2475 Regina Street

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

Windmill Developments Group Ltd.
300 Richmond Road, Suite 400
Ottawa, Ontario K1Z 6X6

Prepared by:

6 Plaza Court
Ottawa, ON K2H 7W1

October 2022

PN: 2021-057

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1 Screening

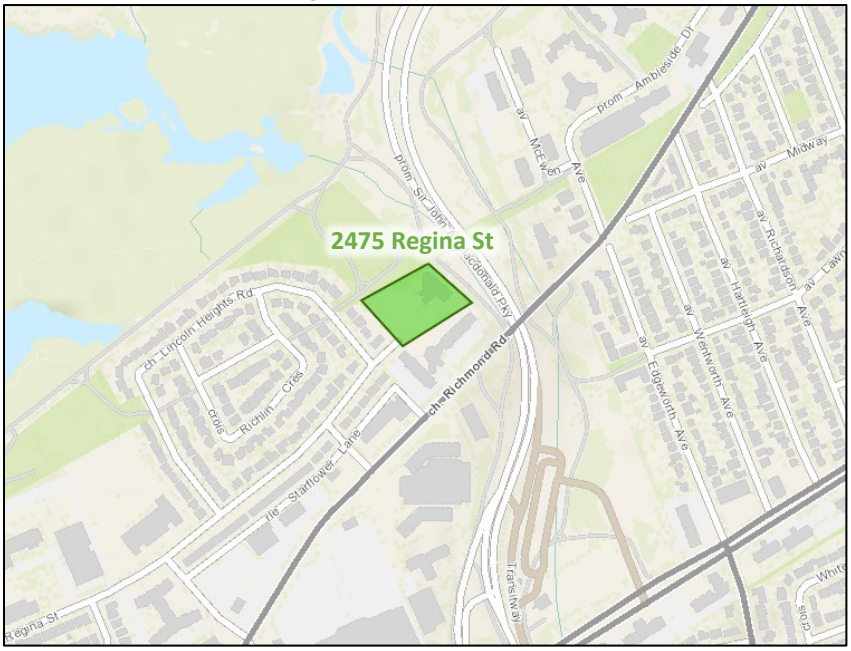
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is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

2 Existing and Planned Conditions

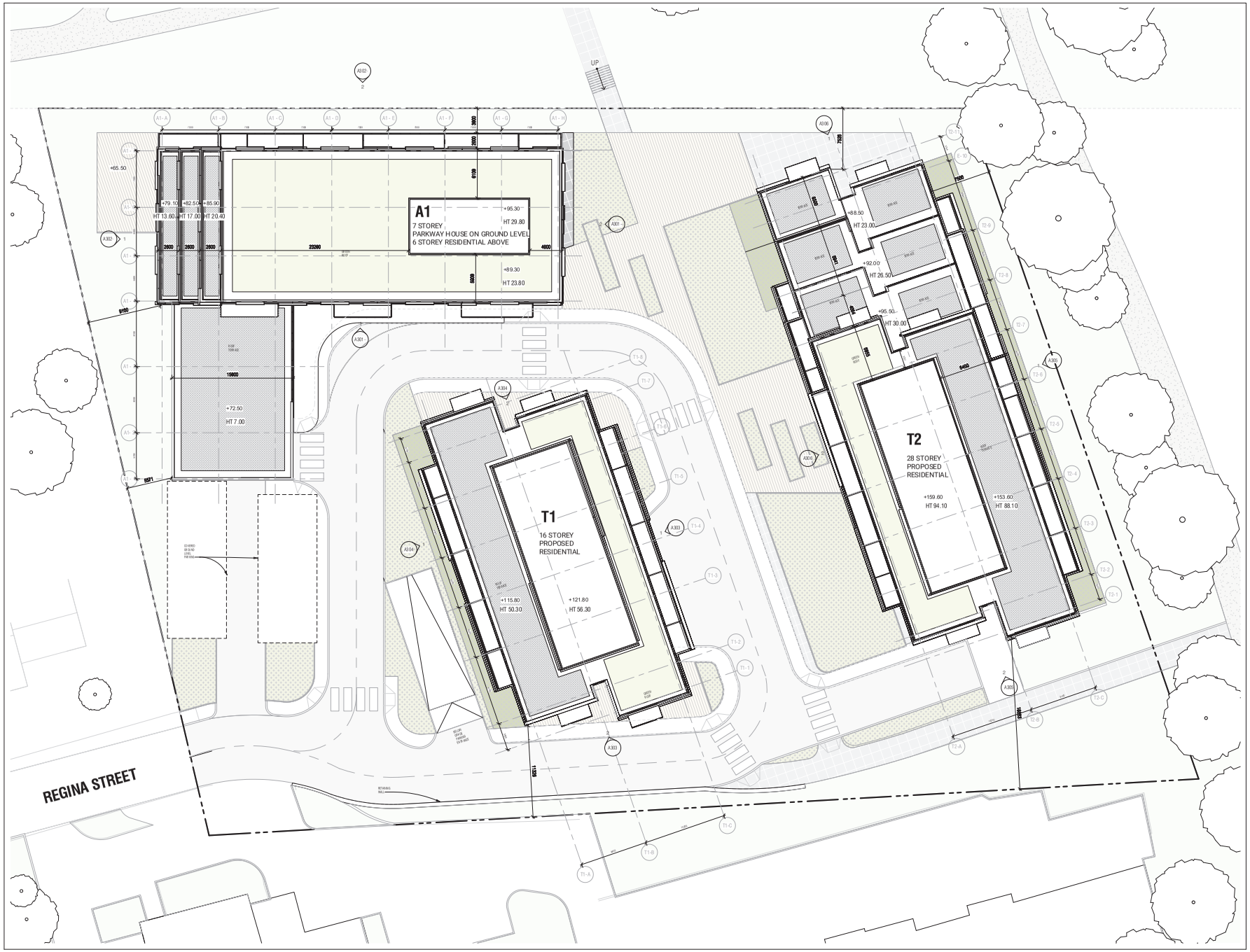
2.1 Proposed Development

The existing site, located at 2475 Regina Street, is currently zoned as Parks and Open Space Zone (O1) is occupied by the Parkway House care facility. The proposed development concept consists of the replacement of the Parkway House structure with an updated facility on-site and the addition of one 25-storey residential tower, one 19-storey residential tower, and one seven-storey residential building incorporating the on-site relocation of the existing care facility at ground level. The proposed development consists of 510 residential units added to the site, and the anticipated full build-out and occupancy horizon is 2026 with construction occurring in two phases. Access is proposed via the existing connection to Regina Street, and 261 vehicle parking spaces and 510 bicycle parking spaces are proposed. Figure 1 illustrates the study area context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 27, 2021



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ISSUED

No.	Date	Description
1	22-05-13	Issued for ZBA
2	22-10-21	Issued for ZBA Resubmission

diamond schmitt

OTTAWA PARKWAY

2475 Regina St
Ottawa, ON K2B 6K3

ROOF PLAN

Scale: 1 : 200
Project No: 211005
Date: 10/21/22

A115

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2022-10-18 3:53:12 PM

2.2 Existing Conditions

2.2.1 Area Road Network

Richmond Road: Richmond Road is a City of Ottawa arterial road with a two-lane urban cross-section with sidewalks on both sides of the road. A bike lane is provided on the north side and cycletrack is provided on the south side of the road approximately west of Starflower Lane, and bike lanes are provided along both sides of the road to the east within the study area. On-street parking is provided in framed parking lanes on the north side of the road between Starflower Lane and Forest Street. The posted speed limit is 50 km/h. The city-protected right-of-way is 37.5 metres west of the Sir John A. MacDonald (SJAM) Parkway, and 26.0 metres to the east, within the study area. Richmond Road is designated a truck route.

Assaly Road: Assaly Road is a City of Ottawa local Road with a two-lane urban cross-section with sidewalks on both sides of the road. The unposted speed limit is assumed to be 50 km/h and the measured right-of-way is 20.0 metres.

Regina Street: Regina Street is a City of Ottawa local road with a two-lane urban cross-section. A sidewalk is provided on the north side of the road between Assaly Road and the site access, and on both sides of the road between to the west within the study area. On-street parking is permitted on the south side of the road. The unposted speed limit is assumed to be 50 km/h and a school zone is signed for 110 metres on either side of Croydon Avenue. The measured right-of-way is 20.0 metres.

Croydon Avenue: Croydon Avenue is a City of Ottawa local road with a two-lane urban cross-section. Sidewalks are provided on both side of the road, discontinuous for approximately 18.0 metres on the west side across the fire station access. The north end of the road has a posted sector speed limit of 40km/h and the unposted speed limit is assumed to be 50 km/h to the south. The measured right-of-way is 20.0 metres.

McEwen Avenue: McEwen Avenue is a City of Ottawa local road with a two-lane urban cross-section. Sidewalks are provided on both side of the road south of Ambleside Drive, and on the east side to the west of Ambleside Drive and on-street parking is provided on the west side of the road. The unposted speed limit is assumed to be 50 km/h and the existing right-of-way provided is 21.0 metres.

Sir John A. MacDonald Parkway: Sir John A. MacDonald Parkway is a federally owned road with a divided, four lane urban cross-section. The posted speed limit is 60 km/h and the existing right-of-way provided is variable throughout the study area.

2.2.2 Existing Intersections

The existing signalized area intersections within 400 metre of the site have been summarized below:

Richmond Road at Croydon Avenue	The intersection of Richmond Road and Croydon Avenue is a signalized intersection. The northbound, westbound, and eastbound approaches each consist of an auxiliary left-turn lane and a shared through/right-turn lane, where the eastbound approach includes a cycletrack and crossride and the westbound approach includes a bike lane. The southbound approach consists of a shared all-movements lane. Northbound right turns on red are prohibited.
Assaly *Road at Richmond Road*	The intersection of Assaly Road and Richmond Road is a signalized intersection. The northbound approach functionally consists of a shared through/left-turn lane and an unmarked auxiliary right-turn lane and includes a bike box, and the southbound approach consists

	of a shared all-movements lane. The westbound and eastbound approaches each consists of an auxiliary left-turn lane and a shared through/right-turn lane where the eastbound approach includes a cycletrack with crossride and the westbound approach includes a bike lane. Northbound right turns on red are prohibited.
Assaly *Road at Regina Road*	The intersection of Assaly Road and Regina Road is an unsignalized T-intersection stop-controlled on the minor approach of Assaly Road. The northbound approach consists of a shared left-turn/right-turn lane. The eastbound approach consists of a shared through/right-turn lane, and westbound approach consists of a shared through/left-turn lane. No turn restrictions were noted.
Richmond Road at McEwen Avenue	The intersection of Richmond Road and McEwen Avenue is a signalized intersection. The southbound approach consists of an auxiliary left-turn lane and a right-turn lane, the westbound approach consists of an auxiliary right-turn lane and a through lane, and the eastbound consists of an auxiliary left-turn lane and a through lane. No turn restrictions were noted

2.2.3 Existing Driveways

Within 200 metres of the site access, 13 driveways to attached and detached low-rise dwellings and two driveways to high-rise apartment building parking garages and loading/garbage areas are present on Regina Street. Figure 3 illustrates the existing area driveways.

Figure 3: Existing Driveways

Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 27, 2021

2.2.4 Cycling and Pedestrian Facilities

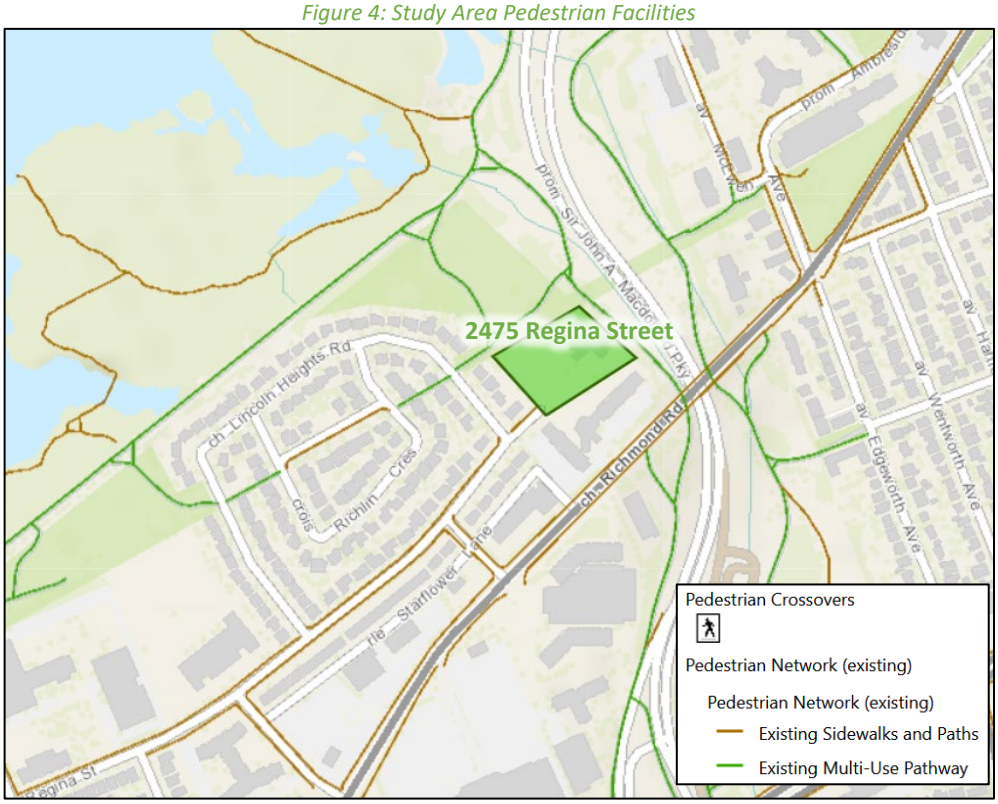
Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities.

Sidewalks are provided along one side of Regina Street between the site access and Assaly Road and along both sides of Regina Street to the west. Sidewalks are provided along both sides of Richmond Road and on both sides of Croydon Road and Assaly Road. Multi-use paths (MUPs) are provided north and east of the site area, connecting

to the future Lincoln Fields light rail transit (LRT) station (presently a bus rapid transit (BRT) station) and additional area and regional pathways.

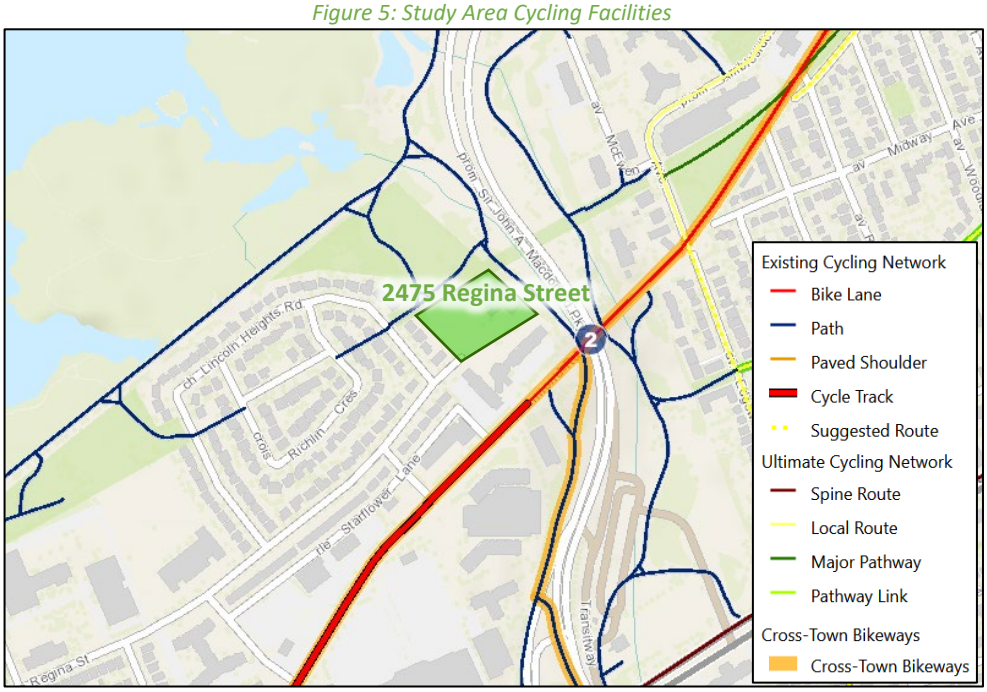
Cycling facilities include the Pinecrest Creek Pathway and Ottawa River Pathway MUPs, a cycle track on the south side and bike lane on the north side of Richmond Road approximately west of Starflower Lane, and bike lanes on both sides of Richmond Road approximately to the east of Starflower Lane. Richmond Road is spine route and a cross-town bikeway, and Pinecrest Creek Pathway south of Richmond Road is a cross-town bikeway.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 27, 2021

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 27, 2021

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 7 and Figure 8 respectively.

Figure 6: Existing Pedestrian Volumes

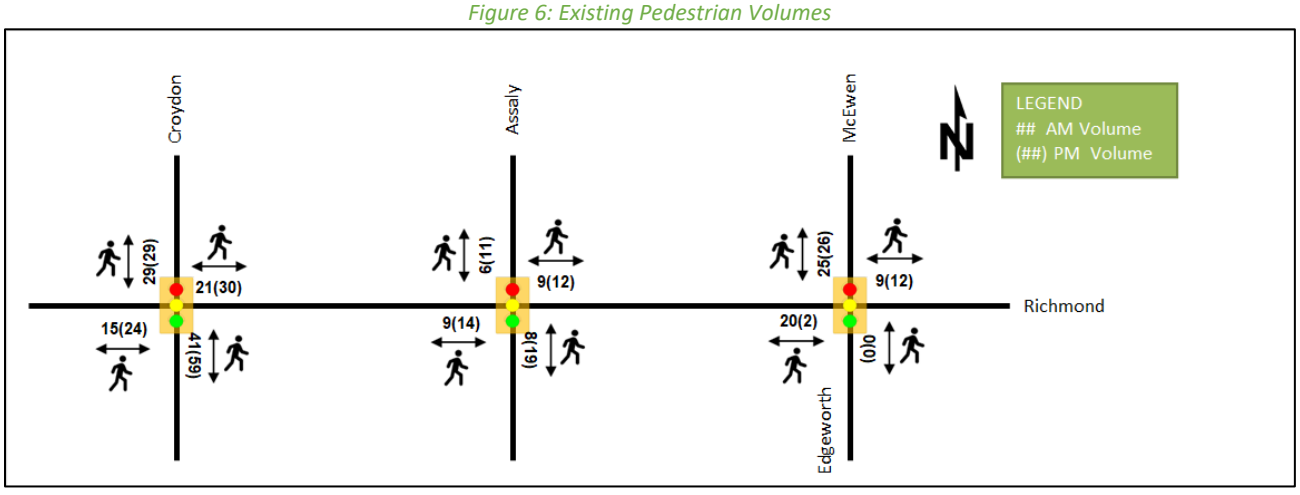
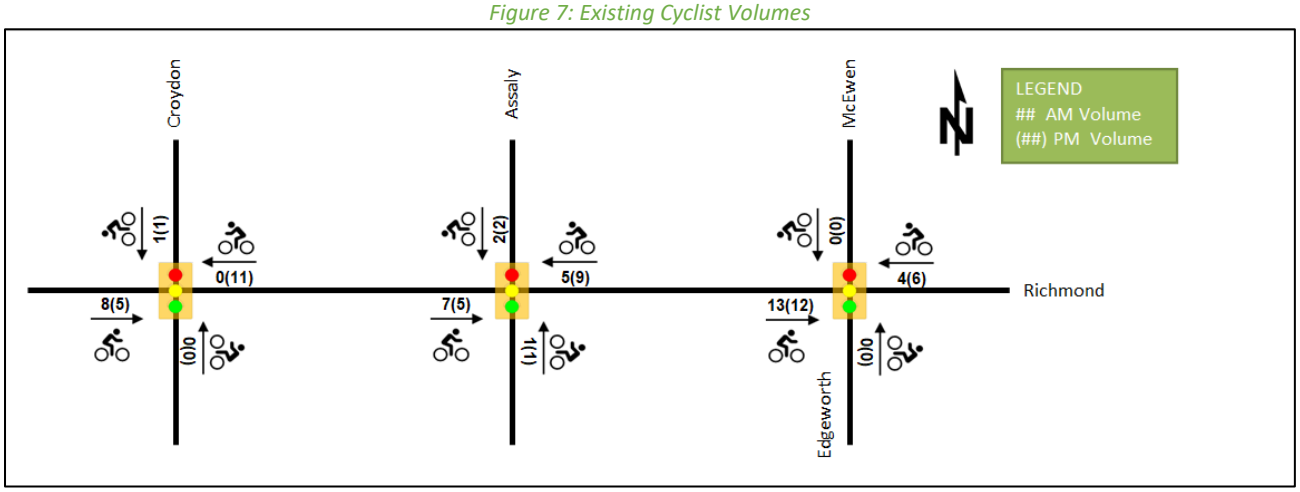


Figure 7: Existing Cyclist Volumes



2.2.5 Existing Transit

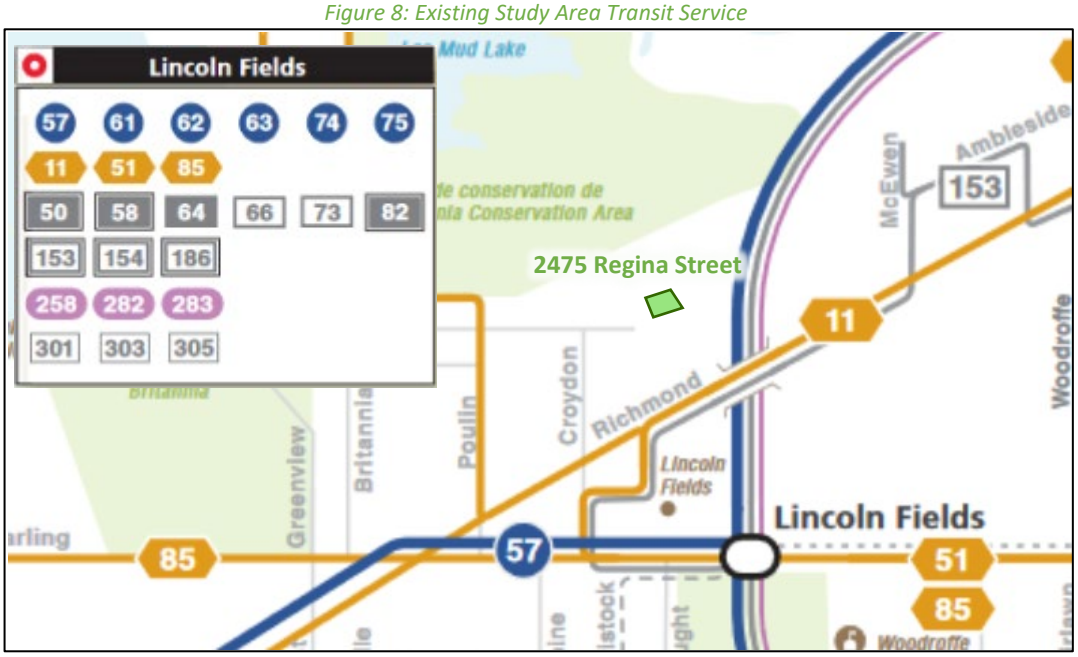
Within the study area, the routes #11, #51, and #153 travel along Richmond Road connect to Lincoln Fields Station. Stops are located at Richmond Road on either side of Starflower Lane (#11, #153), and west of Assaly Road (#11, #51). The frequency of these routes within proximity of the proposed site as of September 2021 are:

- Route # 11 – 15-minute service all day, 20-minute service after 7:00PM
- Route # 51 – 30-minute service after 10:00AM
- Route # 153 – 8-9 buses per day

The site is additionally 400 metres from Lincoln Fields Station, where the routes #11, #50, #51, #57, #58, #61, #62, #63, #64, #66, #73, #74, #75, #82, #85, #153, #154, #186, #258, #282, #283, #301, #303, #305 currently stop. Based upon the existing access to area sidewalks and pathways along the road network, the station is currently an approximately 2.75-kilometre walk from the subject property. Using the roadway of Lincoln Heights Road for approximately 90 metres to connect from the sidewalk on Regina Street to the Ottawa River Pathway connection, however, the site is an approximately 1.1-kilometre walk from Lincoln Fields Station.

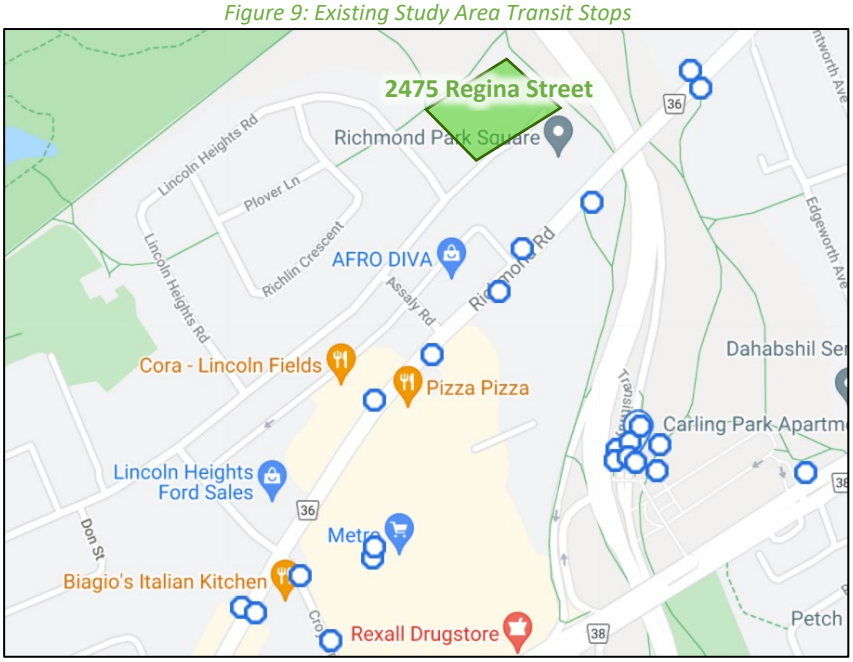
Figure 8 illustrates the transit system map in the study area and Figure 9 illustrates nearby transit stops.

Figure 8: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: September 14, 2021

Figure 9: Existing Study Area Transit Stops



Source: http://www.octranspo.com/ Accessed: July 27, 2021

2.2.6 Existing Area Traffic Management Measures

Primary traffic management measures include framed parking provided at intersection on Richmond Road, on-street parking permitted on local roads throughout the study area. The connection of Edgeworth Avenue to Richmond Road has been closed permanently.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing study area intersections. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Croydon Avenue and Richmond Road	Thursday, August 11, 2016
Assaly Road and Richmond Road	Thursday, August 11, 2016
Richmond Road and Edgeworth Avenue/McEwen Avenue	Thursday, August 25, 2016

Figure 10 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on volume-to-capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Counts

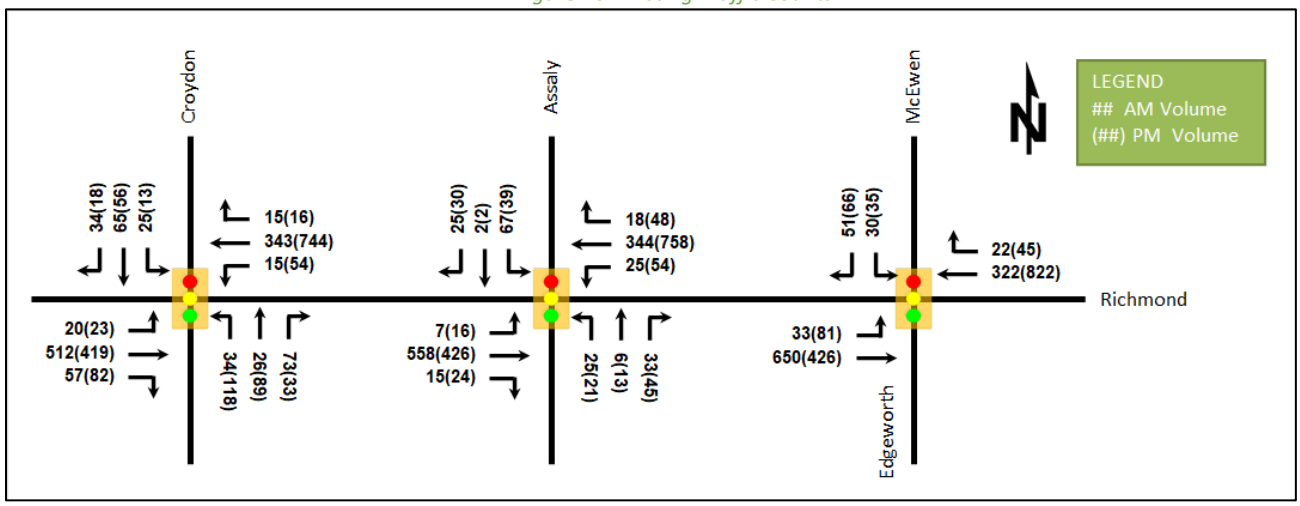


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Croydon Avenue & Richmond Road *Signalized*	EBL	A	0.04	10.6	5.0	A	0.14	11.4	6.3
	EBT/R	B	0.62	17.1	**#124.8**	A	0.56	13.8	83.5
	WBL	A	0.05	9.2	m3.9	A	0.16	9.1	m5.3
	WBT/R	A	0.38	12.6	75.7	D	0.82	15.8	**#183.5**
	NBL	A	0.14	17.4	9.1	A	0.40	28.7	31.9
	NBT/R	A	0.28	19.7	20.3	A	0.33	26.4	31.4
	SB	A	0.32	15.8	21.2	A	0.23	20.5	21.0
	Overall	**A**	**0.56**	**15.7**	-	**B**	**0.69**	**16.8**	-
Assaly Road & Richmond Road *Signalized*	EBL	A	0.01	4.7	m0.5	A	0.07	13.7	m3.4
	EBT/R	A	0.54	9.4	**#138.6**	A	0.41	12.0	74.4
	WBL	A	0.08	4.4	m2.5	A	0.12	2.6	m2.8
	WBT/R	A	0.34	4.3	17.4	C	0.73	11.5	**#226.4**
	NBT/L	A	0.14	21.6	8.0	A	0.16	26.0	11.0
	NBR	A	0.14	21.8	8.3	A	0.19	26.7	13.6
	SB	A	0.38	20.9	15.8	A	0.28	18.5	15.0
	Overall	**A**	**0.53**	**9.3**	-	**B**	**0.65**	**12.5**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
McEwen Avenue / Edgeworth Avenue & Richmond Road *Signalized*	EBL	A	0.07	5.8	m1.7	A	0.40	13.5	7.7
	EBT	B	0.68	15.6	**#148.3**	A	0.40	7.6	28.1
	WBT	A	0.35	10.2	46.5	C	0.77	18.3	**#205.3**
	WBR	A	0.03	5.5	3.7	A	0.05	5.7	6.6
	SBL	A	0.11	23.0	9.6	A	0.16	31.3	13.2
	SBR	A	0.19	8.3	7.8	A	0.27	10.3	10.4
	Overall	**A**	**0.55**	**13.4**	-	**B**	**0.67**	**14.5**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
V/C = volume-to-capacity ratio
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity
Delay = average driver delay

During both the AM and PM peak hours, the study area intersections operate well. Extended queues may be exhibited at all study area intersections on the peak direction mainline arterial movements. No other issues are noted.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study are road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 11 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2015-2019

		Number	%
Total Collisions		**79**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	22	28%
	Property Damage Only	57	72%
	Angle	13	16%
	Rear end	31	39%
	Sideswipe	3	4%
	Turning Movement	12	15%
	SMV Unattended	7	9%
	SMV Other	12	15%
	Other	1	1%
Road Surface Condition	**Dry**	56	71%
	Wet	15	19%
	Loose Snow	1	1%
	Slush	1	1%
	Packed Snow	1	1%
	Ice	5	6%
Pedestrian Involved		8	10%
Cyclists Involved		1	1%

Figure 11: Study Area Collision Records – Representation of 2015-2019

Table 4: Summary of Collision Locations, 2015-2019

	Number	%
Intersections / Segments	**79**	**100%**
Croydon Ave @ Richmond Rd	28	35%
Assaly Rd @ Richmond Rd	8	10%
Regina Lane @ Richmond Rd	1	1%
Croydon Ave @ Regina St	1	1%
Assaly Rd @ Regina St	2	3%
Richmond Rd @ Edgeworth Avenue/ McEwen Ave	7	9%
Richmond Rd btwn Croydon Ave & Assaly Rd	10	13%
Richmond Rd btwn Assaly Rd & Regina Lane	6	8%
Richmond Rd btwn Edgeworth Avenue/ McEwen Ave& Regina Lane	10	13%
Regina St btwn Lincoln Heights Rd & Assaly Rd	4	5%
Regina St btwn Lincoln Heights Rd & End	1	1%
Assaly Rd btwn Regina Lane & Richmond Rd	1	1%

Within the study area, the intersection of Croydon Avenue at Richmond Road is noted to have experienced higher collisions than other locations. Table 5 summarizes the collision types and conditions for the Croydon Avenue at Richmond intersection.

Table 5: Croydon Avenue at Richmond Road Collision Summary

		Number	%
Total Collisions		**28**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	8	29%
	Property Damage Only	20	71%
	Angle	6	21%
	Rear end	11	39%

		Number	%
Total Collisions		**28**	**100%**
	Turning Movement	6	21%
	SMV Other	4	14%
	Other	1	4%
Road Surface Condition	**Dry**	23	82%
	Wet	2	7%
	Loose Snow	1	4%
	Slush	1	4%
	Ice	1	4%
Pedestrian Involved		3	11%
Cyclists Involved		1	4%

The Croydon Avenue at Richmond Road intersection had a total of 28 collisions during the 2015-2019 time period, with 20 involving property damage only and the remaining eight having non-fatal injuries. The collision types are most represented by rear end with 11 collisions, followed by angle and turning movement each with six collisions, four SMV other with the remaining other collisions. Rear end collisions are typical of congested locations, and angle and turning movement collisions may be impacted by the skew of the intersection. Weather conditions do not affect collisions at this location. No mitigation is recommended within the context of this study, although continued improvement along Richmond Road and a protected intersection may improve the collisions rates of the turning movement and angled incidents.

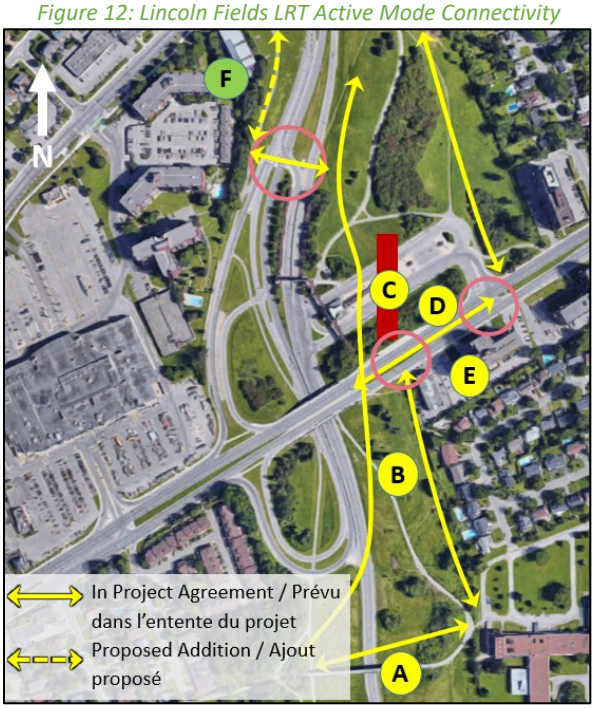
2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

Within the Transportation Master Plan, the Rapid Transit and Transit Priority Network's Affordable Network diagram includes the extension of the LRT line from Tunney's Pasture to both Moodie Drive and Algonquin College, and Lincoln Fields Station is a node on the line.

In support of the new station construction, the station active mode connectivity is being studied as part of the Stage 2 LRT Station Connectivity Enhancement Study. Figure 12 illustrates the planned components for Lincoln Fields Station within the study.

Figure 12: Lincoln Fields LRT Active Mode Connectivity



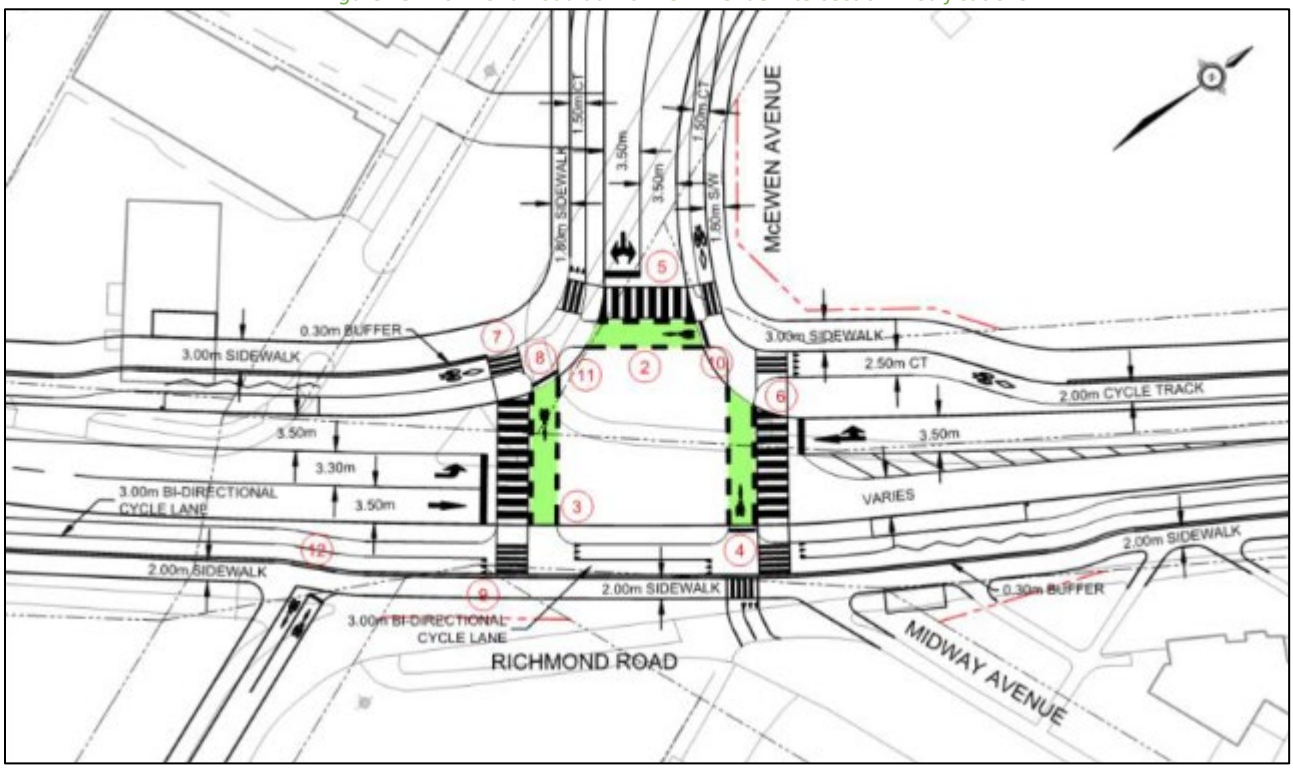
Source: https://ottawa.ca/en/city-hall/public-engagement/projects Accessed: March 30, 2021

Corresponding elements planned for inclusion as listed are:

A. Replace pedestrian bridge
B. New multi-use pathway along east and west side of alignment, from Richmond Road to new pedestrian bridge south of Carling Avenue, including reconstruction of pathway to Rosewood Avenue
C. Station plaza, passenger pick up and drop off and bike parking
D. Cycle tracks on Carling Avenue
E. Signalized crossing including for active modes on Carling Avenue and on Sir John A. Macdonald Parkway
F. Add lighting to NCC pathway to Richmond Road

In addition to the active mode connectivity in the study area, complete streets projects as part of the LRT Extension are planned. Figure 13 illustrates the proposed modifications at the intersection of Richmond Road at McEwen Avenue.

Figure 13: Richmond Road at McEwen Avenue Intersection Modifications



Source: https://ottawa.ca/en/city-hall/public-engagement/projects Accessed: April 12, 2022

2.3.2 Other Study Area Developments

365 Forest Street, 1240 Richmond Road, 2583, 2589 Bond Street

The proposed development application included a site plan for the construction of two 12-storey residential buildings comprising 391 dwelling units. The development is anticipated to be built out in 2024 and to generate 38 AM and 29 PM peak hour two-way auto trips. (EXP, 2021)

2525 Carling Avenue

The proposed development application includes site plan facilitating the demolition of the Lincoln Fields Mall and includes 8,700 sq. ft. of new office space and the retention of a 28,300 sq. ft. supermarket, a 8,1000 sq. ft. pharmacy, a 3,600 sq. ft. fast food restaurant with a drive-through window, and a 3,500 sq. ft. fast food restaurant without a drive-through window. The development concept is anticipated to constitute a reduction in traffic accessing the site and on the surrounding network. (Parsons, 2019)

1071 Ambleside Drive

The proposed development application includes a zoning by-law amendment to permit the construction of a 20-storey, 293-unit apartment building in the location of an existing surface parking lot on site. The development is anticipated to be built out in 2023 and to generate 47 new AM and PM peak hour auto trips in advance of the LRT Station construction transitioning to 18 new AM and PM peak hour auto trips after its construction. (Parsons, 2021)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Richmond Road at Croydon Avenue, Assaly Road, and McEwen Avenue/Edgeworth Avenue and the boundary road will be Regina Street. TRANS screenline SL24 is immediately west of the site and will not be analyzed as part of this study.

3.2 Time Periods

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

3.3 Horizon Years

The anticipated build-out year is 2026. As a result, the full build-out plus five years horizon year is 2031.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required at site plan application
	4.1.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Required at site plan application
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	May be required at site plan application
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Required

5 Development-Generated Travel Demand

5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Bayshore/Cedarview have been summarized in Table 7.

Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Bayshore/Cedarview

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	40%	40%
Auto Passenger	12%	15%
Transit	38%	33%
Cycling	2%	1%
Walking	8%	11%
Total	**100%**	**100%**

The site proposes a pathway connection to the Pinecrest Creek Pathway on the southeast corner of the site, bringing it within 800 metres-walk of the future rapid transit station of Lincoln Fields. Based upon this proximity to transit and being in close proximity to the Pinecrest Creek and Ottawa River Pathways, modified mode share targets are proposed for the development and are summarized in Table 8.

Table 8: Proposed Development Mode Shares

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	30%	30%
Auto Passenger	10%	10%
Transit	50%	50%
Cycling	3%	2%
Walking	7%	8%
Total	**100%**	**100%**

5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings from the TRANS Trip Generation Manual (2020). Table 9 summarizes the person trip rates for the proposed residential land use for each peak period.

Table 9: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Person Trip Rates
Multi-Unit High-Rise	221 & 222 (TRANS)	AM	0.80
		PM	0.90

Using the above person trip rates, the total person trip generation has been estimated. Table 10 summarizes the total person trip generation for the residential land use.

Table 10: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit High-Rise	510	126	282	408	266	193	459

Using the site-specific mode share targets and the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020). Table 11 summarizes the residential trip generation and by mode and peak hour.

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit High-Rise	Auto Driver	**30%**	18	41	59	**30%**	35	26	61
	Auto Passenger	**10%**	6	13	20	**10%**	12	8	20
	Transit	**50%**	35	78	112	**50%**	63	46	108
	Cycling	**3%**	2	5	7	**2%**	2	2	4
	Walking	**7%**	5	12	17	**8%**	11	8	19
	Total	**100%**	**66**	**149**	**215**	**100%**	**123**	**90**	**212**

As shown above, a total of 59 AM and 61 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development, the OD Survey has been reviewed to determine the travel for the residential development, and these patterns were applied based on the build-out of Bayshore/Cedarview. Table 12 below summarizes the distributions.

Table 12: OD Survey Distribution – Bayshore/Cedarview

To/From	% of Trips
North	5%
South	20%
East	45%
West	30%
Total	**100%**

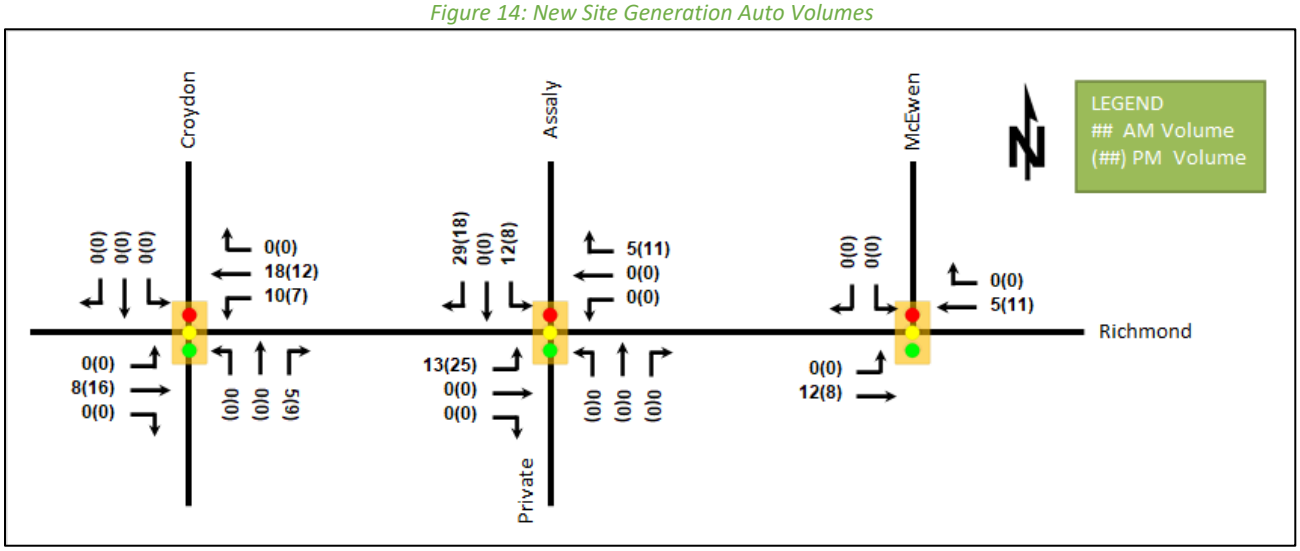
5.4 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Table 13 summarizes the proportional assignment to the study area roadways, and Figure 14 illustrates the new site generated volumes.

Table 13: Trip Assignment

To/From	Via
North	Richmond Rd (E)
South	5% Richmond Rd (E), 15% Richmond Rd (W)
East	20% Richmond Rd (E), 25% Croydon Ave
West	Richmond Rd (W)
Total	**100%**

Figure 14: New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. The intersection modifications at the Richmond Road at McEwen Avenue intersection will be included in the modeled conditions at the build-out horizon.

6.2 Background Growth

A review of the background projections from the City's TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. The TRANS model plots are provided in Appendix E.

The growth rates in the study area derived from the two TRANS model horizons are projected to be negative within the study area. To provide a more conservative analysis, a 1.00% bi-directional annual compound growth rate will be applied to Richmond Road for both peak hours. Table 14 summarizes the growth rates applied within the study area.

Table 14: Applied Study Area Growth Rates

Street	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Richmond Road	1.00%	1.00%	1.00%	1.00%

6.3 Other Developments

The background developments explicitly considered in the background conditions (Section 6.2) include:

- 1071 Ambleside Drive
- 365 Forest Avenue

The background development volumes within the study area have been provided in Appendix F.

7 Demand Rationalization

7.1 2026 Future Background Operations

Figure 15 illustrates the 2026 background volumes and Table 15 summarizes the 2026 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2026 future background horizon are provided in Appendix G.

Figure 15: 2026 Future Background Volumes

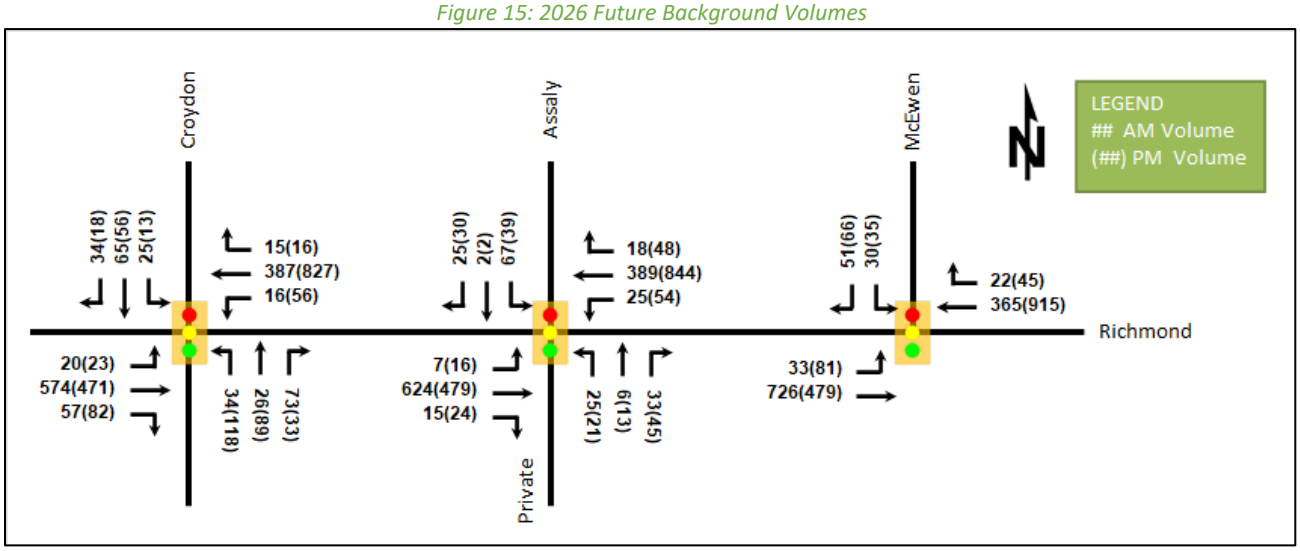


Table 15: 2026 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Croydon Avenue & Richmond Road *Signalized*	EBL	A	0.04	10.6	4.8	A	0.12	11.0	5.6
	EBT/R	B	0.62	17.1	**#124.1**	A	0.55	13.7	82.8
	WBL	A	0.05	9.2	m3.4	A	0.15	8.9	m4.9
	WBT/R	A	0.38	12.9	77.5	D	0.82	15.5	**#183.9**
	NBL	A	0.12	16.9	8.4	A	0.35	27.5	28.8
	NBT/R	A	0.25	19.2	18.5	A	0.29	25.8	28.5
	SB	A	0.29	15.0	19.0	A	0.21	20.1	19.2
	Overall	**A**	**0.54**	**15.6**	-	**B**	**0.68**	**16.4**	-
Assaly Road & Richmond Road *Signalized*	EBL	A	0.01	4.4	m0.5	A	0.06	14.0	m2.9
	EBT/R	A	0.54	9.1	**#138.6**	A	0.41	12.0	74.4
	WBL	A	0.07	4.4	m2.2	A	0.11	2.7	m2.3
	WBT/R	A	0.34	4.2	17.9	C	0.73	11.2	**m#224.4**
	NBT/L	A	0.13	21.6	7.3	A	0.14	25.6	10.2
	NBR	A	0.13	21.6	7.7	A	0.17	26.3	12.6
	SB	A	0.35	20.6	14.5	A	0.25	18.2	13.9
	Overall	**A**	**0.52**	**8.9**	-	**B**	**0.65**	**12.2**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
McEwen Avenue & Richmond Road *Signalized*	EBL	A	0.06	5.5	m1.4	A	0.42	15.0	7.7
	EBT	B	0.69	15.4	**#148.7**	A	0.41	7.3	22.9
	WBT/R	A	0.38	10.4	50.7	D	0.82	20.8	**#224.6**
	SBL/R	A	0.26	13.3	12.6	A	0.36	17.0	17.4
	Overall	**A**	**0.56**	**13.4**	-	**C**	**0.71**	**16.3**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
V/C = volume-to-capacity ratio
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity
Delay = average driver delay

During both the AM and PM peak hours, the study area intersections at the 2026 future background horizon operate well. No new capacity issues are noted. Signal timing may benefit the operations at the intersection of Richmond Road and McEwen Avenue for the new geometry, coordinated through the remainder of the Richmond Road corridor.

7.2 2031 Future Background Operations

Figure 16 illustrates the 2031 background volumes and Table 16 summarizes the 2031 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2031 future background horizon are provided in Appendix H.

Figure 16: 2031 Future Background Volumes

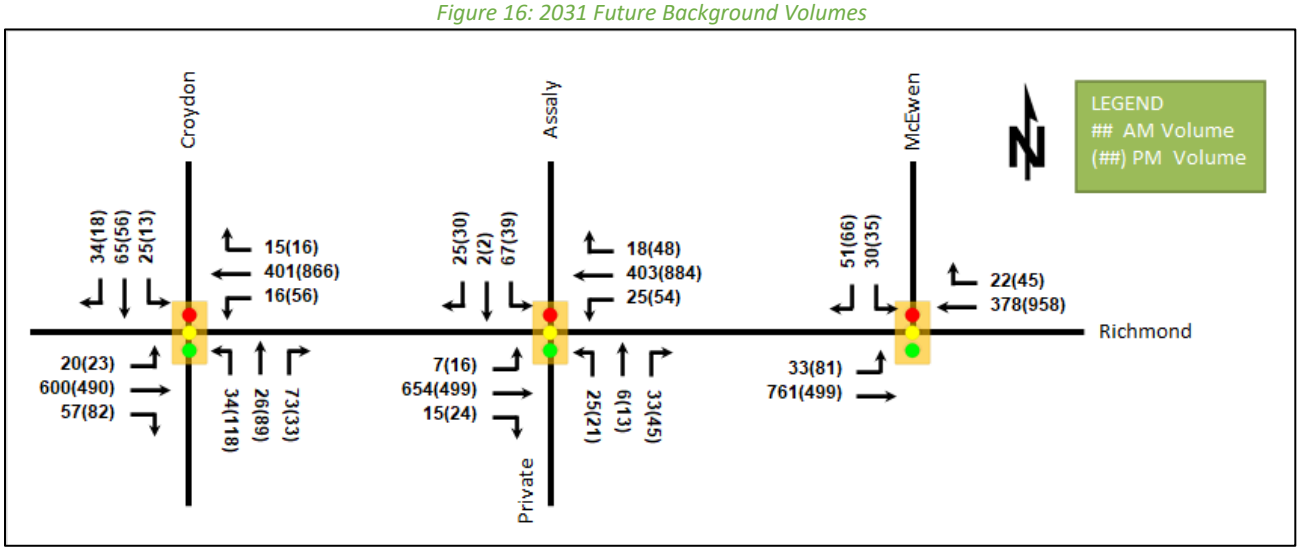


Table 16: 2031 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Croydon Avenue & Richmond Road *Signalized*	EBL	A	0.04	10.6	4.8	A	0.14	11.8	5.9
	EBT/R	B	0.64	17.9	**#132.4**	A	0.57	14.2	86.9
	WBL	A	0.05	9.2	m3.3	A	0.15	8.9	m4.6
	WBT/R	A	0.39	13.1	80.0	D	0.85	17.2	**#197.3**
	NBL	A	0.12	16.9	8.4	A	0.35	27.5	28.8
	NBT/R	A	0.25	19.2	18.5	A	0.29	25.8	28.5
	SB	A	0.29	15.0	19.0	A	0.21	20.1	19.2
	Overall	**A**	**0.56**	**16.0**	-	**B**	**0.70**	**17.3**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Assaly Road & Richmond Road *Signalized*	EBL	A	0.01	4.3	m0.4	A	0.07	14.6	m3.0
	EBT/R	A	0.56	9.5	**#148.7**	A	0.43	12.6	78.2
	WBL	A	0.07	4.4	m2.1	A	0.11	2.7	m2.2
	WBT/R	A	0.36	4.3	18.2	C	0.76	12.1	**m#225.5**
	NBT/L	A	0.13	21.6	7.3	A	0.14	25.6	10.2
	NBR	A	0.13	21.6	7.7	A	0.17	26.3	12.6
	SB	A	0.35	20.6	14.5	A	0.25	18.2	13.9
	Overall	**A**	**0.54**	**9.1**	-	**B**	**0.67**	**12.9**	-
McEwen Avenue & Richmond Road *Signalized*	EBL	A	0.07	5.3	m1.4	A	0.49	21.1	**#20.9**
	EBT	C	0.72	16.4	**#159.9**	A	0.43	7.3	21.7
	WBT/R	A	0.39	10.6	52.6	D	0.86	23.4	**#240.4**
	SBL/R	A	0.26	13.3	12.6	A	0.36	17.0	17.4
	Overall	**A**	**0.59**	**14.1**	-	**C**	**0.74**	**18.1**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
V/C = volume-to-capacity ratio
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity
Delay = average driver delay

During both the AM and PM peak hours, the study area intersections at the 2031 future background horizon operate well and similarly to the 2026 future background conditions.

At the intersection of Richmond Road and McEwen Avenue, the eastbound left-turn movement may exhibit extended queues at this horizon during the PM peak hour. As in the 2026 background conditions, signal timing optimization may be beneficial to the operations at the intersection given the new geometry, coordinated through the remainder of the Richmond Road corridor.

7.3 Modal Share Sensitivity and Demand Rationalization Conclusions

No capacity constraints have been noted at the study area intersections. Further, as this development is targeted for a transit focus and meets the planned context of this area, rationalization for adjusted demand is not required for this TIA.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent a shift from auto modes to transit modes, given the site proximity to Lincoln Fields Station which will include LRT in the future conditions. Overall, the modal shares are likely to be achieved and supporting TDM measures should be provided to encourage this shift.

The subject site is not located within a design priority area, the total bedroom count within the development is subject to the final unit breakdown, and no age restrictions are noted.

8.2 Need and Opportunity

The subject site is forecasted to rely predominantly on transit, and those assumptions have been carried through the analysis. The study area intersections are anticipated to have residual capacity, thus the risks to the network due to not meeting the target mode shares are low. The primary result would be the potential for increased queuing along Richmond Road.

8.3 TDM Program

The "suite of post occupancy TDM measures" has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix I. The key TDM measures recommended include:

- Provide a multi-modal travel option information package to new residents
- Display local area maps with walking/cycling routes and with transit routes at major building entrances
- Contract with providers to install on-site bike-share station (or other micromobility e.g., scootershare)
- Contract with provider to install on-site carshare vehicles and promote their use by residents
- Inclusion of a 1-year Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
- Unbundle parking cost from purchase or rental costs

It should be noted that at the time of this report, scootershare cannot access NCC lands, and therefore may not be appropriate for the subject site as presently offered.

9 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network at Richmond Road via the local roads Regina Street and Assaly Road. The TIA Guidelines state a threshold of 1,000 vehicles per day or 120 vehicles during the peak hour for local roads and is defined by the City as a two-way volume threshold. This volume threshold is equivalent to two cars per minute in both directions total.

On Assaly Road, the two-way volumes are forecasted to be 125 two-way AM and 148 two-way PM peak hour vehicles in the background conditions, and 184 two-way AM and 210 two-way PM peak hour vehicles in the total conditions. The values at both peak hours in both the background and total conditions are above the local road thresholds and is equivalent to 2.5 two-way cars per minute during the background horizons and to 3.5 two-way cars per minute during the total horizons.

The site volumes on Regina Street constitute 49%-52% of the local road thresholds and is expected to be near the thresholds in the total conditions, based on the volumes noted along Assaly Road.

In general, the TIA thresholds are too low for local roads of this nature and may be more applicable as one-way volumes. The City is presently reviewing these thresholds with view to increasing them. The site traffic is not considered to impact the road classification or function of either Regina Street or Assaly Road.

10 Transit

10.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 17 summarizes the transit trip generation.

Table 17: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Transit	50%	35	78	112	63	46	108

The proposed development is anticipated to generate an additional 112 two-way AM and 108 two-way PM peak hour transit trips. Of these trips, 78 outbound AM and 63 inbound PM peak hour trips are anticipated.

Site peak hour transit trips are anticipated to be taken via the LRT at Lincoln Fields Station, either by walking or connecting to the station via route #11 or taken directly via the route #11.

In reviewing the OD survey, increases in transit ridership on the LRT line are anticipated to comprise on the order of 30 AM peak hour riders to the east and eight to the west, and 22 PM peak hour riders from the east and 13 from the west during the PM peak hour.

Increases in ridership on the route #11 are anticipated to comprise on the order of 23 AM peak hour riders to the west and 15 to the east on Richmond Road, and 19 PM peak hour riders from the west and 10 from the east on Richmond Road. Increases in ridership between the Assaly Road and Richmond Road intersection and Lincoln Fields station would not be captured in these ridership figures as they would not add to these totals.

Given the existing bus service, a maximum average of five riders on any one bus in either peak hour it is anticipated. As such, a maximum service increase on the order of the substitution of one higher-capacity bus in the off-peak direction per peak hour (i.e. articulated in place of standard) may be required to service site transit demand.

10.2 Transit Priority

Impacts on transit movements equate to maximum increases in delays of 10.9 seconds on the westbound approach at the intersection of Croydon Avenue Richmond Road and of 9.9 seconds at the intersection of McEwen Avenue at Richmond Road. Delays on all other transit movements within the study area equate to increases of 3.6 seconds or less. No additional transit priority measures are required beyond those being implemented through the OLRT Stage 2 project.

11 Network Concept

Screenline data for TRANS Screenline 24 were requested from the City of Ottawa. Screenline 24 has a capacity of 10,000 vehicles in each direction in the 2011 conditions and 11,600 in the 2031 conditions.

The total traffic crossing Screenline 24 provided by the City is 10,525 eastbound vehicles and 5,368 westbound vehicles during the AM peak hour at the 2011 horizon, and 12,348 eastbound vehicles and 5,554 westbound vehicles during the AM peak hour at the 2031 horizon. Both horizons are over the theoretical screenline capacitates for Richmond Road, Carling Avenue, Highway 417, and Iris Street.

When examining Richmond Road, the existing volume of 683 vehicles is noted as being over the theoretical screenline capacity of 600 vehicles, and the study area intersections operate with a maximum level of service B on the eastbound approaches during the AM peak hour. Therefore, Richmond Road has a greater capacity than the theoretical value, and residual capacity throughout the study area.

Site-generated traffic crossing Screenline 24 constitutes 22 eastbound vehicles during the AM peak hour (comprising 0.2% of existing screenline capacity) and 10 westbound vehicles during the AM peak hour (comprising 0.1% of existing screenline capacity in the westbound direction). Consequently, negligible impacts to Screenline 24 are anticipated as a result of site-generated traffic which can be accommodated by the residual capacity on the single screenline element of Richmond Road.

12 Network Intersection Design

12.1 Network Intersection Control

No change to the existing signalized control is recommended for the network intersections.

12.2 Network Intersection Design

12.2.1 2026 Future Total Network Intersection Operations

Figure 17 illustrates the 2026 future total volumes and the network intersection operations are summarized below in Table 18. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix J.

Figure 17: 2026 Future Total Volumes

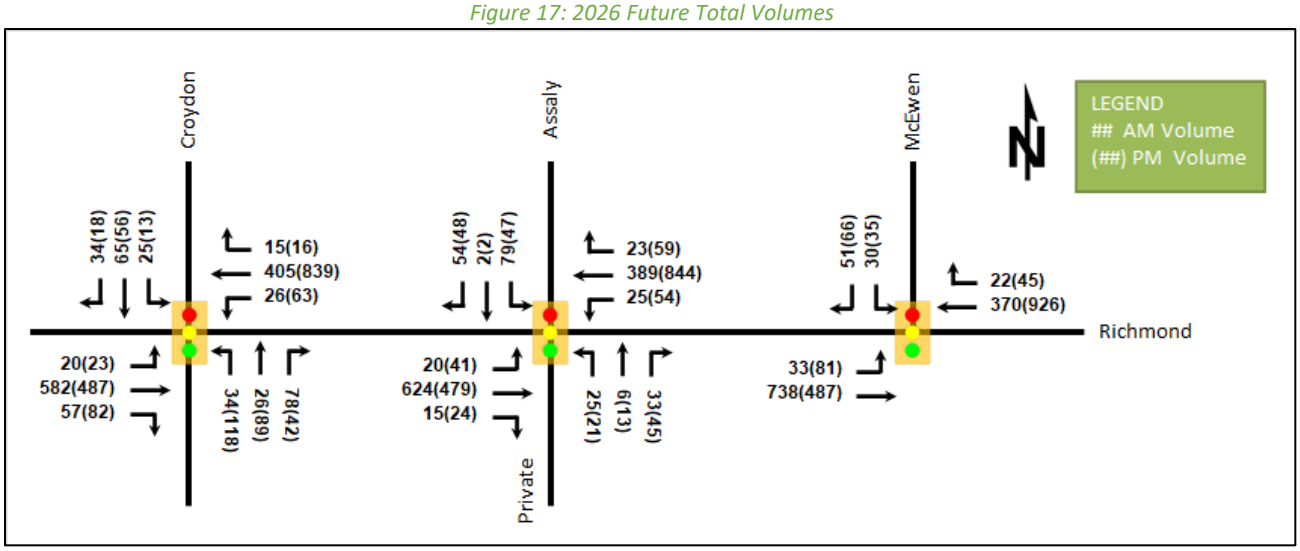


Table 18: 2026 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Croydon Avenue & Richmond Road *Signalized*	EBL	A	0.04	10.7	4.8	A	0.13	11.2	5.7
	EBT/R	B	0.62	17.3	**#126.8**	A	0.57	14.1	86.4
	WBL	A	0.08	9.0	m5.7	A	0.17	11.3	m8.2
	WBT/R	A	0.40	12.2	77.3	D	0.83	27.9	**#202.3**
	NBL	A	0.12	16.9	8.4	A	0.35	27.5	28.8
	NBT/R	A	0.27	19.4	19.3	A	0.32	26.3	30.5
	SB	A	0.29	15.1	19.0	A	0.21	20.1	19.2
	Overall	**A**	**0.55**	**15.4**	-	**B**	**0.68**	**22.4**	-
Assaly Road & Richmond Road *Signalized*	EBL	A	0.04	5.5	m1.1	A	0.20	8.3	m5.7
	EBT/R	A	0.58	11.9	**#138.5**	A	0.44	8.2	96.8
	WBL	A	0.08	5.4	m2.0	A	0.12	3.2	m2.2
	WBT/R	A	0.37	5.2	17.8	C	0.79	14.3	**m#216.4**
	NBT/L	A	0.10	17.6	7.3	A	0.12	22.7	10.2
	NBR	A	0.11	17.6	7.7	A	0.15	23.3	12.6
	SB	A	0.39	15.1	17.7	A	0.29	14.8	16.5
	Overall	**A**	**0.54**	**10.2**	-	**B**	**0.67**	**12.4**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
McEwen Avenue & Richmond Road *Signalized*	EBL	A	0.06	4.4	m1.4	A	0.49	21.8	**#15.1**
	EBT	B	0.70	13.7	**#152.4**	A	0.43	7.4	28.0
	WBT/R	A	0.38	10.5	51.5	D	0.85	23.7	**#228.8**
	SBL/R	A	0.26	13.3	12.6	A	0.34	16.0	17.4
	Overall	**A**	**0.57**	**12.4**	-	**C**	**0.72**	**18.3**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
V/C = volume-to-capacity ratio
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity
Delay = average driver delay

The network intersection operations for the 2026 future total horizon operate similarly to the 2026 future background conditions. At the intersection of McEwen Avenue at Richmond Road, the eastbound left movement may exhibit extended queues at this horizon. No new capacity issues are noted.

12.2.2 2031 Future Total Network Intersection Operations

Figure 18 illustrates the 2031 future total volumes and the network intersection operations are summarized below in Table 19. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix K.

Figure 18: 2031 Future Total Volumes

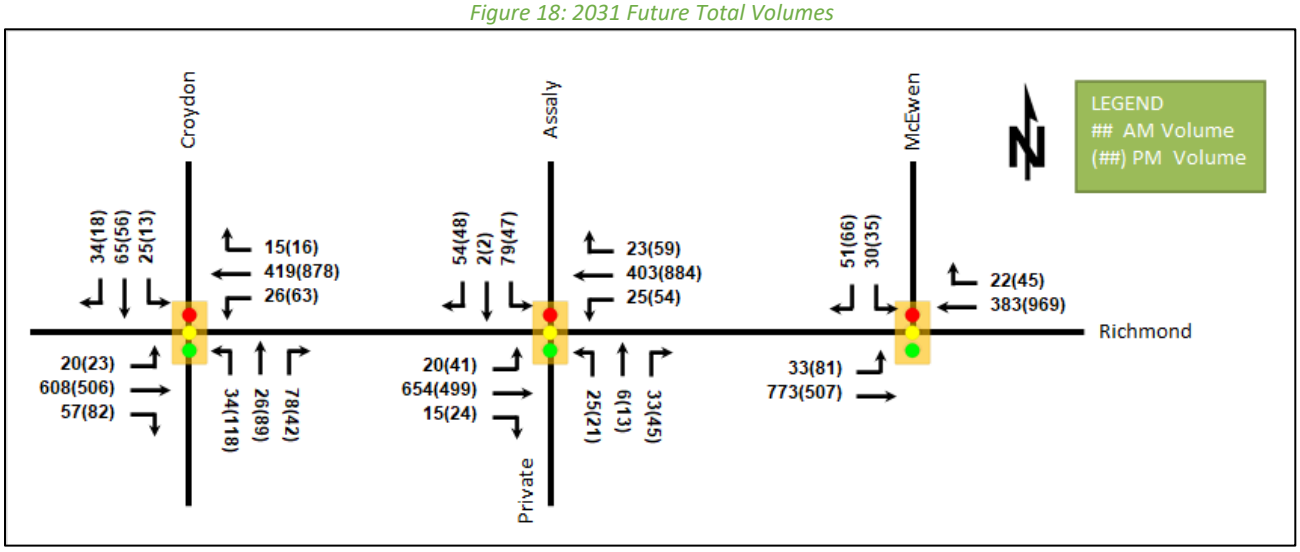


Table 19: 2031 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Croydon Avenue & Richmond Road *Signalized*	EBL	A	0.04	10.7	4.8	A	0.15	12.0	6.0
	EBT/R	B	0.65	18.2	**#135.0**	A	0.59	14.5	91.0
	WBL	A	0.08	9.1	m5.5	A	0.18	11.6	m8.0
	WBT/R	A	0.41	12.4	79.9	D	0.87	29.9	**m#216.9**
	NBL	A	0.12	16.9	8.4	A	0.35	27.5	28.8
	NBT/R	A	0.27	19.4	19.3	A	0.32	26.3	30.5
	SB	A	0.29	15.1	19.0	A	0.21	20.1	19.2
	Overall	**A**	**0.57**	**15.9**	-	**C**	**0.71**	**23.5**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Assaly Road & Richmond Road *Signalized*	EBL	A	0.04	5.3	m1.0	A	0.23	9.5	m5.8
	EBT/R	A	0.60	12.5	**#148.5**	A	0.46	8.4	102.3
	WBL	A	0.08	5.4	m2.0	A	0.12	3.1	m2.1
	WBT/R	A	0.39	5.3	18.2	D	0.82	15.4	**m#217.4**
	NBT/L	A	0.10	17.6	7.3	A	0.12	22.7	10.2
	NBR	A	0.11	17.6	7.7	A	0.15	23.3	12.6
	SB	A	0.39	15.1	17.7	A	0.29	14.8	16.5
	Overall	**A**	**0.56**	**10.5**	**-**	**B**	**0.70**	**13.1**	**-**
McEwen Avenue & Richmond Road *Signalized*	EBL	A	0.07	4.3	m1.4	A	0.59	32.6	**#21.3**
	EBT	C	0.73	14.9	**#163.8**	A	0.45	7.4	27.7
	WBT/R	A	0.40	10.6	53.6	D	0.89	27.0	**#244.6**
	SBL/R	A	0.26	13.3	12.6	A	0.34	16.0	17.4
	Overall	**A**	**0.60**	**13.2**	**-**	**C**	**0.75**	**20.8**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00
V/C = volume-to-capacity ratio
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity
Delay = average driver delay

The network intersection operations for the 2031 future total horizon operate similarly to the 2031 future background conditions. No new capacity issues are noted.

12.3 Richmond Road Queueing and Blocking Analysis

The City requested that a queueing and blocking analysis be conducted for Richmond Road for both peak hours to assess the impacts to side street turning movements. Per their request, SimTraffic was used for the analysis, using a 30-minute seeding time and a 30-minute recording time. Table 20, Table 21, and Table 22 summarize the queueing and blocking analysis results for the existing, 2031 future background, and 2031 future total horizons, respectively. The SimTraffic worksheets are provided in Appendix L.

Table 20: Existing Conditions Queuing Analysis

Intersection	Lane	Link/Storage Distance	AM Peak Hour			PM Peak Hour		
			Q (95th)	Upst Blk	Strg Blk	Q (95th)	Upst Blk	Strg Blk
Croydon Avenue & Richmond Road *Signalized*	EBL	45.0	18.9	-	-	11.4	-	-
	EBT/R	565.6	86.5	-	10%	65.4	-	3%
	WBL	40.0	9.7	-	-	27.8	-	-
	WBT/R	304.9	57.2	-	3%	86.9	-	16%
	NBL	30.0	17.3	-	0%	30.0	-	2%
	NBT/R	230.4	21.4	-	0%	18.7	-	0%
	SB	162.1	24.4	-	-	22.5	-	-
Assaly Road & Richmond Road *Signalized*	EBL	215.0	5.9	-	-	12.2	-	-
	EBT/R	304.9	48.1	-	-	68.2	-	-
	WBL	45.0	14.4	-	-	24.7	-	-
	WBT/R	483.0	37.6	-	1%	83.0	-	4%
	NBT/L	138.4	15.7	-	0%	21.9	-	2%
	NBR	20.0	20.3	-	2%	26.5	-	4%
	SB	93.4	23.3	-	-	26.4	-	-

Intersection	Lane	Link/Storage Distance	AM Peak Hour			PM Peak Hour		
			Q (95th)	Upst Blk	Strg Blk	Q (95th)	Upst Blk	Strg Blk
McEwen Avenue & Richmond Road *Signalized*	EBL	50.0	14.4	-	-	45.4	-	6%
	EBT	479.6	49.0	-	1%	58.5	-	0%
	WBT	381.9	38.6	-	17%	135.2	-	29%
	WBR	10.0	10.1	-	1%	21.8	-	1%
	SBL	245.9	11.6	-	-	10.3	-	-
	SBR	40.0	6.4	-	-	10.4	-	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 0.90
Queue is measured in metres
Link or auxiliary storage distances are measured in metres
Upstream blocking time represents proportion of peak hour
Storage blocking time represents proportion of peak hour

As shown above, extended queuing is noted on the through movements of Richmond Road in the peak direction during each peak hour and particularly during the PM peak hour. The queuing will not extend to adjacent intersections and possible auxiliary lane blockage is noted at the intersections of Croydon Avenue at Richmond Road and McEwen Avenue at Richmond Road.

Table 21: 2031 Future Background Queuing Analysis

Intersection	Lane	Link/Storage Distance	AM Peak Hour			PM Peak Hour		
			Q (95th)	Upst Blk	Strg Blk	Q (95th)	Upst Blk	Strg Blk
Croydon Avenue & Richmond Road *Signalized*	EBL	45.0	11.7	-	-	20.2	-	-
	EBT/R	565.6	102.3	-	13%	89.8	-	10%
	WBL	40.0	13.6	-	-	57.3	-	-
	WBT/R	304.9	54.5	-	3%	165.7	-	37%
	NBL	30.0	14.4	-	-	31.5	-	-
	NBT/R	230.4	20.5	-	0%	28.2	-	2%
	SB	162.1	27.0	-	-	26.5	-	1%
Assaly Road & Richmond Road *Signalized*	EBL	215.0	4.2	-	-	11.9	-	-
	EBT/R	304.9	58.0	-	-	203.5	2%	6%
	WBL	45.0	16.6	-	-	44.1	-	-
	WBT/R	483.0	32.0	-	0%	299.5	-	21%
	NBT/L	138.4	13.1	-	0%	26.9	-	5%
	NBR	20.0	21.8	-	3%	22.9	-	3%
	SB	93.4	28.8	-	-	33.9	-	-
McEwen Avenue & Richmond Road *Signalized*	EBL	50.0	12.5	-	-	78.7	-	-
	EBT	483.0	60.7	-	1%	592.6	14%	5%
	WBT/R	384.3	42.8	-	-	265.4	-	-
	SBL/R	249.9	18.2	-	-	26.5	-	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
Link or auxiliary storage distances are measured in metres
Upstream blocking time represents proportion of peak hour
Storage blocking time represents proportion of peak hour

For the 2031 future background conditions, queueing along Richmond Road is forecast to increase during the PM peak hour. Due to a combination of an increase in background volumes and proposed geometric changes, the eastbound queueing at the intersection of McEwen Avenue and Richmond Road is forecast to increase. As discussed in the context of the operational analyses, adjustments to the new signal timing for the proposed geometry may mitigate the forecasted conditions at this intersection. These adjustments may include increasing the cycle length at the intersection. These changes are subject to the City's Signal Operations group reviewing/monitoring the intersection and implementing as required.

Queueing on the eastbound approach at this intersection may cause upstream blocking for 14% of the peak hour, approximately equating to eight and a half minutes or six cycles per PM peak hour where queues may extend towards the west and the intersection of Assaly Road and Richmond Road.

Table 22: 2031 Future Total Queuing Analysis

Intersection	Lane	Link/Storage Distance	AM Peak Hour			PM Peak Hour		
			Q (95th)	Upst Blk	Strg Blk	Q (95th)	Upst Blk	Strg Blk
Croydon Avenue & Richmond Road *Signalized*	EBL	45.0	18.7	-	-	30.0	-	-
	EBT/R	565.6	104.0	-	17%	289.4	1%	16%
	WBL	40.0	12.4	-	-	51.7	-	-
	WBT/R	304.9	59.1	-	3%	236.0	-	27%
	NBL	30.0	14.4	-	-	34.3	-	-
	NBT/R	230.4	16.4	-	0%	39.8	-	3%
	SB	162.1	24.2	-	-	23.6	-	2%
Assaly Road & Richmond Road *Signalized*	EBL	215.0	9.7	-	-	136.2	-	-
	EBT/R	304.9	62.0	-	-	241.6	7%	13%
	WBL	45.0	16.7	-	-	58.4	-	-
	WBT/R	483.0	47.6	-	1%	480.1	0%	35%
	NBT/L	138.4	17.2	-	1%	22.3	-	2%
	NBR	20.0	18.2	-	1%	22.3	-	3%
	SB	93.4	38.2	-	-	28.8	-	-
McEwen Avenue & Richmond Road *Signalized*	EBL	50.0	12.2	-	-	82.5	-	-
	EBT	483.0	60.3	-	1%	529.9	10%	4%
	WBT/R	384.3	55.0	-	-	434.5	-	-
	SBL/R	249.9	15.2	-	-	24.7	-	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
Link or auxiliary storage distances are measured in metres
Upstream blocking time represents proportion of peak hour
Storage blocking time represents proportion of peak hour

Examining the queueing on Richmond Road, negligible changes are noted during the AM peak hour from the 2031 background conditions.

During the PM peak hour, a substantial increase in the queueing is noted in the eastbound direction on Richmond Road, which is a result of the through lane being blocked by left-turning vehicles in queue on the eastbound approach of the intersection of McEwen Avenue at Richmond Road. The proposed site traffic is not contributing additional volumes to the eastbound left-turn, but is contributing 11 conflicting vehicles on the westbound through movement. A potential solution the City can investigate is lengthening the storage length of the eastbound left-turn lane at the McEwen Avenue at Richmond Road intersection as part of the OLRT works to mitigate this condition. Overall, if the intersection and storage configuration is sensitive to this low volume increase, which is commensurate with a typical fluctuation in daily traffic volumes, the City may want to review the signal timing and geometric elements for intersection re-design.

For the intersection of Assaly Road and Richmond Road, no specific issues are noted for the eastbound left, westbound right, and southbound movements beyond the general condition of through movement queueing in the peak directions during each peak hour.

12.3.1 Network Intersection MMLOS

Table 20 summarizes the MMLOS analysis for the network intersections of Croydon Avenue at Richmond Road, Assaly Road at Richmond Road, and Richmond Road at Edgeworth Avenue/McEwen Avenue. The intersection analysis is based on the policy area of “Within 600m of a rapid transit station.” The MMLOS worksheets has been provided in Appendix M.

Table 23: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Croydon Avenue & Richmond Road	**E**	A	**F**	A	E	E	-	-	C	E
Assaly Road & Richmond Road	**E**	A	**F**	A	D	E	-	-	B	E
McEwen Avenue & Richmond Road	**D**	A	A	A	E	E	-	-	C	E

The MMLOS targets will not be met for the pedestrian LOS at all network intersections and bicycle LOS at the intersections of Croydon Avenue at Richmond Road and Assaly Road at Richmond Road.

Pedestrian LOS is limited by both crossing distances and effective walk times. Effective walk time targets of LOS A cannot typically be met at arterial roads, as with pedestrian exposure to traffic targets, as crossing distances of no more than two-lane widths would be required. No mitigation is recommended beyond the City undertaking a corridor study of Richmond Road to determine the requirements and opportunities to achieve the desired balance of MMLOS priorities.

Bicycle LOS is governed by the left-turn conditions on the westbound approaches of Richmond Road and limited by the left-turn conditions on the southbound approach on Croydon Avenue and the right-turn condition on the private northbound approach at the intersection. To meet targets, two-stage left-turn lanes would be required on all approaches, and separated facilities would be required on the private northbound approach at the intersection of Assaly Road and Richmond Road. In conjunction with the pedestrian LOS limitations, it is recommended that the City further study the Richmond Road corridor to determine opportunities to achieve the desired balance of MMLOS priorities.

12.3.2 Recommended Design Elements

No study area intersection design elements are proposed as part of this study.

13 Summary of Improvements Indicated and Modifications Options

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

Proposed Site and Screening

- The proposed development concept includes 510 residential dwelling units across one 25-storey, one 19-storey tower, and one seven-storey residential tower with the on-site relocation of an existing care facility at ground level
- Accesses will be provided from the existing terminal extension of Regina Street
- The development is proposed to be completed as two phases by 2026
- The Trip Generation Trigger was met for the TIA Screening
- This report is supporting a zoning by-law amendment and Official Plan amendment

Existing Conditions

- Richmond Road is an arterial road in the study area
- Sidewalks are provided on both sides of Richmond Road, Croydon Avenue, McEwen Avenue and Regina Street west of Assaly Road, and on one side of Regina Street east of Assaly Road

- A curbside bike lane is on the north side of Richmond Road which is a cross-town bikeway and spine route, and a cycle track is on the south side west of Starflower Lane, and pathways are located north and east of the site and Pinecrest Creek Pathway south of Richmond Road is a cross-town bikeway
- Higher instances of collisions were noted at the Croydon Avenue at Richmond Road intersection than other locations within the study area and these were found to be largely rear end collisions which are lower speed and typical of congested conditions
- The route #11 services Richmond Road and Lincoln Fields Station, and Lincoln Field Station is approximately 1.1 kilometres walking distance from the site with existing pedestrian connections
- Queueing is noted in the peak directions on Richmond Road during both peak hours, but generally the study area intersections operate well

Development Generated Travel Demand

- The proposed development is forecasted produce 215 two-way people trips during the AM peak hour and 212 two-way people trips during the PM peak hour
- Of the forecasted people trips, 59 two-way trips will be vehicle trips during the AM peak hour and 61 two-way trips will be vehicle trips during the PM peak hour based on a 30% auto modal share target
- Of the forecasted trips, 5% are anticipated to travel north, 20% to travel south, 45% to travel east, and 30% to travel west

Background Conditions

- The background developments were explicitly included in the background conditions, along with a total background growth of 1.0% per annum along the mainline volumes on Richmond Road
- The study area intersections at both future background horizons will operate similar to the existing conditions

TDM

- Supportive TDM measures to be included within the proposed development should include:
    - Provide a multi-modal travel option information package to new residents
    - Display local area maps with walking/cycling routes and with transit routes at major building entrances
    - Contract with providers to install on-site bike-share station (or other micromobility e.g., scootershare*)
    - Contract with provider to install on-site carshare vehicles and promote their use by residents
    - Inclusion of a 1-year Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
    - Unbundle parking cost from purchase or rental costs
- Scootershare ultimately may not be appropriate for the if service function at build out is as at present

NTM

- Assaly Road is over local road NTM thresholds and will continue to be with the addition of site traffic, and site traffic constitutes 45%-52% of the local road classification thresholds on Regina Street
- The TIA NTM thresholds are typically considered low and are presently being revised, and site traffic is not considered to impact the road classification or function

Transit

- The development is forecasted to generate 112 two-way AM and 108 two-way PM peak hour transit trips of which 78 outbound AM and 63 inbound PM peak hour trips are anticipated
- To meet forecasted transit use, a maximum service increase of the substitution of one higher capacity bus in the off-peak direction on the route #11 is anticipated during each peak hour
- No transit priority is located within the study area, and the maximum increase in delay on any study area transit movement is 10.9 seconds

Network Concept

- Screenline 24 in proximity to the site is forecasted to be slightly over the theoretical capacity
- The screenline element of Richmond Road has residual capacity over its theoretical value
- The site is anticipated to have negligible impacts on the screenline, where a maximum of 24 site-generated vehicles, comprising 0.2% of the screenline capacity, are forecasted to cross in the AM peak hour and these volumes can be accommodated by the residual capacity of Richmond Road

Network Intersection Design

- Generally, the network intersections will operate similarly to the background conditions with an increase in v/c noted for the westbound through/right movement at the intersection of Croydon Avenue at Richmond Road and on the eastbound left movement at the intersection of McEwen Avenue at Richmond Road forecasted with the addition of site traffic
- impacts from site traffic to the study area intersections are negligible during the AM peak hour, the storage length at the signal timing and geometric design of the intersection of McEwen Avenue at Richmond Road should be reviewed for sensitivity, and no issues for site access are noted from the analysis
- The MMLOS targets will not be met for the pedestrian LOS at all study area intersection and bicycle LOS at the intersections of Croydon Avenue at Richmond Road and Assaly Road at Richmond Road
- Improved cycling facilities, including left-turn configurations out of mixed flow could meet the LOS targets but due to the nature of arterials roadways, the pedestrian and transit LOS cannot be met
- It is recommended that the City study the corridor of Richmond Road to identify their ultimate objectives and manage the trade-offs to achieve the desired balance of MMLOS priorities.

14 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

Prepared By:

John Kingsley, EIT
Transportation Engineering-Intern

Reviewed By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Ottawa ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 14-Sep-21
Project Number: 2021-057
Project Reference: Parkway Home

1.1 Description of Proposed Development	
Municipal Address	2475 Regina Street
Description of Location	End of Regina St, north of Richmond, west of SJAM Pkwy
Land Use Classification	Parks and Open Space (O1)
Development Size	2 High Rises, 17 Townhouses - 525 Dwelling Units
Accesses	One existing via Regina St
Phase of Development	Two
Buildout Year	2026
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	525	Units
Trip Generation Trigger	Yes	

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

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

TIA Plan Reports

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

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

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

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering √ or transportation planning □.

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

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

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at ___Ottawa_____ this __20__ day of _____September_____, 2018.
(City)

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

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

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

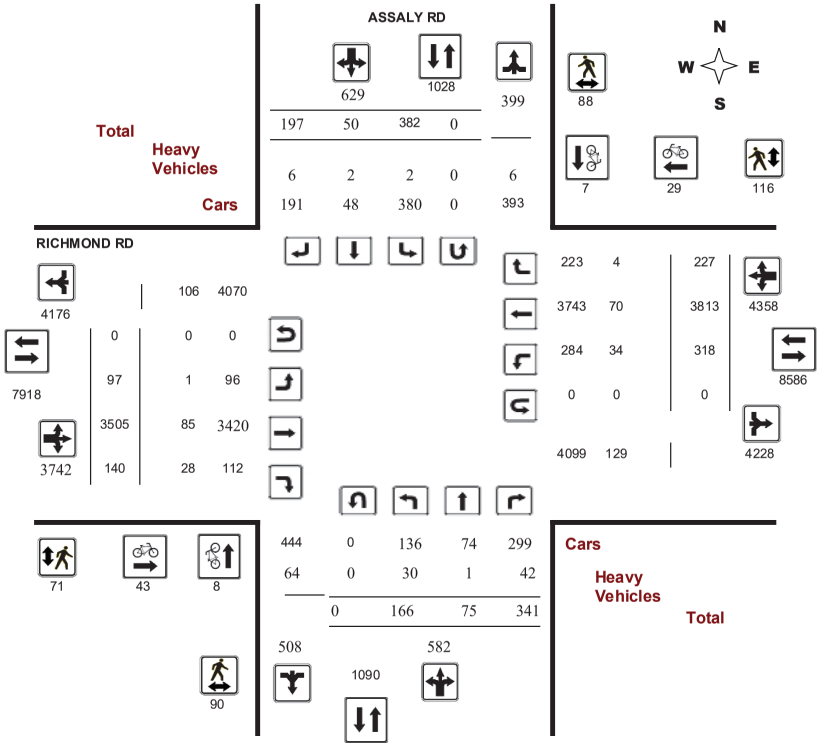
Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Diagram



Transportation Services - Traffic Services

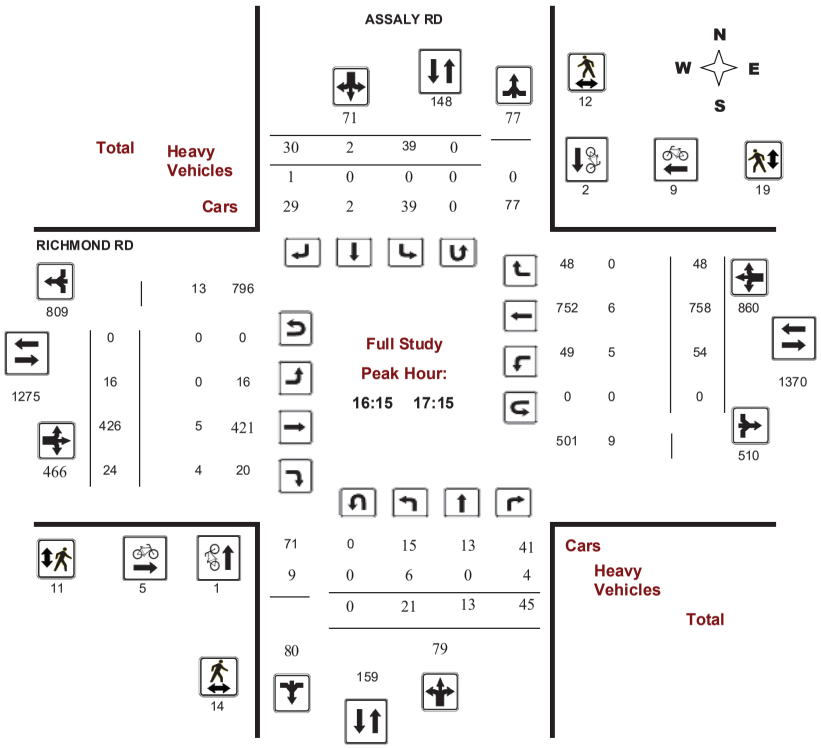
Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Peak Hour Diagram



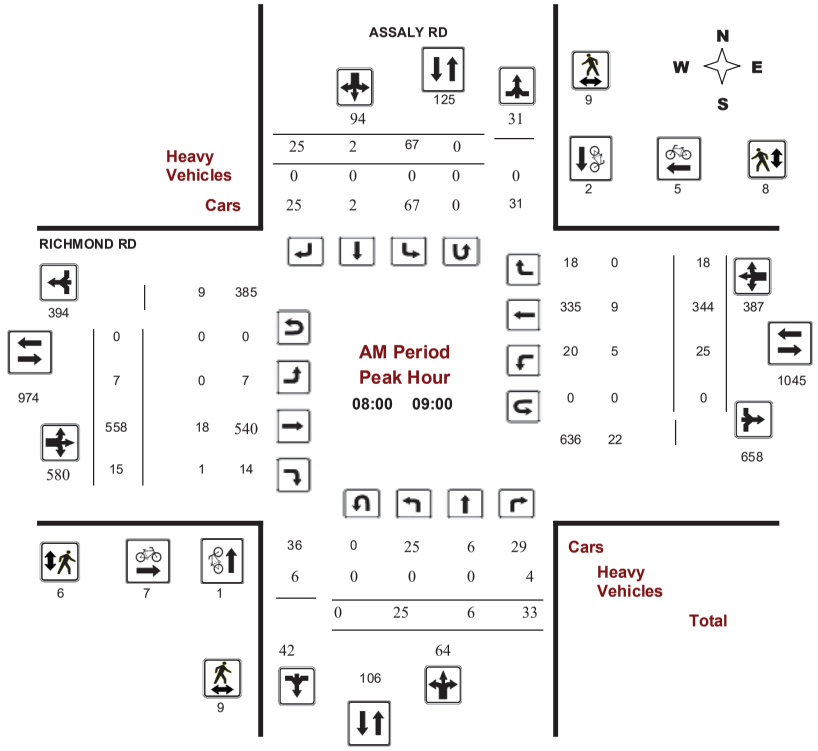
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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



Comments

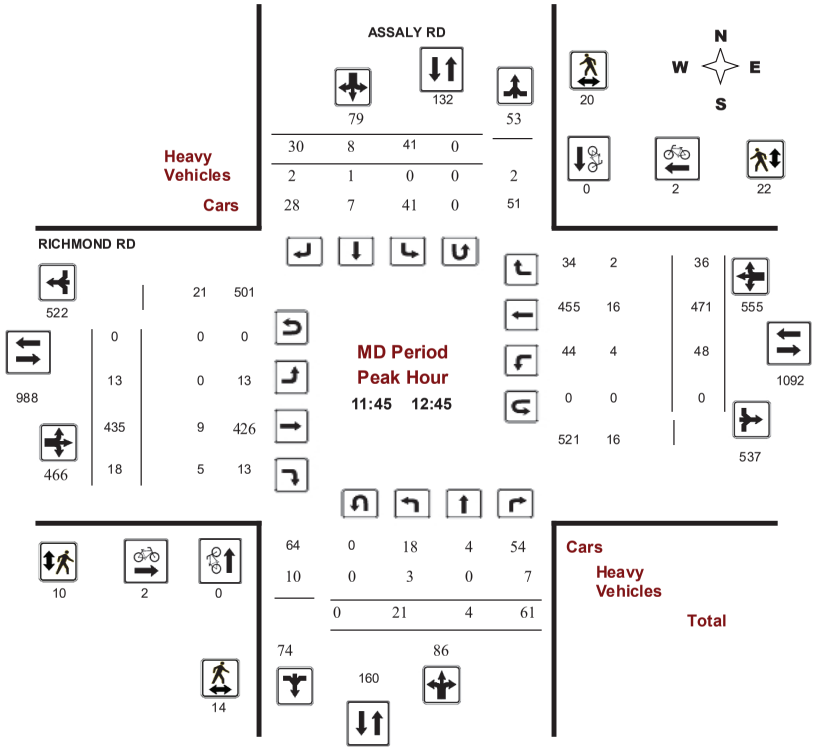
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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



Comments

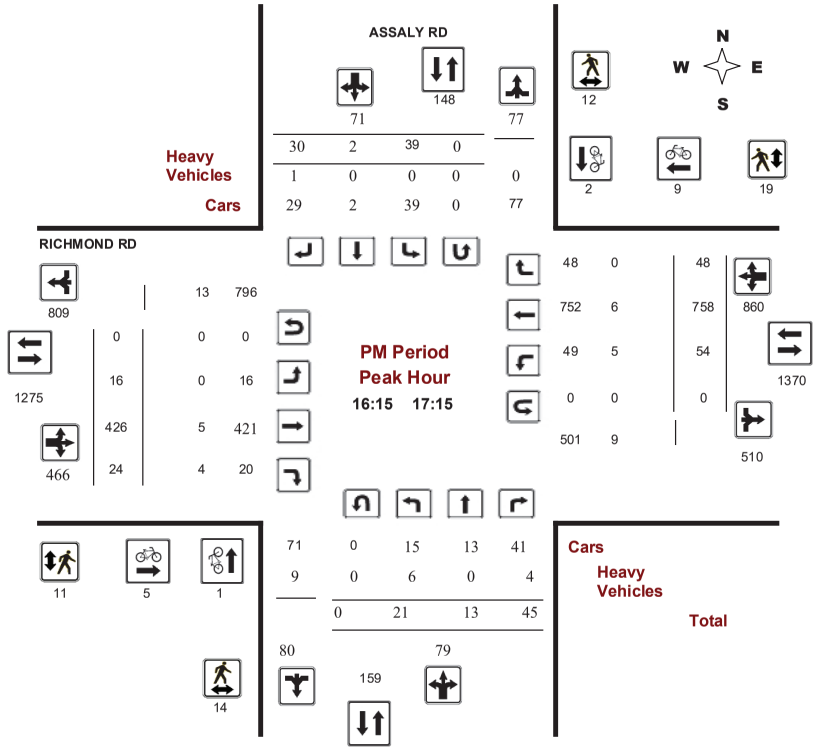
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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



Transportation Services - Traffic Services

Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Summary (8 HR Standard)

Survey Date: Thursday, August 11, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

	ASSALY RD								RICHMOND 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	16	4	29	**49**	56	3	17	**76**	**125**	2	461	6	**469**	17	232	5	**254**	**723**	**848**
08:00 09:00	25	6	33	**64**	67	2	25	**94**	**158**	7	558	15	**580**	25	344	18	**387**	**967**	**1125**
09:00 10:00	23	9	28	**60**	67	4	26	**97**	**157**	14	377	14	**405**	32	342	14	**388**	**793**	**950**
11:30 12:30	23	5	56	**84**	42	10	32	**84**	**168**	11	433	15	**459**	48	453	33	**534**	**993**	**1161**
12:30 13:30	21	5	52	**78**	32	9	28	**69**	**147**	14	438	20	**472**	43	423	33	**499**	**971**	**1118**
15:00 16:00	18	17	50	**85**	42	9	25	**76**	**161**	9	409	24	**442**	57	631	40	**728**	**1170**	**1331**
16:00 17:00	25	11	47	**83**	42	0	24	**66**	**149**	19	420	18	**457**	55	727	44	**826**	**1283**	**1432**
17:00 18:00	15	18	46	**79**	34	13	20	**67**	**146**	21	409	28	**458**	41	661	40	**742**	**1200**	**1346**
Sub Total	166	75	341	**582**	382	50	197	**629**	**1211**	97	3505	140	**3742**	318	3813	227	**4358**	**8100**	**9311**
U Turns	0			**0**	0			**0**	**0**	**0**			**0**	0			**0**	**0**	**0**
Total	166	75	341	**582**	382	50	197	**629**	**1211**	97	3505	140	**3742**	318	3813	227	**4358**	**8100**	**9311**
EQ 12Hr	231	104	474	**809**	531	70	274	**875**	**1684**	135	4872	195	**5202**	442	5300	316	**6058**	**11260**	**12944**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	208	94	427	**729**	478	63	247	**788**	**1517**	122	4385	176	**4683**	398	4770	284	**5452**	**10135**	**11652**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**.90**					
AVG 24Hr	272	123	559	**954**	626	83	324	**1033**	**1987**	160	5744	231	**6135**	521	6249	372	**7142**	**13277**	**15264**
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

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study 15 Minute Increments

		ASSALY RD									RICHMOND 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	4	2	2	8	9	0	1	10	**18**	0	79	0	79	5	54	1	60	**139**	**157**
07:15	07:30	6	0	9	15	12	0	2	14	**29**	0	108	2	110	3	42	1	46	**156**	**185**
07:30	07:45	5	1	9	15	17	1	6	24	**39**	1	142	4	147	6	61	2	69	**216**	**255**
07:45	08:00	1	1	9	11	18	2	8	28	**39**	1	132	0	133	3	75	1	79	**212**	**251**
08:00	08:15	5	2	8	15	15	0	6	21	**36**	0	139	3	142	9	81	8	98	**240**	**276**
08:15	08:30	7	1	10	18	14	1	8	23	**41**	4	140	3	147	6	90	4	100	**247**	**288**
08:30	08:45	6	1	9	16	26	1	7	34	**50**	1	152	2	155	3	87	2	92	**247**	**297**
08:45	09:00	7	2	6	15	12	0	4	16	**31**	2	127	7	136	7	86	4	97	**233**	**264**
09:00	09:15	4	3	8	15	20	2	4	26	**41**	6	92	4	102	6	79	3	88	**190**	**231**
09:15	09:30	4	1	9	14	21	0	9	30	**44**	3	95	4	102	8	93	4	105	**207**	**251**
09:30	09:45	8	3	6	17	17	1	6	24	**41**	2	100	3	105	8	90	3	101	**206**	**247**
09:45	10:00	7	2	5	14	9	1	7	17	**31**	3	90	3	96	10	80	4	94	**190**	**221**
11:30	11:45	9	1	8	18	11	3	10	24	**42**	1	108	3	112	12	85	9	106	**218**	**260**
11:45	12:00	4	2	15	21	12	2	7	21	**42**	3	96	5	104	12	111	10	133	**237**	**279**
12:00	12:15	2	1	18	21	5	2	7	14	**35**	4	116	3	123	16	124	7	147	**270**	**305**
12:15	12:30	8	1	15	24	14	3	8	25	**49**	3	113	4	120	8	133	7	148	**268**	**317**
12:30	12:45	7	0	13	20	10	1	8	19	**39**	3	110	6	119	12	103	12	127	**246**	**285**
12:45	13:00	2	1	18	21	4	4	8	16	**37**	2	119	4	125	12	95	7	114	**239**	**276**
13:00	13:15	5	2	12	19	10	4	3	17	**36**	4	124	5	133	9	113	5	127	**260**	**296**
13:15	13:30	7	2	9	18	8	0	9	17	**35**	5	85	5	95	10	112	9	131	**226**	**261**
15:00	15:15	3	3	12	18	10	0	6	16	**34**	4	90	9	103	12	130	10	152	**255**	**289**
15:15	15:30	8	4	13	25	11	6	6	23	**48**	5	100	6	111	16	159	6	181	**292**	**340**
15:30	15:45	3	5	14	22	15	2	6	23	**45**	0	115	6	121	10	173	9	192	**313**	**358**
15:45	16:00	4	5	11	20	6	1	7	14	**34**	0	104	3	107	19	169	15	203	**310**	**344**
16:00	16:15	4	4	10	18	9	0	1	10	**28**	7	102	3	112	15	171	14	200	**312**	**340**
16:15	16:30	8	2	15	25	8	0	7	15	**40**	3	97	7	107	16	179	13	208	**315**	**355**
16:30	16:45	5	1	11	17	14	0	5	19	**36**	3	120	1	124	12	194	6	212	**336**	**372**
16:45	17:00	8	4	11	23	11	0	11	22	**45**	6	101	7	114	12	183	11	206	**320**	**365**
17:00	17:15	0	6	8	14	6	2	7	15	**29**	4	108	9	121	14	202	18	234	**355**	**384**
17:15	17:30	4	8	9	21	10	3	3	16	**37**	5	106	6	117	9	153	7	169	**286**	**323**
17:30	17:45	2	2	18	22	11	3	7	21	**43**	7	100	8	115	12	165	6	183	**298**	**341**
17:45	18:00	9	2	11	22	7	5	3	15	**37**	5	95	5	105	6	141	9	156	**261**	**298**
Total:		166	75	341	582	382	50	197	629	**1211**	97	3505	140	3742	318	3813	227	4358	**1211**	**9,311**

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Cyclist Volume

		ASSALY RD			RICHMOND RD			
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	**0**	3	1	**4**	**4**
07:15	07:30	0	0	**0**	0	0	**0**	**0**
07:30	07:45	0	1	**1**	2	0	**2**	**3**
07:45	08:00	0	0	**0**	2	0	**2**	**2**
08:00	08:15	0	1	**1**	2	2	**4**	**5**
08:15	08:30	0	0	**0**	2	2	**4**	**4**
08:30	08:45	0	0	**0**	3	0	**3**	**3**
08:45	09:00	1	1	**2**	0	1	**1**	**3**
09:00	09:15	0	0	**0**	3	0	**3**	**3**
09:15	09:30	0	0	**0**	0	1	**1**	**1**
09:30	09:45	1	0	**1**	2	1	**3**	**4**
09:45	10:00	0	0	**0**	1	1	**2**	**2**
11:30	11:45	0	0	**0**	2	0	**2**	**2**
11:45	12:00	0	0	**0**	1	0	**1**	**1**
12:00	12:15	0	0	**0**	0	1	**1**	**1**
12:15	12:30	0	0	**0**	1	1	**2**	**2**
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	1	**1**	0	2	**2**	**3**
15:15	15:30	0	0	**0**	0	1	**1**	**1**
15:30	15:45	1	0	**1**	4	2	**6**	**7**
15:45	16:00	2	0	**2**	0	1	**1**	**3**
16:00	16:15	1	1	**2**	3	0	**3**	**5**
16:15	16:30	0	1	**1**	3	3	**6**	**7**
16:30	16:45	0	0	**0**	0	4	**4**	**4**
16:45	17:00	1	0	**1**	1	1	**2**	**3**
17:00	17:15	0	1	**1**	1	1	**2**	**3**
17:15	17:30	0	0	**0**	2	2	**4**	**4**
17:30	17:45	0	0	**0**	0	1	**1**	**1**
17:45	18:00	1	0	**1**	5	0	**5**	**6**
Total		8	7	**15**	43	29	**72**	**87**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Pedestrian Volume

		ASSALY RD			RICHMOND 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	4	3	**7**	0	1	**1**	**8**
07:15	07:30	1	1	**2**	0	1	**1**	**3**
07:30	07:45	3	0	**3**	1	5	**6**	**9**
07:45	08:00	3	1	**4**	1	2	**3**	**7**
08:00	08:15	0	1	**1**	2	1	**3**	**4**
08:15	08:30	5	5	**10**	2	2	**4**	**14**
08:30	08:45	3	1	**4**	2	2	**4**	**8**
08:45	09:00	1	2	**3**	0	3	**3**	**6**
09:00	09:15	2	2	**4**	2	3	**5**	**9**
09:15	09:30	2	0	**2**	3	3	**6**	**8**
09:30	09:45	4	4	**8**	1	1	**2**	**10**
09:45	10:00	1	1	**2**	1	5	**6**	**8**
11:30	11:45	3	4	**7**	3	3	**6**	**13**
11:45	12:00	5	5	**10**	4	7	**11**	**21**
12:00	12:15	1	9	**10**	6	7	**13**	**23**
12:15	12:30	3	5	**8**	0	2	**2**	**10**
12:30	12:45	5	1	**6**	0	6	**6**	**12**
12:45	13:00	1	4	**5**	1	4	**5**	**10**
13:00	13:15	2	4	**6**	5	3	**8**	**14**
13:15	13:30	2	0	**2**	1	6	**7**	**9**
15:00	15:15	4	3	**7**	4	1	**5**	**12**
15:15	15:30	7	4	**11**	3	4	**7**	**18**
15:30	15:45	1	3	**4**	2	0	**2**	**6**
15:45	16:00	0	1	**1**	2	2	**4**	**5**
16:00	16:15	5	1	**6**	2	4	**6**	**12**
16:15	16:30	2	1	**3**	0	7	**7**	**10**
16:30	16:45	6	1	**7**	2	0	**2**	**9**
16:45	17:00	4	4	**8**	8	7	**15**	**23**
17:00	17:15	2	6	**8**	1	5	**6**	**14**
17:15	17:30	3	4	**7**	6	10	**16**	**23**
17:30	17:45	1	2	**3**	1	4	**5**	**8**
17:45	18:00	4	5	**9**	5	5	**10**	**19**
Total	.....	90	88	**178**	71	116	**187**	**365**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study Heavy Vehicles

		ASSALY RD									RICHMOND 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	1	**1**	0	0	0	**0**	**1**	0	6	0	**6**	1	1	0	**2**	**8**	**9**
07:15	07:30	0	0	1	**1**	0	0	0	**0**	**1**	0	7	0	**7**	0	3	0	**3**	**10**	**11**
07:30	07:45	0	0	1	**1**	0	0	0	**0**	**1**	0	5	0	**5**	2	2	0	**4**	**9**	**10**
07:45	08:00	0	0	1	**1**	0	0	0	**0**	**1**	0	2	0	**2**	0	2	0	**2**	**4**	**5**
08:00	08:15	0	0	2	**2**	0	0	0	**0**	**2**	0	3	0	**3**	1	4	0	**5**	**8**	**10**
08:15	08:30	0	0	1	**1**	0	0	0	**0**	**1**	0	3	0	**3**	1	2	0	**3**	**6**	**7**
08:30	08:45	0	0	0	**0**	0	0	0	**0**	**0**	0	10	0	**10**	0	1	0	**1**	**11**	**11**
08:45	09:00	0	0	1	**1**	0	0	0	**0**	**1**	0	2	1	**3**	3	2	0	**5**	**8**	**9**
09:00	09:15	2	0	1	**3**	0	0	0	**0**	**3**	0	4	2	**6**	2	2	0	**4**	**10**	**13**
09:15	09:30	0	0	4	**4**	0	0	1	**1**	**5**	0	0	1	**1**	0	3	0	**3**	**4**	**9**
09:30	09:45	3	1	1	**5**	0	0	0	**0**	**5**	0	6	2	**8**	1	5	0	**6**	**14**	**19**
09:45	10:00	0	0	1	**1**	0	0	0	**0**	**1**	1	4	0	**5**	0	3	0	**3**	**8**	**9**
11:30	11:45	2	0	1	**3**	0	0	1	**1**	**4**	0	5	0	**5**	2	4	1	**7**	**12**	**16**
11:45	12:00	1	0	2	**3**	0	0	2	**2**	**5**	0	1	1	**2**	1	4	1	**6**	**8**	**13**
12:00	12:15	0	0	2	**2**	0	1	0	**1**	**3**	0	1	1	**2**	1	4	1	**6**	**8**	**11**
12:15	12:30	1	0	2	**3**	0	0	0	**0**	**3**	0	6	1	**7**	2	2	0	**4**	**11**	**14**
12:30	12:45	1	0	1	**2**	0	0	0	**0**	**2**	0	1	2	**3**	0	6	0	**6**	**9**	**11**
12:45	13:00	1	0	1	**2**	0	0	0	**0**	**2**	0	1	1	**2**	2	0	0	**2**	**4**	**6**
13:00	13:15	2	0	2	**4**	0	0	0	**0**	**4**	0	2	2	**4**	1	2	0	**3**	**7**	**11**
13:15	13:30	0	0	1	**1**	0	0	0	**0**	**1**	0	3	2	**5**	1	3	0	**4**	**9**	**10**
15:00	15:15	1	0	2	**3**	0	0	0	**0**	**3**	0	2	1	**3**	1	3	1	**5**	**8**	**11**
15:15	15:30	1	0	1	**2**	1	0	1	**2**	**4**	0	1	1	**2**	1	1	0	**2**	**4**	**8**
15:30	15:45	0	0	1	**1**	1	1	0	**2**	**3**	0	2	1	**3**	1	0	0	**1**	**4**	**7**
15:45	16:00	2	0	1	**3**	0	0	0	**0**	**3**	0	0	1	**1**	1	2	0	**3**	**4**	**7**
16:00	16:15	1	0	2	**3**	0	0	0	**0**	**3**	0	0	1	**1**	0	1	0	**1**	**2**	**5**
16:15	16:30	2	0	1	**3**	0	0	0	**0**	**3**	0	1	1	**2**	2	4	0	**6**	**8**	**11**
16:30	16:45	2	0	1	**3**	0	0	1	**1**	**4**	0	3	1	**4**	1	1	0	**2**	**6**	**10**
16:45	17:00	2	0	1	**3**	0	0	0	**0**	**3**	0	1	1	**2**	1	0	0	**1**	**3**	**6**
17:00	17:15	0	0	1	**1**	0	0	0	**0**	**1**	0	0	1	**1**	1	1	0	**2**	**3**	**4**
17:15	17:30	1	0	1	**2**	0	0	0	**0**	**2**	0	1	1	**2**	1	1	0	**2**	**4**	**6**
17:30	17:45	2	0	1	**3**	0	0	0	**0**	**3**	0	1	1	**2**	2	0	0	**2**	**4**	**7**
17:45	18:00	3	0	2	**5**	0	0	0	**0**	**5**	0	1	1	**2**	1	1	0	**2**	**4**	**9**
Total:	None	30	1	42	**73**	2	2	6	**10**	**83**	1	85	28	**114**	34	70	4	**108**	**222**	**305**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ASSALY RD @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36181

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

Full Study 15 Minute U-Turn Total

		ASSALY RD		RICHMOND RD		
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**

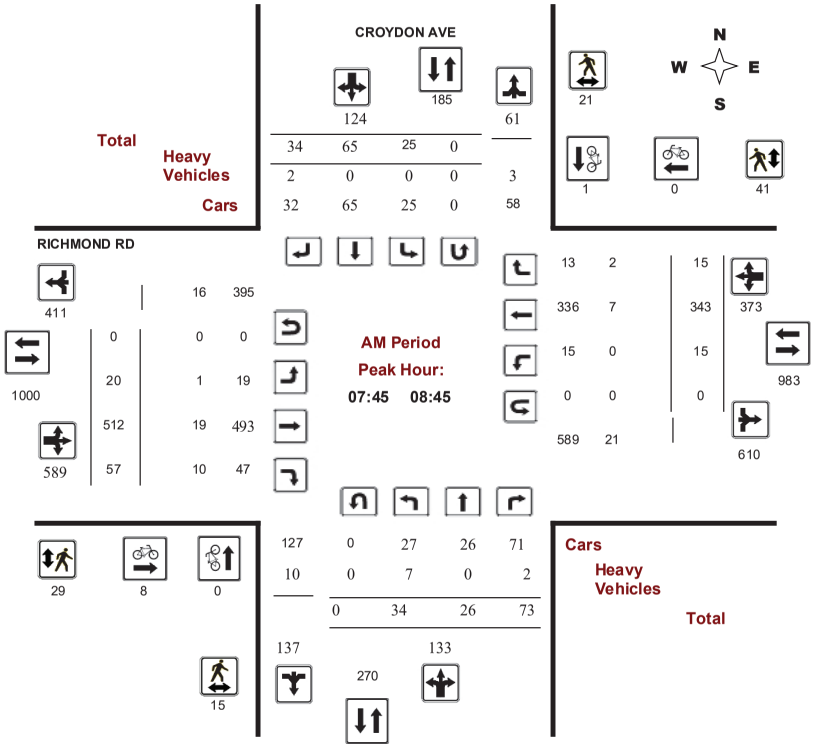
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36184

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



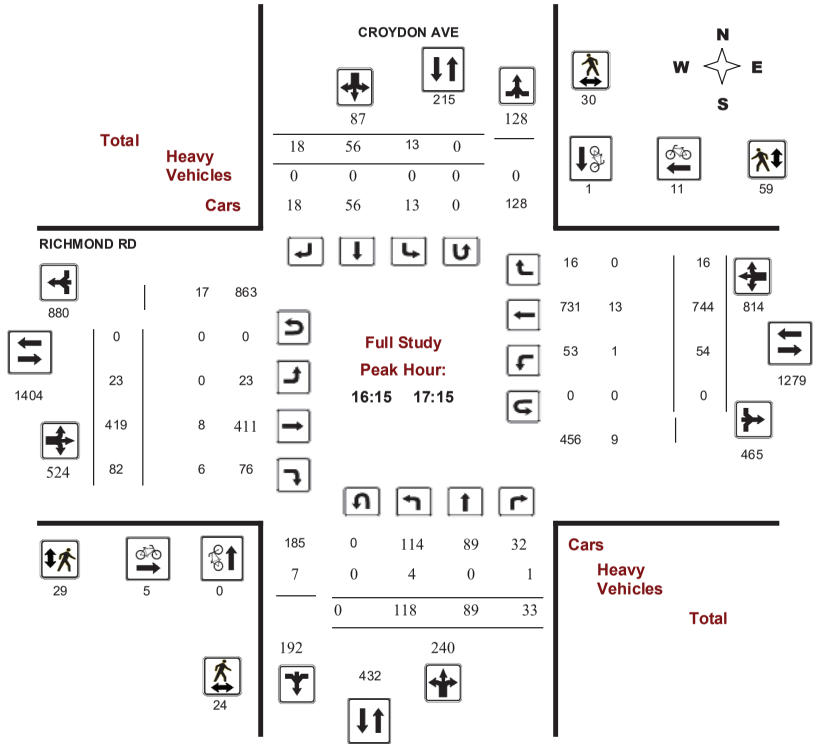
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36184

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



Comments

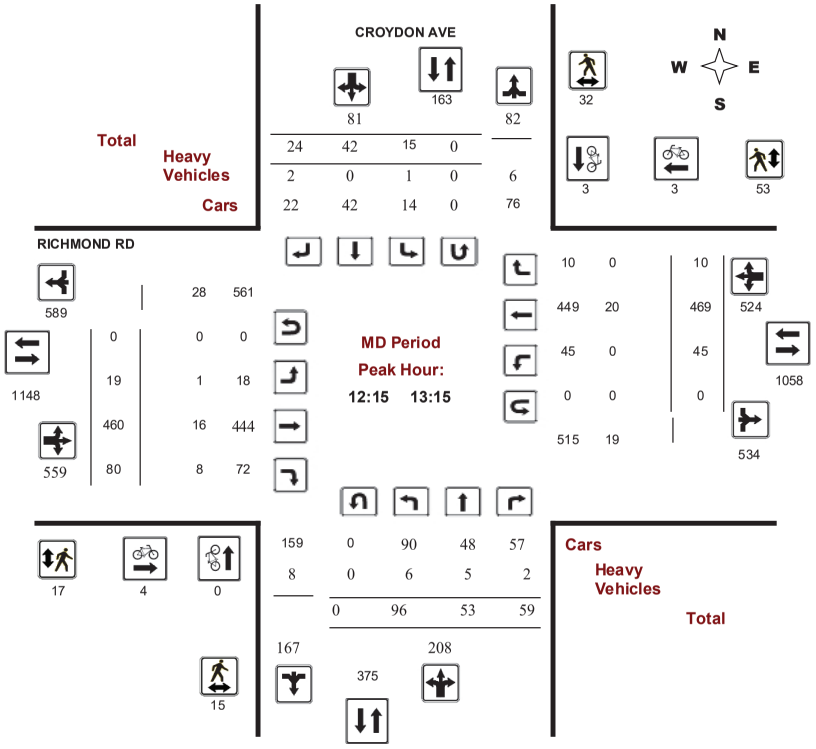
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36184

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



Comments

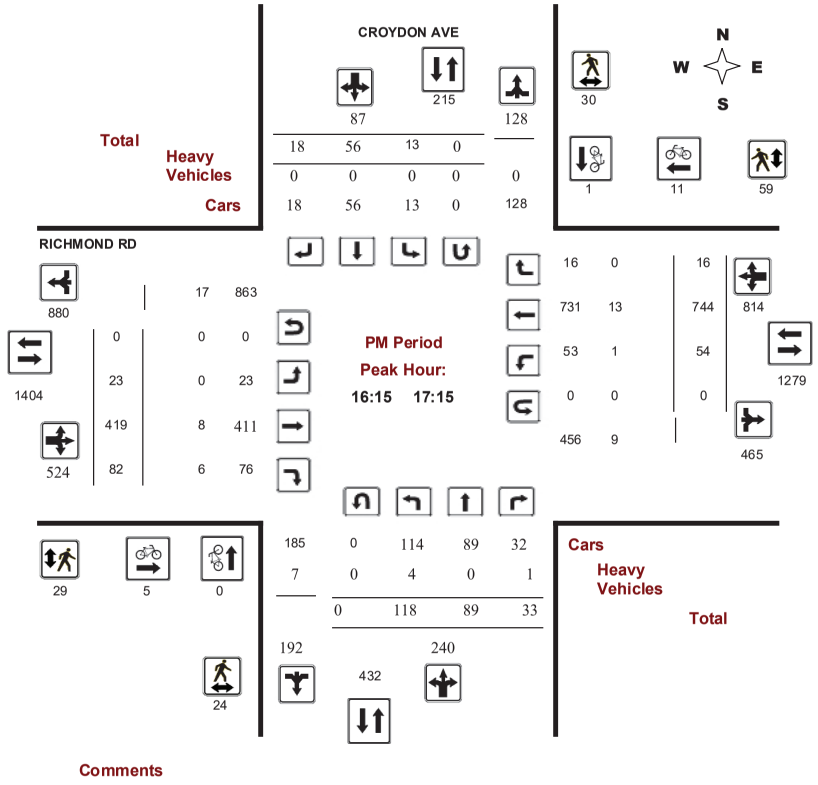
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO No:** 36184

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



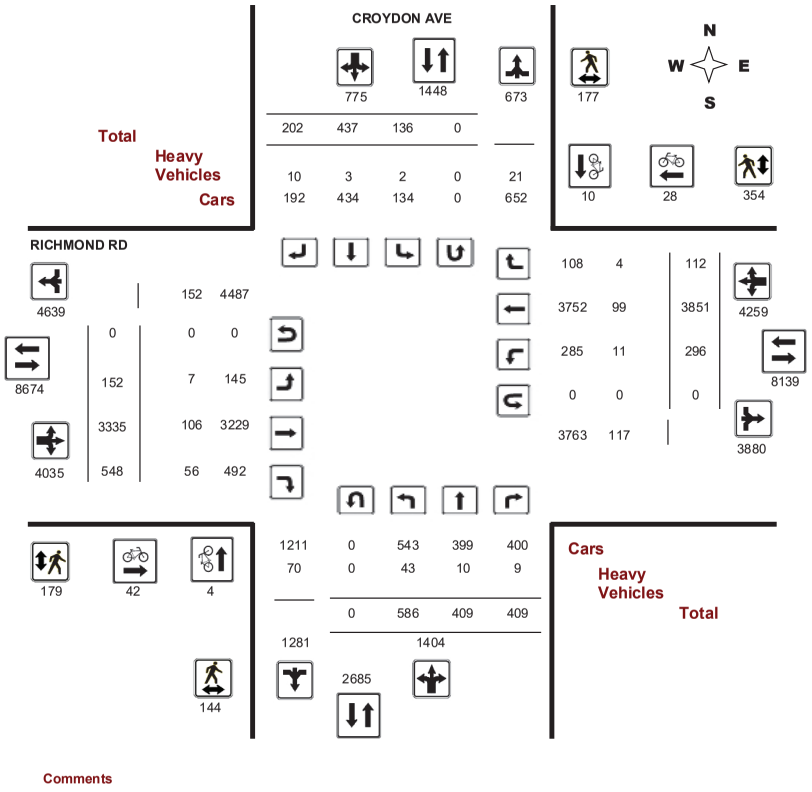
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016 **WO#:** 36184

Device: Miovision



Transportation Services - Traffic Services

Work Order 36184

Turning Movement Count - Full Study Summary Report

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor .90

Full Study

	CROYDON AVE									RICHMOND 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	25	21	59	**105**	11	50	18	**79**	**184**	19	440	51	**510**	14	236	7	**257**	**767**	**951**
08:00 09:00	35	23	68	**126**	28	69	38	**135**	**261**	19	502	54	**575**	19	345	16	**380**	**955**	**1216**
09:00 10:00	46	34	48	**128**	21	61	20	**102**	**230**	16	363	65	**444**	36	353	14	**403**	**847**	**1077**
11:30 12:30	72	48	46	**166**	12	56	15	**83**	**249**	12	396	73	**481**	56	439	13	**508**	**989**	**1238**
12:30 13:30	95	53	63	**211**	19	33	30	**82**	**293**	20	435	79	**534**	39	456	11	**506**	**1040**	**1333**
15:00 16:00	93	63	43	**199**	17	54	30	**101**	**300**	20	373	75	**468**	42	644	24	**710**	**1178**	**1478**
16:00 17:00	114	72	36	**222**	16	60	23	**99**	**321**	22	419	84	**525**	47	711	14	**772**	**1297**	**1618**
17:00 18:00	106	95	46	**247**	12	54	28	**94**	**341**	24	407	67	**498**	43	667	13	**723**	**1221**	**1562**
Sub Total	586	409	409	**1404**	136	437	202	**775**	**2179**	152	3335	548	**4035**	296	3851	112	**4259**	**8294**	**10473**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	586	409	409	**1404**	136	437	202	**775**	**2179**	152	3335	548	**4035**	296	3851	112	**4259**	**8294**	**10473**
EQ 12Hr	815	569	569	**1952**	189	607	281	**1077**	**3029**	211	4636	762	**5609**	411	5353	156	**5920**	**11529**	**14558**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	733	512	512	**1756**	170	547	253	**970**	**2726**	190	4172	686	**5048**	370	4818	140	**5328**	**10376**	**13102**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**.90**						
AVG 24Hr	960	670	670	**2301**	223	716	331	**1270**	**3571**	249	5465	898	**6613**	485	6311	184	**6980**	**13593**	**17164**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

Transportation Services - Traffic Services

W.O. 36184

Turning Movement Count - 15 Minute Summary Report

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

	CROYDON AVE									RICHMOND 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	9	3	11	**23**	2	11	1	**14**	**37**	5	90	6	**101**	2	45	1	**48**	**149**	**186**
07:15 07:30	4	6	20	**30**	2	12	6	**20**	**50**	3	93	16	**112**	2	53	1	**56**	**168**	**218**
07:30 07:45	5	4	10	**19**	3	13	9	**25**	**44**	5	128	12	**145**	6	56	4	**66**	**211**	**255**
07:45 08:00	7	8	18	**33**	4	14	2	**20**	**53**	6	129	17	**152**	4	82	1	**87**	**239**	**292**
08:00 08:15	9	6	22	**37**	8	22	13	**43**	**80**	6	122	11	**139**	3	73	5	**81**	**220**	**300**
08:15 08:30	10	9	8	**27**	7	17	9	**33**	**60**	3	113	13	**129**	6	93	6	**105**	**234**	**294**
08:30 08:45	8	3	25	**36**	6	12	10	**28**	**64**	5	148	16	**169**	2	95	3	**100**	**269**	**333**
08:45 09:00	8	5	13	**26**	7	18	6	**31**	**57**	5	119	14	**138**	8	84	2	**94**	**232**	**289**
09:00 09:15	5	4	12	**21**	9	14	6	**29**	**50**	5	108	17	**130**	4	81	6	**91**	**221**	**271**
09:15 09:30	10	7	15	**32**	4	15	4	**23**	**55**	4	79	14	**97**	12	89	3	**104**	**201**	**256**
09:30 09:45	11	16	12	**39**	5	19	3	**27**	**66**	4	94	17	**115**	13	92	4	**109**	**224**	**290**
09:45 10:00	20	7	9	**36**	3	13	7	**23**	**59**	3	82	17	**102**	7	91	1	**99**	**201**	**260**
11:30 11:45	19	11	5	**35**	6	18	2	**26**	**61**	3	80	17	**100**	6	102	5	**113**	**213**	**274**
11:45 12:00	14	11	14	**39**	3	15	4	**22**	**61**	3	109	15	**127**	15	97	4	**116**	**243**	**304**
12:00 12:15	20	13	18	**51**	1	6	7	**14**	**65**	3	94	16	**113**	16	115	2	**133**	**246**	**311**
12:15 12:30	19	13	9	**41**	2	17	2	**21**	**62**	3	113	25	**141**	19	125	2	**146**	**287**	**349**
12:30 12:45	26	11	9	**46**	1	9	6	**16**	**62**	4	112	21	**137**	10	118	4	**132**	**269**	**331**
12:45 13:00	22	16	20	**58**	3	8	7	**18**	**76**	5	123	20	**148**	9	107	3	**119**	**267**	**343**
13:00 13:15	29	13	21	**63**	9	8	9	**26**	**89**	7	112	14	**133**	7	119	1	**127**	**260**	**349**
13:15 13:30	18	13	13	**44**	6	8	8	**22**	**66**	4	88	24	**116**	13	112	3	**128**	**244**	**310**
15:00 15:15	14	12	14	**40**	7	17	12	**36**	**76**	4	80	17	**101**	9	123	7	**139**	**240**	**316**
15:15 15:30	19	14	13	**46**	4	17	6	**27**	**73**	7	97	13	**117**	13	172	4	**189**	**306**	**379**
15:30 15:45	23	15	7	**45**	3	12	4	**19**	**64**	5	108	21	**134**	10	176	4	**190**	**324**	**388**
15:45 16:00	37	22	9	**68**	3	8	8	**19**	**87**	4	88	24	**116**	10	173	9	**192**	**308**	**395**
16:00 16:15	24	16	11	**51**	5	17	11	**33**	**84**	4	104	19	**127**	6	164	4	**174**	**301**	**385**
16:15 16:30	38	15	10	**63**	2	13	1	**16**	**79**	5	96	22	**123**	16	178	4	**198**	**321**	**400**
16:30 16:45	24	17	8	**49**	4	15	4	**23**	**72**	9	108	22	**139**	13	191	4	**208**	**347**	**419**
16:45 17:00	28	24	7	**59**	5	15	7	**27**	**86**	4	111	21	**136**	12	178	2	**192**	**328**	**414**
17:00 17:15	28	33	8	**69**	2	13	6	**21**	**90**	5	104	17	**126**	13	197	6	**216**	**342**	**432**
17:15 17:30	26	21	8	**55**	4	16	6	**26**	**81**	6	112	17	**135**	9	168	5	**182**	**317**	**398**
17:30 17:45	29	18	19	**66**	3	12	10	**25**	**91**	8	93	21	**122**	12	159	1	**172**	**294**	**385**
17:45 18:00	23	23	11	**57**	3	13	6	**22**	**79**	5	98	12	**115**	9	143	1	**153**	**268**	**347**
TOTAL:	586	409	409	**1404**	136	437	202	**775**	**2179**	152	3335	548	**4035**	296	3851	112	**4259**	**8294**	**10473**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 36184

CROYDON AVE @ RICHMOND RD

Count Date: Thursday, August 11, 2016 **Start Time:** 07:00

	CROYDON AVE			RICHMOND RD			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	1	1	**2**	5	2	**7**	**9**
08:00 09:00	0	0	**0**	7	0	**7**	**7**
09:00 10:00	0	0	**0**	8	2	**10**	**10**
11:30 12:30	0	4	**4**	2	4	**6**	**10**
12:30 13:30	0	1	**1**	4	1	**5**	**6**
15:00 16:00	2	0	**2**	3	3	**6**	**8**
16:00 17:00	0	1	**1**	8	11	**19**	**20**
17:00 18:00	1	3	**4**	5	5	**10**	**14**
Total	4	10	**14**	42	28	**70**	**84**

Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

Transportation Services - Traffic Services

W.O. 36184

Turning Movement Count - Heavy Vehicle Report

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016

	CROYDON AVE									RICHMOND 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 08:00	8	0	1	**9**	1	0	1	**2**	**11**	1	18	11	**30**	2	5	1	**8**	**38**	**49**
08:00 09:00	8	0	2	**10**	0	0	2	**2**	**12**	1	19	8	**28**	0	6	2	**8**	**36**	**48**
09:00 10:00	4	0	0	**4**	0	0	1	**1**	**5**	1	20	11	**32**	2	17	0	**19**	**51**	**56**
11:30 12:30	4	3	3	**10**	1	1	1	**3**	**13**	1	12	8	**21**	3	18	0	**21**	**42**	**55**
12:30 13:30	5	4	1	**10**	0	0	3	**3**	**13**	1	14	5	**20**	1	18	0	**19**	**39**	**52**
15:00 16:00	6	2	1	**9**	0	2	2	**4**	**13**	1	9	3	**13**	0	11	0	**11**	**24**	**37**
16:00 17:00	4	0	1	**5**	0	0	0	**0**	**5**	1	8	4	**13**	2	13	0	**15**	**28**	**33**
17:00 18:00	4	1	0	**5**	0	0	0	**0**	**5**	0	6	6	**12**	1	11	1	**13**	**25**	**30**
Sub Total	43	10	9	**62**	2	3	10	**15**	**77**	7	106	56	**169**	11	99	4	**114**	**283**	**360**
U-Turns (Heavy Vehicles)				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	43	10	9	**0**	2	3	10	**15**	**77**	7	106	56	**169**	11	99	4	**114**	**283**	**360**

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.

Transportation Services - Traffic Services

Work Order 36184

Turning Movement Count - Pedestrian Volume Report

CROYDON AVE @ RICHMOND RD

Count Date: Thursday, August 11, 2016 **Start Time:** 07:00

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	3	1	4	4	11	15	19
07:15 07:30	2	1	3	5	4	9	12
07:30 07:45	1	5	6	2	8	10	16
07:45 08:00	3	4	7	8	11	19	26
07:00 08:00	9	11	20	19	34	53	73
08:00 08:15	1	0	1	6	12	18	19
08:15 08:30	5	13	18	8	9	17	35
08:30 08:45	6	4	10	7	9	16	26
08:45 09:00	11	5	16	3	12	15	31
08:00 09:00	23	22	45	24	42	66	111
09:00 09:15	5	1	6	3	11	14	20
09:15 09:30	2	0	2	4	12	16	18
09:30 09:45	1	1	2	5	8	13	15
09:45 10:00	2	4	6	8	16	24	30
09:00 10:00	10	6	16	20	47	67	83
11:30 11:45	6	2	8	3	5	8	16
11:45 12:00	3	4	7	4	6	10	17
12:00 12:15	5	15	20	4	22	26	46
12:15 12:30	6	9	15	4	17	21	36
11:30 12:30	20	30	50	15	50	65	115
12:30 12:45	2	3	5	4	7	11	16
12:45 13:00	4	8	12	2	15	17	29
13:00 13:15	3	12	15	7	14	21	36
13:15 13:30	3	3	6	2	7	9	15
12:30 13:30	12	26	38	15	43	58	96
15:00 15:15	5	4	9	6	7	13	22
15:15 15:30	6	3	9	6	10	16	25
15:30 15:45	3	16	19	10	17	27	46
15:45 16:00	8	5	13	4	10	14	27
15:00 16:00	22	28	50	26	44	70	120
16:00 16:15	9	6	15	13	14	27	42
16:15 16:30	6	9	15	4	21	25	40
16:30 16:45	7	9	16	12	18	30	46
16:45 17:00	9	4	13	5	10	15	28
16:00 17:00	31	28	59	34	63	97	156
17:00 17:15	2	8	10	8	10	18	28
17:15 17:30	5	6	11	7	7	14	25
17:30 17:45	5	8	13	7	9	16	29
17:45 18:00	5	4	9	4	5	9	18
17:00 18:00	17	26	43	26	31	57	100
Total	144	177	321	179	354	533	854

Comment:

Transportation Services - Traffic Services

Work Order 36184

Turning Movement Count - 15 Min U-Turn Total Report

CROYDON AVE @ RICHMOND RD

Survey Date: Thursday, August 11, 2016

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

Transportation Services - Traffic Services

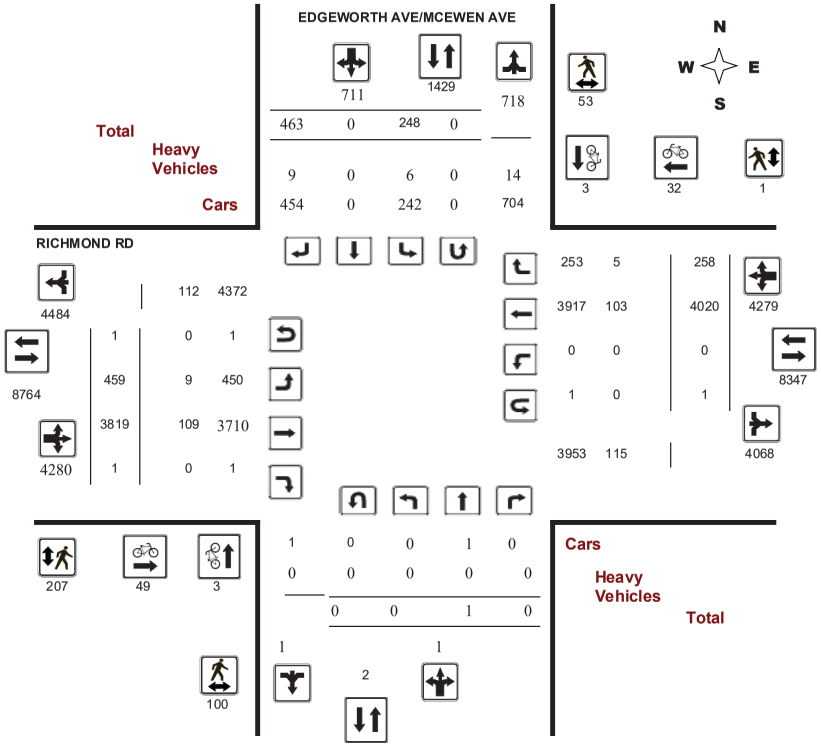
Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Diagram



Transportation Services - Traffic Services

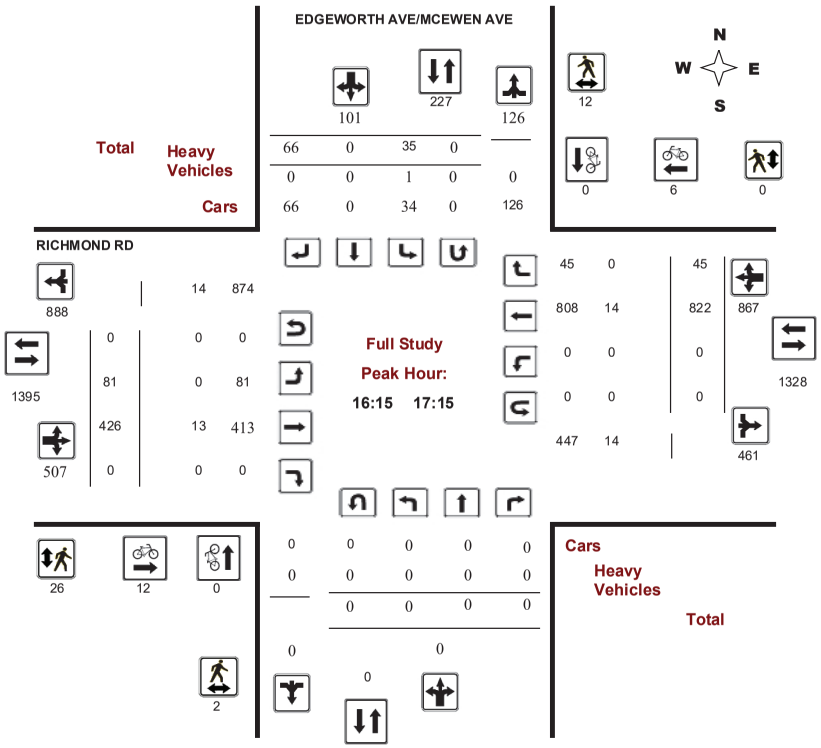
Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Peak Hour Diagram



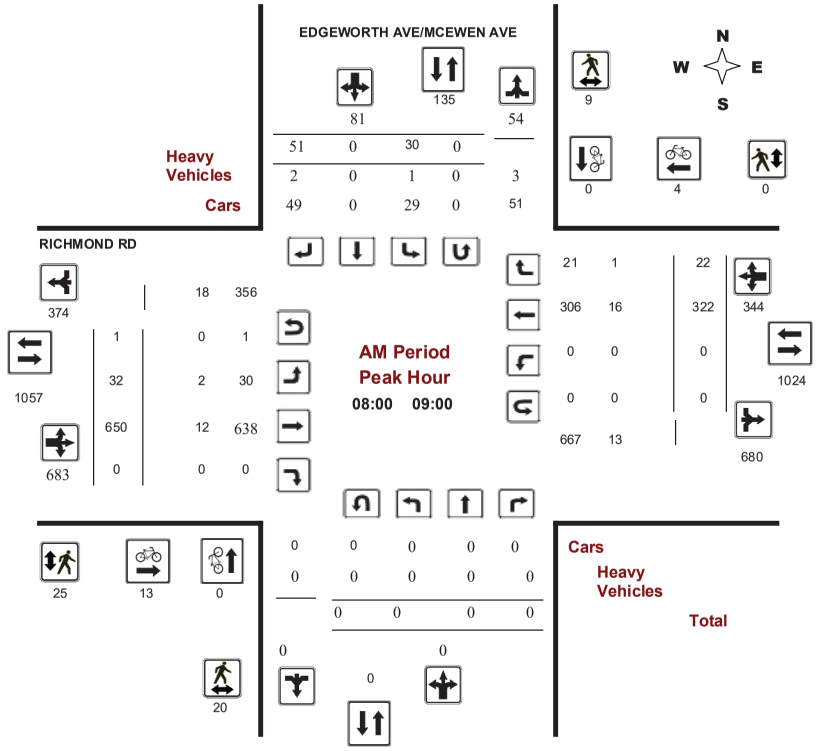
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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



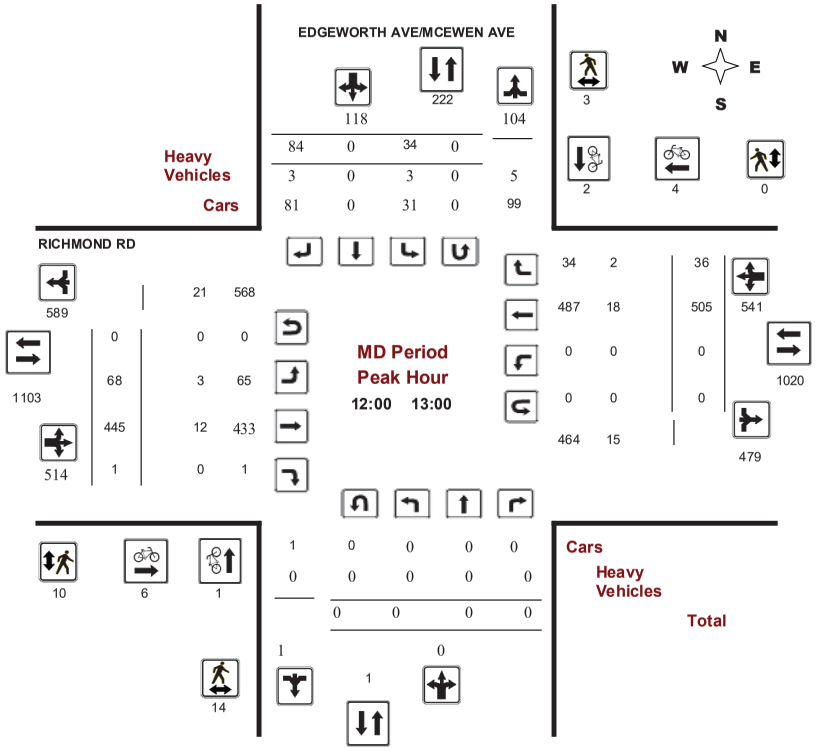
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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



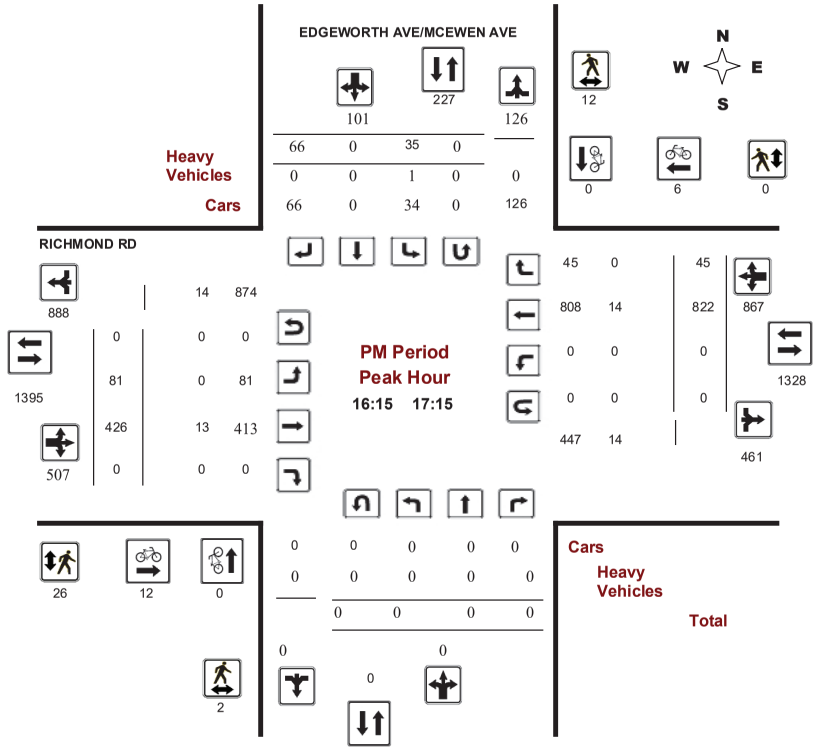
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Summary (8 HR Standard)

Survey Date: Thursday, August 25, 2016

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 1 Westbound: 1

AADT Factor .90

	EDGEWORTH AVE/MCEWEN AVE								RICHMOND 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**	24	0	40	**64**	**64**	26	572	0	**598**	0	187	21	**208**	**806**	**870**
08:00 09:00	0	0	0	**0**	30	0	51	**81**	**81**	32	650	0	**682**	0	322	22	**344**	**1026**	**1107**
09:00 10:00	0	0	0	**0**	30	0	59	**89**	**89**	39	428	0	**467**	0	318	28	**346**	**813**	**902**
11:30 12:30	0	0	0	**0**	28	0	71	**99**	**99**	70	460	1	**531**	0	463	36	**499**	**1030**	**1129**
12:30 13:30	0	0	0	**0**	39	0	71	**110**	**110**	70	456	0	**526**	0	461	33	**494**	**1020**	**1130**
15:00 16:00	0	0	0	**0**	31	0	54	**85**	**85**	57	395	0	**452**	0	706	36	**742**	**1194**	**1279**
16:00 17:00	0	0	0	**0**	35	0	60	**95**	**95**	75	404	0	**479**	0	797	39	**836**	**1315**	**1410**
17:00 18:00	0	1	0	**1**	31	0	57	**88**	**89**	90	454	0	**544**	0	766	43	**809**	**1353**	**1442**
Sub Total	0	1	0	**1**	248	0	463	**711**	**712**	459	3819	1	**4279**	0	4020	258	**4278**	**8557**	**9269**
U Turns	0			**0**	0			**0**	**0**	**1**			**1**	1			**1**	**2**	**2**
Total	0	1	0	**1**	248	0	463	**711**	**712**	460	3819	1	**4280**	1	4020	258	**4279**	**8559**	**9271**
EQ 12Hr	0	1	0	**1**	345	0	644	**989**	**990**	639	5308	1	**5948**	1	5588	359	**5948**	**11896**	**12886**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	0	1	0	**1**	310	0	580	**890**	**891**	575	4777	1	**5353**	1	5029	323	**5353**	**10706**	**11597**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**.90**					
AVG 24Hr	0	1	0	**1**	406	0	760	**1166**	**1167**	753	6258	1	**7012**	1	6588	423	**7012**	**14024**	**15191**
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

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study 15 Minute Increments

		EDGEWORTH AVE/MCEWEN AVE									RICHMOND 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	4	0	7	11	**11**	3	105	0	108	0	34	4	38	**146**	**157**
07:15	07:30	0	0	0	0	3	0	11	14	**14**	4	149	0	153	0	39	10	49	**202**	**216**
07:30	07:45	0	0	0	0	9	0	11	20	**20**	12	165	0	177	0	53	5	58	**235**	**255**
07:45	08:00	0	0	0	0	8	0	11	19	**19**	7	153	0	160	0	61	2	63	**223**	**242**
08:00	08:15	0	0	0	0	5	0	16	21	**21**	11	142	0	153	0	61	9	70	**223**	**244**
08:15	08:30	0	0	0	0	6	0	12	18	**18**	10	163	0	173	0	80	6	86	**259**	**277**
08:30	08:45	0	0	0	0	11	0	9	20	**20**	4	189	0	193	0	84	3	87	**280**	**300**
08:45	09:00	0	0	0	0	8	0	14	22	**22**	8	156	0	164	0	97	4	101	**265**	**287**
09:00	09:15	0	0	0	0	7	0	16	23	**23**	7	121	0	128	0	74	9	83	**211**	**234**
09:15	09:30	0	0	0	0	5	0	14	19	**19**	16	115	0	131	0	82	9	91	**222**	**241**
09:30	09:45	0	0	0	0	12	0	13	25	**25**	8	95	0	103	0	89	5	94	**197**	**222**
09:45	10:00	0	0	0	0	6	0	16	22	**22**	8	97	0	105	0	73	5	78	**183**	**205**
11:30	11:45	0	0	0	0	8	0	16	24	**24**	13	116	0	129	0	106	9	115	**244**	**268**
11:45	12:00	0	0	0	0	5	0	16	21	**21**	21	139	0	160	0	100	8	108	**268**	**289**
12:00	12:15	0	0	0	0	7	0	19	26	**26**	18	96	1	115	0	129	8	137	**252**	**278**
12:15	12:30	0	0	0	0	8	0	20	28	**28**	18	109	0	127	0	128	11	139	**266**	**294**
12:30	12:45	0	0	0	0	8	0	23	31	**31**	16	116	0	132	0	112	7	119	**251**	**282**
12:45	13:00	0	0	0	0	11	0	22	33	**33**	16	124	0	140	0	136	10	146	**286**	**319**
13:00	13:15	0	0	0	0	8	0	11	19	**19**	14	98	0	112	1	105	9	115	**227**	**246**
13:15	13:30	0	0	0	0	12	0	15	27	**27**	24	118	0	142	0	108	7	115	**257**	**284**
15:00	15:15	0	0	0	0	11	0	16	27	**27**	13	83	0	96	0	130	8	138	**234**	**261**
15:15	15:30	0	0	0	0	6	0	16	22	**22**	17	100	0	117	0	168	8	176	**293**	**315**
15:30	15:45	0	0	0	0	6	0	12	18	**18**	10	112	0	122	0	198	5	203	**325**	**343**
15:45	16:00	0	0	0	0	8	0	10	18	**18**	17	100	0	117	0	210	15	225	**342**	**360**
16:00	16:15	0	0	0	0	8	0	9	17	**17**	14	109	0	123	0	186	7	193	**316**	**333**
16:15	16:30	0	0	0	0	8	0	20	28	**28**	23	93	0	116	0	210	16	226	**342**	**370**
16:30	16:45	0	0	0	0	11	0	16	27	**27**	17	101	0	118	0	180	11	191	**309**	**336**
16:45	17:00	0	0	0	0	8	0	15	23	**23**	21	101	0	122	0	221	5	226	**348**	**371**
17:00	17:15	0	0	0	0	8	0	15	23	**23**	20	131	0	151	0	211	13	224	**375**	**398**
17:15	17:30	0	1	0	1	8	0	19	27	**28**	22	104	0	126	0	182	14	196	**322**	**350**
17:30	17:45	0	0	0	0	7	0	10	17	**17**	24	99	0	123	0	202	11	213	**336**	**353**
17:45	18:00	0	0	0	0	8	0	13	21	**21**	24	120	0	144	0	171	5	176	**320**	**341**
Total:		0	1	0	1	248	0	463	711	**712**	460	3819	1	4280	1	4020	258	4279	**712**	**9,271**

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Cyclist Volume

		EDGEWORTH AVE/MCEWEN AVE			RICHMOND RD			
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**	2	1	**3**	**3**
07:30	07:45	0	0	**0**	0	0	**0**	**0**
07:45	08:00	0	0	**0**	1	1	**2**	**2**
08:00	08:15	0	0	**0**	5	1	**6**	**6**
08:15	08:30	0	0	**0**	2	2	**4**	**4**
08:30	08:45	0	0	**0**	4	1	**5**	**5**
08:45	09:00	0	0	**0**	2	0	**2**	**2**
09:00	09:15	0	0	**0**	1	1	**2**	**2**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	0	**0**	3	0	**3**	**3**
09:45	10:00	0	0	**0**	0	0	**0**	**0**
11:30	11:45	0	0	**0**	1	1	**2**	**2**
11:45	12:00	0	0	**0**	1	2	**3**	**3**
12:00	12:15	0	1	**1**	1	2	**3**	**4**
12:15	12:30	0	0	**0**	1	0	**1**	**1**
12:30	12:45	0	0	**0**	1	0	**1**	**1**
12:45	13:00	1	1	**2**	3	2	**5**	**7**
13:00	13:15	0	0	**0**	4	0	**4**	**4**
13:15	13:30	0	0	**0**	0	2	**2**	**2**
15:00	15:15	1	1	**2**	2	0	**2**	**4**
15:15	15:30	0	0	**0**	0	0	**0**	**0**
15:30	15:45	0	0	**0**	0	1	**1**	**1**
15:45	16:00	0	0	**0**	0	0	**0**	**0**
16:00	16:15	0	0	**0**	0	3	**3**	**3**
16:15	16:30	0	0	**0**	2	1	**3**	**3**
16:30	16:45	0	0	**0**	3	2	**5**	**5**
16:45	17:00	0	0	**0**	3	1	**4**	**4**
17:00	17:15	0	0	**0**	4	2	**6**	**6**
17:15	17:30	0	0	**0**	0	1	**1**	**1**
17:30	17:45	1	0	**1**	0	2	**2**	**3**
17:45	18:00	0	0	**0**	3	3	**6**	**6**
Total		3	3	**6**	49	32	**81**	**87**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Pedestrian Volume

	EDGEWORTH AVE/MCEWEN AVE			RICHMOND 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**	6	0	**6**	**6**
07:15 07:30	0	0	**0**	8	0	**8**	**8**
07:30 07:45	0	0	**0**	7	0	**7**	**7**
07:45 08:00	0	1	**1**	8	0	**8**	**9**
08:00 08:15	6	3	**9**	7	0	**7**	**16**
08:15 08:30	2	1	**3**	2	0	**2**	**5**
08:30 08:45	5	2	**7**	9	0	**9**	**16**
08:45 09:00	7	3	**10**	7	0	**7**	**17**
09:00 09:15	1	2	**3**	6	0	**6**	**9**
09:15 09:30	7	1	**8**	10	0	**10**	**18**
09:30 09:45	5	2	**7**	6	0	**6**	**13**
09:45 10:00	3	0	**3**	5	0	**5**	**8**
11:30 11:45	2	3	**5**	6	0	**6**	**11**
11:45 12:00	5	0	**5**	8	0	**8**	**13**
12:00 12:15	2	0	**2**	1	0	**1**	**3**
12:15 12:30	5	2	**7**	5	0	**5**	**12**
12:30 12:45	3	1	**4**	3	0	**3**	**7**
12:45 13:00	4	0	**4**	1	0	**1**	**5**
13:00 13:15	4	1	**5**	8	0	**8**	**13**
13:15 13:30	3	6	**9**	4	1	**5**	**14**
15:00 15:15	1	0	**1**	3	0	**3**	**4**
15:15 15:30	7	3	**10**	8	0	**8**	**18**
15:30 15:45	2	5	**7**	10	0	**10**	**17**
15:45 16:00	5	1	**6**	6	0	**6**	**12**
16:00 16:15	3	0	**3**	6	0	**6**	**9**
16:15 16:30	1	4	**5**	2	0	**2**	**7**
16:30 16:45	0	2	**2**	3	0	**3**	**5**
16:45 17:00	0	2	**2**	10	0	**10**	**12**
17:00 17:15	1	4	**5**	11	0	**11**	**16**
17:15 17:30	4	1	**5**	10	0	**10**	**15**
17:30 17:45	5	2	**7**	12	0	**12**	**19**
17:45 18:00	7	1	**8**	9	0	**9**	**17**
Total	100	53	**153**	207	1	**208**	**361**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study Heavy Vehicles

		EDGEWORTH AVE/MCEWEN AVE										RICHMOND 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**	0	0	0	**0**	**0**		0	6	0	**6**	0	1	0	**1**	**7**	**7**
07:15	07:30	0	0	0	**0**	0	0	0	**0**	**0**		0	2	0	**2**	0	1	0	**1**	**3**	**3**
07:30	07:45	0	0	0	**0**	0	0	0	**0**	**0**		0	5	0	**5**	0	5	0	**5**	**10**	**10**
07:45	08:00	0	0	0	**0**	0	0	0	**0**	**0**		0	4	0	**4**	0	2	0	**2**	**6**	**6**
08:00	08:15	0	0	0	**0**	0	0	0	**0**	**0**		1	2	0	**3**	0	5	0	**5**	**8**	**8**
08:15	08:30	0	0	0	**0**	1	0	1	**2**	**2**		0	2	0	**2**	0	4	1	**5**	**7**	**9**
08:30	08:45	0	0	0	**0**	0	0	0	**0**	**0**		1	2	0	**3**	0	2	0	**2**	**5**	**5**
08:45	09:00	0	0	0	**0**	0	0	1	**1**	**1**		0	6	0	**6**	0	5	0	**5**	**11**	**12**
09:00	09:15	0	0	0	**0**	0	0	1	**1**	**1**		0	5	0	**5**	0	2	1	**3**	**8**	**9**
09:15	09:30	0	0	0	**0**	0	0	1	**1**	**1**		0	3	0	**3**	0	4	0	**4**	**7**	**8**
09:30	09:45	0	0	0	**0**	0	0	0	**0**	**0**		0	4	0	**4**	0	4	0	**4**	**8**	**8**
09:45	10:00	0	0	0	**0**	0	0	0	**0**	**0**		0	2	0	**2**	0	1	1	**2**	**4**	**4**
11:30	11:45	0	0	0	**0**	0	0	0	**0**	**0**		0	7	0	**7**	0	7	0	**7**	**14**	**14**
11:45	12:00	0	0	0	**0**	0	0	1	**1**	**1**		0	8	0	**8**	0	5	0	**5**	**13**	**14**
12:00	12:15	0	0	0	**0**	0	0	0	**0**	**0**		2	2	0	**4**	0	8	0	**8**	**12**	**12**
12:15	12:30	0	0	0	**0**	0	0	1	**1**	**1**		0	3	0	**3**	0	3	0	**3**	**6**	**7**
12:30	12:45	0	0	0	**0**	0	0	1	**1**	**1**		1	5	0	**6**	0	2	1	**3**	**9**	**10**
12:45	13:00	0	0	0	**0**	3	0	1	**4**	**4**		0	2	0	**2**	0	5	1	**6**	**8**	**12**
13:00	13:15	0	0	0	**0**	0	0	0	**0**	**0**		1	7	0	**8**	0	2	0	**2**	**10**	**10**
13:15	13:30	0	0	0	**0**	0	0	0	**0**	**0**		0	3	0	**3**	0	2	0	**2**	**5**	**5**
15:00	15:15	0	0	0	**0**	0	0	0	**0**	**0**		0	2	0	**2**	0	3	0	**3**	**5**	**5**
15:15	15:30	0	0	0	**0**	0	0	0	**0**	**0**		1	6	0	**7**	0	8	0	**8**	**15**	**15**
15:30	15:45	0	0	0	**0**	1	0	0	**1**	**1**		0	3	0	**3**	0	2	0	**2**	**5**	**6**
15:45	16:00	0	0	0	**0**	0	0	0	**0**	**0**		0	1	0	**1**	0	1	0	**1**	**2**	**2**
16:00	16:15	0	0	0	**0**	0	0	0	**0**	**0**		1	1	0	**2**	0	1	0	**1**	**3**	**3**
16:15	16:30	0	0	0	**0**	0	0	0	**0**	**0**		0	3	0	**3**	0	3	0	**3**	**6**	**6**
16:30	16:45	0	0	0	**0**	0	0	0	**0**	**0**		0	3	0	**3**	0	4	0	**4**	**7**	**7**
16:45	17:00	0	0	0	**0**	0	0	0	**0**	**0**		0	2	0	**2**	0	2	0	**2**	**4**	**4**
17:00	17:15	0	0	0	**0**	1	0	0	**1**	**1**		0	5	0	**5**	0	5	0	**5**	**10**	**11**
17:15	17:30	0	0	0	**0**	0	0	1	**1**	**1**		0	0	0	**0**	0	1	0	**1**	**1**	**2**
17:30	17:45	0	0	0	**0**	0	0	0	**0**	**0**		0	2	0	**2**	0	2	0	**2**	**4**	**4**
17:45	18:00	0	0	0	**0**	0	0	0	**0**	**0**		1	1	0	**2**	0	1	0	**1**	**3**	**3**
Total:	None	0	0	0	**0**	6	0	9	**15**	**15**		9	109	0	**118**	0	103	5	**108**	**226**	**241**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE

Survey Date: Thursday, August 25, 2016 **WO No:** 36242

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

Full Study 15 Minute U-Turn Total

EDGEWORTH AVE/MCEWEN AVE RICHMOND RD

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	1	0	**1**
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	1	**1**
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	1	1	**2**

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	512	57	15	343	15	34	26	73	25	65	34
Future Volume (vph)	20	512	57	15	343	15	34	26	73	25	65	34
Satd. Flow (prot)	1610	1655	0	1658	1723	0	1398	1455	0	0	1618	0
Flt Permitted	0.502			0.325			0.717				0.920	
Satd. Flow (perm)	835	1655	0	563	1723	0	1020	1455	0	0	1489	0
Satd. Flow (RTOR)		11			4						30	
Lane Group Flow (vph)	22	632	0	17	398	0	38	110	0	0	138	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	38.9	38.9		38.9	38.9		31.1	31.1		31.1	31.1	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	43.0	43.0		43.0	43.0		19.0	19.0			19.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.27	0.27			0.27	
v/c Ratio	0.04	0.62		0.05	0.38		0.14	0.28			0.32	
Control Delay	10.6	17.1		9.2	12.6		17.4	19.7			15.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	10.6	17.1		9.2	12.6		17.4	19.7			15.8	
LOS	B	B		A	B		B	B			B	
Approach Delay		16.9			12.4			19.1			15.8	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	1.5	66.7		1.6	45.5		3.3	9.8			9.6	
Queue Length 95th (m)	5.0	#124.8		m3.9	75.7		9.1	20.3			21.2	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	512	1021		346	1060		364	519			551	
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	0.04	0.62		0.05	0.38		0.10	0.21			0.25	

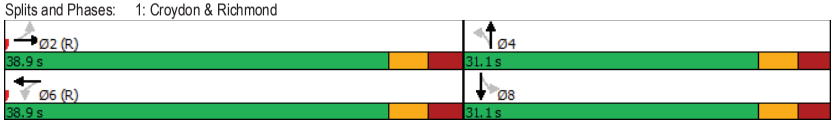
Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 40 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 15.7	Intersection LOS: B
Intersection Capacity Utilization 61.1%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



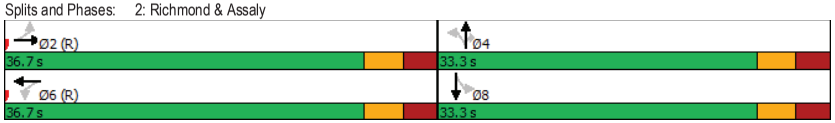
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	558	15	25	344	18	25	6	33	67	2	25
Future Volume (vph)	7	558	15	25	344	18	25	6	33	67	2	25
Satd. Flow (prot)	1658	1718	0	1409	1714	0	0	1679	1351	0	1612	0
Flt Permitted	0.518			0.358				0.759			0.767	
Satd. Flow (perm)	898	1718	0	529	1714	0	0	1317	1309	0	1271	0
Satd. Flow (RTOR)		2			5						28	
Lane Group Flow (vph)	8	637	0	28	402	0	0	35	37	0	104	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	36.7	36.7		36.7	36.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	52.4%	52.4%		52.4%	52.4%		47.6%	47.6%	47.6%	47.6%	47.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	48.2	48.2		48.2	48.2			13.7	13.7		13.7	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.20	0.20		0.20	
v/c Ratio	0.01	0.54		0.08	0.34			0.14	0.14		0.38	
Control Delay	4.7	9.4		4.4	4.3			21.6	21.8		20.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	4.7	9.4		4.4	4.3			21.6	21.8		20.9	
LOS	A	A		A	A			C	C		C	
Approach Delay		9.3			4.3			21.7			20.9	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	0.1	13.8		0.5	7.5			4.1	4.4		9.2	
Queue Length 95th (m)	m0.5	#138.6		m2.5	17.4			8.0	8.3		15.8	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	618	1184		364	1182			507	504		507	
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	0.54		0.08	0.34			0.07	0.07		0.21	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54
Intersection Signal Delay: 9.3 Intersection LOS: A
Intersection Capacity Utilization 70.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	33	650	322	22	30	51	
Future Volume (vph)	33	650	322	22	30	51	
Satd. Flow (prot)	1595	1745	1695	1441	1642	1455	
Flt Permitted	0.536				0.950		
Satd. Flow (perm)	895	1745	1695	1393	1642	1352	
Satd. Flow (RTOR)				16		57	
Lane Group Flow (vph)	37	722	358	24	33	57	
Turn Type	Perm	NA	NA	Perm	Perm	Perm	
Protected Phases		2	6				7
Permitted Phases	2			6	8	8	
Detector Phase	2	2	6	6	8	8	
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	1.0
Minimum Split (s)	36.3	36.3	36.3	36.3	23.8	23.8	5.0
Total Split (s)	41.0	41.0	41.0	41.0	24.0	24.0	5.0
Total Split (%)	58.6%	58.6%	58.6%	58.6%	34.3%	34.3%	7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.5	3.5	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.8	6.8	
Lead/Lag					Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	Ped
Act Effct Green (s)	42.5	42.5	42.5	42.5	12.8	12.8	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.18	0.18	
v/c Ratio	0.07	0.68	0.35	0.03	0.11	0.19	
Control Delay	5.8	15.6	10.2	5.5	23.0	8.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.8	15.6	10.2	5.5	23.0	8.3	
LOS	A	B	B	A	C	A	
Approach Delay		15.1	9.9		13.7		
Approach LOS		B	A		B		
Queue Length 50th (m)	1.5	78.5	21.2	0.4	3.9	0.0	
Queue Length 95th (m)	m1.7	#148.3	46.5	3.7	9.6	7.8	
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0			10.0	40.0		
Base Capacity (vph)	542	1058	1028	851	403	375	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.68	0.35	0.03	0.08	0.15	

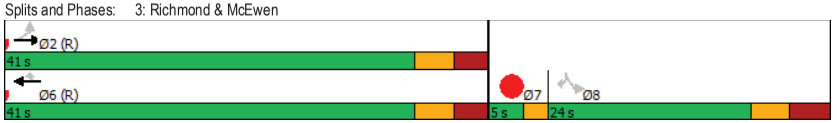
Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 38 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 13.4	Intersection LOS: B
Intersection Capacity Utilization 58.7%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Richmond & McEwen



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	419	82	54	744	16	118	89	33	13	56	18
Future Volume (vph)	23	419	82	54	744	16	118	89	33	13	56	18
Satd. Flow (prot)	1658	1668	0	1658	1737	0	1642	1615	0	0	1660	0
Flt Permitted	0.182			0.374			0.762				0.951	
Satd. Flow (perm)	318	1668	0	641	1737	0	1260	1615	0	0	1571	0
Satd. Flow (RTOR)		19			2						16	
Lane Group Flow (vph)	26	557	0	60	845	0	131	136	0	0	96	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	53.9	53.9		53.9	53.9		31.1	31.1		31.1	31.1	
Total Split (%)	63.4%	63.4%		63.4%	63.4%		36.6%	36.6%		36.6%	36.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	50.5	50.5		50.5	50.5		22.0	22.0			22.0	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.26	0.26			0.26	
v/c Ratio	0.14	0.56		0.16	0.82		0.40	0.33			0.23	
Control Delay	11.4	13.8		9.1	15.8		28.7	26.4			20.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.4	13.8		9.1	15.8		28.7	26.4			20.5	
LOS	B	B		A	B		C	C			C	
Approach Delay		13.7			15.3			27.6			20.5	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	1.9	53.4		1.5	42.5		16.7	17.0			9.6	
Queue Length 95th (m)	6.3	83.5		m5.3	#183.5		31.9	31.4			21.0	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	188	998		381	1032		370	475			473	
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	0.14	0.56		0.16	0.82		0.35	0.29			0.20	

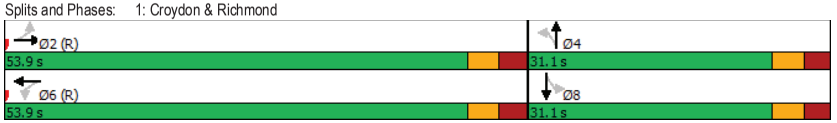
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 71 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 16.8	Intersection LOS: B
Intersection Capacity Utilization 77.6%	ICU Level of Service D
Analysis Period (min) 15	

\# 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.

Splits and Phases: 1: Croydon & Richmond



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	426	24	54	758	48	21	13	45	39	2	30
Future Volume (vph)	16	426	24	54	758	48	21	13	45	39	2	30
Satd. Flow (prot)	1658	1713	0	1551	1725	0	0	1454	1388	0	1568	0
Flt Permitted	0.212			0.445				0.796			0.808	
Satd. Flow (perm)	370	1713	0	719	1725	0	0	1181	1318	0	1282	0
Satd. Flow (RTOR)		5			6						33	
Lane Group Flow (vph)	18	500	0	60	895	0	0	37	50	0	78	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	51.7	51.7		51.7	51.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	60.8%	60.8%		60.8%	60.8%		39.2%	39.2%	39.2%	39.2%	39.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	60.1	60.1		60.1	60.1			16.8	16.8		16.8	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.20	0.20		0.20	
v/c Ratio	0.07	0.41		0.12	0.73			0.16	0.19		0.28	
Control Delay	13.7	12.0		2.6	11.5			26.0	26.7		18.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	13.7	12.0		2.6	11.5			26.0	26.7		18.5	
LOS	B	B		A	B			C	C		B	
Approach Delay		12.1			11.0			26.4			18.5	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	0.8	28.9		0.1	2.2			5.6	7.6		6.8	
Queue Length 95th (m)	m3.4	74.4		m2.8	#226.4			11.0	13.6		15.0	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	261	1213		508	1221			375	418		429	
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	0.07	0.41		0.12	0.73			0.10	0.12		0.18	

Intersection Summary

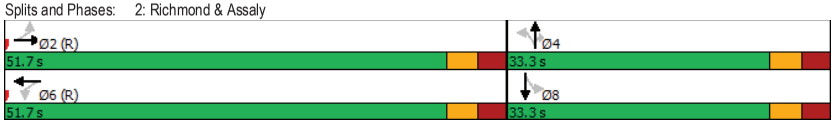
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 64 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 12.5	Intersection LOS: B
Intersection Capacity Utilization 72.8%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	81	426	822	45	35	66	
Future Volume (vph)	81	426	822	45	35	66	
Satd. Flow (prot)	1658	1728	1745	1483	1642	1483	
Flt Permitted	0.190				0.950		
Satd. Flow (perm)	332	1728	1745	1423	1642	1359	
Satd. Flow (RTOR)				13		73	
Lane Group Flow (vph)	90	473	913	50	39	73	
Turn Type	Perm	NA	NA	Perm	Perm	Perm	
Protected Phases		2	6				7
Permitted Phases	2			6	8	8	
Detector Phase	2	2	6	6	8	8	
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	1.0
Minimum Split (s)	36.3	36.3	36.3	36.3	23.8	23.8	5.0
Total Split (s)	56.0	56.0	56.0	56.0	24.0	24.0	5.0
Total Split (%)	65.9%	65.9%	65.9%	65.9%	28.2%	28.2%	6%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.5	3.5	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.8	6.8	
Lead/Lag					Lag	Lag	Lead
Lead-Lag Optimize?					Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	Ped
Act Effct Green (s)	57.5	57.5	57.5	57.5	12.8	12.8	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.15	0.15	
v/c Ratio	0.40	0.40	0.77	0.05	0.16	0.27	
Control Delay	13.5	7.6	18.3	5.7	31.3	10.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.5	7.6	18.3	5.7	31.3	10.3	
LOS	B	A	B	A	C	B	
Approach Delay		8.6	17.6		17.6		
Approach LOS		A	B		B		
Queue Length 50th (m)	8.0	42.2	89.5	1.8	5.8	0.0	
Queue Length 95th (m)	7.7	28.1	#205.3	6.6	13.2	10.4	
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0			10.0	40.0		
Base Capacity (vph)	224	1168	1179	965	332	333	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.40	0.40	0.77	0.05	0.12	0.22	

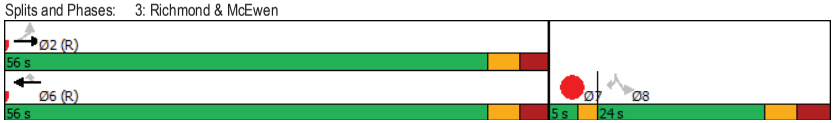
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 17 (20%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 14.5	Intersection LOS: B
Intersection Capacity Utilization 81.9%	ICU Level of Service D
Analysis Period (min) 15	

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

Splits and Phases: 3: Richmond & McEwen



Appendix D

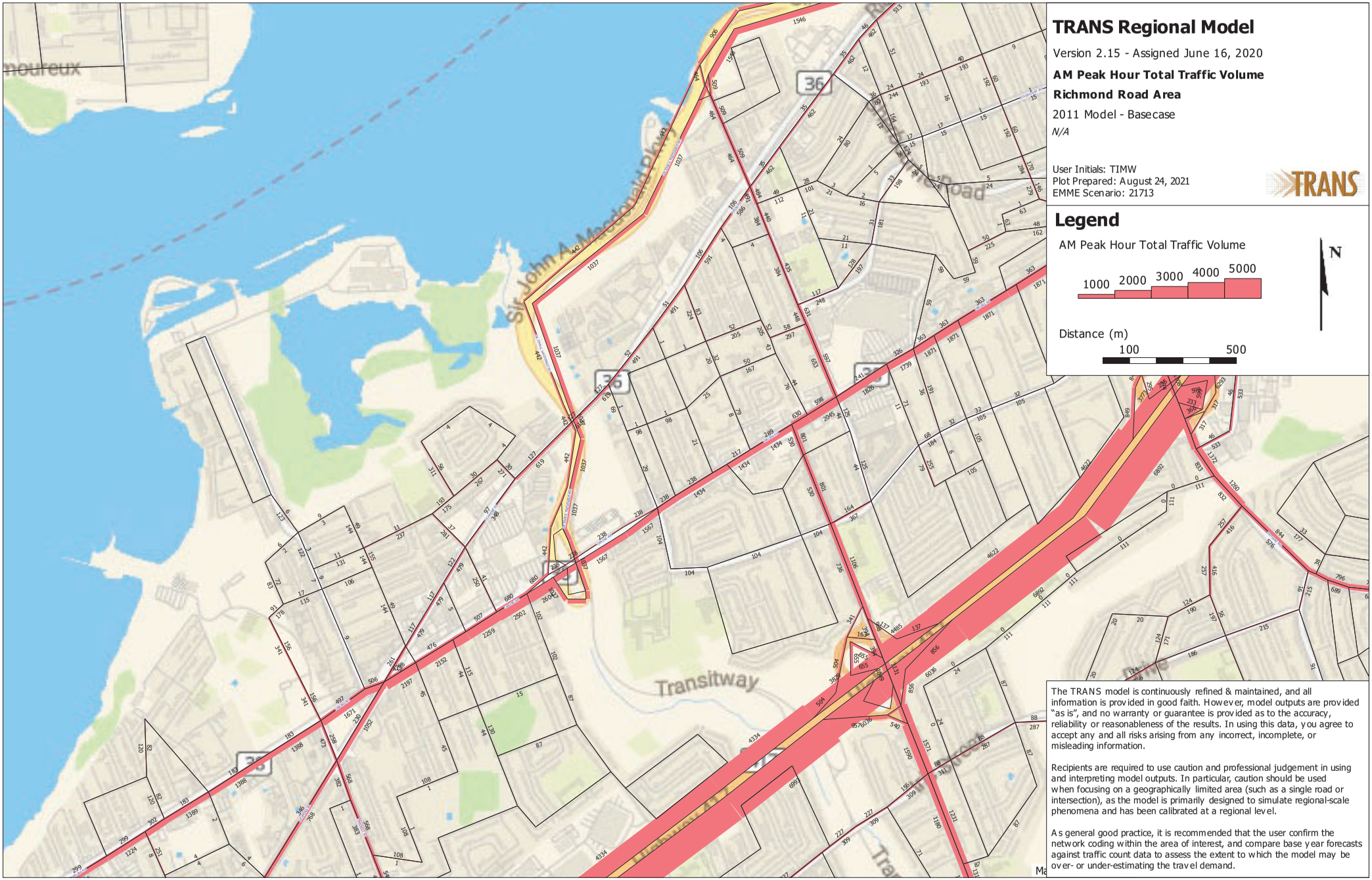
Collision Data

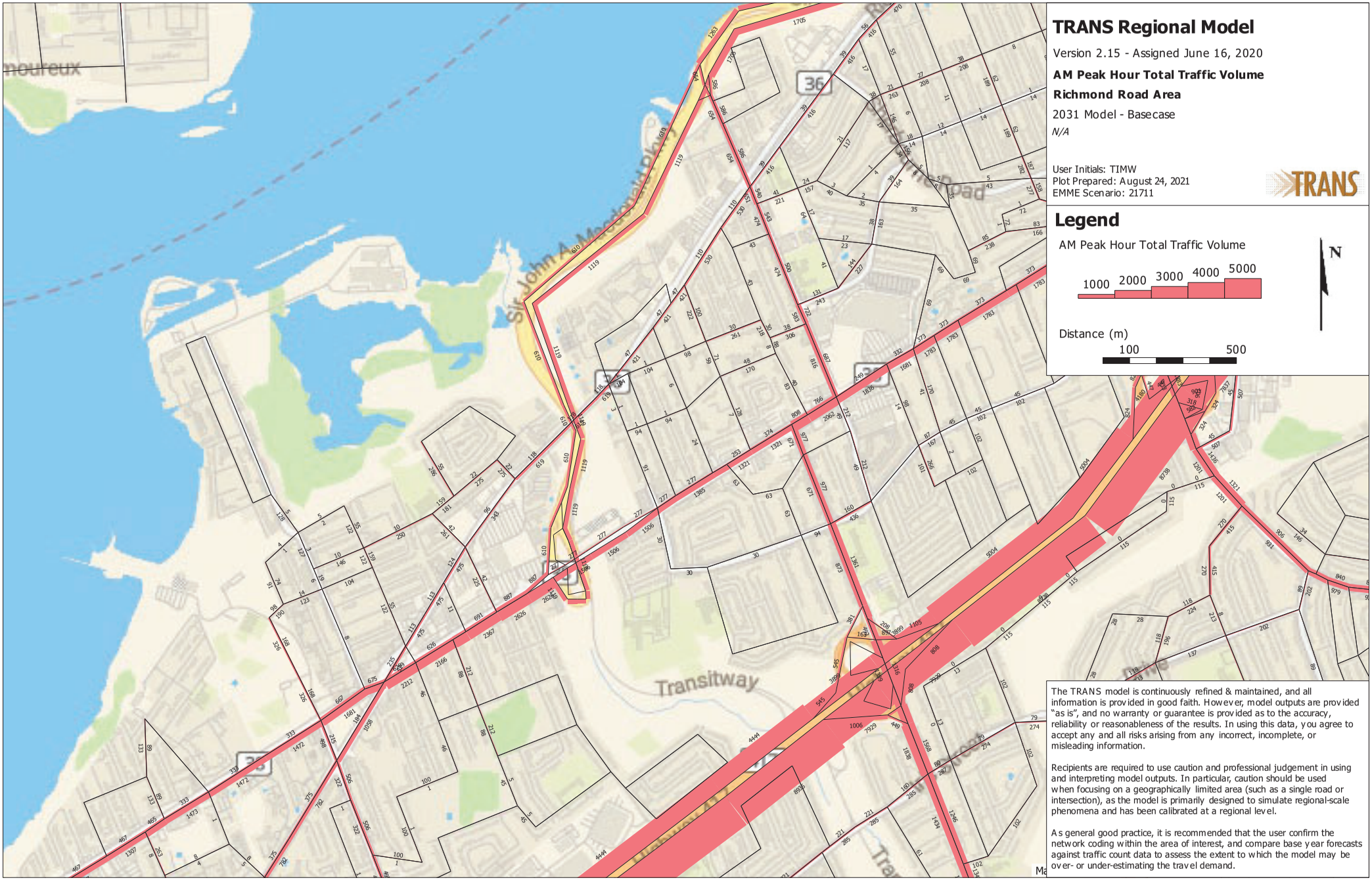
CGH TRANSPORTATION

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition
2015-01-15	2015	11:51	ASSALY RD @ REGINA ST	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	02 - Angle	05 - Packed snow
2017-04-26	2017	11:28	ASSALY RD @ REGINA ST	01 - Clear	01 - Daylight	02 - Stop sign		03 - P.D. only	04 - Sideswipe	01 - Dry
2015-01-06	2015	15:29	ASSALY RD @ RICHMOND RD	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	06 - Ice
2015-01-06	2015	18:24	ASSALY RD @ RICHMOND RD	03 - Snow	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	06 - Ice
2016-12-19	2016	12:57	ASSALY RD @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	06 - Ice
2017-02-21	2017	17:45	ASSALY RD @ RICHMOND RD	02 - Rain	07 - Dark	01 - Traffic signal		03 - P.D. only	06 - SMV unattended vehicle	02 - Wet
2017-08-20	2017	11:40	ASSALY RD @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2018-11-22	2018	18:05	ASSALY RD @ RICHMOND RD (0002682)	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2019-06-10	2019	15:30	ASSALY RD @ RICHMOND RD (0002682)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2019-08-21	2019	17:05	ASSALY RD @ RICHMOND RD (0002682)	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-10-11	2018	Unknown	ASSALY RD btwn REGINA LANE & RICHMOND RD (__3ZA5XK)	01 - Clear	00 - Unknown	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	01 - Dry
2018-11-12	2018	8:15	CROYDON AVE @ REGINA ST (0002786)	03 - Snow	01 - Daylight	02 - Stop sign		03 - P.D. only	03 - Rear end	06 - Ice
2015-02-05	2015	13:01	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2015-03-09	2015	15:15	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	99 - Other	01 - Dry
2015-07-04	2015	18:16	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-10-22	2015	16:50	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-12-05	2015	17:52	CROYDON AVE @ RICHMOND RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-02-17	2016	19:39	CROYDON AVE @ RICHMOND RD	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	06 - Ice
2016-03-17	2016	18:31	CROYDON AVE @ RICHMOND RD	01 - Clear	05 - Dusk	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2016-05-28	2016	14:02	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2016-09-01	2016	16:02	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-11-24	2016	19:13	CROYDON AVE @ RICHMOND RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-11-24	2016	9:00	CROYDON AVE @ RICHMOND RD	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	04 - Slush
2017-01-07	2017	14:21	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2017-07-21	2017	13:08	CROYDON AVE @ RICHMOND RD	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2017-10-24	2017	20:28	CROYDON AVE @ RICHMOND RD	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-04-24	2018	13:35	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-06-20	2018	21:30	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2018-06-21	2018	15:12	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-08-02	2018	15:32	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2018-08-06	2018	13:42	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2018-09-28	2018	17:15	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-10-25	2018	8:29	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-12-21	2018	5:34	CROYDON AVE @ RICHMOND RD (0002652)	02 - Rain	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	02 - Wet
2019-01-05	2019	23:40	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	07 - SMV other	02 - Wet
2019-02-12	2019	20:30	CROYDON AVE @ RICHMOND RD (0002652)	03 - Snow	07 - Dark	01 - Traffic signal		03 - P.D. only	02 - Angle	03 - Loose snow
2019-04-04	2019	18:47	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	01 - Dry
2019-10-23	2019	8:10	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2019-11-03	2019	21:25	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2019-11-29	2019	10:48	CROYDON AVE @ RICHMOND RD (0002652)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2016-11-18	2016	9:52	REGINA LANE @ RICHMOND RD	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	02 - Angle	01 - Dry
2015-02-20	2015	12:56	REGINA ST btwn LINCOLN HEIGHTS RD & ASSALY RD	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	04 - Sideswipe	01 - Dry
2018-04-18	2018	Unknown	REGINA ST btwn LINCOLN HEIGHTS RD & ASSALY RD (__3ZABY3)	01 - Clear	00 - Unknown	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	01 - Dry
2018-08-24	2018	Unknown	REGINA ST btwn LINCOLN HEIGHTS RD & ASSALY RD (__3ZABY3)	01 - Clear	00 - Unknown	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	01 - Dry
2019-04-12	2019	0:00	REGINA ST btwn LINCOLN HEIGHTS RD & ASSALY RD (__3ZABY3)	01 - Clear	00 - Unknown	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	01 - Dry
2017-03-17	2017	3:32	REGINA ST btwn LINCOLN HEIGHTS RD & END	03 - Snow	07 - Dark	10 - No control		02 - Non-fatal injury	07 - SMV other	02 - Wet
2015-03-06	2015	18:54	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2015-11-03	2015	8:20	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-06-28	2016	10:23	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-03-02	2017	18:44	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE	01 - Clear	05 - Dusk	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	01 - Dry
2018-05-31	2018	17:10	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE (0002352)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-09-22	2018	9:45	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE (0002352)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2019-01-02	2019	17:00	RICHMOND RD @ EDGEWORTH AVE/MCEWEN AVE (0002352)	01 - Clear	05 - Dusk	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2015-02-09	2015	15:23	RICHMOND RD btwn ASSALY RD & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	02 - Wet
2016-04-07	2016	14:08	RICHMOND RD btwn ASSALY RD & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	02 - Angle	01 - Dry
2017-05-11	2017	17:04	RICHMOND RD btwn ASSALY RD & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	05 - Turning movement	01 - Dry
2017-06-27	2017	20:30	RICHMOND RD btwn ASSALY RD & REGINA LANE	01 - Clear	05 - Dusk	10 - No control		03 - P.D. only	07 - SMV other	01 - Dry
2017-10-05	2017	16:30	RICHMOND RD btwn ASSALY RD & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	01 - Dry
2017-10-29	2017	10:32	RICHMOND RD btwn ASSALY RD & REGINA LANE	02 - Rain	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	02 - Wet
2015-06-09	2015	15:47	RICHMOND RD btwn CROYDON AVE & ASSALY RD	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2015-10-23	2015	16:56	RICHMOND RD btwn CROYDON AVE & ASSALY RD	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	01 - Dry
2015-12-24	2015	13:23	RICHMOND RD btwn CROYDON AVE & ASSALY RD	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	01 - Dry
2016-05-29	2016	1:11	RICHMOND RD btwn CROYDON AVE & ASSALY RD	01 - Clear	07 - Dark	10 - No control		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2017-03-02	2017	9:30	RICHMOND RD btwn CROYDON AVE & ASSALY RD	03 - Snow	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	02 - Wet
2017-06-21	2017	15:44	RICHMOND RD btwn CROYDON AVE & ASSALY RD	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	01 - Dry
2018-01-16	2018	19:59	RICHMOND RD btwn CROYDON AVE & ASSALY RD (__3ZA2XS)	03 - Snow	07 - Dark	10 - No control		03 - P.D. only	07 - SMV other	02 - Wet
2018-02-26	2018	14:22	RICHMOND RD btwn CROYDON AVE & ASSALY RD (__3ZA2XS)	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	04 - Sideswipe	01 - Dry
2018-04-30	2018	13:24	RICHMOND RD btwn CROYDON AVE & ASSALY RD (__3ZA2XS)	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	02 - Angle	01 - Dry
2018-11-15	2018	17:06	RICHMOND RD btwn CROYDON AVE & ASSALY RD (__3ZA2XS)	01 - Clear	07 - Dark	10 - No control		03 - P.D. only	02 - Angle	01 - Dry
2015-07-11	2015	23:12	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE	01 - Clear	07 - Dark	10 - No control		02 - Non-fatal injury	05 - Turning movement	01 - Dry
2016-04-11	2016	19:29	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE	01 - Clear	05 - Dusk	10 - No control		03 - P.D. only	05 - Turning movement	01 - Dry
2016-11-25	2016	19:01	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE	01 - Clear	07 - Dark	10 - No control		03 - P.D. only	06 - SMV unattended vehicle	02 - Wet
2017-04-27	2017	10:13	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	02 - Angle	01 - Dry
2017-12-14	2017	15:00	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE	01 - Clear	01 - Daylight	10 - No control		02 - Non-fatal injury	07 - SMV other	02 - Wet
2018-05-22	2018	17:42	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE (__3ZA4L9)	02 - Rain	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	02 - Wet
2018-10-25	2018	8:13	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE (__3ZA4L9)	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	01 - Dry
2018-12-24	2018	16:40	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE (__3ZA4L9)	01 - Clear	05 - Dusk	10 - No control		03 - P.D. only	05 - Turning movement	02 - Wet
2019-10-28	2019	8:02	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE (__3ZA4L9)	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	02 - Wet
2019-12-10	2019	8:43	RICHMOND RD btwn EDGEWORTH AVE/MCEWEN AVE & REGINA LANE (__3ZA4L9)	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	03 - Rear end	02 - Wet

Appendix E

TRANS Model Plots


TRANS Regional Model
Version 2.15 - Assigned June 16, 2020
AM Peak Hour Total Traffic Volume
Richmond Road Area
2011 Model - Basecase
N/A
User Initials: TIMW
Plot Prepared: August 24, 2021
EMME Scenario: 21713
TRANS
Legend
AM Peak Hour Total Traffic Volume
1000 2000 3000 4000 5000
Distance (m)
100 500
N
Sir John A. Macdonald Parkway
Richmond Road
Transitway
The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.
Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.
As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.


TRANS Regional Model
Version 2.15 - Assigned June 16, 2020
AM Peak Hour Total Traffic Volume
Richmond Road Area
2031 Model - Basecase
N/A
User Initials: TIMW
Plot Prepared: August 24, 2021
EMME Scenario: 21711
TRANS
Legend
AM Peak Hour Total Traffic Volume
1000 2000 3000 4000 5000
Distance (m)
100 500
N
Transitway
The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.
Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.
As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Appendix F

Background Development Volumes

CGH TRANSPORTATION

Figure 10: 2023 New Site-Generated Traffic

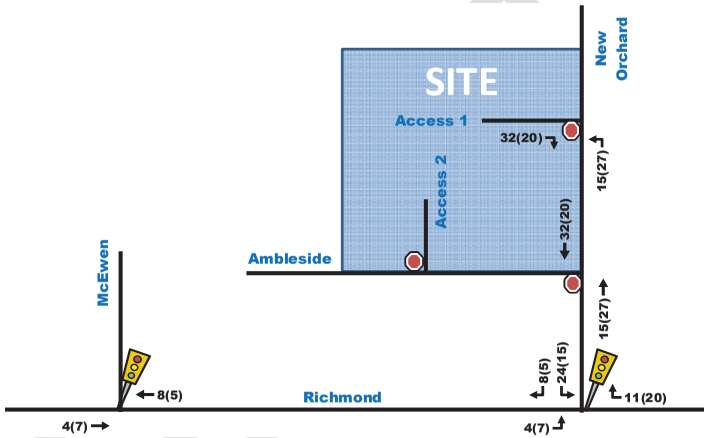
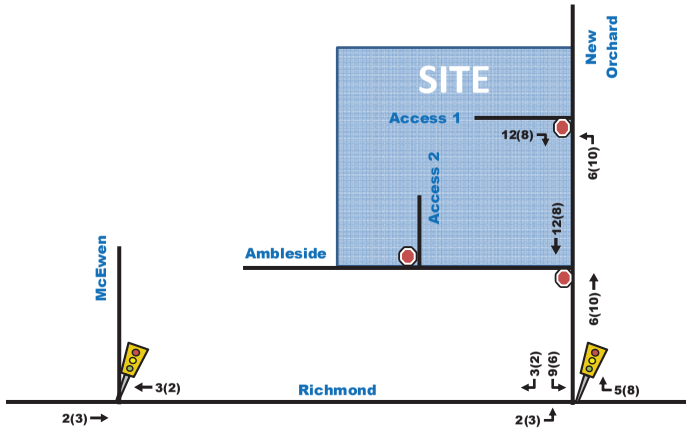
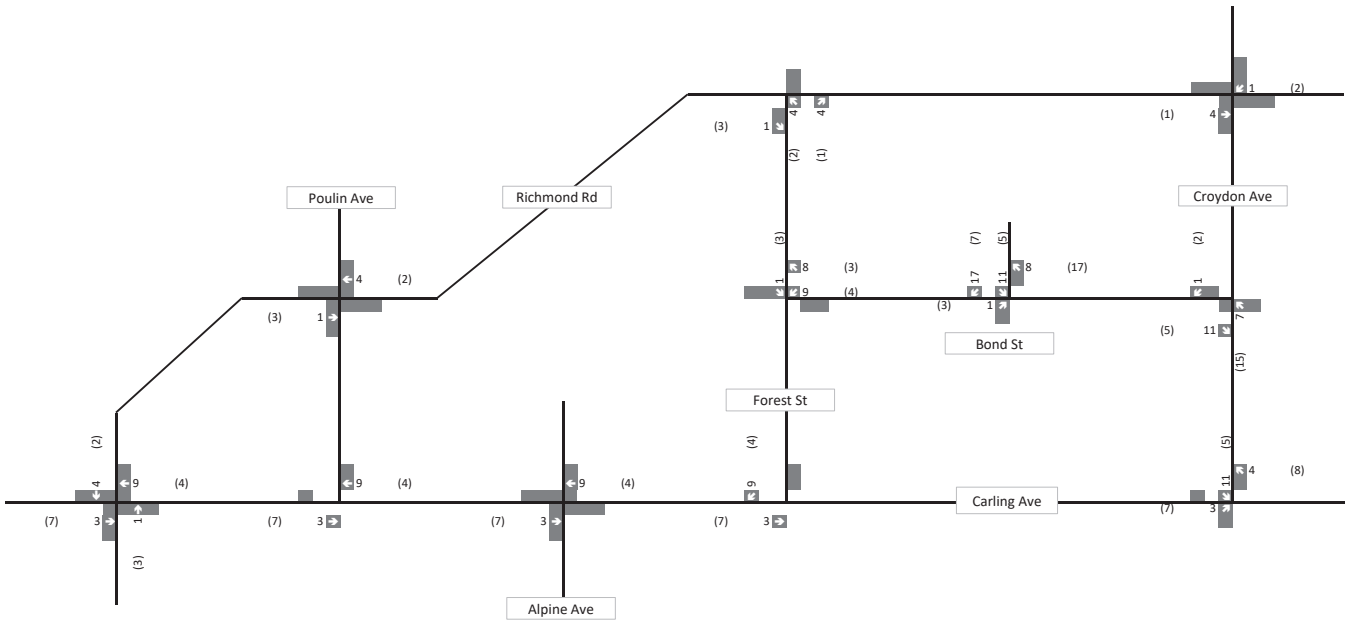


Figure 11: 2028 New Site-Generated Traffic Volumes





Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 6

Site Trips - Subject Site

Appendix G

Synchro Intersection Worksheets – 2026 Future Background Conditions

CGH TRANSPORTATION

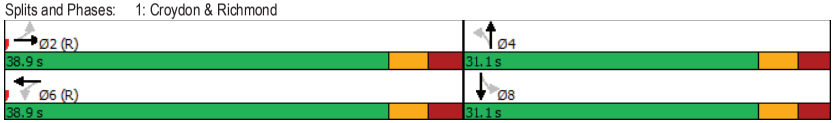
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	574	57	16	387	15	34	26	73	25	65	34
Future Volume (vph)	20	574	57	16	387	15	34	26	73	25	65	34
Satd. Flow (prot)	1610	1659	0	1658	1724	0	1398	1454	0	0	1619	0
Flt Permitted	0.498			0.325			0.746				0.925	
Satd. Flow (perm)	828	1659	0	563	1724	0	1060	1454	0	0	1497	0
Satd. Flow (RTOR)		10			4						30	
Lane Group Flow (vph)	20	631	0	16	402	0	34	99	0	0	124	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	38.9	38.9		38.9	38.9		31.1	31.1		31.1	31.1	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	43.0	43.0		43.0	43.0		19.0	19.0			19.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.27	0.27			0.27	
v/c Ratio	0.04	0.62		0.05	0.38		0.12	0.25			0.29	
Control Delay	10.6	17.1		9.2	12.9		16.9	19.2			15.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	10.6	17.1		9.2	12.9		16.9	19.2			15.0	
LOS	B	B		A	B		B	B			B	
Approach Delay		16.9			12.8			18.6			15.0	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	1.4	66.6		1.5	47.3		2.9	8.8			8.3	
Queue Length 95th (m)	4.8	#124.1		m3.4	77.5		8.4	18.5			19.0	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	508	1022		346	1060		378	519			553	
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	0.04	0.62		0.05	0.38		0.09	0.19			0.22	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 40 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	624	15	25	389	18	25	6	33	67	2	25
Future Volume (vph)	7	624	15	25	389	18	25	6	33	67	2	25
Satd. Flow (prot)	1658	1718	0	1409	1714	0	0	1677	1351	0	1612	0
Flt Permitted	0.514			0.357				0.715			0.769	
Satd. Flow (perm)	891	1718	0	528	1714	0	0	1241	1309	0	1274	0
Satd. Flow (RTOR)		2			4						25	
Lane Group Flow (vph)	7	639	0	25	407	0	0	31	33	0	94	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	36.7	36.7		36.7	36.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	52.4%	52.4%		52.4%	52.4%		47.6%	47.6%	47.6%	47.6%	47.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	48.3	48.3		48.3	48.3			13.6	13.6		13.6	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.19	0.19		0.19	
v/c Ratio	0.01	0.54		0.07	0.34			0.13	0.13		0.35	
Control Delay	4.4	9.1		4.4	4.2			21.6	21.6		20.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	4.4	9.1		4.4	4.2			21.6	21.6		20.6	
LOS	A	A		A	A			C	C		C	
Approach Delay		9.0			4.2			21.6			20.6	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	0.1	12.4		0.4	7.4			3.6	3.9		8.3	
Queue Length 95th (m)	m0.5	#138.6		m2.2	17.9			7.3	7.7		14.5	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	615	1186		364	1184			478	504		506	
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	0.54		0.07	0.34			0.06	0.07		0.19	

Intersection Summary

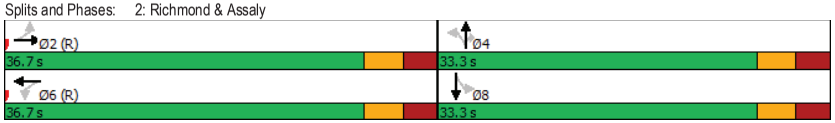
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 73.9%	ICU Level of Service D
Analysis Period (min) 15	

\# 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.

Splits and Phases: 2: Richmond & Assaly



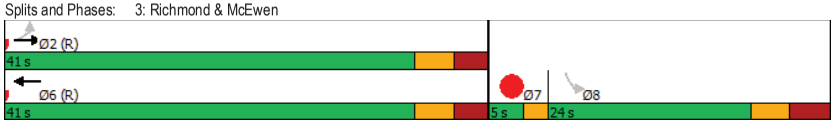
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	33	726	365	22	30	51	
Future Volume (vph)	33	726	365	22	30	51	
Satd. Flow (prot)	1595	1745	1678	0	1475	0	
Flt Permitted	0.512				0.982		
Satd. Flow (perm)	855	1745	1678	0	1475	0	
Satd. Flow (RTOR)			6		51		
Lane Group Flow (vph)	33	726	387	0	81	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	41.0	41.0	41.0		24.0		5.0
Total Split (%)	58.6%	58.6%	58.6%		34.3%		7%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	42.5	42.5	42.5		12.8		
Actuated g/C Ratio	0.61	0.61	0.61		0.18		
v/c Ratio	0.06	0.69	0.38		0.26		
Control Delay	5.5	15.4	10.4		13.3		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	5.5	15.4	10.4		13.3		
LOS	A	B	B		B		
Approach Delay		15.0	10.4		13.3		
Approach LOS		B	B		B		
Queue Length 50th (m)	1.2	76.0	23.0		3.5		
Queue Length 95th (m)	m1.4	#148.7	50.7		12.6		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	518	1058	1020		400		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.06	0.69	0.38		0.20		

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 38 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69
Intersection Signal Delay: 13.4 — Intersection LOS: B
Intersection Capacity Utilization 62.9% — ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Richmond & McEwen



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	471	82	56	827	16	118	89	33	13	56	18
Future Volume (vph)	23	471	82	56	827	16	118	89	33	13	56	18
Satd. Flow (prot)	1658	1676	0	1658	1737	0	1642	1616	0	0	1660	0
Flt Permitted	0.183			0.377			0.781				0.952	
Satd. Flow (perm)	319	1676	0	646	1737	0	1291	1616	0	0	1571	0
Satd. Flow (RTOR)		17			2						16	
Lane Group Flow (vph)	23	553	0	56	843	0	118	122	0	0	87	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	53.9	53.9		53.9	53.9		31.1	31.1		31.1	31.1	
Total Split (%)	63.4%	63.4%		63.4%	63.4%		36.6%	36.6%		36.6%	36.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	50.5	50.5		50.5	50.5		22.0	22.0			22.0	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.26	0.26			0.26	
v/c Ratio	0.12	0.55		0.15	0.82		0.35	0.29			0.21	
Control Delay	11.0	13.7		8.9	15.5		27.5	25.8			20.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.0	13.7		8.9	15.5		27.5	25.8			20.1	
LOS	B	B		A	B		C	C			C	
Approach Delay		13.6			15.1			26.6			20.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	1.7	52.9		1.3	30.5		14.8	15.0			8.5	
Queue Length 95th (m)	5.6	82.8		m4.9	#183.9		28.8	28.5			19.2	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	189	1002		384	1032		379	475			473	
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	0.12	0.55		0.15	0.82		0.31	0.26			0.18	

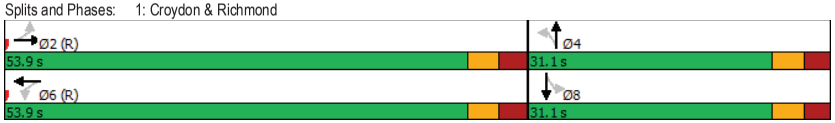
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 71 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 16.4	Intersection LOS: B
Intersection Capacity Utilization 79.4%	ICU Level of Service D
Analysis Period (min) 15	

\# 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.

Splits and Phases: 1: Croydon & Richmond



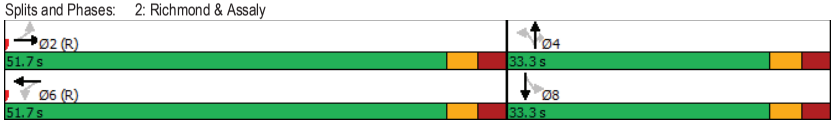
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	479	24	54	844	48	21	13	45	39	2	30
Future Volume (vph)	16	479	24	54	844	48	21	13	45	39	2	30
Satd. Flow (prot)	1658	1717	0	1551	1727	0	0	1455	1388	0	1568	0
Flt Permitted	0.214			0.443				0.804			0.813	
Satd. Flow (perm)	373	1717	0	716	1727	0	0	1194	1318	0	1290	0
Satd. Flow (RTOR)		5			5						30	
Lane Group Flow (vph)	16	503	0	54	892	0	0	34	45	0	71	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	51.7	51.7		51.7	51.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	60.8%	60.8%		60.8%	60.8%		39.2%	39.2%	39.2%	39.2%	39.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	60.1	60.1		60.1	60.1			16.8	16.8		16.8	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.20	0.20		0.20	
v/c Ratio	0.06	0.41		0.11	0.73			0.14	0.17		0.25	
Control Delay	14.0	12.0		2.7	11.2			25.6	26.3		18.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	14.0	12.0		2.7	11.2			25.6	26.3		18.2	
LOS	B	B		A	B			C	C		B	
Approach Delay		12.1			10.7			26.0			18.2	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	0.7	28.8		0.3	5.3			5.1	6.8		6.2	
Queue Length 95th (m)	m2.9	74.4		m2.3	m#224.4			10.2	12.6		13.9	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	263	1215		506	1223			379	418		430	
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	0.06	0.41		0.11	0.73			0.09	0.11		0.17	

Intersection Summary

Cycle Length: 85
Actuated Cycle Length: 85
Offset: 64 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73
Intersection Signal Delay: 12.2 Intersection LOS: B
Intersection Capacity Utilization 75.5% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	81	479	915	45	35	66	
Future Volume (vph)	81	479	915	45	35	66	
Satd. Flow (prot)	1658	1728	1731	0	1474	0	
Flt Permitted	0.164				0.983		
Satd. Flow (perm)	286	1728	1731	0	1474	0	
Satd. Flow (RTOR)			5		66		
Lane Group Flow (vph)	81	479	960	0	101	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	56.0	56.0	56.0		24.0		5.0
Total Split (%)	65.9%	65.9%	65.9%		28.2%		6%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	57.5	57.5	57.5		12.8		
Actuated g/C Ratio	0.68	0.68	0.68		0.15		
v/c Ratio	0.42	0.41	0.82		0.36		
Control Delay	15.0	7.3	20.8		17.0		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	15.0	7.3	20.8		17.0		
LOS	B	A	C		B		
Approach Delay		8.4	20.8		17.0		
Approach LOS		A	C		B		
Queue Length 50th (m)	7.2	42.1	100.1		5.2		
Queue Length 95th (m)	7.7	22.9	#224.6		17.4		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	193	1168	1171		350		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.42	0.41	0.82		0.29		

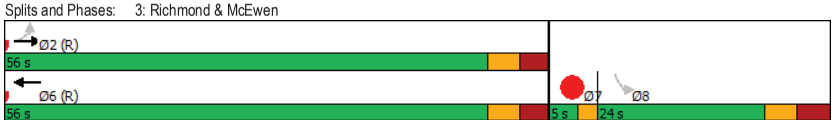
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 17 (20%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 16.3	Intersection LOS: B
Intersection Capacity Utilization 90.0%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 3: Richmond & McEwen



Appendix H

Synchro Intersection Worksheets – 2031 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	600	57	16	401	15	34	26	73	25	65	34
Future Volume (vph)	20	600	57	16	401	15	34	26	73	25	65	34
Satd. Flow (prot)	1610	1662	0	1658	1726	0	1398	1454	0	0	1619	0
Flt Permitted	0.487			0.307			0.746				0.925	
Satd. Flow (perm)	811	1662	0	532	1726	0	1060	1454	0	0	1497	0
Satd. Flow (RTOR)		9			4						30	
Lane Group Flow (vph)	20	657	0	16	416	0	34	99	0	0	124	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	38.9	38.9		38.9	38.9		31.1	31.1		31.1	31.1	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	43.0	43.0		43.0	43.0		19.0	19.0			19.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.27	0.27			0.27	
v/c Ratio	0.04	0.64		0.05	0.39		0.12	0.25			0.29	
Control Delay	10.6	17.9		9.2	13.1		16.9	19.2			15.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	10.6	17.9		9.2	13.1		16.9	19.2			15.0	
LOS	B	B		A	B		B	B			B	
Approach Delay		17.7			12.9			18.6			15.0	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	1.4	71.1		1.6	49.8		2.9	8.8			8.3	
Queue Length 95th (m)	4.8	#132.4		m3.3	80.0		8.4	18.5			19.0	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	498	1024		327	1061		378	519			553	
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	0.04	0.64		0.05	0.39		0.09	0.19			0.22	

Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 40 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

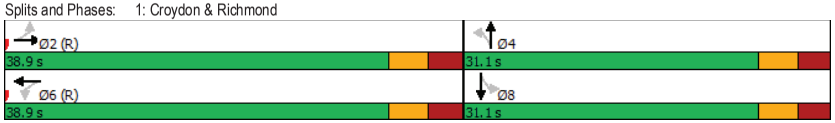
Maximum v/c Ratio: 0.64

Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 66.0%	ICU Level of Service C
Analysis Period (min) 15	

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	654	15	25	403	18	25	6	33	67	2	25
Future Volume (vph)	7	654	15	25	403	18	25	6	33	67	2	25
Satd. Flow (prot)	1658	1720	0	1409	1716	0	0	1677	1351	0	1612	0
Flt Permitted	0.504			0.339				0.715			0.769	
Satd. Flow (perm)	874	1720	0	501	1716	0	0	1241	1309	0	1274	0
Satd. Flow (RTOR)		2			4						25	
Lane Group Flow (vph)	7	669	0	25	421	0	0	31	33	0	94	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	36.7	36.7		36.7	36.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	52.4%	52.4%		52.4%	52.4%		47.6%	47.6%	47.6%	47.6%	47.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	48.3	48.3		48.3	48.3			13.6	13.6		13.6	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.19	0.19		0.19	
v/c Ratio	0.01	0.56		0.07	0.36			0.13	0.13		0.35	
Control Delay	4.3	9.5		4.4	4.3			21.6	21.6		20.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	4.3	9.5		4.4	4.3			21.6	21.6		20.6	
LOS	A	A		A	A			C	C		C	
Approach Delay		9.4			4.3			21.6			20.6	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	0.1	12.5		0.4	8.0			3.6	3.9		8.3	
Queue Length 95th (m)	m0.4	#148.7		m2.1	18.2			7.3	7.7		14.5	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	603	1188		346	1185			478	504		506	
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	0.56		0.07	0.36			0.06	0.07		0.19	

Intersection Summary

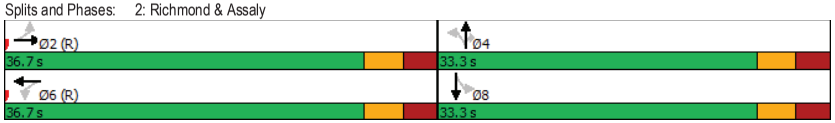
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 9.1	Intersection LOS: A
Intersection Capacity Utilization 75.6%	ICU Level of Service D
Analysis Period (min) 15	

\# 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.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	33	761	378	22	30	51	
Future Volume (vph)	33	761	378	22	30	51	
Satd. Flow (prot)	1595	1745	1680	0	1475	0	
Flt Permitted	0.501				0.982		
Satd. Flow (perm)	837	1745	1680	0	1475	0	
Satd. Flow (RTOR)			6		51		
Lane Group Flow (vph)	33	761	400	0	81	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	41.0	41.0	41.0		24.0		5.0
Total Split (%)	58.6%	58.6%	58.6%		34.3%		7%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	42.5	42.5	42.5		12.8		
Actuated g/C Ratio	0.61	0.61	0.61		0.18		
v/c Ratio	0.07	0.72	0.39		0.26		
Control Delay	5.3	16.4	10.6		13.3		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	5.3	16.4	10.6		13.3		
LOS	A	B	B		B		
Approach Delay		15.9	10.6		13.3		
Approach LOS		B	B		B		
Queue Length 50th (m)	1.2	83.3	24.1		3.5		
Queue Length 95th (m)	m1.4	#159.9	52.6		12.6		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	507	1058	1021		400		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.07	0.72	0.39		0.20		

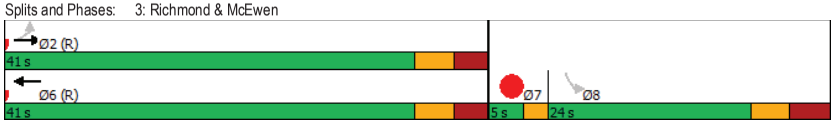
Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 38 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Richmond & McEwen



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	490	82	56	866	16	118	89	33	13	56	18
Future Volume (vph)	23	490	82	56	866	16	118	89	33	13	56	18
Satd. Flow (prot)	1658	1677	0	1658	1737	0	1642	1616	0	0	1660	0
Flt Permitted	0.158			0.363			0.781				0.952	
Satd. Flow (perm)	276	1677	0	623	1737	0	1291	1616	0	0	1571	0
Satd. Flow (RTOR)		16			2						16	
Lane Group Flow (vph)	23	572	0	56	882	0	118	122	0	0	87	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	53.9	53.9		53.9	53.9		31.1	31.1		31.1	31.1	
Total Split (%)	63.4%	63.4%		63.4%	63.4%		36.6%	36.6%		36.6%	36.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	50.5	50.5		50.5	50.5		22.0	22.0			22.0	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.26	0.26			0.26	
v/c Ratio	0.14	0.57		0.15	0.85		0.35	0.29			0.21	
Control Delay	11.8	14.2		8.9	17.2		27.5	25.8			20.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.8	14.2		8.9	17.2		27.5	25.8			20.1	
LOS	B	B		A	B		C	C			C	
Approach Delay		14.1			16.7			26.6			20.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	1.7	55.8		1.3	36.6		14.8	15.0			8.5	
Queue Length 95th (m)	5.9	86.9		m4.6	#197.3		28.8	28.5			19.2	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	164	1003		370	1032		379	475			473	
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	0.14	0.57		0.15	0.85		0.31	0.26			0.18	

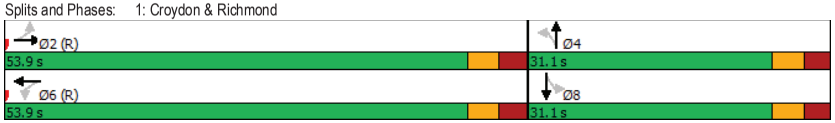
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 71 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 17.3	Intersection LOS: B
Intersection Capacity Utilization 79.4%	ICU Level of Service D
Analysis Period (min) 15	

\# 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.

Splits and Phases: 1: Croydon & Richmond



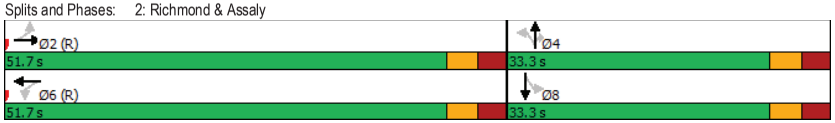
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	499	24	54	884	48	21	13	45	39	2	30
Future Volume (vph)	16	499	24	54	884	48	21	13	45	39	2	30
Satd. Flow (prot)	1658	1718	0	1551	1727	0	0	1455	1388	0	1568	0
Flt Permitted	0.192			0.430				0.804			0.813	
Satd. Flow (perm)	335	1718	0	696	1727	0	0	1194	1318	0	1290	0
Satd. Flow (RTOR)		4			5						30	
Lane Group Flow (vph)	16	523	0	54	932	0	0	34	45	0	71	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	51.7	51.7		51.7	51.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	60.8%	60.8%		60.8%	60.8%		39.2%	39.2%	39.2%	39.2%	39.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	60.1	60.1		60.1	60.1			16.8	16.8		16.8	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.20	0.20		0.20	
v/c Ratio	0.07	0.43		0.11	0.76			0.14	0.17		0.25	
Control Delay	14.6	12.6		2.7	12.1			25.6	26.3		18.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	14.6	12.6		2.7	12.1			25.6	26.3		18.2	
LOS	B	B		A	B			C	C		B	
Approach Delay		12.6			11.6			26.0			18.2	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	0.8	32.9		0.3	5.2			5.1	6.8		6.2	
Queue Length 95th (m)	m3.0	78.2		m2.2	m#225.5			10.2	12.6		13.9	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	236	1216		492	1223			379	418		430	
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	0.07	0.43		0.11	0.76			0.09	0.11		0.17	

Intersection Summary

Cycle Length: 85
Actuated Cycle Length: 85
Offset: 64 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 77.7% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	81	499	958	45	35	66	
Future Volume (vph)	81	499	958	45	35	66	
Satd. Flow (prot)	1658	1728	1731	0	1474	0	
Flt Permitted	0.139				0.983		
Satd. Flow (perm)	243	1728	1731	0	1474	0	
Satd. Flow (RTOR)			5		66		
Lane Group Flow (vph)	81	499	1003	0	101	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	56.0	56.0	56.0		24.0		5.0
Total Split (%)	65.9%	65.9%	65.9%		28.2%		6%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	57.5	57.5	57.5		12.8		
Actuated g/C Ratio	0.68	0.68	0.68		0.15		
v/c Ratio	0.49	0.43	0.86		0.36		
Control Delay	21.1	7.3	23.4		17.0		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	21.1	7.3	23.4		17.0		
LOS	C	A	C		B		
Approach Delay		9.2	23.4		17.0		
Approach LOS		A	C		B		
Queue Length 50th (m)	7.8	46.5	111.0		5.2		
Queue Length 95th (m)	#20.9	21.7	#240.4		17.4		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	164	1168	1171		350		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.49	0.43	0.86		0.29		

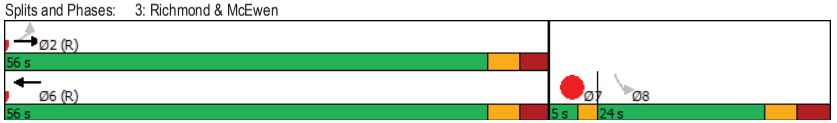
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 17 (20%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 18.1	Intersection LOS: B
Intersection Capacity Utilization 92.4%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 3: Richmond & McEwen



Appendix I

TDM Checklist

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

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

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

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

		TDM measures: *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)*	☑
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

		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)*	☑
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	☐
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)*	☐
	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)*	☑
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	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

Appendix J

Synchro Intersection Worksheets – 2026 Future Total Conditions

CGH TRANSPORTATION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	582	57	26	405	15	34	26	78	25	65	34
Future Volume (vph)	20	582	57	26	405	15	34	26	78	25	65	34
Satd. Flow (prot)	1610	1661	0	1658	1726	0	1398	1447	0	0	1618	0
Flt Permitted	0.484			0.320			0.746				0.924	
Satd. Flow (perm)	804	1661	0	554	1726	0	1059	1447	0	0	1495	0
Satd. Flow (RTOR)		9			4						30	
Lane Group Flow (vph)	20	639	0	26	420	0	34	104	0	0	124	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	38.9	38.9		38.9	38.9		31.1	31.1		31.1	31.1	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	43.0	43.0		43.0	43.0		19.0	19.0			19.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.27	0.27			0.27	
v/c Ratio	0.04	0.62		0.08	0.40		0.12	0.27			0.29	
Control Delay	10.7	17.3		9.0	12.2		16.9	19.4			15.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	10.7	17.3		9.0	12.2		16.9	19.4			15.1	
LOS	B	B		A	B		B	B			B	
Approach Delay		17.1			12.0			18.8			15.1	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	1.4	68.0		2.4	47.7		2.9	9.2			8.3	
Queue Length 95th (m)	4.8	#126.8		m5.7	77.3		8.4	19.3			19.0	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	494	1024		340	1061		378	516			553	
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	0.04	0.62		0.08	0.40		0.09	0.20			0.22	

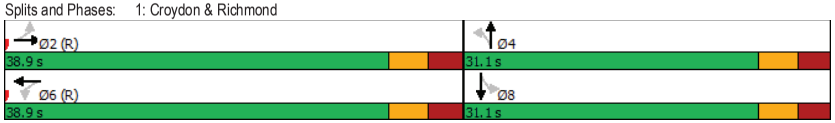
Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 40 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 15.4	Intersection LOS: B
Intersection Capacity Utilization 65.1%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



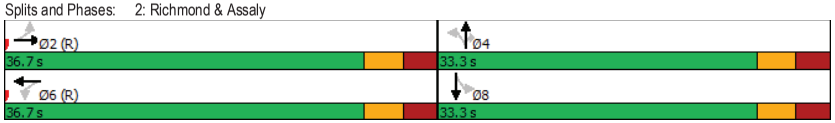
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	624	15	25	389	23	25	6	33	79	2	54
Future Volume (vph)	20	624	15	25	389	23	25	6	33	79	2	54
Satd. Flow (prot)	1658	1718	0	1409	1708	0	0	1677	1351	0	1565	0
Flt Permitted	0.498			0.335				0.728			0.802	
Satd. Flow (perm)	848	1718	0	493	1708	0	0	1240	1285	0	1270	0
Satd. Flow (RTOR)		2			5						54	
Lane Group Flow (vph)	20	639	0	25	412	0	0	31	33	0	135	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	36.7	36.7		36.7	36.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	52.4%	52.4%		52.4%	52.4%		47.6%	47.6%	47.6%	47.6%	47.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	45.1	45.1		45.1	45.1			16.8	16.8		16.8	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.24	0.24		0.24	
v/c Ratio	0.04	0.58		0.08	0.37			0.10	0.11		0.39	
Control Delay	5.5	11.9		5.4	5.2			17.6	17.6		15.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.5	11.9		5.4	5.2			17.6	17.6		15.1	
LOS	A	B		A	A			B	B		B	
Approach Delay		11.7			5.3			17.6			15.1	
Approach LOS		B			A			B			B	
Queue Length 50th (m)	0.4	12.8		0.4	7.5			3.6	3.9		9.9	
Queue Length 95th (m)	m1.1	#138.5		m2.0	17.8			7.3	7.7		17.7	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	546	1108		317	1102			478	495		523	
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	0.04	0.58		0.08	0.37			0.06	0.07		0.26	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58
Intersection Signal Delay: 10.2 — Intersection LOS: B
Intersection Capacity Utilization 84.4% — ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	33	738	370	22	30	51	
Future Volume (vph)	33	738	370	22	30	51	
Satd. Flow (prot)	1595	1745	1678	0	1479	0	
Flt Permitted	0.508				0.982		
Satd. Flow (perm)	847	1745	1678	0	1479	0	
Satd. Flow (RTOR)			6		51		
Lane Group Flow (vph)	33	738	392	0	81	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	41.0	41.0	41.0		24.0		5.0
Total Split (%)	58.6%	58.6%	58.6%		34.3%		7%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	42.5	42.5	42.5		12.8		
Actuated g/C Ratio	0.61	0.61	0.61		0.18		
v/c Ratio	0.06	0.70	0.38		0.26		
Control Delay	4.4	13.7	10.5		13.3		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	4.4	13.7	10.5		13.3		
LOS	A	B	B		B		
Approach Delay		13.3	10.5		13.3		
Approach LOS		B	B		B		
Queue Length 50th (m)	1.2	78.6	23.5		3.5		
Queue Length 95th (m)	m1.4	#152.4	51.5		12.6		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	513	1058	1020		401		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.06	0.70	0.38		0.20		

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 38 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

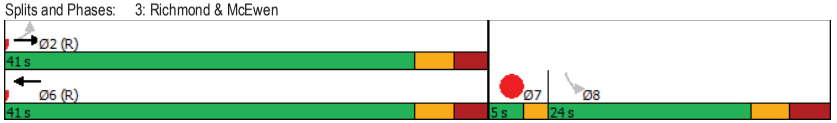
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 63.4%	ICU Level of Service B

Analysis Period (min) 15

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Richmond & McEwen



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	487	82	63	839	16	118	89	42	13	56	18
Future Volume (vph)	23	487	82	63	839	16	118	89	42	13	56	18
Satd. Flow (prot)	1658	1675	0	1658	1737	0	1642	1592	0	0	1660	0
Flt Permitted	0.176			0.365			0.781				0.951	
Satd. Flow (perm)	307	1675	0	625	1737	0	1289	1592	0	0	1569	0
Satd. Flow (RTOR)		16			2						16	
Lane Group Flow (vph)	23	569	0	63	855	0	118	131	0	0	87	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	53.9	53.9		53.9	53.9		31.1	31.1		31.1	31.1	
Total Split (%)	63.4%	63.4%		63.4%	63.4%		36.6%	36.6%		36.6%	36.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	50.5	50.5		50.5	50.5		22.0	22.0			22.0	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.26	0.26			0.26	
v/c Ratio	0.13	0.57		0.17	0.83		0.35	0.32			0.21	
Control Delay	11.2	14.1		11.3	27.9		27.5	26.3			20.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.2	14.1		11.3	27.9		27.5	26.3			20.1	
LOS	B	B		B	C		C	C			C	
Approach Delay		14.0			26.8			26.9			20.1	
Approach LOS		B			C			C			C	
Queue Length 50th (m)	1.7	55.5		5.8	151.6		14.8	16.3			8.5	
Queue Length 95th (m)	5.7	86.4		m8.2	#202.3		28.8	30.5			19.2	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	182	1001		371	1032		379	468			472	
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	0.13	0.57		0.17	0.83		0.31	0.28			0.18	

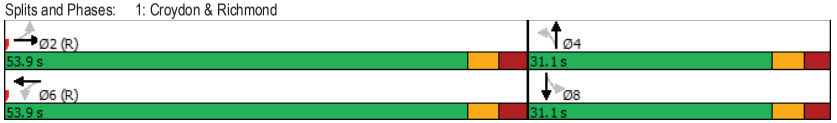
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 28 (33%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 22.4	Intersection LOS: C
Intersection Capacity Utilization 85.5%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



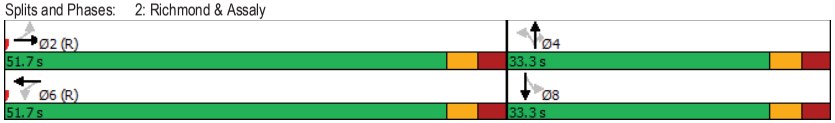
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	479	24	54	844	59	21	13	45	47	2	48
Future Volume (vph)	41	479	24	54	844	59	21	13	45	47	2	48
Satd. Flow (prot)	1658	1716	0	1551	1718	0	0	1455	1388	0	1522	0
Flt Permitted	0.180			0.429				0.811			0.838	
Satd. Flow (perm)	314	1716	0	690	1718	0	0	1182	1286	0	1275	0
Satd. Flow (RTOR)		5			6						48	
Lane Group Flow (vph)	41	503	0	54	903	0	0	34	45	0	97	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	51.7	51.7		51.7	51.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	60.8%	60.8%		60.8%	60.8%		39.2%	39.2%	39.2%	39.2%	39.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	56.7	56.7		56.7	56.7			20.2	20.2		20.2	
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.24	0.24		0.24	
v/c Ratio	0.20	0.44		0.12	0.79			0.12	0.15		0.29	
Control Delay	8.3	8.2		3.2	14.3			22.7	23.3		14.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	8.3	8.2		3.2	14.3			22.7	23.3		14.8	
LOS	A	A		A	B			C	C		B	
Approach Delay		8.2			13.6			23.0			14.8	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	2.9	61.0		1.7	160.8			3.9	5.1		5.6	
Queue Length 95th (m)	m5.7	96.8		m2.2	m#216.4			10.2	12.6		16.5	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	209	1146		460	1148			375	408		437	
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	0.20	0.44		0.12	0.79			0.09	0.11		0.22	

Intersection Summary

Cycle Length: 85
Actuated Cycle Length: 85
Offset: 64 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 81.1% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	81	487	926	45	35	66	
Future Volume (vph)	81	487	926	45	35	66	
Satd. Flow (prot)	1658	1728	1731	0	1464	0	
Flt Permitted	0.144				0.983		
Satd. Flow (perm)	251	1728	1731	0	1464	0	
Satd. Flow (RTOR)			5		66		
Lane Group Flow (vph)	81	487	971	0	101	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	56.0	56.0	56.0		24.0		5.0
Total Split (%)	65.9%	65.9%	65.9%		28.2%		6%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	56.1	56.1	56.1		14.2		
Actuated g/C Ratio	0.66	0.66	0.66		0.17		
v/c Ratio	0.49	0.43	0.85		0.34		
Control Delay	21.8	7.4	23.7		16.0		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	21.8	7.4	23.7		16.0		
LOS	C	A	C		B		
Approach Delay		9.5	23.7		16.0		
Approach LOS		A	C		B		
Queue Length 50th (m)	2.0	11.6	135.2		4.7		
Queue Length 95th (m)	#15.1	28.0	#228.8		17.4		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	165	1139	1143		348		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.49	0.43	0.85		0.29		

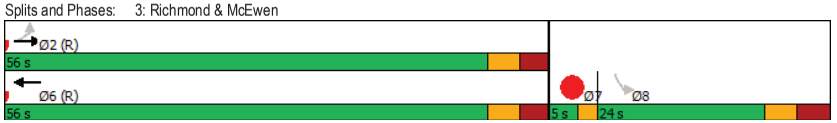
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 17 (20%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 18.3	Intersection LOS: B
Intersection Capacity Utilization 90.9%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 3: Richmond & McEwen



Appendix K

Synchro Intersection Worksheets – 2031 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	608	57	26	419	15	34	26	78	25	65	34
Future Volume (vph)	20	608	57	26	419	15	34	26	78	25	65	34
Satd. Flow (prot)	1610	1662	0	1658	1726	0	1398	1447	0	0	1618	0
Flt Permitted	0.473			0.301			0.746				0.924	
Satd. Flow (perm)	787	1662	0	521	1726	0	1059	1447	0	0	1495	0
Satd. Flow (RTOR)		9			3						30	
Lane Group Flow (vph)	20	665	0	26	434	0	34	104	0	0	124	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	38.9	38.9		38.9	38.9		31.1	31.1		31.1	31.1	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	43.0	43.0		43.0	43.0		19.0	19.0			19.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.27	0.27			0.27	
v/c Ratio	0.04	0.65		0.08	0.41		0.12	0.27			0.29	
Control Delay	10.7	18.2		9.1	12.4		16.9	19.4			15.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	10.7	18.2		9.1	12.4		16.9	19.4			15.1	
LOS	B	B		A	B		B	B			B	
Approach Delay		17.9			12.2			18.8			15.1	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	1.4	72.5		2.5	50.1		2.9	9.2			8.3	
Queue Length 95th (m)	4.8	#135.0		m5.5	79.9		8.4	19.3			19.0	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	483	1024		319	1061		378	516			553	
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	0.04	0.65		0.08	0.41		0.09	0.20			0.22	

Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 40 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

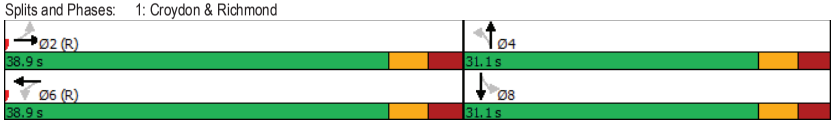
Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 66.6%	ICU Level of Service C
Analysis Period (min) 15	

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



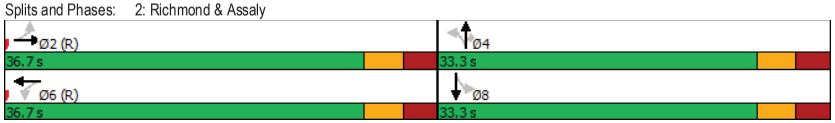
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	654	15	25	403	23	25	6	33	79	2	54
Future Volume (vph)	20	654	15	25	403	23	25	6	33	79	2	54
Satd. Flow (prot)	1658	1720	0	1409	1709	0	0	1677	1351	0	1565	0
Flt Permitted	0.488			0.315				0.728			0.802	
Satd. Flow (perm)	832	1720	0	464	1709	0	0	1240	1285	0	1270	0
Satd. Flow (RTOR)		2			5						54	
Lane Group Flow (vph)	20	669	0	25	426	0	0	31	33	0	135	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	36.7	36.7		36.7	36.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	52.4%	52.4%		52.4%	52.4%		47.6%	47.6%	47.6%	47.6%	47.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	45.1	45.1		45.1	45.1			16.8	16.8		16.8	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.24	0.24		0.24	
v/c Ratio	0.04	0.60		0.08	0.39			0.10	0.11		0.39	
Control Delay	5.3	12.5		5.4	5.3			17.6	17.6		15.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.3	12.5		5.4	5.3			17.6	17.6		15.1	
LOS	A	B		A	A			B	B		B	
Approach Delay		12.3			5.3			17.6			15.1	
Approach LOS		B			A			B			B	
Queue Length 50th (m)	0.4	13.0		0.4	8.1			3.6	3.9		9.9	
Queue Length 95th (m)	m1.0	#148.5		m2.0	18.2			7.3	7.7		17.7	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	536	1109		299	1103			478	495		523	
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	0.04	0.60		0.08	0.39			0.06	0.07		0.26	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60
Intersection Signal Delay: 10.5 — Intersection LOS: B
Intersection Capacity Utilization 86.1% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Richmond & Assaly



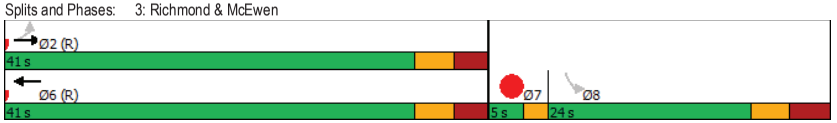
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	33	773	383	22	30	51	
Future Volume (vph)	33	773	383	22	30	51	
Satd. Flow (prot)	1595	1745	1680	0	1479	0	
Flt Permitted	0.497				0.982		
Satd. Flow (perm)	829	1745	1680	0	1479	0	
Satd. Flow (RTOR)			6		51		
Lane Group Flow (vph)	33	773	405	0	81	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	41.0	41.0	41.0		24.0		5.0
Total Split (%)	58.6%	58.6%	58.6%		34.3%		7%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	42.5	42.5	42.5		12.8		
Actuated g/C Ratio	0.61	0.61	0.61		0.18		
v/c Ratio	0.07	0.73	0.40		0.26		
Control Delay	4.3	14.9	10.6		13.3		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	4.3	14.9	10.6		13.3		
LOS	A	B	B		B		
Approach Delay		14.4	10.6		13.3		
Approach LOS		B	B		B		
Queue Length 50th (m)	1.2	86.3	24.4		3.5		
Queue Length 95th (m)	m1.4	#163.8	53.6		12.6		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	503	1058	1021		401		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.07	0.73	0.40		0.20		

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 38 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73
Intersection Signal Delay: 13.2 — Intersection LOS: B
Intersection Capacity Utilization 65.3% — ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Richmond & McEwen



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	506	82	63	878	16	118	89	42	13	56	18
Future Volume (vph)	23	506	82	63	878	16	118	89	42	13	56	18
Satd. Flow (prot)	1658	1678	0	1658	1737	0	1642	1592	0	0	1660	0
Flt Permitted	0.151			0.352			0.781				0.951	
Satd. Flow (perm)	264	1678	0	603	1737	0	1289	1592	0	0	1569	0
Satd. Flow (RTOR)		16			2						16	
Lane Group Flow (vph)	23	588	0	63	894	0	118	131	0	0	87	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		4	4		8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.4	26.4		26.4	26.4		31.1	31.1		31.1	31.1	
Total Split (s)	53.9	53.9		53.9	53.9		31.1	31.1		31.1	31.1	
Total Split (%)	63.4%	63.4%		63.4%	63.4%		36.6%	36.6%		36.6%	36.6%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3		3.3	3.3	
All-Red Time (s)	3.1	3.1		3.1	3.1		2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.4	6.4		6.4	6.4		6.1	6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Act Effct Green (s)	50.5	50.5		50.5	50.5		22.0	22.0			22.0	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.26	0.26			0.26	
v/c Ratio	0.15	0.59		0.18	0.87		0.35	0.32			0.21	
Control Delay	12.0	14.5		11.6	29.9		27.5	26.3			20.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	12.0	14.5		11.6	29.9		27.5	26.3			20.1	
LOS	B	B		B	C		C	C			C	
Approach Delay		14.4			28.7			26.9			20.1	
Approach LOS		B			C			C			C	
Queue Length 50th (m)	1.7	58.3		5.8	158.8		14.8	16.3			8.5	
Queue Length 95th (m)	6.0	91.0		m8.0	m#216.9		28.8	30.5			19.2	
Internal Link Dist (m)		558.1			298.5			223.2			148.4	
Turn Bay Length (m)	45.0			40.0			30.0					
Base Capacity (vph)	156	1003		357	1032		379	468			472	
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	0.15	0.59		0.18	0.87		0.31	0.28			0.18	

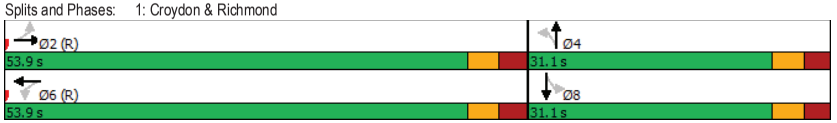
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 28 (33%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 23.5	Intersection LOS: C
Intersection Capacity Utilization 85.5%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Croydon & Richmond



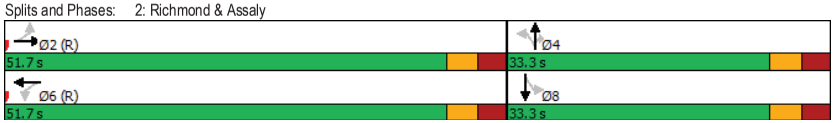
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	499	24	54	884	59	21	13	45	47	2	48
Future Volume (vph)	41	499	24	54	884	59	21	13	45	47	2	48
Satd. Flow (prot)	1658	1716	0	1551	1720	0	0	1455	1388	0	1522	0
Flt Permitted	0.156			0.415				0.811			0.838	
Satd. Flow (perm)	272	1716	0	668	1720	0	0	1182	1286	0	1275	0
Satd. Flow (RTOR)		4			6						48	
Lane Group Flow (vph)	41	523	0	54	943	0	0	34	45	0	97	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	30.3	30.3		30.3	30.3		33.3	33.3	33.3	33.3	33.3	
Total Split (s)	51.7	51.7		51.7	51.7		33.3	33.3	33.3	33.3	33.3	
Total Split (%)	60.8%	60.8%		60.8%	60.8%		39.2%	39.2%	39.2%	39.2%	39.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	6.3	6.3		6.3	6.3			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)	56.7	56.7		56.7	56.7			20.2	20.2		20.2	
Actuated g/C Ratio	0.67	0.67		0.67	0.67			0.24	0.24		0.24	
v/c Ratio	0.23	0.46		0.12	0.82			0.12	0.15		0.29	
Control Delay	9.5	8.4		3.1	15.4			22.7	23.3		14.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	9.5	8.4		3.1	15.4			22.7	23.3		14.8	
LOS	A	A		A	B			C	C		B	
Approach Delay		8.4			14.7			23.0			14.8	
Approach LOS		A			B			C			B	
Queue Length 50th (m)	3.0	64.7		1.5	~172.5			3.9	5.1		5.6	
Queue Length 95th (m)	m5.8	102.3		m2.1	m#217.4			10.2	12.6		16.5	
Internal Link Dist (m)		298.5			472.9			123.5			78.3	
Turn Bay Length (m)	215.0			45.0					20.0			
Base Capacity (vph)	181	1146		445	1149			375	408		437	
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	0.23	0.46		0.12	0.82			0.09	0.11		0.22	

Intersection Summary

Cycle Length: 85
Actuated Cycle Length: 85
Offset: 64 (75%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82
Intersection Signal Delay: 13.1 Intersection LOS: B
Intersection Capacity Utilization 83.3% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Richmond & Assaly



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø7
Lane Configurations							
Traffic Volume (vph)	81	507	969	45	35	66	
Future Volume (vph)	81	507	969	45	35	66	
Satd. Flow (prot)	1658	1728	1731	0	1464	0	
Flt Permitted	0.119				0.983		
Satd. Flow (perm)	208	1728	1731	0	1464	0	
Satd. Flow (RTOR)			5		66		
Lane Group Flow (vph)	81	507	1014	0	101	0	
Turn Type	Perm	NA	NA		Perm		
Protected Phases		2	6				7
Permitted Phases	2				8		
Detector Phase	2	2	6		8		
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0		10.0		1.0
Minimum Split (s)	36.3	36.3	36.3		23.8		5.0
Total Split (s)	56.0	56.0	56.0		24.0		5.0
Total Split (%)	65.9%	65.9%	65.9%		28.2%		6%
Yellow Time (s)	3.3	3.3	3.3		3.3		2.0
All-Red Time (s)	3.0	3.0	3.0		3.5		0.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		
Total Lost Time (s)	6.3	6.3	6.3		6.8		
Lead/Lag					Lag		Lead
Lead-Lag Optimize?					Yes		Yes
Recall Mode	C-Max	C-Max	C-Max		None		Ped
Act Effct Green (s)	56.1	56.1	56.1		14.2		
Actuated g/C Ratio	0.66	0.66	0.66		0.17		
v/c Ratio	0.59	0.45	0.89		0.34		
Control Delay	32.6	7.4	27.0		16.0		
Queue Delay	0.0	0.0	0.0		0.0		
Total Delay	32.6	7.4	27.0		16.0		
LOS	C	A	C		B		
Approach Delay		10.9	27.0		16.0		
Approach LOS		B	C		B		
Queue Length 50th (m)	4.1	11.6	149.8		4.7		
Queue Length 95th (m)	#21.3	27.7	#244.6		17.4		
Internal Link Dist (m)		472.9	376.1		243.1		
Turn Bay Length (m)	50.0				40.0		
Base Capacity (vph)	137	1139	1143		348		
Starvation Cap Reductn	0	0	0		0		
Spillback Cap Reductn	0	0	0		0		
Storage Cap Reductn	0	0	0		0		
Reduced v/c Ratio	0.59	0.45	0.89		0.29		

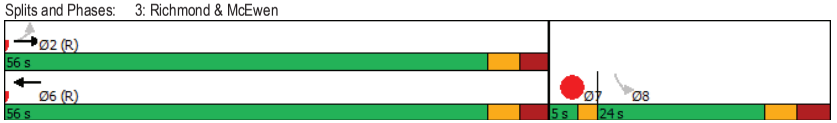
Intersection Summary
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 17 (20%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 93.3%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 3: Richmond & McEwen



Appendix L

SimTraffic Worksheets

SimTraffic Simulation Summary - Existing AM

10-20-2022

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	756	755	732	745
Vehs Exited	748	769	752	756
Starting Vehs	51	58	67	56
Ending Vehs	59	44	47	48
Travel Distance (km)	1010	1025	1005	1013
Travel Time (hr)	27.2	28.2	27.5	27.6
Total Delay (hr)	6.2	6.9	6.7	6.6
Total Stops	629	730	705	686
Fuel Used (l)	80.1	81.9	80.1	80.7

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	756	755	732	745
Vehs Exited	748	769	752	756
Starting Vehs	51	58	67	56
Ending Vehs	59	44	47	48
Travel Distance (km)	1010	1025	1005	1013
Travel Time (hr)	27.2	28.2	27.5	27.6
Total Delay (hr)	6.2	6.9	6.7	6.6
Total Stops	629	730	705	686
Fuel Used (l)	80.1	81.9	80.1	80.7

Queuing and Blocking Report - Existing AM

10-20-2022

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	25.3	97.9	9.8	59.4	23.1	25.6	27.8
Average Queue (m)	4.3	54.2	3.1	33.8	6.6	8.1	12.2
95th Queue (m)	18.9	86.5	9.7	57.2	17.3	21.4	24.4
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		10		3	0	0	
Queuing Penalty (veh)		2		0	0	0	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	8.5	62.8	17.6	42.0	15.2	23.0	24.2
Average Queue (m)	1.1	22.7	4.7	16.5	6.9	8.1	12.9
95th Queue (m)	5.9	48.1	14.4	37.6	15.7	20.3	23.3
Link Distance (m)		304.9		479.6	138.4		93.4
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)				1	0	2	
Queuing Penalty (veh)				0	0	1	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (m)	19.4	56.4	41.8	13.3	12.6	11.6
Average Queue (m)	4.5	25.1	18.8	2.4	4.4	1.3
95th Queue (m)	14.4	49.0	38.6	10.1	11.6	6.4
Link Distance (m)		479.6	381.9			245.9
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	50.0			10.0	40.0	
Storage Blk Time (%)		1	17	1		
Queuing Penalty (veh)		0	4	3		

Network Summary

Network wide Queuing Penalty: 10

SimTraffic Simulation Summary - Existing PM

10-20-2022

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	994	899	983	958
Vehs Exited	1009	889	1000	965
Starting Vehs	86	76	92	85
Ending Vehs	71	86	75	74
Travel Distance (km)	1332	1213	1349	1298
Travel Time (hr)	39.6	34.4	41.2	38.4
Total Delay (hr)	12.0	9.2	13.5	11.5
Total Stops	1010	852	1049	972
Fuel Used (l)	109.1	96.8	111.5	105.8

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	994	899	983	958
Vehs Exited	1009	889	1000	965
Starting Vehs	86	76	92	85
Ending Vehs	71	86	75	74
Travel Distance (km)	1332	1213	1349	1298
Travel Time (hr)	39.6	34.4	41.2	38.4
Total Delay (hr)	12.0	9.2	13.5	11.5
Total Stops	1010	852	1049	972
Fuel Used (l)	109.1	96.8	111.5	105.8

Queuing and Blocking Report - Existing PM

10-20-2022

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	13.8	67.4	40.9	93.4	31.7	18.2	25.7
Average Queue (m)	3.9	35.7	9.3	51.2	15.8	8.3	10.8
95th Queue (m)	11.4	65.4	27.8	86.9	30.0	18.7	22.5
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		3		16	2	0	
Queuing Penalty (veh)		1		9	3	0	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	13.4	71.0	34.7	100.6	24.8	31.1	24.6
Average Queue (m)	3.9	36.3	8.0	33.6	8.1	12.0	12.7
95th Queue (m)	12.2	68.2	24.7	83.0	21.9	26.5	26.4
Link Distance (m)		304.9		479.6	138.4		93.4
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)				4	2	4	
Queuing Penalty (veh)				2	1	2	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (m)	40.4	66.3	144.1	24.9	12.4	11.5
Average Queue (m)	19.4	25.8	71.1	6.2	4.1	3.2
95th Queue (m)	45.4	58.5	135.2	21.8	10.3	10.4
Link Distance (m)		479.6	381.9			245.9
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	50.0			10.0	40.0	
Storage Blk Time (%)	6	0	29	1		
Queuing Penalty (veh)	27	0	13	10		

Network Summary

Network wide Queuing Penalty: 67

SimTraffic Simulation Summary
Future Background 2031

10-17-2022

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	794	846	770	804
Vehs Exited	803	852	761	805
Starting Vehs	65	63	55	60
Ending Vehs	56	57	64	57
Travel Distance (km)	1093	1152	1051	1099
Travel Time (hr)	29.7	31.5	28.8	30.0
Total Delay (hr)	7.1	7.8	7.1	7.3
Total Stops	708	774	694	727
Fuel Used (l)	85.7	90.1	82.3	86.0

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	794	846	770	804
Vehs Exited	803	852	761	805
Starting Vehs	65	63	55	60
Ending Vehs	56	57	64	57
Travel Distance (km)	1093	1152	1051	1099
Travel Time (hr)	29.7	31.5	28.8	30.0
Total Delay (hr)	7.1	7.8	7.1	7.3
Total Stops	708	774	694	727
Fuel Used (l)	85.7	90.1	82.3	86.0

Queuing and Blocking Report
Future Background 2031 - AM

10-17-2022

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	16.5	102.3	16.6	61.0	16.6	24.8	34.4
Average Queue (m)	3.7	63.1	4.5	33.6	5.0	7.8	12.9
95th Queue (m)	11.7	102.3	13.6	54.5	14.4	20.5	27.0
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		13		3		0	
Queuing Penalty (veh)		3		0		0	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	5.6	66.7	20.7	36.4	10.8	22.8	32.4
Average Queue (m)	0.7	25.6	6.1	14.3	5.7	8.7	16.3
95th Queue (m)	4.2	58.0	16.6	32.0	13.1	21.8	28.8
Link Distance (m)		304.9		483.0	138.4		93.4
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)				0	0	3	
Queuing Penalty (veh)				0	0	1	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	13.0	65.4	46.2	18.9
Average Queue (m)	4.4	27.3	21.9	7.7
95th Queue (m)	12.5	60.7	42.8	18.2
Link Distance (m)		483.0	384.3	249.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	50.0			
Storage Blk Time (%)		1		
Queuing Penalty (veh)		0		

Network Summary

Network wide Queuing Penalty: 4

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1112	1114	1080	1102
Vehs Exited	1115	1038	959	1037
Starting Vehs	129	125	99	118
Ending Vehs	126	201	220	183
Travel Distance (km)	1533	1482	1409	1475
Travel Time (hr)	66.9	75.7	83.0	75.2
Total Delay (hr)	35.3	45.2	54.0	44.8
Total Stops	2157	1917	2036	2039
Fuel Used (l)	142.8	146.8	149.8	146.5

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	1112	1114	1080	1102
Vehs Exited	1115	1038	959	1037
Starting Vehs	129	125	99	118
Ending Vehs	126	201	220	183
Travel Distance (km)	1533	1482	1409	1475
Travel Time (hr)	66.9	75.7	83.0	75.2
Total Delay (hr)	35.3	45.2	54.0	44.8
Total Stops	2157	1917	2036	2039
Fuel Used (l)	142.8	146.8	149.8	146.5

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	29.4	109.2	55.0	166.3	38.4	34.0	32.4
Average Queue (m)	5.0	50.5	22.0	97.4	14.0	11.3	10.7
95th Queue (m)	20.2	89.8	57.3	165.7	31.5	28.2	26.5
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		10		37	2	1	
Queuing Penalty (veh)		2		21	3	1	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	12.6	236.7	46.5	267.9	30.6	26.2	39.2
Average Queue (m)	4.5	83.9	13.4	120.7	10.9	9.1	15.1
95th Queue (m)	11.9	203.5	44.1	299.5	26.9	22.9	33.9
Link Distance (m)		304.9		483.0	138.4		93.4
Upstream Blk Time (%)		2					
Queuing Penalty (veh)		12					
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)		6		21	5	3	
Queuing Penalty (veh)		1		12	2	1	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	64.8	460.2	229.6	31.0
Average Queue (m)	58.9	314.1	147.2	12.1
95th Queue (m)	78.7	592.6	265.4	26.5
Link Distance (m)		483.0	384.3	249.9
Upstream Blk Time (%)		14		
Queuing Penalty (veh)		81		
Storage Bay Dist (m)	50.0			
Storage Blk Time (%)	82	5		
Queuing Penalty (veh)	409	4		

Network Summary

Network wide Queuing Penalty: 549

SimTraffic Simulation Summary
Future Total 2031 - AM
10-17-2022

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	857	861	812	844
Vehs Exited	842	859	811	836
Starting Vehs	51	72	71	63
Ending Vehs	66	74	72	70
Travel Distance (km)	1133	1151	1106	1130
Travel Time (hr)	32.2	32.2	30.8	31.7
Total Delay (hr)	8.9	8.4	7.9	8.4
Total Stops	870	834	795	834
Fuel Used (l)	92.5	90.9	88.9	90.8

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	857	861	812	844
Vehs Exited	842	859	811	836
Starting Vehs	51	72	71	63
Ending Vehs	66	74	72	70
Travel Distance (km)	1133	1151	1106	1130
Travel Time (hr)	32.2	32.2	30.8	31.7
Total Delay (hr)	8.9	8.4	7.9	8.4
Total Stops	870	834	795	834
Fuel Used (l)	92.5	90.9	88.9	90.8

Queuing and Blocking Report
Future Total 2031 - AM
10-17-2022

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	27.2	102.2	14.3	64.1	16.2	18.3	24.0
Average Queue (m)	3.6	66.0	4.5	32.2	5.4	5.9	12.9
95th Queue (m)	18.7	104.0	12.4	59.1	14.4	16.4	24.2
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		17		3		0	
Queuing Penalty (veh)		3		1		0	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	8.6	67.3	19.7	48.8	21.1	16.8	42.4
Average Queue (m)	3.1	29.9	5.7	22.9	5.7	7.2	21.1
95th Queue (m)	9.7	62.0	16.7	47.6	17.2	18.2	38.2
Link Distance (m)		304.9		483.0	138.4		93.4
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)				1	1	1	
Queuing Penalty (veh)				0	0	0	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	11.3	63.0	54.9	18.6
Average Queue (m)	4.5	31.1	26.7	6.8
95th Queue (m)	12.2	60.3	55.0	15.2
Link Distance (m)		483.0	384.3	249.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	50.0			
Storage Blk Time (%)		1		
Queuing Penalty (veh)		0		

Network Summary

Network wide Queuing Penalty: 6

SimTraffic Simulation Summary
Future Total 2031 - PM
10-17-2022

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	6:45	6:45	6:45	6:45
End Time	7:45	7:45	7:45	7:45
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1111	1082	1115	1103
Vehs Exited	1153	996	1175	1108
Starting Vehs	158	210	167	177
Ending Vehs	116	296	107	171
Travel Distance (km)	1529	1382	1563	1491
Travel Time (hr)	68.7	136.2	61.3	88.7
Total Delay (hr)	37.2	107.7	29.1	58.0
Total Stops	2206	2908	1955	2356
Fuel Used (l)	143.6	191.7	140.3	158.5

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	7:15
End Time	7:45
Total Time (min)	30

Volumes adjusted by Growth Factors.

Run Number	1	2	3	Avg
Vehs Entered	1111	1082	1115	1103
Vehs Exited	1153	996	1175	1108
Starting Vehs	158	210	167	177
Ending Vehs	116	296	107	171
Travel Distance (km)	1529	1382	1563	1491
Travel Time (hr)	68.7	136.2	61.3	88.7
Total Delay (hr)	37.2	107.7	29.1	58.0
Total Stops	2206	2908	1955	2356
Fuel Used (l)	143.6	191.7	140.3	158.5

Queuing and Blocking Report
Future Total 2031 - PM
10-17-2022

Intersection: 1: Croydon & Richmond

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	LTR
Maximum Queue (m)	42.9	253.6	54.9	201.3	35.1	42.3	26.2
Average Queue (m)	6.3	87.6	18.8	132.2	17.0	17.3	11.4
95th Queue (m)	30.0	289.4	51.7	236.0	34.3	39.8	23.6
Link Distance (m)		565.6		304.9		230.4	162.1
Upstream Blk Time (%)		1					
Queuing Penalty (veh)		0					
Storage Bay Dist (m)	45.0		40.0		30.0		
Storage Blk Time (%)		16		27	3	2	
Queuing Penalty (veh)		4		17	4	3	

Intersection: 2: Richmond & Assaly

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	LT	R	LTR
Maximum Queue (m)	124.5	139.1	59.8	375.2	31.2	25.6	30.1
Average Queue (m)	46.6	73.4	19.5	255.9	7.8	10.5	15.3
95th Queue (m)	136.2	241.6	58.4	480.1	22.3	22.3	28.8
Link Distance (m)		304.9		483.0	138.4		93.4
Upstream Blk Time (%)		7		0			
Queuing Penalty (veh)		40		0			
Storage Bay Dist (m)	215.0		45.0			20.0	
Storage Blk Time (%)		13		35	2	3	
Queuing Penalty (veh)		5		19	1	1	

Intersection: 3: Richmond & McEwen

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	64.8	316.5	283.3	28.8
Average Queue (m)	50.5	209.2	209.4	11.8
95th Queue (m)	82.5	529.9	434.5	24.7
Link Distance (m)		483.0	384.3	249.9
Upstream Blk Time (%)		10	25	
Queuing Penalty (veh)		58	0	
Storage Bay Dist (m)	50.0			
Storage Blk Time (%)	58	4		
Queuing Penalty (veh)	295	3		

Network Summary

Network wide Queuing Penalty: 450

Appendix M

MMLOS Analysis

CGH TRANSPORTATION

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc.**	**Project**	**2021-057**
Scenario	**Future Conditions**	**Date**	**2022-04-13**
Comments			

INTERSECTIONS		Richmond @ Croydon				Richmond @ Assaly				Richmond @ McEwen			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	3	5	4	5	4	5	5	5	3		4	4
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive		Permissive	No left turn / Prohib.
	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		No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR prohibited		RTOR allowed	RTOR prohibited
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No		Yes	Yes
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel		No Right Turn	No Channel
	Corner Radius	5-10m	5-10m	10-15m	3-5m	5-10m	5-10m	10-15m	5-10m	10-15m		No Right Turn	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	Zebra stripe hi-vis markings		Zebra stripe hi-vis markings	Zebra stripe hi-vis markings
	PETSI Score	**71**	**41**	**53**	**39**	**54**	**41**	**37**	**38**	**76**		**73**	**69**
	Ped. Exposure to Traffic LoS	**C**	**E**	**D**	**E**	**D**	**E**	**E**	**E**	**B**	**-**	**C**	**C**
	Cycle Length	70	70	85	85	70	70	85	85	70		85	85
	Effective Walk Time	20	20	7	7	15	15	10	10	21		7	7
	Average Pedestrian Delay	**18**	**18**	**36**	**36**	**22**	**22**	**33**	**33**	**17**		**36**	**36**
	Pedestrian Delay LoS	**B**	**B**	**D**	**D**	**C**	**C**	**D**	**D**	**B**	**-**	**D**	**D**
	Level of Service	**C**	**E**	**D**	**E**	**D**	**E**	**E**	**E**	**B**	**-**	**D**	**D**
		E				**E**				**D**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	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
	Right Turn Lane Configuration				Not Applicable		≤ 50 m		Not Applicable	Not Applicable		Not Applicable	Not Applicable
	Right Turning Speed				Not Applicable		≤ 25 km/h		Not Applicable	Not Applicable		Not Applicable	Not Applicable
	Cyclist relative to RT motorists	**-**	**-**	**-**	**Not Applicable**	**-**	**D**	**-**	**Not Applicable**	**Not Applicable**	**-**	**Not Applicable**	**Not Applicable**
	Separated or Mixed Traffic	**Mixed Traffic**	**Separated**	**Mixed Traffic**	**Separated**	**Mixed Traffic**	**Separated**	**Mixed Traffic**	**Separated**	**Separated**	**-**	**Separated**	**Separated**
	Left Turn Approach	No lane crossed	2-stage, LT box	One lane crossed	2-stage, LT box		2-stage, LT box	One lane crossed	2-stage, LT box	2-stage, LT box		2-stage, LT box	2-stage, LT box
	Operating Speed	> 50 to < 60 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h		≤ 40 km/h	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h		≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	**C**	**A**	**F**	**A**	**-**	**A**	**F**	**A**	**A**	**-**	**A**	**A**
	Level of Service	**-**	**-**	**-**	**A**	**-**	**D**	**-**	**A**	**A**	**-**	**A**	**A**
		F				**F**				**A**			
Transit	Average Signal Delay		≤ 30 sec	≤ 40 sec	≤ 20 sec		≤ 30 sec	≤ 10 sec	≤ 20 sec	≤ 20 sec		≤ 30 sec	≤ 40 sec
	Level of Service	**-**	**D**	**E**	**C**	**-**	**D**	**B**	**C**	**C**	**-**	**D**	**E**
		E				**D**				**E**			
Truck	Effective Corner Radius												
	Number of Receiving Lanes on Departure from Intersection												
	Level of Service	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		-				**-**				**-**			
Auto	Volume to Capacity Ratio	0.71 - 0.80				0.61 - 0.70				0.71 - 0.80			
	Level of Service	**C**				**B**				**C**			