485 Richmond Road
Residential Condominium Project

• TRANSPORTATION BRIEF •

July 25, 2012

Delcan
TRANSPORTATION • INFORMATION TECHNOLOGY • WATER

Address 485 Richmond TB

File # TO3003TOQ00 Modified

Date 25 July 2012

Check List

- ☑ Municipal address;
- ☑ Location relative to major elements of the existing transportation system (e.g., the site is located in the southwest quadrant of the intersection of Main Street/ First Street, 600 metres from the Maple Street Rapid Transit Station);
- ☑ Existing land uses or permitted use provisions in the Official Plan, Zoning By-law, etc.;
- ☑ Proposed land uses and relevant planning regulations to be used in the analysis;
- ☑ Proposed development size (building size, number of residential units, etc.) and location on site;
- ☐ Estimated date of occupancy;
- ☐ Planned phasing of development;
- ☑ Proposed number of parking spaces (not relevant for Draft Plans of Subdivision); and
- ☑ Proposed access points and type of access (full turns, right-in/ right-out, turning restrictions, etc.
- ☑ Study area;
- ☑ Time periods and phasing; and
- ☐ Horizon years (include reference to phased development).

Existing Conditions

- ☑ Existing roads and ramps in the study area, including jurisdiction, classification, number of lanes, and posted speed limit;
- ☑ Existing intersections, indicating type of control, lane configurations, turning restrictions, and any other relevant data (e.g., extraordinary lane widths, grades, etc.);
- ☐ Existing access points to adjacent developments (both sides of all roads bordering the site);
- ☑ Existing transit system, including stations and stops;
- ☑ Existing on- and off-road bicycle facilities and pedestrian sidewalks and pathway networks;
- ☑ Existing system operations (V/C, LOS); and

☑ Major trip generators/ attractors within the Study Area should be indicated.

Demand Forecasting

☑ Trip generation forecasts

☐

☐

☐

☑ Trip generation rates;

☑ Trip distribution and assignment:

Impact Analysis

☑ Synchro Files

☑ Signal and auxiliary lane (device) warrants;

☑ Qualitative assessment of impacts on capacity; non-auto modes; on-site circulation;

☐ community

☑ Pedestrian and bicycle network connections and continuity;

☑ On-site circulation and design;

☑ Potential for neighbourhood impacts; and

☐

☐

☐

☐

☐

☐

☐

☐

☐

485 Richmond Road
Residential Condominium Project
Transportation Brief

Prepared for:

Minto Communities Inc.
200-180 Kent Street
Ottawa, ON K1P 0B6

Prepared by:

1223 Michael Street
Suite 100
Ottawa, ON K1J 7T2

TO3003TOQ00

25 July 2012

Table of Contents

List of Attachments

List of Figures

List of Tables

1. INTRODUCTION

Minto is proposing to develop a portion of their property located at 485 Richmond Road, which is currently occupied by a surface parking lot (approximately 35 parking spaces). The parking lot is located at the north-east corner of the site and is adjacent to a 7 storey office building located on the same site but closer to the site's main connection to Richmond Road. From the information provided, we understand that the proposed development will consist of approximately 191 high-rise condominium/apartment units and 153 structured parking spaces.

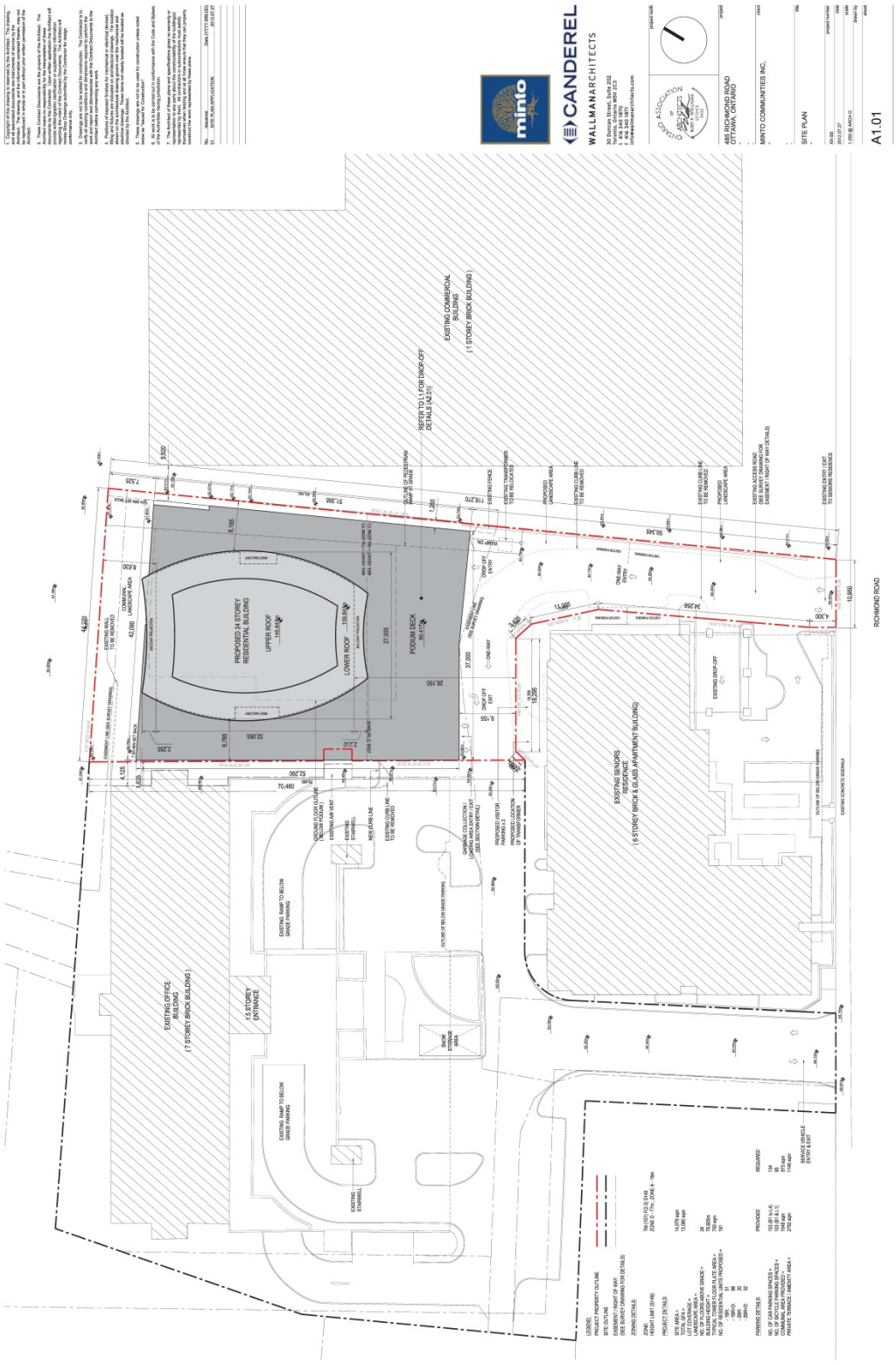
Based on the ensuing trip generation and our review of the City's Transportation Assessment Guidelines (TIA), the proposed development is projected to generate less than the City's 75 veh/h TIA guideline for any assessment. Therefore, from a transportation perspective, it is more appropriate to conduct a Modified Transportation Brief (TB) to capture only the relevant transportation issues. On this basis, this TB will address only the following:

- existing traffic conditions at key adjacent intersections;
- background growth, future site trip generation and distribution;
- off-site traffic control requirements (if any); and
- Site Plan issues, including proposed pedestrian circulation and vehicle access, parking, loading and circulation layout.

The site's local context is depicted in Figure 1 and the Site Plan is depicted in Figure 2.

Figure 1: Local Context

Figure 2: Site Plan

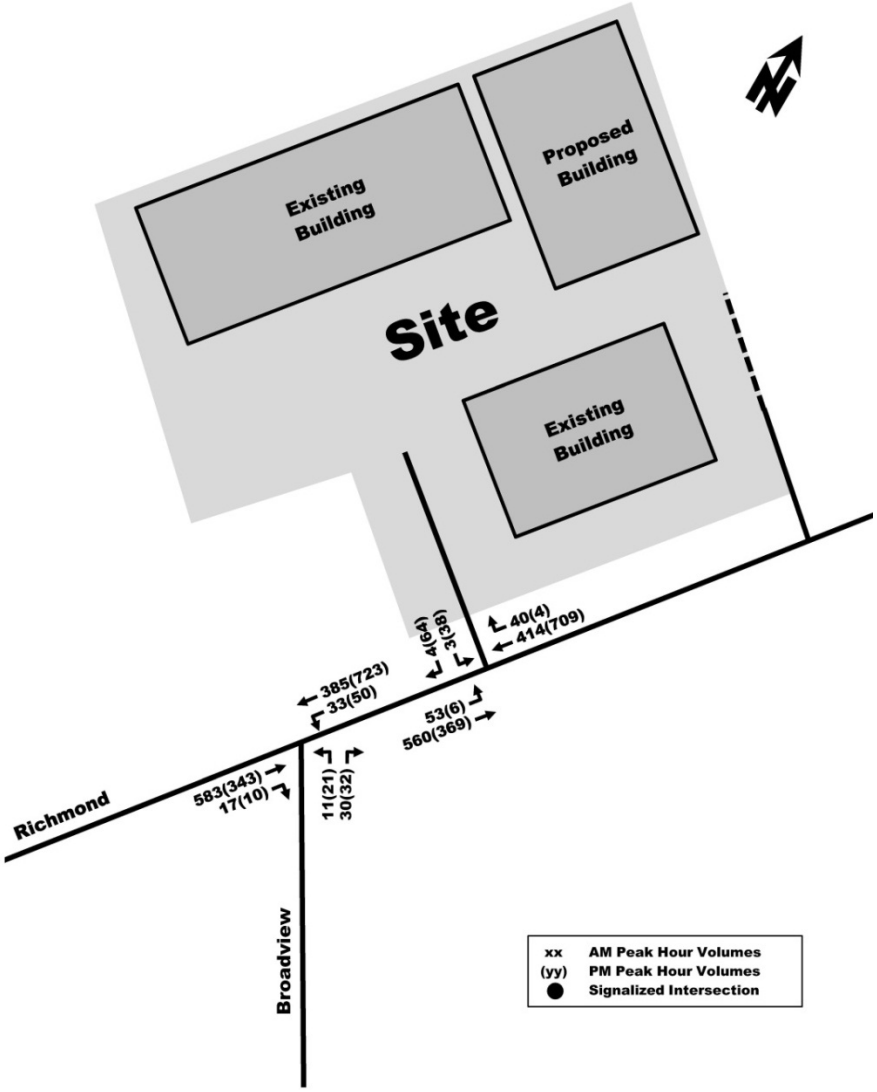


2. EXISTING CONDITIONS

2.1 Traffic Operations

Recent weekday morning and afternoon peak hour traffic counts were obtained from the City of Ottawa for the unsignalized Broadview/Richmond intersection. Existing weekday morning and afternoon peak hour traffic volumes were collected by Delcan at the existing western most unsignalized Site Driveway/Richmond intersection. Current peak hour traffic volumes are illustrated in Figure 3 and are included as Attachment A. It should also be noted that at the east end of the site there is a two-way driveway to Richmond road serving the Amica retirement residence. Once past the Amica on-site drop-off loop, the driveway functions only as one-way inbound.

Figure 3: Existing Traffic Volumes



As shown on Figure 3, the existing two-way traffic on Richmond Road adjacent to the site totals approximately 1030 veh/h and 1150 veh/h during the weekday morning and afternoon peak hours respectively. The existing two-way traffic on Broadview Avenue west of the site totals approximately 90 veh/h and 115 veh/h respectively.

In the City's Transportation Master Plan, Richmond Road is designated as an arterial roadway with an unposted speed limit of 50 km/h. It has a sidewalk on the north side and a multi-use pathway on the south side. Broadview Avenue is designated as a collector roadway with an unposted speed limit of 50 km/h. It has sidewalks on both sides for the short section between Richmond and Byron.

The ensuing Table 1 provides a summary of existing traffic operations at study area intersections based on the Synchro (V8) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The Synchro model output of existing conditions are provided within Attachment B.

Table 1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Broadview/Richmond	B(C)	14.3(15.0)	NBT(NBT)	0.6(0.8)	A(A)	-
Richmond/Site Access	C(C)	18.1(21.8)	SBL(SBL)	0.4(1.3)	A(A)	-

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

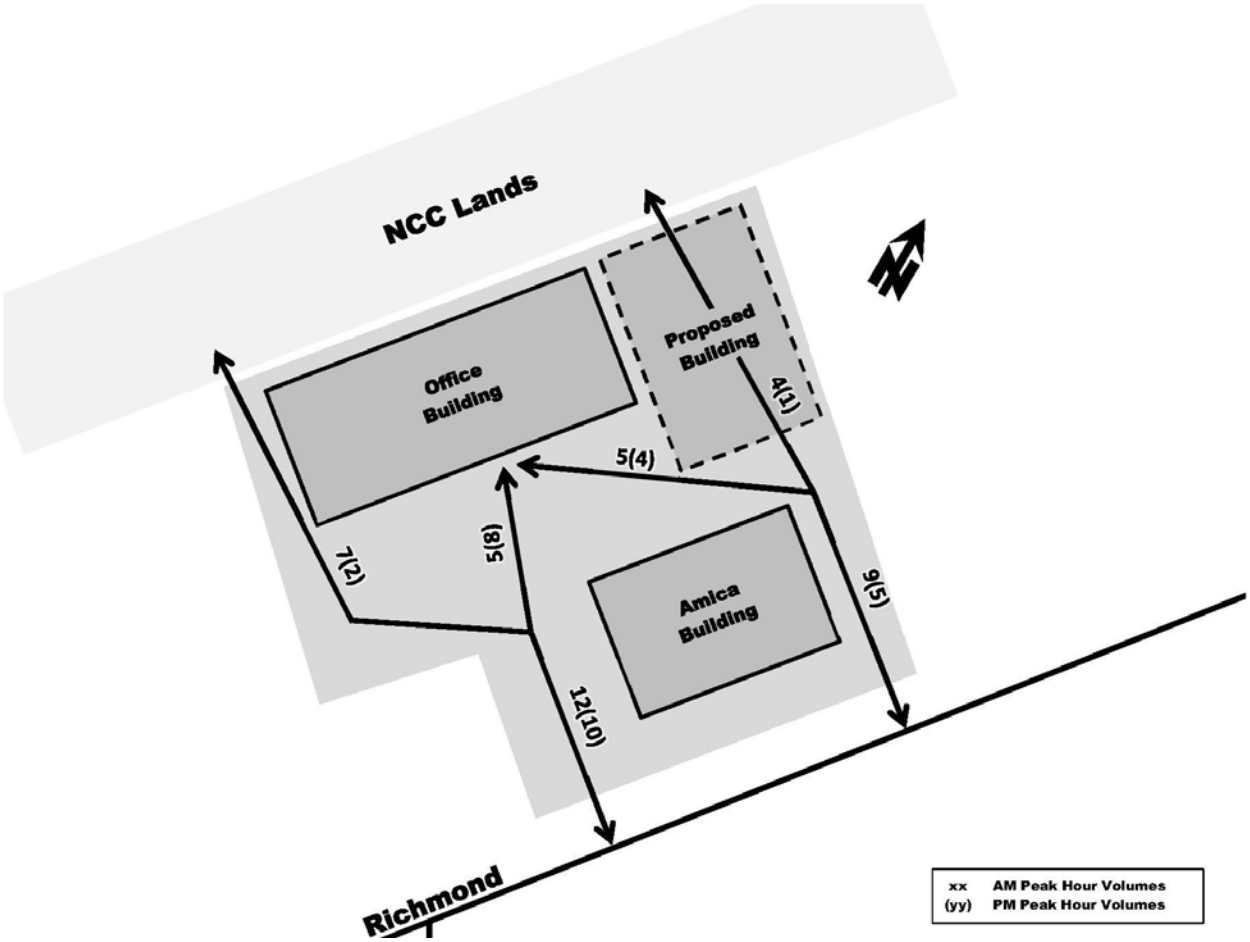
As shown in Table 1, study area intersections, 'as a whole', are currently operating at an acceptable overall LoS 'A' during the morning and afternoon peak hours, respectively. With regard to the 'critical movements' at study area intersections, they are currently operating at an acceptable LoS 'C' or better during the morning and afternoon peak hours, respectively.

Field observations of the operating conditions of these two intersections during peak hours are consistent with this very good level of service. No operating problems were observed at either intersection. Traffic signal warrant analysis was conducted under 'worst case scenario' conditions, which analyzed the Richmond/Broadview/Site Driveway as a single intersection. As a result traffic signal warrants are only 41% satisfied for the projected 'worst case scenario' traffic conditions at the combined Richmond/Broadview/Site Driveway intersection, as per Attachment C.

2.2 Pedestrians

Adjacent to the south of the site, the streets have a combination of sidewalks and multi-use pathways. There are no signalized pedestrian crossings of Richmond Road in the immediate vicinity. As depicted in Figure 4, peak hour pedestrian counts were conducted at both site driveways to determine the total number of pedestrians crossing Richmond Road into the site. The counts were conducted during the month of July 2012 and it should be noted that these volumes could increase during spring and fall months.

Figure 4: Peak Hour Pedestrian Volumes



Of the total 21(15) peds/h crossing through 485 Richmond Road it was observed that 50%(80%) were going to/ from the existing office building. The remaining 50%(20%) were recorded crossing through the site between Richmond Road and the NCC lands, of these, only 20%(5%) crossed around the east of the existing office building through the proposed site. To the rear of the site, there are informal pedestrian footpaths, through the NCC lands to the transitway stop at Dominion. Some of the identified pedestrian movements at the both site driveways could be walking through the site to access the transit station.

2.3 Transit Service

The nearest public transit service is provided on Richmond Road (in front of the site) where sheltered bus stops are located directly in front of the site. Regular all-day (black) Route #2 services Richmond Road, where it begins in the west-end at the Bayshore Shopping Centre and ends in the east-end at the Rideau Shopping Centre and vice versa. Route #2 also provides transit riders with access to the Westboro Rapid Transit Station where riders are able to connect with a wide range of regular service, peak hour service and express service routes that are able to transport riders throughout the city of Ottawa. The Dominion Rapid Transit Station is accessible to transit riders by taking a local roadway route (approximately 650 m actual walking distance) or by taking a cut-through trail to the Ottawa River Parkway multi-use pathway system (approximately 350 m actual walking distance), where that same range of transit services as those provided at the Westboro Rapid transit Station are available.

3. PROPOSED DEVELOPMENT AND PEAK HOUR TRAFFIC GENERATION

3.1 Background Growth

Table 2 contains the change in traffic volumes at the Richmond/Woodroffe intersection for 2007 to 2011. As shown, total traffic volumes have declined over the five year period in the vicinity of the Richmond/Woodroffe intersection, with the exception of the afternoon peak (increased growth of 2.62%). This is the busiest intersection most adjacent to the proposed development, and the one for which a lengthy traffic volume history was available from the City. Based on these historical trends a overall growth of 1% will be assumed.

Table 2: Historical Trends: Carling/Preston Intersection

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-1.71%	-1.36%	-1.75%	-0.95%	**-1.38%**
AM Peak	-3.74%	-2.07%	-3.90%	-4.68%	**-3.70%**
PM Peak	0.08%	0.43%	5.55%	3.13%	**2.62%**

3.2 Site Vehicle Trip Generation

The proposed development will consist of approximately 191 high-rise condominium/apartment units and 153 parking spaces. The appropriate trip generation rate for the proposed land use was obtained from the 8th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual and is summarized in Table 3.

Table 3: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
High-Rise Condominium	ITE 232	T = 0.34(du); T = 0.29(du)+28.86	T = 0.38(du); T = 0.34(du)+15.47
Notes: T = Average Vehicle Trip Ends du = Dwelling Units			

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of the available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The person trip generation for the proposed site is summarized in Table 4.

Table 4: Modified Person Trip Generation

Land Use	Data Source	Area	AM Peak (persons)			PM Peak (persons)		
			In	Out	Total	In	Out	Total
High-Rise Condominium	ITE 232	191 Du	20	90	110	65	40	105
Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%								

The person trips shown in Table 4 for the proposed site were then reduced by modal share values based on the 2005 TRANS O-D survey to reflect the site's location and proximity to employment, shopping uses and transit availability. Modal share values for the proposed site are summarized in Table 6. It is noteworthy that a 25% transit modal split has been assumed reflecting the site's close proximity to both on-road and Transitway bus services. The walk/bike modal split is a reflection of the site's close proximity to Westboro Village and the good connectivity to the area's multi-use pathway system.

Table 5: Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Persons/hr)			PM Peak (Persons/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	55%	11	50	61	36	22	58
Auto Passenger	10%	2	9	11	6	4	10
Transit	25%	5	22	27	17	10	27
Non-motorized	10%	2	9	11	6	4	10
Total Person Trips	100%	20	90	110	65	40	105
Total 'New' High-Rise Condo Auto Trips		**11**	**50**	**61**	**36**	**22**	**58**

As shown in Table 5, the resulting number of potential 'new' two-way vehicle trips for the proposed site is approximately 60 veh/h during both the weekday morning and afternoon peak hours. These volumes equate to approximately 1 new vehicle every minute, and are below the City's guideline of 75 veh/h for requiring a formal TIA.

3.3 Traffic Distribution and Assignment

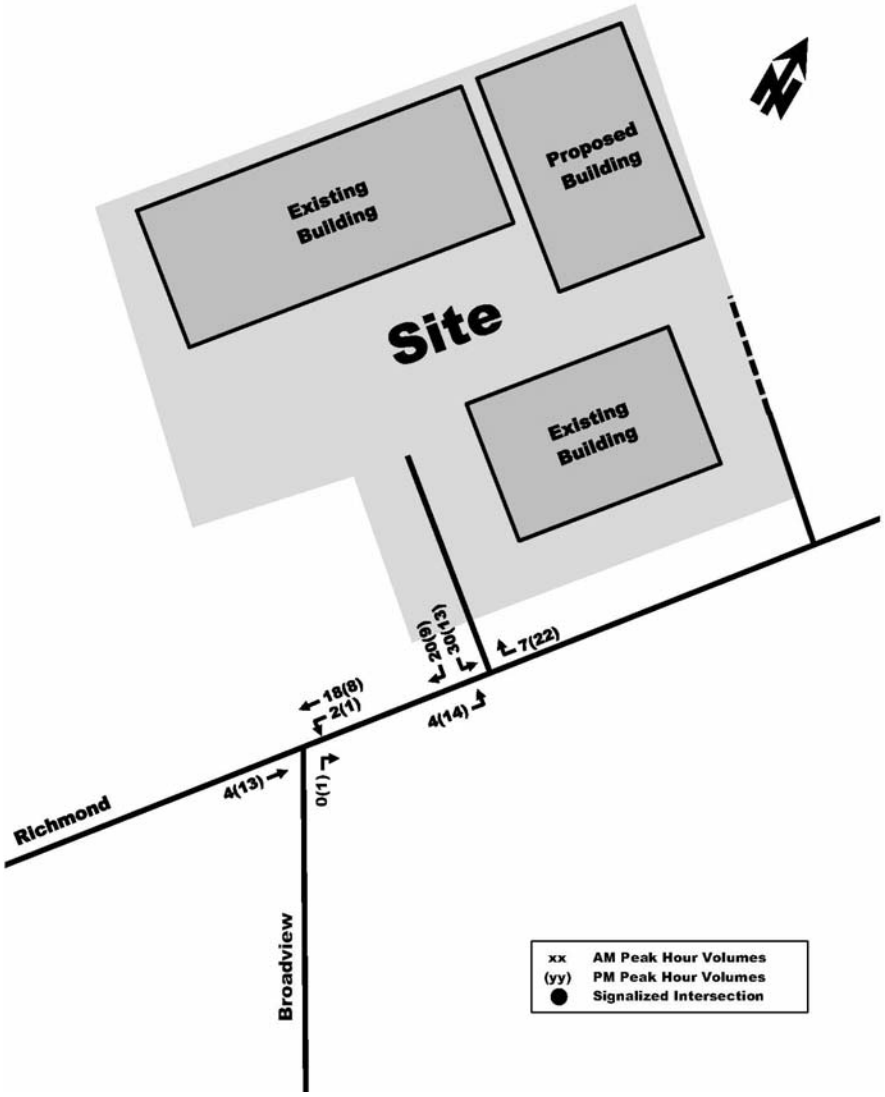
Traffic distribution was based on the site's connectivity to the existing road network and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

- 60% to/from the east via Richmond Road;
- 35% to/from the west via Richmond Road; and
- 5% to/from the south via Broadview Avenue;

100%

The 'new' auto trips generated by the site are depicted in Figure 5. Note, that they are currently all assigned to the main westerly site driveway. Depending on resolution of garage access/egress, some inbound trips may be reassigned to the site's easterly driveway.

Figure 5: 'New' Site-Generated Residential Auto Trips



4. FUTURE TRAFFIC OPERATIONS

4.1 Projected Intersection Operation

For the purpose of this study, the total projected traffic volumes were derived by superimposing site-generated traffic (Figure 5) and background growth (1% per year for 5 years) onto existing traffic volumes (Figure 3). The resulting total projected traffic volumes are illustrated as Figure 6.

Figure 6: Projected Traffic Volumes

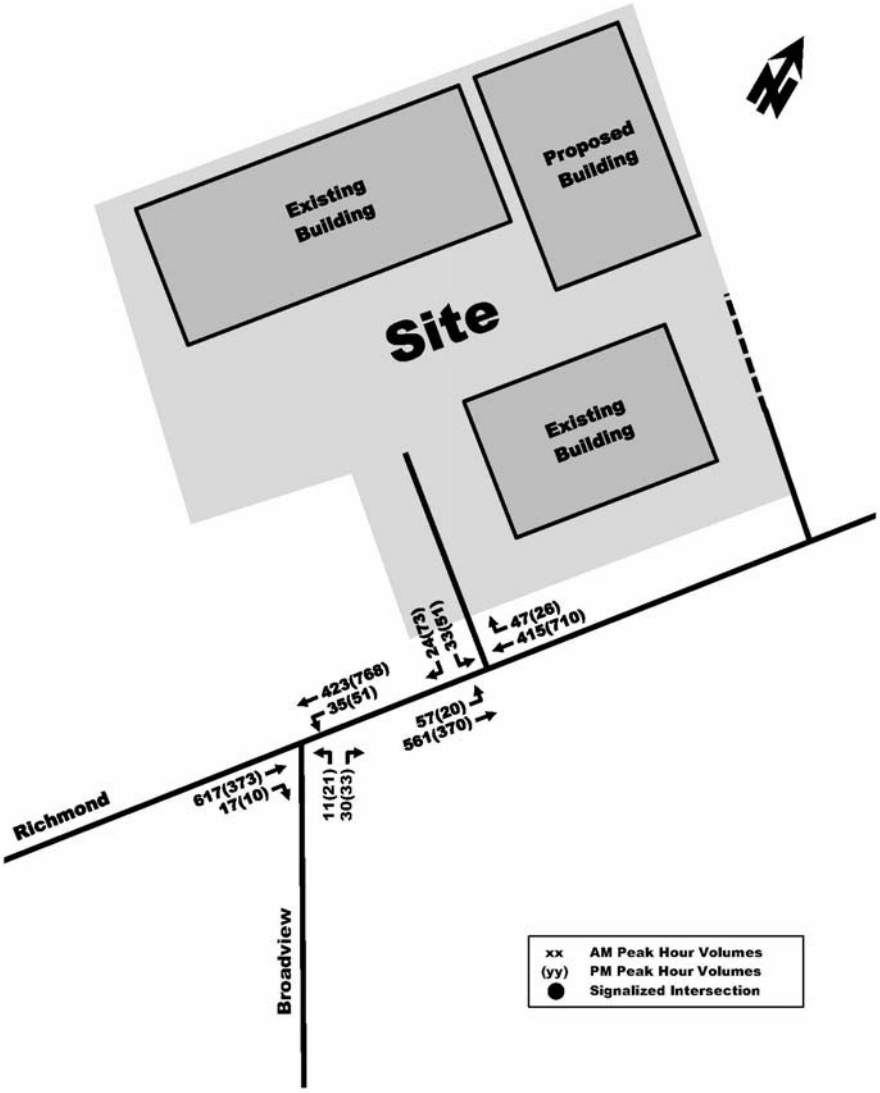


Table 6 provides a summary of projected performance of the study area intersections.

Table 6: Projected Performance at Study Area Intersection

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Broadview/Richmond	C(C)	15.0(15.8)	NBL(NBL)	0.6(0.8)	A(A)	-
Richmond/Site Access	C(C)	20.2(24.9)	SBL(SBL)	1.2(1.8)	A(A)	-

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

As shown in Table 6, the signalized study area intersections, 'as a whole', are projected to operate similar as compared to existing conditions, which is a very good LoS A during both peak periods. With regard to the 'critical movements' at study area intersections, they are

also projected to operate similar as compared to existing conditions. Existing performance at study area intersections is summarized in Table 1.

The proposed site driveway connection is projected to operate with acceptable delays of 9 to 25 seconds during peak hours with 95th percentile queues ranging from 0 to 7 meters (no more than 1 vehicle in queue). Traffic signal control and additional auxiliary turn lanes are not warranted at these proposed driveway connections.

The overall increase in projected traffic at study area intersections is approximately 7% and 5% at the Richmond/Broadview and Richmond/Site Access intersections, respectively. This amount of additional traffic is not considered significant and it is projected to have a negligible effect on the Level of Service at study area intersections as shown in Table 6.

4.2 Potential Traffic on Broadview

Broadview is identified as a local collector roadway in the City's Transportation Master Plan. Due to its direct connection between Richmond Road and Carling Avenue, this local collector is frequently used as a cut-through route. Therefore, the proposed development located at north end of Broadview is projected to add approximately 2 veh/h during the morning and afternoon peak hours, respectively. This amount of cut-through traffic is considered to negligible and have little to no effect on the overall level of service of the Broadview intersections.

5. SITE PLAN REVIEW

This section provides an overview of site access, parking requirements, pedestrian circulation and transit accessibility. The proposed Site Plan was previously illustrated in Figure 2.

Access Requirements
There are two driveway connections proposed to serve the development, which are located at the southwest end of the building and would connect to the existing on-site drive aisle network. The eastern most driveway provides access to the above ground parking garage, while the western most driveway provides access to the basement parking floor, loading and garbage bays. The eastern driveway ramp is 6.7 m wide with a 15% incline and 7.5% transition slopes at the top and bottom of the ramp and the western driveway ramp is 7.25 m wide with an 8% decline, both driveway ramps satisfy Private Approach By-Law requirements. As a guideline, the City's Private Approach By-Law states that a private approach may be greater than 6% but shall not exceed 12% provided that a subsurface melting device sufficient to keep the private approach free of ice at all times is installed and properly maintained. Our review of the available industry literature and recent site visits to garages that have ramps in the 15% to 20% range indicates that a proposed ramp with a 15% grade will operate acceptably.

Parking
A total of 153 vehicle parking spaces are proposed to serve the development. This amount of is sufficient with regard to the City's Zoning By-Law requirement of a minimum of 132 parking spaces and a maximum of 335 parking spaces due to that fact that the site is approximately 650 m actual walking distance to a rapid transit station at the intersection of the Ottawa River Parkway/Transitway. The amount of visitor parking has not yet been determined and will be addressed at a later date, when more information is available.

Pedestrians/Transit
The proposed site fronts Richmond Road to the south where a sidewalk is currently provided along the north side of the roadway and a multi-use pathway is provided along the south side of the roadway, connecting pedestrians to transit service, recreational pathways, Westboro Village and other adjacent developments. Transit stops on Richmond Road are located directly in front of the proposed development and service regular all-day (black) route #2. Route #2 travels from Bayshore Shopping Centre to Rideau Shopping Centre and stops at the Westboro rapid transit station. The Dominion Rapid Transit Station is within walking distance of the site and can be accessed by taking a local roadway route (approximately 650 m) or by taking a cut-through trail north of the site to the Ottawa River Parkway's multi-use pathway system that connects to Dominion (approximately 350 m).

There has been discussion regarding provision of a signalized crossing of Richmond Road in the vicinity of the site to provide a protected pedestrian crossing. Things to be considered in this discussion are:

- Site driveway location;
- Current north-south pedestrian activity on both site driveways totals 21(15) pedestrians during the morning and afternoon peak hour and approximately 60% of the pedestrians were recorded using the west driveway and 40% used the east driveway. Pedestrian movements within the site indicated that approximately 50% were going to/from the existing office building and the remaining 50% were crossing through the site between Richmond Road and the NCC lands. Of those pedestrians crossing through the site, 20% crossed to the east of the existing office building. Pedestrian counts were conducted in July 2012 and it should be noted that counts could be higher during the spring and fall months.
- The warrants for traffic signal control are not met at the primary site driveway connection to Richmond Road or at the Broadview intersection; and
- The $250,000 to $300,000 cost to provide a fully signalized intersection.

Bicycles
A total of 103 bicycle parking spaces located in the underground B1 parking level are proposed to serve the development. This amount of bicycle parking is sufficient with regard to the City's minimum By-Law requirements of 96 bicycle parking.

Site Circulation
With regard to on-site circulation, the drive aisles meet minimum City By-Law requirements, with the exception of the northern drive aisle on L2, L3 and L4 which may require a variance. Parking stall dimensions also satisfy City By-Law requirements.

Identified in the final site plan, parking level B1 is proposed to have a single driveway access to 15 underground parking spaces that would be signalized to coordinate traffic flow. From our analysis of the B1 parking level layout and turning template review, with proper signal hardware, signage and pavement markings the underground garage could function acceptably. The main potential conflict area noted in the analysis of the underground garage would be the southern drive aisle, where both inbound and outbound vehicles need to drive along the outer lane to properly enter/exit the garage. To avoid potential vehicle conflicts it is recommended that 2 or 3 signal heads be placed inside the garage and positioned so that all vehicles have a clear view of the signals from their parking stalls. A single signal head is also recommended at the base of the ramp from L1 to stop inbound vehicles before they travel into potential conflict areas. It is also suggested that the default (resting) phase be set for the outbound vehicles and only cycle when an inbound vehicle is

waiting at the base of the ramp from L1 to access the garage. As there would only be a maximum of 15 veh/h (1 new vehicle every 4 minutes) entering/exiting the garage the potential conflicts are reduced.

6. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing, the conclusions and recommendations of this Transportation Brief are as follows:

- The proposed development is projected to generate approximately 60 veh/h two-way total trips during the weekday morning and afternoon peak hours. These volumes equate to approximately 1 new vehicle every minute during peak hours, and are considered relatively insignificant. Also, according to the City's Transportation Impact Assessment Guidelines, this Site Plan requires no traffic analysis;

- Future traffic conditions at study area intersections are projected to operate similar to existing conditions, indicating negligible site impact, and a very good level of service. The warrants for traffic signal control are not met at the combined Richmond/Broadview and Richmond/Site Driveway intersections (only 41%);

- A total of 153 vehicle parking spaces are proposed to serve the development which satisfies minimum City Zoning By-Law requirements. The amount visitor parking has not yet been determined and will be addressed at a late date;

- A total of 21(15) pedestrian were recorded crossing Richmond Road into the site during the morning and afternoon peak hour. Of the total 10(12) peds/h (50%) were recorded going to/from the existing office building and the remainder 11(3) peds/h (50%) crossed through the site between Richmond Road and the NCC lands. Of the 50% cutting through the site, 20% crossed to the east of the existing office building;

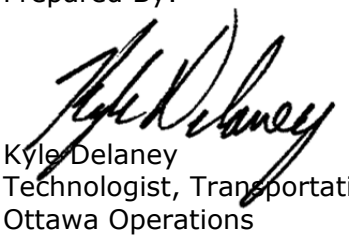
- The proposed ramp designs are considered safe and acceptable;

- The internal garage circulation is well laid out and with proper signal hardware, signage and pavement markings is expected to operate efficiently; and

- The proposed development fits well into the context of the surrounding area, and its location and design servers to promote the use of walking, cycling, and transit modes, thus supporting City of Ottawa policies, goals and objectives with respect to the redevelopment, intensification and modal share.

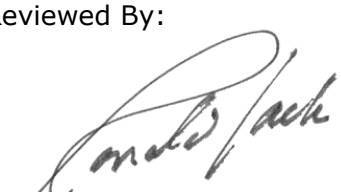
Based on the above, approval of the proposed development is recommended from a transportation perspective.

Prepared By:



Kyle Delaney
Technologist, Transportation Division
Ottawa Operations

Reviewed By:



Ron M. Jack, P.Eng.
Vice President Transportation
Manager Ottawa Operations

Appendix A
Current Peak Hour Volumes

Ottawa *Public Works and Services Department*

Count ID 2967

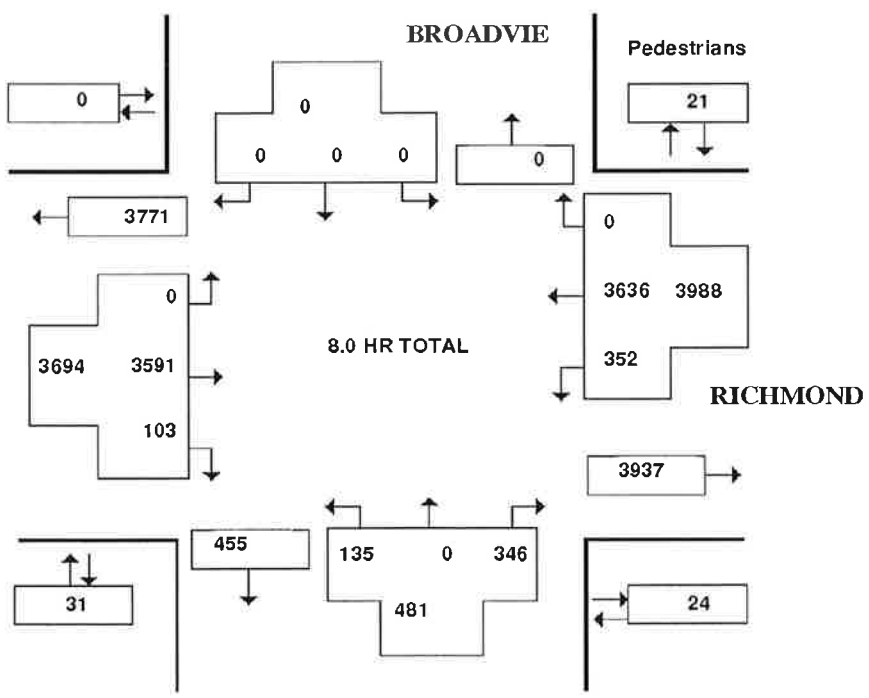
BROADVIEW AVE and RICHMOND RD

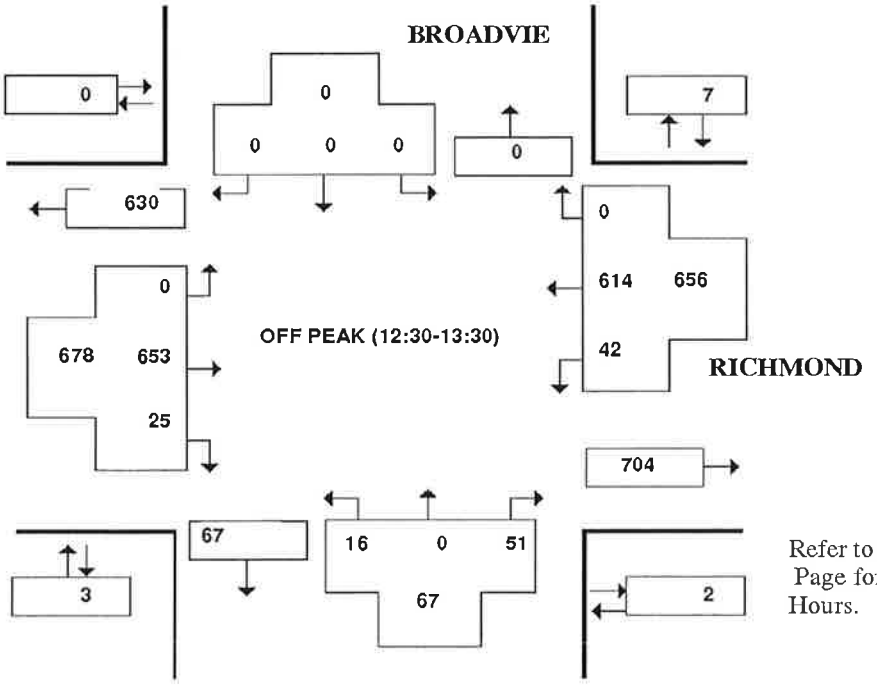
(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011
Conditions: dry
Start Time: 0700

Total Observed U-Turns
Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor
Wednesday in June i:
9





Refer to Summary Page for Survey Hours.

Approved by : KC

Printed on : 31/01/2012

Ottawa *Public Works and Services Department*

Count ID 2967

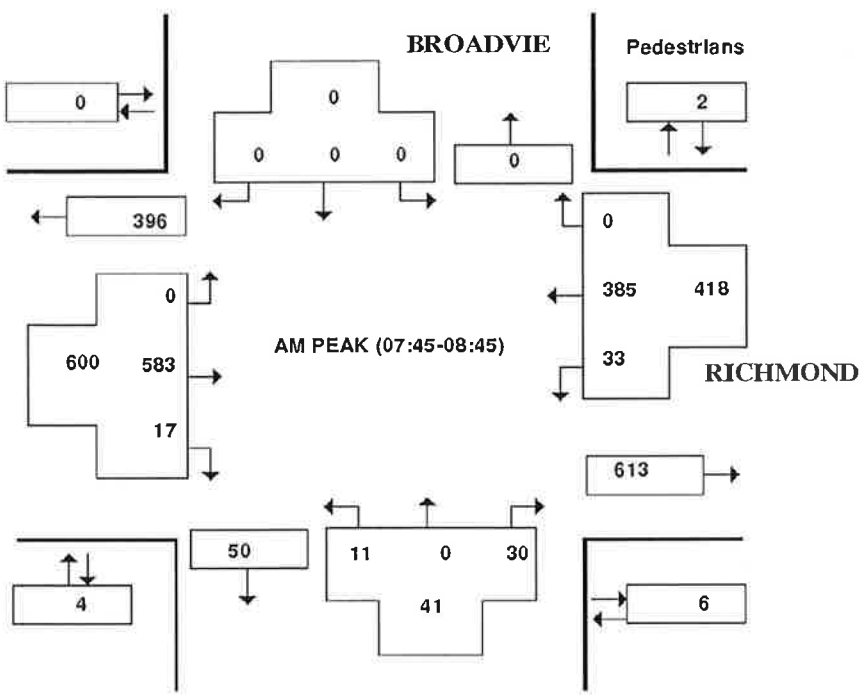
BROADVIEW AVE and RICHMOND RD

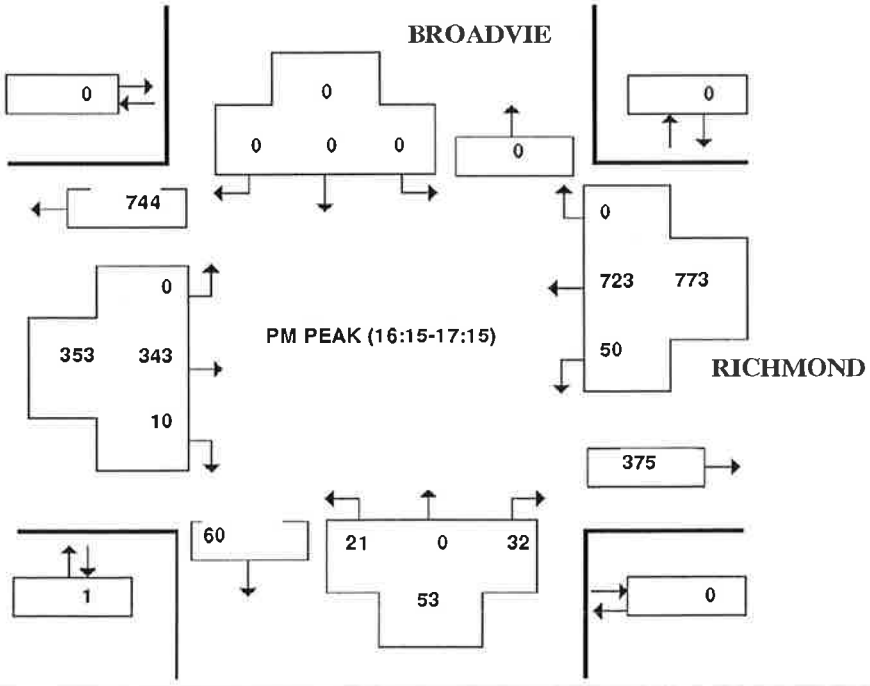
(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011
Conditions: dry
Start Time: 0700

Total Observed U-Turns
Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor
Wednesday in June i:
9





Approved by : KC

Printed on : 31/01/2012

Ottawa *Public Works and Services Department*

Count ID 29675

Vehicular Turning Movements - Summary

BROADVIEW AVE and RICHMOND RD

(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011
Conditions: dry
Start Time: 0700

Total Observed U-Turns
Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor
Wednesday in June is 9

	BROADVIE									RICHMOND									
	Northbound			SUB	Southbound			SUB	STR	Eastbound			SUB	Westbound			SUB	STR	GRAND
Time Period	LT	ST	RT	TOT	LT	ST	RT	TOT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	TOT	TOT
07:00-08:00	5	0	34	**39**	0	0	0	**0**	**39**	0	535	5	**540**	40	218	0	**258**	**798**	**837**
08:00-09:00	8	0	40	**48**	0	0	0	**0**	**48**	0	566	20	**586**	31	393	0	**424**	**1010**	**1058**
09:00-10:00	15	0	65	**80**	0	0	0	**0**	**80**	0	440	6	**446**	61	294	0	**355**	**801**	**881**
11:30-12:30	28	0	37	**65**	0	0	0	**0**	**65**	0	323	6	**329**	45	352	0	**397**	**726**	**791**
12:30-13:30	16	0	51	**67**	0	0	0	**0**	**67**	0	653	25	**678**	42	614	0	**656**	**1334**	**1401**
15:00-16:00	10	0	43	**53**	0	0	0	**0**	**53**	0	333	3	**336**	29	492	0	**521**	**857**	**910**
16:00-17:00	13	0	37	**50**	0	0	0	**0**	**50**	0	338	15	**353**	49	679	0	**728**	**1081**	**1131**
17:00-18:00	40	0	39	**79**	0	0	0	**0**	**79**	0	403	23	**426**	55	594	0	**649**	**1075**	**1154**
8.0 HR TOTAL	135	0	346	**481**	0	0	0	**0**	**481**	0	3591	103	**3694**	352	3636	0	**3988**	**7682**	**8163**
EQU. 12 HR TOTAL	187	0	480	**667**	0	0	0	**0**	**667**	0	4991	143	**5134**	489	5054	0	**5543**	**10677**	**11344**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.																			
AVG. 12 HR TOTAL	168	0	432	**600**	0	0	0	**0**	**600**	0	4491	128	**4619**	440	4548	0	**4988**	**9607**	**10207**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.																			
AVG. 24 HR TOTAL	220	0	565	**785**	0	0	0	**0**	**785**	0	5883	167	**6050**	576	5957	0	**6533**	**12583**	**13368**
Note: These volumes were calculated by multiplying the Average Daily 12 hr totals by 1.31.																			
AM TOTAL (0700-0900)	13	0	74	**87**	0	0	0	**0**	**87**	0	1101	25	**1126**	71	611	0	**682**	**1808**	**1895**
PM TOTAL (1530-1730)	39	0	78	**117**	0	0	0	**0**	**117**	0	692	20	**712**	94	1321	0	**1415**	**2127**	**2244**

Ottawa

Public Works and Services Department

Count ID 29675

Vehicular Turning Movements (15 Min. Volumes)

BROADVIEW AVE and RICHMOND RD

(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011
Conditions: dry
Start Time: 07:00

Total Observed U-Turns
Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor
Wednesday in June is 9

	BROADVIE									RICHMOND									
	Northbound				Southbound					Eastbound				Westbound					
Time Period	LT	ST	RT	SUB TOT	LT	ST	RT	SUB TOT	STR TOT	LT	ST	RT	SUB TOT	LT	ST	RT	SUB TOT	STR TOT	GRAND TOT
07:00-07:15	0	0	6	6	0	0	0	0	6	0	116	0	116	4	43	0	47	163	169
07:15-07:30	2	0	9	11	0	0	0	0	11	0	122	1	123	11	55	0	66	189	200
07:30-07:45	0	0	9	9	0	0	0	0	9	0	152	3	155	13	53	0	66	221	230
07:45-08:00	3	0	10	13	0	0	0	0	13	0	145	1	146	12	67	0	79	225	238
08:00-08:15	2	0	7	9	0	0	0	0	9	0	129	7	136	10	78	0	88	224	233
08:15-08:30	2	0	3	5	0	0	0	0	5	0	146	2	148	4	68	0	72	220	225
08:30-08:45	4	0	10	14	0	0	0	0	14	0	163	7	170	7	172	0	179	349	363
08:45-09:00	0	0	20	20	0	0	0	0	20	0	128	4	132	10	75	0	85	217	237
09:00-09:15	3	0	21	24	0	0	0	0	24	0	136	4	140	21	83	0	104	244	268
09:15-09:30	7	0	16	23	0	0	0	0	23	0	104	1	105	15	61	0	76	181	204
09:30-09:45	2	0	16	18	0	0	0	0	18	0	90	1	91	8	72	0	80	171	189
09:45-10:00	3	0	12	15	0	0	0	0	15	0	110	0	110	17	78	0	95	205	220
11:30-11:45	13	0	12	25	0	0	0	0	25	0	81	0	81	6	67	0	73	154	179
11:45-12:00	7	0	11	18	0	0	0	0	18	0	82	1	83	8	84	0	92	175	193
12:00-12:15	7	0	9	16	0	0	0	0	16	0	86	5	91	21	110	0	131	222	238
12:15-12:30	1	0	5	6	0	0	0	0	6	0	74	0	74	10	91	0	101	175	181
12:30-12:45	3	0	14	17	0	0	0	0	17	0	151	6	157	10	156	0	166	323	340
12:45-13:00	5	0	15	20	0	0	0	0	20	0	134	4	138	21	125	0	146	284	304
13:00-13:15	4	0	7	11	0	0	0	0	11	0	188	6	194	7	164	0	171	365	376
13:15-13:30	4	0	15	19	0	0	0	0	19	0	180	9	189	4	169	0	173	362	381
15:00-15:15	4	0	7	11	0	0	0	0	11	0	90	0	90	5	82	0	87	177	188
15:15-15:30	1	0	18	19	0	0	0	0	19	0	82	1	83	8	124	0	132	215	234
15:30-15:45	2	0	9	11	0	0	0	0	11	0	73	2	75	4	144	0	148	223	234
15:45-16:00	3	0	9	12	0	0	0	0	12	0	88	0	88	12	142	0	154	242	254
16:00-16:15	3	0	18	21	0	0	0	0	21	0	91	6	97	17	160	0	177	274	295
16:15-16:30	0	0	4	4	0	0	0	0	4	0	87	6	93	11	199	0	210	303	307
16:30-16:45	5	0	9	14	0	0	0	0	14	0	87	2	89	11	150	0	161	250	264
16:45-17:00	5	0	6	11	0	0	0	0	11	0	73	1	74	10	170	0	180	254	265
17:00-17:15	11	0	13	24	0	0	0	0	24	0	96	1	97	18	204	0	222	319	343
17:15-17:30	10	0	10	20	0	0	0	0	20	0	97	2	99	11	152	0	163	262	282
17:30-17:45	6	0	6	12	0	0	0	0	12	0	113	7	120	14	132	0	146	266	278
17:45-18:00	13	0	10	23	0	0	0	0	23	0	97	13	110	12	106	0	118	228	251

Approved by: KC

Printed on : 31/01/2012

Ottawa *Public Works and Services Department*

Count ID 29675

Pedestrian Volume Summary Sheet - Hourly Volumes

BROADVIEW AVE and RICHMOND RD

(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011 **Conditions:** dry **Start Time:** 0700

Time Period	CROSSING BROADVIE N/B APPROACH	CROSSING BROADVIE S/B APPROACH	STREET TOTAL	CROSSING RICHMOND E/B APPROACH	CROSSING RICHMOND W/B APPROACH	STREET TOTAL	GRAND TOTAL
07:00-08:00	1	0	1	6	2	8	9
08:00-09:00	9	0	9	2	8	10	19
09:00-10:00	3	0	3	6	2	8	11
11:30-12:30	0	0	0	4	2	6	6
12:30-13:30	2	0	2	3	7	10	12
15:00-16:00	8	0	8	5	0	5	13
16:00-17:00	0	0	0	0	0	0	0
17:00-18:00	1	0	1	5	0	5	6
8.0 HR TOTAL	24	0	24	31	21	52	76

PEAK PERIOD SUMMARIES

AM PEAK PERIOD (7:00-9:00)							
07:00-07:15	1	0	1	0	0	0	1
07:15-07:30	0	0	0	2	0	2	2
07:30-07:45	0	0	0	2	1	3	3
07:45-08:00	0	0	0	2	1	3	3
08:00-08:15	0	0	0	0	0	0	0
08:15-08:30	5	0	5	0	0	0	5
08:30-08:45	1	0	1	2	1	3	4
08:45-09:00	3	0	3	0	7	7	10
TOTALS	10	0	10	8	10	18	28

OFF PEAK PERIOD (11:30-13:30)							
11:30-11:45	0	0	0	1	0	1	1
11:45-12:00	0	0	0	1	1	2	2
12:00-12:15	0	0	0	2	0	2	2
12:15-12:30	0	0	0	0	1	1	1
12:30-12:45	1	0	1	0	2	2	3
12:45-13:00	0	0	0	0	0	0	0
13:00-13:15	1	0	1	3	2	5	6
13:15-13:30	0	0	0	0	3	3	3
TOTALS	2	0	2	7	9	16	18

PM PEAK PERIOD (15:30-17:30)							
15:30-15:45	0	0	0	2	0	2	2
15:45-16:00	3	0	3	1	0	1	4
16:00-16:15	0	0	0	0	0	0	0
16:15-16:30	0	0	0	0	0	0	0
16:30-16:45	0	0	0	0	0	0	0
16:45-17:00	0	0	0	0	0	0	0
17:00-17:15	0	0	0	1	0	1	1
17:15-17:30	0	0	0	0	0	0	0
TOTALS	3	0	3	4	0	4	7

Approved by: KC

Printed on : 31/01/2012

Public Works and Services Department

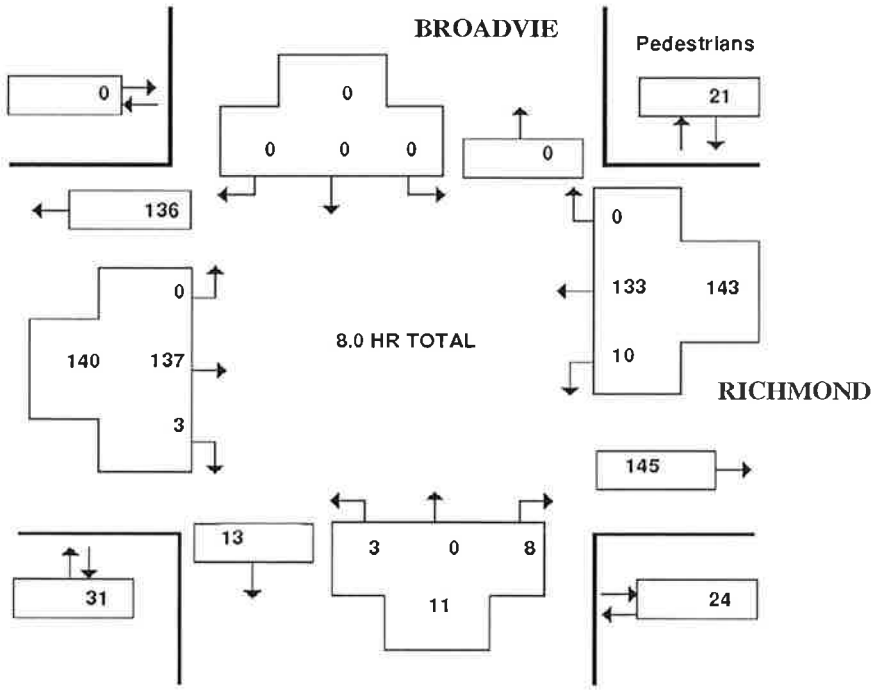
Count ID 29675

Heavy Vehicle Summary Sheet - Hourly Volumes

BROADVIEW AVE and RICHMOND RD

(ULRS Listing BROADVIE & RICHMOND)

Survey Date :Wednesday 1 June 2011 **Conditions : dry** **Start Time : 0700**



	BROADVIE									RICHMOND									
	Northbound			SUB	Southbound			SUB	STR	Eastbound			SUB	Westbound			SUB	STR	GRAND
Time Period	LT	ST	RT	TOT	LT	ST	RT	TOT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	TOT	TOT
07:00-08:00	0	0	2	**2**	0	0	0	**0**	**2**	0	14	0	**14**	0	20	0	**20**	**34**	**36**
08:00-09:00	1	0	0	**1**	0	0	0	**0**	**1**	0	16	0	**16**	3	23	0	**26**	**42**	**43**
09:00-10:00	0	0	1	**1**	0	0	0	**0**	**1**	0	23	1	**24**	1	22	0	**23**	**47**	**48**
11:30-12:30	1	0	2	**3**	0	0	0	**0**	**3**	0	15	0	**15**	3	15	0	**18**	**33**	**36**
12:30-13:30	0	0	1	**1**	0	0	0	**0**	**1**	0	30	1	**31**	0	14	0	**14**	**45**	**46**
15:00-16:00	0	0	1	**1**	0	0	0	**0**	**1**	0	17	0	**17**	2	16	0	**18**	**35**	**36**
16:00-17:00	0	0	1	**1**	0	0	0	**0**	**1**	0	14	1	**15**	0	15	0	**15**	**30**	**31**
17:00-18:00	1	0	0	**1**	0	0	0	**0**	**1**	0	8	0	**8**	1	8	0	**9**	**17**	**18**
8.0 HR TOTAL	3	0	8	**11**	0	0	0	**0**	**11**	0	137	3	**140**	10	133	0	**143**	**283**	**294**

Heavy Vehicles are vehicles having one rear axle with four or more wheels, or having two or more rear axles. These vehicles include most O.C. Transpo, school and inter-city buses. Further, they ARE included in the Turning Movement Count Summary.

Approved by: KC

Printed on: 31/01/2012

Ottawa *Public Works and Services Department*

Count ID 29675

Bicycle Volume Summary Sheet - Hourly Volumes

BROADVIEW AVE and RICHMOND RD

(ULRS Listing BROADVIE & RICHMOND)

Survey Date: Wednesday 1 June 2011 **Conditions:** dry **Start Time:** 0700

Time Period	NORTHBOUND APPROACH ON BROADVIE	SOUTHBOUND APPROACH ON BROADVIE	STREET TOTAL	EASTBOUND APPROACH ON RICHMOND	WESTBOUND APPROACH ON RICHMOND	STREET TOTAL	GRAND TOTAL
07:00-08:00	4	0	**4**	7	5	**12**	**16**
08:00-09:00	1	0	**1**	13	6	**19**	**20**
09:00-10:00	1	0	**1**	6	9	**15**	**16**
11:30-12:30	0	0	**0**	2	4	**6**	**6**
12:30-13:30	0	0	**0**	7	3	**10**	**10**
15:00-16:00	1	0	**1**	6	7	**13**	**14**
16:00-17:00	0	0	**0**	9	12	**21**	**21**
17:00-18:00	0	0	**0**	6	17	**23**	**23**
8.0 HR TOTAL	7	0	**7**	56	63	**119**	**126**

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

Approved by: KC

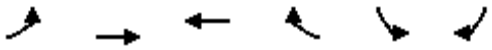
Printed on: 31/01/2012

Appendix B
Existing Peak Hour Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	583	17	33	385	11	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	614	18	35	405	12	32
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			632		895	316
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			632		895	316
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		96	95
cM capacity (veh/h)			947		270	680

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	409	214	152	270	27
Volume Left	0	0	17	0	12
Volume Right	0	9	0	0	16
cSH	1700	1700	947	1700	414
Volume to Capacity	0.24	0.13	0.04	0.16	0.07
Queue Length 95th (m)	0.0	0.0	0.9	0.0	1.6
Control Delay (s)	0.0	0.0	1.3	0.0	14.3
Lane LOS			A		B
Approach Delay (s)	0.0		0.5		14.3
Approach LOS					B

Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	43.2%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	53	560	414	40	3	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	56	589	436	42	3	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	478				863	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				863	239
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				99	99
cM capacity (veh/h)	1081				279	762

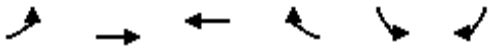
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	224	393	291	166	3	4
Volume Left	28	0	0	0	3	0
Volume Right	0	0	0	21	0	4
cSH	1081	1700	1700	1700	279	762
Volume to Capacity	0.05	0.23	0.17	0.10	0.01	0.01
Queue Length 95th (m)	1.2	0.0	0.0	0.0	0.3	0.1
Control Delay (s)	1.5	0.0	0.0	0.0	18.1	9.7
Lane LOS	A				C	A
Approach Delay (s)	0.5		0.0		13.3	
Approach LOS					B	

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	343	10	50	723	21	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	361	11	53	761	22	34
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			372		852	186
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			372		852	186
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		92	96
cM capacity (veh/h)			1184		285	825

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	241	126	280	507	39
Volume Left	0	0	26	0	22
Volume Right	0	5	0	0	17
cSH	1700	1700	1184	1700	398
Volume to Capacity	0.14	0.07	0.04	0.30	0.10
Queue Length 95th (m)	0.0	0.0	1.1	0.0	2.5
Control Delay (s)	0.0	0.0	1.2	0.0	15.0
Lane LOS			A		C
Approach Delay (s)	0.0		0.4		15.0
Approach LOS					C

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	6	369	709	4	38	64
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	6	388	746	4	40	67
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	751				955	375
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	751				955	375
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				84	89
cM capacity (veh/h)	855				254	622

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	133	259	498	251	40	67
Volume Left	3	0	0	0	40	0
Volume Right	0	0	0	2	0	67
cSH	855	1700	1700	1700	254	622
Volume to Capacity	0.01	0.15	0.29	0.15	0.16	0.11
Queue Length 95th (m)	0.2	0.0	0.0	0.0	4.2	2.8
Control Delay (s)	0.3	0.0	0.0	0.0	21.8	11.5
Lane LOS	A				C	B
Approach Delay (s)	0.1		0.0		15.3	
Approach LOS					C	

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C
Traffic Signal Warrant Analysis
For Projected Conditions:
Richmond/Broadview/Site Driveway

Richmond / Broadview / Site Access - Projected

Signal Warrant		Description		Minimum Requirement for Two-Lane Roadways	Compliance		
				Restricted Flow - Operating Speed Less Than 70 km/h	Sectional %	Entire %	Warrant
Intersection	1. Minimum Vehicular Volume	(1) A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of on Average Day, and	900	76%	41%	**No**
		(4) B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	170	41%		
	2. Delay to Cross Traffic	(1) A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	900	68%	39%	
		(2) B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	75	39%		

Notes

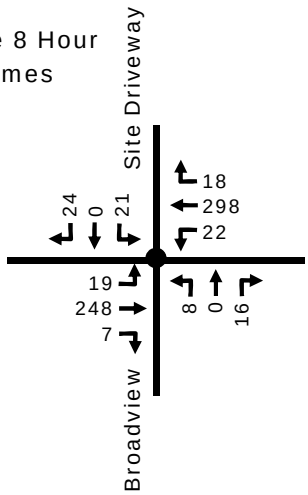
1 *Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above* — **Yes**

2 *For Definition of Crossing Volume Refer to Note 4 on the Signal Warrant Analysis Form B2.03.08*

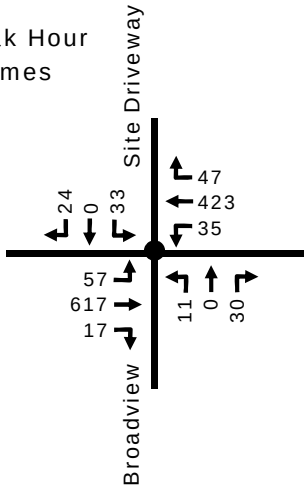
3 *The Lowest Sectional Percentage Governs the Entire Warrant*

4 *For "T" Intersections the Warrant Values for Minor Street Should be Increased by 50% (Warrant 1B only)* — **No**

Average 8 Hour Volumes



AM Peak Hour Volumes



PM Peak Hour Volumes