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Technical Memorandum

To:	Mike Giampa	Date:	8 June 2020
Copy:	Mark Baker, P.Eng.	Project:	477514-01000
From:	Matthew Mantle, P.Eng./Rani Nahas, E.I.T.		

Re: 850 Champlain Street Block 4 SPA – Addendum #3

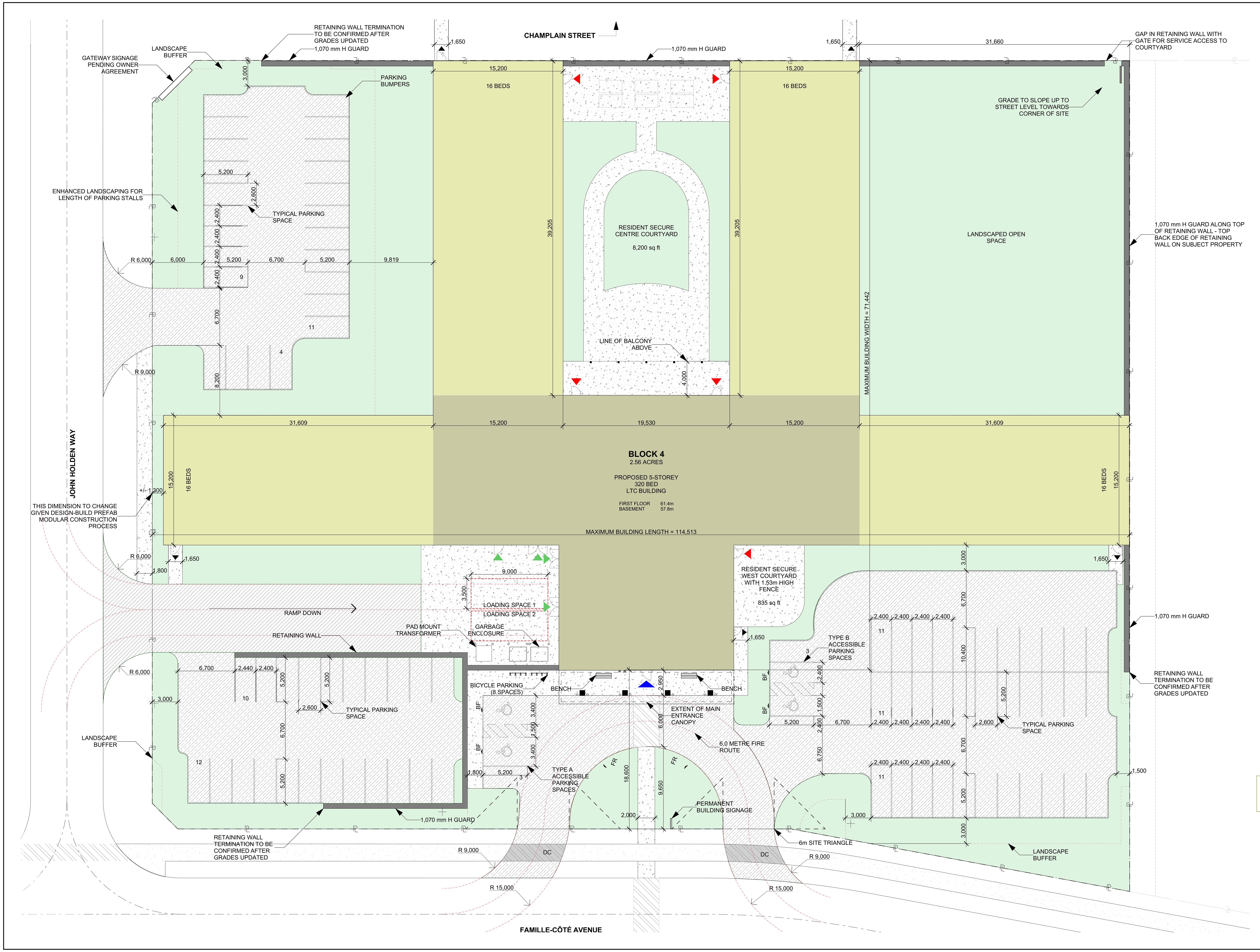
1.0 Introduction

This Addendum has been prepared to support the Site Plan Application (SPA) for the residential care facility within Block 4 of the Plan of Subdivision located at 850 Champlain. It is updating the previously completed Community Transportation Study (CTS) in support of the Plan of Subdivision in 2013 and Addendum 2 in support of registering the subdivision and an anticipated Site Plan Control application in 2017, all of which can be found in Appendix A. This site is currently zoned as Mixed-Use Centre with Exceptions (MC [2179]). The planned horizon year for the residential care facility is 2021 with the full site build-out horizon year of 2026.

It has been confirmed with the City of Ottawa, that an addendum letter is considered appropriate at this time given no change to the land use relative to the earlier transportation planning work. The analysis should identify the change is trips (by mode) for the proposed 320-unit residential care facility, and also include a Multi-Modal Level of Service (MMLoS) assessment along the boundary streets of the subject site.

The site is located approximately 150m south of Jeanne D'Arc Boulevard along Champlain Street within Block 4 of the 850 Champlain Street Plan of Subdivision. The four proposed driveway connections are located to the north and west sides of the proposed building, which connect to two local streets within the 850 Champlain Street Plan of Subdivision. The two driveways along the north face of the proposed building will connect to John Holden Way and the remaining two will connect to Famille-Côté Avenue. Local context and the site plan are shown in Figure 1 and Figure 2, respectively.

Figure 1: Local Context



1 ENLARGED SITE PLAN
Axxx A101 1:200

Planner & Landscape:
FOTENN Planning + Design
223 McLeod Street
Ottawa, ON, K2P 0Z8

Structural:
Entuitive
200 University Avenue, 7th Floor
Toronto, ON, M5H 3C6

Mechanical & Electrical:
exp
499 King Street East, Suite 200
Hamilton, ON, L8N 1E1

Civil:
Ainley Graham & Associates Limited
2724 Fenton Road
Ottawa, ON, K1T 3T7

Geotechnical:
Paterson Group
154 Colonnade Road South
Ottawa, ON, K2E 7J5

Transportation:
Parsons Transportation Group
1223 Michael Street, Suite 100
Ottawa, ON, K1J 7T2

Noise/Wind:
Gradient Wind Engineering Inc.
127 Walgreen Road
Ottawa, ON, K0A 1L0

Environmental
Kilgour & Associates LTD
2285 St. Laurent Boulevard
Ottawa, ON, K1G 4Z6

Prints issued to

Particulars	No.	Date	By

Particulars	No.	Date	By

Revisions to drawing — All previous issues of this drawing are superseded.

MMMC ARCHITECTS
Brantford Studio: 127 Brant Ave., Brantford, ON N3T 3H5, 519.756.6331 1.877.789.6662
K-W Studio: 564 Weber St. N., Suite 1, Waterloo, ON N2L 5C6, 519.575.2227 1.877.789.6662
www.mmmc.on.ca

PRELIMINARY ONLY
DO NOT USE FOR CONSTRUCTION

PLAN NORTH

Project title
REVERA
5 STOREY, 320 BED LONG TERM CARE FACILITY
OTTAWA **ONTARIO**

Project number	Date issued	Scale
1844		1:200
	Drawn by: VP	Date: 2020-05-25

Sheet title: **ENLARGED SITE PLAN**
Drawing no.: **A101**

2.0 Existing Conditions

2.1 Updated Traffic Volumes

This section reviews the update to existing conditions, which now include the most current intersection turning movement counts at Champlain/P&R/OR 174 and Champlain/Jeanne d'Arc. The previous transportation planning work was based on data extending back to 2015/2016.

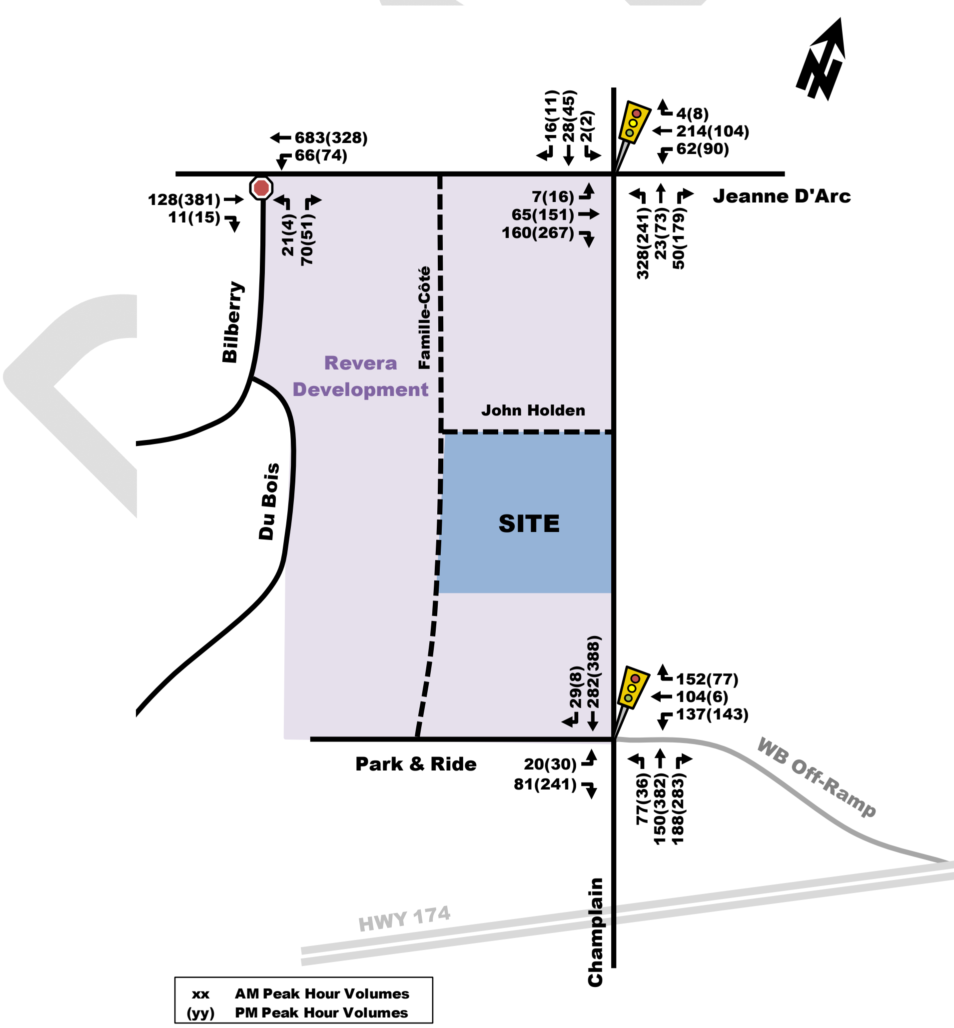
Updated intersection turning movement counts were obtained through the City of Ottawa at the following two locations:

- Champlain/P&R/OR 174 (February 2018); and
- Champlain/Jeanne d'Arc (November 2020).

The source traffic data are included as Appendix B, and the values summarized in Figure 3 below. It is noteworthy that the volumes along the east leg (westbound movement) of the Champlain/P&R-OR 174 intersection are significantly lower than traffic volumes recorded in the 2015 count. It was noted however in Addendum #2 that the 2015 count at this location was significantly higher than previous years. The 2020 volumes exiting OR174 at this location total approximately 400 veh/h during the morning peak hour compared to the 925 veh/h observed during the morning peak hour in 2015. Prior to 2015, previous count data shows this volume to be in the range of 250 to 300 veh/h during the morning peak hour. All other volumes at this intersection remained relatively consistent when compared to previous count data.

At the Champlain/Jeanne d'Arc intersection, volumes at this intersection were noted to have remained relatively consistent when compared to the previous 2016 count data.

Figure 3: Existing Peak Hour Traffic Volumes

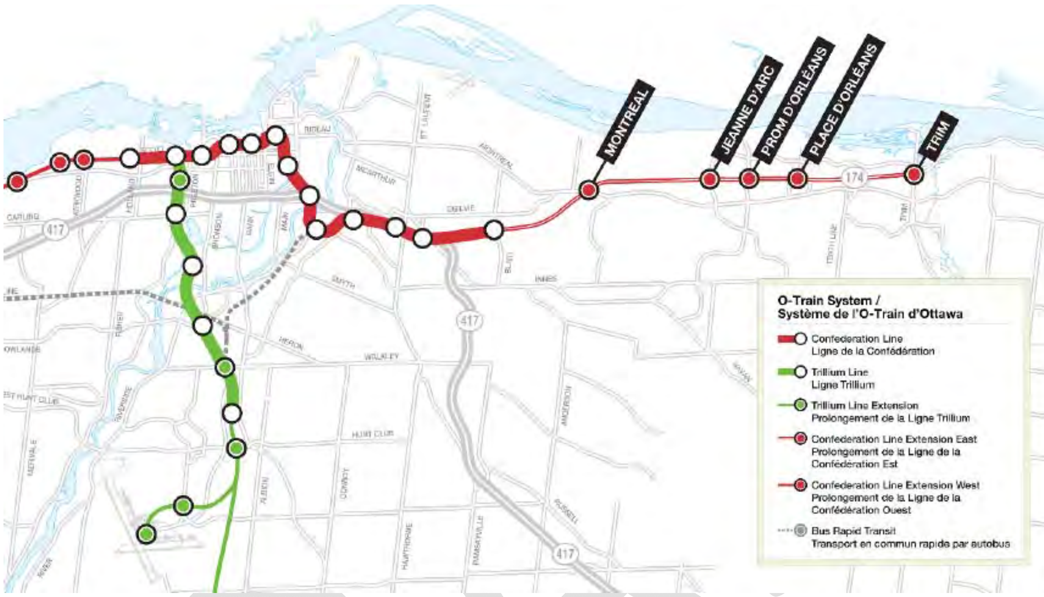


2.1.1 Planned Conditions

Planned Network Transportation Projects

A notable transportation network change is the Stage 2 construction of the east-west LRT, which is the conversion of the City's existing BRT corridor to LRT. Stage 2 LRT is planned to extend east to the existing Place d'Orleans Transit Station (and beyond to Trim Station) and is expected to be completed by 2025. The following Figure 4 illustrates the planned Stages 1 and 2 of the future Confederation/Trillium Lines. Note that the existing BRT will still operate within the study area until LRT construction.

Figure 4: Stage 2 LRT – East Extension



Other Area Development

1220-1226 Place D'Orleans Drive, 6883 Rocque Street

Choice Properties REIT is proposing the construction of a commercial development consisting of 32,830 ft^2 of retail/pharmacy, and a 4,500 ft^2 fast-food restaurant with a drive-through at the above noted address. The Transportation Impact Assessment (prepared by Parsons) projected an increase in vehicle traffic of approximately 105 to 155 veh/h during peak hours.

3.0 Forecasting

3.1 Trip Generation, and Mode Shares (Updated)

Appropriate trip generation rate for the residential care facility consisting of approximately 320 units was obtained from ITE's Trip Generation Manual 10th Edition. Table 1 summarizes the trip generation rates.

Table 1: Vehicle Trip Rates for Retail and Residential Uses

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Assisted Living	ITE 254	T = 0.19(du)	T = 0.26(du)
Note: T = Average Vehicle Trip; 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 Ottawa study area context were applied to attain estimates of person trips for the proposed development. 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 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 Phase 1 retail developments is summarized in Table 2.

Table 2: Modified Person Trip Generation – Phase 1 Update

Land Use	Area	AM Peak (Person Trips/hr)			PM Peak (Person Trips/hr)		
		In	Out	Total	In	Out	Total
Assisted Living	320 units	49	29	78	40	66	106
Total Phase 1 "New" Person Trips		49	29	78	40	66	106

The person trips shown in Table 2 for the proposed development was then reduced by modal share values. Based on the updated land use statistics and assuming similar modal share assumptions identified in the previous work, the resulting mode share results are outlined in Table 3.

Table 3: OD-Survey Mode Share

Travel Mode	Mode Share	AM Peak (Person Trips/hr)			PM Peak (Person Trips/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	50%	25	15	40	20	33	53
Auto Passenger	10%	5	3	8	4	7	11
Transit	35%	17	10	27	14	23	37
Non-motorized	5%	2	1	3	2	3	5
Total Person Trips	100%	49	29	78	40	66	106
Total 'New' Auto Trips		25	15	40	20	33	53

Since the site is located within walking distance of an existing BRT station/future LRT station, auto driver trips are typically reduced and transit increased. Table 4 displays the modified person trips for the development to reach 50% transit ridership.

Table 4: Transit Priority Person Trip Generation.

Travel Mode	Mode Share	AM Peak (Person Trips/hr)			PM Peak (Person Trips/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	35%	18	11	29	14	24	38
Auto Passenger	10%	5	3	8	4	6	10
Transit	50%	24	14	38	20	33	53
Non-motorized	5%	2	1	3	2	3	5
Total Person Trips	100%	49	29	78	40	66	106
Total 'New' Auto Trips		18	11	29	14	24	38

However, due to the current uncertainty of how transit ridership will be affected in the near future and that a large portion of the traffic is anticipated to be generated by staff and visiting family members, the analysis will be based conservatively on the higher auto mode shares as presented in Table 3.

3.1.1 Residential Care Facility – Net Auto Trip Increase

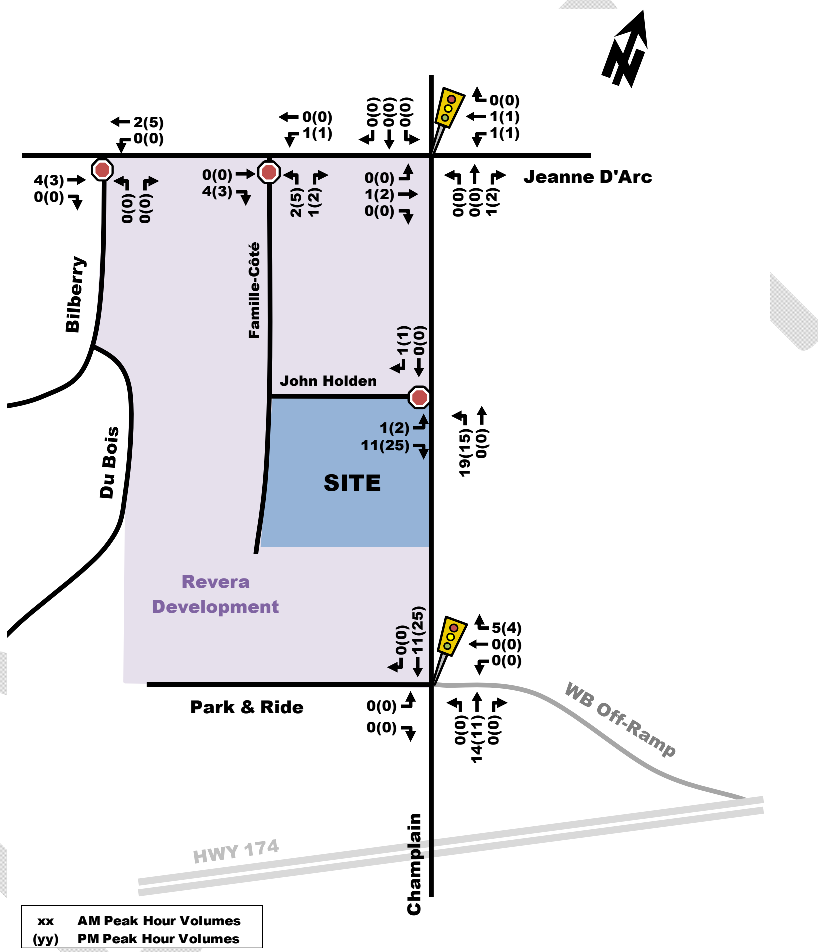
The current site plan for the residential care facility consists of 320 units compared to the previous Addendum #2 site plan which assumed 256 units. As shown below in Table 5, this represents an increase in the projected two-way traffic volumes of approximately 16 veh/h during both peak hours.

Table 5: Net 'New' Auto Trips – Residential Care Facility

Travel Mode	AM Peak (veh/hr)			PM Peak (veh/hr)		
	In	Out	Total	In	Out	Total
Addendum #2 (2016)	18	6	24	11	26	37
Addendum #3 (2020)	25	15	40	20	33	53
Net 'New' Auto Trips	7	9	16	9	7	16

It was assumed that the site driveway connections at Jeanne D'Arc Boulevard and at Champlain Street will be constructed for this stage of development based on site visits. Both site driveway connections are assessed as full-movement driveway connections. The total 'new' vehicle trips are illustrated in Figure 5.

Figure 5: Total 'New' Auto Trips - Residential Care Facility



3.2 Background Growth

The following background traffic growth (summarized in Table 6) was calculated based on historical traffic count data (years 2009, 2011, 2016 and 2020) provided by the City of Ottawa at the Champlain/Jeanne D'Arc intersection. Detailed background traffic growth analysis is included as Appendix C.

Table 6: Champlain/Jeanne D'Arc Historical Background Growth (2009-2020)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-1.96%	0.09%	0.85%	-0.59%	0.08%
AM Peak	-4.95%	0.32%	2.62%	0.31%	1.08%
PM Peak	-2.11%	-0.80%	-0.39%	-1.95%	-1.00%

As shown in Table 6, the Champlain/Jeanne D'Arc intersection has experienced approximately 0.1 to 2% overall annual increase in traffic within recent years. As such a 1% per annum growth rate will be applied for the 2026 horizon year along Jeanne D'Arc Boulevard and Champlain Street. A background traffic growth rate is not applied to the 2021 horizon year as updated counts are from 2018-2020 and traffic patterns are trending downwards due to the COVID-19 work from home restrictions. The 2026 background traffic volumes are illustrated in Figure 6 below.

Figure 6: 2026 Background Traffic Volumes

3.3 Other Developments

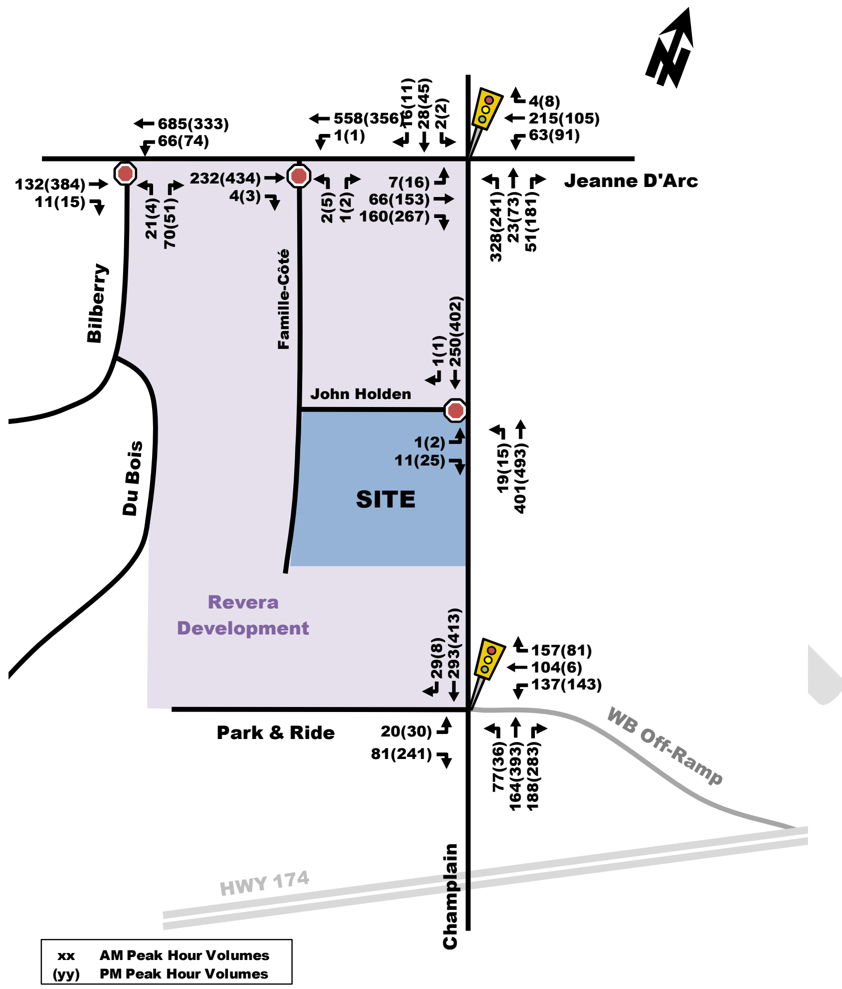
Other area developments are outlined in Section 2.1.1. As the 1226 Place D'Orleans Transportation Impact Assessment did not include a formal trip assignment, traffic associated with these developments are accounted for within the background traffic growth rate.

4.0 Analysis

4.1.1 Interim 2021 Site Build-Out

The total projected traffic volumes for the 2021 horizon year were derived by superimposing the residential care facility site-generated traffic volumes (Figure 5) onto the existing traffic volumes (Figure 3). The resulting total projected traffic volumes for the 2021 horizon year is illustrated in Figure 7.

Figure 7: Total Projected Interim Traffic Volumes - Residential Care Facility



4.1.2 Full Site Build-Out

The full site build-out for the 850 Champlain development assessed in Addendum #2 is assumed to consist of the following land uses:

- 320 residential care facility
- 180 suite retirement home
- 352 residential dwelling units
- 14,875 m² office

The resultant trip generation during the peak hours is approximately 400 veh/h two-way during the morning peak hour and 460 veh/h during the afternoon peak hour. These volumes were distributed to the study area intersections and are illustrated as Figure 8. The total projected traffic volumes for the 2026 horizon year were derived by superimposing the 2026 site-generated traffic volumes (Figure 8) onto the total 2026 background traffic volumes (Figure 6). The resulting total projected traffic volumes for the 2026 horizon year is illustrated in Figure 9.

Figure 8: Projected Full Build-Out 'New' Auto Trips

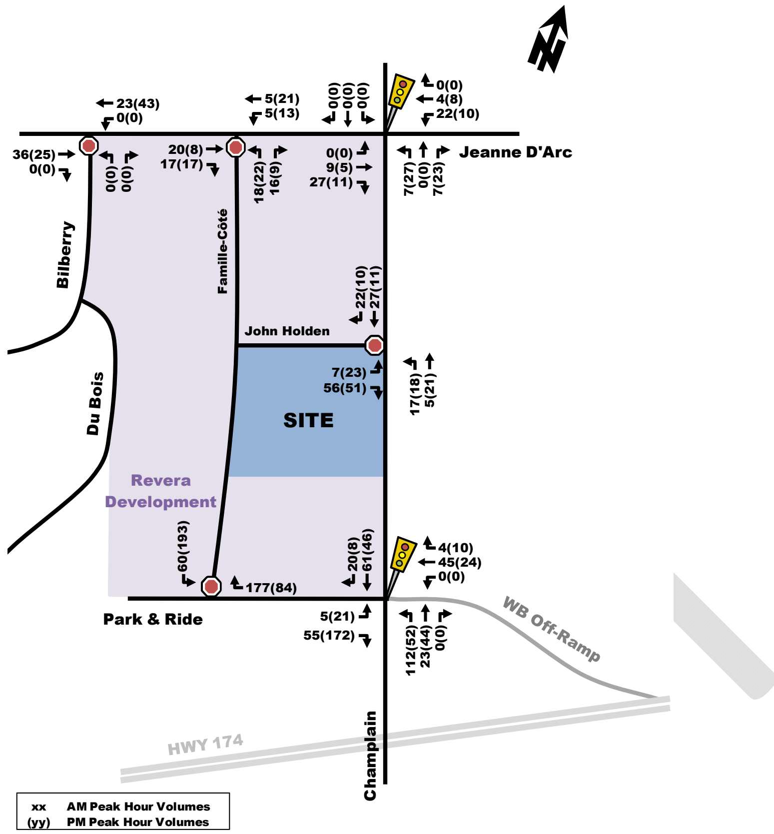
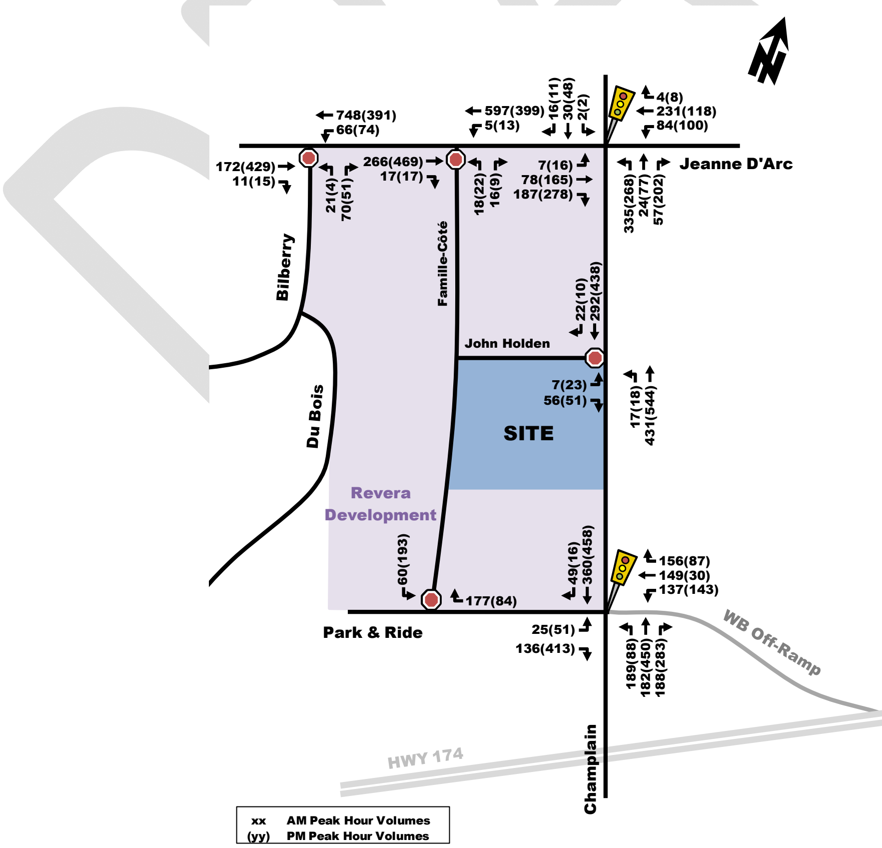


Figure 9: Projected Full Site Build-Out Total Volumes



4.2 MMLoS Analysis

4.2.1 Boundary Road MMLoS Analysis

The boundary streets for the development are Jeanne D'Arc Boulevard, Champlain Street, Famille-Côté Avenue, and John Holden Way. At this time, there has not been any complete street concepts prepared for these streets in proximity of the development. The existing roadways, geometry consists of the following features.

Jeanne D'Arc Boulevard:

- Major collector roadway;
- 1 vehicle travel lane in each direction;
- 1.5-1.8m sidewalks with 3m boulevards on both sides of the roadway;
- More than 3,000 vehicles per day; and,
- Designated as a 'Spine' cycling route.

Champlain Street:

- Major collector roadway;
- 1 vehicle travel lane in each direction;
- 1.5-1.8 m sidewalks with 4m boulevards on both sides of the roadway;
- More than 3,000 vehicles per day; and,
- Designated as a 'Local' cycling route.

Famille-Côté Avenue:

- Local roadway;
- 1 vehicle travel lane in each direction;
- 1.8m sidewalks with 1.8m boulevards on both sides of the roadway; and,
- Less than 3,000 vehicles per day.

John Holden Way:

- Local roadway;
- 1 vehicle travel lane in each direction;
- A MUP provided on the north side of the roadway connecting Champlain Street and Famille-Côté Avenue; and,
- Less than 3,000 vehicles per day.

The multi-modal level of service analysis for the subject road segments adjacent to the site is summarized in Table 7 with detail analysis provided in Appendix D. The site targets reflect the Mixed-Use Centre designation. As shown below, the all MMLoS targets have been met for the boundary roads.

Table 7: MMLoS – Boundary Road Analysis

Road Segment	Level of Service							
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Jeanne D'Arc Boulevard	C	C	B	B	D	No Target	B	D
Champlain Street	C	C	B	B	D		B	D
John Holden Way	A	C	A	D	D		B	No Target
Famille-Côté Avenue	A	C	A	D	D		B	

4.2.2 Intersection MMLoS Analysis

The MMLOS analysis for the signalized Jeanne D'Arc/Champlain and Champlain/P&R-OR174 WB Off-Ramp intersections are summarized in Table 8. The detailed MMLoS analysis is provided as Appendix D.

Table 8: MMLoS – Signalized Intersection Analysis

Road Segment	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicle (LoS)	
	PLoS	Target	BLoS	Target	TLoS	TLoS	TkLoS	Target	LoS	Target
Champlain/Jeanne D'Arc	D	C	D	B	C	No Target	E	D	A	D
Champlain/P&R-OR174	F	C	F	B	E		C	D	A	D

The letters identified in red text in Table 8 do not meet the MMLoS Target. There are no plans for transit priority measures identified in the TMP within the study area and, as such, there is no target TLoS. The vehicle level of service is met at both signalized intersections and the truck level of service is met at the Champlain/P&R-OR174 intersection.

With regard to pedestrians, the long crossing distances (4 to 7 lanes) results in the poor pedestrian levels of service. As both intersections are comprised of major collector roadways, it would be very difficult to raise the PLoS to an 'A' without significant geometric changes.

With regard to cyclists, the lack of cycling facilities provided at the intersection results in the failing bicycle levels of service at both locations. Should curbside bike lanes or cross-rides be implemented, the BLoS would improve to a BLoS ‘B’ or better, meeting the target. These can be considered by the City should the Champlain/Jeanne D’Arc and Champlain/P&R-OR174 be improved.

With regard to trucks, the Champlain/Jeanne D’Arc intersection only has one receiving lane for trucks which results in a TkLoS ‘E’. Improving the truck level of service would require extensive geometry changes.

As there are no planned transportation network changes that would affect the MMLoS results, the MMLoS analysis will remain the same for both existing and projected conditions.

4.3 Traffic Analysis

The following Table 9 provides a summary of the traffic operations for existing and projected conditions at study area intersections based on the Synchro (V10). The subject signalized 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 subject signalized intersections ‘as a whole’ were assessed based on weighted v/c ratio. The unsignalized intersections were assessed based on delay and the corresponding level of service. The Synchro model output are provided within Appendix E.

Table 9: Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection ‘as a whole’		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Existing						
Champlain/Jeanne D’Arc (S)	B(A)	0.63(0.57)	WBT(EBR)	15.6(13.3)	A(A)	0.46(0.40)
Champlain/P&R-OR174 (S)	A(A)	0.43(0.33)	WBT(NBR)	7.3(6.3)	A(A)	0.35(0.32)
Jeanne D’Arc/Bilberry (U)	C(C)	15.2(16.3)	NB(NB)	1.7(1.5)	A(A)	-
Projected – Residential Care Facility						
Champlain/Jeanne D’Arc (S)	B(A)	0.63(0.57)	WBT(EBR)	15.6(13.3)	A(A)	0.46(0.40)
Champlain/P&R-OR174 (S)	A(A)	0.43(0.33)	WBT(NBR)	7.3(6.3)	A(A)	0.35(0.32)
Jeanne D’Arc/Bilberry (U)	C(C)	15.3(16.4)	NB(NB)	1.7(1.5)	A(A)	-
Jeanne D’Arc/Famille-Côté (U)	B(B)	11.5(12.8)	NB(NB)	0.0(0.1)	A(A)	-
Champlain/John Holden (U)	A(A)	7.8(8.2)	EB(EB)	0.0(0.4)	A(A)	-
Projected – Full Site Build-Out						
Champlain/Jeanne D’Arc (S)	B(A)	0.65(0.58)	WBT(EBR)	16.2(13.8)	A(A)	0.48(0.42)
Champlain/P&R-OR174 (S)	A(A)	0.55(0.58)	NBL(EBR)	9.0(8.2)	A(A)	0.37(0.50)
Jeanne D’Arc/Bilberry (U)	C(C)	16.7(17.9)	NB(NB)	1.6(1.4)	A(A)	-
Jeanne D’Arc/Famille-Côté (U)	B(B)	11.9(14.5)	NB(NB)	0.5(0.7)	A(A)	-
Champlain/John Holden (U)	B(C)	11.2(16.0)	EB(EB)	1.0(1.2)	A(A)	-
Note:	Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane. S – Signalized Intersection U – Unsignalized Intersection					

As shown in Table 9, all study area intersections ‘as a whole’ are projected to operate at an acceptable LoS ‘A’ during the morning and afternoon peak hours for existing and projected conditions. Regarding critical movements, the study area intersections are projected to operate at an acceptable LoS ‘C’ or better during morning and afternoon peak hours for existing and projected conditions.

5.0 Conclusions

Based on the results summarized herein, the following transportation related conclusions are offered:

Proposed Site

- Revera is proposing a residential care facility within Block 4 of the 850 Champlain site;
- The proposed development is projected to generate 'new' two-way vehicle volumes of approximately 40 veh/h and 53 veh/h during the weekday morning and afternoon peak hours, respectively; and,
- Vehicle access to the development is proposed via four new driveway connections: two on Famille-Côté Avenue and two on John Holden Way.

MMLoS and Traffic Analysis

- The boundary roads meet the MMLoS targets;
- The study area intersections meet vehicle level of service targets only;
  - Pedestrian, bicycle, and truck level of service targets are not met due to the geometric design of the signalized study area intersections; and,
- The study area intersections are projected to operate 'as a whole' with a LoS 'A' during peak hours for both build-out of the residential care facility and build-out of the full site.

Based on the foregoing, the proposed development fits well into the context of the surrounding area, and its location and design serve to promote use of walking, cycling, and transit modes, thus supporting City of Ottawa policies, goals and objectives with respect to redevelopment, intensification and modal share. Therefore, approval from a transportation perspective of the proposed residential care facility development is recommended.

Prepared By:	Reviewed by:
Rani Nahas, E.I.T. Transportation Analyst	Matthew Mantle, P.Eng. Transportation Engineer

Appendix A

Community Transportation Study (2013) & Addendum #2 (2017)

Champlain Centre

Community Transportation Study (CTS)

Prepared for:

minto

Prepared by:

Delcan 60e ANNIVERSAIRE

July 2013

CTS Check List

prepared for: Minto Commercial Properties Inc.
200-180 Kent Street
Ottawa, ON K1P 0B6

OUR REF:TO3003TOL00

Report Context

- ☑ Municipal address;
  No inclusion rational: ____________________
- ☑ 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, 600metres from the Maple Street Rapid Transit Station);
  No inclusion rational: ____________________
- ☑ Existing land uses or permitted use provisions in the Official Plan, Zoning By-law, etc.;
  No inclusion rational: ____________________
- ☑ Proposed land uses and relevant planning regulations to be used in the analysis;
  No inclusion rational: ____________________
- ☑ Proposed development size (building size, number of residential units, etc.) and location on site;
  No inclusion rational: ____________________
- ☑ Estimated date of occupancy;
  No inclusion rational: ____________________
- ☑ Planned phasing of development;
  No inclusion rational: ____________________
- ☐ Proposed number of parking spaces (not relevant for Draft Plans of Subdivision);
  No inclusion rational: Unknown
- ☑ Proposed access points and type of access (full turns, right-in/ right-out, turning restrictions, etc.
  No inclusion rational: ____________________
- ☑ Study area;
  No inclusion rational: ____________________

Existing Conditions

- ☑ Existing roads and ramps in the study area, including jurisdiction, classification, number of lanes, and posted speed limit;
  No inclusion rational: ____
- ☑ Existing intersections, indicating type of control, lane configurations, turning restrictions, and any other relevant data (e.g., extraordinary lane widths, grades, etc.);
  No inclusion rational: ____
- ☑ Existing access points to adjacent developments (both sides of all roads bordering the site);
  No inclusion rational: ____
- ☑ Existing transit system, including stations and stops;
  No inclusion rational: ____
- ☑ Existing on- and off-road bicycle facilities and pedestrian sidewalks and pathway networks;
  No inclusion rational: ____
- ☑ Existing system operations (V/C, LOS);
  No inclusion rational: ____
- ☑ Major trip generators/ attractors within the Study Area should be indicated.
  No inclusion rational: ____

Demand Forecasting

- ☑ General background growth;
  No inclusion rational: ____
- ☑ Other study area developments;
  No inclusion rational: ____
- ☑ Changes to the study area road network;
  No inclusion rational: ____
- ☑ Future background system operations (V/C, LOS, queue lengths):
  No inclusion rational: ____
- ☑ Trip generation rates;
  No inclusion rational: ____
- ☑ Trip distribution and assignment.
  No inclusion rational: ____

Impact Analysis

- ☑ Total future system operations (V/C, LOS, queue lengths);

  No inclusion rational: ____
- ☑ Signal and auxiliary lane (device) warrants;

  No inclusion rational: ____
- ☑ Operational/ safety assessment (e.g., sight line assessment where grades are an issue);

  No inclusion rational: ____
- ☑ Storage analysis for closely spaced intersections;

  No inclusion rational: ____
- ☑ Pedestrian and bicycle network connections and continuity;

  No inclusion rational: ____
- ☑ On-site circulation and design;

  No inclusion rational: ____
- ☑ Potential for neighbourhood impacts; and TDM.

  No inclusion rational: ____
- ☑ Synchro Files

  No inclusion rational: ____

CTS

Impact Analysis

- ☑ Network Capacity Analysis;

  No inclusion rational: ____
- ☑ Non-auto network connections and continuity;

  No inclusion rational: ____
- ☑ Potential for community impacts, and TDM.

  No inclusion rational: ____
- ☑ Synchro Files

  No inclusion rational: ____
- ☑ Screenline Analysis

  No inclusion rational: ____

Champlain Centre

Community Transportation Study (CTS)

prepared for:
Minto Commercial Properties Inc.
200-180 Kent Street
Ottawa, ON K1P 0B6

prepared by:
Delcan Corporation
1223 Michael Street
Suite 100
Ottawa, ON K1J 7T2

16 July 2013

TO3003TOL00

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 INTRODUCTION

From the information provided, it is our understanding that Minto Commercial Properties Inc. (Minto) is proposing a substantial mixed-use development on their lands located in the northwest quadrant of the Champlain/OR174 intersection in Orléans, as depicted on Figure 1: Site Location.

The proposal includes retail commercial, office, and residential components that will be developed within two phases – the initial, shorter-term phase (5 year horizon) and the second, longer-term phase (20 years +). The majority of the mixed-use development is envisioned within the shorter-term, whereas the additional office development on the current Park & Ride lot is being contemplated in the fullness of time should future market conditions warrant. In view of the Plan of Subdivision being sought by the developer at this time for the initial phase only, a Community Transportation Study (CTS) is one of the necessary supporting documents.

2.0 LOCATION DETAILS

As shown on the Concept Plan (5 year), Figure 2, the proposed Area 1 development is bounded on the north side by Jeanne d'Arc Boulevard, on the east side by Champlain Street, on the south side by the City of Ottawa Park & Ride Lot and on the west side by Bilberry Drive (East) and Du Bois Avenue. Area 1 consists of 472 residential units and approximately 15,726 m^2 (169,273 ft^2) of commercial uses.

Area 2 development, which includes the additional office development being contemplated for the long-term is situated adjacent to the south (primarily within the existing Champlain Park & Ride Lot). Although the not the subject of the CTS, the Ultimate Concept Plan is included as Appendix A for reference.

Residential development currently exists along the west side of both Bilberry Drive and Du Bois Avenue and along the north and east sides of Jeanne d'Arc Boulevard and Champlain Street, respectively.

The southern boundary of the site is the access road to the City-owned Park & Ride Lot, the intersection of which occurs on Champlain Street opposite the OR174 westbound off-ramp.

3.0 STUDY AREA CURRENT TRANSPORTATION NETWORK

3.1 Road Network

Jeanne d'Arc Boulevard is a 2/4 lane undivided major collector along the northern perimeter of the proposed development. It runs parallel to OR174 both east and west of Champlain Street. West of the Bilberry Drive (East)/Jeanne d'Arc intersection, which is unsignalized and controlled by a 'STOP' sign on the minor road, Jeanne d'Arc contains two lanes while east of the Bilberry Drive (East) intersection it widens to four lanes as far east as Champlain

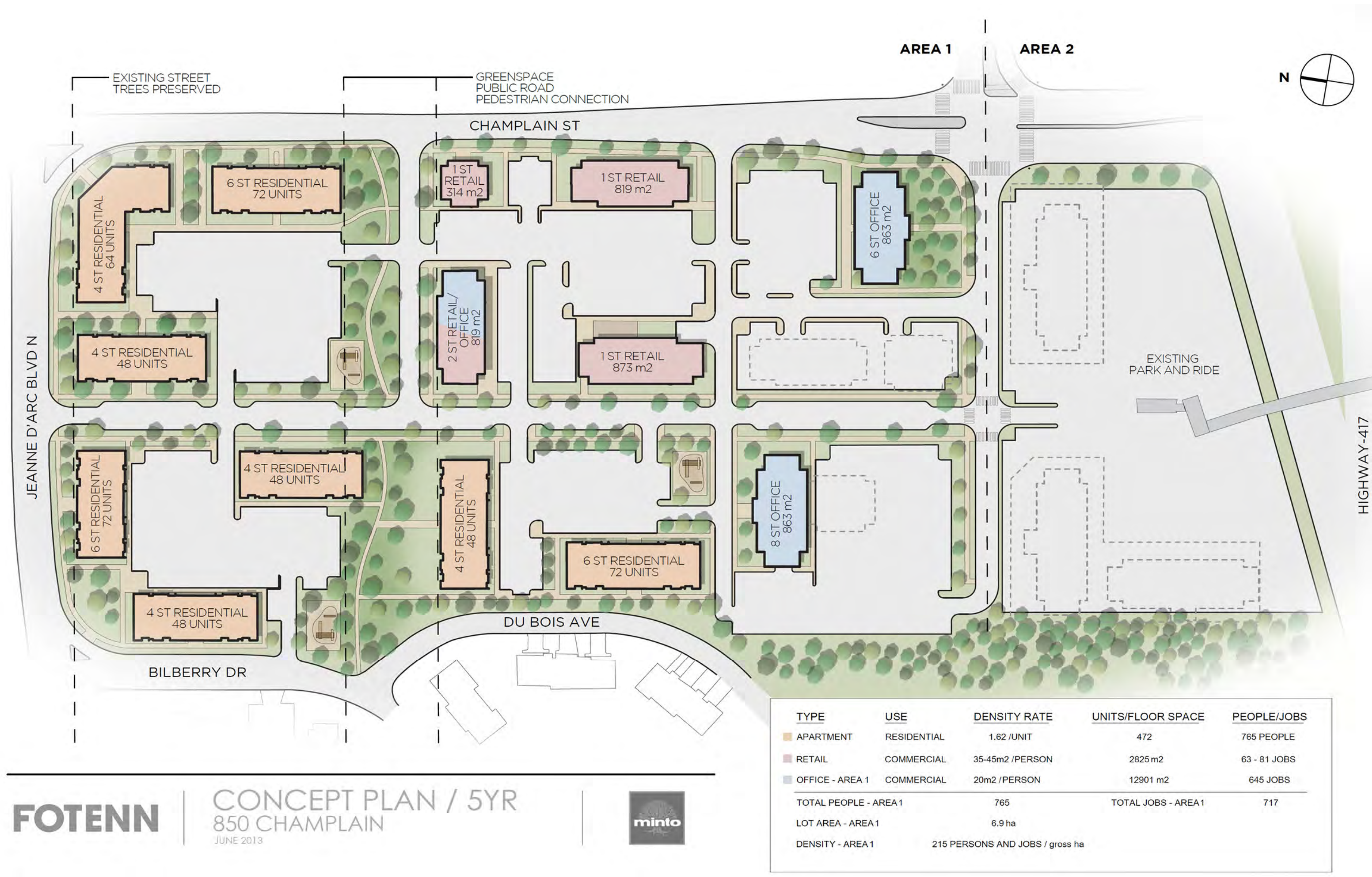
Street. In the eastbound direction, one lane continues on east of Champlain Street while one lane turns south. An eastbound left-turn lane is also provided at Champlain Street.

Figure 1: Site Location

Champlain Street intersects with Jeanne d'Arc Boulevard north of the proposed development. Between Jeanne d'Arc Boulevard and the access to/from the Park & Ride Lot, Champlain Street has a two-lane urban arterial cross-section at Jeanne d'Arc Boulevard gradually widening to a four-lane divided arterial approaching OR174 to the south. Champlain Street has a 40 km/h maximum speed limit.

Bilberry Drive and Du Bois Avenue are two-lane local roads, both subjected to 40 km/h speed limits. Du Bois is 'STOP' controlled at Bilberry Drive, and has multi-way 'STOP' controlled intersections and speed control humps along its length.

The Champlain Street Interchange on OR174 has on and off lanes to/from both the east and west.



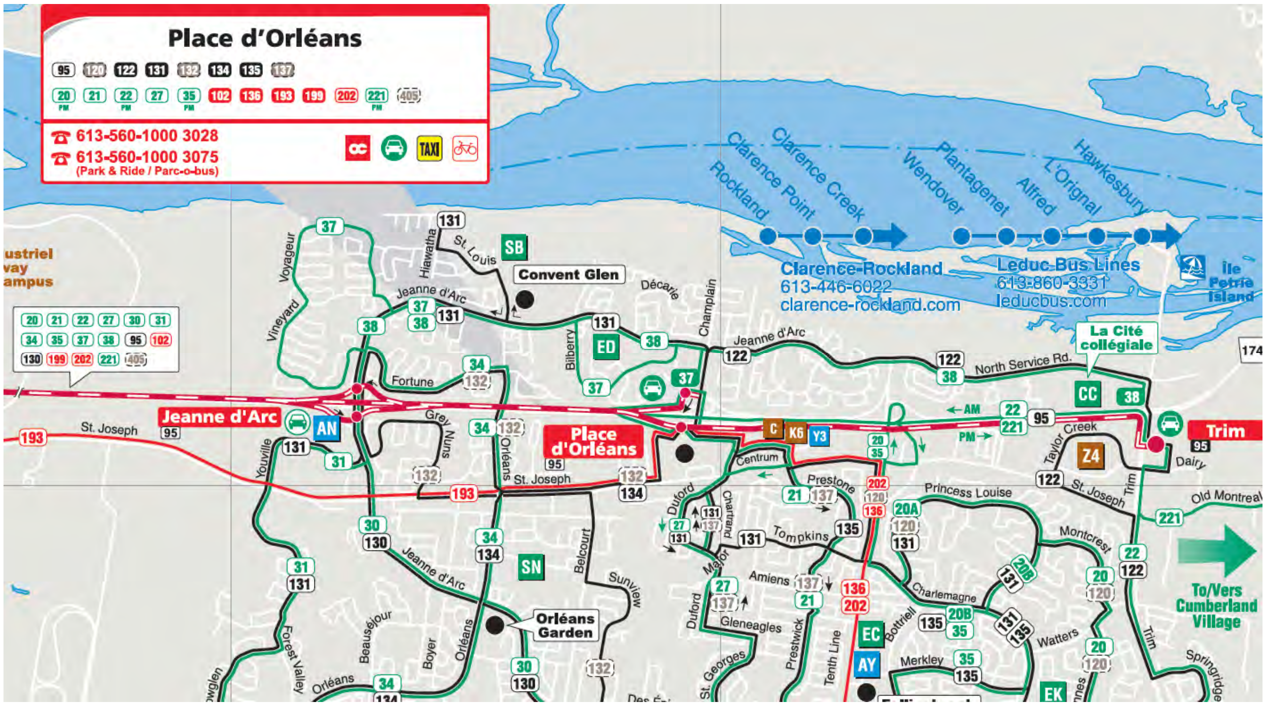
Delcan

Figure 2: Concept Plan (5 Years)

3.2 Transit Network

As shown on Figure 3, the site is well served by public transit, being within 400 m walking distance of the East Transitway and the Place d'Orléans Transitway Station (which serves the Place d'Orléans Shopping Centre).

Figure 3: OC Transpo Route Map for Orléans Area



All day Route #130, Express Routes #38 and #39 operate on Jeanne d'Arc Boulevard between Champlain Street and Bilberry Drive (East). Route #39 operates as a peak period route on Bilberry Drive in the westbound direction and as a weekday express route in the eastbound direction. All day Routes #130 and #122 operate on Champlain Street between Jeanne d'Arc Boulevard and Place d'Orléans. Due to its proximity to the Champlain Street Park & Ride Lot, the site has very convenient access to the Route #95 cross-town service along OR174/East Transitway between Trim Road and Barrhaven.

There are several OC Transpo routes that operate on Jeanne d'Arc Boulevard between Champlain Street and Bilberry Drive (East), including Regular Route #131, Express Routes #37 and #38. All day Routes #131 and #122 operate on Champlain Street between Jeanne d'Arc Boulevard and Place d'Orléans. Due to its proximity to the Champlain Street Park and Ride Lot, the site has very convenient access to the Route #95 cross-town service along OR174/East Transitway between Trim Road and Barrhaven.

Pedestrian System

Being within the urban area, sidewalks are provided on both sides of Champlain Street and Jeanne d'Arc Boulevard and along the south/east side of Bilberry Drive. There are no sidewalks along Du Bois Avenue. A temporary pedestrian pathway has been developed across the site linking Du Bois Avenue to the Champlain Park & Ride Lot.

Cycling Facilities

The current City of Ottawa Official Plan indicates that Champlain Street and Jeanne d'Arc Boulevard are part of the Primary Urban Cycling Transportation Network with on-road facilities provided by way of wider general traffic lanes and sections of bicycle-only lanes.

4.0 STUDY AREA FUTURE TRANSPORTATION NETWORK

The 2008 Transportation Master Plan for the City of Ottawa contains a number of future transportation projects which are of relevance to the continuing growth of the Orléans Community. Included are the following:

East Transitway Bus Rapid Transit (BRT)	*Extension of BRT from Place D'Orléans to Trim Road in the Ottawa Road (OR) 174 corridor.*
Cumberland Transitway (BRT)	*Construction of a BRT corridor from Blair Station to Trim Road south of Innes Road.*
Ottawa Road 174	*Widening from five to six lanes between Highway 417 and Blair Road as a Phase 1 project (2009-2015)*[1] *and from four to six lanes between Blair Road and Jeanne d'Arc Boulevard as a Phase 2 project (2016-2022).*
Trim Road	*Widening/realignment from two to four lanes between the North Service Road, north of OR 174 to the Blackburn Hamlet Bypass Extension as a Phase 1 project (2009-2015)*
Blackburn Hamlet Bypass Extension	*Construction of a new two lane (later four lanes) link between Navan Road and Frank Kenny Road. Two laning scheduled as a Phase 1 (2009-2015) project. Four laning scheduled as a Phase 2/3 (2016-2031) project.*
St. Joseph Boulevard	*Widening from two to four lanes from east of Tenth Line Road to Dairy Road scheduled as a Phase 2 (2016-2022) project.*

[1] Completed

5.0 EXISTING TRANSPORTATION CONDITIONS

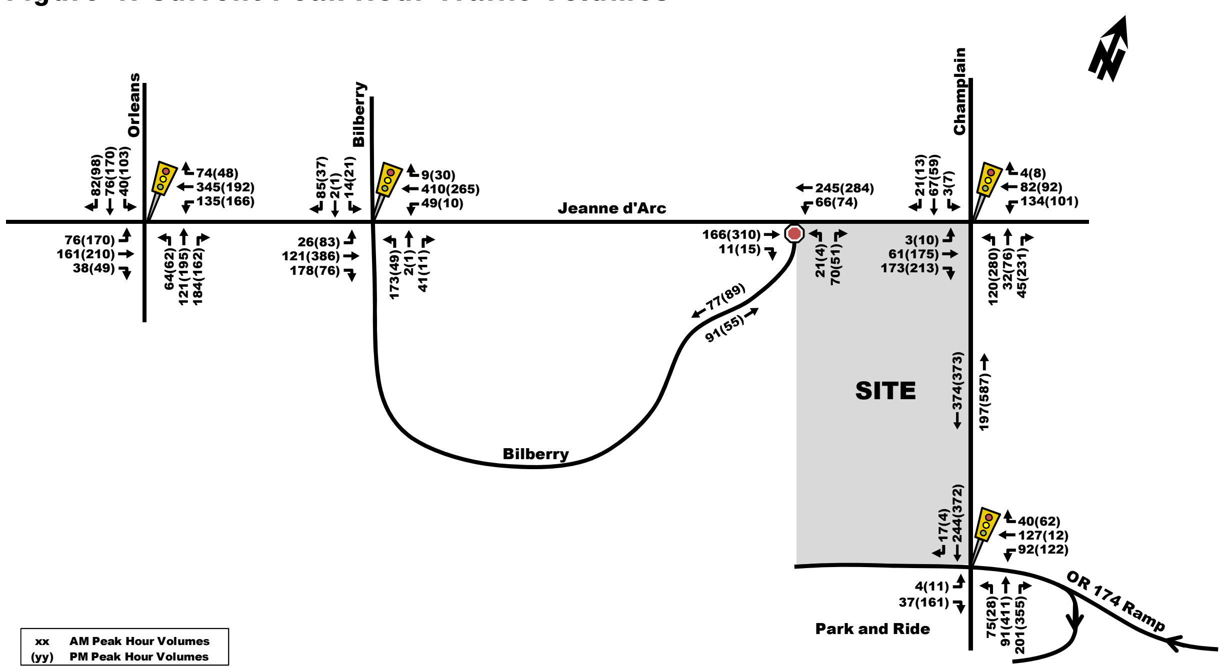
5.1 Traffic Volumes

Current traffic counts provided by the City of Ottawa (Appendix B) and depicted on Figure 4, indicate that Champlain Street between Jeanne d'Arc Boulevard and OR174 currently carries a two-way volume of approximately 600 vph during the morning peak hour and approximately 950 vph during the afternoon peak hour. North of Jeanne d'Arc Boulevard, Champlain Street carries two-way totals of approximately 125 vph during the morning peak hour and approximately 175 vph during the afternoon peak hour.

Between Champlain Street and Bilberry Drive (East), Jeanne d'Arc Boulevard carries two-way totals of approximately 500 vph during the morning peak hour and 800 vph during the afternoon peak hour.

A recent traffic count on Bilberry Drive (East), carried out by Delcan (March 2010), indicated two-way volumes totalling approximately 170 vph during the morning peak hour and approximately 150 vph during the afternoon peak hour.

Figure 4: Current Peak Hour Traffic Volumes



Hourly volumes on the westbound off-ramp from OR174 at its intersection with Champlain Street total approximately 250 vph during the morning peak and approximately 200 vph during the afternoon peak. On the access road to the Champlain Park & Ride Lot, which intersects with Champlain Street opposite the OR174 off-ramp, the two-way volumes are approximately 260 vph during the morning peak hour and approximately 215 during the afternoon peak hour.

5.2 Current Operating Conditions

These foregoing existing traffic volumes were analyzed using the analysis tool SYNCHRO (Version 8) and the current signal timing plans. The results are shown in Table 1 and the analysis sheets are to be found in Appendix C.

Table 1: Current Intersection Operating Conditions

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	Max v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
Champlain / Jeanne d'Arc	A(A)	0.47(0.46)	WBL(EBT)	10.2(10.3)	A(A)	0.25(0.38)
Champlain / Off Ramp / Park & Ride Access	A(A)	0.59(0.43)	WBT(WBT)	10.2(7.3)	A(A)	0.39(0.37)
Jeanne d'Arc / Orléans	A(B)	0.49(0.69)	NBT(SBL)	13.5(17.4)	A(A)	0.32(0.38)
Jeanne d'Arc / Bilberry (West)	A(A)	0.55(0.20)	NBT(EBT)	9.8(7.2)	A(A)	0.31(0.19)
Jeanne d'Arc / Bilberry (East)	B(B)	10.8(11.0)	NBL(NBL)	2.6(1.6)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

The analysis results indicate that the adjacent intersections to the proposed development currently operate at very acceptable Levels of Service (LoS) being LoS 'A' during both morning and afternoon commuter peak hours.

The LoS of the most critical movement at all intersections is also no worse than LoS 'B', during the morning and afternoon peak hours.

It is noteworthy that the current City of Ottawa operating standard for intersections is LoS 'D' during peak hours and as a result, the superior levels of service currently available indicate that there is significant spare capacity available in the adjacent major road network that can be utilized by additional development such as that proposed by Minto at Champlain Centre.

5.3 Existing Road Safety Conditions

Collision history for study area roads (2010 to 2012, inclusive) was obtained from the City of Ottawa and most collisions (72%) involved only property damage, indicating low impact speeds and 28% involved personal injuries.

The primary causes of collisions cited by police include rear end (28%), turning movement (21%), single vehicle (21%), and angle (17%) type collisions. The total number of collisions at each of the study area intersections ranges from 1 to 11 over the 3 year period.

A standard unit of measure for assessing collisions at an intersection is based on the number collisions per million entering vehicles (MEV). In consultation with the City's Traffic, Safety and Mobility Unit of the Traffic Management and Operational Support Branch, an intersection exhibiting a standard Collisions/MEV (Collisions per Million Entering Vehicles) approaching or exceeding 2.0 is considered to be problematic and will require further investigation. At signalized intersections within the study area, reported collisions have historically take place at a rate of:

- 0.88/MEV at the Champlain/Jeanne d'Arc intersection; and
- 0.12/MEV at the Champlain/Off Ramp/Park & Ride Access intersection.

Based on the available data, there does not appear to be any prevailing safety issues. The roadways within the study area are noted as being relatively straight and level, resulting in good sight-lines/visibility and vehicle traction. The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix D.

5.4 Background Traffic Growth

Table 2 contains the total approaching traffic volume data at the Champlain/Jeanne d'Arc intersection for the years 2002, 2009 and 2011. As shown in Table 2, peak hour traffic volumes have on average declined over the 9 year period, resulting in an overall decrease of approximately 2.5% and 1.3% during the morning and afternoon peak hours, respectively.

Table 2: Approaching Traffic Volumes at Champlain/Jeanne d'Arc Intersection

Year		NB	SB	EB	WB	Total	% Change
2002	AM	291	128	300	349	1068	AM: -2.5% PM: -1.3%
	PM	634	79	462	266	1441	
2009	AM	392	85	236	326	1039	
	PM	572	70	467	235	1344	
2011	AM	197	91	237	220	745	
	PM	587	79	398	201	1265	
Average decline – 4.7% over 7 years – 0.7% pa							

Nevertheless, despite this gradual annual decline, in an abundance of caution, a growth rate of 1% per annum has been adopted to be applied to the existing traffic volumes (depicted on Figure 4) in order to arrive at appropriate background traffic volumes for the future years when the development impact is to be analyzed in accordance with the current City of

Ottawa TIA Guidelines. This projected growth accounts for the impact from local area development, including for example, the Quarry Glen development along Bilberry Drive.

6.0 PROJECTED CONDITIONS

6.1 Projected Background Traffic Volumes

Based on the assumption that background traffic volumes will grow at an annual rate of 1% pa, depicted on Figures 5 and 6, are the projected background peak hour traffic volumes at year 2018, the year of proposed project build-out, and 2023, representing five years beyond the proposed project build-out date.

Figure 5: Background Peak Hour Traffic Volumes - 2018 (Area 1 Build-Out Year)

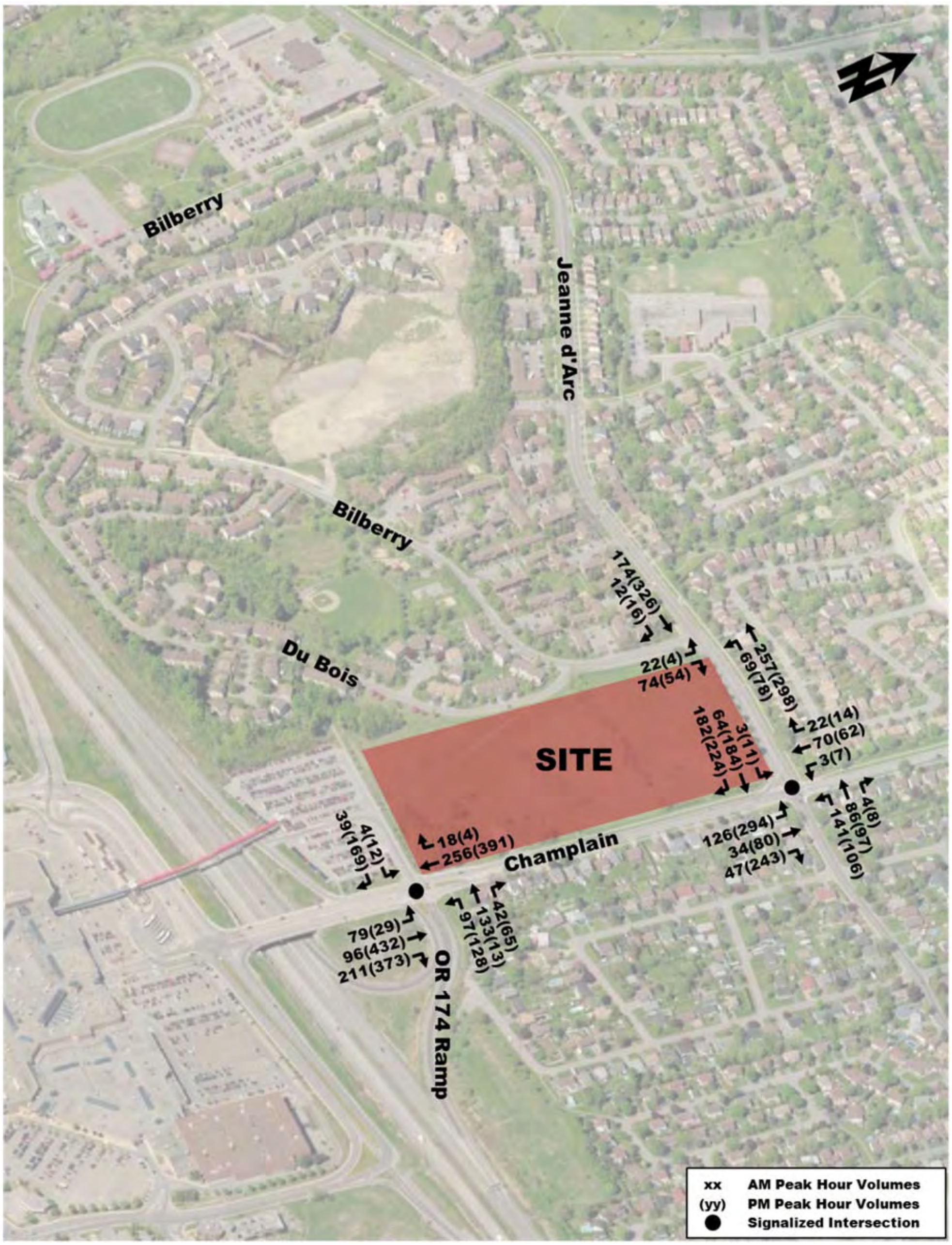
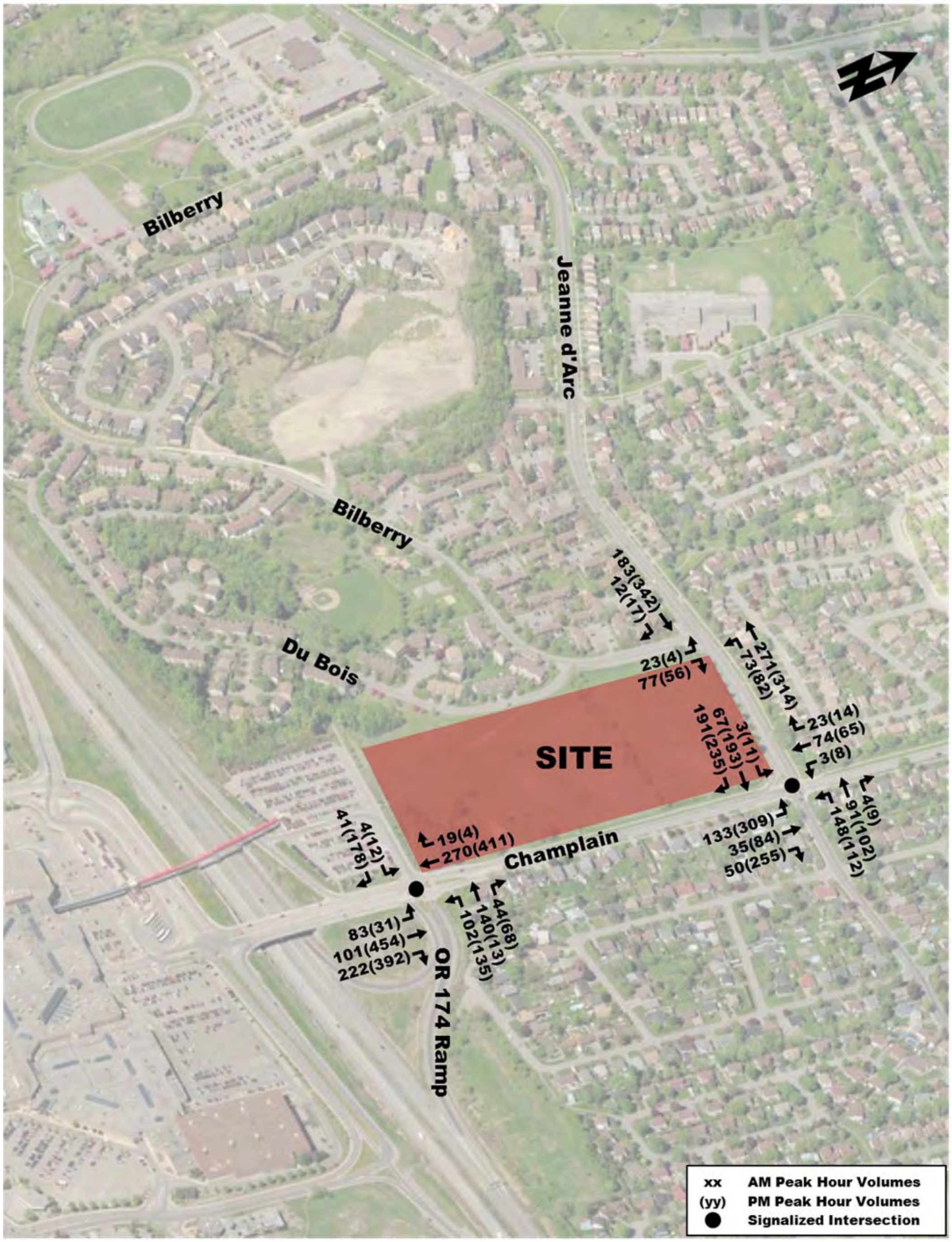


Figure 6: Background Peak Hour Traffic Volumes - 2023 (Area 1 Build-Out + 5 Years)



6.2 Development Generated Traffic and Distribution

6.2.1 Peak Hour Generation

The proposed Champlain Centre is to be a mixed-use development comprising residential, office, and retail land uses, details of which are shown in Table 3 in conjunction with the ITE Trip Generation Codes that have been assumed to apply. Specific tenants have not been identified for the retail land uses, but uses such as a bank, restaurant, and/or pharmacy are envisioned.

Table 3: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Residential	ITE 232	T = 0.34(du); T = 0.29(du) + 28.86	T = 0.38(du); T = 0.34(du) + 15.47
Specialty Retail Centre	ITE 826	T = 1.36(X); T = 1.20(X) + 10.74	T = 2.71(X); T = 2.40(X) + 21.48
Pharmacy	ITE 880	T = 2.94(X); T = 10.22(X) - 75.80	T = 8.40(X);
Fast-Food Restaurant	ITE 933	T = 43.87(X);	T = 26.15(X);
Office	ITE 720	T = 2.39(X);	T = 3.57(X); Ln(T) = 0.90Ln(X) + 1.53

Notes: T = Average Vehicle Trip Ends
X = 1000 ft^2 Gross Floor Area
du = dwelling units
Specialty Retail AM Peak is assumed to be 50% of the PM Peak

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.

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 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%. As such, the person trip generation for the proposed site is summarized in Table 4.

Table 4: Modified Person Trip Generation

Land Use	Area	AM Peak (persons/h)			PM Peak (persons/h)		
		In	Out	Total	In	Out	Total
Residential	472 du	40	175	215	141	88	229
Specialty Retail Centre	18,213 ft²	18	24	42	37	48	85
Pharmacy	8,815 ft²	12	7	19	47	49	96
Fast-Food Restaurant	3,380 ft²	115	78	193	58	57	115
Office	138,865 ft²	340	91	431	142	367	509
Total Person Trips		**525**	**375**	**900**	**425**	**609**	**1,034**
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, including a reduction for 'pass-by' trips based on the site's location and proximity to adjacent communities, employment, other shopping uses and transit availability. Modal share and 'pass-by' values for the land uses within the proposed development are summarized in Tables 5.

Table 5: Total Site Trip Generation (Area 1)

Travel Mode	Mode Share	AM Peak (persons/h)			PM Peak (persons/h)		
		In	Out	Total	In	Out	Total
Auto Driver	50%	263	189	452	214	306	520
Auto Passenger	10%	52	35	87	40	57	97
Transit	35%	184	134	318	149	215	364
Non-motorized	5%	26	17	43	22	31	53
Total Person Trips	100%	525	375	900	425	609	1,034
Less Retail Pass-by		-28	-28	-56	-29	-29	-58
Total 'New' Auto Trips		**235**	**161**	**396**	**185**	**277**	**462**

The following Table 6 provides a summary of potential two-way vehicle trips to/from the proposed development categorized by each land use. The site is projected to generate two-way traffic totals of 396 vph and 462 vph during the morning and afternoon peak hours respectively with a peak inbound movement of 235 vph during the morning and a peak outbound movement of 277 vph during the afternoon.

Table 6: Total Site Vehicle Trip Generation (Area 1)

Land Use	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Residential	20	88	108	71	44	115
Specialty Retail	9	12	21	19	24	43
Fast-Food	58	39	97	29	29	58
Pharmacy	6	4	10	24	25	49
Office	170	46	216	71	184	255
Less Pass-by Trips(1)	-28	-28	-56	-29	-29	-58
Total	**235**	**161**	**396**	**185**	**277**	**462**

Notes:
(1) Assumes 20% pass-by for Specialty Retail, 50% for Fast-Food, and 40% for Pharmacy.

Longer-term, an additional 50,492 m^2 of office space and 819 m^2 of retail space is being contemplated for the City-owned land located south of the foregoing mixed-use development (Area 2). Based on the same assumption set outlined above, this scale of office development is expected to generate an additional 400 veh/h and 330 veh/h two-way trips in the morning and afternoon peak hours, respectively.

6.2.2 Peak Hour Traffic Distribution and Assignment

As depicted on the Concept Plan, Figure 2, site access is proposed by way of four new access roads:

- two intersecting Champlain Street approximately one-third and two-thirds between the existing Jeanne d'Arc and Champlain Park & Ride intersections;
- one located on Jeanne d'Arc Boulevard approximately midway between Champlain Street and Bilberry Drive; and
- one located on Bilberry Drive approximately midway between Jeanne d'Arc and Du Bois Avenue.

A central spine road linking Jeanne d'Arc to the existing Park & Ride Access Road is proposed which will result in the increased utilization of the existing Park & Ride Access Road and signalized intersection with Champlain Street located opposite the OR174 westbound off ramp.

Access is proposed to Bilberry Drive and there could be a tendency by some (especially visitors to the residential buildings) to park along Bilberry Drive and Du Bois Avenue given their proximity to the development site. However, there are currently "no parking signs" on Bilberry Drive and Du Bois Avenue[2].

Based on the proposed internal road network and major all-movement road intersection locations, the following are the assumed directional splits of site-generated traffic to/from the various land uses.

[2] Dubois Avenue is a private road with signage already indicating that parking on the east side is restricted to visitors of the nearby private residents.

Residential – Site Driveway Distribution

- 30% to/from Jeanne d'Arc Boulevard;
- 50% to/from Champlain Street (north access);
- 10% to/from the Park and Ride Access/Champlain Street; and
- 10% to/from Bilberry Drive.

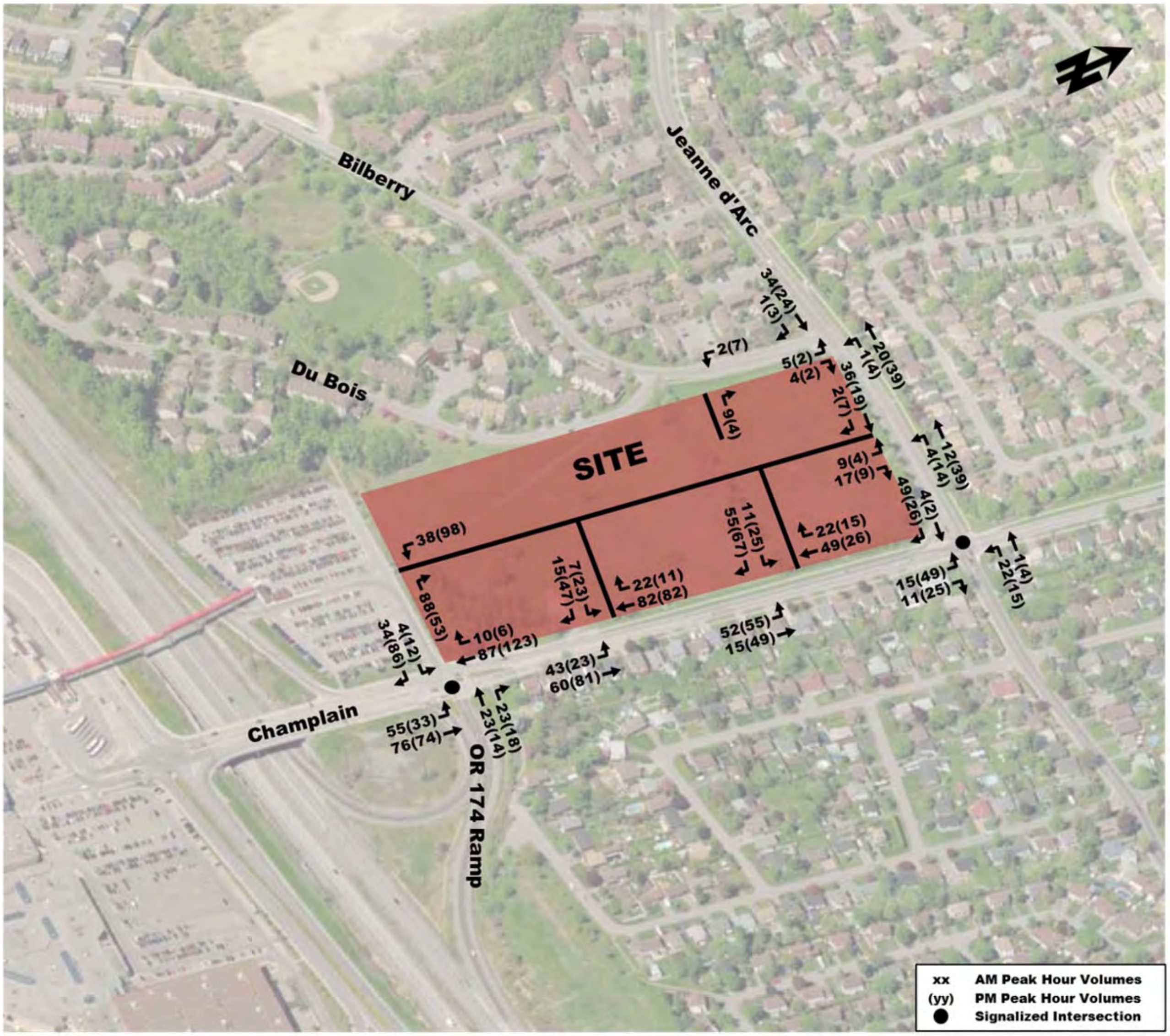
Retail/Office/Restaurant/Pharmacy – Site Driveway Distribution

- 30% to/from Champlain Street (north access);
- 30% to/from Champlain Street (south access); and
- 40% to/from Park and Ride Access/Champlain Street.

Once onto the adjacent road network, it was assumed that: 10% of traffic was to/from the west via Jeanne d'Arc Boulevard; 15% to/from the east via Jeanne d'Arc Boulevard; and 75% to/from the south/OR174.

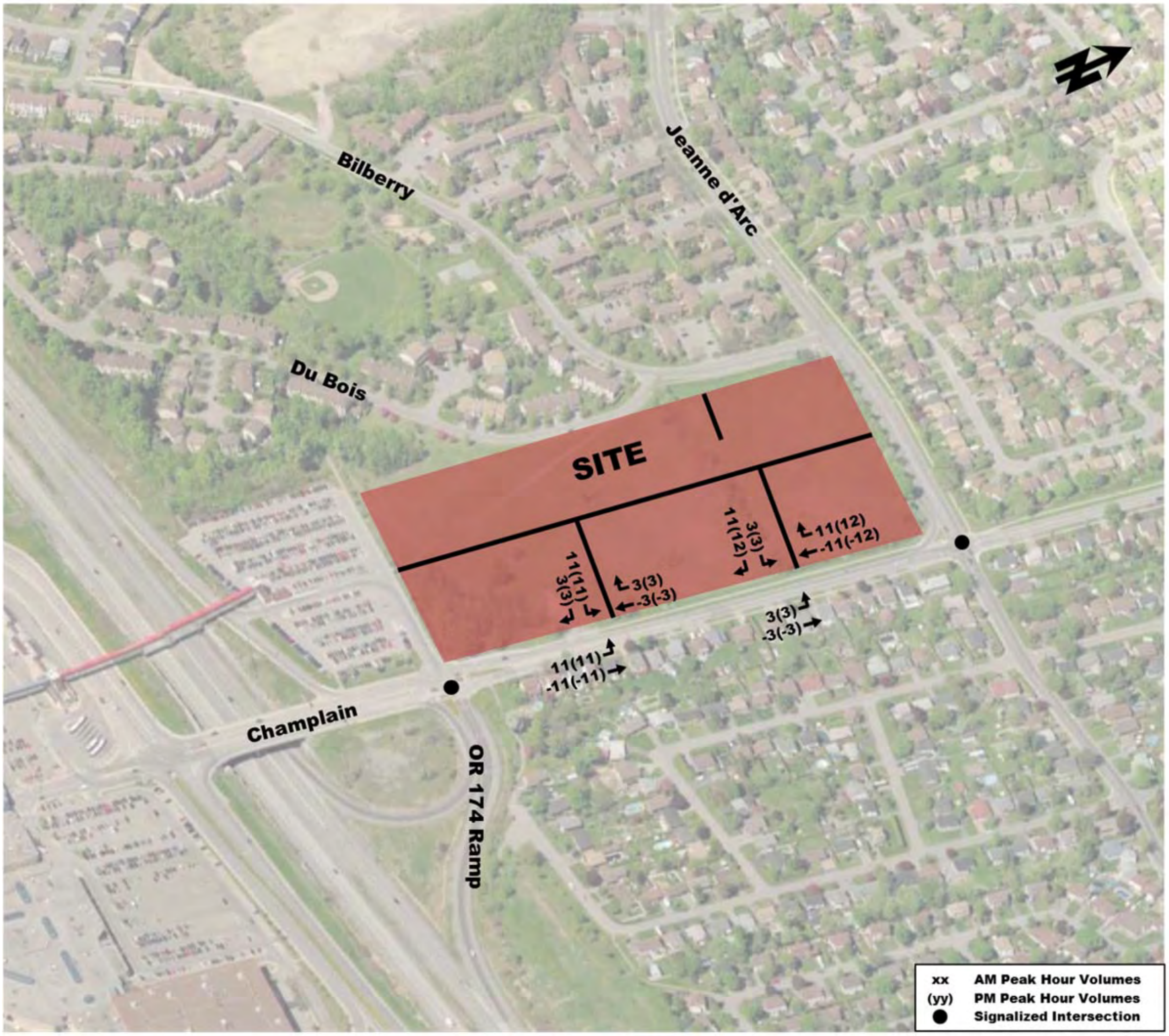
The resultant 'new' peak hour generated traffic volumes to/from the adjoining roadways are depicted on Figure 7 and the site-generated 'Pass-by' traffic volumes are depicted on Figure 8.

Figure 7: Peak Hour 'New' Site-Generated Traffic Volumes (Area 1)



As depicted on Figure 7, the majority of the site-generated traffic is projected to travel by way of Champlain Street to/from OR174 and/or destinations to the south. Little impact is anticipated on Champlain Street north of Jeanne d'Arc Boulevard. A relatively small amount of newly generated traffic is anticipated to impact Jeanne d'Arc Boulevard both west of Bilberry Drive and east of Champlain Street. Negligible impact is also envisaged on Bilberry Drive or Du Bois Avenue as there connectivity to Jeanne d'Arc Boulevard further to the west is very indirect.

Figure 8: Peak Hour Site-Generated 'Pass-by' Traffic Volumes (Area 1)



The projected site-generated peak hour traffic volumes (Figure 7) and the site-generated pass-by traffic volumes (Figure 8) were then combined with the projected background traffic volumes (Figures 5 and 6) to arrive at the projected estimated future peak hour total traffic volumes by 2018 (build-out), depicted on Figure 9 and by 2023 (build-out + 5 years), as depicted on Figure 10.

Figure 9: Projected Total Peak Hour Traffic Volumes – 2018 (Area 1 Build-Out Year)

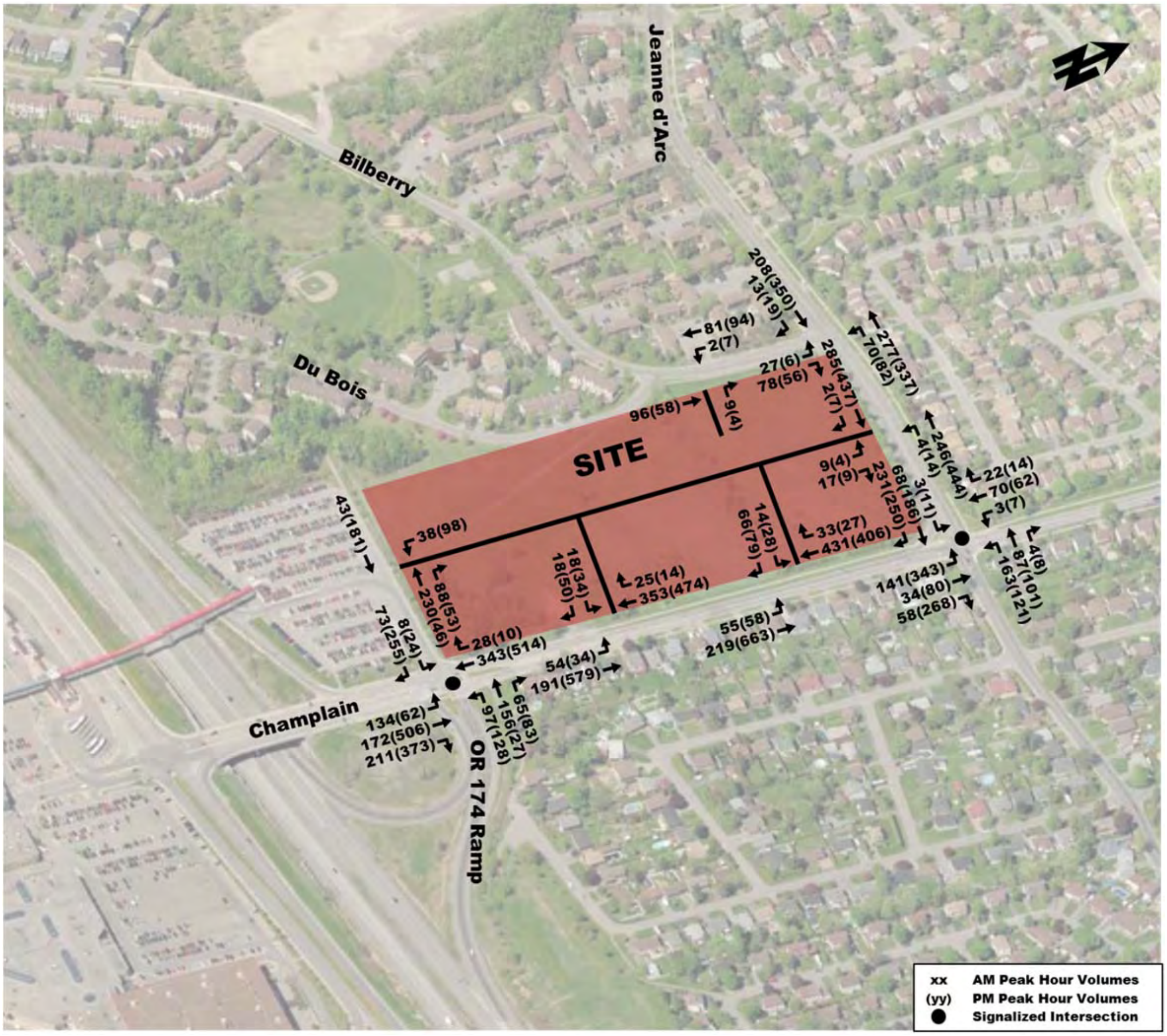
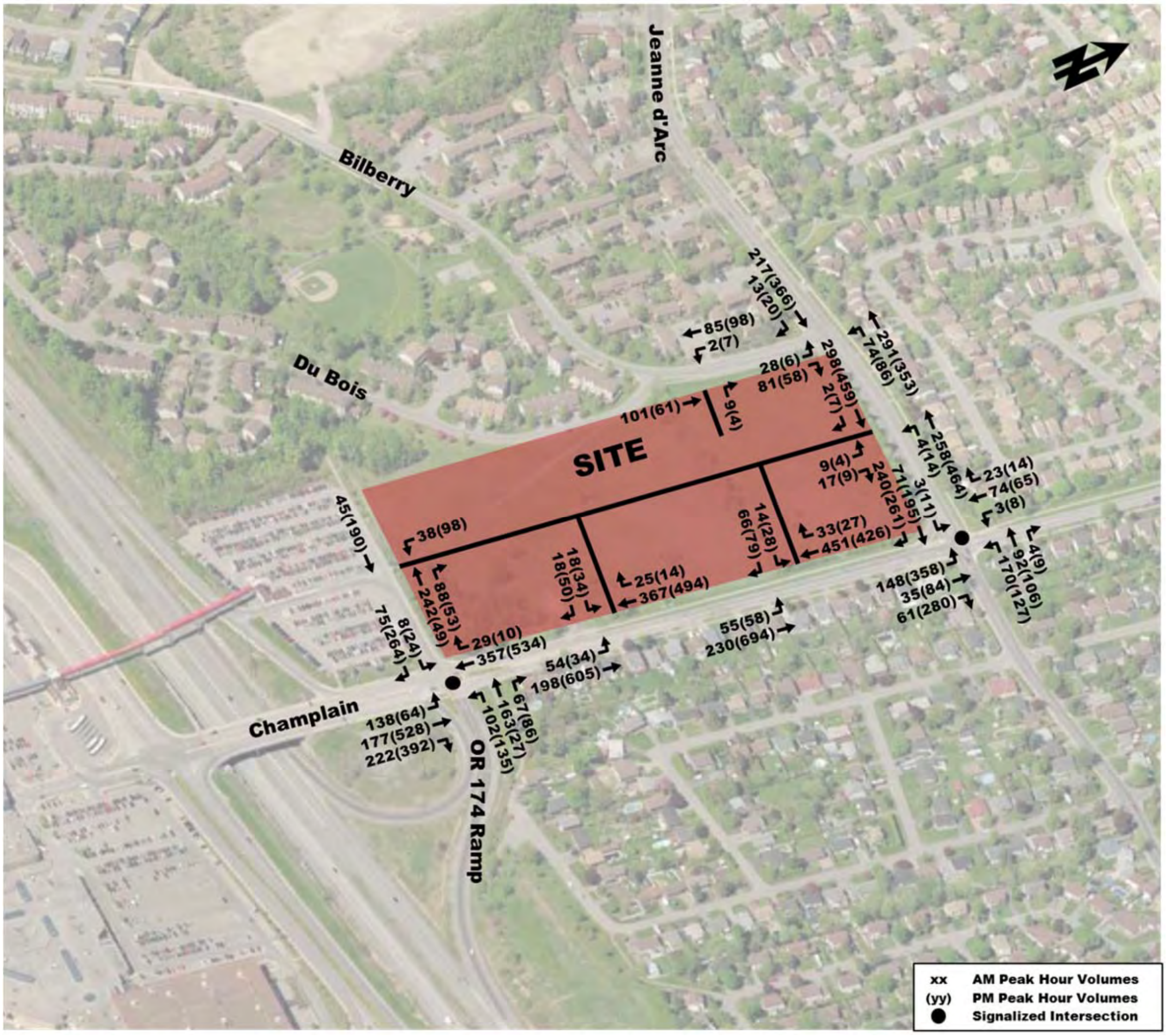


Figure 10: Projected Total Peak Hour Traffic Volumes - 2023 (Area 1 Build-Out + 5 Years)



The resultant intersection totals for each of the analysis years in question were then used as the basis for determining future operating conditions at intersections in the immediate vicinity of the proposed Champlain Centre development.

6.3 Analysis of Projected Future Traffic Conditions

6.3.1 Traffic Signal Warrants

Based on the projected peak hour traffic volumes by both 2018 and 2023, none of the proposed new site driveway intersections on Champlain Street or Jeanne d'Arc Boulevard warrant signal or all-way STOP control by 2023, which represent projected operating conditions five years beyond build-out (details in Appendix E). Note that signalization of these intersections would be severely constrained by the placement of existing residential driveways on the east side of Champlain Street (as shown in Figure 11).

Figure 11: Single Family Home Driveways along Champlain Street

Consequently, all four of these new intersections are projected to operate with 'STOP' control on the minor (access) road.

6.3.2 Auxiliary Lane Requirements

Based on the 2023 projected traffic volumes, northbound left-turn lanes are warranted at the Champlain/Site N and Champlain/Site S intersections. A westbound left-turn is not warranted at the Jeanne d'Arc/Site intersection. Left-turn lane warrant analyses are provided as part of Appendix E.

The Transportation Association of Canada (TAC) recommended minimum storage lengths for the auxiliary left-turn lanes on Champlain Street, based on the 2023 projected traffic volumes presented in Figure 10, are as follows:

- NBL lane on Champlain Street approaching Site (south driveway) 19 m + taper
- NBL lane on Champlain Street approaching Site (north driveway) 20 m + taper

Minimum taper lengths would be in the order of 30 m, assuming TAC's minimum 8:1 taper ratio consistent with the 40 km/h speed limit (design speed of 50 km/h). Note, however, that the City of Ottawa prefers, if possible, a minimum storage length of 40 m and taper lengths of closer to 50 m. Given the proposed intersection spacing along Champlain Street (as shown in the Concept Plan), there is likely insufficient space available to provide the City's preferred minimums for storage length and taper at both driveway locations. Included as Appendix F is a Functional Design of a configuration that features a continuous auxiliary left-turn lane serving both site access driveways on Champlain Street. This design is considered to best serve the site and the adjacent single family homes along the east side of Champlain Street as it will allow them to continue to have all-movement access into/out of the driveways. The projected volumes utilizing the driveways on Champlain Street do not warrant auxiliary right-turn lanes.

It is understood that the placement of the driveway connections to Champlain Street have not yet been finalized, and will be the subject of further investigation to be reflected in the Final Site Plan.

Despite the increased traffic volumes utilizing the existing signalized intersection on Champlain Street at the Park & Ride Lot Access, the southbound right-turn lane at this intersection does not require an extension based on the 2023 projected volumes. The existing northbound left-turn lane at this location is approximately 40 m + taper, whereas the TAC recommended storage length is 45 m (based on the 2018 projected traffic volumes). The northbound left-turn storage lane at this location may require lengthening in subsequent phases of development, however, the ability to do so is constrained by the back-to-back arrangement with the southbound left-turn lane on Champlain Street serving Place d'Orleans Drive. An eastbound right-turn lane is recommended at this location based on high right-turn volumes along the Park & Ride Access Road, and should extend as far back as the intersection with the north-south central spine road (4-way STOP).

6.3.3 Intersection Operation

Using the analysis tool SYNCHRO (Version 8) traffic operations were assessed for projected peak hour conditions along both Champlain Street and Jeanne d'Arc Boulevard at both existing signalized/unsignalized intersections and the newly proposed development intersections where signalization is judged not to be warranted.

Detailed analysis worksheets are to be found in Appendix G with the results summarized in Table 7 (2018 conditions) and Table 8 (2023 conditions) reflecting the projected peak hour data depicted on Figures 9 and 10, respectively.

As shown on Table 7, all the intersections continue to operate at very satisfactory performance levels (LoS 'A'), by 2018 when the projected Champlain Centre is anticipated to become fully operational, and with no critical movements operating at less than LoS 'D'. According to the SYNCHRO analysis, there are no notable queuing issues within the study area.

Table 7: 2018 Projected Intersection Performance

Intersections	Critical Movement			Intersection		
	LoS	Max v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
Champlain / Jeanne d'Arc	A(A)	0.53(0.50)	WBL(WBL)	10.2(10.9)	A(A)	0.30(0.45)
Champlain / OR174 Off Ramp / Park & Ride Access	B(A)	0.64(0.59)	WBT(WBT)	10.7(9.3)	A(A)	0.33(0.50)
Jeanne d'Arc / Bilberry (East)	B(B)	11.7(11.8)	NBL(NBL)	2.6(1.7)	-	-
Jeanne d'Arc / Site	B(B)	10.7(13.0)	NBL(NBL)	0.6(0.4)	-	-
Champlain / Site N	B(C)	13.2(19.8)	EBL(EBL)	2.0(2.5)	-	-
Champlain / Site S	B(C)	13.0(21.3)	EBL(EBL)	1.5(2.0)	-	-
Park and Ride / Site	B(B)	11.2(11.2)	SBL(SBL)	1.1(2.9)	-	-
Bilberry / Site	A(A)	8.8(8.6)	WBR(WBR)	0.5(0.5)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Table 8: 2023 Projected Intersection Performance

Intersections	Critical Movement			Intersection		
	LoS	Max v/c or avg. delay(s)	Movement	Delay(s)	LoS	v/c
Champlain / Jeanne d'Arc	A(A)	0.55(0.53)	WBL(WBL)	10.3(11.1)	A(A)	0.31(0.47)
Champlain / OR174 Off Ramp / Park & Ride Access	B(B)	0.66(0.62)	WBT(WBT)	10.9(9.7)	A(A)	0.35(0.52)
Jeanne d'Arc / Bilberry (East)	B(B)	12.0(12.1)	NBL(NBL)	2.7(1.7)	-	-
Jeanne d'Arc / Site	B(B)	10.9(13.4)	NBL(NBL)	0.5(0.4)	-	-
Champlain / Site N	B(C)	13.6(21.3)	EBL(EBL)	2.0(2.6)	-	-
Champlain / Site S	B(C)	13.2(23.3)	EBL(EBL)	1.5(2.1)	-	-
Park and Ride / Site	A(B)	11.4(11.3)	SBL(SBL)	1.0(2.8)	-	-
Bilberry / Site	A(A)	8.8(8.6)	WBR(WBR)	0.5(0.5)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

By 2023, as shown in Table 8, all intersections are projected to continue to operate at very satisfactory performance levels (LoS ‘A’) and with no critical movements operating at less than LoS ‘D’. According to the Synchro analysis, there are no notable queuing issues within the study area.

6.4 Impact on Local Streets

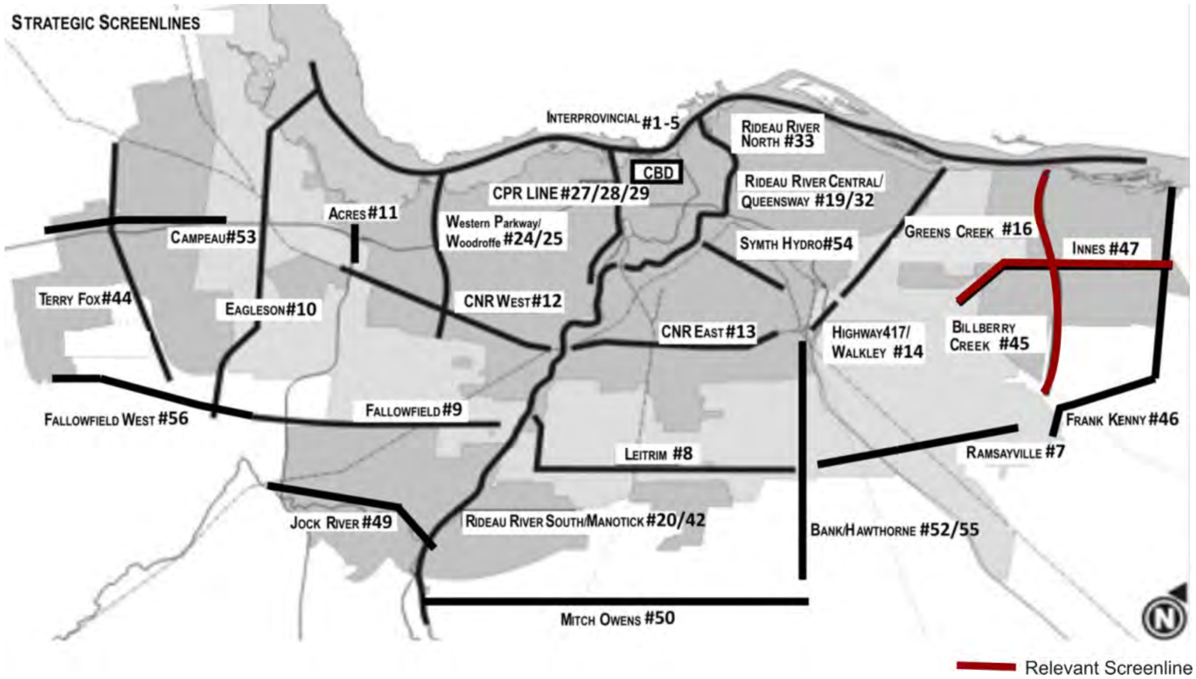
The traffic impact from the proposed Champlain Centre development will be predominantly confined to Champlain Street, an arterial roadway, and Jeanne d’Arc Boulevard, a major collector road. There is one minor driveway access proposed to Billberry Drive serving (as an option) some of the residential units in the northwest quadrant of the site, however the traffic volume impact is expected to be in the order of 10 vph two-way, which is considered negligible.

The other existing local road that will experience some added traffic is the access to/from Champlain Street serving the existing Park & Ride Lot north of OR174. As the intersection of this road with Champlain Street is already signalized, and as the projected future operating conditions are judged to continue to be very satisfactory, the impact of the proposed utilization of this access road by development traffic is not considered to be a negative feature, but rather a positive one reflecting greater utilization of an investment that has already been made on behalf of the citizens of Ottawa.

6.5 Future Screenline Analysis

In keeping with City of Ottawa requirements for CTS reports, it is necessary to address the future macro-transportation network situation at the most adjacent screenlines to the location of the proposed Plan of Subdivision. In the case of the subject site, the most adjacent screenlines in the City’s Strategic Screenline System are the Bilberry Creek Screenline #45 and the Innes Road Screenline #47. The locations of these screenlines relative to the site are depicted on Figure 11.

Figure 12: Strategic Screenlines



The Bilberry Creek Screenline reflects peak east/west traffic volumes within Orléans crossing Bilberry Creek which is west of the proposed development site while the Innes Road Screenline captures peak north/south traffic within Orléans crossing the Innes Road Corridor.

The 2008 Transportation Master Plan (TMP) includes detailed analysis of the two screenline conditions at 2031, the horizon year of the current City of Ottawa Official Plan.

An extract from the 2008 TMP is shown in Table 9.

Table 9: 2008 TMP - Bilberry Creek / Innes Road Screenline Analysis 2031

Screenline Name and Number	Total Peak Hour Person Trip Direction a.m./p.m. (model)	Peak Hour Transit Modal Split (model)	Assumed Auto Occupancy Factory	Projected PCUS / Hour / Peak Direction	Assumed Current Vehicle Factor	Projected Total PCUS / HR / Peak Direction	Current Screenline Capacity LoS 'D'	Projected Screenline Deficiency by 2031 pcus/hr
Bilberry Creek #45	12,900 / 13,500	40% / 39%	1.2 ppv	6,500 / 6,920	1.16	7,540 / 8,080	8,820	None
Innes Road #47	7800 / 8700	40% / 38%	1.2 ppv	3,920 / 4,500	1.16	4,550 / 5,220	5,400	None

As shown on Table 9, subject to the achievement of a 40%/39% transit modal split during the a.m./p.m. peak hours respectively (as compared to the current 35% (a.m.) and 32% (p.m.) modal splits), there would be no major network capacity deficiency during peak hours by 2031 at the Bilberry Creek Screenline.

Similarly, subject to the achievement of a 40% (a.m.)/38% (p.m.) peak hour transit modal splits respectively (as compared to the current 19% (a.m.)/12% (p.m.)) there would be no major network capacity deficiency during peak hours by 2031 across the Innes Road Screenline.

It is noteworthy that the implementation of two BRT corridors, along OR174 and south of Innes Road, by 2031, along with the implementation of a number of new roads and the widening of existing roads within Orléans, as detailed earlier in Section 4.0, leads to the conclusion that the required transit modal splits are very likely to be achieved by the horizon year of the Official Plan, while there is also adequate additional roadway capacity planned for the Orléans Community to cater to all the future development needs.

7.0 SITE CONCEPT PLAN REVIEW

The internal road network for the proposed Champlain Centre is planned to be comprised of a north-south spine road linking Jeanne d'Arc Boulevard with the Park & Ride Access Road, as well as two east-west links from the Spine Road to new intersections with Champlain Street.

For the north-south spine road, which is understood to be a City road and planned to have longitudinal parking on both sides as well as sidewalks, a minimum right-of-way (ROW) of 20 m is recommended allowing 3.5 m for landscaping/utilities, 4 m for sidewalks (2 x 2 m), 5.0 m for parking (2 x 2.5 m) and 7.5 m for the travel lanes (2 x 3.75 m). The removal of parking on one side could permit a reduction to a right-of-way measuring 16 to 18 m.

The proposed intersection of the site's Spine Road and Jeanne d'Arc Boulevard is envisioned to be full-movement and STOP controlled on the minor approach (south leg) only.

The intersection of the site's Spine Road and the Park & Ride Access Road is currently STOP controlled on the eastbound approach only (no north leg exists). The south leg is restricted for buses only. Further detail is required as to how the intersection is to operate with buses and vehicles accessing the parking lot.

For the segment of the Park & Ride Access Road located between the Spine Road and Champlain Street, it is recommended to protect for up to two travel lanes in each direction as a second inbound lane may be necessary at full build-out. A second outbound lane is recommended at the onset for the west leg of the Park & Ride/Champlain intersection to improve operations at the intersection. Therefore, a minimum 20 m ROW is suggested (and possibly higher depending on the vision for sidewalk and landscaping) for this roadway segment, which is understood to be a City road.

For the two proposed east-west driveway connections to Champlain Street (located on the segment south of Jeanne d'Arc and north of the Park & Ride Access), one inbound and one outbound lane is considered sufficient based on the projected volume of traffic. However, it may be prudent to protect for a 3-lane cross section in the event that separate outbound left and right-turn lanes are required to support future development phases. Assuming additional allowances for landscaping and sidewalks for these east-west roads, a 20 m ROW is also considered appropriate. The more northerly connection is understood to be a City road, while the more southerly connection a private road.

8.0 TRANSPORTATION DEMAND MANAGEMENT

This section provides an overview of potential Transportation Demand Management (TDM) strategies that are proposed in support of the Plan of Subdivision in order to address and support City of Ottawa policies.

The dominant TDM feature will be the fact that the proposed development is within a few minutes' walk of the Rapid Transit facilities at Place d'Orléans and the already high-frequency cross-town services linking Orléans, Kanata and Barrhaven through the CBD.

BRT services will continue to improve within the Orléans Community with the planned implementation of the Orléans and Cumberland BRT corridors as far east as Trim Road, which will result in enhanced services and frequencies centred on the Place d'Orléans Transit Station within a short walk of the development. Consequently, transit can be expected to cater to the travel needs of a very substantial component of trips by both residents and employees of the proposed development.

In addition, the mixture of proposed land uses, residential/commercial/retail, that are proposed in such close proximity to the already established Orléans Wood and Queenswood Village communities, supplemented by sidewalks and pathways within the development linked to the existing network will cater to enhanced pedestrian/cycle trip-making to/from the Champlain Centre community.

9.0 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The following are the significant findings, conclusions and recommendations emanating from this Community Transportation Study (CTS) which reflect the projected traffic impact of the Minto development proposed for Champlain Centre.

1. The proposed Plan of Subdivision for a mixed-use development by Minto Commercial Properties Inc. of a site in the northwest quadrant of the Champlain Street/OR174 intersection has the short-term potential to contain a total of 472 residential units and approximately 15,726 m^2 (169,273 ft^2) of commercial uses.

2. Net generated traffic volumes are projected to total 396 vph (two-way) during the weekday morning peak hour and 462 vph (two-way) during the afternoon peak hour.

3. An additional 46,896 m^2 of office space and 819 m^2 of retail space may be contemplated for the adjacent site to the south, but this longer-term development is not the focus of this assessment. The analysis suggests that an office development of this magnitude would generate approximately 370 vph and 300 vph during the morning and afternoon commuter peak hour, respectively, which would likely trigger the need for modifications at the signalized intersection on Champlain Street at the Park & Ride Lot Access. For example, it may be prudent at that time to extend the length of the existing southbound shared through/right-turn lane.

4. Champlain Street, which forms the eastern boundary of the proposed development, is a 2 to 4 lane arterial carrying peak hour two-way traffic volumes ranging from 750 vph during the morning peak to 1000 vph during the afternoon peak, while Jeanne d'Arc Boulevard which forms the northern site boundary, is a four-lane major collector road carrying peak hour two-way volumes within the range 600 vph (morning) to 850 vph (afternoon).

5. Although the historical peak hour traffic volumes approaching the Champlain/Jeanne d'Arc intersection are noted to have declined slightly in recent years, nevertheless, for the foreseeable future an annual growth rate of 1% pa has been assumed to apply, up to 2023.

6. The existing adjacent signalized intersections on Champlain Street at the OR174 Off-Ramp and at Jeanne d'Arc Boulevard both currently operate at very satisfactory levels of service during both morning and afternoon peak hours being LoS 'A' in all cases.

7. The proposed development will be served by a north-south spine road with a minimum 20 m right-of-way linking Jeanne d'Arc Boulevard with the Park & Ride Access Road, and by two east-west road links from the spine road to new intersections on Champlain Street. Both of these east-west roads would have a minimum 20 m right-of-way.

8. All site driveway connections serving the development will provide for full turning movements, and none will warrant signalization by 2023.

9. On Champlain Street, auxiliary northbound left-turn lanes are recommended at both driveway accesses to accommodate left-turn traffic movements into the new development given the high volumes of southbound through traffic. The exact location of these driveway connections to Champlain Street have not been finalized at this time. It should be noted that the provision of traffic signals at these intersections is be constrained by the placement of the existing residential driveways serving the homes on the east side of Champlain.

10. By 2023, five years beyond build-out, the existing signalized intersection on Champlain Street at Jeanne d'Arc Boulevard and the OR174 Off Ramp/Park & Ride

Access will both continue to operate at very satisfactory levels of service being LoS 'A' during morning and afternoon peaks.

11. To minimize potential operational issues given the heavy outbound movements at the Champlain/ OR174 Off Ramp/Park & Ride intersection during the afternoon peak, two eastbound lanes are recommended at this location (one right-turn and one left-turn extending as far back as its intersection with the north-south central spine road). Furthermore, to accommodate any future development potential, consideration should be given to protecting the ability to extend the storage length of the existing southbound through/right-turn lane (extending as far back as the more southerly site driveway connection to Champlain) and northbound left-turn lane (providing additional storage length if possible), as well as provision of a second inbound lane to the site/Park & Ride (resulting in a 4-lane cross section on the section of road west of Champlain).

12. No other auxiliary lanes are recommended at either of the new site accesses on Bilberry Drive and Jeanne d'Arc Boulevard.

Based on the foregoing, the proposed Plan of Subdivision is recommended from a transportation perspective.

Prepared By:

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LICENSED PROFESSIONAL ENGINEER
M. A. BAKER
16 July, 2013
PROVINCE OF ONTARIO

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Addendum #2

To:	Asad Yousfani (City of Ottawa)	Date:	14 February 2017
Copy:	Peter Ciuciura (Revera Inc).	Project:	476162-01000
From:	Mark Baker/André Sponder (Parsons)		

Re: Champlain Centre (850 Champlain Street)
Transportation Impact Assessment – Addendum #2 to CTS

1. INTRODUCTION

From the information provided, Revera Inc. has acquired the subject property and intends to build a residential care facility and may develop a retirement home on a portion of the site. The residual development blocks would also be owned by Revera, who will be seeking partners to develop these lands.

Parsons prepared the Community Transportation Study (CTS) in support of Draft Plan Approval (2013), and at this time Revera is seeking to register the entire subdivision. Concurrent to subdivision registration, Revera will also be submitting a Site Plan Application (SPA) for a residential care facility on Block 4. As such, an updated transportation assessment is required in support of the current submission, including a functional design of the required roadway modifications.

As part of a kick-off subdivision registration meeting with the City of Ottawa (November 8, 2016), it was determined through discussions with Asad Yousfani (and other City staff) that an addendum to the original CTS would satisfy the City's requirements for the Transportation Impact Assessment (TIA). The subject addendum should be focused on the following:

- update of existing conditions on Champlain Street and at the intersections of Champlain/P&R/OR 174 and Champlain/Jeanne d'Arc based on current intersection turning movement volumes;
- change in trip generation resulting from the proposed land use (remove retail, add residential care facility and retirement residences on Blocks 4 and 8, respectively;
- confirmation of site access requirements, assumed at this time to be comprised of the existing private driveway access to the adjacent OC Transpo P&R lot via Street No. 1 (requires Joint Use Agreement), an unsignalized full-movement connection to Champlain Street (Street No. 2), and unsignalized full-movement connection to Jeanne d'Arc Boulevard (Street No. 1);
- assess the feasibility of a possible right-in/right-out connection to Champlain Street at Street No. 2; and
- update of functional design drawings of the proposed roadway modifications required to support the ultimate development.

2. ANALYSIS

2.1. EXISTING CONDITIONS (UPDATED)

The update of existing conditions includes reviewing the most current intersection turning movement counts at Champlain/P&R/OR 174 and Champlain/Jeanne d'Arc, as well as observing existing traffic operations in the area, including delay to vehicles exiting private driveways on the east side of Champlain Street. The previous transportation planning work was based on data extending back to 2011/2012.

2.1.1. TRAFFIC VOLUMES

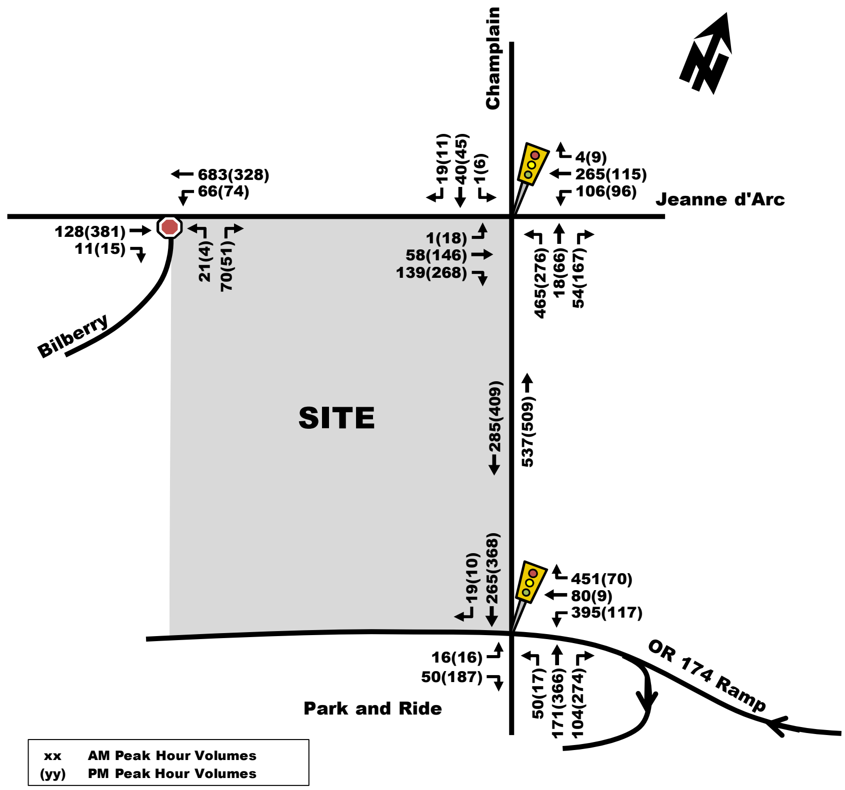
Updated intersection turning movement counts were obtained through the City of Ottawa at the following two locations:

- Champlain/P&R/OR 174 (February 2015); and
- Champlain/Jeanne d'Arc (November 2016).

The source traffic data are included as Appendix A, and the values summarized in Figure 1 below. It is noteworthy that the volumes along the east leg (westbound movement) of the Champlain/P&R/OR 174 intersection are significantly higher than traffic volumes recorded in previous years. The 2015 count was conducted in February and previous year counts were conducted in the summer months (July and August). The 2015 volumes exiting OR174 at this location total approximately 925 veh/h during the morning peak hour. Previous count data shows this volume to be in the range of 250 to 300 veh/h during the morning peak hour. All other volumes at this intersection remained relatively consistent when compared to previous count data.

At the Champlain/Jeanne d'Arc intersection, significant increases in the northbound left-turn and westbound through movements during the morning peak hour are noted. Between 2011 and 2016 the northbound left-turn movement at this intersection increased from 120 veh/h to 460 veh/h during the morning peak hour. In addition, the westbound through movement increased from 80 veh/h to 260 veh/h during the morning peak hour.

Figure 1: Existing Peak Hour Traffic Volumes



It is assumed that a notable portion of the increased volume from the eastbound OR 174 off-ramp in the morning is attributable to drivers seeking alternative eastbound travel routes to the congested OR 174. Morning observations revealed that the highway was moving much slower than the posted 100 km/h speed limit (estimate 40-60 km/h). Alternative routes could include Jeanne d'Arc that parallels the highway to the north, and for some a ramp surf from the eastbound off-ramp to eastbound on-ramp (spans up to 1.5 km) may have a perceived travel time benefit to the congested mainline.

Based on the updated traffic counts, existing study area intersection performance analysis was assessed using SYNCHRO (V9) intersection analysis software. The results are summarized in Table 1 and the SYNCHRO model output of existing conditions is included as Appendix B.

Table 1: Existing Study Area Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Champlain/Jeanne D'Arc	D(A)	0.81(0.49)	NBL(EBR)	17.3(9.4)	B(A)	0.63(0.42)
Champlain/P&R/OR 174 Ramp	D(A)	0.90(0.40)	WBL(WBL)	16.5(7.2)	B(A)	0.69(0.31)
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, the signalized intersections ‘as a whole’ are currently operating at an acceptable LoS ‘B’ or better during the morning and afternoon peak hours. During the afternoon peak hours, all movements at both intersections are operating at LoS ‘A’. During the morning peak hour there is a significant volume of vehicles exiting OR174 at the Champlain/P&R/OR 174 intersection. Approximately half of these vehicles travel north towards the Champlain/Jeanne d’Arc intersection and turn left onto Jeanne d’Arc Boulevard, and slightly less than half complete the left-turn onto Champlain Street towards either the eastbound on-ramp (i.e., ramp surfing) or the Place d’Orleans Shopping Centre area. As such, the critical movements within the study area are the westbound left-turn movement at the Champlain/P&R/OR 174 intersection and the northbound left-turn movement at the Champlain/Jeanne d’Arc intersection, which are both operating at LoS ‘D’ during the morning peak hour.

Both the northbound left-turn movement at the Champlain/Jeanne d’Arc intersection and the westbound left-turn movement at the Champlain/P&R/OR 174 intersection have traffic volumes that would typically warrant a double left-turn lane. However, in both scenarios, the opposing traffic (southbound at Jeanne d’Arc/Champlain and eastbound at Champlain/P&R/OR 174) are relatively low and these movements currently operate with acceptable levels of service. During the morning peak hour, the northbound left-turn 95th percentile queue at the Champlain/Jeanne d’Arc intersection is 88 m, according to the SYNCHRO analysis. This queue spills back out of the existing 50 m storage lane.

2.1.2. FIELD OBSERVATIONS

Field observations were conducted in December 2016 during the afternoon peak hour and in January 2017 during the morning peak hour. The results of field observations revealed the following:

- Traffic exiting OR 174 is significant during the morning peak hour and the heaviest movements at the Champlain/P&R/OR 174 intersection are the westbound left-turn and right-turn movements, as reflected in the 2015 traffic count data;
  - The majority of vehicles that turned westbound right onto Champlain Street were destined to Jeanne d’Arc Boulevard and turned northbound left at the Champlain/Jeanne d’Arc intersection (this is consistent with the updated traffic counts);
    - Some of these vehicles stopped at one of the three elementary schools within the neighbourhood;
    - Some stopped at local retail establishments;
    - Some continued on to the Jeanne d’Arc/OR 174 interchange;
- Field observations were conducted during the morning and afternoon peak hours to observe traffic conditions/volumes along Champlain Street and the delay to private driveways located along the east side of the roadway;
  - During the morning peak period, delays (30 to 60 seconds) for vehicles exiting the driveways were observed because of the heavy vehicle volume travelling northbound along Champlain Street;
  - During the afternoon peak period, significant gaps of approximately 10 to 20 seconds were observed to occur relatively frequently allowing drivers to exit their properties safely.

2.2. TRIP GENERATION/DISTRIBUTION/ASSIGNMENT (UPDATED)

The previous (5-year) Concept Plan for 850 Champlain Street that was the basis for the earlier transportation planning work assumed the following mixed-use development:

- 472 dwelling units
- 2,825 m^2 retail
- 12,901 m^2 office

The current 5-Year Site Plan, included as Figure 2, for the subject development is assumed to consist of the following land uses:

- 352 dwelling units
- 14,875 m^2 office
- 180 suite retirement home and 256 unit residential care facility

The notable changes include an approximate one quarter reduction in the number of typical apartment/condo units, elimination of retail space, and addition of a retirement home and long-care facility (both of which are considered relatively low traffic generators). Based on the updated land use statistics and assuming similar modal share assumptions identified in the previous work, the resulting vehicle generation is 380 veh/h two-way during the morning peak hour and 445 veh/h during the afternoon peak hour. This represents a reduction in the projected two-way traffic volumes of approximately 15 veh/h as summarized in Table 2. Details on the trip generation associated with the current Site Plan for the residential care facility proposed on Block 4 and for the 5-year Concept Plan is provided within Appendix C.

Table 2: Vehicle Trip Generation – Land Use Plans

Land Use Plan	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Concept Plan - 2013	235	161	396	185	277	462
Concept Plan - 2016	235	147	382	168	278	446
Difference	0	-14	-14	-17	+1	-16

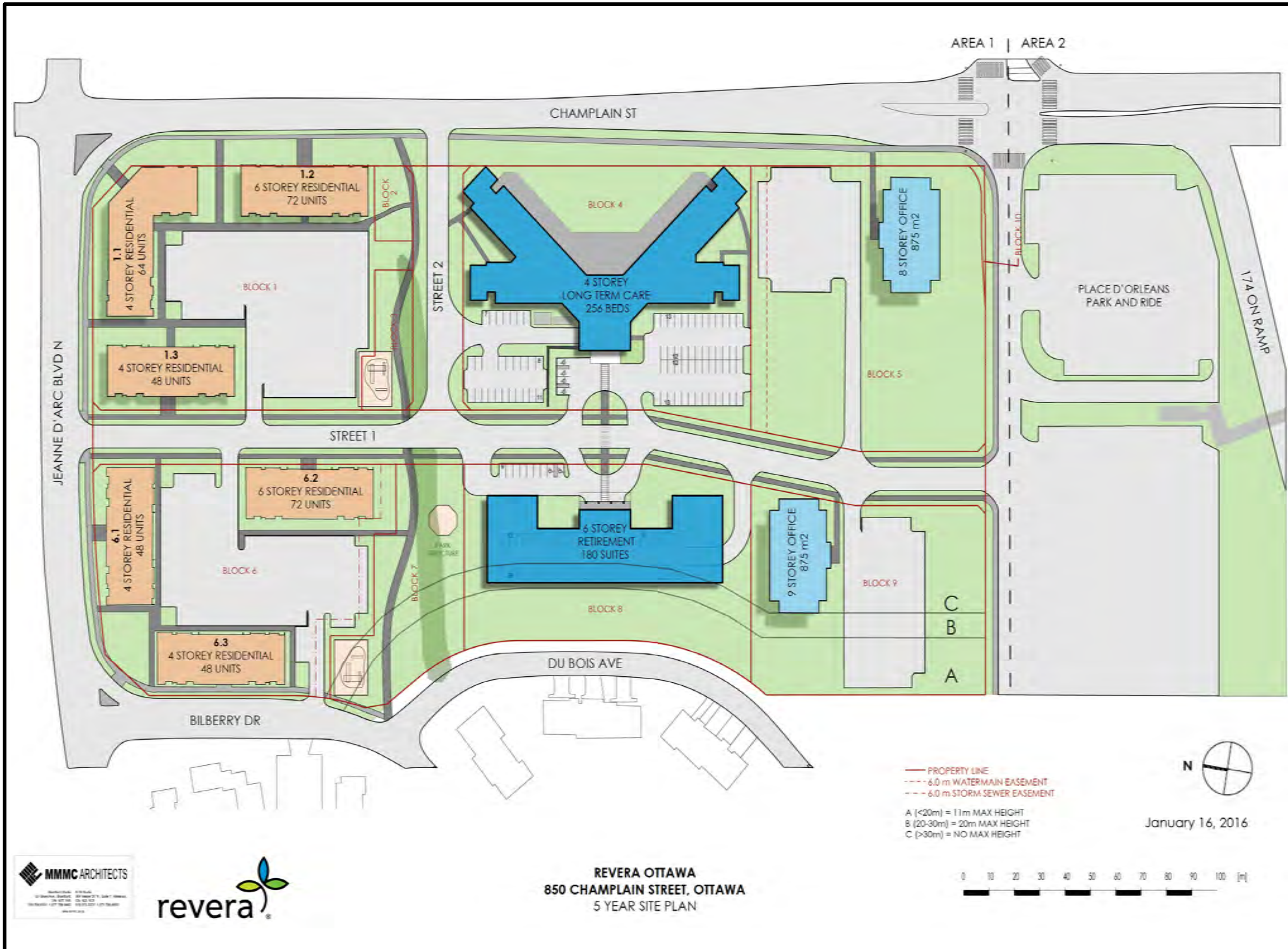


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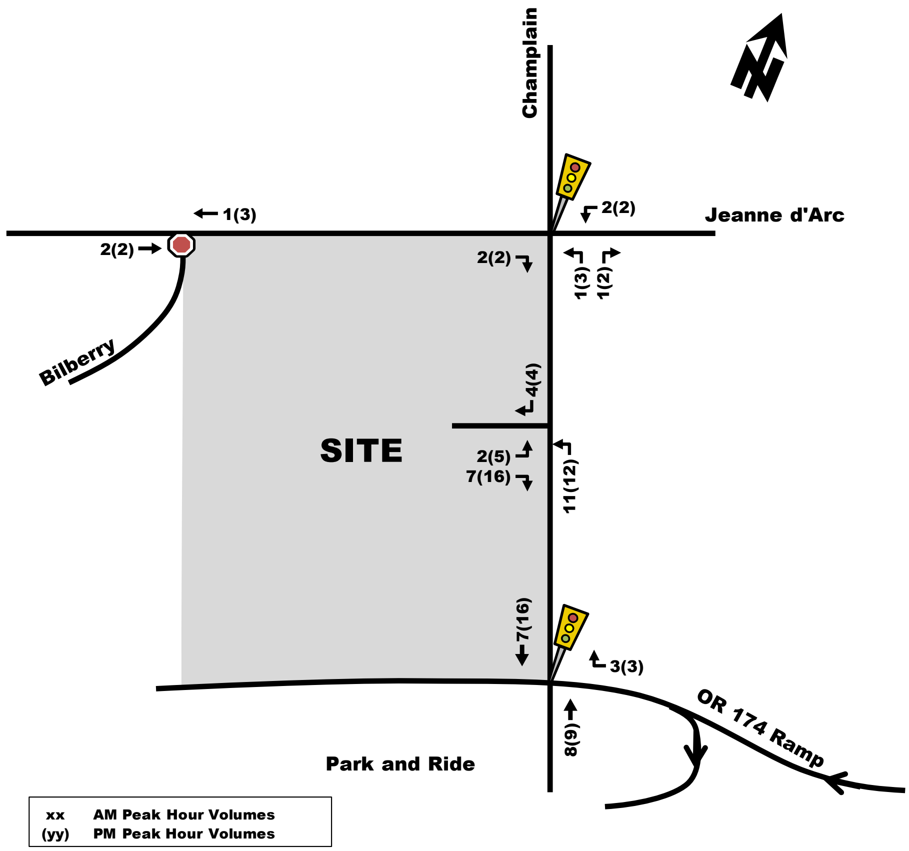
Figure 2: 5-Year Site Plan

With regards to development phasing, consideration is to be given to the following: Phase 1A - residential care facility (Block 4); Phase 1B – retirement home (Block 8); Interim – 5 year plan; Ultimate - balance of the development blocks north of the OC Transpo P&R.

2.2.1. PHASE 1A – RESIDENTIAL CARE FACILITY (FIRST RESIDENTS TO MOVE IN MID 2019)

For Phase 1A of the development only the residential care facility will be constructed/occupied. Traffic generated by this portion of the development is estimated to be approximately 24 and 37 veh/h two-way during the morning and afternoon peak hours, respectively, as shown in Appendix C. It was assumed that only the proposed site driveway connection to Champlain Street (Street No. 2) will be opened during this stage and as such, all site-generated traffic is projected to travel into and out of the site via this driveway. Figure 3 illustrates the projected 'new' site-generated trips for Phase 1A of the development.

Figure 3: 'New' Phase 1A Site-Generated Traffic Volumes

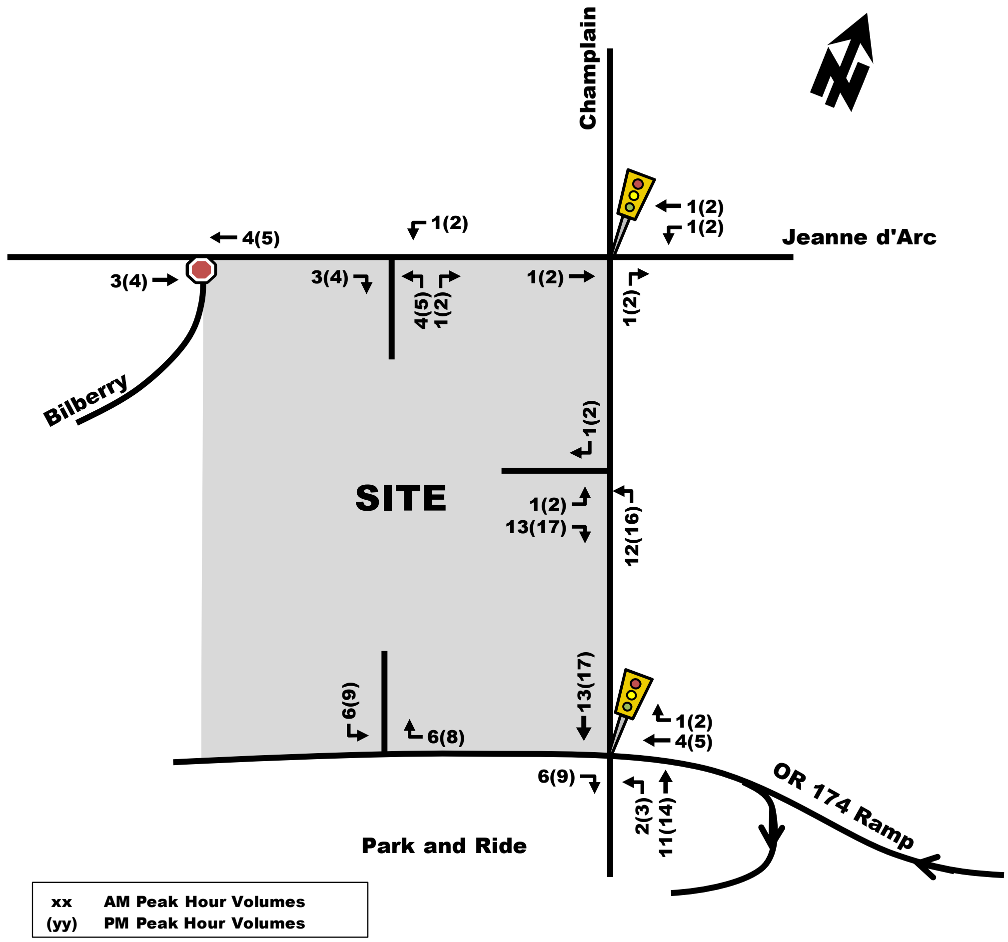


Based on the above distribution in Figure 3, given the low traffic volumes entering/exiting the site, the site driveway connection to Champlain Street is projected to operate with acceptable delays and minimal queues. This driveway is assessed as a full-movement driveway connection to Champlain Street as per the draft approved plan of subdivision conditions.

2.2.2. PHASE 1B – RESIDENTIAL CARE FACILITY + RETIREMENT RESIDENCE (OPEN 2020)

For Phase 1B of the development the residential care facility and retirement residence is planned to be constructed/occupied. Traffic generated by these land uses is estimated to be approximately 48 and 67 veh/h two-way during the morning and afternoon peak hours, respectively, as shown in Appendix C. It was assumed that all site driveway connections will be constructed for this stage of development. The site driveway connection to Champlain Street is assessed as a full-movement driveway connection. Figure 4 illustrates the projected 'new' site-generated trips for Phase 1B of the development.

Figure 4: 'New' Phase 1A and Phase 1B Site-Generated Traffic Volumes



Based on the above distribution in Figure 4, given the low traffic volumes entering/exiting the site, the site driveway connections are projected to operate with acceptable delays and minimal queues.

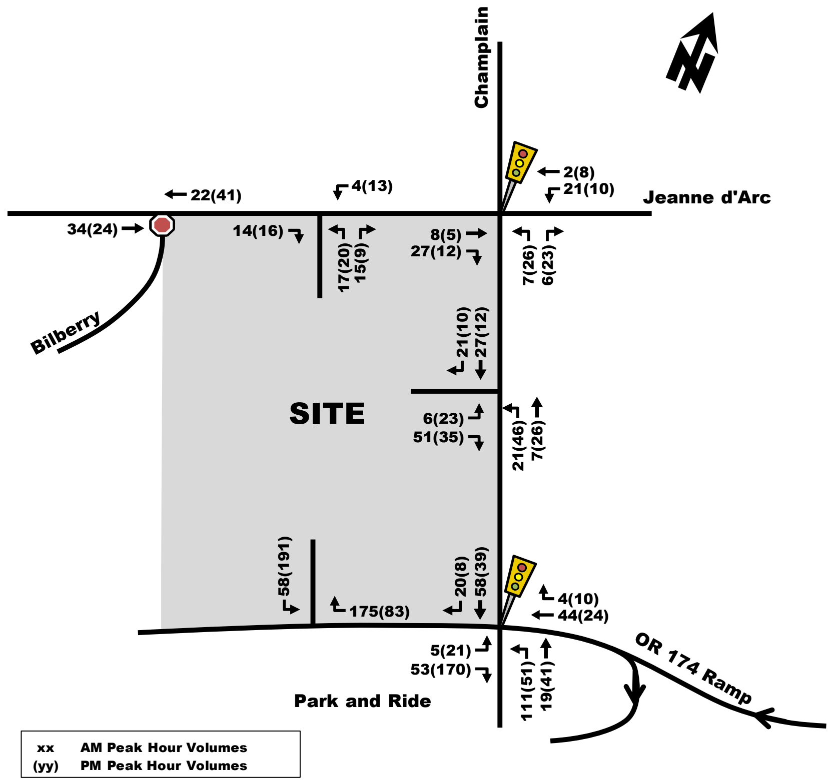
2.2.3. INTERIM 5-YEAR – REVERA + BALANCE OF DEVELOPMENT (2022)

The 5-Year Site Plan (Figure 2) includes all land uses outlined in the previous Section 2.2 with the resultant site-generated trip generation summarized in Table 2. These land uses include:

- 352 dwelling units
- 14,875 m^2 office
- 180 suite retirement home and 256 unit residential care facility

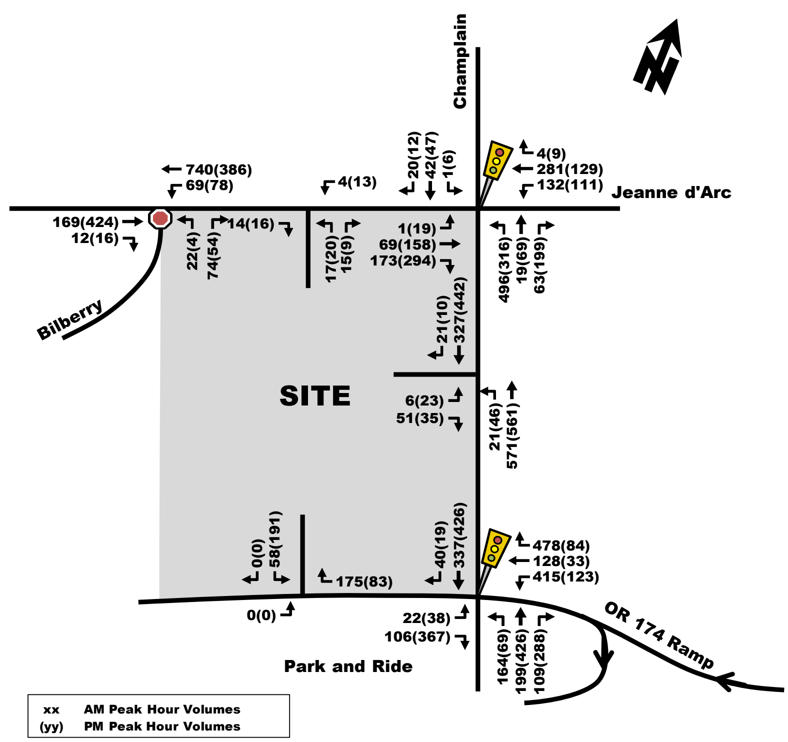
The resultant trip generation during the peak hours is approximately 380 veh/h two-way during the morning peak hour and 445 veh/h during the afternoon peak hour. These volumes were distributed to the study area intersections and are illustrated as Figure 5.

Figure 5: 'New' Site-Generated Traffic Volumes – 5-Year Site Plan



Similar to the original CTS, a 1% background traffic growth for 5 years was applied to existing traffic volumes and then the total projected site-generated traffic volumes (Table 2) were distributed to the study area intersections. The total projected traffic volumes for 2022 are illustrated as Figure 6.

Figure 6: Total Projected 2022 Traffic Volumes



Based on these traffic volumes, the projected intersection operations are summarized in Table 3 and the SYNCHRO (V9) model output of projected 2022 conditions is included as Appendix D.

Table 3: Projected 2022 Intersection Operation

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Champlain/Jeanne D'Arc	D(A)	0.89(0.54)	NBL(EBR)	20.5(10.9)	B(A)	0.67(0.46)
Champlain/P&R/OR 174 Ramp	F(B)	1.01(0.66)	WBL(EBR)	22.2(9.3)	C(A)	0.76(0.52)
Jeanne D'Arc/Site	B(B)	12.3(14.6)	NBL(NBL)	0.4(0.6)	-	-
Champlain/Site	B(C)	11.7(18.4)	EBL(EBL)	0.8(1.3)	-	-
Park and Ride/Site	B(B)	10.5(11.2)	SBL(SBL)	1.5(5.0)	-	-
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 3, the signalized study area intersections 'as a whole' are projected to operate with acceptable levels of service (LoS 'C' or better) during both peak hours. The critical westbound left-turn/through movement at the signalized Champlain/P&R/OR 174 intersection is projected to operate above capacity (LoS 'F') during the morning peak hour. The critical northbound left-turn movement at the Champlain/Jeanne d'Arc intersection is projected to operate close to capacity (LoS 'D') during the morning peak hour. During the afternoon peak hour, the signalized intersections are projected to operate with considerable spare capacity (LoS 'B or better).

Signal timing modifications at the Champlain/P&R/OR174 intersection can be implemented to improve the performance of the critical westbound through/left-turn movement. The SYNCHRO model output of the modified signal is provided within Appendix D.

With regard to queuing, the 95th percentile queue for the northbound left-turn movement at the Champlain/P&R/OR174 intersection projected to be 30 m and the existing northbound left-turn lane is approximately 38 m. The westbound through/left-turn movement has a projected 95th percentile queue of 120 m, which is approximately the length of the existing storage lane. At the Champlain/Jeanne d'Arc intersection, the northbound left-turn 95th percentile queue is projected to be 98 m, which will spill back out of the formal storage lane[1]. An extension of the left-turn lane to approximately 85 m (plus taper) is recommended as shown on the attached Functional Drawing.

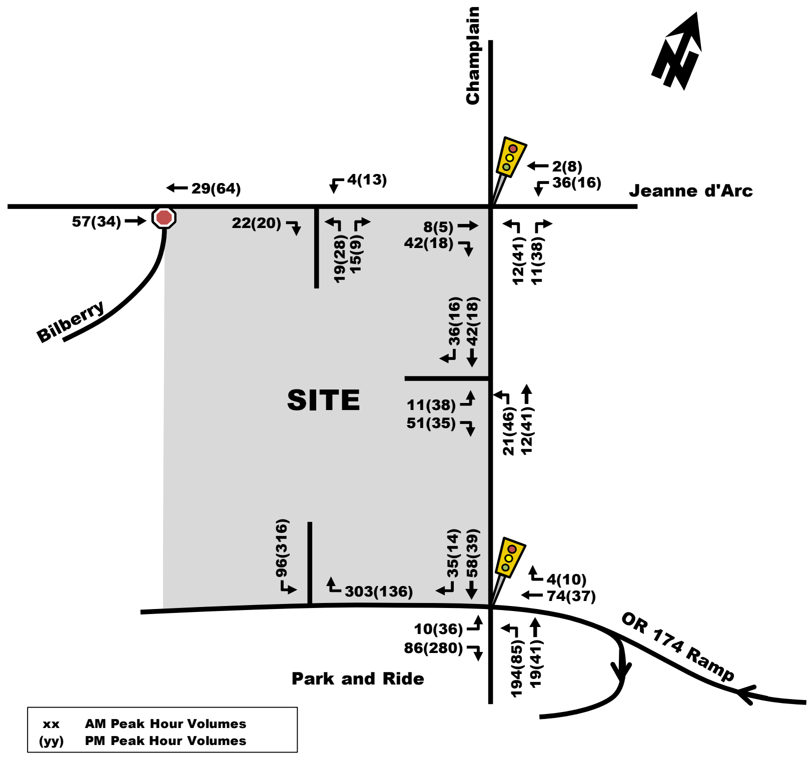
With regard to the unsignalized site driveway connections, they are projected to operate with acceptable delays of 10 to 20 seconds for vehicles exiting the site. Minimal queues and delays are projected for vehicles entering the site.

2.2.4. INTERIM 20-YEAR –BALANCE OF DEVELOPMENT (2037)

The 20-Year Site Plan is provided as Appendix E. This plan includes the addition of approximately 10,815 m^2 of office and an 850 m^2 retail pad. The increase in land use results in total projected traffic volumes of approximately 575 and 650 veh/h during the morning and afternoon peak hours, respectively. All new traffic volumes were distributed to study area intersections and are illustrated as Figure 7.

[1] The width of asphalt (approximately 6 m) to the south is sufficiently wide at this location that queued left-turn vehicles are unlikely to block through traffic.

Figure 7: ‘New’ Site-Generated Traffic Volumes – 20-Year Site Plan



Existing traffic volumes were increased by 10% to account for background traffic growth within the study area for the Horizon Year 2037. The resulting total projected 2037 traffic volumes are illustrated as Figure 8.

Figure 8: Total Projected 2037 Traffic Volumes – 20 Year Site Plan

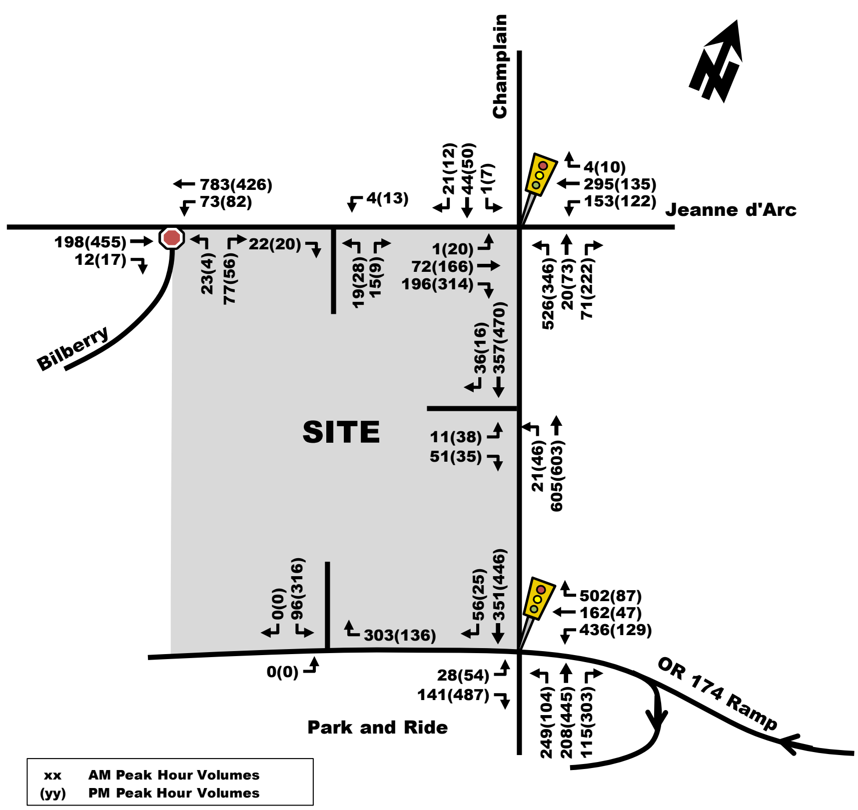


Table 4: Projected 2037 Intersection Operation – 20 Year Plan

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a Whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Champlain/Jeanne D'Arc	E(A)	0.97(0.56)	NBL(NBL)	25.3(10.2)	C(A)	0.72(0.50)
Champlain/P&R/OR 174 Ramp	F(D)	1.11(0.82)	WBL(EBR)	31.1(12.3)	C(B)	0.71(0.65)
Jeanne D'Arc/Site	B(C)	13.0(16.1)	NBL(NBL)	0.4(0.7)	-	-
Champlain/Site	B(D)	13.4(24.9)	EBL(EBL)	0.9(1.8)	-	-
Park and Ride/Site	B(B)	11.7(13.9)	SBL(SBL)	1.9(7.0)	-	-
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 4, the signalized study area intersections 'as a whole' are projected to continue to operate with an acceptable LoS 'C' or better during the morning and afternoon peak hours. During the morning peak hour, the critical movements at both signalized intersections are projected to operate at or above capacity (LoS 'E' or LoS 'F'). All other 'critical movements' are projected to operate at acceptable levels of service during the weekday peak hours.

Signal timing modifications can be applied to the signalized intersections during the critical morning peak hour to improve the level of service for all movements to LoS 'E' or better. At the Champlain/P&R/OR174 intersection a left-turn lane may be required in the future to improve the through and left-turn movements (currently one shared through/left-turn lane). The SYNCHRO model output of the projected 2037 condition is provided within Appendix F.

2.3. SITE ACCESS REQUIREMENTS (UPDATED)

Previous studies indicated the ultimate need for auxiliary northbound left-turn lane on Champlain Street (approaching Street No. 2) and widening of the private roadway serving the OC Transpo P&R (linking Champlain to Street No. 1) to facilitate two westbound travel lanes, one of which is to be used exclusively by transit. The modifications were incorporated into the approved draft plan conditions.

With regard to the shared access to the Park & Ride, two westbound lanes are proposed to extend from the Champlain/P&R/OR174 intersection for approximately 90 m. One lane (southern lane) is proposed for Park & Ride related vehicles turning left into the eastern Park & Ride parking lot and for OC Transpo buses turning left to access the bus terminal. The other lane (northern lane) is proposed for the subject site-generated traffic and Park & Ride related traffic accessing the western parking lot.

2.3.1. DRIVEWAY CONNECTION TO CHAMPLAIN

Based on the projected volumes, a northbound left-turn lane at Champlain/Site intersection is warranted (see Appendix G). The recommended storage length is 40 m plus taper, which represents the City of Ottawa's suggested minimum length in unconstrained environments.

The proposed full-movement site driveway connection to Champlain Street is projected to operate with acceptable delays of 10 to 25 seconds based on the 2022 and 2037 traffic projections. There is minimal traffic projected to turn left out of the site and vehicles turning into the site will not impact the northbound through movement as a left-turn lane is warranted/proposed. The office land uses are the highest trip generators and as such, the majority of the traffic is assigned to the full-movement signalized Champlain/P&R/OR174 intersection.

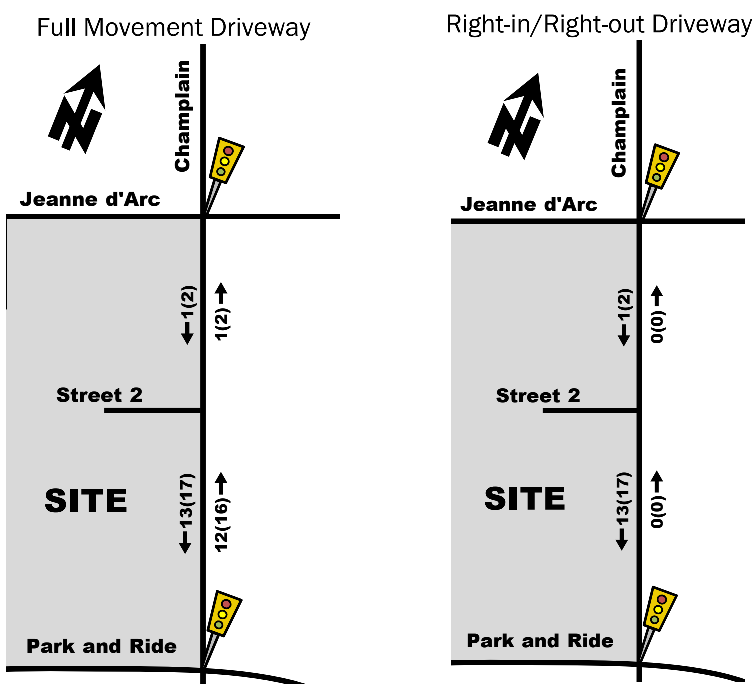
Providing a right-in/right-out driveway connection to Champlain Street will increase turning movements at the adjacent signalized intersections. During the morning peak hour, the northbound left-turn movements at both signalized intersections are projected to operate at or close to capacity (LoS 'D' or LoS 'E') given the 2037 background traffic scenario. Given the proposed left-turn lane at the site driveway connection to Champlain Street, the minimal amount of traffic assigned to left-turn movement out of the driveway and the existing and projected volumes along Champlain Street, a full-movement driveway connection at this location is recommended, however, a right-in/right-out driveway would operate acceptably and slightly increase turning movements at the adjacent signalized intersections.

There are several options to provide a right-in/right-out driveway connection including; signage, channelization ('pork chop'), or full centre median. Compliance is often an issue with the first two options, whereas, a centre median would restrict full-access movements to/from private driveways along the east side of Champlain Street.

Increase in Traffic Volumes along Champlain Street

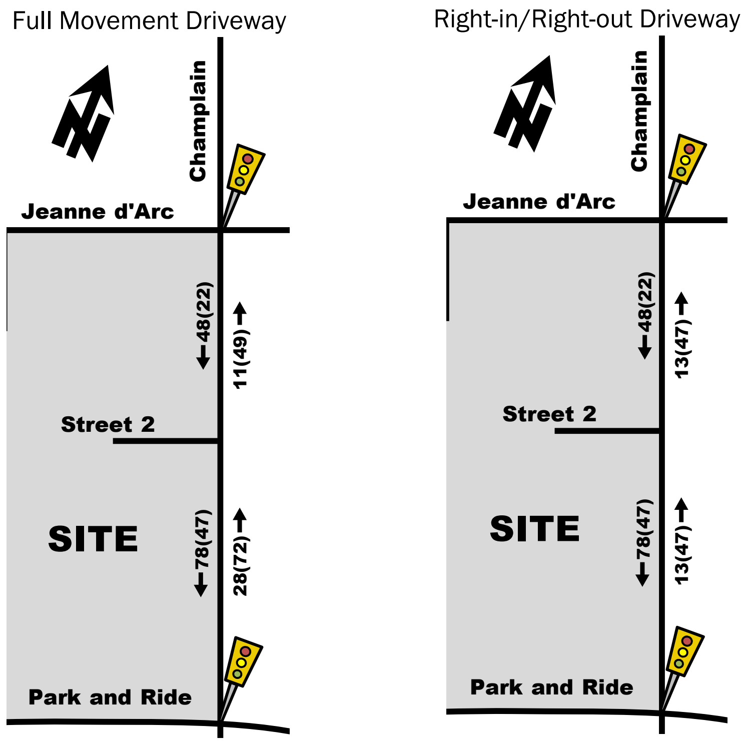
The projected increase in traffic volumes on Champlain Street as a result of the development range between 25 to 35 veh/h two-way during the Phase 1 scenario (Phase 1A: residential care facility and Phase 1B: retirement home combined), assuming a full movement driveway at Street Number 2. If this driveway is restricted to right-in/right-out, the increase in northbound vehicle volume decreases by approximately 15 veh/h with no impact to the southbound volumes. This is illustrated in Figure 9 below.

Figure 9: Increase Traffic on Champlain Street – Phase 1



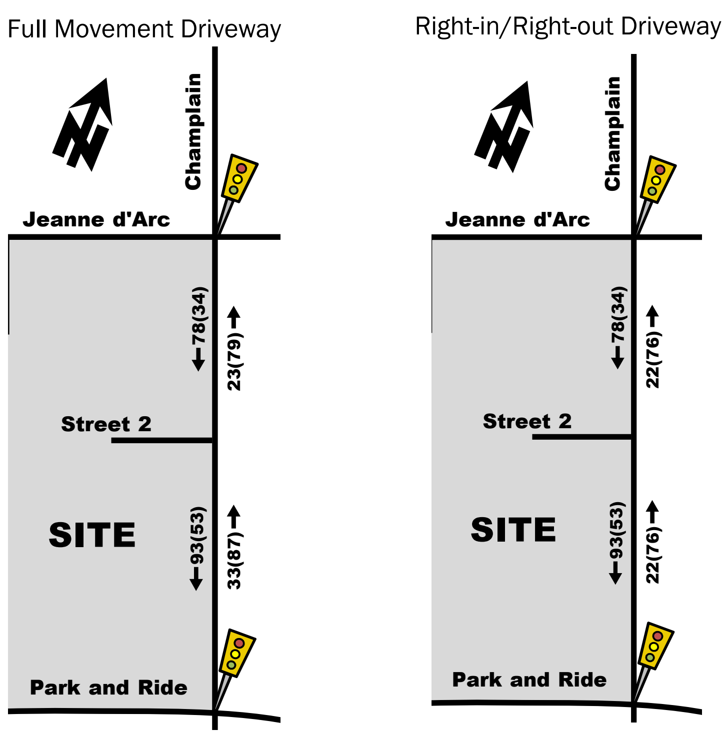
For the 5-year plan with a full movement driveway connection to Champlain Street, the increase in vehicles volume along Champlain Street is approximately 60 to 70 veh/h two-way north of Street Number 2 and 100 to 120 veh/h two-way south of Street Number 2. For the right-in/right-out scenario, the increase in vehicles north of Street Number 2 effectively does not change and south of Street Number 2, the increase is approximately 90 to 95 veh/h two-way, which represents a difference of approximately 10 to 25 veh/h two-way during the peak hours. Figure 10 illustrates these projected vehicle volumes.

Figure 10: Increase Traffic on Champlain Street – 5 Year Plan



With respect to the 20-year plan, the increase in vehicles along Champlain Street is projected to be 100 to 115 veh/h two way north of Street Number 2 and 125 to 140 veh/h two-way south of Street Number 2. With a right-in/right-out driveway scenario, the increase in traffic north of Street Number 2 is effectively unchanged and south of the Street 2 the increase in traffic is approximately 115 to 130 veh/h two-way, which represents a difference of approximately 10 veh/h. These volumes are illustrated in Figure 11.

Figure 11: Increase Traffic on Champlain Street – 20 Year Plan



As shown in the above Figures 9, 10 and 11, by providing a right-in/right-out driveway connection at Street 2 to Champlain Street the amount of traffic along Champlain Street is approximately 10 to 25 veh/h lower than providing a full movement connection. This amount of vehicle traffic represents approximately 1 new vehicle every 2 to 6 minutes, which is considered a negligible amount of traffic. As such, providing a right-in/right-out site driveway connection to Champlain Street does not significantly decrease the amount of traffic along this roadway when compared to the full-movement driveway option.

2.3.2. DRIVEWAY CONNECTION TO PARK & RIDE ACCESS ROAD

The site's driveway connection to the Park & Ride roadways is proposed to be STOP controlled on the minor approach only (southbound approach) for Phase 1 of the development. All-way STOP control warrant analysis was performed for the three development phases based on peak hour volumes. For Phase 1 of the development, all-way STOP control is not warranted at this location. For the 5-year and 20-year plans, the analysis indicates that all-way STOP control is warranted (based on peak hour volumes[2]), however the operational analysis indicates delays on the minor approach of less than 15 seconds. As these phases are developed, the operations of this site driveway connection should be monitored and all-way STOP control should be implemented if necessary.

With the current configuration within the P&R lot, vehicles turning left out of the site will then have to stop at the existing STOP sign located approximately 20 m to the east of the driveway[3] (see Section 2.3.3 below). These two STOP-controlled intersections are in close proximity with sufficient storage for only 3 or 4 vehicles.

Given the low site-generated traffic at this driveway associated with Phase 1 development and all vehicle site traffic is destined to/from the east (towards Champlain Street), the proposed geometry is considered acceptable. This intersection configuration should be further assessed at subsequent phases of development.

2.3.3. PEDESTRIAN CONNECTION BETWEEN DEVELOPMENT AND TRANSIT STATION

Several options were considered to provide a safe crossing for future pedestrian activity between the existing Transit Station and the proposed development. There is an existing pedestrian pathway/desire line that connects the Park & Ride parking lot to the open field. At this location, a painted crosswalk is provided, as well as STOP control in the eastbound direction only. A sidewalk is proposed on the north side of the Park & Ride Access Road.

Existing traffic data during the critical PM peak hour (3:45-4:45 PM) indicate eastbound vehicle volumes at the STOP bar of approximately 160 veh/h, pedestrian crossing volumes of approximately 20 veh/h, and westbound left-turn bus volumes of 22 veh/h.

- The foregoing analysis projects increases to the eastbound vehicle volumes: +10 veh/h Phase 1; +190 veh/h for the 5-year Plan; and +315 veh/h for the 20-year Plan.
- Pedestrian crossing volumes are also expected to increase substantially
- No change assumed to the westbound left-turning bus volumes

Options to enhance pedestrian safety at this location are provided below:

- Option 1 is to leave the intersection 'as-is'. There is an existing eastbound STOP sign and painted cross-walk, however, westbound vehicles are not required to stop unless a pedestrian is present. It is understood that the eastbound STOP also benefits transit operations as westbound left-turning buses avoid any potential delay.
- Option 2 is to provide STOP control on the westbound approach to coincide with the existing eastbound STOP sign provided today. Compliance may be an issue for vehicles to stop at this intersection when pedestrians are not present.

[2] Warrants for AWSC are often based on data reflecting the busiest 8-hour (if available). It is noted that traffic to/from the Park & Ride is highest during the AM and PM commuting periods, and very low at other times of the day.
[3] The eastbound STOP bar is understood to be a measure used to provide priority to westbound left-turning buses into the Station.

- Option 3 is to provide a pedestrian crossover (PXO) at this location and remove the eastbound STOP sign.

In the interest of pedestrian safety, Option 3 (to provide a PXO) is recommended as the ultimate configuration. This also removes the requirement for vehicles exiting the proposed development to stop at the downstream intersection unless pedestrians are present, overall improving the vehicle and pedestrian movements at this location. The current configuration is considered acceptable for Phase 1 development as the volume of traffic to/from the P&R Access/Street 1 intersection is very modest.

It should be noted that OC Transpo has indicated a preference to maintain an eastbound STOP bar on the crosswalk location in order to maintain the current no delay to westbound left-turning buses. Analysis of conditions assuming the 20-year Plan indicates that the delay introduced to the buses as a result of removing the STOP bar is projected to be approximately 10 seconds.

3. FUNCTIONAL DESIGN DRAWING

An updated functional design drawing, showing the proposed connections to Jeanne d'Arc Boulevard, Champlain Street, and the P&R Access, is provided as Appendix H.

The following features are highlighted for Phase 1:

- full movement configuration on the Jeanne d'Arc/Street 1 intersection; STOP control on minor approach
- full movement configuration at the Champlain/Street 2 intersection complete with auxiliary northbound left-turn lane; STOP control on minor approach
- Champlain/Jeanne d'Arc intersection, extend length of existing northbound left-turn lane
- Champlain/P&R/OR174 intersection, provide a westbound shared right-through lane
- P&R Access Road west of Champlain, two westbound lanes
- full movement configuration on the P&R Access/Street 1 intersection; STOP control on minor approach

For the subsequent phases of development (i.e., 5-year and 20-year plans):

- consider PXO intersection at the P&R Access Road crosswalk
    - removal of eastbound STOP control at PXO location

4. CONCLUSION AND RECOMMENDATIONS

Based on the foregoing, the following transportation related conclusions are offered:

- The total site-generated traffic associated with Phase 1A is 24 and 37 veh/h during the weekday peak hours, and for the entire Phase 1, the site-generated traffic is projected to be 48 and 67 veh/h;
- When compared to the trips generated by the proposed development in the original CTS, the trip generated by the current 5-Year Site Plan are similar. The revised 5-year trip generation is 380 veh/h two-way during the morning peak hour and 445 veh/h during the afternoon peak hour;
- Based on the total projected 2022 traffic volumes (5-year plan), study area intersections 'as a whole' are projected to operate with acceptable levels of service;
    - the westbound left-turn movement at the Champlain/P&R/OR174 intersection is projected to operate above capacity (LoS 'F'). This movement's performance can be improved by adjusting the signal timing at this intersection;

  - the northbound left-turn movement 95th percentile queue at the Champlain/Jeanne d'Arc intersection is projected to be approximately 100 m. As such, increased left-turn storage would be advantageous. The proposed driveway connection to Champlain Street limits the left-turn storage lane to 85 m;
- The total site-generated traffic associated 20-year plan is 575 and 650 veh/h during the morning and afternoon peak hours, respectively;
- Based on the total projected 2037 traffic volumes (20-year plan), study area intersections 'as a whole' are projected to operate with acceptable levels of service during the peak hours;
  - the 'critical' westbound left-turn and northbound left-turn movements at the Champlain/P&R/OR174 and Champlain/Jeanne d'Arc intersections, respectively are projected to operate at or above capacity (LoS 'E' or LoS 'F');
  - signal timing modifications to these intersections can help improve the level of service for the critical movements;
- The site driveway connection to Champlain Street is recommended to be full-movement with a 40 m northbound left-turn lane;
  - full movement access improves overall site access and there is negligible increase in traffic on Champlain Street as a result (less than 1 vehicle per minute);
- With regard to the shared access to the Park & Ride, two westbound lanes are proposed to extend from the Champlain/P&R/OR174 intersection for approximately 90 m to provide a dedicated lane to Park & Ride related traffic:
  - the site driveway connection to the Park & Ride road is proposed to be STOP controlled on the minor approach only (southbound approach);
  - this proposed intersection is in close proximity to the exiting STOP controlled intersection within the Park & Ride parking lot;
  - the interaction between these two intersections is projected to operate acceptably, however, during the planning stage of the 20-year concept plan, the performance of these intersections should be assessed to account for the projected increase in vehicle traffic to this driveway.
- There are currently high volumes of vehicles exiting OR174 at Champlain Street and travelling northbound to Jeanne d'Arc Boulevard;
  - much of this traffic appears to be related to the local schools, retail and diverted traffic from OR174;
  - field observations revealed notable delays (30 to 60 seconds) for vehicles exiting private driveways located on the east side of Champlain Street during the morning peak hour only, whereas delays in the afternoon peak hour were more modest (10-20 seconds);
  - existing two-way volumes on Champlain Street are 820 to 920 veh/h, whereas the proposed Phase 1 site is expected to add 25 to 35 veh/h two-way and the 5-year Interim Development is expected to add 100 to 120 veh/h two-way;
  - if the decision is made to provide a right-in/right-out only connection to Champlain Street at Street Number 2, the two-way vehicle volume is projected to increase along Champlain Street by 90 to 95 veh/h relative to existing. This is approximately 10 to 25 veh/h two-way less than the full-movement driveway scenario for the 5-year Interim Development;

Based on the foregoing the proposed 850 Champlain development continues to be recommended from a transportation perspective.

Prepared by:	Reviewed by:
André Jane Sponder, B.A.Sc. Transportation Analyst	Mark Baker, P.Eng. Senior Transportation Engineer

LICENSED PROFESSIONAL ENGINEER
M. A. BAKER
02-14-17
PROVINCE OF ONTARIO

Appendix B

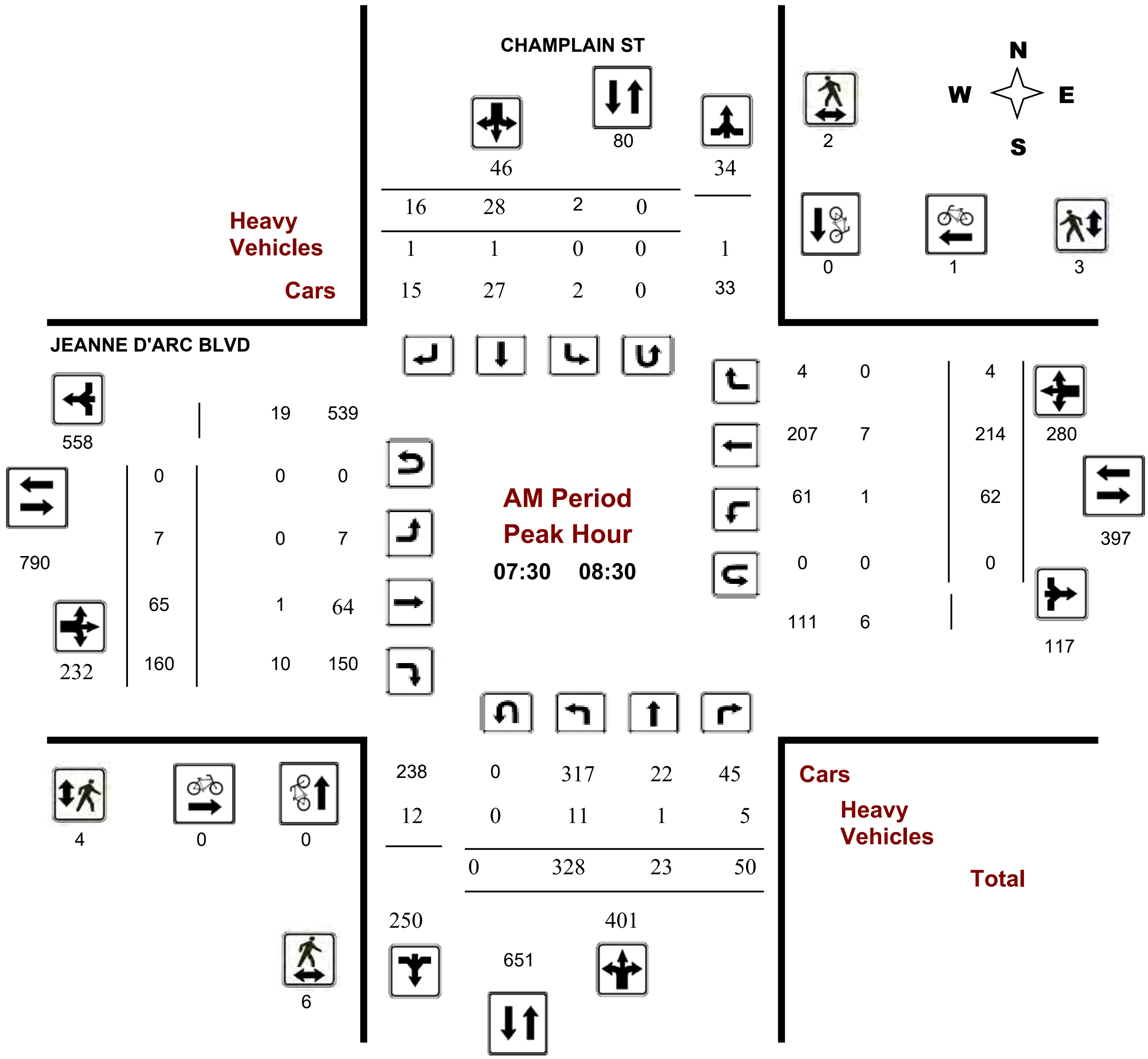
Traffic Count Data

Turning Movement Count - Peak Hour Diagram

CHAMPLAIN ST @ JEANNE D'ARC BLVD

Survey Date: Wednesday, January 08, 2020 **WO No:** 39270

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



Comments 5469211 - WED JAN 08, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

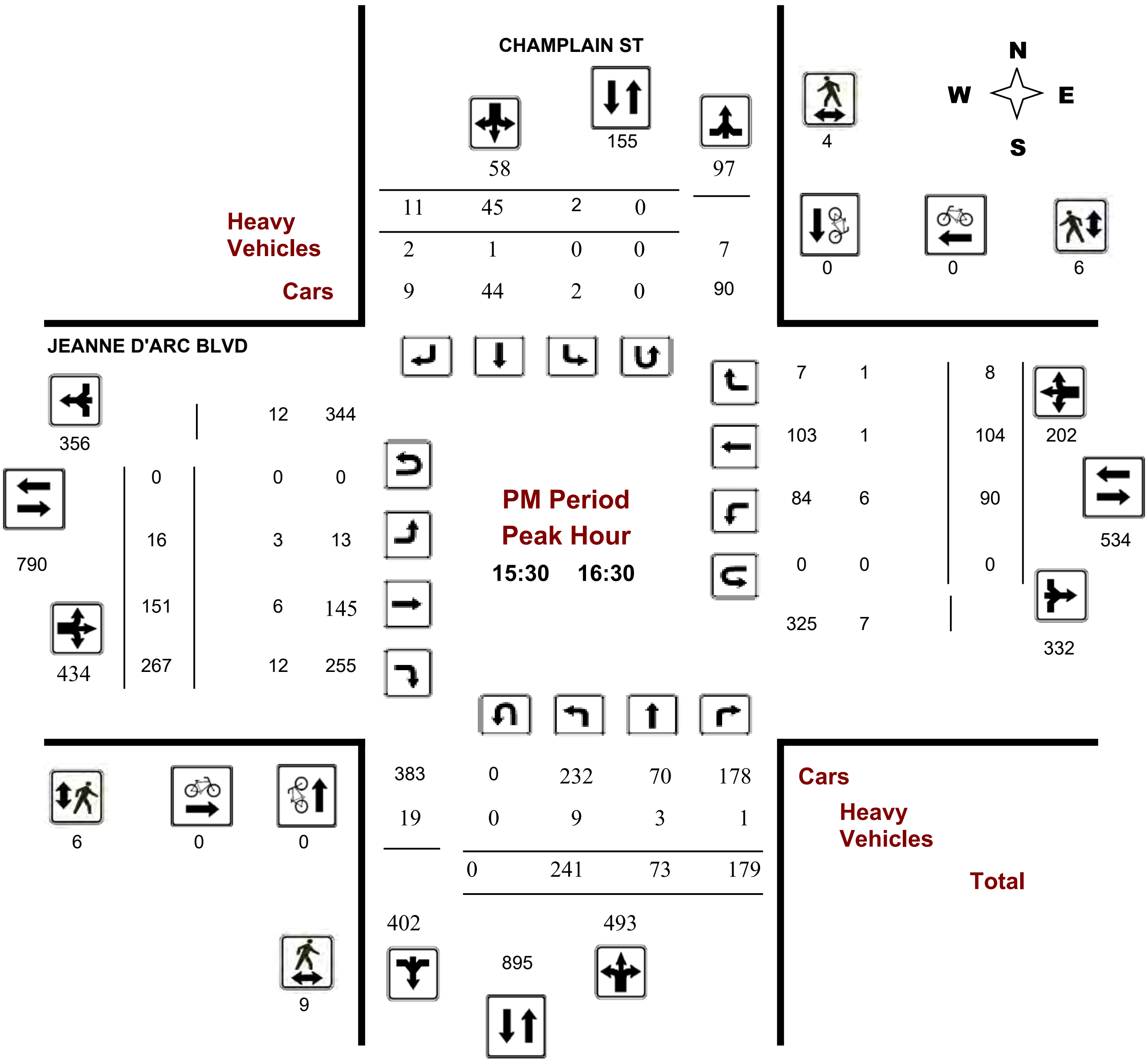
CHAMPLAIN ST @ JEANNE D'ARC BLVD

Survey Date: Wednesday, January 08, 2020

Start Time: 07:00

WO No: 39270

Device: Miovision



Comments 5469211 - WED JAN 08, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMPLAIN ST @ JEANNE D'ARC BLVD

Survey Date: Wednesday, January 08, 2020 **WO No:** 39270

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

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, January 08, 202

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 0 Westbound: 0

AADT Factor

1.00

	CHAMPLAIN ST									JEANNE D'ARC BLVD									
	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	324	17	37	**378**	3	30	16	**49**	**427**	2	40	121	**163**	72	251	2	**325**	**488**	**915**
08:00 09:00	230	19	57	**306**	4	42	18	**64**	**370**	10	84	201	**295**	82	171	8	**261**	**556**	**926**
09:00 10:00	160	31	54	**245**	7	58	8	**73**	**318**	5	69	187	**261**	94	99	9	**202**	**463**	**781**
11:30 12:30	168	40	97	**305**	11	52	12	**75**	**380**	13	82	190	**285**	86	93	5	**184**	**469**	**849**
12:30 13:30	158	46	92	**296**	7	51	7	**65**	**361**	6	72	166	**244**	87	63	5	**155**	**399**	**760**
15:00 16:00	248	55	167	**470**	3	37	11	**51**	**521**	14	149	256	**419**	64	109	9	**182**	**601**	**1122**
16:00 17:00	254	78	172	**504**	4	40	8	**52**	**556**	10	153	229	**392**	97	96	4	**197**	**589**	**1145**
17:00 18:00	255	68	145	**468**	3	52	5	**60**	**528**	20	148	190	**358**	81	80	8	**169**	**527**	**1055**
Sub Total	1797	354	821	**2972**	42	362	85	**489**	**3461**	80	797	1540	**2417**	663	962	50	**1675**	**4092**	**7553**
U Turns				**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total	1797	354	821	**2972**	42	362	85	**489**	**3461**	80	797	1540	**2417**	663	962	50	**1675**	**4092**	**7553**
EQ 12Hr	2498	492	1141	**4131**	58	503	118	**680**	**4811**	111	1108	2141	**3360**	922	1337	70	**2328**	**5688**	**10499**
AVG 12Hr	2354	464	1076	**3893**	55	474	111	**641**	**4811**	105	1044	2017	**3166**	869	1260	66	**2194**	**5688**	**10499**
AVG 24Hr	3084	607	1409	**5100**	72	621	146	**839**	**5939**	137	1368	2643	**4148**	1138	1651	86	**2874**	**7022**	**12961**

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

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

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.

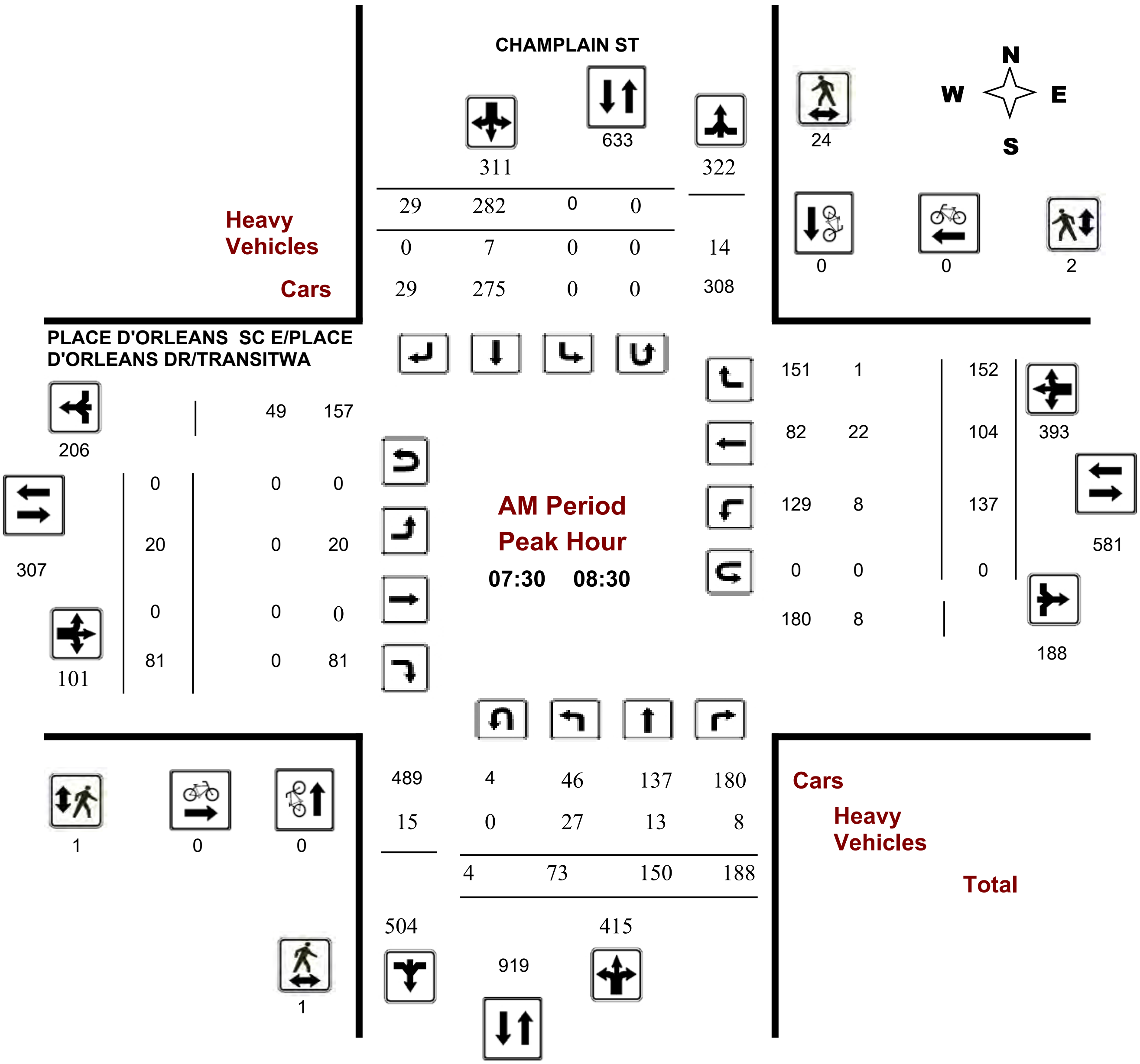
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CHAMPLAIN ST @ PLACE D'ORLEANS SC E/PLACE D'O

Survey Date: Wednesday, February 21, 2018 **WO No:** 37543

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



Comments

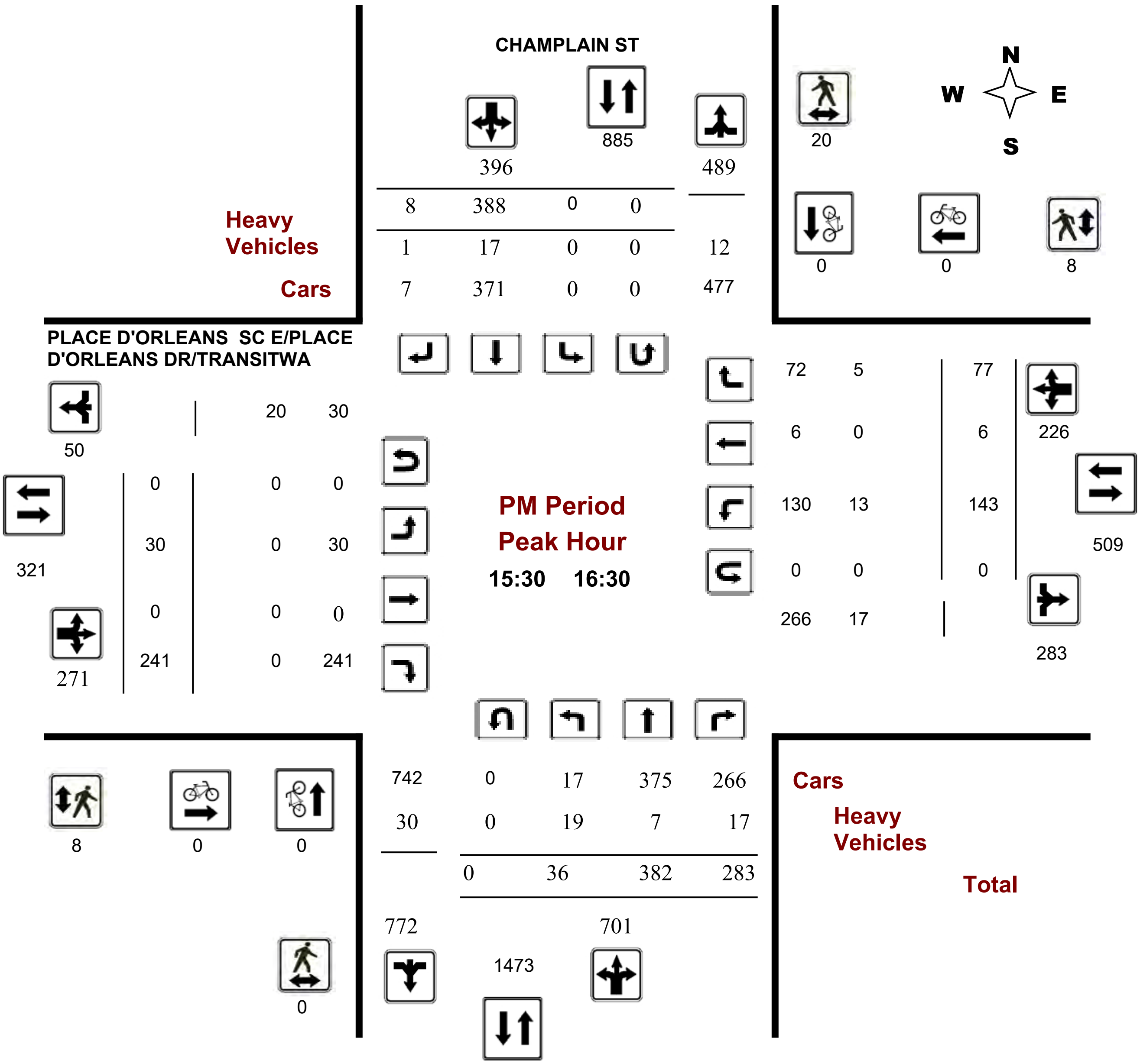
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

CHAMPLAIN ST @ PLACE D'ORLEANS SC E/PLACE D'O

Survey Date: Wednesday, February 21, 2018 **WO No:** 37543

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



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

CHAMPLAIN ST @ PLACE D'ORLEANS SC E/PLACE D'O

Survey Date: Wednesday, February 21, 2018 **WO No:** 37543

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

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, February 21, 2018

Total Observed U-Turns

Northbound: 17 Southbound: 1

Eastbound: 0 Westbound: 0

AADT Factor 1.00

CHAMPLAIN ST — PLACE D'ORLEANS SC E/PLACE D'ORLEANS DR/TRANSITWA

	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	65	104	195	**364**	0	237	24	**261**	**625**	12	0	91	**103**	126	117	125	**368**	**471**	**1096**
08:00 09:00	52	150	210	**412**	0	314	19	**333**	**745**	15	0	44	**59**	152	63	129	**344**	**403**	**1148**
09:00 10:00	15	142	278	**435**	0	381	5	**386**	**821**	3	0	16	**19**	139	11	65	**215**	**234**	**1055**
11:30 12:30	20	223	275	**518**	0	294	4	**298**	**816**	5	0	14	**19**	123	8	33	**164**	**183**	**999**
12:30 13:30	17	214	297	**528**	0	274	3	**277**	**805**	1	0	25	**26**	129	4	60	**193**	**219**	**1024**
15:00 16:00	29	331	301	**661**	0	387	7	**394**	**1055**	30	0	192	**222**	122	9	82	**213**	**435**	**1490**
16:00 17:00	31	419	299	**749**	0	369	6	**375**	**1124**	18	0	174	**192**	134	6	82	**222**	**414**	**1538**
17:00 18:00	17	403	328	**748**	0	346	8	**354**	**1102**	18	0	92	**110**	128	7	69	**204**	**314**	**1416**
Sub Total	246	1986	2183	**4415**	0	2602	76	**2678**	**7093**	102	0	648	**750**	1053	225	645	**1923**	**2673**	**9766**
U Turns				**17**				**1**	**18**				**0**				**0**	**0**	**18**
Total	246	1986	2183	**4432**	0	2602	76	**2679**	**7111**	102	0	648	**750**	1053	225	645	**1923**	**2673**	**9784**
EQ 12Hr	342	2761	3034	**6160**	0	3617	106	**3724**	**9884**	142	0	901	**1042**	1464	313	897	**2673**	**3715**	**13600**
AVG 12Hr	322	2602	2860	**5806**	0	3409	100	**3509**	**9884**	134	0	849	**982**	1379	295	845	**2519**	**3715**	**13600**
AVG 24Hr	422	3408	3746	**7606**	0	4465	130	**4597**	**12203**	175	0	1112	**1287**	1807	386	1107	**3300**	**4587**	**16790**

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

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

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.

Appendix C

Background Traffic Growth

Champlain / Jeanne D'Arc
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2009	Thurs 4 Jun	577	630	3047	2659	2770	2410	1829	1854	15776
2011	Wed 13 Jul	588	568	2633	2588	2204	2179	1647	1607	14014
2016	Wed 6 Nov	525	516	3034	2635	2933	2399	1607	1733	15382
2020	Wed 8 Jan	489	484	2972	2565	2844	2417	1660	1675	15106

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	630	577	1207	15776				
2011	568	588	1156	14014	-9.8%	1.9%	-4.2%	-11.2%
2016	516	525	1041	15382	-9.2%	-10.7%	-9.9%	9.8%
2020	484	489	973	15106	-6.2%	-6.9%	-6.5%	-1.8%

Regression Estimate	2009	612	590	1201
Regression Estimate	2020	475	491	966
Average Annual Change		**-2.27%**	**-1.65%**	**-1.96%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	1829	1854	3683	15776				
2011	1647	1607	3254	14014	-10.0%	-13.3%	-11.6%	-11.2%
2016	1607	1733	3340	15382	-2.4%	7.8%	2.6%	9.8%
2020	1660	1675	3335	15106	3.3%	-3.3%	-0.1%	-1.8%

Regression Estimate	2009	1747	1756	3503
Regression Estimate	2020	1612	1671	3282
Average Annual Change		**-0.73%**	**-0.45%**	**-0.59%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	2410	2770	5180	15776				
2011	2179	2204	4383	14014	-9.6%	-20.4%	-15.4%	-11.2%
2016	2399	2933	5332	15382	10.1%	33.1%	21.7%	9.8%
2020	2417	2844	5261	15106	0.8%	-3.0%	-1.3%	-1.8%

Regression Estimate	2009	2303	2521	4824
Regression Estimate	2020	2409	2888	5297
Average Annual Change		**0.41%**	**1.24%**	**0.85%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	3047	2659	5706	15776				
2011	2633	2588	5221	14014	-13.6%	-2.7%	-8.5%	-11.2%
2016	3034	2635	5669	15382	15.2%	1.8%	8.6%	9.8%
2020	2972	2565	5537	15106	-2.0%	-2.7%	-2.3%	-1.8%

Regression Estimate	2009	2870	2639	5508
Regression Estimate	2020	2984	2579	5563
Average Annual Change		**0.35%**	**-0.21%**	**0.09%**

Champlain / Jeanne D'Arc
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2009	Thurs 4 Jun	85	41	392	342	530	236	129	326	2081
2011	Wed 13 Jul	91	39	197	374	223	237	109	220	1490
2016	Wed 6 Nov	60	23	537	285	749	198	113	375	2340
2020	Wed 8 Jan	46	34	401	250	558	232	117	280	1918

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	41	85	126	2081				
2011	39	91	130	1490	-4.9%	7.1%	3.2%	-28.4%
2016	23	60	83	2340	-41.0%	-34.1%	-36.2%	57.0%
2020	34	46	80	1918	47.8%	-23.3%	-3.6%	-18.0%

	Year			
Regression Estimate	2009	39	91	130
Regression Estimate	2020	28	46	74
Average Annual Change		**-2.86%**	**-6.00%**	**-4.95%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	129	326	455	2081				
2011	109	220	329	1490	-15.5%	-32.5%	-27.7%	-28.4%
2016	113	375	488	2340	3.7%	70.5%	48.3%	57.0%
2020	117	280	397	1918	3.5%	-25.3%	-18.6%	-18.0%

	Year			
Regression Estimate	2009	120	291	411
Regression Estimate	2020	113	312	425
Average Annual Change		**-0.51%**	**0.63%**	**0.31%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	236	530	766	2081				
2011	237	223	460	1490	0.4%	-57.9%	-39.9%	-28.4%
2016	198	749	947	2340	-16.5%	235.9%	105.9%	57.0%
2020	232	558	790	1918	17.2%	-25.5%	-16.6%	-18.0%

	Year			
Regression Estimate	2009	233	412	645
Regression Estimate	2020	217	639	856
Average Annual Change		**-0.62%**	**4.07%**	**2.62%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	392	342	734	2081				
2011	197	374	571	1490	-49.7%	9.4%	-22.2%	-28.4%
2016	537	285	822	2340	172.6%	-23.8%	44.0%	57.0%
2020	401	250	651	1918	-25.3%	-12.3%	-20.8%	-18.0%

	Year			
Regression Estimate	2009	319	364	683
Regression Estimate	2020	457	251	708
Average Annual Change		**3.32%**	**-3.33%**	**0.32%**

Champlain / Jeanne D'Arc
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2009	Thurs 4 Jun	70	127	572	404	392	467	421	235	2688
2011	Wed 13 Jul	79	94	587	373	385	398	413	201	2530
2016	Wed 6 Nov	62	93	509	409	402	432	319	220	2446
2020	Wed 8 Jan	58	97	493	402	356	434	332	202	2374

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	127	70	197	2688				
2011	94	79	173	2530	-26.0%	12.9%	-12.2%	-5.9%
2016	93	62	155	2446	-1.1%	-21.5%	-10.4%	-3.3%
2020	97	58	155	2374	4.3%	-6.5%	0.0%	-2.9%

Regression Estimate	2009	113	75	188
Regression Estimate	2020	91	58	149
Average Annual Change		**-1.97%**	**-2.32%**	**-2.11%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	421	235	656	2688				
2011	413	201	614	2530	-1.9%	-14.5%	-6.4%	-5.9%
2016	319	220	539	2446	-22.8%	9.5%	-12.2%	-3.3%
2020	332	202	534	2374	4.1%	-8.2%	-0.9%	-2.9%

Regression Estimate	2009	419	223	643
Regression Estimate	2020	313	204	518
Average Annual Change		**-2.62%**	**-0.79%**	**-1.95%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2009	467	392	859	2688				
2011	398	385	783	2530	-14.8%	-1.8%	-8.8%	-5.9%
2016	432	402	834	2446	8.5%	4.4%	6.5%	-3.3%
2020	434	356	790	2374	0.5%	-11.4%	-5.3%	-2.9%

Regression Estimate	2009	437	396	832
Regression Estimate	2020	428	370	797
Average Annual Change		**-0.19%**	**-0.62%**	**-0.39%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2009	572	404	976	2688				
2011	587	373	960	2530	2.6%	-7.7%	-1.6%	-5.9%
2016	509	409	918	2446	-13.3%	9.7%	-4.4%	-3.3%
2020	493	402	895	2374	-3.1%	-1.7%	-2.5%	-2.9%

Regression Estimate	2009	584	391	975
Regression Estimate	2020	488	404	892
Average Annual Change		**-1.62%**	**0.31%**	**-0.80%**

Appendix D

MMLoS Analysis Results

Multi-Modal Level of Service - Intersections Form

Consultant	**PARSONS**	**Project**	**477514-01000**
Scenario	**850 Champlain Addendem 3**	**Date**	**May 2020**
Comments			

	INTERSECTIONS	Champlain/Jeanne D'Arc				Champlain/HWY 174 WB OFF-Ramp-P&R			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	3	4	3	4	5	7	3	3
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	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
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel	Conv'tl without Receiving Lane	No Channel	Conv'tl without Receiving Lane	No Channel	Conventional with Receiving Lane	Conventional with Receiving Lane	No Channel
	Corner Radius	10-15m	15-25m	10-15m	10-15m	15-25m	15-25m	15-25m	15-25m
	Crosswalk Type	Zebra stripe hi-vis markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**73**	**55**	**70**	**57**	**38**	**3**	**69**	**68**
	Ped. Exposure to Traffic LoS	**C**	**D**	**C**	**D**	**E**	**F**	**C**	**C**
	Cycle Length	55	55	55	55	60	60	60	60
	Effective Walk Time	11	11	13	13	8	18	10	10
	Average Pedestrian Delay	**18**	**18**	**16**	**16**	**23**	**15**	**21**	**21**
	Pedestrian Delay LoS	**B**	**B**	**B**	**B**	**C**	**B**	**C**	**C**
	Level of Service	**C**	**D**	**C**	**D**	**E**	**F**	**C**	**C**
		D				**F**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic		Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m	> 50 m		≤ 50 m
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	>25 km/h		≤ 25 km/h
	Cyclist relative to RT motorists	**D**	**D**	**D**	**D**	**D**	**F**	**-**	**D**
	Separated or Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**	**Mixed Traffic**
	Left Turn Approach	No lane crossed	No lane crossed	No lane crossed	No lane crossed	One lane crossed	≥ 2 lanes crossed		No lane crossed
	Operating Speed	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h		≤ 40 km/h
	Left Turning Cyclist	**B**	**B**	**B**	**B**	**D**	**E**	**-**	**B**
	Level of Service	**D**	**D**	**D**	**D**	**D**	**F**	**-**	**D**
		D				**F**			
Transit	Average Signal Delay	≤ 40 sec				≤ 20 sec			
	Level of Service	**-**	**-**	**E**	**-**	**-**	**-**	**C**	**-**
		E				**C**			
Truck	Effective Corner Radius	> 15 m	10 - 15 m	10 - 15 m	> 15 m	> 15 m	> 15 m	> 15 m	10 - 15 m
	Number of Receiving Lanes on Departure from Intersection	1	1	1	1	1	1	≥ 2	≥ 2
	Level of Service	**C**	**E**	**E**	**C**	**C**	**C**	**A**	**B**
		E				**C**			
Auto	Volume to Capacity Ratio	0.0 - 0.60				0.0 - 0.60			
	Level of Service	**A**				**A**			

Multi-Modal Level of Service - Segments Form

Consultant	**PARSONS**	**Project**	**477514-01000**
Scenario	**850 Champlain Addendum 3**	**Date**	**May 2020**
Comments			

SEGMENTS		**Street A**	Jeanne D'Arc 1	Champlain 2	Famille-Cote 3	John Holden 4
Pedestrian	Sidewalk Width Boulevard Width	**-**	1.8 m > 2 m	1.8 m > 2 m	1.8 m 0.5 - 2 m	≥ 2 m > 2 m
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	≤ 3000	≤ 3000
	Operating Speed On-Street Parking		> 30 to 50 km/h no	> 30 to 50 km/h no	≤ 30 km/h no	≤ 30 km/h no
	Exposure to Traffic PLoS		**C**	**C**	**A**	**A**
	Effective Sidewalk Width					
	Pedestrian Volume					
	Crowding PLoS		**-**	**-**	**-**	**-**
	Level of Service		**-**	**-**	**-**	**-**
Bicycle	Type of Cycling Facility	**B**	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Number of Travel Lanes		≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)	≤ 2 (no centreline)
	Operating Speed		>40 to <50 km/h	>40 to <50 km/h	≤ 40 km/h	≤ 40 km/h
	# of Lanes & Operating Speed LoS		**B**	**B**	**A**	**A**
	Bike Lane (+ Parking Lane) Width					
	Bike Lane Width LoS		-	-	-	-
	Bike Lane Blockages					
	Blockage LoS		-	-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge	< 1.8 m refuge
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes	≤ 3 lanes	≤ 3 lanes
	Sidestreet Operating Speed		≤ 40 km/h	≤ 40 km/h	≤ 40 km/h	≤ 40 km/h
	Unsignalized Crossing - Lowest LoS		**A**	**A**	**A**	**A**
	Level of Service		**B**	**B**	**A**	**A**
Transit	Facility Type	**D**	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8
	Level of Service		**D**	**D**	**D**	**D**
Truck	Truck Lane Width	**B**	> 3.7 m	> 3.7 m	> 3.7 m	> 3.7 m
	Travel Lanes per Direction		1	1	1	1
	Level of Service		**B**	**B**	**B**	**B**

Appendix E

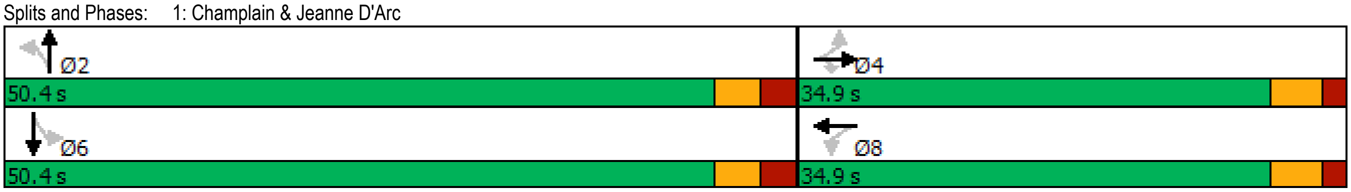
Synchro Analysis Results

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	7	65	160	62	214	328	23	2	28
Future Volume (vph)	7	65	160	62	214	328	23	2	28
Lane Group Flow (vph)	7	68	168	65	229	345	77	2	46
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	14.3	14.3	14.3	13.5	14.3	45.1	45.1	45.1	45.1
Actuated g/C Ratio	0.20	0.20	0.20	0.19	0.20	0.65	0.65	0.65	0.65
v/c Ratio	0.04	0.19	0.39	0.27	0.63	0.41	0.07	0.00	0.04
Control Delay	21.9	23.6	7.0	26.5	33.1	8.7	3.0	6.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	23.6	7.0	26.5	33.1	8.7	3.0	6.0	4.2
LOS	C	C	A	C	C	A	A	A	A
Approach Delay		12.1			31.7		7.6		4.3
Approach LOS		B			C		A		A
Queue Length 50th (m)	0.7	7.4	0.0	7.3	27.3	18.2	0.9	0.1	1.1
Queue Length 95th (m)	3.6	16.5	13.2	16.7	47.0	43.3	6.0	0.9	5.3
Internal Link Dist (m)		193.2			58.8		178.0		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	366	765	713	515	763	832	1031	807	1087
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.09	0.24	0.13	0.30	0.41	0.07	0.00	0.04

Intersection Summary

Cycle Length: 85.3
Actuated Cycle Length: 69.9
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 49.9% ICU Level of Service A
Analysis Period (min) 15

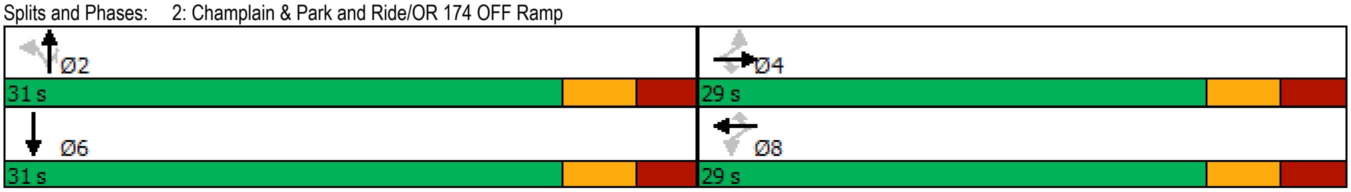
Splits and Phases: 1: Champlain & Jeanne D'Arc



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	20	0	81	137	104	152	77	150	188	282
Future Volume (vph)	20	0	81	137	104	152	77	150	188	282
Lane Group Flow (vph)	0	21	85	0	253	160	81	158	198	328
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		15.6	15.6		15.6	15.6	14.5	14.5	14.5	14.5
Actuated g/C Ratio		0.41	0.41		0.41	0.41	0.38	0.38	0.38	0.38
v/c Ratio		0.05	0.13		0.43	0.23	0.22	0.12	0.29	0.18
Control Delay		8.2	3.1		11.4	2.9	11.0	8.8	3.3	8.0
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		8.2	3.1		11.4	2.9	11.0	8.8	3.3	8.0
LOS		A	A		B	A	B	A	A	A
Approach Delay		4.1			8.1			6.7		8.0
Approach LOS		A			A			A		A
Queue Length 50th (m)		0.7	0.0		9.2	0.0	2.8	2.7	0.0	3.6
Queue Length 95th (m)		4.3	5.9		31.9	8.1	12.6	9.6	9.3	11.2
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		727	1062		993	1061	716	2495	1130	3539
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.03	0.08		0.25	0.15	0.11	0.06	0.18	0.09

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 38.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.43	
Intersection Signal Delay: 7.3	Intersection LOS: A
Intersection Capacity Utilization 47.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	128	11	66	683	21	70
Future Vol, veh/h	128	11	66	683	21	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	135	12	69	719	22	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	147	0	639	74
Stage 1	-	-	-	-	141	-
Stage 2	-	-	-	-	498	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1432	-	408	973
Stage 1	-	-	-	-	871	-
Stage 2	-	-	-	-	576	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1432	-	375	973
Mov Cap-2 Maneuver	-	-	-	-	375	-
Stage 1	-	-	-	-	871	-
Stage 2	-	-	-	-	530	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	10.4
HCM LOS			B

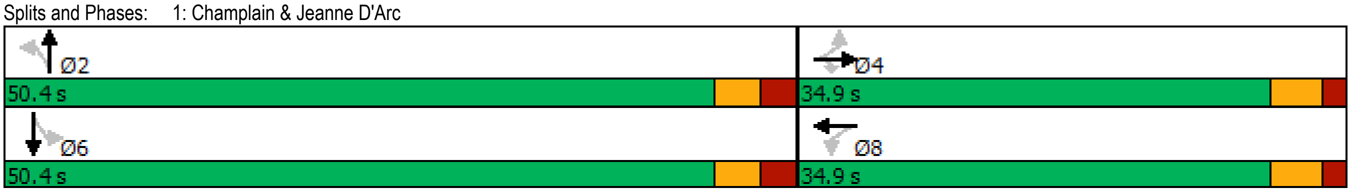
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	375	973	-	-	1432	-
HCM Lane V/C Ratio	0.059	0.076	-	-	0.049	-
HCM Control Delay (s)	15.2	9	-	-	7.6	0.3
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0.2	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	16	151	267	90	104	241	73	2	45
Future Volume (vph)	16	151	267	90	104	241	73	2	45
Lane Group Flow (vph)	17	159	281	95	117	254	265	2	59
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	12.3	12.3	12.3	11.5	12.3	45.1	45.1	45.1	45.1
Actuated g/C Ratio	0.18	0.18	0.18	0.17	0.18	0.67	0.67	0.67	0.67
v/c Ratio	0.08	0.49	0.57	0.51	0.36	0.30	0.24	0.00	0.05
Control Delay	23.2	30.3	8.5	35.5	26.3	6.4	2.3	5.0	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.2	30.3	8.5	35.5	26.3	6.4	2.3	5.0	4.1
LOS	C	C	A	D	C	A	A	A	A
Approach Delay		16.6			30.4		4.3		4.1
Approach LOS		B			C		A		A
Queue Length 50th (m)	1.8	18.2	0.0	11.0	12.5	10.3	2.6	0.1	1.6
Queue Length 95th (m)	6.5	33.9	17.1	23.9	25.3	26.3	11.8	0.8	6.0
Internal Link Dist (m)		193.2			58.8		178.0		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	531	788	792	474	781	848	1102	703	1149
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.20	0.35	0.20	0.15	0.30	0.24	0.00	0.05

Intersection Summary

Cycle Length: 85.3
Actuated Cycle Length: 67.8
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 56.3% ICU Level of Service B
Analysis Period (min) 15

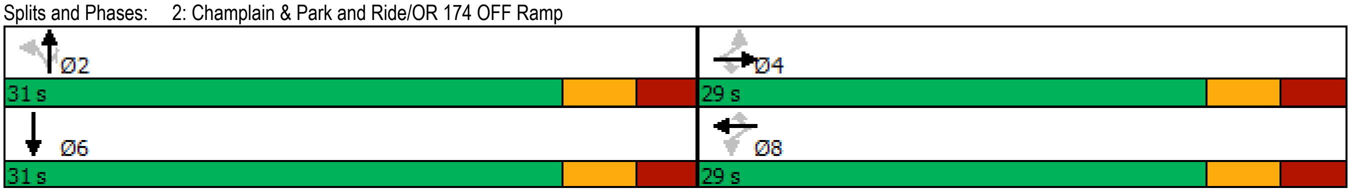
Splits and Phases: 1: Champlain & Jeanne D'Arc



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	30	0	241	143	6	77	36	382	283	388
Future Volume (vph)	30	0	241	143	6	77	36	382	283	388
Lane Group Flow (vph)	0	32	254	0	157	81	38	402	298	416
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		16.4	16.4		16.4	16.4	18.7	18.7	18.7	18.7
Actuated g/C Ratio		0.46	0.46		0.46	0.46	0.53	0.53	0.53	0.53
v/c Ratio		0.06	0.30		0.27	0.11	0.08	0.23	0.33	0.16
Control Delay		8.9	2.8		10.6	3.3	8.9	8.2	2.7	7.6
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		8.9	2.8		10.6	3.3	8.9	8.2	2.7	7.6
LOS		A	A		B	A	A	A	A	A
Approach Delay		3.5			8.1			6.0		7.6
Approach LOS		A			A			A		A
Queue Length 50th (m)		1.1	0.0		6.1	0.0	1.2	7.2	0.0	4.9
Queue Length 95th (m)		5.7	10.0		20.6	5.7	6.9	22.0	11.3	14.6
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		836	1163		914	1089	677	2578	1184	3694
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.04	0.22		0.17	0.07	0.06	0.16	0.25	0.11

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 35.6	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.33	
Intersection Signal Delay: 6.3	Intersection LOS: A
Intersection Capacity Utilization 47.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection						
Int Delay, s/veh	1.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	381	15	74	328	4	51
Future Vol, veh/h	381	15	74	328	4	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	401	16	78	345	4	54

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	417	0	738	209
Stage 1	-	-	-	-	409	-
Stage 2	-	-	-	-	329	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1138	-	353	797
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	701	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1138	-	323	797
Mov Cap-2 Maneuver	-	-	-	-	323	-
Stage 1	-	-	-	-	639	-
Stage 2	-	-	-	-	641	-

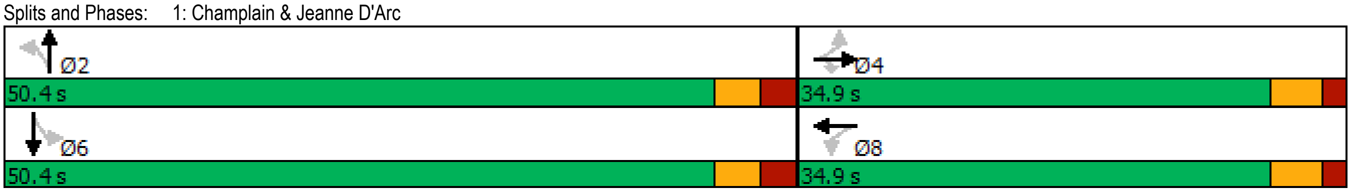
Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	323	797	-	-	1138	-
HCM Lane V/C Ratio	0.013	0.067	-	-	0.068	-
HCM Control Delay (s)	16.3	9.8	-	-	8.4	0.2
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0.2	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	7	66	160	63	215	328	23	2	28
Future Volume (vph)	7	66	160	63	215	328	23	2	28
Lane Group Flow (vph)	7	69	168	66	230	345	78	2	46
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	14.3	14.3	14.3	13.5	14.3	45.1	45.1	45.1	45.1
Actuated g/C Ratio	0.20	0.20	0.20	0.19	0.20	0.65	0.65	0.65	0.65
v/c Ratio	0.04	0.19	0.39	0.28	0.63	0.41	0.08	0.00	0.04
Control Delay	21.9	23.6	7.0	26.6	33.2	8.7	3.0	6.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	23.6	7.0	26.6	33.2	8.7	3.0	6.0	4.2
LOS	C	C	A	C	C	A	A	A	A
Approach Delay		12.1			31.7		7.6		4.3
Approach LOS		B			C		A		A
Queue Length 50th (m)	0.7	7.5	0.0	7.4	27.4	18.2	0.9	0.1	1.1
Queue Length 95th (m)	3.6	16.7	13.2	17.0	47.1	43.4	6.1	0.9	5.3
Internal Link Dist (m)		76.3			58.8		156.4		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	364	765	713	515	763	832	1030	807	1087
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.09	0.24	0.13	0.30	0.41	0.08	0.00	0.04

Intersection Summary	
Cycle Length: 85.3	
Actuated Cycle Length: 69.9	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 15.6	Intersection LOS: B
Intersection Capacity Utilization 49.9%	ICU Level of Service A
Analysis Period (min) 15	

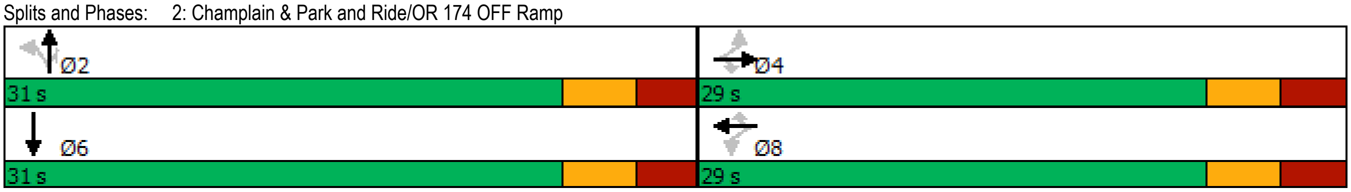
Splits and Phases: 1: Champlain & Jeanne D'Arc



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	20	0	81	137	104	157	77	164	188	293
Future Volume (vph)	20	0	81	137	104	157	77	164	188	293
Lane Group Flow (vph)	0	21	85	0	253	165	81	173	198	339
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		15.7	15.7		15.7	15.7	14.7	14.7	14.7	14.7
Actuated g/C Ratio		0.40	0.40		0.40	0.40	0.38	0.38	0.38	0.38
v/c Ratio		0.05	0.13		0.43	0.24	0.22	0.13	0.29	0.18
Control Delay		8.2	3.2		11.5	3.0	10.9	8.8	3.3	8.0
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		8.2	3.2		11.5	3.0	10.9	8.8	3.3	8.0
LOS		A	A		B	A	B	A	A	A
Approach Delay		4.2			8.2			6.8		8.0
Approach LOS		A			A			A		A
Queue Length 50th (m)		0.7	0.0		9.2	0.0	2.8	3.0	0.0	3.8
Queue Length 95th (m)		4.3	5.9		31.9	8.1	12.6	10.3	9.3	11.5
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		722	1055		986	1056	703	2477	1123	3513
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.03	0.08		0.26	0.16	0.12	0.07	0.18	0.10

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 38.8	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.43	
Intersection Signal Delay: 7.3	Intersection LOS: A
Intersection Capacity Utilization 47.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	11	19	401	250	1
Future Vol, veh/h	1	11	19	401	250	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	400	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	12	20	422	263	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	726	264	264	0	-	0
Stage 1	264	-	-	-	-	-
Stage 2	462	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	391	775	1300	-	-	-
Stage 1	780	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	385	775	1300	-	-	-
Mov Cap-2 Maneuver	385	-	-	-	-	-
Stage 1	768	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	10.1		0.4		0	
HCM LOS	B					

Minor Lane/Major Mvmt		NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)		1300	-	715	-	-
HCM Lane V/C Ratio		0.015	-	0.018	-	-
HCM Control Delay (s)		7.8	-	10.1	-	-
HCM Lane LOS		A	-	B	-	-
HCM 95th %tile Q(veh)		0	-	0.1	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	11	66	685	21	70
Future Vol, veh/h	132	11	66	685	21	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	139	12	69	721	22	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	151	0	644	76
Stage 1	-	-	-	-	145	-
Stage 2	-	-	-	-	499	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1428	-	405	970
Stage 1	-	-	-	-	867	-
Stage 2	-	-	-	-	575	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1428	-	372	970
Mov Cap-2 Maneuver	-	-	-	-	372	-
Stage 1	-	-	-	-	867	-
Stage 2	-	-	-	-	528	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	372	970	-	-	1428	-
HCM Lane V/C Ratio	0.059	0.076	-	-	0.049	-
HCM Control Delay (s)	15.3	9	-	-	7.7	0.3
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	232	4	1	558	2	1
Future Vol, veh/h	232	4	1	558	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	244	4	1	587	2	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	248	0	542	124
Stage 1	-	-	-	-	246	-
Stage 2	-	-	-	-	296	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1315	-	470	904
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	729	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1315	-	470	904
Mov Cap-2 Maneuver	-	-	-	-	470	-
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	728	-

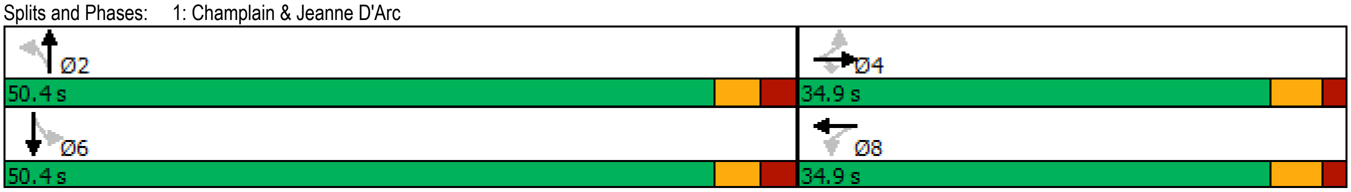
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.5	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	560	-	-	1315	-
HCM Lane V/C Ratio	0.006	-	-	0.001	-
HCM Control Delay (s)	11.5	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	16	153	267	91	105	241	73	2	45
Future Volume (vph)	16	153	267	91	105	241	73	2	45
Lane Group Flow (vph)	17	161	281	96	119	254	268	2	59
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	12.3	12.3	12.3	11.5	12.3	45.1	45.1	45.1	45.1
Actuated g/C Ratio	0.18	0.18	0.18	0.17	0.18	0.67	0.67	0.67	0.67
v/c Ratio	0.08	0.50	0.57	0.52	0.37	0.30	0.24	0.00	0.05
Control Delay	23.2	30.4	8.5	35.9	26.4	6.5	2.3	5.0	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.2	30.4	8.5	35.9	26.4	6.5	2.3	5.0	4.1
LOS	C	C	A	D	C	A	A	A	A
Approach Delay		16.7			30.6		4.3		4.1
Approach LOS		B			C		A		A
Queue Length 50th (m)	1.8	18.4	0.0	11.2	12.7	10.4	2.7	0.1	1.6
Queue Length 95th (m)	6.5	34.2	17.1	24.1	25.7	26.3	11.9	0.8	6.0
Internal Link Dist (m)		76.3			58.8		156.4		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	529	787	792	470	781	847	1101	700	1148
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.20	0.35	0.20	0.15	0.30	0.24	0.00	0.05

Intersection Summary	
Cycle Length: 85.3	
Actuated Cycle Length: 67.8	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 56.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Champlain & Jeanne D'Arc

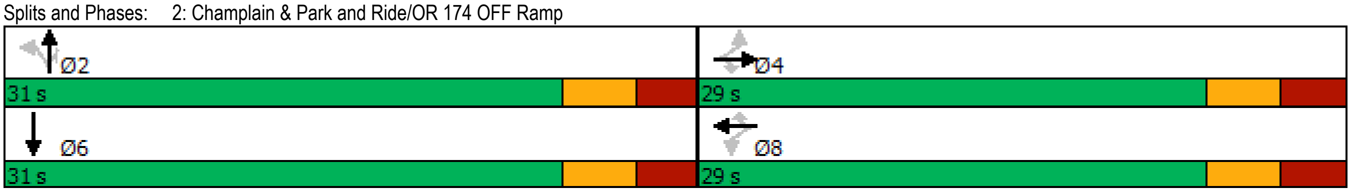


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	30	0	241	143	6	81	36	393	283	413
Future Volume (vph)	30	0	241	143	6	81	36	393	283	413
Lane Group Flow (vph)	0	32	254	0	157	85	38	414	298	443
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		16.5	16.5		16.5	16.5	19.0	19.0	19.0	19.0
Actuated g/C Ratio		0.46	0.46		0.46	0.46	0.53	0.53	0.53	0.53
v/c Ratio		0.06	0.30		0.27	0.12	0.08	0.23	0.33	0.17
Control Delay		9.1	2.8		10.8	3.3	8.9	8.2	2.7	7.6
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		9.1	2.8		10.8	3.3	8.9	8.2	2.7	7.6
LOS		A	A		B	A	A	A	A	A
Approach Delay		3.5			8.2			6.0		7.6
Approach LOS		A			A			A		A
Queue Length 50th (m)		1.1	0.0		6.2	0.0	1.2	7.5	0.0	5.3
Queue Length 95th (m)		5.7	10.0		20.6	5.9	7.0	22.6	11.3	15.5
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		829	1156		907	1082	653	2558	1178	3665
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.04	0.22		0.17	0.08	0.06	0.16	0.25	0.12

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 35.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.33
Intersection Signal Delay: 6.3 — Intersection LOS: A
Intersection Capacity Utilization 47.8% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	25	15	493	402	1
Future Vol, veh/h	2	25	15	493	402	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	400	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	26	16	519	423	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	975	424	424	0	-	0
Stage 1	424	-	-	-	-	-
Stage 2	551	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	279	630	1135	-	-	-
Stage 1	660	-	-	-	-	-
Stage 2	577	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	275	630	1135	-	-	-
Mov Cap-2 Maneuver	275	-	-	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	577	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	11.6		0.2		0
HCM LOS	B				

Minor Lane/Major Mvmt		NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)		1135	-	575	-	-
HCM Lane V/C Ratio		0.014	-	0.049	-	-
HCM Control Delay (s)		8.2	-	11.6	-	-
HCM Lane LOS		A	-	B	-	-
HCM 95th %tile Q(veh)		0	-	0.2	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	384	15	74	333	4	51
Future Vol, veh/h	384	15	74	333	4	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	404	16	78	351	4	54

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	420	0	744	210
Stage 1	-	-	-	-	412	-
Stage 2	-	-	-	-	332	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1136	-	350	796
Stage 1	-	-	-	-	637	-
Stage 2	-	-	-	-	699	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1136	-	320	796
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	637	-
Stage 2	-	-	-	-	640	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	10.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	320	796	-	-	1136	-
HCM Lane V/C Ratio	0.013	0.067	-	-	0.069	-
HCM Control Delay (s)	16.4	9.8	-	-	8.4	0.2
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	434	3	1	356	5	2
Future Vol, veh/h	434	3	1	356	5	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	457	3	1	375	5	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	460	0	649	230
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	190	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1097	-	402	772
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1097	-	402	772
Mov Cap-2 Maneuver	-	-	-	-	402	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	822	-

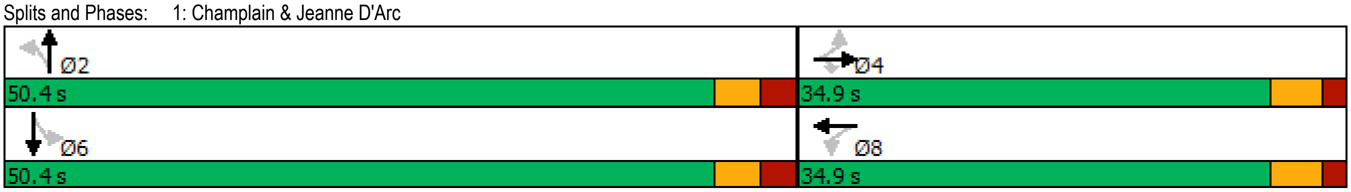
Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	466	-	-	1097	-
HCM Lane V/C Ratio	0.016	-	-	0.001	-
HCM Control Delay (s)	12.8	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	7	78	187	84	231	335	24	2	30
Future Volume (vph)	7	78	187	84	231	335	24	2	30
Lane Group Flow (vph)	7	82	197	88	247	353	85	2	49
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	15.0	15.0	15.0	14.2	15.0	45.2	45.2	45.2	45.2
Actuated g/C Ratio	0.21	0.21	0.21	0.20	0.21	0.64	0.64	0.64	0.64
v/c Ratio	0.04	0.22	0.43	0.36	0.65	0.43	0.08	0.00	0.05
Control Delay	21.6	23.7	6.9	28.1	33.7	9.2	3.0	6.0	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	23.7	6.9	28.1	33.7	9.2	3.0	6.0	4.5
LOS	C	C	A	C	C	A	A	A	A
Approach Delay		12.1			32.2		8.0		4.6
Approach LOS		B			C		A		A
Queue Length 50th (m)	0.7	9.0	0.0	10.1	29.8	19.6	1.0	0.1	1.3
Queue Length 95th (m)	3.6	19.1	14.0	21.5	50.4	46.7	6.5	0.9	5.8
Internal Link Dist (m)		76.3			58.8		156.4		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	338	758	725	504	757	822	1021	795	1081
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.11	0.27	0.17	0.33	0.43	0.08	0.00	0.05

Intersection Summary	
Cycle Length: 85.3	
Actuated Cycle Length: 70.6	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 16.2	Intersection LOS: B
Intersection Capacity Utilization 51.1%	ICU Level of Service A
Analysis Period (min) 15	

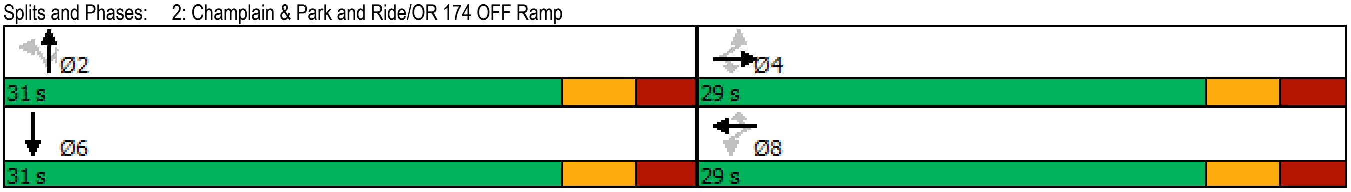
Splits and Phases: 1: Champlain & Jeanne D'Arc



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	25	0	136	137	149	156	189	182	188	360
Future Volume (vph)	25	0	136	137	149	156	189	182	188	360
Lane Group Flow (vph)	0	26	143	0	301	164	199	192	198	431
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		17.4	17.4		17.4	17.4	18.7	18.7	18.7	18.7
Actuated g/C Ratio		0.39	0.39		0.39	0.39	0.42	0.42	0.42	0.42
v/c Ratio		0.07	0.21		0.52	0.24	0.54	0.14	0.27	0.21
Control Delay		10.8	3.4		15.1	3.4	17.1	8.8	3.0	7.8
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		10.8	3.4		15.1	3.4	17.1	8.8	3.0	7.8
LOS		B	A		B	A	B	A	A	A
Approach Delay		4.5			11.0			9.6		7.8
Approach LOS		A			B			A		A
Queue Length 50th (m)		1.2	0.0		16.2	0.0	9.9	4.1	0.0	5.7
Queue Length 95th (m)		5.5	8.2		42.0	8.8	32.0	11.1	9.0	13.7
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		561	962		893	949	564	2180	1012	3090
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.05	0.15		0.34	0.17	0.35	0.09	0.20	0.14

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 44.6	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.54	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 53.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection						
Int Delay, s/veh	1					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	56	17	431	292	22
Future Vol, veh/h	7	56	17	431	292	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	400	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	59	18	454	307	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	809	319	330	0	-	0
Stage 1	319	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	350	722	1229	-	-	-
Stage 1	737	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	345	722	1229	-	-	-
Mov Cap-2 Maneuver	345	-	-	-	-	-
Stage 1	726	-	-	-	-	-
Stage 2	616	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	11.2		0.3		0	
HCM LOS	B					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1229	-	644	-	-
HCM Lane V/C Ratio	0.015	-	0.103	-	-
HCM Control Delay (s)	8	-	11.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	172	11	66	748	21	70
Future Vol, veh/h	172	11	66	748	21	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	181	12	69	787	22	74

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	193	0	719	97
Stage 1	-	-	-	-	187	-
Stage 2	-	-	-	-	532	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1378	-	363	940
Stage 1	-	-	-	-	826	-
Stage 2	-	-	-	-	553	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1378	-	331	940
Mov Cap-2 Maneuver	-	-	-	-	331	-
Stage 1	-	-	-	-	826	-
Stage 2	-	-	-	-	504	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	331	940	-	-	1378	-
HCM Lane V/C Ratio	0.067	0.078	-	-	0.05	-
HCM Control Delay (s)	16.7	9.2	-	-	7.8	0.3
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	266	17	5	597	18	16
Future Vol, veh/h	266	17	5	597	18	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	280	18	5	628	19	17

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	298	0	613	149
Stage 1	-	-	-	-	289	-
Stage 2	-	-	-	-	324	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1260	-	424	871
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	705	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1260	-	421	871
Mov Cap-2 Maneuver	-	-	-	-	421	-
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	701	-

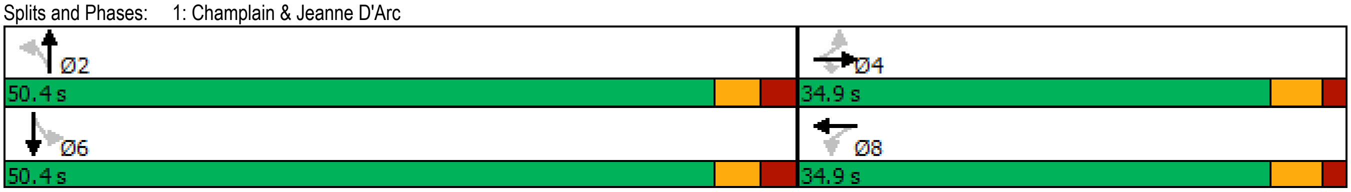
Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	556	-	-	1260	-
HCM Lane V/C Ratio	0.064	-	-	0.004	-
HCM Control Delay (s)	11.9	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	16	165	278	100	118	268	77	2	48
Future Volume (vph)	16	165	278	100	118	268	77	2	48
Lane Group Flow (vph)	17	174	293	105	132	282	294	2	63
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
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)	21.3	21.3	21.3	21.3	21.3	24.4	24.4	24.4	24.4
Total Split (s)	34.9	34.9	34.9	34.9	34.9	50.4	50.4	50.4	50.4
Total Split (%)	40.9%	40.9%	40.9%	40.9%	40.9%	59.1%	59.1%	59.1%	59.1%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
All-Red Time (s)	1.6	1.6	1.6	1.6	1.6	2.4	2.4	2.4	2.4
Lost Time Adjust (s)	0.1	0.1	0.1	0.9	0.1	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.8	5.0	5.4	5.4	5.4	5.4
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Min	Min	Min	Min	Min	Max	Max	Max	Max
Act Effct Green (s)	12.9	12.9	12.9	12.1	12.9	45.1	45.1	45.1	45.1
Actuated g/C Ratio	0.19	0.19	0.19	0.18	0.19	0.66	0.66	0.66	0.66
v/c Ratio	0.08	0.52	0.58	0.57	0.39	0.34	0.27	0.00	0.06
Control Delay	22.9	30.6	8.3	38.5	26.9	7.1	2.4	5.0	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.9	30.6	8.3	38.5	26.9	7.1	2.4	5.0	4.4
LOS	C	C	A	D	C	A	A	A	A
Approach Delay		16.8			32.1		4.7		4.4
Approach LOS		B			C		A		A
Queue Length 50th (m)	1.8	20.1	0.0	12.4	14.4	13.0	3.1	0.1	1.9
Queue Length 95th (m)	6.4	36.5	17.2	26.4	28.1	30.9	12.9	0.8	6.6
Internal Link Dist (m)		76.3			58.8		156.4		90.8
Turn Bay Length (m)	35.0			30.0		35.0		35.0	
Base Capacity (vph)	519	781	794	443	775	837	1098	678	1141
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.22	0.37	0.24	0.17	0.34	0.27	0.00	0.06

Intersection Summary	
Cycle Length: 85.3	
Actuated Cycle Length: 68.4	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 13.8	Intersection LOS: B
Intersection Capacity Utilization 57.1%	ICU Level of Service B
Analysis Period (min) 15	

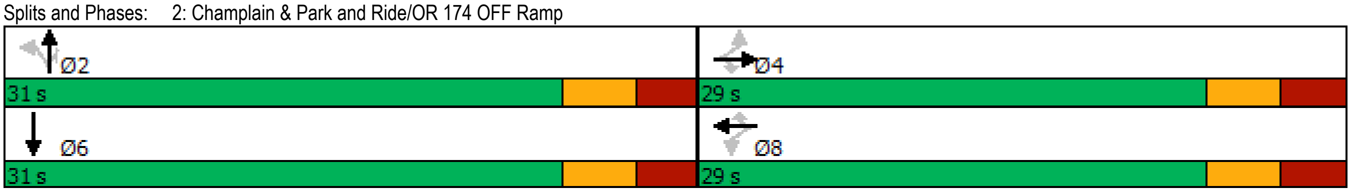
Splits and Phases: 1: Champlain & Jeanne D'Arc



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Configurations										
Traffic Volume (vph)	51	0	413	143	30	87	88	450	283	458
Future Volume (vph)	51	0	413	143	30	87	88	450	283	458
Lane Group Flow (vph)	0	54	435	0	183	92	93	474	298	499
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		4			8			2		6
Permitted Phases	4		4	8		8	2		2	
Detector Phase	4	4	4	8	8	8	2	2	2	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	29.3	29.3	29.3	29.3	29.3	29.3	28.1	28.1	28.1	28.1
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	31.0	31.0	31.0	31.0
Total Split (%)	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%	51.7%	51.7%	51.7%	51.7%
Yellow Time (s)	3.3	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	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		-2.3	-2.3		-2.3	-2.3	-2.1	-2.1	-2.1	-2.1
Total Lost Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)		16.0	16.0		16.0	16.0	17.3	17.3	17.3	17.3
Actuated g/C Ratio		0.38	0.38		0.38	0.38	0.41	0.41	0.41	0.41
v/c Ratio		0.12	0.58		0.37	0.15	0.27	0.34	0.38	0.25
Control Delay		10.4	8.2		12.8	3.6	11.4	9.4	3.1	8.4
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		10.4	8.2		12.8	3.6	11.4	9.4	3.1	8.4
LOS		B	A		B	A	B	A	A	A
Approach Delay		8.4			9.7			7.4		8.4
Approach LOS		A			A			A		A
Queue Length 50th (m)		2.2	7.2		8.1	0.0	3.5	9.5	0.0	6.5
Queue Length 95th (m)		9.2	32.4		26.0	6.7	14.7	25.5	10.9	17.1
Internal Link Dist (m)		104.4			208.1			87.3		39.8
Turn Bay Length (m)			30.0			80.0	40.0			
Base Capacity (vph)		719	1059		822	972	559	2317	1095	3315
Starvation Cap Reductn		0	0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0
Reduced v/c Ratio		0.08	0.41		0.22	0.09	0.17	0.20	0.27	0.15

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 41.7	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 8.2	Intersection LOS: A
Intersection Capacity Utilization 60.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Champlain & Park and Ride/OR 174 OFF Ramp



Intersection						
Int Delay, s/veh	1.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	23	51	18	544	438	10
Future Vol, veh/h	23	51	18	544	438	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	400	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	54	19	573	461	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1078	467	472	0	-	0
Stage 1	467	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	242	596	1090	-	-	-
Stage 1	631	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	238	596	1090	-	-	-
Mov Cap-2 Maneuver	238	-	-	-	-	-
Stage 1	620	-	-	-	-	-
Stage 2	542	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	16		0.3		0	
HCM LOS	C					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1090	-	406	-	-
HCM Lane V/C Ratio	0.017	-	0.192	-	-
HCM Control Delay (s)	8.4	-	16	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.7	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	429	15	74	391	4	51
Future Vol, veh/h	429	15	74	391	4	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	452	16	78	412	4	54

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	468	0	822	234
Stage 1	-	-	-	-	460	-
Stage 2	-	-	-	-	362	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1090	-	312	768
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	675	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1090	-	283	768
Mov Cap-2 Maneuver	-	-	-	-	283	-
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	612	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	283	768	-	-	1090	-
HCM Lane V/C Ratio	0.015	0.07	-	-	0.071	-
HCM Control Delay (s)	17.9	10	-	-	8.6	0.3
HCM Lane LOS	C	B	-	-	A	A
HCM 95th %tile Q(veh)	0	0.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	469	17	13	399	22	9
Future Vol, veh/h	469	17	13	399	22	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	494	18	14	420	23	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	512	0	741	256
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	238	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1050	-	352	743
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1050	-	346	743
Mov Cap-2 Maneuver	-	-	-	-	346	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	766	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	14.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	410	-	-	1050	-
HCM Lane V/C Ratio	0.08	-	-	0.013	-
HCM Control Delay (s)	14.5	-	-	8.5	0.1
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-