTON TERR/MAXWELL BRIDGE RD @ MARCH RD

Traffic Control: Traffic signal **Total Collisions:** 12

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jul-29, Tue,19:40	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Skidding/sliding	
2016-Feb-28, Sun,19:57	Freezing Rain	Turning movement	P.D. only	Ice	West	Turning left	Pick-up truck	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Dec-13, Sun,17:23	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Passenger van	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2016-Sep-30, Fri,19:32	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2016-Dec-23, Fri,10:59	Clear	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2016-Nov-24, Thu,06:47	Snow	Turning movement	Non-fatal injury	Ice	South	Turning left	Pick-up truck	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-05, Mon,08:23	Snow	Sideswipe	P.D. only	Loose snow	West	Changing lanes	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Apr-19, Wed,14:14	Rain	Angle	Non-fatal injury	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2017-Jun-22, Thu,10:59	Clear	Other	P.D. only	Dry	West	Reversing	Automobile, station wagon	Other motor vehicle

					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Nov-28, Tue,22:03	Rain	SMV other	Non-fatal injury	Wet	South	Turning left	Automobile, station wagon	Pedestrian	1
2018-Dec-05, Wed,18:26	Snow	Turning movement	P.D. only	Loose snow	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Nov-15, Thu,17:20	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: MARCH RD @ MAXWELL RD

Traffic Control: Stop sign **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Oct-24, Fri,09:54	Clear	Angle	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Feb-14, Tue,16:55	Snow	Rear end	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Pick-up truck	Other motor vehicle	

Location: MARCH RD btwn DUNROBIN RD & MURPHY CRT

Traffic Control: No control **Total Collisions:** 26

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Apr-20, Sun,21:05	Clear	SMV other	P.D. only	Dry	South	Going ahead	Pick-up truck	Animal - wild	

2014-Sep-27, Sat,04:51	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Steel guide rail
2014-Nov-19, Wed,17:35	Clear	Other	P.D. only	Dry	North	Going ahead	Unknown	Animal - wild
					South	Going ahead	Automobile, station wagon	Animal - wild
2014-Nov-19, Wed,17:35	Clear	SMV other	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Animal - wild
2015-Sep-24, Thu,07:01	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild
2015-Apr-18, Sat,07:17	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild
2016-Aug-04, Thu,09:45	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild
2016-Jan-09, Sat,07:00	Rain	SMV other	Non-fatal injury	Slush	South	Going ahead	Automobile, station wagon	Skidding/sliding
2015-Nov-06, Fri,18:08	Clear	SMV other	P.D. only	Dry	South	Going ahead	Passenger van	Animal - wild
2015-Dec-03, Thu,17:00	Clear	Approaching	Non-fatal injury	Dry	North	Going ahead	Passenger van	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Pick-up truck	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle

					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2016-Jan-14, Thu,08:13	Snow	SMV other	Non-fatal injury	Slush	North	Going ahead	Passenger van	Skidding/sliding
2015-Dec-28, Mon,18:54	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild
2016-Apr-17, Sun,17:15	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Passenger van	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jun-11, Sat,17:12	Rain	Turning movement	P.D. only	Wet	North	Making "U" turn	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-21, Wed,17:53	Clear	SMV other	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Animal - wild
2016-Dec-25, Sun,21:46	Clear	SMV other	P.D. only	Dry	North	Going ahead	Passenger van	Animal - wild
2017-Mar-25, Sat,14:46	Clear	Rear end	P.D. only	Wet	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2017-Jun-01, Thu,21:10	Clear	SMV other	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Animal - wild
2017-Dec-14, Thu,21:05	Clear	SMV other	P.D. only	Wet	South	Going ahead	Pick-up truck	Ran off road

2018-Jan-14, Sun,11:45	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild	
2018-Jun-21, Thu,04:55	Clear	SMV other	P.D. only	Dry	South	Going ahead	Delivery van	Animal - wild	
2018-Dec-06, Thu,19:08	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild	
2018-Dec-03, Mon,17:33	Clear	SMV other	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Animal - wild	
2018-Dec-13, Thu,20:46	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild	
2018-Nov-14, Wed,17:35	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - domestic	
2018-Dec-20, Thu,20:46	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild	

Location: MARCH RD btwn HALTON TERR/MAXWELL BRIDGE RD & MAXWELL RD

Traffic Control: No control **Total Collisions:** 22

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-May-01, Thu,20:55	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild	
2014-May-20, Tue,01:30	Clear	SMV other	P.D. only	Dry	North	Going ahead	Pick-up truck	Animal - wild	
2014-Jun-23, Mon,00:02	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild	
2014-Nov-11, Tue,17:44	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild	

2015-Jun-20, Sat,03:14	Clear	SMV other	Non-fatal injury	Dry	South	Overtaking	Automobile, station wagon	Ran off road
2014-Dec-18, Thu,21:15	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Animal - wild
2015-Jan-20, Tue,09:37	Clear	Rear end	Non-fatal injury	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2015-Sep-04, Fri,21:33	Clear	SMV other	P.D. only	Dry	South	Going ahead	Pick-up truck	Animal - wild
2015-Jun-17, Wed,13:38	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Sep-02, Wed,09:15	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Pick-up truck	Other motor vehicle
2016-Oct-19, Wed,09:08	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2016-May-06, Fri,06:56	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild
2016-Apr-22, Fri,13:53	Clear	SMV other	P.D. only	Wet	North	Unknown	Unknown	Animal - domestic

2016-Apr-24, Sun,11:02	Clear	Turning movement	P.D. only	Dry	North	Making "U" turn	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Pick-up truck	Other motor vehicle
2017-Feb-08, Wed,04:35	Freezing Rain	SMV other	P.D. only	Slush	West	Reversing	Construction equipment	Pole (sign, parking meter)
2017-Feb-21, Tue,11:58	Clear	Sideswipe	Non-fatal injury	Dry	North	Merging	Pick-up truck	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-11, Sun,21:53	Snow	SMV other	P.D. only	Loose snow	South	Going ahead	Passenger van	Pole (utility, power)
2017-Jun-06, Tue,14:15	Clear	Sideswipe	P.D. only	Wet	North	Changing lanes	Unknown	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Apr-06, Thu,21:59	Rain	Rear end	P.D. only	Wet	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Passenger van	Other motor vehicle
2017-Nov-27, Mon,17:36	Clear	SMV other	Non-fatal injury	Wet	South	Going ahead	Automobile, station wagon	Ran off road
2018-Feb-01, Thu,17:05	Snow	Rear end	P.D. only	Loose snow	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					North	Making "U" turn	Snow plow	Other

2018-Dec-05, Wed,16:50	Snow	SMV other	P.D. only	Loose snow	West	Going ahead	Automobile, station wagon	Animal - wild	

Location: MARCH RD btwn MURPHY CRT & MAXWELL RD

Traffic Control: No control **Total Collisions:** 5

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jun-23, Mon,05:55	Clear	SMV other	P.D. only	Dry	South	Going ahead	Passenger van	Animal - wild	
2015-Jan-04, Sun,13:31	Clear	Approaching	Non-fatal injury	Wet	North	Going ahead	Pick-up truck	Skidding/sliding	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Sep-17, Sun,11:02	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Oct-01, Mon,19:31	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Slowing or stopping	Pick-up truck	Other motor vehicle	
2018-Dec-11, Tue,18:30	Snow	SMV other	P.D. only	Loose snow	North	Going ahead	Automobile, station wagon	Animal - wild	

Location: MAXWELL BRIDGE RD btwn CELTIC RIDGE CRES & BRAECREEK AVE

Traffic Control: No control **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Dec-22, Thu,12:45	Clear	Turning movement	P.D. only	Packed snow	North	Going ahead	Pick-up truck	Other motor vehicle	
					North	Turning right	Automobile, station wagon	Other motor vehicle	

Location: MAXWELL BRIDGE RD btwn FORDELL AVE & ARNCLIFFE AVE

Traffic Control: No control **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Apr-11, Fri,07:30	Clear	SMV unattended vehicle	P.D. only	Wet	North	Reversing	Pick-up truck	Unattended vehicle	

Location: MAXWELL BRIDGE RD btwn MARCH RD & WINDANCE CRES

Traffic Control: No control **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-May-13, Tue,09:44	Clear	SMV unattended vehicle	P.D. only	Dry	East	Going ahead	Passenger van	Unattended vehicle	

Location: MAXWELL BRIDGE RD btwn WINDANCE CRES & PENDRA WAY

Traffic Control: No control **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jul-27, Sun,16:52	Clear	SMV unattended vehicle	P.D. only	Dry	North	Reversing	Pick-up truck	Unattended vehicle	

Appendix B CORRESPONDENCE

Al Hasoo, Mohammed

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Friday, March 5, 2021 8:25 AM
To: Abdelnaby, Ahmed
Cc: Al Hasoo, Mohammed
Subject: RE: 927 March Rd Strategy Report - TPM Comments _Stantec Response

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Ahmed,

I wanted to follow-up with the issues we discussed last week.

- Comment 2: Your proposed approach is good.
- Comment 8: The reference to the Transit Priority Measures are those currently included in the TMP along March Road. In addition, supplemental TDM measures should be discussed within the Strategy report.
- Comment 9d: The current RMA plan assumes March Road in it’s current configuration. If you wish to assume a double WB-LT for future horizon years, please state your assumptions within the TIA.
- Comment 11: A cycle length of 120 seconds or less should be used for the Synchro analysis.
- 910 March Road: There is a SPA on DevApps now (Application # D02-02-20-0050) for 910 March Road. Note that the applicant is proposing signalizing their access with March Road. This application is currently in review and the proposed intersection modification have no official status, however there is a high probability that there will be a signal at this location. Please proceed how you think is best for your site.

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d’infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d’Ottawa
Tel |Tél. : 613-580- 2424 ext. | poste 21765
web | Site Web : www.ottawa.ca

Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.
Veuillez noter que je travaille de la maison en ce moment. Veuillez communiquer avec moi par courriel. Merci de votre patience et compréhension.

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Thursday, December 17, 2020 10:21 AM
To: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Cc: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Subject: 927 March Rd Strategy Report - TPM Comments

Hello,

Please find comments below regarding the Strategy Report for 927 March Road.

Transportation Engineering Services

1. *Section 2.1.1 Proposed Development*: Inconsistencies remain in the concept plan, Table 1, and the trip generation sections of the report with regards to unit counts. This makes the report difficult to follow so please ensure that these are corrected. Noted, upon clarification with the developer, the unit count provided in Table 1 is the latest. The Site plan will be updated through the next submission to reflect the table.

2. *Section 3.1.1 Trip Generation and Mode Shares*: Recognize that mode shares will change at various horizon years and that the transit mode share in particular will need significant TDM support in order to achieve 20% by the construction of phase 1.

Noted, we have reached out to Minto and to Claridge to ensure consistency with assumptions. In support of reaching the City's modal share targets, Brigil is open to have an early transit service agreement with OC Tranpo. Furthermore we will investigate supportive TDM measures and tools that can enhance transit modal shares. It is noted that by the end of year 2025, the western LRT extension would have been completed, which is anticipated to result in generally more transit users. Although the timing of the future park and ride in the Claridge site is unknown, assuming this may be completed by the Claridge's buildout (2026) will also enhance transit modal shares in the general area.

To address the City's concerns, we propose using a transit modal share of 10% for Phases 1 and 2 (2024 and 2025). Both phases can be supported by very basic TDM measures and this modal share reflects the existing modal shares for the Rural West zone just north of the study area. For phases being completed by 2026 and onwards a 20% is likely to be met given an early transit service, supplemental TDM measures, and the confederation line extension. We note that significant portions of KNUEA lands would be built by the 2026 horizon including (1053,1075, 1145 March Rd, 936 March Rd, and phases 1-3 of 927 March). By then, we are assuming that there will be sufficient transit coverage in place for the general area and that the modal share for KNUEA lands would look similar to that of Stittsville (closer to the 20%).

3. *Section 4.1.1 Design for Sustainable Modes & 4.1.3 New Street Networks*:
    a. Add a discussion of the cross-section of Street B. Noted and will be added to the report. Street B is anticipated to be similar to Street A (neighborhood collector) in terms of the ROW and its cross section will be extracted from the 2019 neighborhood collector design guidelines.
    b. Consider the need for parking along Street A, in particular, along the boundary of the proposed school for parent drop off or school bus drop off. Noted; this will be investigated in further detail with the developer.
    c. Street D will require traffic calming features. Consider designating parking or layby areas along the corridor to narrow lanes and address the 30km/h design speed. The school drop off needs should be considered during this road design. Noted, will be explored in further details in the next submission.

4. *Section 4.3.1 Multi Modal Level of Service*:
    a. Include MMLOS of Street B. Noted and will be addressed in subsequent submissions
    b. Correct the PLOS segment achievement of March Road between Maxwell Bridge and Street D. The curbside right-turn lane is not present for the entirety of the segment, therefore should not govern. The original analysis attempted to capture the segment of March Road with a sidewalk (i.e adjacent to the curbside right-turn lane) because the point at which the sidewalk and curbside right turn lane terminate together was captured in another segment along March Road between Street A and Street D. This will be revised in the subsequent submission as per the City's request.

5. *Section 4.5 Transportation Demand Management*: While TDM strategies will be further developed as individual site plans are presented, the recognition of a few TDM Measures such as unbundling the price of parking for apartment units and those suggested by transit will set the course for the next

stages of development. Noted, TDM measures will be investigated in further details in the following submission.

6. *Section 4.7.1 Route Capacity*: The 21% transit mode share referenced in the Kanata North Urban Expansion Area (KNUEA) TMP is based on implementation of the following infrastructure:
    a. BRT from Corkstown to Solandt,
    b. KNUEA Park and Ride, and
    c. transit priority measures from Solandt to the KNUEA Park and Ride.

    Given that these are not likely to be in place by buildout, either provide a demand rationalization strategy or a TDM strategy and monitoring plan to achieve these targets.

    Refer to Comment #2.

7. *Section 4.9.2.2 - 2022-First Phase Buildout*:
    a. The report indicates the 45% of the site generated traffic will use the NB LT. Confirm that this 45% include all trips generated from Phase 1 since the connection to Old Carp Road will not be provided at that time. Noted, the 45% does not include all of the site generated traffic. These will be moved to use the NBLT at March / Street A for phase 1. We have reached out to the developer and were advised that roads will be constructed based on their respective phases. Old Carp Road will be assumed to be in place by 2026.
    b. The implementation of a NB left-turn lane of the March Road/Street A intersection at Phase 1 build out is supported but should accommodate ultimate volumes as well. Noted, queue length will be outlined for each horizon to reflect interim and ultimate conditions.

8. *Section 5.0 Summary and Conclusions*: Include the transit priority measures in this section to support mode shares presented in other parts of the report. There are no transit priority measures proposed outside the City's TMP range. Is the City referring to TDM measures?

9. *General comments*:
    a. There is currently no timeline for the widening of March Road. However, it is acknowledged that widening is required to meet future vehicle needs. Demand rationalization should discuss the impacts of no widening with full build out at 2034 and be detailed in section 4.9.2.5. Consider what is required to reduce the vehicle demand to acceptable limits. Noted, description will be added to the impacts of not widening March Road. Demand rationalization in case March road remains as a 2-lane road will be mainly around choosing alternative routes, peak spreading, or changing modes due to congestion. We do note that demand rationalization for this area is likely to be around peak spreading or changing modes given the limited route choices to reach the area. We will provide a summary of how much theoretical demand rationalization is required in case March Road is not widened. Proper description will be added accordingly.
    b. It is acknowledged that side street failure will come first but please indicate when March Road and Street A show failure on March Road following proposed intersection modifications and signalization. Modifications are assumed to include NB and SB LT lanes, EB and WB LT lanes and a NB RT lane. Previous reports have provided information based on number of units, however, much of this has changed since the Kanata North TMP report was completed. Noted March Rd failure as a 2-lane rd has been described in the report under the demand rationalization section as well as for the 2026 horizon analysis. We will revisit this section to ensure clarity.

c. The intersection of March Road and Street A is DC funded and it is anticipated that it will be built with all required auxiliary lanes and traffic signals for both subdivisions on the east and west side at Street A. Cross rides will only be provided in the NB and SB directional until March Road is widened to 4 lanes at which point a protected intersection will be constructed. Noted.

d. Co-ordination between Brigil and Minto is strongly urged to facilitate the full intersection modification including signalization. This will minimize throwaway costs by having all roadworks in a final configuration within the ROW. Funds for civil works at the intersection are available in 2021, however, the cost of the traffic signal would need to be front-ended until warrants are met. Noted, we have connected with Minto and confirmed the geometry at Street A. We note that Minto indicated that the WBL turn will be a double left once March Rd is widened. And we will be reflecting this in our analysis of the ultimate conditions.

Traffic Signal Operations

10. The development at 927 March Road is interconnected to developments at 936 March Road and possibly with a commercial development on the east side of proposed Street D. Noted. Street D (right-in-right-out) was assigned a portion of traffic in the report, including pass-by traffic due to the commercial development

11. A cycle length of 130 seconds for analysis is too high. Please lower it and re-analyze. An initial cycle length of 100s was used for phase 1, and the cycle length was increased to 130s for the 2026 year horizon onwards to support the operations on March Road as they were nearing capacity and to accommodate side street traffic. A 130s cycle was selected to as the maximum cycle that can be used for planning and is also consistent with the cycle length at Maxwell Bridge / March Rd. A shorter cycle length would likely result in deteriorated traffic operations at the intersection.

Transit Services

12. Note that Street A is identified as a transit street and it is anticipated that OC Transpo will extend bus service along this street to serve the development. Bus stop locations will be identified with each phase of development. Noted. This will be mentioned in the subsequent submission.

13. Despite the future Park and Ride and BRT in this area, transit supportive TDM measures are still needed to meet the targeted transit modal share. Noted and will be explored in further details in subsequent submissions

14. Item 3.1.1 of the TDM Measures: Residential developments checklist - "Display relevant transit schedules and route maps at entrances" - should be checked off and applied to all multi-family (apartment) buildings. Note that Item 3.2 - Transit face incentives - may also be applicable depending on the status of transit improvements; the need for face incentives will be assessed with each phase of the development. Noted and will be explored in further details in subsequent submissions

Traffic Signal Design

15. No comments with initial TIA Strategy for this circulation. Traffic Signal Design and Specification reserves the right to make future comments based on subsequent submissions. Noted

16. Future considerations:

a. If there are any future proposed changes to the existing roadway geometry for the purpose of construction of a new TCS(s) or modifications to existing TCS(s) the City of Ottawa Traffic Signal Design and Specification Unit is required to complete a review for traffic signal plant re-design and provide the actual re-design to the proponent.
b. If the proposed traffic signals are warranted/approved for installation or modifications to existing TCS are approved, and RMA approved, please forward an approved geometry detail design drawings (dwg digital format in NAD 83 coordinates) including following: base mapping, existing and new underground utilities and sewers, new/existing catch basins locations, Auto Turn Radius Modeling for approved vehicles and approved pavement marking drawings in separate files, no Xref files attached in master file(s), for detail traffic plant design lay out.
c. Please send all digital (CADD) design files to Peter.Grajcar@ottawa.ca or call 613-580-2424x23035. If not sure as per above request and more detail info needed as per input files, (i.e. format, etc.) please ask for our Dispatch checklist document and it will be provided.

Street Lighting

17. No comments with initial TIA for this circulation. Street Lighting reserves the right to make future comments based on subsequent submissions. Noted

18. Future considerations are as follows:
    a. If there are any proposed changes to the existing roadway geometry, the City of Ottawa Street Light Asset Management Group is required to provide a full street light design. Upon completion of proposed roadway geometry design changes, please submit digital Micro Station drawings with proposed roadway geometry changes to the Street Lighting Department, so that we may proceed with the detailed street light design and coordination with the Street Light maintenance provider and all necessary parties. Be advised that the applicant will be 100% responsible for all costs associated with any Street Light design as a result of the roadway geometry change.
    b. Alterations and/or repairs are required where the existing street light plant is directly, indirectly or adversely affected by the scope of work under this circulation, due to the proposed road reconstruction process. All street light plant alterations and/or repairs must be performed by the City of Ottawa's Street Light maintenance provider.
    c. Be advised that the applicant will be 100% responsible for all costs associated with any relocations/modifications to the existing street light plant.

Development Review – Transportation

19. If it is known what the internal streets will look like, discuss internal intersections throughout report. I.e. Street A at Street B, and Street A at Street D. Noted, The configuration of the internal intersections is unknown at this time and will be verified at a more detailed stage of the project.

20. Table 15:
    a. What is the Street A at Old Carp Road intersection? There is no intersection here today, as Street A is Old Carp Road. Refer to comment #7
    b. Street A at Halton Terrace should be renamed as Old Carp Road at Halton Terrace under existing traffic volume conditions. Noted

21. The TIA indicates that a minimum storage length of 30m is required for the NB-LT lane at March Road and Street A. Section 4.9.3 also indicates that the 90m storage is sufficient for the ultimate horizon. Confirm what the storage length requirement is for the ultimate horizon. Noted; this will be clarified in the following submission. Given that Old Carp Road connection is not anticipated to be provided by phase 1, the analysis will be revised accordingly to reflect interim and ultimate queue lengths.

22. Construction of Street A and Old Carp Road realignment is indicated within Figure 2 as "by others". Because Street A (through the 1145 Old Carp Road property) is identified as a main access to the subdivision property, please elaborate "by who" and "when" this roadway would be constructed? Refer to comment #7.

23. Who would be responsible for the realignment of the Old Carp Road and the Halton Terrace intersections with Street A and when would these be constructed? Old Carp road is out of the property lines and we don't know the responsibility of construction. However, we reached out to Brigil and clarified that this will be in place through phasing progression and will be assumed to be in place by Phase 3 of the development.

24. As indicated in comment 9d above, please coordinate with Minto's transportation consultant (936 March Road) on the RMA design of Street A/Street 1/March Road. This intersection is DC funded and we wish to construct the intersection only once. Noted and coordination is currently ongoing

Please address the above comments and re-submit the TIA and digital files of ICA outputs (Synchro/Sidra/Rodel, if applicable) for review and circulation. Noted

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
Tel |Tél. : 613-580- 2424 ext. | poste 21765
web | Site Web : www.ottawa.ca

Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.
Veuillez noter que je travaille de la maison en ce moment. Veuillez communiquer avec moi par courriel. Merci de votre patience et compréhension.

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Al Hasoo, Mohammed

From:	Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent:	Tuesday, October 27, 2020 10:23 AM
To:	Al Hasoo, Mohammed
Cc:	Abdelnaby, Ahmed
Subject:	RE: 927 March Road - Widening/BRT Timeline

Hi Mohammed,

As I indicated in our call yesterday, the TMP is currently under review and I may only confirm that the timelines for March Road widening and BRT are post-2031.

However, since your two horizon years are beyond 2031, please <u>assume</u> the following:

- 2034, March Road remains at 2-lanes, BRT is not in place;
- 2039, March Road is widened to 4-lanes, BRT is not in place.

Once again, these are <u>only assumptions at this time to be used for the purposes of this study</u>, because the actual horizon years for the infrastructure have not yet been identified.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
Tel |Tél. : 613-580- 2424 ext. | poste 21765
web | Site Web : www.ottawa.ca

Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.

From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: October 26, 2020 2:53 PM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Subject: 927 March Road - Widening/BRT Timeline

Good Afternoon Josiane,

Thank you very much for the chat this morning and for shedding light on some of the grey areas. All the elements from our discussion today will be addressed in the Strategy Report submission.

As we alluded to during the meeting, the final item to verify would be the approximate implementation year for the widening of March Road / the median BRT system (if they go hand in hand). If that widened cross section can support the ultimate horizon (2039) traffic, there shouldn't be a need for demand rationalization assumptions.

Hopefully we can get confirmation at your earliest convenience! I will hold off on the analysis for now as demand rationalization is the first step in the analysis.

Thank you again for your kind help!

Regards,

Mohammed Al Hasoo, M.Eng, P.Eng
Intern, Transportation Planning

Direct: 613-725-5566
Fax: 613-722-2799
Mohammed.AlHasoo@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Al Hasoo, Mohammed

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Friday, October 23, 2020 10:09 AM
To: Al Hasoo, Mohammed
Cc: Abdelnaby, Ahmed
Subject: RE: 927 March Road TIA - Forecasting Report Resubmission
Attachments: image006.wmz; 936 March Rd FD -AUG 10 ROLL PLAN.pdf

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mohammed,

Thank your for your patience on this! Please find below my responses to your questions for the 927 March Road file in blue.

If you require further clarification, please do not hesitate to contact me and we can set up a Teams call.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
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web | Site Web : www.ottawa.ca

Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.

From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: October 15, 2020 2:34 PM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: RE: 927 March Road TIA - Forecasting Report Resubmission

Hi Josiane,

Thank you very much for your comments. They have been noted and will be addressed in the Strategy Report submission.

I would like to enquire further about the enclosed Street 1 RMA that was provided earlier. I don't think the area of road modifications corresponds to the 927 March (Brigil) or 936 March (Minto) developments. Looking at the key plan and north direction, it seems that the area of road modifications is on the west side of March Road and it appears to correspond to the Claridge development (1053 March) that is situated just north of our Brigil development. [illegible] The design for this intersection is underway, I've attached a DRAFT functional plan that you can use to create your synchro network. Please note that changes to the design are possible, as this is still a draft.

Searching through the 936 March (Minto) TIA report, I found that the recommended roadway modifications at the intersection of March Road with Street A/Street 1 were: a 115m WBL storage lane + a 10m SBL storage lane + a NBR turn lane. If no RMA currently exists, these dimensions will be carried over into the analysis of March Road @ Street A/Street 1. See attached functional plan for storage length dimensions.

For the bi-directional cross-rides, and in reference to the KNUEA TMP (excerpt below), the planned MUP appears only on the north side of the collector road that is Street A/Street 1, which is consistent with the "Typical Collector Road" cross sections from the TMP that feature a MUP on one side and a sidewalk on the other. Note that the MUP will be present on the north side of the east leg of the Street A/Street 1/March Road intersection, as this was decided upon earlier in the planning process for the Minto development. However, this cross-section does not fall within the new vetted cross-sections outlined within the 2019 Designing Neighborhood Collector Streets document. As noted in comment 7, the 927 March Road development should follow these new guidelines (i.e. provide cycle tracks instead of a MUP).

In addition, as this is a temporary intersection, until such time as March Road is widened, east-west cross-rides are not required and only cross-walks will be provided. The north-south cross rides/cross walks to remain as shown in the attached plan to facilitate cycling along March. With this change, please disregard the previous comment #6 (sent October 14th 2020 via e-mail).

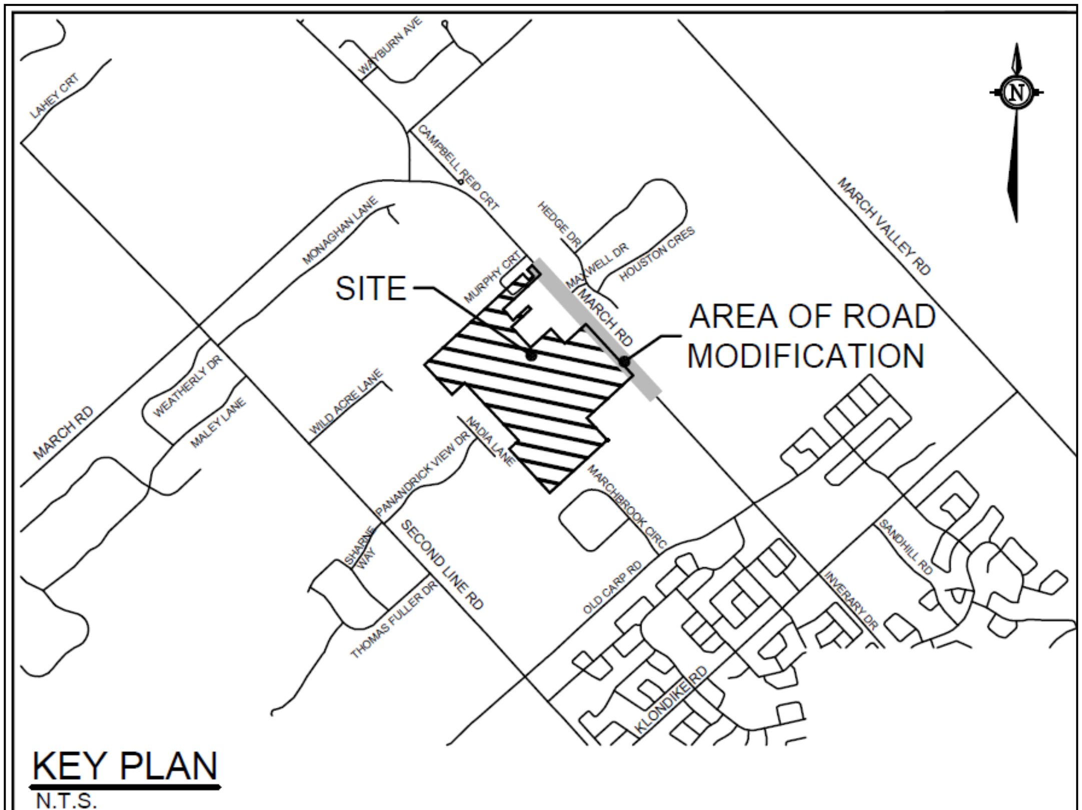
You are correct in that the eastbound left movement will have to be protected. A cross-ride will not be provided for the east-west movement, see comment above. We will confirm the location of the planned MUP with the developer and adjust the signal accordingly. The 936 March TIA report did not explicitly mention the location of the planned MUP. I can confirm that, for the east leg, the MUP is along the north side of the roadway.

You also pointed out below that [illegible]roadways will have a target operating speed of 30 km/h. May I please ask what the City of Ottawa's operating speed target is for future [illegible]roadways? I would like to confirm that with you for the MMLOS analysis. The target operating speed for residential collector roadways is 40 km/hr.

Thank you very much for your help and direction. If you would like to have a chat about this, please let me know and we can schedule a Teams meeting.

Regards,

Mohammed Al Hasoo



Mohammed Al Hasoo, M.Eng, P.Eng
Intern, Transportation Planning

Direct: 613-725-5566
Fax: 613-722-2799
Mohammed.AlHasoo@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Wednesday, October 14, 2020 2:11 PM
To: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: RE: 927 March Road TIA - Forecasting Report Resubmission

Hello Mohammed,

My apologies for the delay in getting these comments to you, and thank you for your patience!

Please find comments below regarding the Forecasting Report for 927 March Rd.

Transportation Engineering Services

1. *Section 2.1.1 - Proposed Development:* Figure 2 does not correspond with the unit types described in this section of the report. The figure still shows the 2150 apartment units. Revise the report accordingly.
2. *Section 3.1.1 Development Generated Travel Demand*:
    a. With regard to the comment response #8 in the memo dated September 21, 2020: To remain conservative and consistent with the KNUEA TMP, use the 1.42 conversion factor if TRANS rates are not being used. Typically, a conversion factor of 1.28 is better suited when using the ITE rates, however, the 1.42 factor used in the KNUEA TMP is more conservative. Also note that the ITE version 9 combined with a 1.28 factor versus using TRANS trip generation projections, would yield 658 and 823 fewer trips for the residential component for the AM and PM Peaks respectively.
    b. Given that this development exceeds the unit count identified in the KNUEA TMP report, it is essential that the strategy report provides guidance as to when March Road will exceed capacity and what solutions are feasible to address the impacts.
3. All other comments on the comment response sheet are accepted.

Traffic Signal Operations

4. Please resubmit synchro analysis. Among other outputs, the synchro report MUST show v/c, queues, and a visual picture of the cycle length and splits.
5. Contrary to the statement on page 26 that "road widening is required prior to the complete buildout of the 927 March Road development", Synchro models must maintain March Road as two lanes (not widened) since widening will not occur prior to the 2034 horizon year:
6. ~~With implementation of a MUP on Street 1 in the 936 March Road development, the March Road and Street 1 intersection requires a bidirectional cross ride on the north side of the intersection. With this bidirectional cross ride, the eastbound left-turn and the westbound left-turn would need to be fully protected movements.~~
    ~~If the 927 March Road development implements cycle tracks on both sides of Street A (applying the newly approved collector road guidelines) a standard protected intersection design with unidirectional cross rides can be applied at the March Road/Street A/Street 1 intersection with no requirement for fully protected left turns. Only permitted protected left turns would be required to facilitate the heavy morning WB LT volumes.~~
    ~~Review the impact on the level of service on March Road at the Street A/Street 1 intersection during the AM peak between the two scenarios. While maintaining the same queue lengths for the~~

~~westbound left turns, compare the LOS and queueing on March Road with fully protected left turns at the intersection versus permitted protected left turns for the EB and WB LT's on Street A and Street 1.~~

Development Review – Transportation

7. While preparing the Draft Plan and TIA Strategy Report, note that:
    - all new collector streets within the subdivision should be designed following the City's Collector Guidelines; and
    - all new local residential streets should be designed with a target operating speed of 30km/h per the new Strategic Road Safety Action Plan Update. A 30 km/h Design Guideline with further guidance on how to achieve a 30km/h target for new roadways is being developed. TES may be contacted for interim guidance on how to achieve a 30km/h design speed on local streets.

If the above comments can be incorporated within the next submission, please proceed to Step 4: Strategy. Please submit Strategy Report and digital files of ICA outputs (Synchro/Sidra/Rodel, if applicable) for circulation.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
Tel |Tél. : 613-580- 2424 ext. | poste 21765
web | Site Web : www.ottawa.ca

Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.

From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: September 21, 2020 6:48 PM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: 927 March Road TIA - Forecasting Report Resubmission

Hello Josiane,

Hope all is well.

Enclosed is the revised forecasting report for the development at 927 March Road along with a separate comment response table summarizing our assumptions in relation to your previous comments.

Please reach out to myself or Ahmed if you have any questions.

Thank you very much.

Regards,

Mohammed Al Hasoo
Transportation Planning EIT

Direct: 613-725-5566
Fax: 613-722-2799
Mohammed.AlHasoo@stantec.com

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400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

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'

Al Hasoo, Mohammed

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Wednesday, October 14, 2020 2:11 PM
To: Al Hasoo, Mohammed
Cc: Abdelnaby, Ahmed
Subject: RE: 927 March Road TIA - Forecasting Report Resubmission

Hello Mohammed,

My apologies for the delay in getting these comments to you, and thank you for your patience!

Please find comments below regarding the Forecasting Report for 927 March Rd.

Transportation Engineering Services

1. *Section 2.1.1 - Proposed Development:* Figure 2 does not correspond with the unit types described in this section of the report. The figure still shows the 2150 apartment units. Revise the report accordingly.
2. *Section 3.1.1 Development Generated Travel Demand*:
   a. With regard to the comment response #8 in the memo dated September 21, 2020: To remain conservative and consistent with the KNUEA TMP, use the 1.42 conversion factor if TRANS rates are not being used. Typically, a conversion factor of 1.28 is better suited when using the ITE rates, however, the 1.42 factor used in the KNUEA TMP is more conservative. Also note that the ITE version 9 combined with a 1.28 factor versus using TRANS trip generation projections, would yield 658 and 823 fewer trips for the residential component for the AM and PM Peaks respectively.
   b. Given that this development exceeds the unit count identified in the KNUEA TMP report, it is essential that the strategy report provides guidance as to when March Road will exceed capacity and what solutions are feasible to address the impacts.
3. All other comments on the comment response sheet are accepted.

Traffic Signal Operations

4. Please resubmit synchro analysis. Among other outputs, the synchro report MUST show v/c, queues, and a visual picture of the cycle length and splits.
5. Contrary to the statement on page 26 that "road widening is required prior to the complete buildout of the 927 March Road development", Synchro models must maintain March Road as two lanes (not widened) since widening will not occur prior to the 2034 horizon year:
6. With implementation of a MUP on Street 1 in the 936 March Road development, the March Road and Street 1 intersection requires a bidirectional cross ride on the north side of the intersection. With this bidirectional cross ride, the eastbound left-turn and the westbound left-turn would need to be fully protected movements.
   If the 927 March Road development implements cycle tracks on both sides of Street A (applying the newly approved collector road guidelines) a standard protected intersection design with unidirectional cross rides can be applied at the March Road/Street A/Street 1 intersection with no requirement for

fully protected left turns. Only permitted protected left turns would be required to facilitate the heavy morning WB LT volumes.
Review the impact on the level of service on March Road at the Street A/Street 1 intersection during the AM peak between the two scenarios. While maintaining the same queue lengths for the westbound left turns, compare the LOS and queueing on March Road with fully protected left turns at the intersection versus permitted protected left turns for the EB and WB LT's on Street A and Street 1.

Development Review – Transportation

7. While preparing the Draft Plan and TIA Strategy Report, note that:
    - all new collector streets within the subdivision should be designed following the City's Collector Guidelines; and
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If the above comments can be incorporated within the next submission, please proceed to Step 4: Strategy. Please submit Strategy Report and digital files of ICA outputs (Synchro/Sidra/Rodel, if applicable) for circulation.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
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Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.

From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: September 21, 2020 6:48 PM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: 927 March Road TIA - Forecasting Report Resubmission

Hello Josiane,

Hope all is well.

Enclosed is the revised forecasting report for the development at 927 March Road along with a separate comment response table summarizing our assumptions in relation to your previous comments.

Please reach out to myself or Ahmed if you have any questions.

Thank you very much.

Regards,

Mohammed Al Hasoo
Transportation Planning EIT

Direct: 613-725-5566
Fax: 613-722-2799
Mohammed.AlHasoo@stantec.com

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Ottawa ON K2C 3G4

Stantec

Al Hasoo, Mohammed

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Monday, August 10, 2020 10:42 AM
To: Abdelnaby, Ahmed
Cc: Al Hasoo, Mohammed
Subject: RE: 927 March Road - Step 3 TIA (way forward)

Good morning Ahmed,

My apologies for not getting back to you last week. I had issues with my internet connectivity.

As the comments on the forecasting report have come from numerous members of City Staff, it would be preferred if you could please re-submit the forecasting report including your assumptions and justifications below. I can then circulate this to the appropriate people and get comments back for you.

Regarding comment 9, my understanding of the comment was to justify the number of units being proposed and why it's resulting in a change in number of dwellings units in comparison to the original TMP. Consider… Were these unit numbers assumed within the KNUEA TMP for these parcels of land and the increase in overall units is because other properties within the area have increased their development numbers? Are there changes in the housing market that would have resulted in the need for additional apartments and less singles or townhomes than what was originally envisioned?

I'll send a copy of the RMA drawing for 936 March Road in a separate e-mail as soon as possible. Please note that this is still considered a draft and as such is subject to change.

Regards,

Josiane Gervais, P.Eng.
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Development Review Branch | Dir Examen des projets d'aménagement
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Please note that I am currently working from home. E-mail is the preferred method to communicate with me. Thank you for your patience and understanding.

From: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Sent: August 06, 2020 6:55 AM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Subject: RE: 927 March Road - Step 3 TIA (way forward)

Good Morning Josiane,

Apologies for the delay getting to this file; as a follow up to Step 3 comments, we have listed all major comments for discussion below, the rest of the comments is noted and will be addressed.

It will be great to have your thoughts; I will be more than happy to discuss over a Teams meeting if needed.

8- Note that the use of the old trip generation rates vs the currently required TRANS person trip rates yields 65 and 272 fewer trips in the AM and PM Peak periods, respectively. To remain consistent with the KNUEA TMP, a conversion factor of 1.42 should be applied, yielding a closer approximation to the TRANS rates. AND
9- Justify the unit count proposed in this development. The KNUEA projected 975 single family homes, 970 townhomes and 1090 apartment residential units. As of this writing, 1,047 single family units, 1,030 townhomes and 216 apartments have been approved in the three other quadrants of the KNUEA. With the 2,150 apartment units shown, the residential trip generation will be significantly higher than what was approved in the KNUEA TMP.

We have looked into the available background studies and have identified an inconsistent use of assumptions related to the person conversion factors and the use of ITE rates. Below is a summary of our findings:

Study	Trip Gen. Assumptions	Notes
1. 788 March Rd – Parsons Aug 2018	• Trans rates and modal splits used for 195 units	• Assumed BRT and TSP along March Rd + P&R • Assumed twinning along March • Assignment 5% North • Assumed Transit share 10% for existing and 25% for future (2028)
2. 936 March Rd – GCGH Dec 2018	• ITE 10th rates for 800 Units + conversion to person trips using a factor of 1.28	• No BRT or TSP assumed • Assumed Twinning along March • Assignment 5% North • Used 10% Transit

3. 1020/1070 March Rd – Stantec
July 2019
	• ITE 9th rates for
	  ○ 297 Single Family Units
	  ○ 315 Townhomes
	  ○ 116 Apt. Units
	  ○ School with 580 students
	  ○ 80,000 sqft retail
	• conversion to person trips using a factor of 1.28
		• No BRT or TSP assumed
		• Assignment 15% North except for commercial (0% to North)
		• No Twinning was assumed
		• Used 20% for all land uses except school (0%)

4. 1053/1075/1145 March Rd – Novatech
October 2018
	• ITE 10th rates for
	  ○ 296 Single Family Units
	  ○ 530 Townhomes
	• conversion to person trips using a factor of 1.28
		• Assumed BRT and TSP along March Rd + P&R
		• Assignment 15% North
		• Assumed twinning March Rd
		• Used 21%

5. 1156 March Rd (Gas Station) March 2016	• ITE 9th edition	• Transportation Brief • NA
6. CDP TMP	• ITE 9th edition with a conversion rate of 1.42	• Assumed BRT and TSP along March Rd + P&R • Assignment 15% North • Assumed twinning March Rd • Assumed 21% through implementation of transit projects

Originally, we were using ITE 9th edition which result in higher trip generation compared to ITE 10th (ITE 10th is lower than the 9th edition by 165 trips in the AM and 159 in the PM for our development). relatively, Trans rates are higher than both. As our development is coming in last, we would like to ensure consistency and capturing all the previous studies. I would propose maintaining ITE 9th edition use with a conversion factor of 1.28. It will be great if we can discuss this in greater details.

I am not sure if due to the use of a lower conversion rate coupled with occasional use of ITE 10th rates may have encouraged higher unit counts as compared to the overall TMP; but would like to discuss this point further to get better feedback from the developer.

10. Justify the transit mode share used in this report. The KNUEA TMP assumes a 20% transit mode share due to the implementation of transit facilities outlined in the Affordable Network of the City's TMP. If these are not expected by the ultimate study horizon, this mode share will be difficult to achieve.

The TRANS manual table (3.6) shows that the modal share is 23% for AM and 11% for the PM; the 20% was assumed to be consistent with the TMP; It is assumed that the transit signal priority lanes will be in place by the 2039 horizon year. We propose using 15% transit modal split to represent existing conditions for the purpose of the analysis while increasing this ratio to 20% for the 2039 horizon year analysis (build out +5). The demand rationalization will be performed by analyzing the 2039 horizon year first, then we will work our way backwards.

12. The KNUEA TMP showed a 15% to/from north for the combination of residential and institutional land uses. However, since this development is in the southwestern quadrant of the KNUEA confirm that 15% is appropriate.

The TMP has assumed that 15% of traffic will be heading north; however, reviewing the recently approved TIAs, there is a mixture of 5% versus 15% for Northbound traffic. To reflect accurate assumptions, we will be using 5% to the north for the residential component (closer to existing splits). On the other hand, the commercial component will reflect 15% to account for potential traffic from residences in the north to the commercial component of our site.

14. Note that the intersection of March Road and Street A is the subject of an RMA. This work proposes: one southbound left-turn lane, one northbound right-turn lane, paved shoulders on the northbound and southbound approaches. Additionally, on the east side of the intersection: cycle tracks immediately north and south of the intersection with cross ride, a boulevard -separated sidewalk along the south side of Street A, a boulevard-separated multi-use pathway on the north side of Street. The RMA also shows a future northbound left-turn lane. Since these road modifications are DC-eligible, coordination between the 927 and 936 March Road for road works is strongly encouraged.

Noted, would you be able to provide the latest drawings, if available? In the absence of a drawing, we will consider the turn lanes as listed in the 936 March Rd TIA

16. For future submissions, please perform a sensitivity analysis showing at what percent build out area intersections will fail.
Noted and will be considered in the analysis

17. Include additional horizon years analyzed as required to address when specific phases will trigger road works.
We propose addressing this point through the suggestion above, performing sensitivity analysis to identify the number of trips/units required for improvements to kick in.

Ahmed Abdelnaby M.Sc., P.Eng, RSP1.
Project Engineer, Transportation

Direct: 613-724-4405
Cell: 343-999-9252
ahmed.abdelnaby@stantec.com

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400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Tuesday, August 4, 2020 7:14 AM
To: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>; Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Subject: RE: 927 March Road - Step 3 TIA

Hi Ahmed,

Thanks for confirming the intention is still to maintain the local classification.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
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web | Site Web : www.ottawa.ca

From: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Sent: July 31, 2020 10:33 AM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>; Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Subject: RE: 927 March Road - Step 3 TIA

Hi Josiane,

Looking at the TMP, our street D is classified as Local. I have attached the relevant Figure from the TMP for your reference.

Let me know if you have any questions, we are going through the Step 3 comments and will follow up with a couple of clarifications shortly.

Thanks!

Ahmed Abdelnaby M.Sc., P.Eng, RSP1.
Project Engineer, Transportation

Direct: 613-724-4405
Cell: 343-999-9252
ahmed.abdelnaby@stantec.com
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Ottawa ON K2C 3G4

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Tuesday, July 28, 2020 2:48 PM
To: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: RE: 927 March Road - Step 3 TIA

Hi Mohammed,

Can you please let me know if Street D is proposed as a local or collector designation?

Thank you.

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa
Tel |Tél. : 613-580- 2424 ext. | poste 21765
web | Site Web : www.ottawa.ca

From: Gervais, Josiane
Sent: June 16, 2020 9:35 AM
To: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Cc: Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: RE: 927 March Road - Step 3 TIA

Hello,

Please find comments below regarding the Forecasting Report for 927 March Rd.

Transportation Engineering Services

1. Correct section 2.1.2.1, Old Carp Road is classified as a collector road.
2. Confirm the proposed network layout in Figures 3 and 4. Figure 3, as shown in the KNUEA TMP, depicts a realignment of Halton Terrace, while Figure 4 seems to show Street A connecting to Halton Terrace in the same space as the existing Old Carp Road.
3. Note that the headways described in Section 2.1.2.3 are atypically low due to reduced service levels associated with COVID-19.

4. Correct Section 2.1.2.4, there are flex stakes in the median along Halton Terrace and Maxwell Bridge Road.
5. Correct Section 2.1.2.5 The report states that the 2016 volumes from the March Road at Halton Terrace/Maxwell Bridge intersection were adjusted for 2020 by applying a 0.5% growth rate, but the numbers shown reflect the March 4, 2020 count.
6. Use the 1053, 1075 and 1145 March Road TIA, 1020/1070 March Road TIA and the 936 March Road TIA to account for the other development trips in the remaining three quadrants of the KNUEA.
7. While there is no timeline for implementation, as stated in the report, it should be assumed that the transit priority lanes will be in place by the 2039 ultimate horizon year since they are on the City's Affordable network.
8. Note that the use of the old trip generation rates vs the currently required TRANS person trip rates yields 65 and 272 fewer trips in the AM and PM Peak periods, respectively. To remain consistent with the KNUEA TMP, a conversion factor of 1.42 should be applied, yielding a closer approximation to the TRANS rates.
9. Justify the unit count proposed in this development. The KNUEA projected 975 single family homes, 970 townhomes and 1090 apartment residential units. As of this writing, 1,047 single family units, 1,030 townhomes and 216 apartments have been approved in the three other quadrants of the KNUEA. With the 2,150 apartment units shown, the residential trip generation will be significantly higher than what was approved in the KNUEA TMP.
10. Justify the transit mode share used in this report. The KNUEA TMP assumes a 20% transit mode share due to the implementation of transit facilities outlined in the Affordable Network of the City's TMP. If these are not expected by the ultimate study horizon, this mode share will be difficult to achieve.
11. Applying 20% of all vehicle trips destined to the park and ride as transit trips results in an overall 32% transit modal share of all person trips. Adjust the number of trips to reflect the 20% transit modal share more accurately.
12. The KNUEA TMP showed a 15% to/from north for the combination of residential and institutional land uses. However, since this development is in the southwestern quadrant of the KNUEA confirm that 15% is appropriate.
13. The demand rationalization module requires the inclusion how much traffic volume requires rationalization to reach acceptable VLOS measurements.
14. Note that the intersection of March Road and Street A is the subject of an RMA. This work proposes: one southbound left-turn lane, one northbound right-turn lane, paved shoulders on the northbound and southbound approaches. Additionally, on the east side of the intersection: cycle tracks immediately north and south of the intersection with cross ride, a boulevard -separated sidewalk along the south side of Street A, a boulevard-separated multi-use pathway on the north side of Street. The RMA also shows a future northbound left-turn lane. Since these road modifications are DC-eligible, coordination between the 927 and 936 March Road for road works is strongly encouraged.

Traffic Signal Operations

15. Please be aware of other developments and take these volumes into account.
16. For future submissions, please perform a sensitivity analysis showing at what percent build out area intersections will fail.

Development Review – Transportation

17. Include additional horizon years analyzed as required to address when specific phases will trigger road works.
18. Include Appendix material.
19. Re-submit the forecasting report to address the above comments.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
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From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: June 01, 2020 9:31 AM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: O'Grady, Lauren <Lauren.OGrady@stantec.com>; Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: 927 March Road - Step 3 TIA

Good Morning Josiane,

Trust all is well.

Enclosed is step 3 of the TIA for 927 March Road (Kanata North Urban Expansion Area) for your review.

Kindly inform us if we can proceed to step 4 of the TIA or if you have any questions, comments, or concerns.

Thank you and regards,

Mohammed Al Hasoo
Transportation Planning EIT

Direct: 613-725-5566
Fax: 613-722-2799
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'

Al Hasoo, Mohammed

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Tuesday, June 16, 2020 9:35 AM
To: Al Hasoo, Mohammed
Cc: Abdelnaby, Ahmed
Subject: RE: 927 March Road - Step 3 TIA

Hello,

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Transportation Engineering Services

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Traffic Signal Operations

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Development Review – Transportation

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18. Include Appendix material.
19. Re-submit the forecasting report to address the above comments.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
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From: Al Hasoo, Mohammed <Mohammed.AlHasoo@stantec.com>
Sent: June 01, 2020 9:31 AM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: O'Grady, Lauren <Lauren.OGrady@stantec.com>; Abdelnaby, Ahmed <Ahmed.Abdelnaby@stantec.com>
Subject: 927 March Road - Step 3 TIA

Good Morning Josiane,

Trust all is well.

Enclosed is step 3 of the TIA for 927 March Road (Kanata North Urban Expansion Area) for your review.

Kindly inform us if we can proceed to step 4 of the TIA or if you have any questions, comments, or concerns.

Thank you and regards,

Mohammed Al Hasoo
Transportation Planning EIT

Direct: 613-725-5566
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Al Hasoo, Mohammed

From: O'Grady, Lauren
Sent: Thursday, May 7, 2020 10:24 AM
To: Al Hasoo, Mohammed
Subject: FW: 927 March Road - Step 1 and 2 TIA

FYI – see below

Lauren O'Grady P.Eng.
Transportation Planning and Traffic Engineering Lead

Direct: 613-784-2264
lauren.o'grady@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Gervais, Josiane <josiane.gervais@ottawa.ca>
Sent: Thursday, April 30, 2020 1:01 PM
To: O'Grady, Lauren <Lauren.OGrady@stantec.com>
Cc: Philip Thibert <pthibert@brigil.com>
Subject: RE: 927 March Road - Step 1 and 2 TIA

Hi Lauren,

Please find comments below regarding the Scoping Report for 927 March Rd.

- Element 2.1.1 - Proposed Development – Include number of parking spaces, if available.
- Element 2.1.2 - Existing Conditions:
  - Define driveways and uses along March Road.
  - Also include volumes of pedestrians and cyclists, as per TIA guideline "Existing peak hour travel demands by mode". Include traffic volumes within Appendix of document.
  - Define peak hours in Figure 7, it is assumed that the figure to the left is AM and the figure to the right is PM.
- Element 2.1.3 - Planned Conditions: Other developments within the study area – Include gas service station at 1156/1170 March Rd.
- Element 2.2.1 - Study Area: Include Street A/Old Carp Road and Street A/Halton Terrace.
- Module 4.6 Neighbourhood Traffic Management - This module is not exempt, since Street A connects to Halton Terrace/Old Carp Rd, which are collector roadways.

If the above comments can be incorporated within the next submission, please proceed to Step 3: Forecasting.

Regards,

Josiane Gervais, P.Eng.
Project Manager, Infrastructure Approvals | GPRJ Approbation des demandes d'infrastructure
Development Review Branch | Dir Examen des projets d'aménagement
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From: O'Grady, Lauren <Lauren.OGrady@stantec.com>
Sent: April 24, 2020 2:02 PM
To: Gervais, Josiane <josiane.gervais@ottawa.ca>
Cc: Philip Thibert <pthibert@brigil.com>
Subject: 927 March Road - Step 1 and 2 TIA

Hi Josiane,

I hope you're doing well.

Please see attached the Step 1 and 2 TIA to support Brigil's development at 927 March Road in Kanata North. Please let me know if you have any questions or comments.

Have a great weekend,

Lauren O'Grady P.Eng.
Transportation Planning and Traffic Engineering Lead

Direct: 613-784-2264
lauren.o'grady@stantec.com

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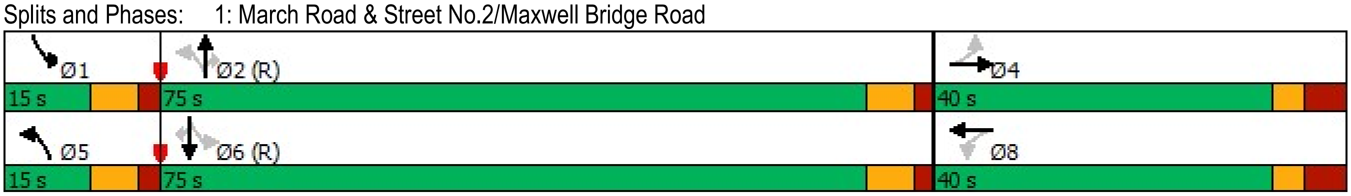
Appendix C INTERSECTION PERFORMANCE WORKSHEETS

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	21	37	125	16	23	178	61	68	807	12
Future Volume (vph)	21	37	125	16	23	178	61	68	807	12
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	21.1	21.1	21.1	21.1	89.0	83.4	83.4	91.5	86.8	86.8
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.68	0.64	0.64	0.70	0.67	0.67
v/c Ratio	0.11	0.45	0.81	0.16	0.07	0.10	0.07	0.09	0.40	0.01
Control Delay	44.1	21.7	84.2	23.5	6.9	11.0	1.5	6.5	12.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.1	21.7	84.2	23.5	6.9	11.0	1.5	6.5	12.3	0.0
LOS	D	C	F	C	A	B	A	A	B	A
Approach Delay		24.7		69.6		8.4			11.7	
Approach LOS		C		E		A			B	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 69 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 18.9	Intersection LOS: B
Intersection Capacity Utilization 69.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	23	147	139	44	26	198	68	76	897	13
v/c Ratio	0.11	0.45	0.81	0.16	0.07	0.10	0.07	0.09	0.40	0.01
Control Delay	44.1	21.7	84.2	23.5	6.9	11.0	1.5	6.5	12.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.1	21.7	84.2	23.5	6.9	11.0	1.5	6.5	12.3	0.0
Queue Length 50th (m)	5.1	11.5	34.8	4.0	1.6	10.0	0.0	4.9	57.9	0.0
Queue Length 95th (m)	12.3	29.1	54.2	13.5	5.3	18.9	3.8	11.8	86.2	0.0
Internal Link Dist (m)		119.5		192.3		117.5			169.9	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	333	459	266	415	403	1981	969	818	2263	986
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.32	0.52	0.11	0.06	0.10	0.07	0.09	0.40	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	37	95	125	16	23	23	178	61	68	807	12
Future Volume (vph)	21	37	95	125	16	23	23	178	61	68	807	12
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1541		1712	1575		1586	3088	1459	1712	3390	1432
Flt Permitted	0.73	1.00		0.59	1.00		0.29	1.00	1.00	0.61	1.00	1.00
Satd. Flow (perm)	1326	1541		1060	1575		480	3088	1459	1104	3390	1432
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	41	106	139	18	26	26	198	68	76	897	13
RTOR Reduction (vph)	0	80	0	0	22	0	0	0	25	0	0	5
Lane Group Flow (vph)	23	67	0	139	22	0	26	198	43	76	897	8
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	21.1	21.1		21.1	21.1		86.3	82.1	82.1	90.3	84.1	84.1
Effective Green, g (s)	21.1	21.1		21.1	21.1		86.3	82.1	82.1	90.3	84.1	84.1
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.66	0.63	0.63	0.69	0.65	0.65
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	250		172	255		354	1950	921	795	2193	926
v/s Ratio Prot		0.04			0.01		0.00	0.06		c0.00	c0.26	
v/s Ratio Perm	0.02			c0.13			0.05		0.03	0.06		0.01
v/c Ratio	0.11	0.27		0.81	0.09		0.07	0.10	0.05	0.10	0.41	0.01
Uniform Delay, d1	46.4	47.7		52.5	46.3		7.7	9.4	9.1	6.4	11.0	8.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.6		23.6	0.1		0.1	0.1	0.1	0.1	0.6	0.0
Delay (s)	46.6	48.2		76.0	46.4		7.8	9.5	9.2	6.4	11.6	8.2
Level of Service	D	D		E	D		A	A	A	A	B	A
Approach Delay (s)		48.0			68.9			9.3			11.1	
Approach LOS		D			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	436	63	159	46	451
Future Volume (vph)	436	63	159	46	451
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	50.0	50.0
Minimum Split (s)	27.3	56.3	56.3	56.3	56.3
Total Split (s)	41.3	56.3	56.3	56.3	56.3
Total Split (%)	42.3%	57.7%	57.7%	57.7%	57.7%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Max	Max	Max	Max
Act Effct Green (s)	18.9	50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.23	0.61	0.61	0.61	0.61
v/c Ratio	0.74	0.06	0.18	0.08	0.45
Control Delay	34.9	7.5	1.8	7.8	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.9	7.5	1.8	7.8	10.8
LOS	C	A	A	A	B
Approach Delay	34.9	3.5			10.5
Approach LOS	C	A			B

Intersection Summary
Cycle Length: 97.6
Actuated Cycle Length: 81.6
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 93.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: March Road & Dunrobin Road

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	546	70	177	51	501
v/c Ratio	0.74	0.06	0.18	0.08	0.45
Control Delay	34.9	7.5	1.8	7.8	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.9	7.5	1.8	7.8	10.8
Queue Length 50th (m)	39.4	3.9	0.0	2.9	37.2
Queue Length 95th (m)	55.6	10.2	7.7	8.4	69.7
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1350	1095	999	661	1106
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.40	0.06	0.18	0.08	0.45

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	436	56	63	159	46	451
Future Volume (vph)	436	56	63	159	46	451
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3119		1784	1517	1441	1802
Flt Permitted	0.96		1.00	1.00	0.71	1.00
Satd. Flow (perm)	3119		1784	1517	1079	1802
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	484	62	70	177	51	501
RTOR Reduction (vph)	12	0	0	68	0	0
Lane Group Flow (vph)	534	0	70	109	51	501
Heavy Vehicles (%)	7%	3%	2%	2%	20%	1%
Turn Type	Prot		NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	18.9		50.1	50.1	50.1	50.1
Effective Green, g (s)	18.9		50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.23		0.61	0.61	0.61	0.61
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	722		1095	931	662	1106
v/s Ratio Prot	c0.17		0.04			c0.28
v/s Ratio Perm				0.07	0.05	
v/c Ratio	0.74		0.06	0.12	0.08	0.45
Uniform Delay, d1	29.1		6.3	6.5	6.4	8.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		0.1	0.3	0.2	1.3
Delay (s)	33.0		6.4	6.8	6.6	9.8
Level of Service	C		A	A	A	A
Approach Delay (s)	33.0		6.7			9.5
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	81.6	Sum of lost time (s)	12.6
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	58	15	0	51	0	95
Future Volume (Veh/h)	58	15	0	51	0	95
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)	64	17	0	57	0	106
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked						
vC, conflicting volume			81		130	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			81		130	72
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		100	89
cM capacity (veh/h)			1517		865	990

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	81	57	106
Volume Left	0	0	0
Volume Right	17	0	106
cSH	1700	1517	990
Volume to Capacity	0.05	0.00	0.11
Queue Length 95th (m)	0.0	0.0	2.7
Control Delay (s)	0.0	0.0	9.1
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	17.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	73	51	0	0	0
Future Volume (Veh/h)	0	73	51	0	0	0
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	81	57	0	0	0
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	114	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	114	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	96			
cM capacity (veh/h)	851	1085	1623			

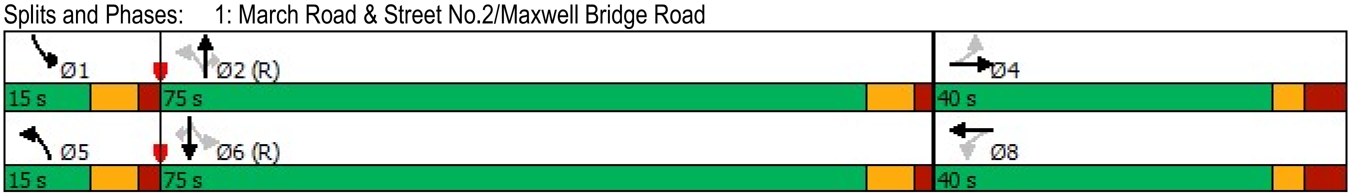
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	81	57	0
Volume Left	0	57	0
Volume Right	81	0	0
cSH	1085	1623	1700
Volume to Capacity	0.07	0.04	0.00
Queue Length 95th (m)	1.8	0.8	0.0
Control Delay (s)	8.6	7.3	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	7.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	14.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	17	55	79	58	172	873	114	59	238	12
Future Volume (vph)	17	55	79	58	172	873	114	59	238	12
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	15.3	15.3	15.3	15.3	97.4	89.6	89.6	91.9	84.7	84.7
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.75	0.69	0.69	0.71	0.65	0.65
v/c Ratio	0.19	0.51	0.63	0.67	0.23	0.41	0.11	0.16	0.12	0.01
Control Delay	53.6	46.9	73.1	48.5	5.0	10.6	1.9	5.4	9.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.6	46.9	73.1	48.5	5.0	10.6	1.9	5.4	9.6	0.0
LOS	D	D	E	D	A	B	A	A	A	A
Approach Delay		47.9		57.1		8.9			8.4	
Approach LOS		D		E		A			A	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 29 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 17.3	Intersection LOS: B
Intersection Capacity Utilization 63.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	19	107	88	163	191	970	127	66	264	13
v/c Ratio	0.19	0.51	0.63	0.67	0.23	0.41	0.11	0.16	0.12	0.01
Control Delay	53.6	46.9	73.1	48.5	5.0	10.6	1.9	5.4	9.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.6	46.9	73.1	48.5	5.0	10.6	1.9	5.4	9.6	0.0
Queue Length 50th (m)	4.5	19.2	21.9	26.3	10.4	54.8	0.0	3.3	12.2	0.0
Queue Length 95th (m)	11.7	35.8	37.6	47.4	21.0	81.8	7.5	8.3	22.2	0.0
Internal Link Dist (m)		119.5		192.3		117.5			169.9	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	218	418	300	453	822	2358	1105	433	2209	1040
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.26	0.29	0.36	0.23	0.41	0.11	0.15	0.12	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	55	41	79	58	89	172	873	114	59	238	12
Future Volume (vph)	17	55	41	79	58	89	172	873	114	59	238	12
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.94		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1579		1647	1635		1729	3424	1547	1729	3390	1547
Flt Permitted	0.48	1.00		0.69	1.00		0.57	1.00	1.00	0.27	1.00	1.00
Satd. Flow (perm)	869	1579		1192	1635		1029	3424	1547	496	3390	1547
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	19	61	46	88	64	99	191	970	127	66	264	13
RTOR Reduction (vph)	0	25	0	0	50	0	0	0	41	0	0	5
Lane Group Flow (vph)	19	82	0	88	113	0	191	970	86	66	264	8
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	15.3	15.3		15.3	15.3		97.6	88.2	88.2	90.6	84.7	84.7
Effective Green, g (s)	15.3	15.3		15.3	15.3		97.6	88.2	88.2	90.6	84.7	84.7
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.75	0.68	0.68	0.70	0.65	0.65
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	102	185		140	192		823	2323	1049	401	2208	1007
v/s Ratio Prot		0.05			0.07		c0.02	c0.28		0.01	0.08	
v/s Ratio Perm	0.02			c0.07			0.16		0.06	0.11		0.01
v/c Ratio	0.19	0.44		0.63	0.59		0.23	0.42	0.08	0.16	0.12	0.01
Uniform Delay, d1	51.7	53.4		54.6	54.4		4.6	9.4	7.1	6.4	8.6	7.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	1.7		8.5	4.5		0.1	0.6	0.2	0.2	0.1	0.0
Delay (s)	52.6	55.1		63.2	58.9		4.7	9.9	7.3	6.6	8.7	8.0
Level of Service	D	E		E	E		A	A	A	A	A	A
Approach Delay (s)		54.7			60.4			8.9			8.2	
Approach LOS		D			E			A			A	

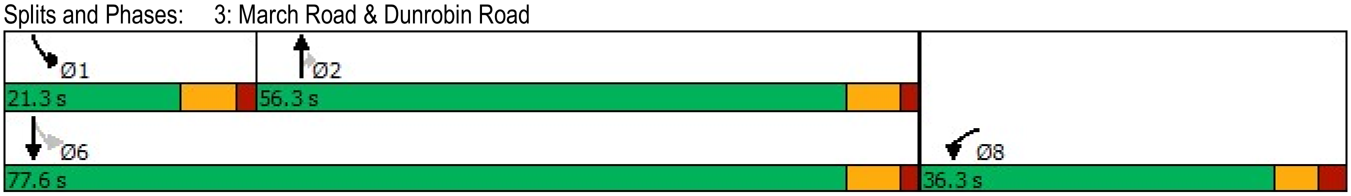
Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	169	476	503	34	140
Future Volume (vph)	169	476	503	34	140
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.6
Total Split (%)	31.9%	49.4%	49.4%	18.7%	68.1%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	12.2	64.4	64.4	72.0	72.0
Actuated g/C Ratio	0.13	0.67	0.67	0.74	0.74
v/c Ratio	0.60	0.44	0.46	0.07	0.12
Control Delay	37.2	10.7	2.2	4.0	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	37.2	10.7	2.2	4.0	4.0
LOS	D	B	A	A	A
Approach Delay	37.2	6.3			4.0
Approach LOS	D	A			A

Intersection Summary

Cycle Length: 113.9
Actuated Cycle Length: 96.8
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 60.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	265	529	559	38	156
v/c Ratio	0.60	0.44	0.46	0.07	0.12
Control Delay	37.2	10.7	2.2	4.0	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	37.2	10.7	2.2	4.0	4.0
Queue Length 50th (m)	19.1	48.5	0.0	1.5	6.6
Queue Length 95th (m)	31.2	81.9	12.9	4.4	13.8
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1008	1199	1206	646	1339
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.26	0.44	0.46	0.06	0.12

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	169	69	476	503	34	140
Future Volume (vph)	169	69	476	503	34	140
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.96		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3131		1802	1532	1679	1802
Flt Permitted	0.97		1.00	1.00	0.37	1.00
Satd. Flow (perm)	3131		1802	1532	656	1802
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	188	77	529	559	38	156
RTOR Reduction (vph)	48	0	0	196	0	0
Lane Group Flow (vph)	217	0	529	363	38	156
Heavy Vehicles (%)	3%	7%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	12.2		64.4	64.4	74.5	74.5
Effective Green, g (s)	12.2		64.4	64.4	74.5	74.5
Actuated g/C Ratio	0.12		0.65	0.65	0.75	0.75
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	384		1168	993	531	1351
v/s Ratio Prot	c0.07		c0.29		0.00	c0.09
v/s Ratio Perm				0.24	0.05	
v/c Ratio	0.56		0.45	0.37	0.07	0.12
Uniform Delay, d1	41.0		8.7	8.0	4.3	3.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9		1.3	1.0	0.1	0.2
Delay (s)	42.9		10.0	9.1	4.3	3.6
Level of Service	D		A	A	A	A
Approach Delay (s)	42.9		9.5			3.7
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	99.3	Sum of lost time (s)	18.9
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	13	0	0	242	0	100
Future Volume (Veh/h)	13	0	0	242	0	100
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)	14	0	0	269	0	111
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.98	
vC, conflicting volume			14		283	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			14		258	14
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		100	90
cM capacity (veh/h)			1604		716	1066

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	14	269	111
Volume Left	0	0	0
Volume Right	0	0	111
cSH	1700	1604	1066
Volume to Capacity	0.01	0.00	0.10
Queue Length 95th (m)	0.0	0.0	2.6
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	13	242	0	0	0
Future Volume (Veh/h)	0	13	242	0	0	0
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	14	269	0	0	0
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	538	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	538	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	83			
cM capacity (veh/h)	421	1085	1623			

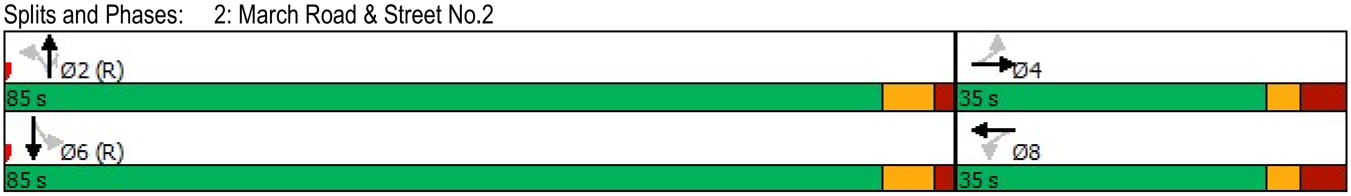
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	269	0
Volume Left	0	269	0
Volume Right	14	0	0
cSH	1085	1623	1700
Volume to Capacity	0.01	0.17	0.00
Queue Length 95th (m)	0.3	4.5	0.0
Control Delay (s)	8.4	7.7	0.0
Lane LOS	A	A	
Approach Delay (s)	8.4	7.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	13	6	304	14	92	400	89	5	1123
Future Volume (vph)	13	6	304	14	92	400	89	5	1123
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	34.3	34.3	34.3	34.3	34.6	34.6	34.6	34.6	34.6
Total Split (s)	35.0	35.0	35.0	35.0	85.0	85.0	85.0	85.0	85.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	70.8%	70.8%	70.8%	70.8%	70.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	27.7	27.7	27.7	27.7	78.4	78.4	78.4	78.4	78.4
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.65	0.65	0.65	0.65	0.65
v/c Ratio	0.04	0.49	1.45	0.08	1.56	0.37	0.09	0.01	0.97
Control Delay	36.5	22.7	261.0	22.5	342.6	10.7	1.7	7.4	40.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	22.7	261.0	22.5	342.6	10.7	1.7	7.4	40.8
LOS	D	C	F	C	F	B	A	A	D
Approach Delay		23.5		239.6		61.9			40.6
Approach LOS		C		F		E			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.56	
Intersection Signal Delay: 73.6	Intersection LOS: E
Intersection Capacity Utilization 122.9%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	213	304	30	92	400	89	5	1129
v/c Ratio	0.04	0.49	1.45	0.08	1.56	0.37	0.09	0.01	0.97
Control Delay	36.5	22.7	261.0	22.5	342.6	10.7	1.7	7.4	40.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	22.7	261.0	22.5	342.6	10.7	1.7	7.4	40.8
Queue Length 50th (m)	2.4	19.7	~97.5	2.6	~16.5	39.6	0.0	0.4	231.8
Queue Length 95th (m)	7.7	43.5	#151.9	10.4	#50.4	57.4	5.4	1.8	#346.2
Internal Link Dist (m)		100.9		128.1		186.1			287.3
Turn Bay Length (m)	38.0		156.0		105.0		90.0	105.0	
Base Capacity (vph)	304	437	210	391	59	1081	1021	572	1164
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	0.04	0.49	1.45	0.08	1.56	0.37	0.09	0.01	0.97

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	6	207	304	14	16	92	400	89	5	1123	6
Future Volume (vph)	13	6	207	304	14	16	92	400	89	5	1123	6
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1695	1524		1695	1642		1695	1655	1517	1695	1783	
Flt Permitted	0.74	1.00		0.51	1.00		0.05	1.00	1.00	0.49	1.00	
Satd. Flow (perm)	1316	1524		910	1642		91	1655	1517	876	1783	
Peak-hour factor, PHF	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	6	207	304	14	16	92	400	89	5	1123	6
RTOR Reduction (vph)	0	86	0	0	12	0	0	0	31	0	0	0
Lane Group Flow (vph)	13	127	0	304	18	0	92	400	58	5	1129	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	10%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	27.7	27.7		27.7	27.7		78.4	78.4	78.4	78.4	78.4	
Effective Green, g (s)	27.7	27.7		27.7	27.7		78.4	78.4	78.4	78.4	78.4	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.65	0.65	0.65	0.65	0.65	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	303	351		210	379		59	1081	991	572	1164	
v/s Ratio Prot		0.08			0.01			0.24			0.63	
v/s Ratio Perm	0.01			c0.33			c1.01		0.04	0.01		
v/c Ratio	0.04	0.36		1.45	0.05		1.56	0.37	0.06	0.01	0.97	
Uniform Delay, d1	35.9	38.7		46.1	35.9		20.8	9.5	7.5	7.3	19.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.6		226.1	0.1		318.8	1.0	0.1	0.0	20.1	
Delay (s)	35.9	39.4		272.3	35.9		339.6	10.5	7.6	7.3	39.8	
Level of Service	D	D		F	D		F	B	A	A	D	
Approach Delay (s)		39.2			251.0			62.2			39.6	
Approach LOS		D			F			E			D	

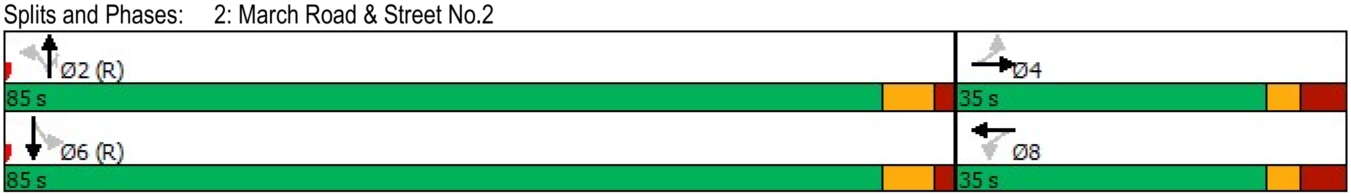
Intersection Summary			
HCM 2000 Control Delay	76.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	122.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	34	22	174	12	238	1138	312	16	443
Future Volume (vph)	34	22	174	12	238	1138	312	16	443
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	34.3	34.3	34.3	34.3	34.6	34.6	34.6	34.6	34.6
Total Split (s)	35.0	35.0	35.0	35.0	85.0	85.0	85.0	85.0	85.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	70.8%	70.8%	70.8%	70.8%	70.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	24.3	24.3	24.3	24.3	81.8	81.8	81.8	81.8	81.8
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.68	0.68	0.68	0.68	0.68
v/c Ratio	0.13	0.43	0.91	0.06	0.43	0.93	0.28	0.18	0.39
Control Delay	38.4	11.1	90.4	25.7	12.4	32.1	1.6	14.1	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.4	11.1	90.4	25.7	12.4	32.1	1.6	14.1	9.9
LOS	D	B	F	C	B	C	A	B	A
Approach Delay		15.2		83.4		23.7			10.0
Approach LOS		B		F		C			B

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 24.9 Intersection LOS: C
Intersection Capacity Utilization 112.9% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	34	190	174	21	238	1138	312	16	466
v/c Ratio	0.13	0.43	0.91	0.06	0.43	0.93	0.28	0.18	0.39
Control Delay	38.4	11.1	90.4	25.7	12.4	32.1	1.6	14.1	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.4	11.1	90.4	25.7	12.4	32.1	1.6	14.1	9.9
Queue Length 50th (m)	6.4	4.1	39.0	2.2	24.9	229.1	0.5	1.4	46.4
Queue Length 95th (m)	15.1	23.0	#75.6	8.8	43.8	#347.6	9.7	5.6	66.7
Internal Link Dist (m)		100.9		128.1		186.1			287.3
Turn Bay Length (m)	37.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	306	486	219	392	553	1227	1130	88	1208
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	0.11	0.39	0.79	0.05	0.43	0.93	0.28	0.18	0.39

Intersection Summary

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

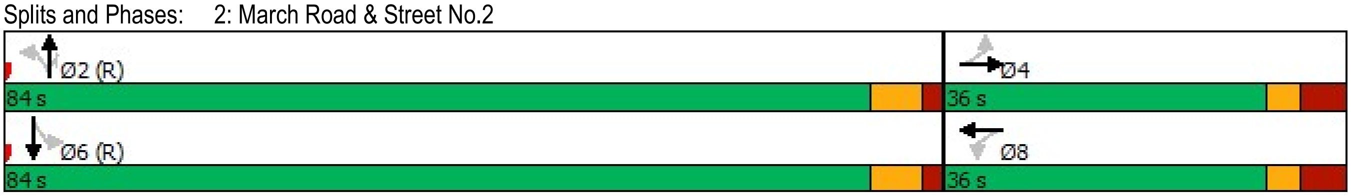
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	22	168	174	12	9	238	1138	312	16	443	23
Future Volume (vph)	34	22	168	174	12	9	238	1138	312	16	443	23
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.87		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1695	1548		1695	1670		1695	1802	1517	1695	1771	
Flt Permitted	0.74	1.00		0.53	1.00		0.45	1.00	1.00	0.07	1.00	
Satd. Flow (perm)	1327	1548		951	1670		811	1802	1517	131	1771	
Peak-hour factor, PHF	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)	34	22	168	174	12	9	238	1138	312	16	443	23
RTOR Reduction (vph)	0	134	0	0	7	0	0	0	97	0	1	0
Lane Group Flow (vph)	34	56	0	174	14	0	238	1138	215	16	465	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	24.3	24.3		24.3	24.3		81.8	81.8	81.8	81.8	81.8	
Effective Green, g (s)	24.3	24.3		24.3	24.3		81.8	81.8	81.8	81.8	81.8	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.68	0.68	0.68	0.68	0.68	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	268	313		192	338		552	1228	1034	89	1207	
v/s Ratio Prot		0.04			0.01			c0.63			0.26	
v/s Ratio Perm	0.03			c0.18			0.29		0.14	0.12		
v/c Ratio	0.13	0.18		0.91	0.04		0.43	0.93	0.21	0.18	0.39	
Uniform Delay, d1	39.2	39.6		46.7	38.5		8.6	16.5	7.1	6.9	8.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.3		39.4	0.0		2.4	13.2	0.5	4.4	0.9	
Delay (s)	39.4	39.9		86.1	38.5		11.1	29.7	7.5	11.3	9.2	
Level of Service	D	D		F	D		B	C	A	B	A	
Approach Delay (s)		39.8			81.0			23.0			9.2	
Approach LOS		D			F			C			A	

Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	112.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	11	6	304	14	48	403	89	5	1132
Future Volume (vph)	11	6	304	14	48	403	89	5	1132
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	34.3	34.3	34.3	34.3	34.6	34.6	34.6	34.6	34.6
Total Split (s)	36.0	36.0	36.0	36.0	84.0	84.0	84.0	84.0	84.0
Total Split (%)	30.0%	30.0%	30.0%	30.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	28.7	28.7	28.7	28.7	77.4	77.4	77.4	77.4	77.4
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.64	0.64	0.64	0.64	0.64
v/c Ratio	0.04	0.25	1.04	0.07	0.81	0.38	0.09	0.01	0.99
Control Delay	35.6	9.4	108.6	22.0	98.0	11.3	1.8	7.8	45.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.6	9.4	108.6	22.0	98.0	11.3	1.8	7.8	45.7
LOS	D	A	F	C	F	B	A	A	D
Approach Delay		11.8		100.9		17.4			45.6
Approach LOS		B		F		B			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.04	
Intersection Signal Delay: 45.2	Intersection LOS: D
Intersection Capacity Utilization 99.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	11	110	304	30	48	403	89	5	1137
v/c Ratio	0.04	0.25	1.04	0.07	0.81	0.38	0.09	0.01	0.99
Control Delay	35.6	9.4	108.6	22.0	98.0	11.3	1.8	7.8	45.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.6	9.4	108.6	22.0	98.0	11.3	1.8	7.8	45.7
Queue Length 50th (m)	2.0	1.1	~77.2	2.6	7.7	41.2	0.0	0.4	242.8
Queue Length 95th (m)	6.9	15.2	#131.6	10.3	#19.7	59.6	5.5	1.8	#353.8
Internal Link Dist (m)		100.9		128.1		186.1			287.3
Turn Bay Length (m)	37.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	314	445	292	404	59	1067	1010	559	1150
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	0.04	0.25	1.04	0.07	0.81	0.38	0.09	0.01	0.99

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	6	104	304	14	16	48	403	89	5	1132	5
Future Volume (vph)	11	6	104	304	14	16	48	403	89	5	1132	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1695	1531		1695	1642		1695	1655	1517	1695	1783	
Flt Permitted	0.74	1.00		0.69	1.00		0.05	1.00	1.00	0.49	1.00	
Satd. Flow (perm)	1316	1531		1224	1642		92	1655	1517	868	1783	
Peak-hour factor, PHF	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)	11	6	104	304	14	16	48	403	89	5	1132	5
RTOR Reduction (vph)	0	79	0	0	12	0	0	0	32	0	0	0
Lane Group Flow (vph)	11	31	0	304	18	0	48	403	57	5	1137	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	10%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	28.7	28.7		28.7	28.7		77.4	77.4	77.4	77.4	77.4	
Effective Green, g (s)	28.7	28.7		28.7	28.7		77.4	77.4	77.4	77.4	77.4	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.65	0.65	0.65	0.65	0.65	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	314	366		292	392		59	1067	978	559	1150	
v/s Ratio Prot		0.02			0.01			0.24			c0.64	
v/s Ratio Perm	0.01			c0.25			0.52		0.04	0.01		
v/c Ratio	0.04	0.08		1.04	0.05		0.81	0.38	0.06	0.01	0.99	
Uniform Delay, d1	35.0	35.4		45.6	35.1		15.9	10.0	7.9	7.6	20.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.1		63.8	0.0		71.8	1.0	0.1	0.0	24.0	
Delay (s)	35.1	35.5		109.4	35.2		87.7	11.0	8.0	7.6	44.8	
Level of Service	D	D		F	D		F	B	A	A	D	
Approach Delay (s)		35.5			102.8			17.3			44.7	
Approach LOS		D			F			B			D	

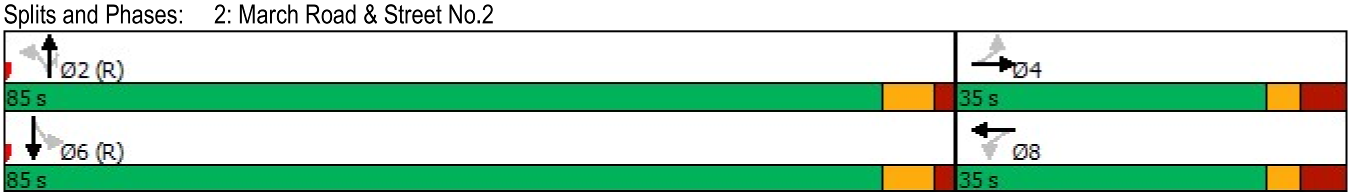
Intersection Summary			
HCM 2000 Control Delay	46.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	33	22	174	12	138	1147	312	16	446
Future Volume (vph)	33	22	174	12	138	1147	312	16	446
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	34.3	34.3	34.3	34.3	34.6	34.6	34.6	34.6	34.6
Total Split (s)	35.0	35.0	35.0	35.0	85.0	85.0	85.0	85.0	85.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	70.8%	70.8%	70.8%	70.8%	70.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	21.6	21.6	21.6	21.6	84.5	84.5	84.5	84.5	84.5
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.70	0.70	0.70	0.70	0.70
v/c Ratio	0.14	0.32	0.80	0.07	0.24	0.90	0.27	0.14	0.37
Control Delay	40.1	13.8	71.8	26.5	8.5	27.7	1.6	11.1	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	13.8	71.8	26.5	8.5	27.7	1.6	11.1	8.8
LOS	D	B	E	C	A	C	A	B	A
Approach Delay		19.7		66.9		20.9			8.9
Approach LOS		B		E		C			A

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 18 (15%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 22.1 Intersection LOS: C
Intersection Capacity Utilization 101.8% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	33	116	174	21	138	1147	312	16	467
v/c Ratio	0.14	0.32	0.80	0.07	0.24	0.90	0.27	0.14	0.37
Control Delay	40.1	13.8	71.8	26.5	8.5	27.7	1.6	11.1	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	13.8	71.8	26.5	8.5	27.7	1.6	11.1	8.8
Queue Length 50th (m)	6.6	4.3	39.3	2.4	10.6	201.6	0.6	1.1	40.1
Queue Length 95th (m)	14.9	19.0	61.5	8.8	22.6	#352.0	10.0	5.0	67.0
Internal Link Dist (m)		100.9		128.1		186.1			287.3
Turn Bay Length (m)	37.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	306	434	280	392	579	1269	1157	111	1249
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	0.11	0.27	0.62	0.05	0.24	0.90	0.27	0.14	0.37

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	22	94	174	12	9	138	1147	312	16	446	21
Future Volume (vph)	33	22	94	174	12	9	138	1147	312	16	446	21
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.88		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1695	1567		1695	1670		1695	1802	1517	1695	1772	
Flt Permitted	0.74	1.00		0.68	1.00		0.46	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	1327	1567		1218	1670		822	1802	1517	159	1772	
Peak-hour factor, PHF	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)	33	22	94	174	12	9	138	1147	312	16	446	21
RTOR Reduction (vph)	0	77	0	0	7	0	0	0	89	0	1	0
Lane Group Flow (vph)	33	39	0	174	14	0	138	1147	223	16	466	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	21.6	21.6		21.6	21.6		84.5	84.5	84.5	84.5	84.5	
Effective Green, g (s)	21.6	21.6		21.6	21.6		84.5	84.5	84.5	84.5	84.5	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.70	0.70	0.70	0.70	0.70	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	238	282		219	300		578	1268	1068	111	1247	
v/s Ratio Prot		0.02			0.01			c0.64			0.26	
v/s Ratio Perm	0.02			c0.14			0.17		0.15	0.10		
v/c Ratio	0.14	0.14		0.79	0.05		0.24	0.90	0.21	0.14	0.37	
Uniform Delay, d1	41.4	41.4		47.1	40.7		6.3	14.5	6.2	5.8	7.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.2		17.8	0.1		1.0	10.8	0.4	2.7	0.9	
Delay (s)	41.6	41.6		64.8	40.7		7.3	25.2	6.6	8.6	8.0	
Level of Service	D	D		E	D		A	C	A	A	A	
Approach Delay (s)		41.6			62.2			20.0			8.0	
Approach LOS		D			E			C			A	

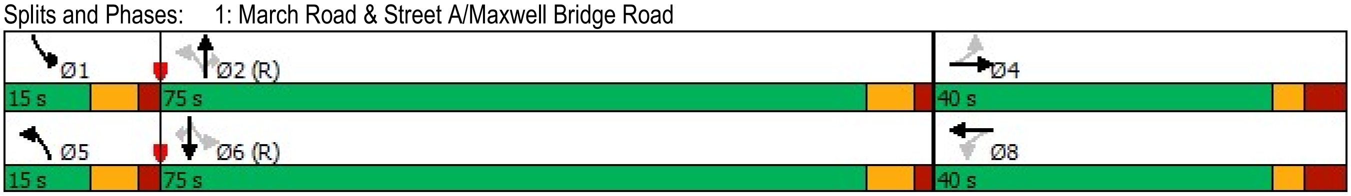
Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	24	40	134	17	25	565	65	78	1581	13
Future Volume (vph)	24	40	134	17	25	565	65	78	1581	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	20.3	20.3	20.3	20.3	89.8	84.2	84.2	92.3	87.6	87.6
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.69	0.65	0.65	0.71	0.67	0.67
v/c Ratio	0.12	0.45	0.80	0.17	0.13	0.28	0.07	0.13	0.69	0.01
Control Delay	45.1	21.8	83.5	23.5	7.7	11.9	1.2	6.4	17.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	21.8	83.5	23.5	7.7	11.9	1.2	6.4	17.6	0.0
LOS	D	C	F	C	A	B	A	A	B	A
Approach Delay		25.1		68.7		10.7			16.9	
Approach LOS		C		E		B			B	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 69 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 19.4 Intersection LOS: B
Intersection Capacity Utilization 92.4% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: March Road & Street A/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	142	134	44	25	565	65	78	1581	13
v/c Ratio	0.12	0.45	0.80	0.17	0.13	0.28	0.07	0.13	0.69	0.01
Control Delay	45.1	21.8	83.5	23.5	7.7	11.9	1.2	6.4	17.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	21.8	83.5	23.5	7.7	11.9	1.2	6.4	17.6	0.0
Queue Length 50th (m)	5.4	10.9	33.5	3.8	1.5	32.3	0.0	4.9	138.0	0.0
Queue Length 95th (m)	12.4	28.4	52.8	13.4	4.9	52.3	3.4	11.8	199.0	0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	333	457	271	414	209	2000	977	596	2284	995
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.31	0.49	0.11	0.12	0.28	0.07	0.13	0.69	0.01

Intersection Summary

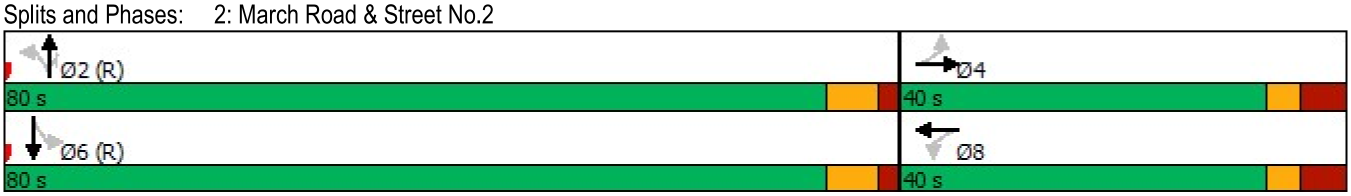
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	40	102	134	17	27	25	565	65	78	1581	13
Future Volume (vph)	24	40	102	134	17	27	25	565	65	78	1581	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1541		1712	1566		1586	3088	1459	1712	3390	1432
Flt Permitted	0.73	1.00		0.60	1.00		0.10	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1326	1541		1077	1566		170	3088	1459	749	3390	1432
Peak-hour factor, PHF	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)	24	40	102	134	17	27	25	565	65	78	1581	13
RTOR Reduction (vph)	0	79	0	0	23	0	0	0	24	0	0	5
Lane Group Flow (vph)	24	63	0	134	21	0	25	565	41	78	1581	8
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	20.3	20.3		20.3	20.3		87.1	82.9	82.9	91.1	84.9	84.9
Effective Green, g (s)	20.3	20.3		20.3	20.3		87.1	82.9	82.9	91.1	84.9	84.9
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.67	0.64	0.64	0.70	0.65	0.65
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	207	240		168	244		159	1969	930	570	2213	935
v/s Ratio Prot		0.04			0.01		0.01	0.18		c0.01	c0.47	
v/s Ratio Perm	0.02			c0.12			0.10		0.03	0.09		0.01
v/c Ratio	0.12	0.26		0.80	0.09		0.16	0.29	0.04	0.14	0.71	0.01
Uniform Delay, d1	47.1	48.3		52.9	46.9		11.1	10.4	8.8	6.2	14.7	7.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.6		22.5	0.2		0.5	0.4	0.1	0.1	2.0	0.0
Delay (s)	47.4	48.8		75.4	47.1		11.5	10.8	8.9	6.3	16.7	7.9
Level of Service	D	D		E	D		B	B	A	A	B	A
Approach Delay (s)		48.6			68.4			10.6			16.1	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	6	304	14	501	89	5	1363
Future Volume (vph)	6	304	14	501	89	5	1363
Turn Type	NA	Perm	NA	NA	Perm	Perm	NA
Protected Phases	4		8	2			6
Permitted Phases		8			2	6	
Detector Phase	4	8	8	2	2	6	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	34.3	34.3	38.6	38.6	38.6	38.6
Total Split (s)	40.0	40.0	40.0	80.0	80.0	80.0	80.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.0	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	6.6	6.6	6.6	6.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	29.9	29.9	29.9	76.2	76.2	76.2	76.2
Actuated g/C Ratio	0.25	0.25	0.25	0.64	0.64	0.64	0.64
v/c Ratio	0.02	0.90	0.07	0.49	0.09	0.01	1.20
Control Delay	32.2	72.5	20.1	14.2	2.2	9.2	123.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.2	72.5	20.1	14.2	2.2	9.2	123.8
LOS	C	E	C	B	A	A	F
Approach Delay	32.2		67.8	12.3			123.4
Approach LOS	C		E	B			F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 106 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 86.6	Intersection LOS: F
Intersection Capacity Utilization 111.8%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	6	304	30	501	89	5	1363
v/c Ratio	0.02	0.90	0.07	0.49	0.09	0.01	1.20
Control Delay	32.2	72.5	20.1	14.2	2.2	9.2	123.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.2	72.5	20.1	14.2	2.2	9.2	123.8
Queue Length 50th (m)	1.0	67.2	2.4	62.1	0.0	0.5	~400.5
Queue Length 95th (m)	4.4	#112.6	9.8	88.9	6.1	2.0	#480.4
Internal Link Dist (m)	124.2		210.3	414.3			287.3
Turn Bay Length (m)		156.0			90.0	105.0	
Base Capacity (vph)	434	370	447	1031	958	474	1133
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.82	0.07	0.49	0.09	0.01	1.20

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	6	0	304	14	16	0	501	89	5	1363	0
Future Volume (vph)	0	6	0	304	14	16	0	501	89	5	1363	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		7.3		7.3	7.3			6.6	6.6	6.6	6.6	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00		1.00	0.92			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1596		1712	1598			1625	1459	1712	1784	
Flt Permitted		1.00		0.75	1.00			1.00	1.00	0.41	1.00	
Satd. Flow (perm)		1596		1358	1598			1625	1459	748	1784	
Peak-hour factor, PHF	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)	0	6	0	304	14	16	0	501	89	5	1363	0
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	32	0	0	0
Lane Group Flow (vph)	0	6	0	304	18	0	0	501	57	5	1363	0
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		29.9		29.9	29.9			76.2	76.2	76.2	76.2	
Effective Green, g (s)		29.9		29.9	29.9			76.2	76.2	76.2	76.2	
Actuated g/C Ratio		0.25		0.25	0.25			0.64	0.64	0.64	0.64	
Clearance Time (s)		7.3		7.3	7.3			6.6	6.6	6.6	6.6	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		397		338	398			1031	926	474	1132	
v/s Ratio Prot		0.00			0.01			0.31			c0.76	
v/s Ratio Perm				c0.22					0.04	0.01		
v/c Ratio		0.02		0.90	0.05			0.49	0.06	0.01	1.20	
Uniform Delay, d1		34.0		43.6	34.2			11.6	8.3	8.0	21.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.0		25.2	0.0			1.6	0.1	0.0	100.4	
Delay (s)		34.0		68.8	34.3			13.2	8.4	8.1	122.3	
Level of Service		C		E	C			B	A	A	F	
Approach Delay (s)		34.0			65.7			12.5			121.9	
Approach LOS		C			E			B			F	

Intersection Summary			
HCM 2000 Control Delay	85.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	111.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	531	144	235	49	553
Future Volume (vph)	531	144	235	49	553
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	50.0	50.0
Minimum Split (s)	27.3	56.3	56.3	56.3	56.3
Total Split (s)	36.3	56.3	56.3	56.3	56.3
Total Split (%)	39.2%	60.8%	60.8%	60.8%	60.8%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Max	Max	Max	Max
Act Effct Green (s)	20.0	50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24	0.61	0.61	0.61	0.61
v/c Ratio	0.75	0.14	0.25	0.08	0.51
Control Delay	34.7	8.3	2.0	8.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	8.3	2.0	8.4	12.1
LOS	C	A	A	A	B
Approach Delay	34.7	4.4			11.8
Approach LOS	C	A			B

Intersection Summary	
Cycle Length: 92.6	
Actuated Cycle Length: 82.7	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 18.7	Intersection LOS: B
Intersection Capacity Utilization 93.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	591	144	235	49	553
v/c Ratio	0.75	0.14	0.25	0.08	0.51
Control Delay	34.7	8.3	2.0	8.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	8.3	2.0	8.4	12.1
Queue Length 50th (m)	43.4	8.8	0.0	2.9	44.4
Queue Length 95th (m)	60.0	20.1	9.5	8.8	85.0
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1179	1040	929	611	1091
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.14	0.25	0.08	0.51

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	531	60	144	235	49	553
Future Volume (vph)	531	60	144	235	49	553
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3218		1717	1381	1441	1802
Flt Permitted	0.96		1.00	1.00	0.67	1.00
Satd. Flow (perm)	3218		1717	1381	1009	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	531	60	144	235	49	553
RTOR Reduction (vph)	11	0	0	93	0	0
Lane Group Flow (vph)	580	0	144	142	49	553
Heavy Vehicles (%)	3%	7%	6%	12%	20%	1%
Turn Type	Prot		NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	20.0		50.1	50.1	50.1	50.1
Effective Green, g (s)	20.0		50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24		0.61	0.61	0.61	0.61
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	778		1040	836	611	1091
v/s Ratio Prot	c0.18		0.08			c0.31
v/s Ratio Perm				0.10	0.05	
v/c Ratio	0.75		0.14	0.17	0.08	0.51
Uniform Delay, d1	29.0		7.0	7.2	6.8	9.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.9		0.3	0.4	0.3	1.7
Delay (s)	32.9		7.3	7.6	7.0	11.0
Level of Service	C		A	A	A	B
Approach Delay (s)	32.9		7.5			10.6
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	82.7	Sum of lost time (s)	12.6
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	64	16	0	55	0	102
Future Volume (Veh/h)	64	16	0	55	0	102
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)	64	16	0	55	0	102
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked						
vC, conflicting volume			80		127	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			80		127	72
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		100	90
cM capacity (veh/h)			1518		868	990

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	80	55	102
Volume Left	0	0	0
Volume Right	16	0	102
cSH	1700	1518	990
Volume to Capacity	0.05	0.00	0.10
Queue Length 95th (m)	0.0	0.0	2.6
Control Delay (s)	0.0	0.0	9.1
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	80	55	0	0	0
Future Volume (Veh/h)	0	80	55	0	0	0
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	80	55	0	0	0
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	110	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	110	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	97			
cM capacity (veh/h)	857	1085	1623			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	80	55	0
Volume Left	0	55	0
Volume Right	80	0	0
cSH	1085	1623	1700
Volume to Capacity	0.07	0.03	0.00
Queue Length 95th (m)	1.8	0.8	0.0
Control Delay (s)	8.6	7.3	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	7.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	60	0	587	31	0	1667	0
Future Volume (Veh/h)	0	0	0	0	0	60	0	587	31	0	1667	0
Sign Control		Stop			Stop			Free			Free	
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)	0	0	0	0	0	60	0	587	31	0	1667	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								196				
pX, platoon unblocked	0.89	0.89		0.89	0.89	0.89				0.89		
vC, conflicting volume	2314	2285	1667	2254	2254	587	1667			618		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2413	2381	1667	2346	2346	476	1667			511		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	89	100			100		
cM capacity (veh/h)	18	31	119	22	32	525	391			940		

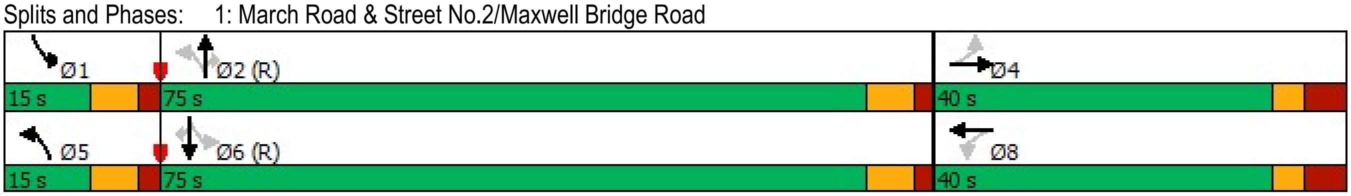
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	60	587	31	1667
Volume Left	0	0	0	0
Volume Right	60	0	31	0
cSH	525	1700	1700	1700
Volume to Capacity	0.11	0.35	0.02	0.98
Queue Length 95th (m)	2.9	0.0	0.0	0.0
Control Delay (s)	12.7	0.0	0.0	0.0
Lane LOS	B			
Approach Delay (s)	12.7	0.0		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	21	59	85	62	184	1660	122	72	711	13
Future Volume (vph)	21	59	85	62	184	1660	122	72	711	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	15.2	15.2	15.2	15.2	96.7	89.0	89.0	92.9	85.0	85.0
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.74	0.68	0.68	0.71	0.65	0.65
v/c Ratio	0.20	0.57	0.67	0.66	0.34	0.71	0.11	0.33	0.32	0.01
Control Delay	54.4	45.5	79.6	47.4	6.0	16.6	3.4	8.8	11.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.4	45.5	79.6	47.4	6.0	16.6	3.4	8.8	11.1	0.0
LOS	D	D	E	D	A	B	A	A	B	A
Approach Delay		46.7		58.6		14.8			10.7	
Approach LOS		D		E		B			B	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 29 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 110	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 18.6	Intersection LOS: B
Intersection Capacity Utilization 95.6%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	85	160	184	1660	122	72	711	13
v/c Ratio	0.20	0.57	0.67	0.66	0.34	0.71	0.11	0.33	0.32	0.01
Control Delay	54.4	45.5	79.6	47.4	6.0	16.6	3.4	8.8	11.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.4	45.5	79.6	47.4	6.0	16.6	3.4	8.8	11.1	0.0
Queue Length 50th (m)	5.0	20.2	21.3	25.3	9.9	130.4	2.4	3.6	38.2	0.0
Queue Length 95th (m)	12.7	38.3	37.4	45.9	20.1	200.6	11.1	8.9	60.8	0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	222	423	272	454	551	2343	1087	228	2216	1043
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.29	0.31	0.35	0.33	0.71	0.11	0.32	0.32	0.01

Intersection Summary

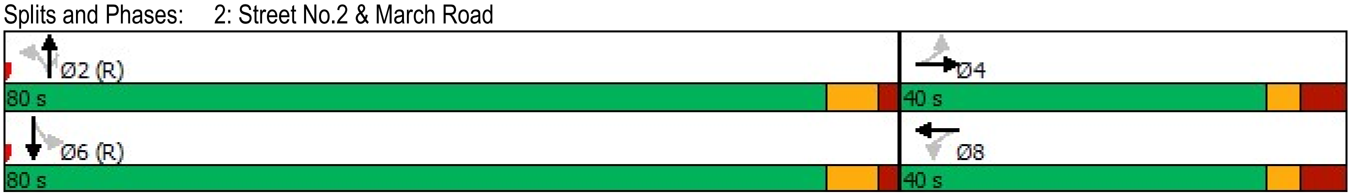
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	59	65	85	62	98	184	1660	122	72	711	13
Future Volume (vph)	21	59	65	85	62	98	184	1660	122	72	711	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.92		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1562		1647	1634		1729	3424	1547	1729	3390	1547
Flt Permitted	0.49	1.00		0.62	1.00		0.35	1.00	1.00	0.09	1.00	1.00
Satd. Flow (perm)	887	1562		1082	1634		632	3424	1547	171	3390	1547
Peak-hour factor, PHF	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)	21	59	65	85	62	98	184	1660	122	72	711	13
RTOR Reduction (vph)	0	36	0	0	51	0	0	0	30	0	0	5
Lane Group Flow (vph)	21	88	0	85	109	0	184	1660	92	72	711	9
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	15.2	15.2		15.2	15.2		96.8	87.6	87.6	91.6	85.0	85.0
Effective Green, g (s)	15.2	15.2		15.2	15.2		96.8	87.6	87.6	91.6	85.0	85.0
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.74	0.67	0.67	0.70	0.65	0.65
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	182		126	191		548	2307	1042	199	2216	1011
v/s Ratio Prot		0.06			0.07		c0.02	c0.48		0.02	0.21	
v/s Ratio Perm	0.02			c0.08			0.23		0.06	0.24		0.01
v/c Ratio	0.20	0.48		0.67	0.57		0.34	0.72	0.09	0.36	0.32	0.01
Uniform Delay, d1	51.9	53.7		55.0	54.3		5.1	13.4	7.4	10.9	9.9	7.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	2.0		13.4	3.9		0.4	2.0	0.2	1.1	0.4	0.0
Delay (s)	52.9	55.7		68.4	58.2		5.4	15.4	7.5	12.0	10.2	7.8
Level of Service	D	E		E	E		A	B	A	B	B	A
Approach Delay (s)		55.3			61.7			14.0			10.4	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	22	174	12	1417	312	16	613
Future Volume (vph)	22	174	12	1417	312	16	613
Turn Type	NA	Perm	NA	NA	Perm	Perm	NA
Protected Phases	4		8	2			6
Permitted Phases		8			2	6	
Detector Phase	4	8	8	2	2	6	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	34.3	34.3	35.9	35.9	38.6	38.6
Total Split (s)	40.0	40.0	40.0	80.0	80.0	80.0	80.0
Total Split (%)	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.0	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	6.6	6.6	6.6	6.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	21.5	21.5	21.5	84.6	84.6	84.6	84.6
Actuated g/C Ratio	0.18	0.18	0.18	0.70	0.70	0.70	0.70
v/c Ratio	0.07	0.76	0.05	1.12	0.27	0.27	0.49
Control Delay	38.2	66.3	31.9	83.5	3.0	22.4	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.2	66.3	31.9	83.5	3.0	22.4	10.5
LOS	D	E	C	F	A	C	B
Approach Delay	38.2		63.5	69.0			10.8
Approach LOS	D		E	E			B

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 36 (30%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.12	
Intersection Signal Delay: 54.1	Intersection LOS: D
Intersection Capacity Utilization 107.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 2: Street No.2 & March Road



Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	22	174	15	1417	312	16	613
v/c Ratio	0.07	0.76	0.05	1.12	0.27	0.27	0.49
Control Delay	38.2	66.3	31.9	83.5	3.0	22.4	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.2	66.3	31.9	83.5	3.0	22.4	10.5
Queue Length 50th (m)	4.4	39.3	2.4	~383.1	6.2	1.2	58.1
Queue Length 95th (m)	10.7	59.0	7.6	#493.8	19.0	8.3	103.9
Internal Link Dist (m)	124.2		210.3	414.8			287.3
Turn Bay Length (m)		156.0			90.0	105.0	
Base Capacity (vph)	450	350	471	1270	1155	60	1258
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.50	0.03	1.12	0.27	0.27	0.49

Intersection Summary

~ 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.

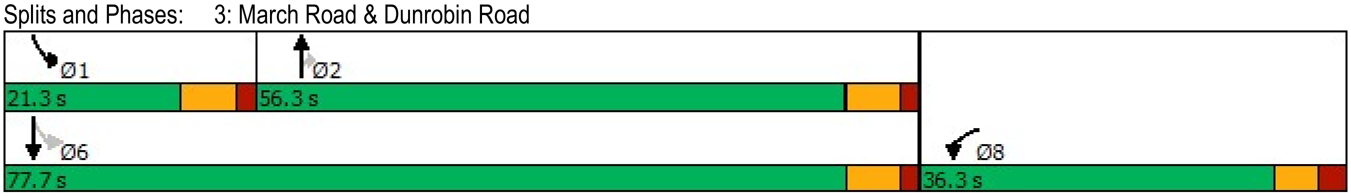
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	22	0	174	12	3	0	1417	312	16	613	0
Future Volume (vph)	0	22	0	174	12	3	0	1417	312	16	613	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		7.3		7.3	7.3			6.6	6.6	6.6	6.6	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00		1.00	0.97			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1655		1647	1724			1802	1547	1729	1784	
Flt Permitted		1.00		0.74	1.00			1.00	1.00	0.05	1.00	
Satd. Flow (perm)		1655		1288	1724			1802	1547	86	1784	
Peak-hour factor, PHF	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)	0	22	0	174	12	3	0	1417	312	16	613	0
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	64	0	0	0
Lane Group Flow (vph)	0	22	0	174	13	0	0	1417	248	16	613	0
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		21.5		21.5	21.5			84.6	84.6	84.6	84.6	
Effective Green, g (s)		21.5		21.5	21.5			84.6	84.6	84.6	84.6	
Actuated g/C Ratio		0.18		0.18	0.18			0.70	0.70	0.70	0.70	
Clearance Time (s)		7.3		7.3	7.3			6.6	6.6	6.6	6.6	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		296		230	308			1270	1090	60	1257	
v/s Ratio Prot		0.01			0.01			c0.79			0.34	
v/s Ratio Perm				c0.14					0.16	0.19		
v/c Ratio		0.07		0.76	0.04			1.12	0.23	0.27	0.49	
Uniform Delay, d1		41.0		46.8	40.7			17.7	6.2	6.4	8.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		13.2	0.1			63.3	0.5	10.6	1.4	
Delay (s)		41.1		60.0	40.8			81.0	6.7	17.0	9.3	
Level of Service		D		E	D			F	A	B	A	
Approach Delay (s)		41.1			58.5			67.6			9.5	
Approach LOS		D			E			E			A	

Intersection Summary			
HCM 2000 Control Delay	52.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	241	574	593	36	220
Future Volume (vph)	241	574	593	36	220
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.7
Total Split (%)	31.8%	49.4%	49.4%	18.7%	68.2%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	14.1	63.9	63.9	71.5	71.5
Actuated g/C Ratio	0.14	0.65	0.65	0.73	0.73
v/c Ratio	0.66	0.49	0.49	0.07	0.17
Control Delay	42.1	12.4	2.4	4.6	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	12.4	2.4	4.6	4.9
LOS	D	B	A	A	A
Approach Delay	42.1	7.3			4.8
Approach LOS	D	A			A

Intersection Summary	
Cycle Length: 114	
Actuated Cycle Length: 98.2	
Natural Cycle: 95	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 61.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	315	574	593	36	220
v/c Ratio	0.66	0.49	0.49	0.07	0.17
Control Delay	42.1	12.4	2.4	4.6	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	12.4	2.4	4.6	4.9
Queue Length 50th (m)	26.0	58.7	0.0	1.6	11.0
Queue Length 95th (m)	39.5	99.1	14.0	4.8	21.4
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	970	1173	1204	601	1310
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.32	0.49	0.49	0.06	0.17

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	241	74	574	593	36	220
Future Volume (vph)	241	74	574	593	36	220
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.96		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3093		1802	1532	1679	1802
Flt Permitted	0.96		1.00	1.00	0.34	1.00
Satd. Flow (perm)	3093		1802	1532	598	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	241	74	574	593	36	220
RTOR Reduction (vph)	31	0	0	216	0	0
Lane Group Flow (vph)	284	0	574	377	36	220
Heavy Vehicles (%)	7%	3%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	14.1		64.0	64.0	74.1	74.1
Effective Green, g (s)	14.1		64.0	64.0	74.1	74.1
Actuated g/C Ratio	0.14		0.63	0.63	0.74	0.74
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	432		1144	972	480	1324
v/s Ratio Prot	c0.09		c0.32		0.00	c0.12
v/s Ratio Perm				0.25	0.05	
v/c Ratio	0.66		0.50	0.39	0.07	0.17
Uniform Delay, d1	41.1		9.9	8.9	5.2	4.0
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6		1.6	1.2	0.1	0.3
Delay (s)	44.7		11.4	10.1	5.2	4.3
Level of Service	D		B	B	A	A
Approach Delay (s)	44.7		10.7			4.4
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.8	Sum of lost time (s)	18.9
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	38	0	0	259	0	107
Future Volume (Veh/h)	38	0	0	259	0	107
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)	38	0	0	259	0	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.98	
vC, conflicting volume			38		297	38
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			38		274	38
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		100	90
cM capacity (veh/h)			1572		702	1034

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	38	259	107
Volume Left	0	0	0
Volume Right	0	0	107
cSH	1700	1572	1034
Volume to Capacity	0.02	0.00	0.10
Queue Length 95th (m)	0.0	0.0	2.6
Control Delay (s)	0.0	0.0	8.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.9
Approach LOS			A

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	259	0	21	0
Future Volume (Veh/h)	0	17	259	0	21	0
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	17	259	0	21	0
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	539	21	21			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	539	21	21			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	84			
cM capacity (veh/h)	422	1056	1595			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	259	21
Volume Left	0	259	0
Volume Right	17	0	0
cSH	1056	1595	1700
Volume to Capacity	0.02	0.16	0.01
Queue Length 95th (m)	0.4	4.4	0.0
Control Delay (s)	8.5	7.7	0.0
Lane LOS	A	A	
Approach Delay (s)	8.5	7.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	52	0	1729	67	0	766	21
Future Volume (Veh/h)	0	0	0	0	0	52	0	1729	67	0	766	21
Sign Control		Stop			Stop			Free			Free	
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)	0	0	0	0	0	52	0	1729	67	0	766	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)								196				
pX, platoon unblocked	0.32	0.32		0.32	0.32	0.32				0.32		
vC, conflicting volume	2558	2572	776	2506	2516	1729	787			1796		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4767	4813	776	4606	4639	2207	787			2414		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	100	100	100	0	100			100		
cM capacity (veh/h)	0	0	397	0	0	18	832			64		

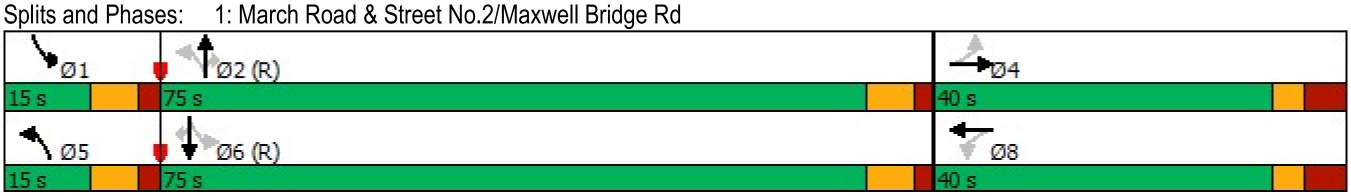
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	52	1729	67	787
Volume Left	0	0	0	0
Volume Right	52	0	67	21
cSH	18	1700	1700	1700
Volume to Capacity	2.87	1.02	0.04	0.46
Queue Length 95th (m)	53.3	0.0	0.0	0.0
Control Delay (s)	1281.6	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	1281.6	0.0		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	25.3		
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	24	40	134	17	134	613	65	78	1715	13
Future Volume (vph)	24	40	134	17	134	613	65	78	1715	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	32.7	32.7	32.7	32.7	78.3	71.8	71.8	76.0	68.4	68.4
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.60	0.55	0.55	0.58	0.53	0.53
v/c Ratio	0.07	0.92	2.35	0.11	0.88	0.36	0.08	0.16	0.96	0.02
Control Delay	38.0	59.6	682.0	19.9	77.2	17.7	1.4	9.9	43.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	59.6	682.0	19.9	77.2	17.7	1.4	9.9	43.9	0.0
LOS	D	E	F	B	E	B	A	A	D	A
Approach Delay		58.5		518.4		26.2			42.1	
Approach LOS		E		F		C			D	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 69 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 2.35	
Intersection Signal Delay: 66.5	Intersection LOS: E
Intersection Capacity Utilization 118.0%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Rd



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	443	134	44	134	613	65	78	1715	13
v/c Ratio	0.07	0.92	2.35	0.11	0.88	0.36	0.08	0.16	0.96	0.02
Control Delay	38.0	59.6	682.0	19.9	77.2	17.7	1.4	9.9	43.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	59.6	682.0	19.9	77.2	17.7	1.4	9.9	43.9	0.0
Queue Length 50th (m)	4.7	83.1	~56.0	3.3	20.7	46.7	0.0	7.0	214.4	0.0
Queue Length 95th (m)	11.9	#146.1	#97.0	12.9	#58.9	60.5	3.6	13.0	#272.8	0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	333	480	57	414	152	1704	846	481	1783	797
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.92	2.35	0.11	0.88	0.36	0.08	0.16	0.96	0.02

Intersection Summary

~ 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.

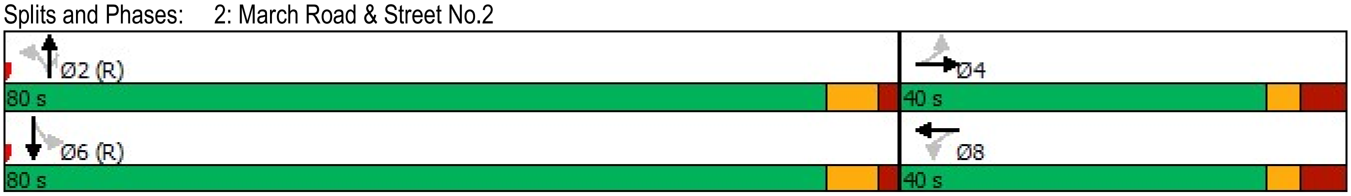
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	40	403	134	17	27	134	613	65	78	1715	13
Future Volume (vph)	24	40	403	134	17	27	134	613	65	78	1715	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1525		1712	1566		1586	3088	1459	1712	3390	1432
Flt Permitted	0.73	1.00		0.13	1.00		0.06	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1326	1525		230	1566		95	3088	1459	708	3390	1432
Peak-hour factor, PHF	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)	24	40	403	134	17	27	134	613	65	78	1715	13
RTOR Reduction (vph)	0	97	0	0	20	0	0	0	30	0	0	6
Lane Group Flow (vph)	24	346	0	134	24	0	134	613	35	78	1715	7
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	32.7	32.7		32.7	32.7		78.7	70.4	70.4	74.7	68.4	68.4
Effective Green, g (s)	32.7	32.7		32.7	32.7		78.7	70.4	70.4	74.7	68.4	68.4
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.61	0.54	0.54	0.57	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	333	383		57	393		152	1672	790	455	1783	753
v/s Ratio Prot		0.23			0.02		c0.06	0.20		0.01	c0.51	
v/s Ratio Perm	0.02			c0.58			0.48		0.02	0.09		0.00
v/c Ratio	0.07	0.90		2.35	0.06		0.88	0.37	0.04	0.17	0.96	0.01
Uniform Delay, d1	37.1	47.1		48.6	37.0		36.6	17.0	14.0	12.4	29.5	14.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	24.0		658.6	0.1		40.5	0.6	0.1	0.2	14.0	0.0
Delay (s)	37.2	71.1		707.3	37.0		77.1	17.7	14.1	12.6	43.6	14.7
Level of Service	D	E		F	D		E	B	B	B	D	B
Approach Delay (s)		69.4			541.6			27.2			42.0	
Approach LOS		E			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	69.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	118.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	28	6	304	14	48	501	89	5	1363
Future Volume (vph)	28	6	304	14	48	501	89	5	1363
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	39.3	35.3	35.3	38.6	38.6	38.6	38.6	38.6
Total Split (s)	40.0	40.0	40.0	40.0	80.0	80.0	80.0	80.0	80.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	31.9	31.9	31.9	31.9	74.2	74.2	74.2	74.2	74.2
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.62	0.62	0.62	0.62	0.62
v/c Ratio	0.08	0.32	0.96	0.07	0.86	0.50	0.10	0.01	1.24
Control Delay	33.3	22.9	84.6	20.1	115.2	15.0	2.2	9.2	140.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	22.9	84.6	20.1	115.2	15.0	2.2	9.2	140.9
LOS	C	C	F	C	F	B	A	A	F
Approach Delay		24.7		78.8		20.7			140.4
Approach LOS		C		E		C			F

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.24	
Intersection Signal Delay: 94.1	Intersection LOS: F
Intersection Capacity Utilization 120.6%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	28	140	304	30	48	501	89	5	1368
v/c Ratio	0.08	0.32	0.96	0.07	0.86	0.50	0.10	0.01	1.24
Control Delay	33.3	22.9	84.6	20.1	115.2	15.0	2.2	9.2	140.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	22.9	84.6	20.1	115.2	15.0	2.2	9.2	140.9
Queue Length 50th (m)	4.9	15.5	69.9	2.4	8.8	62.1	0.0	0.5	~403.3
Queue Length 95th (m)	12.3	32.8	#123.4	9.8	#22.2	88.9	6.1	2.0	#483.1
Internal Link Dist (m)		124.2		210.3		414.3			287.3
Turn Bay Length (m)	57.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	365	454	326	447	56	1004	936	454	1102
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	0.08	0.31	0.93	0.07	0.86	0.50	0.10	0.01	1.24

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	6	134	304	14	16	48	501	89	5	1363	5
Future Volume (vph)	28	6	134	304	14	16	48	501	89	5	1363	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1520		1712	1598		1586	1625	1459	1712	1783	
Flt Permitted	0.74	1.00		0.66	1.00		0.05	1.00	1.00	0.41	1.00	
Satd. Flow (perm)	1342	1520		1198	1598		90	1625	1459	736	1783	
Peak-hour factor, PHF	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)	28	6	134	304	14	16	48	501	89	5	1363	5
RTOR Reduction (vph)	0	40	0	0	12	0	0	0	34	0	0	0
Lane Group Flow (vph)	28	100	0	304	18	0	48	501	55	5	1368	0
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	31.9	31.9		31.9	31.9		74.2	74.2	74.2	74.2	74.2	
Effective Green, g (s)	31.9	31.9		31.9	31.9		74.2	74.2	74.2	74.2	74.2	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.62	0.62	0.62	0.62	0.62	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	356	404		318	424		55	1004	902	455	1102	
v/s Ratio Prot		0.07			0.01			0.31			c0.77	
v/s Ratio Perm	0.02			c0.25			0.53		0.04	0.01		
v/c Ratio	0.08	0.25		0.96	0.04		0.87	0.50	0.06	0.01	1.24	
Uniform Delay, d1	33.0	34.6		43.4	32.7		19.0	12.6	9.1	8.8	22.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.3		38.5	0.0		88.3	1.8	0.1	0.0	116.5	
Delay (s)	33.1	34.9		81.8	32.8		107.3	14.4	9.2	8.8	139.4	
Level of Service	C	C		F	C		F	B	A	A	F	
Approach Delay (s)		34.6			77.4			20.7			138.9	
Approach LOS		C			E			C			F	

Intersection Summary			
HCM 2000 Control Delay	93.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	120.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	536	158	249	49	558
Future Volume (vph)	536	158	249	49	558
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	50.0	50.0
Minimum Split (s)	27.3	56.3	56.3	56.3	56.3
Total Split (s)	36.3	56.3	56.3	56.3	56.3
Total Split (%)	39.2%	60.8%	60.8%	60.8%	60.8%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Max	Max	Max	Max
Act Effct Green (s)	20.1	50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24	0.60	0.60	0.60	0.60
v/c Ratio	0.75	0.15	0.27	0.08	0.51
Control Delay	34.8	8.5	2.1	8.5	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	8.5	2.1	8.5	12.3
LOS	C	A	A	A	B
Approach Delay	34.8	4.6			12.0
Approach LOS	C	A			B

Intersection Summary	
Cycle Length: 92.6	
Actuated Cycle Length: 82.9	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 18.5	Intersection LOS: B
Intersection Capacity Utilization 93.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	596	158	249	49	558
v/c Ratio	0.75	0.15	0.27	0.08	0.51
Control Delay	34.8	8.5	2.1	8.5	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	8.5	2.1	8.5	12.3
Queue Length 50th (m)	43.9	9.7	0.0	2.9	45.2
Queue Length 95th (m)	60.5	21.9	9.7	8.9	86.6
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1177	1038	933	602	1090
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.51	0.15	0.27	0.08	0.51

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	536	60	158	249	49	558
Future Volume (vph)	536	60	158	249	49	558
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3218		1717	1381	1441	1802
Flt Permitted	0.96		1.00	1.00	0.66	1.00
Satd. Flow (perm)	3218		1717	1381	996	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	536	60	158	249	49	558
RTOR Reduction (vph)	11	0	0	98	0	0
Lane Group Flow (vph)	585	0	158	151	49	558
Heavy Vehicles (%)	3%	7%	6%	12%	20%	1%
Turn Type	Prot		NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	20.1		50.1	50.1	50.1	50.1
Effective Green, g (s)	20.1		50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24		0.61	0.61	0.61	0.61
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	781		1038	835	602	1090
v/s Ratio Prot	c0.18		0.09			c0.31
v/s Ratio Perm				0.11	0.05	
v/c Ratio	0.75		0.15	0.18	0.08	0.51
Uniform Delay, d1	29.0		7.1	7.2	6.8	9.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		0.3	0.5	0.3	1.7
Delay (s)	33.0		7.4	7.7	7.1	11.1
Level of Service	C		A	A	A	B
Approach Delay (s)	33.0		7.6			10.7
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	12.6
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	365	16	0	164	0	102
Future Volume (Veh/h)	365	16	0	164	0	102
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)	365	16	0	164	0	102
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.98	
vC, conflicting volume			381		537	373
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			381		515	373
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		100	85
cM capacity (veh/h)			1177		508	673

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	381	164	102
Volume Left	0	0	0
Volume Right	16	0	102
cSH	1700	1177	673
Volume to Capacity	0.22	0.00	0.15
Queue Length 95th (m)	0.0	0.0	4.0
Control Delay (s)	0.0	0.0	11.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.3
Approach LOS			B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	80	55	109	301	0
Future Volume (Veh/h)	0	80	55	109	301	0
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	80	55	109	301	0
Pedestrians	136					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	656	437	437			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	656	437	437			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	85	94			
cM capacity (veh/h)	355	541	980			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	80	164	301
Volume Left	0	55	0
Volume Right	80	0	0
cSH	541	980	1700
Volume to Capacity	0.15	0.06	0.18
Queue Length 95th (m)	3.9	1.4	0.0
Control Delay (s)	12.8	3.3	0.0
Lane LOS	B	A	
Approach Delay (s)	12.8	3.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	60	0	635	31	0	1801	5
Future Volume (Veh/h)	0	0	0	0	0	60	0	635	31	0	1801	5
Sign Control		Stop			Stop			Free			Free	
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)	0	0	0	0	0	60	0	635	31	0	1801	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)								196				
pX, platoon unblocked	0.86	0.86		0.86	0.86	0.86				0.86		
vC, conflicting volume	2498	2470	1804	2436	2441	635	1806			666		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2666	2632	1804	2593	2599	490	1806			526		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	88	100			100		
cM capacity (veh/h)	11	20	99	14	21	495	345			891		

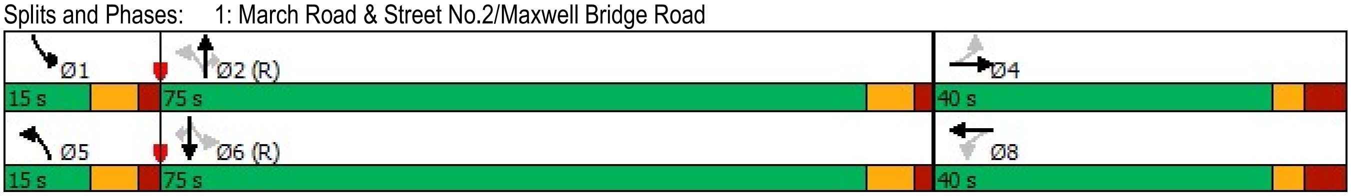
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	60	635	31	0	1806
Volume Left	0	0	0	0	0
Volume Right	60	0	31	0	5
cSH	495	1700	1700	1700	1700
Volume to Capacity	0.12	0.37	0.02	0.00	1.06
Queue Length 95th (m)	3.1	0.0	0.0	0.0	0.0
Control Delay (s)	13.3	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	13.3	0.0		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	21	59	85	62	464	1784	122	72	795	13
Future Volume (vph)	21	59	85	62	464	1784	122	72	795	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	23.0	23.0	23.0	23.0	91.0	81.6	81.6	75.8	68.4	68.4
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.70	0.63	0.63	0.58	0.53	0.53
v/c Ratio	0.12	0.79	1.44	0.47	0.91	0.83	0.12	0.45	0.45	0.02
Control Delay	41.9	38.0	313.0	32.9	40.3	26.1	4.8	22.3	20.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	38.0	313.0	32.9	40.3	26.1	4.8	22.3	20.1	0.0
LOS	D	D	F	C	D	C	A	C	C	A
Approach Delay		38.2		130.1		27.8			20.0	
Approach LOS		D		F		C			B	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 29 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.44	
Intersection Signal Delay: 33.4	Intersection LOS: C
Intersection Capacity Utilization 109.3%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	313	85	160	464	1784	122	72	795	13
v/c Ratio	0.12	0.79	1.44	0.47	0.91	0.83	0.12	0.45	0.45	0.02
Control Delay	41.9	38.0	313.0	32.9	40.3	26.1	4.8	22.3	20.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	38.0	313.0	32.9	40.3	26.1	4.8	22.3	20.1	0.0
Queue Length 50th (m)	4.5	38.5	~28.8	23.1	42.9	189.2	3.0	5.1	64.1	0.0
Queue Length 95th (m)	11.2	66.6	#56.9	40.8	#156.9	#289.6	13.1	17.0	79.7	0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	259	498	84	454	508	2149	1005	169	1783	857
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.63	1.01	0.35	0.91	0.83	0.12	0.43	0.45	0.02

Intersection Summary

~ 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.

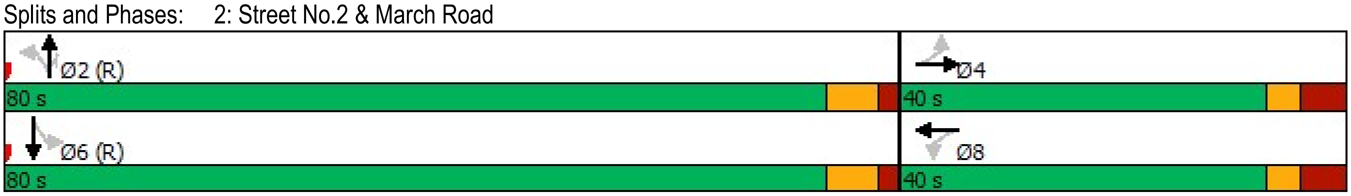
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	59	254	85	62	98	464	1784	122	72	795	13
Future Volume (vph)	21	59	254	85	62	98	464	1784	122	72	795	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.88		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1509		1647	1634		1729	3424	1547	1729	3390	1547
Flt Permitted	0.57	1.00		0.19	1.00		0.26	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1030	1509		334	1634		479	3424	1547	113	3390	1547
Peak-hour factor, PHF	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)	21	59	254	85	62	98	464	1784	122	72	795	13
RTOR Reduction (vph)	0	131	0	0	48	0	0	0	35	0	0	6
Lane Group Flow (vph)	21	182	0	85	112	0	464	1784	87	72	795	7
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	23.0	23.0		23.0	23.0		93.1	80.3	80.3	74.5	68.4	68.4
Effective Green, g (s)	23.0	23.0		23.0	23.0		93.1	80.3	80.3	74.5	68.4	68.4
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.72	0.62	0.62	0.57	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	182	266		59	289		516	2114	955	140	1783	813
v/s Ratio Prot		0.12			0.07		c0.12	0.52		0.02	0.23	
v/s Ratio Perm	0.02			c0.25			c0.52		0.06	0.27		0.00
v/c Ratio	0.12	0.68		1.44	0.39		0.90	0.84	0.09	0.51	0.45	0.01
Uniform Delay, d1	45.0	50.1		53.5	47.3		12.1	19.8	10.1	19.4	19.1	14.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	7.1		271.2	0.9		18.3	4.3	0.2	3.2	0.8	0.0
Delay (s)	45.2	57.2		324.7	48.2		30.4	24.2	10.3	22.6	19.9	14.7
Level of Service	D	E		F	D		C	C	B	C	B	B
Approach Delay (s)		56.5			144.1			24.7			20.0	
Approach LOS		E			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	109.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	41	22	174	12	149	1393	312	16	604
Future Volume (vph)	41	22	174	12	149	1393	312	16	604
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	39.3	35.3	35.3	35.9	35.9	35.9	38.6	38.6
Total Split (s)	40.0	40.0	40.0	40.0	80.0	80.0	80.0	80.0	80.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	22.9	22.9	22.9	22.9	83.2	83.2	83.2	83.2	83.2
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.69	0.69	0.69	0.69	0.69
v/c Ratio	0.16	0.32	0.77	0.06	0.33	1.11	0.27	0.27	0.51
Control Delay	38.9	13.1	67.3	25.0	11.2	84.0	3.2	23.5	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.9	13.1	67.3	25.0	11.2	84.0	3.2	23.5	11.6
LOS	D	B	E	C	B	F	A	C	B
Approach Delay		19.9		62.8		64.5			11.9
Approach LOS		B		E		E			B

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.11	
Intersection Signal Delay: 50.1	Intersection LOS: D
Intersection Capacity Utilization 115.5%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: Street No.2 & March Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	115	174	21	149	1393	312	16	626
v/c Ratio	0.16	0.32	0.77	0.06	0.33	1.11	0.27	0.27	0.51
Control Delay	38.9	13.1	67.3	25.0	11.2	84.0	3.2	23.5	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.9	13.1	67.3	25.0	11.2	84.0	3.2	23.5	11.6
Queue Length 50th (m)	8.1	4.3	39.2	2.3	12.6	~376.8	6.3	1.3	62.8
Queue Length 95th (m)	16.5	18.2	58.9	8.4	30.4	#489.4	19.6	8.6	112.7
Internal Link Dist (m)		124.2		210.3		414.8			287.3
Turn Bay Length (m)	57.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	368	479	322	462	454	1250	1141	60	1233
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	0.11	0.24	0.54	0.05	0.33	1.11	0.27	0.27	0.51

Intersection Summary

~ 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.

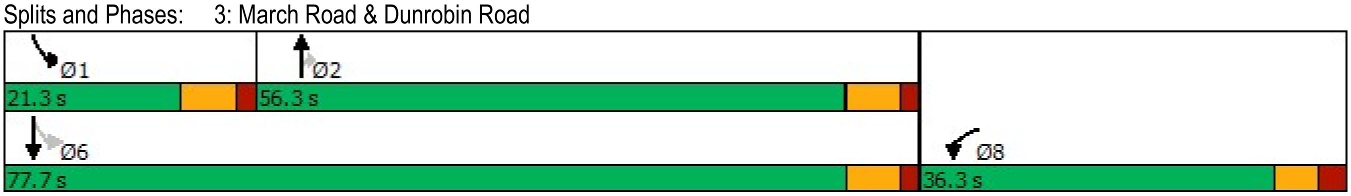
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	22	93	174	12	9	149	1393	312	16	604	22
Future Volume (vph)	41	22	93	174	12	9	149	1393	312	16	604	22
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.88		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1509		1647	1674		1729	1802	1547	1729	1776	
Flt Permitted	0.74	1.00		0.68	1.00		0.36	1.00	1.00	0.05	1.00	
Satd. Flow (perm)	1353	1509		1184	1674		656	1802	1547	88	1776	
Peak-hour factor, PHF	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)	41	22	93	174	12	9	149	1393	312	16	604	22
RTOR Reduction (vph)	0	75	0	0	7	0	0	0	68	0	1	0
Lane Group Flow (vph)	41	40	0	174	14	0	149	1393	244	16	625	0
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	22.9	22.9		22.9	22.9		83.2	83.2	83.2	83.2	83.2	
Effective Green, g (s)	22.9	22.9		22.9	22.9		83.2	83.2	83.2	83.2	83.2	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.69	0.69	0.69	0.69	0.69	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	258	287		225	319		454	1249	1072	61	1231	
v/s Ratio Prot		0.03			0.01			c0.77			0.35	
v/s Ratio Perm	0.03			c0.15			0.23		0.16	0.18		
v/c Ratio	0.16	0.14		0.77	0.04		0.33	1.12	0.23	0.26	0.51	
Uniform Delay, d1	40.5	40.4		46.1	39.6		7.3	18.4	6.7	6.9	8.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.2		15.2	0.1		1.9	63.3	0.5	10.2	1.5	
Delay (s)	40.8	40.6		61.2	39.7		9.2	81.7	7.2	17.1	10.2	
Level of Service	D	D		E	D		A	F	A	B	B	
Approach Delay (s)		40.6			58.9			63.3			10.4	
Approach LOS		D			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	49.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	254	583	602	36	233
Future Volume (vph)	254	583	602	36	233
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.7
Total Split (%)	31.8%	49.4%	49.4%	18.7%	68.2%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	14.7	64.0	64.0	71.5	71.5
Actuated g/C Ratio	0.15	0.65	0.65	0.72	0.72
v/c Ratio	0.67	0.50	0.50	0.07	0.18
Control Delay	42.8	12.8	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.8	12.8	2.5	4.8	5.1
LOS	D	B	A	A	A
Approach Delay	42.8	7.6			5.1
Approach LOS	D	A			A

Intersection Summary	
Cycle Length: 114	
Actuated Cycle Length: 98.8	
Natural Cycle: 95	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 62.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	328	583	602	36	233
v/c Ratio	0.67	0.50	0.50	0.07	0.18
Control Delay	42.8	12.8	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.8	12.8	2.5	4.8	5.1
Queue Length 50th (m)	27.7	61.1	0.0	1.7	12.0
Queue Length 95th (m)	41.6	103.1	14.2	4.9	23.3
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	964	1166	1204	589	1303
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.50	0.50	0.06	0.18

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	254	74	583	602	36	233
Future Volume (vph)	254	74	583	602	36	233
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3095		1802	1532	1679	1802
Flt Permitted	0.96		1.00	1.00	0.33	1.00
Satd. Flow (perm)	3095		1802	1532	586	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	254	74	583	602	36	233
RTOR Reduction (vph)	28	0	0	222	0	0
Lane Group Flow (vph)	300	0	583	380	36	233
Heavy Vehicles (%)	7%	3%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	14.7		64.0	64.0	74.1	74.1
Effective Green, g (s)	14.7		64.0	64.0	74.1	74.1
Actuated g/C Ratio	0.14		0.63	0.63	0.73	0.73
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448		1137	966	469	1316
v/s Ratio Prot	c0.10		c0.32		0.00	c0.13
v/s Ratio Perm				0.25	0.05	
v/c Ratio	0.67		0.51	0.39	0.08	0.18
Uniform Delay, d1	41.0		10.2	9.2	5.4	4.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.8		1.7	1.2	0.1	0.3
Delay (s)	44.8		11.9	10.4	5.5	4.5
Level of Service	D		B	B	A	A
Approach Delay (s)	44.8		11.1			4.6
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	101.4	Sum of lost time (s)	18.9
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	227	0	0	539	0	107
Future Volume (Veh/h)	227	0	0	539	0	107
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)	227	0	0	539	0	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.86	
vC, conflicting volume			227		766	227
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			227		647	227
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		100	87
cM capacity (veh/h)			1341		375	812

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	227	539	107
Volume Left	0	0	0
Volume Right	0	0	107
cSH	1700	1341	812
Volume to Capacity	0.13	0.00	0.13
Queue Length 95th (m)	0.0	0.0	3.4
Control Delay (s)	0.0	0.0	10.1
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	259	280	210	0
Future Volume (Veh/h)	0	17	259	280	210	0
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	17	259	280	210	0
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	1008	210	210			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1008	210	210			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	81			
cM capacity (veh/h)	216	830	1361			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	539	210
Volume Left	0	259	0
Volume Right	17	0	0
cSH	830	1361	1700
Volume to Capacity	0.02	0.19	0.12
Queue Length 95th (m)	0.5	5.3	0.0
Control Delay (s)	9.4	5.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.4	5.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	0	52	0	1854	67	0	850	34
Future Volume (Veh/h)	0	0	0	0	0	52	0	1854	67	0	850	34
Sign Control		Stop			Stop			Free			Free	
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)	0	0	0	0	0	52	0	1854	67	0	850	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								196				
pX, platoon unblocked	0.38	0.38		0.38	0.38	0.38				0.38		
vC, conflicting volume	2773	2788	867	2721	2738	1854	884			1921		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4867	4906	867	4729	4774	2436	884			2613		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	100	100	100	0	100			100		
cM capacity (veh/h)	0	0	352	0	0	15	765			62		

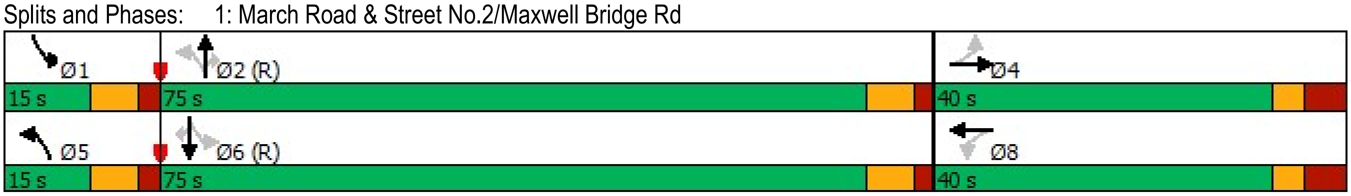
Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	52	1854	67	884
Volume Left	0	0	0	0
Volume Right	52	0	67	34
cSH	15	1700	1700	1700
Volume to Capacity	3.40	1.09	0.04	0.52
Queue Length 95th (m)	Err	0.0	0.0	0.0
Control Delay (s)	Err	0.0	0.0	0.0
Lane LOS	F			
Approach Delay (s)	Err	0.0		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	182.0		
Intersection Capacity Utilization	113.1%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	24	40	134	17	134	613	65	78	1831	13
Future Volume (vph)	24	40	134	17	134	613	65	78	1831	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	31.7	31.7	31.7	31.7	79.4	72.8	72.8	76.8	69.2	69.2
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.61	0.56	0.56	0.59	0.53	0.53
v/c Ratio	0.07	0.70	1.00	0.11	0.87	0.35	0.08	0.16	1.01	0.02
Control Delay	38.0	35.7	127.8	19.9	74.7	17.4	1.4	7.8	35.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	35.7	127.8	19.9	74.7	17.4	1.4	7.8	35.0	0.0
LOS	D	D	F	B	E	B	A	A	D	A
Approach Delay		35.9		101.2		25.6			33.7	
Approach LOS		D		F		C			C	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 69 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 35.6	Intersection LOS: D
Intersection Capacity Utilization 113.8%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Rd



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	327	134	44	134	613	65	78	1831	13
v/c Ratio	0.07	0.70	1.00	0.11	0.87	0.35	0.08	0.16	1.01	0.02
Control Delay	38.0	35.7	127.8	19.9	74.7	17.4	1.4	7.8	35.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	35.7	127.8	19.9	74.7	17.4	1.4	7.8	35.0	0.0
Queue Length 50th (m)	4.7	47.3	34.2	3.3	20.8	46.7	0.0	5.7	~262.2	0.0
Queue Length 95th (m)	11.9	81.4	#75.5	12.9	#59.2	60.5	3.6	m5.8	m175.7	m0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	333	478	138	414	154	1729	857	489	1805	806
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.68	0.97	0.11	0.87	0.35	0.08	0.16	1.01	0.02

Intersection Summary

~ 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.

m Volume for 95th percentile queue is metered by upstream signal.

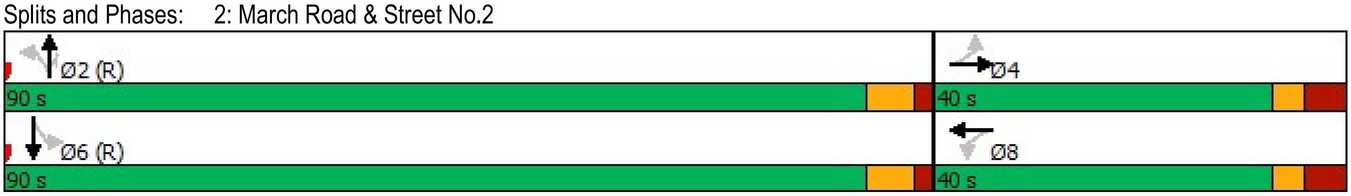
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	40	287	134	17	27	134	613	65	78	1831	13
Future Volume (vph)	24	40	287	134	17	27	134	613	65	78	1831	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1527		1712	1566		1586	3088	1459	1712	3390	1432
Flt Permitted	0.73	1.00		0.31	1.00		0.06	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1326	1527		550	1566		94	3088	1459	713	3390	1432
Peak-hour factor, PHF	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)	24	40	287	134	17	27	134	613	65	78	1831	13
RTOR Reduction (vph)	0	95	0	0	20	0	0	0	29	0	0	6
Lane Group Flow (vph)	24	232	0	134	24	0	134	613	36	78	1831	7
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	31.7	31.7		31.7	31.7		79.9	71.4	71.4	75.5	69.2	69.2
Effective Green, g (s)	31.7	31.7		31.7	31.7		79.9	71.4	71.4	75.5	69.2	69.2
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.61	0.55	0.55	0.58	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	323	372		134	381		155	1696	801	462	1804	762
v/s Ratio Prot		0.15			0.02		c0.06	0.20		0.01	c0.54	
v/s Ratio Perm	0.02			c0.24			0.48		0.02	0.09		0.00
v/c Ratio	0.07	0.62		1.00	0.06		0.86	0.36	0.04	0.17	1.01	0.01
Uniform Delay, d1	37.9	43.8		49.1	37.7		38.3	16.5	13.5	12.0	30.4	14.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.86	0.78	1.00
Incremental Delay, d2	0.1	3.2		77.7	0.1		36.1	0.6	0.1	0.0	10.6	0.0
Delay (s)	37.9	47.1		126.9	37.8		74.4	17.1	13.6	10.3	34.2	14.3
Level of Service	D	D		F	D		E	B	B	B	C	B
Approach Delay (s)		46.4			104.9			26.3			33.1	
Approach LOS		D			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	113.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	28	6	304	14	48	501	89	5	1363
Future Volume (vph)	28	6	304	14	48	501	89	5	1363
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	39.3	35.3	35.3	38.6	38.6	38.6	38.6	38.6
Total Split (s)	40.0	40.0	40.0	40.0	90.0	90.0	90.0	90.0	90.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	69.2%	69.2%	69.2%	69.2%	69.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	32.7	32.7	32.7	32.7	83.4	83.4	83.4	83.4	83.4
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.64	0.64	0.64	0.64	0.64
v/c Ratio	0.08	0.33	1.03	0.07	0.94	0.48	0.09	0.01	1.20
Control Delay	38.2	23.7	109.0	22.7	155.1	19.5	2.3	8.6	121.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.2	23.7	109.0	22.7	155.1	19.5	2.3	8.6	121.8
LOS	D	C	F	C	F	B	A	A	F
Approach Delay		26.1		101.3		27.3			121.4
Approach LOS		C		F		C			F

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 33 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.20	
Intersection Signal Delay: 88.5	Intersection LOS: F
Intersection Capacity Utilization 120.6%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	28	140	304	30	48	501	89	5	1368
v/c Ratio	0.08	0.33	1.03	0.07	0.94	0.48	0.09	0.01	1.20
Control Delay	38.2	23.7	109.0	22.7	155.1	19.5	2.3	8.6	121.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.2	23.7	109.0	22.7	155.1	19.5	2.3	8.6	121.8
Queue Length 50th (m)	5.5	15.4	~83.5	2.7	9.7	63.2	0.0	0.5	~423.8
Queue Length 95th (m)	13.6	33.7	#140.0	10.6	#36.7	100.1	6.8	2.0	#504.2
Internal Link Dist (m)		124.2		210.3		414.3			287.3
Turn Bay Length (m)	57.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	337	430	294	413	51	1042	967	478	1143
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	0.08	0.33	1.03	0.07	0.94	0.48	0.09	0.01	1.20

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	6	134	304	14	16	48	501	89	5	1363	5
Future Volume (vph)	28	6	134	304	14	16	48	501	89	5	1363	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1520		1712	1598		1586	1625	1459	1712	1783	
Flt Permitted	0.74	1.00		0.65	1.00		0.05	1.00	1.00	0.41	1.00	
Satd. Flow (perm)	1342	1520		1170	1598		80	1625	1459	747	1783	
Peak-hour factor, PHF	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)	28	6	134	304	14	16	48	501	89	5	1363	5
RTOR Reduction (vph)	0	48	0	0	12	0	0	0	32	0	0	0
Lane Group Flow (vph)	28	92	0	304	18	0	48	501	57	5	1368	0
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	32.7	32.7		32.7	32.7		83.4	83.4	83.4	83.4	83.4	
Effective Green, g (s)	32.7	32.7		32.7	32.7		83.4	83.4	83.4	83.4	83.4	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.64	0.64	0.64	0.64	0.64	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	337	382		294	401		51	1042	936	479	1143	
v/s Ratio Prot		0.06			0.01			0.31			c0.77	
v/s Ratio Perm	0.02			c0.26			0.60		0.04	0.01		
v/c Ratio	0.08	0.24		1.03	0.04		0.94	0.48	0.06	0.01	1.20	
Uniform Delay, d1	37.2	38.8		48.6	36.8		21.1	12.1	8.7	8.4	23.3	
Progression Factor	1.00	1.00		1.00	1.00		2.08	1.45	1.19	1.00	1.00	
Incremental Delay, d2	0.1	0.3		61.6	0.0		107.8	1.5	0.1	0.0	97.3	
Delay (s)	37.3	39.1		110.2	36.9		151.6	19.0	10.4	8.4	120.6	
Level of Service	D	D		F	D		F	B	B	A	F	
Approach Delay (s)		38.8			103.6			27.8			120.2	
Approach LOS		D			F			C			F	

Intersection Summary			
HCM 2000 Control Delay	89.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	120.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	536	158	249	49	558
Future Volume (vph)	536	158	249	49	558
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	50.0	50.0
Minimum Split (s)	27.3	56.3	56.3	56.3	56.3
Total Split (s)	36.3	56.3	56.3	56.3	56.3
Total Split (%)	39.2%	60.8%	60.8%	60.8%	60.8%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Max	Max	Max	Max
Act Effct Green (s)	20.1	50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24	0.60	0.60	0.60	0.60
v/c Ratio	0.75	0.15	0.27	0.08	0.51
Control Delay	34.8	8.5	2.1	8.5	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	8.5	2.1	8.5	12.3
LOS	C	A	A	A	B
Approach Delay	34.8	4.6			12.0
Approach LOS	C	A			B

Intersection Summary
Cycle Length: 92.6
Actuated Cycle Length: 82.9
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 93.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: March Road & Dunrobin Road

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	596	158	249	49	558
v/c Ratio	0.75	0.15	0.27	0.08	0.51
Control Delay	34.8	8.5	2.1	8.5	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	8.5	2.1	8.5	12.3
Queue Length 50th (m)	43.9	9.7	0.0	2.9	45.2
Queue Length 95th (m)	60.5	21.9	9.7	8.9	86.6
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1177	1038	933	602	1090
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.51	0.15	0.27	0.08	0.51

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	536	60	158	249	49	558
Future Volume (vph)	536	60	158	249	49	558
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3218		1717	1381	1441	1802
Flt Permitted	0.96		1.00	1.00	0.66	1.00
Satd. Flow (perm)	3218		1717	1381	996	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	536	60	158	249	49	558
RTOR Reduction (vph)	11	0	0	98	0	0
Lane Group Flow (vph)	585	0	158	151	49	558
Heavy Vehicles (%)	3%	7%	6%	12%	20%	1%
Turn Type	Prot		NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	20.1		50.1	50.1	50.1	50.1
Effective Green, g (s)	20.1		50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24		0.61	0.61	0.61	0.61
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	781		1038	835	602	1090
v/s Ratio Prot	c0.18		0.09			c0.31
v/s Ratio Perm				0.11	0.05	
v/c Ratio	0.75		0.15	0.18	0.08	0.51
Uniform Delay, d1	29.0		7.1	7.2	6.8	9.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		0.3	0.5	0.3	1.7
Delay (s)	33.0		7.4	7.7	7.1	11.1
Level of Service	C		A	A	A	B
Approach Delay (s)	33.0		7.6			10.7
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	12.6
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	365	16	0	164	0	102
Future Volume (Veh/h)	365	16	0	164	0	102
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)	365	16	0	164	0	102
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.98	
vC, conflicting volume			381		537	373
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			381		516	373
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		100	85
cM capacity (veh/h)			1177		508	673

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	381	164	102
Volume Left	0	0	0
Volume Right	16	0	102
cSH	1700	1177	673
Volume to Capacity	0.22	0.00	0.15
Queue Length 95th (m)	0.0	0.0	4.0
Control Delay (s)	0.0	0.0	11.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.3
Approach LOS			B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	80	55	109	301	0
Future Volume (Veh/h)	0	80	55	109	301	0
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	80	55	109	301	0
Pedestrians	136					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	13					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	656	437	437			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	656	437	437			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	85	94			
cM capacity (veh/h)	355	541	980			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	80	164	301
Volume Left	0	55	0
Volume Right	80	0	0
cSH	541	980	1700
Volume to Capacity	0.15	0.06	0.18
Queue Length 95th (m)	3.9	1.4	0.0
Control Delay (s)	12.8	3.3	0.0
Lane LOS	B	A	
Approach Delay (s)	12.8	3.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	116	0	0	60	0	635	31	0	1801	5
Future Volume (Veh/h)	0	0	116	0	0	60	0	635	31	0	1801	5
Sign Control		Stop			Stop			Free			Free	
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)	0	0	116	0	0	60	0	635	31	0	1801	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)								196				
pX, platoon unblocked	0.86	0.86		0.86	0.86	0.86				0.86		
vC, conflicting volume	2498	2470	1804	2552	2441	635	1806			666		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2664	2630	1804	2726	2597	492	1806			528		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	0	0	100	88	100			100		
cM capacity (veh/h)	11	20	99	0	21	495	345			892		

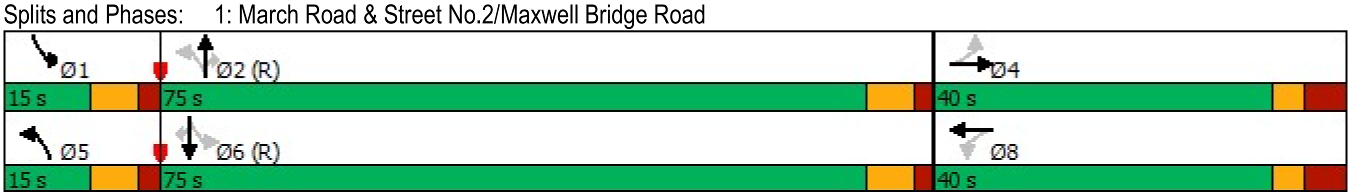
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	116	60	635	31	0	1806
Volume Left	0	0	0	0	0	0
Volume Right	116	60	0	31	0	5
cSH	99	495	1700	1700	1700	1700
Volume to Capacity	1.18	0.12	0.37	0.02	0.00	1.06
Queue Length 95th (m)	59.0	3.1	0.0	0.0	0.0	0.0
Control Delay (s)	225.4	13.3	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	225.4	13.3	0.0		0.0	
Approach LOS	F	B				

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	114.6%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	21	59	85	62	464	1784	122	72	868	13
Future Volume (vph)	21	59	85	62	464	1784	122	72	868	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.2	18.2	18.2	18.2	97.1	85.9	85.9	76.3	68.4	68.4
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.75	0.66	0.66	0.59	0.53	0.53
v/c Ratio	0.16	0.73	1.02	0.57	0.85	0.79	0.12	0.40	0.49	0.02
Control Delay	48.4	42.3	160.5	39.9	28.5	21.4	4.1	15.5	18.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	42.3	160.5	39.9	28.5	21.4	4.1	15.5	18.5	0.0
LOS	D	D	F	D	C	C	A	B	B	A
Approach Delay		42.8		81.7		21.9			18.0	
Approach LOS		D		F		C			B	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 29 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 26.1	Intersection LOS: C
Intersection Capacity Utilization 103.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	219	85	160	464	1784	122	72	868	13
v/c Ratio	0.16	0.73	1.02	0.57	0.85	0.79	0.12	0.40	0.49	0.02
Control Delay	48.4	42.3	160.5	39.9	28.5	21.4	4.1	15.5	18.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	42.3	160.5	39.9	28.5	21.4	4.1	15.5	18.5	0.0
Queue Length 50th (m)	4.8	29.6	~23.4	24.5	42.6	164.0	2.6	3.4	52.3	0.0
Queue Length 95th (m)	11.9	53.0	#46.4	43.4	#124.1	#277.8	12.3	m14.6	87.6	m0.0
Internal Link Dist (m)		119.5		192.3		117.5			120.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		
Base Capacity (vph)	240	457	149	454	547	2263	1053	192	1783	857
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.48	0.57	0.35	0.85	0.79	0.12	0.38	0.49	0.02

Intersection Summary

~ 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.

m Volume for 95th percentile queue is metered by upstream signal.

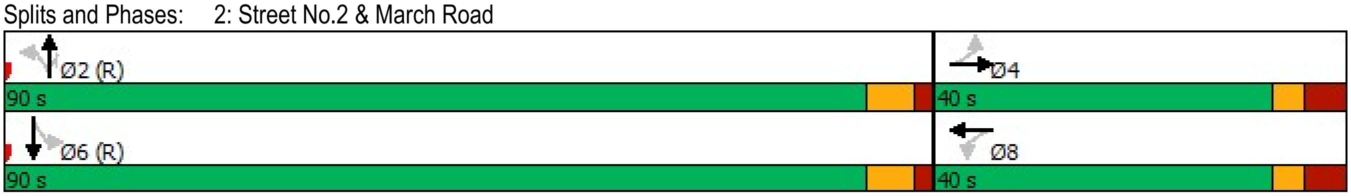
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	59	160	85	62	98	464	1784	122	72	868	13
Future Volume (vph)	21	59	160	85	62	98	464	1784	122	72	868	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1524		1647	1634		1729	3424	1547	1729	3390	1547
Flt Permitted	0.53	1.00		0.34	1.00		0.24	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	957	1524		593	1634		428	3424	1547	144	3390	1547
Peak-hour factor, PHF	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)	21	59	160	85	62	98	464	1784	122	72	868	13
RTOR Reduction (vph)	0	86	0	0	50	0	0	0	32	0	0	6
Lane Group Flow (vph)	21	133	0	85	110	0	464	1784	90	72	868	7
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	18.2	18.2		18.2	18.2		97.9	84.6	84.6	75.0	68.4	68.4
Effective Green, g (s)	18.2	18.2		18.2	18.2		97.9	84.6	84.6	75.0	68.4	68.4
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.75	0.65	0.65	0.58	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	133	213		83	228		550	2228	1006	163	1783	813
v/s Ratio Prot		0.09			0.07		c0.15	0.52		0.02	0.26	
v/s Ratio Perm	0.02			c0.14			c0.49		0.06	0.23		0.00
v/c Ratio	0.16	0.62		1.02	0.48		0.84	0.80	0.09	0.44	0.49	0.01
Uniform Delay, d1	49.2	52.7		55.9	51.6		14.7	16.6	8.4	16.1	19.6	14.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.04	0.89	1.00
Incremental Delay, d2	0.6	5.6		105.5	1.6		11.3	3.1	0.2	1.8	0.9	0.0
Delay (s)	49.7	58.3		161.4	53.2		26.1	19.7	8.6	18.5	18.3	14.7
Level of Service	D	E		F	D		C	B	A	B	B	B
Approach Delay (s)		57.5			90.7			20.4			18.3	
Approach LOS		E			F			C			B	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	41	22	174	12	149	1393	312	16	604
Future Volume (vph)	41	22	174	12	149	1393	312	16	604
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	39.3	35.3	35.3	35.9	35.9	35.9	38.6	38.6
Total Split (s)	40.0	40.0	40.0	40.0	90.0	90.0	90.0	90.0	90.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	69.2%	69.2%	69.2%	69.2%	69.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	24.1	24.1	24.1	24.1	92.0	92.0	92.0	92.0	92.0
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.71	0.71	0.71	0.71	0.71
v/c Ratio	0.16	0.32	0.79	0.07	0.32	1.09	0.27	0.29	0.50
Control Delay	43.0	14.2	74.6	27.7	2.8	66.3	0.5	26.4	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	14.2	74.6	27.7	2.8	66.3	0.5	26.4	11.2
LOS	D	B	E	C	A	E	A	C	B
Approach Delay		21.8		69.6		50.1			11.6
Approach LOS		C		E		D			B

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 52 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.09	
Intersection Signal Delay: 41.2	Intersection LOS: D
Intersection Capacity Utilization 115.5%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 2: Street No.2 & March Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	115	174	21	149	1393	312	16	626
v/c Ratio	0.16	0.32	0.79	0.07	0.32	1.09	0.27	0.29	0.50
Control Delay	43.0	14.2	74.6	27.7	2.8	66.3	0.5	26.4	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	14.2	74.6	27.7	2.8	66.3	0.5	26.4	11.2
Queue Length 50th (m)	8.9	4.7	42.9	2.6	1.5	~408.0	0.0	1.4	65.7
Queue Length 95th (m)	17.7	19.4	63.9	9.1	m2.8	#524.9	m0.0	9.6	113.2
Internal Link Dist (m)		124.2		210.3		414.8			287.3
Turn Bay Length (m)	57.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	340	449	297	428	468	1275	1159	55	1258
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	0.26	0.59	0.05	0.32	1.09	0.27	0.29	0.50

Intersection Summary

~ 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.

m Volume for 95th percentile queue is metered by upstream signal.

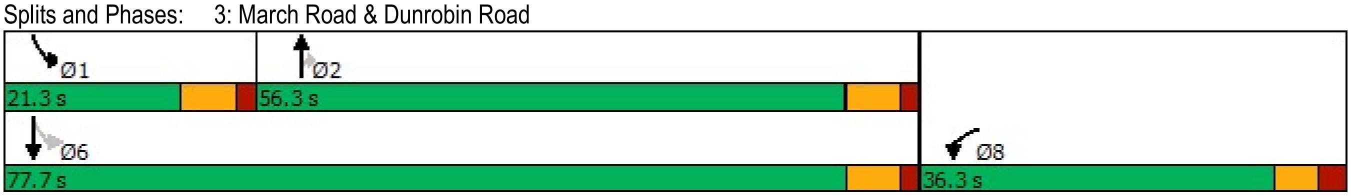
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	22	93	174	12	9	149	1393	312	16	604	22
Future Volume (vph)	41	22	93	174	12	9	149	1393	312	16	604	22
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.88		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1509		1647	1674		1729	1802	1547	1729	1776	
Flt Permitted	0.74	1.00		0.68	1.00		0.36	1.00	1.00	0.04	1.00	
Satd. Flow (perm)	1353	1509		1184	1674		662	1802	1547	79	1776	
Peak-hour factor, PHF	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)	41	22	93	174	12	9	149	1393	312	16	604	22
RTOR Reduction (vph)	0	76	0	0	7	0	0	0	65	0	1	0
Lane Group Flow (vph)	41	39	0	174	14	0	149	1393	247	16	625	0
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	24.1	24.1		24.1	24.1		92.0	92.0	92.0	92.0	92.0	
Effective Green, g (s)	24.1	24.1		24.1	24.1		92.0	92.0	92.0	92.0	92.0	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.71	0.71	0.71	0.71	0.71	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	250	279		219	310		468	1275	1094	55	1256	
v/s Ratio Prot		0.03			0.01			c0.77			0.35	
v/s Ratio Perm	0.03			c0.15			0.22		0.16	0.20		
v/c Ratio	0.16	0.14		0.79	0.04		0.32	1.09	0.23	0.29	0.50	
Uniform Delay, d1	44.5	44.3		50.6	43.5		7.2	19.0	6.6	7.0	8.6	
Progression Factor	1.00	1.00		1.00	1.00		0.18	0.60	0.05	1.00	1.00	
Incremental Delay, d2	0.3	0.2		17.8	0.1		1.2	50.8	0.3	12.9	1.4	
Delay (s)	44.8	44.5		68.3	43.5		2.5	62.2	0.6	19.9	10.0	
Level of Service	D	D		E	D		A	E	A	B	A	
Approach Delay (s)		44.6			65.7			47.1			10.2	
Approach LOS		D			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	39.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	254	583	602	36	233
Future Volume (vph)	254	583	602	36	233
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.7
Total Split (%)	31.8%	49.4%	49.4%	18.7%	68.2%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	14.7	64.0	64.0	71.5	71.5
Actuated g/C Ratio	0.15	0.65	0.65	0.72	0.72
v/c Ratio	0.67	0.50	0.50	0.07	0.18
Control Delay	42.8	12.8	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.8	12.8	2.5	4.8	5.1
LOS	D	B	A	A	A
Approach Delay	42.8	7.6			5.1
Approach LOS	D	A			A

Intersection Summary	
Cycle Length: 114	
Actuated Cycle Length: 98.8	
Natural Cycle: 95	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 62.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	328	583	602	36	233
v/c Ratio	0.67	0.50	0.50	0.07	0.18
Control Delay	42.8	12.8	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.8	12.8	2.5	4.8	5.1
Queue Length 50th (m)	27.7	61.1	0.0	1.7	12.0
Queue Length 95th (m)	41.6	103.1	14.2	4.9	23.3
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	964	1166	1204	589	1303
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.50	0.50	0.06	0.18

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	254	74	583	602	36	233
Future Volume (vph)	254	74	583	602	36	233
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3095		1802	1532	1679	1802
Flt Permitted	0.96		1.00	1.00	0.33	1.00
Satd. Flow (perm)	3095		1802	1532	586	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	254	74	583	602	36	233
RTOR Reduction (vph)	28	0	0	222	0	0
Lane Group Flow (vph)	300	0	583	380	36	233
Heavy Vehicles (%)	7%	3%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	14.7		64.0	64.0	74.1	74.1
Effective Green, g (s)	14.7		64.0	64.0	74.1	74.1
Actuated g/C Ratio	0.14		0.63	0.63	0.73	0.73
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448		1137	966	469	1316
v/s Ratio Prot	c0.10		c0.32		0.00	c0.13
v/s Ratio Perm				0.25	0.05	
v/c Ratio	0.67		0.51	0.39	0.08	0.18
Uniform Delay, d1	41.0		10.2	9.2	5.4	4.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.8		1.7	1.2	0.1	0.3
Delay (s)	44.8		11.9	10.4	5.5	4.5
Level of Service	D		B	B	A	A
Approach Delay (s)	44.8		11.1			4.6
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	101.4	Sum of lost time (s)	18.9
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	133	0	0	539	0	107
Future Volume (Veh/h)	133	0	0	539	0	107
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)	133	0	0	539	0	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.87	
vC, conflicting volume			133		672	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			133		551	133
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		100	88
cM capacity (veh/h)			1452		432	916

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	133	539	107
Volume Left	0	0	0
Volume Right	0	0	107
cSH	1700	1452	916
Volume to Capacity	0.08	0.00	0.12
Queue Length 95th (m)	0.0	0.0	3.0
Control Delay (s)	0.0	0.0	9.4
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.4
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	259	280	116	0
Future Volume (Veh/h)	0	17	259	280	116	0
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	17	259	280	116	0
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	914	116	116			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	914	116	116			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	82			
cM capacity (veh/h)	250	936	1473			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	539	116
Volume Left	0	259	0
Volume Right	17	0	0
cSH	936	1473	1700
Volume to Capacity	0.02	0.18	0.07
Queue Length 95th (m)	0.4	4.8	0.0
Control Delay (s)	8.9	4.7	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	4.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	94	0	0	52	0	1854	67	0	850	34
Future Volume (Veh/h)	0	0	94	0	0	52	0	1854	67	0	850	34
Sign Control		Stop			Stop			Free			Free	
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)	0	0	94	0	0	52	0	1854	67	0	850	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								196				
pX, platoon unblocked	0.35	0.35		0.35	0.35	0.35				0.35		
vC, conflicting volume	2773	2788	867	2815	2738	1854	884			1921		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5190	5233	867	5311	5088	2526	884			2720		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	73	100	100	0	100			100		
cM capacity (veh/h)	0	0	352	0	0	12	765			51		

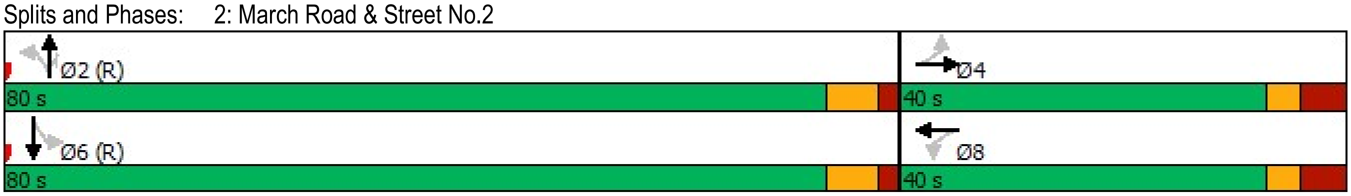
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	94	52	1854	67	884
Volume Left	0	0	0	0	0
Volume Right	94	52	0	67	34
cSH	352	12	1700	1700	1700
Volume to Capacity	0.27	4.23	1.09	0.04	0.52
Queue Length 95th (m)	8.0	Err	0.0	0.0	0.0
Control Delay (s)	18.9	Err	0.0	0.0	0.0
Lane LOS	C	F			
Approach Delay (s)	18.9	Err	0.0		0.0
Approach LOS	C	F			

Intersection Summary			
Average Delay	176.8		
Intersection Capacity Utilization	113.1%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	28	6	304	14	48	501	89	5	1080
Future Volume (vph)	28	6	304	14	48	501	89	5	1080
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	39.3	39.3	35.3	35.3	38.6	38.6	38.6	38.6	38.6
Total Split (s)	40.0	40.0	40.0	40.0	80.0	80.0	80.0	80.0	80.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.0	2.0	2.0	2.0	2.0
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)	7.3	7.3	7.3	7.3	6.6	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	31.9	31.9	31.9	31.9	74.2	74.2	74.2	74.2	74.2
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.62	0.62	0.62	0.62	0.62
v/c Ratio	0.08	0.29	0.96	0.07	0.86	0.50	0.10	0.01	0.99
Control Delay	33.3	12.3	84.6	20.1	115.2	15.0	2.2	9.2	48.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	12.3	84.6	20.1	115.2	15.0	2.2	9.2	48.1
LOS	C	B	F	C	F	B	A	A	D
Approach Delay		15.8		78.8		20.7			47.9
Approach LOS		B		E		C			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 42.4	Intersection LOS: D
Intersection Capacity Utilization 105.2%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 2: March Road & Street No.2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	28	140	304	30	48	501	89	5	1090
v/c Ratio	0.08	0.29	0.96	0.07	0.86	0.50	0.10	0.01	0.99
Control Delay	33.3	12.3	84.6	20.1	115.2	15.0	2.2	9.2	48.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	12.3	84.6	20.1	115.2	15.0	2.2	9.2	48.1
Queue Length 50th (m)	4.9	6.2	69.9	2.4	8.8	62.1	0.0	0.5	240.7
Queue Length 95th (m)	12.3	22.0	#123.4	9.8	#22.2	88.9	6.1	2.0	#345.6
Internal Link Dist (m)		124.2		210.3		414.3			287.3
Turn Bay Length (m)	57.5		156.0		105.0		90.0	105.0	
Base Capacity (vph)	365	490	326	447	56	1004	936	454	1102
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	0.08	0.29	0.93	0.07	0.86	0.50	0.10	0.01	0.99

Intersection Summary

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

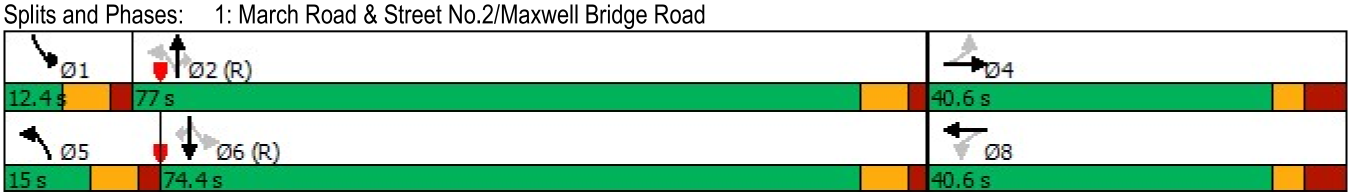
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	6	134	304	14	16	48	501	89	5	1080	10
Future Volume (vph)	28	6	134	304	14	16	48	501	89	5	1080	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.86		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1520		1712	1598		1586	1625	1459	1712	1781	
Flt Permitted	0.74	1.00		0.66	1.00		0.05	1.00	1.00	0.41	1.00	
Satd. Flow (perm)	1342	1520		1198	1598		90	1625	1459	736	1781	
Peak-hour factor, PHF	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)	28	6	134	304	14	16	48	501	89	5	1080	10
RTOR Reduction (vph)	0	77	0	0	12	0	0	0	34	0	0	0
Lane Group Flow (vph)	28	63	0	304	18	0	48	501	55	5	1090	0
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	31.9	31.9		31.9	31.9		74.2	74.2	74.2	74.2	74.2	
Effective Green, g (s)	31.9	31.9		31.9	31.9		74.2	74.2	74.2	74.2	74.2	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.62	0.62	0.62	0.62	0.62	
Clearance Time (s)	7.3	7.3		7.3	7.3		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	356	404		318	424		55	1004	902	455	1101	
v/s Ratio Prot		0.04			0.01			0.31			c0.61	
v/s Ratio Perm	0.02			c0.25			0.53		0.04	0.01		
v/c Ratio	0.08	0.16		0.96	0.04		0.87	0.50	0.06	0.01	0.99	
Uniform Delay, d1	33.0	33.7		43.4	32.7		19.0	12.6	9.1	8.8	22.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.2		38.5	0.0		88.3	1.8	0.1	0.0	24.8	
Delay (s)	33.1	33.9		81.8	32.8		107.3	14.4	9.2	8.8	47.3	
Level of Service	C	C		F	C		F	B	A	A	D	
Approach Delay (s)		33.8			77.4			20.7			47.1	
Approach LOS		C			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	43.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	105.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	25	41	137	18	134	618	67	79	1852	13
Future Volume (vph)	25	41	137	18	134	618	67	79	1852	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	11.7	34.6	34.6	11.7	34.6	34.6
Total Split (s)	40.6	40.6	40.6	40.6	15.0	77.0	77.0	12.4	74.4	74.4
Total Split (%)	31.2%	31.2%	31.2%	31.2%	11.5%	59.2%	59.2%	9.5%	57.2%	57.2%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	32.3	32.3	32.3	32.3	80.5	73.9	73.9	74.3	68.6	68.6
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.62	0.57	0.57	0.57	0.53	0.53
v/c Ratio	0.08	0.74	1.00	0.11	0.86	0.35	0.08	0.17	1.04	0.02
Control Delay	37.6	42.7	126.7	20.0	73.8	16.6	1.4	10.3	61.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	42.7	126.7	20.0	73.8	16.6	1.4	10.3	61.7	0.0
LOS	D	D	F	B	E	B	A	B	E	A
Approach Delay		42.3		100.3		24.8			59.2	
Approach LOS		D		F		C			E	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.04	
Intersection Signal Delay: 51.1	Intersection LOS: D
Intersection Capacity Utilization 114.6%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	330	137	45	134	618	67	79	1852	13
v/c Ratio	0.08	0.74	1.00	0.11	0.86	0.35	0.08	0.17	1.04	0.02
Control Delay	37.6	42.7	126.7	20.0	73.8	16.6	1.4	10.3	61.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	42.7	126.7	20.0	73.8	16.6	1.4	10.3	61.7	0.0
Queue Length 50th (m)	4.9	56.7	34.9	3.5	20.8	46.0	0.0	7.2	~271.1	0.0
Queue Length 95th (m)	12.2	91.2	#76.2	13.2	#59.0	59.0	3.7	13.3	#313.4	0.0
Internal Link Dist (m)		119.5		192.3		265.8			127.3	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		37.5
Base Capacity (vph)	339	459	141	422	155	1755	869	459	1789	799
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.72	0.97	0.11	0.86	0.35	0.08	0.17	1.04	0.02

Intersection Summary

~ 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.

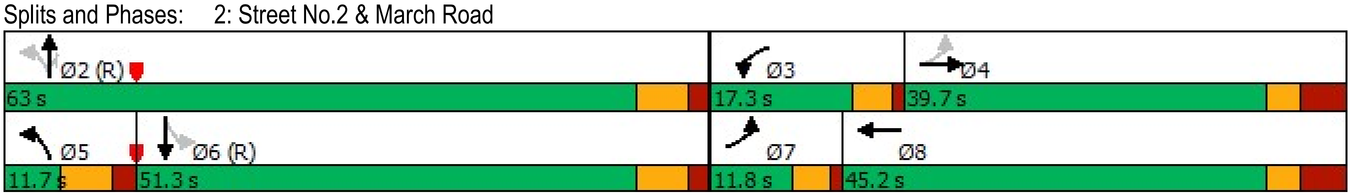
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	41	289	137	18	27	134	618	67	79	1852	13
Future Volume (vph)	25	41	289	137	18	27	134	618	67	79	1852	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1528		1712	1571		1586	3088	1459	1712	3390	1432
Flt Permitted	0.73	1.00		0.31	1.00		0.06	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1324	1528		553	1571		92	3088	1459	729	3390	1432
Peak-hour factor, PHF	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)	25	41	289	137	18	27	134	618	67	79	1852	13
RTOR Reduction (vph)	0	69	0	0	20	0	0	0	30	0	0	6
Lane Group Flow (vph)	25	261	0	137	25	0	134	618	37	79	1852	7
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	32.3	32.3		32.3	32.3		81.0	72.5	72.5	73.2	68.6	68.6
Effective Green, g (s)	32.3	32.3		32.3	32.3		81.0	72.5	72.5	73.2	68.6	68.6
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.62	0.56	0.56	0.56	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	328	379		137	390		155	1722	813	445	1788	755
v/s Ratio Prot		0.17			0.02		c0.06	0.20		0.01	c0.55	
v/s Ratio Perm	0.02			c0.25			c0.48		0.03	0.09		0.00
v/c Ratio	0.08	0.69		1.00	0.06		0.86	0.36	0.05	0.18	1.04	0.01
Uniform Delay, d1	37.4	44.3		48.9	37.3		39.0	15.9	13.1	13.0	30.7	14.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	5.1		76.9	0.1		36.1	0.6	0.1	0.2	31.2	0.0
Delay (s)	37.5	49.4		125.7	37.4		75.2	16.5	13.2	13.2	61.9	14.6
Level of Service	D	D		F	D		E	B	B	B	E	B
Approach Delay (s)		48.6			103.9			25.8			59.6	
Approach LOS		D			F			C			E	

Intersection Summary			
HCM 2000 Control Delay	52.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	114.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	28	6	304	14	48	506	89	5	1385
Future Volume (vph)	28	6	304	14	48	506	89	5	1385
Turn Type	pm+pt	NA	Prot	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	7	4	3	8	5	2			6
Permitted Phases	4				2		2	6	
Detector Phase	7	4	3	8	5	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	39.3	9.5	39.3	11.7	35.9	35.9	38.6	38.6
Total Split (s)	11.8	39.7	17.3	45.2	11.7	63.0	63.0	51.3	51.3
Total Split (%)	9.8%	33.1%	14.4%	37.7%	9.8%	52.5%	52.5%	42.8%	42.8%
Yellow Time (s)	3.5	3.0	3.5	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.0	4.3	1.0	4.3	2.1	2.0	2.0	2.0	2.0
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)	4.5	7.3	4.5	7.3	6.7	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lead			Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	18.9	9.4	12.8	19.7	79.3	79.4	79.4	68.3	68.3
Actuated g/C Ratio	0.16	0.08	0.11	0.16	0.66	0.66	0.66	0.57	0.57
v/c Ratio	0.12	0.66	0.86	0.11	0.26	0.25	0.09	0.01	0.72
Control Delay	34.4	32.0	76.0	27.4	11.7	9.0	0.9	15.0	23.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	32.0	76.0	27.4	11.7	9.0	0.9	15.0	23.4
LOS	C	C	E	C	B	A	A	B	C
Approach Delay		32.4		71.7		8.1			23.4
Approach LOS		C		E		A			C

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 26.5	Intersection LOS: C
Intersection Capacity Utilization 75.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: Street No.2 & March Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	28	140	304	30	48	506	89	5	1390
v/c Ratio	0.12	0.66	0.86	0.11	0.26	0.25	0.09	0.01	0.72
Control Delay	34.4	32.0	76.0	27.4	11.7	9.0	0.9	15.0	23.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	32.0	76.0	27.4	11.7	9.0	0.9	15.0	23.4
Queue Length 50th (m)	5.1	8.7	36.8	3.0	3.6	22.7	0.0	0.5	123.7
Queue Length 95th (m)	11.7	27.7	#60.1	11.2	9.1	36.4	3.2	2.8	178.6
Internal Link Dist (m)		124.2		210.3		459.3			287.3
Turn Bay Length (m)	57.5		156.0		100.0		90.0	105.0	
Base Capacity (vph)	241	484	354	515	183	2043	1006	478	1927
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	0.29	0.86	0.06	0.26	0.25	0.09	0.01	0.72

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	6	134	304	14	16	48	506	89	5	1385	5
Future Volume (vph)	28	6	134	304	14	16	48	506	89	5	1385	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.86		1.00	0.92		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1520		3321	1598		1586	3088	1459	1712	3388	
Flt Permitted	0.74	1.00		0.95	1.00		0.09	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	1342	1520		3321	1598		154	3088	1459	840	3388	
Peak-hour factor, PHF	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)	28	6	134	304	14	16	48	506	89	5	1385	5
RTOR Reduction (vph)	0	92	0	0	13	0	0	0	31	0	0	0
Lane Group Flow (vph)	28	48	0	304	17	0	48	506	58	5	1390	0
Heavy Vehicles (%)	0%	14%	2%	1%	0%	9%	9%	12%	6%	1%	2%	8%
Turn Type	pm+pt	NA		Prot	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)	15.5	11.2		12.8	19.7		77.6	77.6	77.6	65.2	65.2	
Effective Green, g (s)	15.5	11.2		12.8	19.7		77.6	77.6	77.6	65.2	65.2	
Actuated g/C Ratio	0.13	0.09		0.11	0.16		0.65	0.65	0.65	0.54	0.54	
Clearance Time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	187	141		354	262		167	1996	943	456	1840	
v/s Ratio Prot	0.01	c0.03		c0.09	0.01		0.01	c0.16			c0.41	
v/s Ratio Perm	0.01						0.17		0.04	0.01		
v/c Ratio	0.15	0.34		0.86	0.06		0.29	0.25	0.06	0.01	0.76	
Uniform Delay, d1	46.3	50.9		52.7	42.4		14.6	9.0	7.8	12.6	21.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	1.4		18.3	0.1		1.0	0.3	0.1	0.0	2.9	
Delay (s)	46.6	52.3		71.0	42.5		15.6	9.3	7.9	12.6	24.2	
Level of Service	D	D		E	D		B	A	A	B	C	
Approach Delay (s)		51.4			68.4			9.6			24.1	
Approach LOS		D			E			A			C	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.1
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	546	160	253	50	569
Future Volume (vph)	546	160	253	50	569
Turn Type	Prot	NA	Perm	Perm	NA
Protected Phases	8	2			6
Permitted Phases			2	6	
Detector Phase	8	2	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	50.0	50.0
Minimum Split (s)	27.3	56.3	56.3	56.3	56.3
Total Split (s)	36.3	56.3	56.3	56.3	56.3
Total Split (%)	39.2%	60.8%	60.8%	60.8%	60.8%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	Max	Max	Max	Max
Act Effct Green (s)	20.3	50.2	50.2	50.2	50.2
Actuated g/C Ratio	0.24	0.60	0.60	0.60	0.60
v/c Ratio	0.75	0.08	0.27	0.08	0.52
Control Delay	34.7	7.8	2.1	8.6	12.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	7.8	2.1	8.6	12.6
LOS	C	A	A	A	B
Approach Delay	34.7	4.3			12.2
Approach LOS	C	A			B

Intersection Summary

Cycle Length: 92.6
Actuated Cycle Length: 83.1
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 18.6 Intersection LOS: B
Intersection Capacity Utilization 93.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: March Road & Dunrobin Road

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	607	160	253	50	569
v/c Ratio	0.75	0.08	0.27	0.08	0.52
Control Delay	34.7	7.8	2.1	8.6	12.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	7.8	2.1	8.6	12.6
Queue Length 50th (m)	44.7	4.9	0.0	3.0	46.8
Queue Length 95th (m)	61.5	10.8	9.7	9.1	89.5
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	1186	1969	933	595	1087
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.51	0.08	0.27	0.08	0.52

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	546	61	160	253	50	569
Future Volume (vph)	546	61	160	253	50	569
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3252		3262	1381	1441	1802
Flt Permitted	0.96		1.00	1.00	0.65	1.00
Satd. Flow (perm)	3252		3262	1381	987	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	546	61	160	253	50	569
RTOR Reduction (vph)	11	0	0	100	0	0
Lane Group Flow (vph)	596	0	160	153	50	569
Confl. Peds. (#/hr)	3	7				
Heavy Vehicles (%)	2%	2%	6%	12%	20%	1%
Turn Type	Prot		NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	20.3		50.1	50.1	50.1	50.1
Effective Green, g (s)	20.3		50.1	50.1	50.1	50.1
Actuated g/C Ratio	0.24		0.60	0.60	0.60	0.60
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	795		1968	833	595	1087
v/s Ratio Prot	c0.18		0.05			c0.32
v/s Ratio Perm				0.11	0.05	
v/c Ratio	0.75		0.08	0.18	0.08	0.52
Uniform Delay, d1	29.0		6.9	7.3	6.9	9.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		0.1	0.5	0.3	1.8
Delay (s)	33.0		6.9	7.8	7.1	11.3
Level of Service	C		A	A	A	B
Approach Delay (s)	33.0		7.5			11.0
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	83.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	251	16	0	165	0	104
Future Volume (Veh/h)	251	16	0	165	0	104
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)	251	16	0	165	0	104
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.98	
vC, conflicting volume			267		424	259
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			267		401	259
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		100	87
cM capacity (veh/h)			1297		592	780

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	267	165	104
Volume Left	0	0	0
Volume Right	16	0	104
cSH	1700	1297	780
Volume to Capacity	0.16	0.00	0.13
Queue Length 95th (m)	0.0	0.0	3.5
Control Delay (s)	0.0	0.0	10.3
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	82	56	109	185	0
Future Volume (Veh/h)	0	82	56	109	185	0
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	82	56	109	185	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				386		
pX, platoon unblocked						
vC, conflicting volume	406	185	185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	406	185	185			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	90	96			
cM capacity (veh/h)	577	857	1390			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	82	165	185
Volume Left	0	56	0
Volume Right	82	0	0
cSH	857	1390	1700
Volume to Capacity	0.10	0.04	0.11
Queue Length 95th (m)	2.4	1.0	0.0
Control Delay (s)	9.6	2.8	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	2.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	116	0	0	60	0	640	11	0	1823	5
Future Volume (Veh/h)	0	0	116	0	0	60	0	640	11	0	1823	5
Sign Control		Stop			Stop			Free			Free	
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)	0	0	116	0	0	60	0	640	11	0	1823	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)								151				
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	2206	2476	914	1673	2474	326	1828			651		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2119	2419	914	1528	2416	34	1828			395		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	58	100	100	94	100			100		
cM capacity (veh/h)	24	29	276	42	29	930	330			1046		

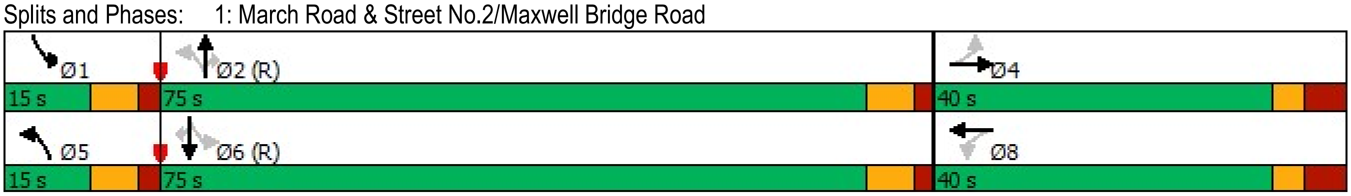
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	116	60	427	224	1215	613
Volume Left	0	0	0	0	0	0
Volume Right	116	60	0	11	0	5
cSH	276	930	1700	1700	1700	1700
Volume to Capacity	0.42	0.06	0.25	0.13	0.71	0.36
Queue Length 95th (m)	15.1	1.6	0.0	0.0	0.0	0.0
Control Delay (s)	27.2	9.1	0.0	0.0	0.0	0.0
Lane LOS	D	A				
Approach Delay (s)	27.2	9.1	0.0		0.0	
Approach LOS	D	A				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	22	60	87	64	468	1806	125	74	874	13
Future Volume (vph)	22	60	87	64	468	1806	125	74	874	13
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	8	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	39.3	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	40.0	40.0	40.0	40.0	15.0	75.0	75.0	15.0	75.0	75.0
Total Split (%)	30.8%	30.8%	30.8%	30.8%	11.5%	57.7%	57.7%	11.5%	57.7%	57.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	4.3	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	7.3	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	18.6	18.6	18.6	18.6	96.6	85.5	85.5	76.4	68.4	68.4
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.74	0.66	0.66	0.59	0.53	0.53
v/c Ratio	0.16	0.73	1.02	0.58	0.87	0.80	0.12	0.42	0.49	0.02
Control Delay	48.2	42.4	158.9	40.2	31.2	22.3	4.3	18.1	20.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.2	42.4	158.9	40.2	31.2	22.3	4.3	18.1	20.8	0.0
LOS	D	D	F	D	C	C	A	B	C	A
Approach Delay		42.9		81.3		23.1			20.3	
Approach LOS		D		F		C			C	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 29 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 27.5	Intersection LOS: C
Intersection Capacity Utilization 103.9%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	22	221	87	164	468	1806	125	74	874	13
v/c Ratio	0.16	0.73	1.02	0.58	0.87	0.80	0.12	0.42	0.49	0.02
Control Delay	48.2	42.4	158.9	40.2	31.2	22.3	4.3	18.1	20.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.2	42.4	158.9	40.2	31.2	22.3	4.3	18.1	20.8	0.0
Queue Length 50th (m)	5.0	30.4	~23.9	25.4	45.4	169.8	2.9	4.3	72.6	0.0
Queue Length 95th (m)	12.3	53.8	#46.6	44.7	#132.8	#287.0	13.1	13.6	89.7	0.0
Internal Link Dist (m)		119.5		192.3		117.5			135.9	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		37.5
Base Capacity (vph)	236	457	149	454	540	2251	1048	187	1783	857
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.48	0.58	0.36	0.87	0.80	0.12	0.40	0.49	0.02

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	60	161	87	64	100	468	1806	125	74	874	13
Future Volume (vph)	22	60	161	87	64	100	468	1806	125	74	874	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1524		1647	1634		1729	3424	1547	1729	3390	1547
Flt Permitted	0.52	1.00		0.34	1.00		0.23	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)	942	1524		596	1634		424	3424	1547	133	3390	1547
Peak-hour factor, PHF	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)	22	60	161	87	64	100	468	1806	125	74	874	13
RTOR Reduction (vph)	0	85	0	0	50	0	0	0	32	0	0	6
Lane Group Flow (vph)	22	136	0	87	114	0	468	1806	93	74	874	7
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	18.6	18.6		18.6	18.6		97.5	84.1	84.1	75.1	68.4	68.4
Effective Green, g (s)	18.6	18.6		18.6	18.6		97.5	84.1	84.1	75.1	68.4	68.4
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.75	0.65	0.65	0.58	0.53	0.53
Clearance Time (s)	7.3	7.3		7.3	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	134	218		85	233		542	2215	1000	159	1783	813
v/s Ratio Prot		0.09			0.07		c0.15	0.53		0.02	0.26	
v/s Ratio Perm	0.02			c0.15			c0.50		0.06	0.25		0.00
v/c Ratio	0.16	0.62		1.02	0.49		0.86	0.82	0.09	0.47	0.49	0.01
Uniform Delay, d1	48.9	52.4		55.7	51.3		15.7	17.1	8.6	16.9	19.7	14.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	5.5		104.2	1.6		13.4	3.4	0.2	2.1	1.0	0.0
Delay (s)	49.5	57.9		159.9	53.0		29.1	20.6	8.8	19.0	20.6	14.7
Level of Service	D	E		F	D		C	C	A	B	C	B
Approach Delay (s)		57.1			90.0			21.6			20.4	
Approach LOS		E			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	20.6
Intersection Capacity Utilization	103.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	41	22	174	12	149	1417	312	16	611
Future Volume (vph)	41	22	174	12	149	1417	312	16	611
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	7	4	3	8	5	2			6
Permitted Phases					2		2	6	
Detector Phase	7	4	3	8	5	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	39.3	9.5	39.3	12.9	35.9	35.9	38.6	38.6
Total Split (s)	10.1	39.3	14.0	43.2	13.2	66.7	66.7	53.5	53.5
Total Split (%)	8.4%	32.8%	11.7%	36.0%	11.0%	55.6%	55.6%	44.6%	44.6%
Yellow Time (s)	3.5	3.0	3.5	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.0	4.3	1.0	4.3	2.1	2.0	2.0	2.0	2.0
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)	4.5	7.3	4.5	7.3	6.7	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lead			Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	9.3	8.4	9.3	15.1	83.8	83.9	83.9	68.2	68.2
Actuated g/C Ratio	0.08	0.07	0.08	0.13	0.70	0.70	0.70	0.57	0.57
v/c Ratio	0.31	0.60	0.70	0.10	0.29	0.59	0.27	0.09	0.33
Control Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
LOS	E	C	E	C	A	B	A	B	B
Approach Delay		36.7		65.9		9.1			15.1
Approach LOS		D		E		A			B

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 39 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 15.8	Intersection LOS: B
Intersection Capacity Utilization 74.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: Street No.2 & March Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	115	174	21	149	1417	312	16	633
v/c Ratio	0.31	0.60	0.70	0.10	0.29	0.59	0.27	0.09	0.33
Control Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Length 50th (m)	8.0	5.0	20.9	2.8	10.1	78.4	0.0	1.6	38.4
Queue Length 95th (m)	#23.8	22.5	#34.7	9.9	20.3	115.7	9.1	6.3	60.2
Internal Link Dist (m)		124.2		210.3		450.7			287.3
Turn Bay Length (m)	57.5		156.0		100.0		90.0	105.0	
Base Capacity (vph)	133	470	252	507	515	2394	1175	178	1918
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	0.31	0.24	0.69	0.04	0.29	0.59	0.27	0.09	0.33

Intersection Summary

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

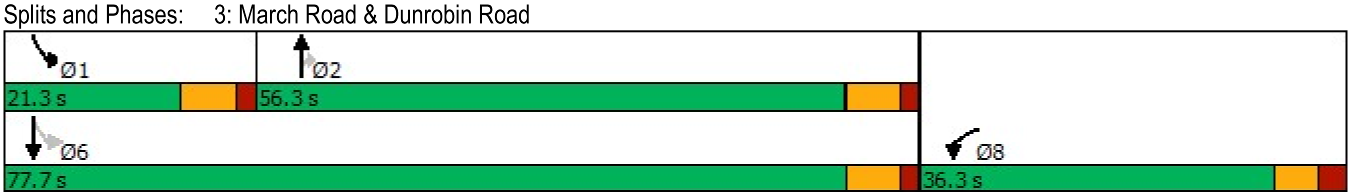
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	22	93	174	12	9	149	1417	312	16	611	22
Future Volume (vph)	41	22	93	174	12	9	149	1417	312	16	611	22
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.88		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1509		3195	1674		1729	3424	1547	1729	3375	
Flt Permitted	0.95	1.00		0.95	1.00		0.34	1.00	1.00	0.17	1.00	
Satd. Flow (perm)	1729	1509		3195	1674		617	3424	1547	314	3375	
Peak-hour factor, PHF	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)	41	22	93	174	12	9	149	1417	312	16	611	22
RTOR Reduction (vph)	0	84	0	0	8	0	0	0	102	0	1	0
Lane Group Flow (vph)	41	31	0	174	13	0	149	1417	210	16	632	0
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)	7.1	11.7		9.3	13.9		80.6	80.6	80.6	64.8	64.8	
Effective Green, g (s)	7.1	11.7		9.3	13.9		80.6	80.6	80.6	64.8	64.8	
Actuated g/C Ratio	0.06	0.10		0.08	0.12		0.67	0.67	0.67	0.54	0.54	
Clearance Time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	102	147		247	193		498	2299	1039	169	1822	
v/s Ratio Prot	0.02	c0.02		c0.05	0.01		0.02	c0.41			0.19	
v/s Ratio Perm							0.18		0.14	0.05		
v/c Ratio	0.40	0.21		0.70	0.07		0.30	0.62	0.20	0.09	0.35	
Uniform Delay, d1	54.4	49.9		54.0	47.3		7.9	11.0	7.5	13.4	15.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.6	0.7		8.8	0.1		0.3	1.2	0.4	1.1	0.5	
Delay (s)	57.0	50.6		62.8	47.4		8.2	12.3	7.9	14.5	16.1	
Level of Service	E	D		E	D		A	B	A	B	B	
Approach Delay (s)		52.3			61.2			11.2			16.1	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.1
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	258	595	615	37	236
Future Volume (vph)	258	595	615	37	236
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.7
Total Split (%)	31.8%	49.4%	49.4%	18.7%	68.2%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	14.6	63.9	63.9	71.5	71.5
Actuated g/C Ratio	0.15	0.65	0.65	0.72	0.72
v/c Ratio	0.67	0.27	0.51	0.07	0.18
Control Delay	42.6	9.2	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	9.2	2.5	4.8	5.1
LOS	D	A	A	A	A
Approach Delay	42.6	5.8			5.1
Approach LOS	D	A			A

Intersection Summary	
Cycle Length: 114	
Actuated Cycle Length: 98.7	
Natural Cycle: 95	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 62.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	334	595	615	37	236
v/c Ratio	0.67	0.27	0.51	0.07	0.18
Control Delay	42.6	9.2	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	9.2	2.5	4.8	5.1
Queue Length 50th (m)	28.2	26.8	0.0	1.7	12.1
Queue Length 95th (m)	42.0	41.8	14.3	5.0	23.6
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	985	2217	1208	638	1304
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.27	0.51	0.06	0.18

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	258	76	595	615	37	236
Future Volume (vph)	258	76	595	615	37	236
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		0.95	1.00	1.00	1.00
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3160		3424	1532	1679	1802
Flt Permitted	0.96		1.00	1.00	0.38	1.00
Satd. Flow (perm)	3160		3424	1532	670	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	258	76	595	615	37	236
RTOR Reduction (vph)	29	0	0	227	0	0
Lane Group Flow (vph)	305	0	595	388	37	236
Heavy Vehicles (%)	3%	7%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	14.6		63.9	63.9	74.0	74.0
Effective Green, g (s)	14.6		63.9	63.9	74.0	74.0
Actuated g/C Ratio	0.14		0.63	0.63	0.73	0.73
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	455		2161	967	527	1317
v/s Ratio Prot	c0.10		0.17		0.00	c0.13
v/s Ratio Perm				c0.25	0.05	
v/c Ratio	0.67		0.28	0.40	0.07	0.18
Uniform Delay, d1	41.0		8.3	9.2	4.1	4.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.9		0.3	1.2	0.1	0.3
Delay (s)	44.9		8.6	10.5	4.1	4.5
Level of Service	D		A	B	A	A
Approach Delay (s)	44.9		9.6			4.5
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	101.2	Sum of lost time (s)	18.9
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	133	0	0	545	0	110
Future Volume (Veh/h)	133	0	0	545	0	110
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)	133	0	0	545	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.87	
vC, conflicting volume			133		678	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			133		554	133
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		100	88
cM capacity (veh/h)			1452		429	916

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	133	545	110
Volume Left	0	0	0
Volume Right	0	0	110
cSH	1700	1452	916
Volume to Capacity	0.08	0.00	0.12
Queue Length 95th (m)	0.0	0.0	3.1
Control Delay (s)	0.0	0.0	9.5
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	265	280	116	0
Future Volume (Veh/h)	0	17	265	280	116	0
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	17	265	280	116	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				391		
pX, platoon unblocked	0.89					
vC, conflicting volume	926	116	116			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	854	116	116			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	82			
cM capacity (veh/h)	240	936	1473			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	545	116
Volume Left	0	265	0
Volume Right	17	0	0
cSH	936	1473	1700
Volume to Capacity	0.02	0.18	0.07
Queue Length 95th (m)	0.4	5.0	0.0
Control Delay (s)	8.9	4.8	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	4.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	94	0	0	52	0	1878	67	0	857	34
Future Volume (Veh/h)	0	0	94	0	0	52	0	1878	67	0	857	34
Sign Control		Stop			Stop			Free			Free	
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)	0	0	94	0	0	52	0	1878	67	0	857	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								160				
pX, platoon unblocked	0.58	0.58		0.58	0.58	0.58				0.58		
vC, conflicting volume	1865	2819	446	2434	2802	972	891			1945		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1035	2687	446	2020	2658	0	891			1173		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	83	100	100	92	100			100		
cM capacity (veh/h)	99	12	560	16	13	626	757			341		

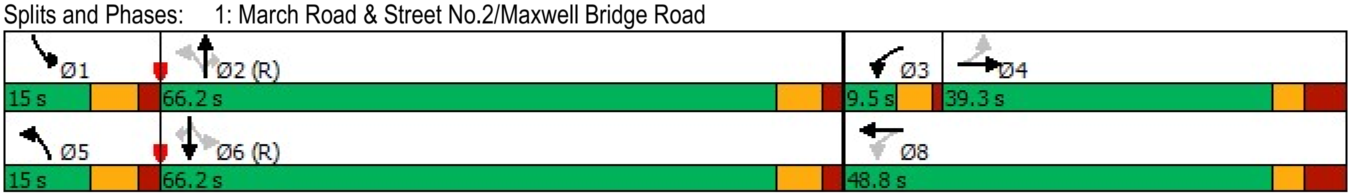
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	94	52	1252	693	571	320
Volume Left	0	0	0	0	0	0
Volume Right	94	52	0	67	0	34
cSH	560	626	1700	1700	1700	1700
Volume to Capacity	0.17	0.08	0.74	0.41	0.34	0.19
Queue Length 95th (m)	4.6	2.1	0.0	0.0	0.0	0.0
Control Delay (s)	12.7	11.3	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	12.7	11.3	0.0		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	22	60	87	64	468	1806	125	74	874	13
Future Volume (vph)	22	60	87	64	468	1806	125	74	874	13
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	4	4	3	8	5	2	2	1	6	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	5.0	10.0	7.0	10.0	10.0	7.0	10.0	10.0
Minimum Split (s)	39.3	39.3	9.5	39.3	13.7	34.6	34.6	13.7	34.6	34.6
Total Split (s)	39.3	39.3	9.5	48.8	15.0	66.2	66.2	15.0	66.2	66.2
Total Split (%)	30.2%	30.2%	7.3%	37.5%	11.5%	50.9%	50.9%	11.5%	50.9%	50.9%
Yellow Time (s)	3.0	3.0	3.5	3.0	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	4.3	4.3	1.0	4.3	2.1	2.0	2.0	2.1	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.3	7.3	4.5	7.3	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.0	17.0	29.3	26.5	89.0	77.5	77.5	67.6	59.6	59.6
Actuated g/C Ratio	0.13	0.13	0.23	0.20	0.68	0.60	0.60	0.52	0.46	0.46
v/c Ratio	0.14	0.78	0.61	0.43	0.94	0.88	0.13	0.45	0.56	0.02
Control Delay	48.9	47.5	59.0	29.3	47.4	30.9	2.8	25.0	27.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	47.5	59.0	29.3	47.4	30.9	2.8	25.0	27.4	0.1
LOS	D	D	E	C	D	C	A	C	C	A
Approach Delay		47.6		39.6		32.7			26.9	
Approach LOS		D		D		C			C	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 140	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 32.6	Intersection LOS: C
Intersection Capacity Utilization 100.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: March Road & Street No.2/Maxwell Bridge Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	22	221	87	164	468	1806	125	74	874	13
v/c Ratio	0.14	0.78	0.61	0.43	0.94	0.88	0.13	0.45	0.56	0.02
Control Delay	48.9	47.5	59.0	29.3	47.4	30.9	2.8	25.0	27.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	47.5	59.0	29.3	47.4	30.9	2.8	25.0	27.4	0.1
Queue Length 50th (m)	5.1	30.9	18.5	22.1	63.9	203.0	0.0	5.5	84.2	0.0
Queue Length 95th (m)	12.5	55.1	30.3	39.8	#164.5	#313.9	9.4	17.8	104.0	0.0
Internal Link Dist (m)		119.5		192.3		117.5			135.9	
Turn Bay Length (m)	68.0		76.0		91.0			120.0		37.5
Base Capacity (vph)	292	450	142	565	499	2042	975	173	1554	779
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.49	0.61	0.29	0.94	0.88	0.13	0.43	0.56	0.02

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	60	161	87	64	100	468	1806	125	74	874	13
Future Volume (vph)	22	60	161	87	64	100	468	1806	125	74	874	13
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.3	7.3		4.5	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.89		1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1729	1524		1647	1634		1729	3424	1547	1729	3390	1547
Flt Permitted	0.65	1.00		0.24	1.00		0.21	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)	1189	1524		424	1634		375	3424	1547	122	3390	1547
Peak-hour factor, PHF	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)	22	60	161	87	64	100	468	1806	125	74	874	13
RTOR Reduction (vph)	0	86	0	0	51	0	0	0	52	0	0	7
Lane Group Flow (vph)	22	135	0	87	113	0	468	1806	73	74	874	6
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.0	17.0		26.5	26.5		89.6	76.2	76.2	66.3	59.6	59.6
Effective Green, g (s)	17.0	17.0		26.5	26.5		89.6	76.2	76.2	66.3	59.6	59.6
Actuated g/C Ratio	0.13	0.13		0.20	0.20		0.69	0.59	0.59	0.51	0.46	0.46
Clearance Time (s)	7.3	7.3		4.5	7.3		6.7	6.6	6.6	6.7	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	155	199		133	333		501	2006	906	145	1554	709
v/s Ratio Prot		0.09		c0.03	0.07		c0.17	c0.53		0.03	0.26	
v/s Ratio Perm	0.02			c0.11			c0.48		0.05	0.23		0.00
v/c Ratio	0.14	0.68		0.65	0.34		0.93	0.90	0.08	0.51	0.56	0.01
Uniform Delay, d1	50.0	53.9		45.7	44.3		22.8	23.6	11.7	23.1	25.7	19.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	8.8		11.0	0.6		24.7	7.0	0.2	3.0	1.5	0.0
Delay (s)	50.5	62.7		56.7	44.9		47.5	30.6	11.9	26.2	27.2	19.2
Level of Service	D	E		E	D		D	C	B	C	C	B
Approach Delay (s)		61.6			49.0			32.9			27.0	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	25.1
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	41	22	174	12	149	1417	312	16	611
Future Volume (vph)	41	22	174	12	149	1417	312	16	611
Turn Type	Prot	NA	Prot	NA	pm+pt	NA	Perm	Perm	NA
Protected Phases	7	4	3	8	5	2			6
Permitted Phases					2		2	6	
Detector Phase	7	4	3	8	5	2	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	39.3	9.5	39.3	12.9	35.9	35.9	38.6	38.6
Total Split (s)	10.1	39.3	14.0	43.2	13.2	66.7	66.7	53.5	53.5
Total Split (%)	8.4%	32.8%	11.7%	36.0%	11.0%	55.6%	55.6%	44.6%	44.6%
Yellow Time (s)	3.5	3.0	3.5	3.0	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	1.0	4.3	1.0	4.3	2.1	2.0	2.0	2.0	2.0
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)	4.5	7.3	4.5	7.3	6.7	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lead			Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	9.3	8.4	9.3	15.1	83.8	83.9	83.9	68.2	68.2
Actuated g/C Ratio	0.08	0.07	0.08	0.13	0.70	0.70	0.70	0.57	0.57
v/c Ratio	0.31	0.60	0.70	0.10	0.29	0.59	0.27	0.09	0.33
Control Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
LOS	E	C	E	C	A	B	A	B	B
Approach Delay		36.7		65.9		9.1			15.1
Approach LOS		D		E		A			B

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 39 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 105

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 15.8 Intersection LOS: B

Intersection Capacity Utilization 74.5% ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 2: Street No.2 & March Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	115	174	21	149	1417	312	16	633
v/c Ratio	0.31	0.60	0.70	0.10	0.29	0.59	0.27	0.09	0.33
Control Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.2	28.7	69.8	33.8	8.0	11.0	1.4	15.9	15.1
Queue Length 50th (m)	8.0	5.0	20.9	2.8	10.1	78.4	0.0	1.6	38.4
Queue Length 95th (m)	#23.8	22.5	#34.7	9.9	20.3	115.7	9.1	6.3	60.2
Internal Link Dist (m)		124.2		210.3		450.7			287.3
Turn Bay Length (m)	57.5		156.0		100.0		90.0	105.0	
Base Capacity (vph)	133	470	252	507	515	2394	1175	178	1918
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	0.31	0.24	0.69	0.04	0.29	0.59	0.27	0.09	0.33

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	22	93	174	12	9	149	1417	312	16	611	22
Future Volume (vph)	41	22	93	174	12	9	149	1417	312	16	611	22
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.88		1.00	0.94		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1729	1509		3195	1674		1729	3424	1547	1729	3375	
Flt Permitted	0.95	1.00		0.95	1.00		0.34	1.00	1.00	0.17	1.00	
Satd. Flow (perm)	1729	1509		3195	1674		617	3424	1547	314	3375	
Peak-hour factor, PHF	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)	41	22	93	174	12	9	149	1417	312	16	611	22
RTOR Reduction (vph)	0	84	0	0	8	0	0	0	102	0	1	0
Lane Group Flow (vph)	41	31	0	174	13	0	149	1417	210	16	632	0
Heavy Vehicles (%)	0%	10%	5%	5%	3%	0%	0%	1%	0%	0%	2%	0%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)	7.1	11.7		9.3	13.9		80.6	80.6	80.6	64.8	64.8	
Effective Green, g (s)	7.1	11.7		9.3	13.9		80.6	80.6	80.6	64.8	64.8	
Actuated g/C Ratio	0.06	0.10		0.08	0.12		0.67	0.67	0.67	0.54	0.54	
Clearance Time (s)	4.5	7.3		4.5	7.3		6.7	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	102	147		247	193		498	2299	1039	169	1822	
v/s Ratio Prot	0.02	c0.02		c0.05	0.01		0.02	c0.41			0.19	
v/s Ratio Perm							0.18		0.14	0.05		
v/c Ratio	0.40	0.21		0.70	0.07		0.30	0.62	0.20	0.09	0.35	
Uniform Delay, d1	54.4	49.9		54.0	47.3		7.9	11.0	7.5	13.4	15.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.6	0.7		8.8	0.1		0.3	1.2	0.4	1.1	0.5	
Delay (s)	57.0	50.6		62.8	47.4		8.2	12.3	7.9	14.5	16.1	
Level of Service	E	D		E	D		A	B	A	B	B	
Approach Delay (s)		52.3			61.2			11.2			16.1	
Approach LOS		D			E			B			B	

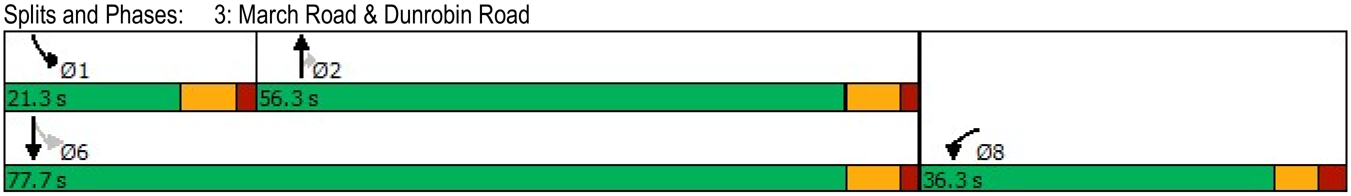
Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.1
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	258	595	615	37	236
Future Volume (vph)	258	595	615	37	236
Turn Type	Prot	NA	Perm	pm+pt	NA
Protected Phases	8	2		1	6
Permitted Phases			2	6	
Detector Phase	8	2	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	50.0	50.0	5.0	50.0
Minimum Split (s)	27.3	56.3	56.3	11.3	56.3
Total Split (s)	36.3	56.3	56.3	21.3	77.7
Total Split (%)	31.8%	49.4%	49.4%	18.7%	68.2%
Yellow Time (s)	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.6	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	Max	Max	None	Max
Act Effct Green (s)	14.6	63.9	63.9	71.5	71.5
Actuated g/C Ratio	0.15	0.65	0.65	0.72	0.72
v/c Ratio	0.67	0.27	0.51	0.07	0.18
Control Delay	42.6	9.2	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	9.2	2.5	4.8	5.1
LOS	D	A	A	A	A
Approach Delay	42.6	5.8			5.1
Approach LOS	D	A			A

Intersection Summary

Cycle Length: 114
Actuated Cycle Length: 98.7
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 62.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: March Road & Dunrobin Road



Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	334	595	615	37	236
v/c Ratio	0.67	0.27	0.51	0.07	0.18
Control Delay	42.6	9.2	2.5	4.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	9.2	2.5	4.8	5.1
Queue Length 50th (m)	28.2	26.8	0.0	1.7	12.1
Queue Length 95th (m)	42.0	41.8	14.3	5.0	23.6
Internal Link Dist (m)	228.2	206.3			170.7
Turn Bay Length (m)	120.0		140.0	145.0	
Base Capacity (vph)	985	2217	1208	638	1304
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.27	0.51	0.06	0.18

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	258	76	595	615	37	236
Future Volume (vph)	258	76	595	615	37	236
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	6.3		6.3	6.3	6.3	6.3
Lane Util. Factor	0.97		0.95	1.00	1.00	1.00
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3160		3424	1532	1679	1802
Flt Permitted	0.96		1.00	1.00	0.38	1.00
Satd. Flow (perm)	3160		3424	1532	670	1802
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	258	76	595	615	37	236
RTOR Reduction (vph)	29	0	0	227	0	0
Lane Group Flow (vph)	305	0	595	388	37	236
Heavy Vehicles (%)	3%	7%	1%	1%	3%	1%
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	14.6		63.9	63.9	74.0	74.0
Effective Green, g (s)	14.6		63.9	63.9	74.0	74.0
Actuated g/C Ratio	0.14		0.63	0.63	0.73	0.73
Clearance Time (s)	6.3		6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	455		2161	967	527	1317
v/s Ratio Prot	c0.10		0.17		0.00	c0.13
v/s Ratio Perm				c0.25	0.05	
v/c Ratio	0.67		0.28	0.40	0.07	0.18
Uniform Delay, d1	41.0		8.3	9.2	4.1	4.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.9		0.3	1.2	0.1	0.3
Delay (s)	44.9		8.6	10.5	4.1	4.5
Level of Service	D		A	B	A	A
Approach Delay (s)	44.9		9.6			4.5
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	101.2	Sum of lost time (s)	18.9
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	133	0	0	545	0	110
Future Volume (Veh/h)	133	0	0	545	0	110
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)	133	0	0	545	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				144		
pX, platoon unblocked					0.85	
vC, conflicting volume			133		678	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			133		529	133
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		100	88
cM capacity (veh/h)			1452		432	916

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	133	545	110
Volume Left	0	0	0
Volume Right	0	0	110
cSH	1700	1452	916
Volume to Capacity	0.08	0.00	0.12
Queue Length 95th (m)	0.0	0.0	3.1
Control Delay (s)	0.0	0.0	9.5
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	265	280	116	0
Future Volume (Veh/h)	0	17	265	280	116	0
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	17	265	280	116	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				391		
pX, platoon unblocked	0.86					
vC, conflicting volume	926	116	116			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	833	116	116			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	82			
cM capacity (veh/h)	239	936	1473			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	17	545	116
Volume Left	0	265	0
Volume Right	17	0	0
cSH	936	1473	1700
Volume to Capacity	0.02	0.18	0.07
Queue Length 95th (m)	0.4	5.0	0.0
Control Delay (s)	8.9	4.8	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	4.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	94	0	0	52	0	1878	67	0	857	34
Future Volume (Veh/h)	0	0	94	0	0	52	0	1878	67	0	857	34
Sign Control		Stop			Stop			Free			Free	
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)	0	0	94	0	0	52	0	1878	67	0	857	34
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								160				
pX, platoon unblocked	0.51	0.51		0.51	0.51	0.51				0.51		
vC, conflicting volume	1865	2819	446	2434	2802	972	891			1945		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	773	2645	446	1890	2613	0	891			930		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	83	100	100	91	100			100		
cM capacity (veh/h)	133	12	560	18	12	553	757			373		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	94	52	1252	693	571	320
Volume Left	0	0	0	0	0	0
Volume Right	94	52	0	67	0	34
cSH	560	553	1700	1700	1700	1700
Volume to Capacity	0.17	0.09	0.74	0.41	0.34	0.19
Queue Length 95th (m)	4.6	2.4	0.0	0.0	0.0	0.0
Control Delay (s)	12.7	12.2	0.0	0.0	0.0	0.0
Lane LOS	B	B				
Approach Delay (s)	12.7	12.2	0.0		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

Appendix D MMLOS ANALYSIS

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]			

[illegible]		[illegible] No.2	Section March Road between Halton Terrace and future Street No.3	Section March Road between future Street No.2 north and future Street No.3	Section Halton Terrace between March Road Road and Old Carp Road	Section Old Carp Road across proposed site frontage
[illegible]	Sidewalk Width Boulevard Width	[illegible]	≥ 2 m < 0.5	no sidewalk n/a	1.8 m < 0.5 m	no sidewalk n/a
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h no	> 30 to 50 km/h no
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Type of Cycling Facility	[illegible]	Curbside Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Number of Travel Lanes		2 ea. dir. (w median)	2-3 lanes total	2-3 lanes total	2-3 lanes total
	Operating Speed		> 70 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	Bike Lane (+ Parking Lane) Width		≥ 1.8 m			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	Bike Lane Blockages		Rare			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Facility Type	[illegible]	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Truck Lane Width	[illegible]	> 3.7 m	> 3.7 m		
	Travel Lanes per Direction		> 1	1		
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]				

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			

[illegible]		[illegible] No.2	Section March Road between Street No.2 south and Street No.3	Section March Road between Street No.2 north and Street No.3	Section Street No.2 Crescent	Section Street No.3
[illegible]	Sidewalk Width Boulevard Width	00	≥ 2 m < 0.5	no sidewalk n/a	≥ 2 m > 2 m	1.8 m < 0.5 m
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h yes	≤ 30 km/h yes
	[illegible]		00	00	ㅅㄴ	ㅅㄴ
	[illegible]		00	00	ㅅㄴ	ㅅㄴ
[illegible]	Type of Cycling Facility	△	Curbside Bike Lane	Curbside Bike Lane	Physically Separated	Mixed Traffic
	Number of Travel Lanes		2 ea. dir. (w median)	≤ 1 each direction		≤ 2 (no centreline)
	Operating Speed		> 70 km/h	> 70 km/h		≤ 40 km/h
	[illegible]		△	△	ㅈ	ㅅㄴ
	Bike Lane (+ Parking Lane) Width		≥ 1.8 m	≥ 1.8 m		
	[illegible]		ㅅㄴ	ㅅㄴ	ㅈ	ㅈ
	Bike Lane Blockages		Rare	Rare		
	[illegible]		ㅅㄴ	ㅅㄴ	ㅈ	ㅈ
	[illegible]		△	△	ㅅㄴ	ㅅㄴ
[illegible]	Facility Type	△	Mixed Traffic	Mixed Traffic	Mixed Traffic	
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≤ 0.6	Vt/Vp ≥ 0.8	
	[illegible]		ㅅㅈ	△	ㅅㅈ	ㅈ
[illegible]	Truck Lane Width	ㅅㄷ	> 3.7 m	> 3.7 m		
	Travel Lanes per Direction		> 1	1		
	[illegible]		ㅅㄴ	ㅅㄷ	ㅈ	ㅈ

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			

[illegible]		[illegible] No.2	Section March Road between Street No.2 south and Street No.3	Section March Road between Street No.2 north and Street No.3	Section Street No.2 Crescent	Section Street No.3
[illegible]	Sidewalk Width Boulevard Width	[illegible]	≥ 2 m < 0.5	no sidewalk n/a	≥ 2 m > 2 m	1.8 m < 0.5 m
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking		> 60 km/h no	> 60 km/h no	> 30 to 50 km/h yes	≤ 30 km/h yes
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Type of Cycling Facility	[illegible]	Curbside Bike Lane	Curbside Bike Lane	Physically Separated	Mixed Traffic
	Number of Travel Lanes		2 ea. dir. (w median)	≤ 1 each direction		≤ 2 (no centreline)
	Operating Speed		> 70 km/h	> 70 km/h		≤ 40 km/h
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	Bike Lane (+ Parking Lane) Width		≥ 1.8 m	≥ 1.8 m		
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	Bike Lane Blockages		Rare	Rare		
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Facility Type	[illegible]	Mixed Traffic	Mixed Traffic	Mixed Traffic	
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Truck Lane Width	[illegible]	> 3.7 m	> 3.7 m		
	Travel Lanes per Direction		> 1	1		
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

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[illegible]		[illegible]				[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lanes	7	7	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		Median > 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected/ 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
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No		No
	Right Turn 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
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cycle Length	130	130	130	130	98		98
	Effective Walk Time	8	8	47	47	37		16
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Bike lane shifts to the left of right turn	Not Applicable			> 50 m	> 50 m	
	Dedicated Right Turning Speed	≤ 25 km/h		≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	
	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]		
[illegible]	Average Signal Delay	≤ 10 sec	≤ 20 sec	> 40 sec	> 40 sec	≤ 40 sec	≤ 10 sec	≤ 10 sec
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]		
[illegible]	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	1	1	1	1	≥ 2
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]		
[illegible]	Volume to Capacity Ratio	0.0 - 0.60				0.0 - 0.60		
	[illegible]	[illegible]				[illegible]		

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]		[illegible]				[illegible] No.2				[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Lanes	7	7	3	3	3	4	3	3	3	[redacted]	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	[redacted]	Median > 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected/ Permissive	Protected/ Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	[redacted]	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	Permissive or yield control	[redacted]	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	[redacted]	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	[redacted]	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	[redacted]	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	[redacted]	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	[redacted]	Std transverse markings
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cycle Length	130	130	130	130	120	120	120	120	98	[redacted]	98
	Effective Walk Time	8	8	47	47	13	13	52	52	37	[redacted]	16
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Mixed Traffic
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Bike lane shifts to the left of right turn	Not Applicable								> 50 m	
	Dedicated Right Turning Speed	≤ 25 km/h		≤ 25 km/h	≤ 25 km/h						≤ 25 km/h	
	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]		[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed	No lane crossed	No lane crossed	No lane crossed	No lane crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
[illegible]	Average Signal Delay	≤ 10 sec	≤ 20 sec	> 40 sec	> 40 sec	> 40 sec	≤ 20 sec	> 40 sec	≤ 40 sec	≤ 40 sec	≤ 10 sec	≤ 20 sec
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
[illegible]	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	1	1	1	1	1	1	1	1	≥ 2
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
[illegible]	Volume to Capacity Ratio	0.71 - 0.80				> 1.00				0.0 - 0.60		
	[illegible]	[illegible]				[illegible]				[illegible]		

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lanes	7	7	3	3	3	4	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	No Median - 2.4 m		Median > 2.4 m
Conflicting Left Turns	Permissive	Permissive	Protected/ Permissive	Protected/ Permissive	Permissive	Permissive	Permissive	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	Permissive or yield control		Permissive or yield control
Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR allowed
Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No		No
Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel		No Channel
Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m		10-15m
Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cycle Length	130	130	130	130	120	120	120	120	98		98
Effective Walk Time	8	8	47	47	13	13	52	52	37		16
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Mixed Traffic
IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Bike lane shifts to the left of right turn	Not Applicable								> 50 m	
Dedicated Right Turning Speed	≤ 25 km/h		≤ 25 km/h	≤ 25 km/h						≤ 25 km/h	
[illegible]	[illegible]	[illegible]			[illegible]	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed	No lane crossed	No lane crossed	No lane crossed	No lane crossed	One lane crossed	One lane crossed
Operating Speed	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average Signal Delay	≤ 10 sec	≤ 20 sec	> 40 sec	> 40 sec	> 40 sec	≤ 20 sec	> 40 sec	≤ 40 sec	≤ 40 sec	≤ 10 sec	≤ 20 sec
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	1	1	1	1	1	1	1	1	≥ 2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Volume to Capacity Ratio	0.91 - 1.00				> 1.00				0.0 - 0.60		
[illegible]	[illegible]				[illegible]				[illegible]		

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[illegible]	Lanes	7	7	3	3	5	6	4	3	4	[redacted]	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	[redacted]	Median > 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Permissive	Protected/ Permissive	Permissive	[redacted]	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	Permissive or yield control	[redacted]	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	[redacted]	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	[redacted]	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	[redacted]	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	[redacted]	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	[redacted]	Std transverse markings
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Cycle Length	130	130	130	130	120	120	120	120	98	[redacted]	98
	Effective Walk Time	8	8	47	47	7	14	37	25	37	[redacted]	16
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]	△	△	[illegible]	[illegible]	△	△	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	△	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Mixed Traffic
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank>	Bike lane shifts to the left of right turn	Not Applicable								> 50 m	
	Dedicated Right Turning Speed	≤ 25 km/h		≤ 25 km/h	≤ 25 km/h						≤ 25 km/h	
	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	No lane crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	≥ 60 km/h
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]				[illegible]				[illegible]		
[illegible]	Average Signal Delay	≤ 30 sec	≤ 20 sec	> 40 sec	> 40 sec	≤ 30 sec	≤ 10 sec	> 40 sec	> 40 sec	≤ 40 sec	≤ 10 sec	≤ 20 sec
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	△	[illegible]	[illegible]
		[illegible]				[illegible]				△		
[illegible]	Effective Corner Radius	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	1	1	≥ 2	≥ 2	1	1	1	1	≥ 2
	[illegible]	[illegible]	[illegible]	△	△	[illegible]	[illegible]	△	△	△	△	[illegible]
		△				△				△		
[illegible]	Volume to Capacity Ratio	0.91 - 1.00				0.61 - 0.70				0.0 - 0.60		
	[illegible]	△				[illegible]				[illegible]		

Appendix E INFRASTRUCTURE DESIGN CHECKLIST

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

Legend

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

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

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

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☐ N/A
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☐ N/A
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☐ N/A
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	☐
	2.2	**Secure bicycle parking**	
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 Zoning By-law Section 111)*	☐ N/A
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
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)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

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

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: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑ Introduce by Phase 1 buildout (2022)
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

Note: All items in this checklist were deemed non applicable to the plan of subdivision

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☑ Introduce by Phase 1 buildout (2024)
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
		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	☑ Introduce by 2026 to facilitate meeting a 20% transit modal share
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		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 *(subdivision)*	☑ Introduce by Phase 1 buildout (2024)
		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)	☐
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station *(multi-family)*	☐
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☑ Introduce by Phase 1 buildout (2024)
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐

			TDM measures: *Residential developments*	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	☑ Introduce by 2026 to facilitate meeting a 20% transit modal share
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐