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City of Clarence-Rockland

Rockland West Secondary Plan – Phase 2 Report

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

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1.0 Introduction

1.1 Background

The Rockland West Secondary Plan (RWSP) lands were identified for development during the 2006 United Counties of Prescott-Russel (UCPR) Official Plan review. Within the UCPR Official Plan the lands are designated as “Urban Policy Area”. Lands under this designation are intended to absorb a significant portion of population growth within the counties. Within the Official Plan of the Urban Area of the City of Clarence-Rockland (the City) the RWSP lands are designated “Special Study Area”, and are further zoned as “Special Study Area 1 (SSA1)” pursuant to Zoning By-law 2016-10 (note following a slight re-adjustment to the SSA1 boundary a section falls outside the current urban limits and are therefore zoned Rural). For the remainder of the Phase 2 report the RWSP lands will be referred to as SSA1.

Starting with a Notice of Commencement and landowners meeting, the City initiated the Rockland West Secondary Plan in December 2021 to:

- establish a policy framework for the lands;
- to provide the basis for future development; and,
- to ensure the efficient use of the land and infrastructure.

Planning Act and Municipal Class Environmental Assessment (EA) processes are required to implement the Rockland West Secondary Plan.

As part of the Municipal Class EA process, meetings were held with landowners in the RWSP area on December 22nd, 2021, and April 7th, 2022. These meetings provided landowners with an opportunity to provide input on the process and any findings from the supporting studies, which included:

- the market study by Shore-Tanner and Associates;
- environmental screening report by Bowfin Environmental Consulting (now CIMA+); and
- the existing conditions report as part of Phase 1 of the EA process.

Meetings with the landowners informed a boundary change for SSA1 which differed from the “Urban Policy Area” boundary identified in the UCPR Official Plan and the “Special Study Area 1” boundary in the Official Plan of the Urban Area of the City of Clarence-Rockland. The changes resulted in a boundary limit that acknowledged the existing lot fabric, the bottom of the ridge, wooded areas, and the existing and continued use of parcels for agricultural purposes. The boundary change added 13.5 hectares of land to the existing 41.1 ha of land identified as “Special Study Area 1” in the Official Plan of the Urban Area of Clarence-Rockland, for a total land area of approximately 54.6 ha making up the study area, SSA1. The land boundary adopted in the current Official Plan of the Urban Area of the City of Clarence-Rockland is outlined in black in Figure 1 whereas the adjusted SSA1 boundary is outlined in red in Figure 1, the latter is the focus of this report.

Figure 1: Map of the Secondary Plan Lands Original (Black) and Revised (Red) Boundaries

On April 20th, 2022, City staff presented the findings of the various studies and recommended a list of land uses for SSA1. Council approved the boundary change as presented in report "PE2022-074", August 3rd, 2022, and the vision that this area be developed primarily for business park or similar uses.

The Phase 1 Report was prepared to summarize the findings from the first phase of the EA process and was used as a basis for the identification and evaluation of alternative options during Phase 2. The Phase 2 report was prepared to identify a preferred direction for future development within SSA1.

Specifically, the Phase 2 Report has been prepared to address the following key aspects:

- To summarize background information related to the City's water servicing and transportation infrastructure within SSA1 including water demands, growth projections, and build-out planning horizons.
- To identify system constraints associated with the existing potable water storage system and to establish a problem and opportunity statement;
- To identify and evaluate possible alternative solutions to address the problem and opportunity statement in terms of overall feasibility, ability to address the problem, and potential impacts to the surrounding environment;
- To identify preliminary design concepts for the preferred solution;
- To identify environmental impacts and mitigation measures of the preferred solution, and
- Consult with agencies, public and other stakeholders throughout the process.

1.2 Class Environmental Assessment Process

The *Ontario Environmental Assessment Act* (EA Act), enacted in 1976, formally recognizes the Municipal Class Environmental Assessment (Class EA) process and outlines requirements for EA approval. The Municipal Class EA applies to municipal infrastructure projects, including roads, water, and wastewater projects. To ensure that environmental impacts and effects are considered for each project per the EA Act, proponents are required to generally follow the planning process set out in the Municipal Class EA Guidelines, prepared by the Municipal Engineers Association (MEA) (2023) (www.municipalclassea.ca). The Class EA process includes the following stages:

Phase 1: Problem and opportunity identification.

Phase 2: Identification and evaluation of alternative solutions to determine a preferred solution to the problem or opportunity. This Phase also compiles an environmental ‘inventory’, identifies impacts, and outlines mitigation measures.

Phase 3: Identification and evaluation of design concepts for the preferred solution. A detailed evaluation of the environmental effects and mitigation measures will be addressed during this project Phase.

Phase 4: Complete and place Environmental Study Report on Public Record. The Report will document Phases 1 through 3 and summarize the consultation undertaken throughout the planning process and is considered valid for a 10-year period.

Phase 5: Implementation and monitoring.

Since projects may vary in their environmental impact, they are classified in terms of the following schedules:

- Schedule ‘A’ projects usually have minimal environmental effects and generally include normal or emergency operational and maintenance activities. These projects are pre-approved under the Class EA planning process. Projects within this category are subject to Phases 1 and 5.
- Schedule ‘A+’ projects are pre-approved projects similar to Schedule ‘A’, however, the public is to be advised prior to project implementation.
- Schedule ‘B’ projects have potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with affected parties. Generally, these projects include improvements and minor expansions to existing facilities. Projects within this category are subject to Phases 1, 2 and 5.
- Schedule ‘C’ projects have potential for greater environmental impacts and are subject to all five (5) Class EA Phases. Generally, these projects include the construction of new facilities and major expansions to existing facilities.

1.3 Secondary Plan

The Rockland West Secondary Plan is a new Secondary Plan that will be added to Section 8 of the Official Plan of the Urban Area for the City of Clarence-Rockland. It will be a land use planning policy document intended to ensure that future growth occurs in an efficient, orderly, and sustainable manner if adopted by the City of Clarence-Rockland's Council under authority of Section 16 of the Planning Act. The purpose of this Secondary Plan will be to provide area-specific policy direction to guide development within these lands over the next 20 years.

As mentioned previously, the SSA1 was identified as "Urban Policy Area" within the UCPR Official Plan and the City of Clarence-Rockland designated and zoned these lands to "Special Study Area". Note the revised SSA1 boundary is identified in the latest UCPR Official Plan and the new boundary will be reflected as part of the Official Plan Amendment (OPA) to approve this Secondary Plan. The intent of the "Special Study Area" designation is to allow for further study to support the development of a Secondary Plan to provide land use policies and direction. In the interim, existing uses are permitted to continue, but no new uses are permitted as per the City of Clarence-Rockland Zoning By-law 2016-10.

Development applications in the Rockland West Secondary Plan will be required to conform with the policies of this Secondary Plan, as well as the City of Clarence-Rockland Official Plan and the UCPR Official Plan.

1.4 Project Team

The following Project Team was involved in carrying out this Class EA:

Proponent: Cite/City of Clarence-Rockland
1560 Laurier Street
Rockland, Ontario, K4K 1P7
Telephone: (613) 446-6022

Prime Consulting Engineer: J.L. Richards & Associates Limited
343 Preston Street
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Ottawa, Ontario K1S 1N4
Telephone: (613) 725-3571

Sub Consultant: Bowfin Environmental Consulting (now CIMA+)
168 Montreal St.
Cornwall, Ontario K6H 1B3
Telephone: (613) 935-6139

Sub Consultant: Shore-Tanner & Associates
148 Colonnade Road South
Suite 202
Ottawa, Ontario K2E 7R4
Telephone: (613) 224-8484

The City, as the Proponent, retained JLR to undertake the Class EA Secondary Plan component of the project in December 2021 and has actively participated in directing and administering this

Class EA. The City was also responsible for issuing notices to the public and communicating with stakeholder agencies. JLR provided project coordination, undertook technical reviews and investigations, advised/liaised with stakeholders, prepared the Phase 1 and Phase 2 Reports, prepared the Secondary Plan and related Official Plan Amendment, chaired project meetings, and organized and attended the Public Information Centre (PIC).

1.5 Methodology

Phase 1 of this Class EA involved the evaluation of existing watermains, sanitary sewers, stormwater infrastructure, and transportation and transit networks in the vicinity of SSA1, and the establishment and initial evaluation of land-use solutions for SSA1. A Problem/Opportunity Statement was generated to serve as the basis for Phase 2. The Phase 1 Report is attached in Appendix A.

Phase 2 of this Class EA evaluates alternatives to determine a preferred servicing solution to address the Problem/Opportunity Statement identified in Phase 1. Transportation simulations were developed to estimate the projected traffic conditions in SSA1 following development and hydraulic modelling was used to simulate the impact of each alternative servicing solution on the distribution system. Section 2.0 summarizes Phase 2 activities completed.

1.6 Phase 2 Problem and Opportunity Statement

The following Problem / Opportunity Statement has been used as the basis for proceeding to Phase 2 of this Class EA:

The Secondary Plan will follow the Municipal Class Environmental Assessment (EA) and Planning Act process to establish a coordinated planning solution for development of this area. An amended Secondary Plan could present economic opportunities for the city and its residents through the establishment of acceptable land use designations leading to an increase in business and commerce in the region. In developing the Secondary Plan, there is an opportunity to consider impacts to neighboring properties, impacts to natural and social environment, climate change, and growth opportunities.

2.0 Phase 2 – Identification and Evaluation of Alternative Solutions

The main objective of Phase 2 of the Class EA was to identify and evaluate possible alternative solutions to the Problem/Opportunity Statement identified in Phase 1. All reasonable potential solutions to the problem, including the ‘Do Nothing’ option, were considered. Class EAs for water distribution system projects generally result in the identification and review of a broad range of solutions. It should be noted that the objective of Phase 2 was to focus on determining an overall “generalized solution” to the problem and not necessarily all of the intricate details which are typically further explored and developed during Phase 5 of a Schedule ‘B’ Class EA, referred to as Implementation (i.e., preliminary and detailed design stage). The following sections describe the evaluation and selection methodology for reviewing alternative solutions, the identification and review of alternatives solutions, and the identification of a preferred servicing solution.

2.1 Evaluation and Selection Methodology

To facilitate the evaluation and selection of the preferred solutions during Phase 2, a transparent and logical three-part assessment process was established. This process included:

1. Initial screening of alternative solutions;
2. Detailed evaluation of screened alternatives; and
3. Selection of a preferred alternative.

The first evaluation stage was conducted as part of Phase 1 activities and considered the overall feasibility of the potential solutions and identified those alternatives that fully address the Problem/Opportunity Statement. This step prevents unrealistic alternatives from being carried forward to the detailed evaluation stage.

Based on the initial screening process, a detailed assessment of the shortlisted alternatives was conducted. Evaluation criteria were developed based on a review of the background information, experience on similar assessments and in consultation with City staff. The evaluation was conducted using criterion in the following four major criteria categories:

- Natural and Cultural Environment;
- Engineering and Technical Considerations;
- Social and Community Well Being; and
- Economic Environment.

Each criterion was assigned a colour to reflect its level of impact relative to other criteria. The relative level of impact for each criterion for each potential solution was then assessed based on the colour weighting system summarized in Table 1. The option that has the least negative impact or has the strongest positive impact was recommended as the preferred solution and presented to stakeholders to solicit input before finalizing.

Table 1: Detailed Evaluation Impact Level and Colouring System

Impact Level	Colour	Relative Impact
Strong Positive Impact	Green	Preferred
Minor Impact	Yellow	Less Preferred
Strong Negative Impact	Red	Least Preferred

2.2 Initial Screening of Alternatives

The general solutions that were considered for initial screening were concept options 1 to 4, as can be seen in **Figure 2** , Figure 3, and Figure 4 below, and the option to 'Do Nothing' (per the MEA Class EA Guidelines). The statistics for options 1 to 4 are summarized in Table 2 below.

Table 2: Statistics for Concept Options 1-4

Land Use	Option 1	Option 2	Option 3	Option 4 'Do Nothing'
Overall Area (ha)	54.6	54.6	54.6	54.6
Bunsiness Park (ha)	16.3	32.8	46.7	0
Service Commercial (ha)	14.3	0	1.4	0
Commercial Core (ha)	15.9	13.7	0	0
Future Development Overlay (ha)	0	8.1	0	0
Medium Density Residential (ha)	4.0	0	6.5	0

Land Use	Option 1	Option 2	Option 3	Option 4 'Do Nothing'
High Density Residential (ha)	4.1	0	0	0
Special Study Area (ha)	0	0	0	54.6

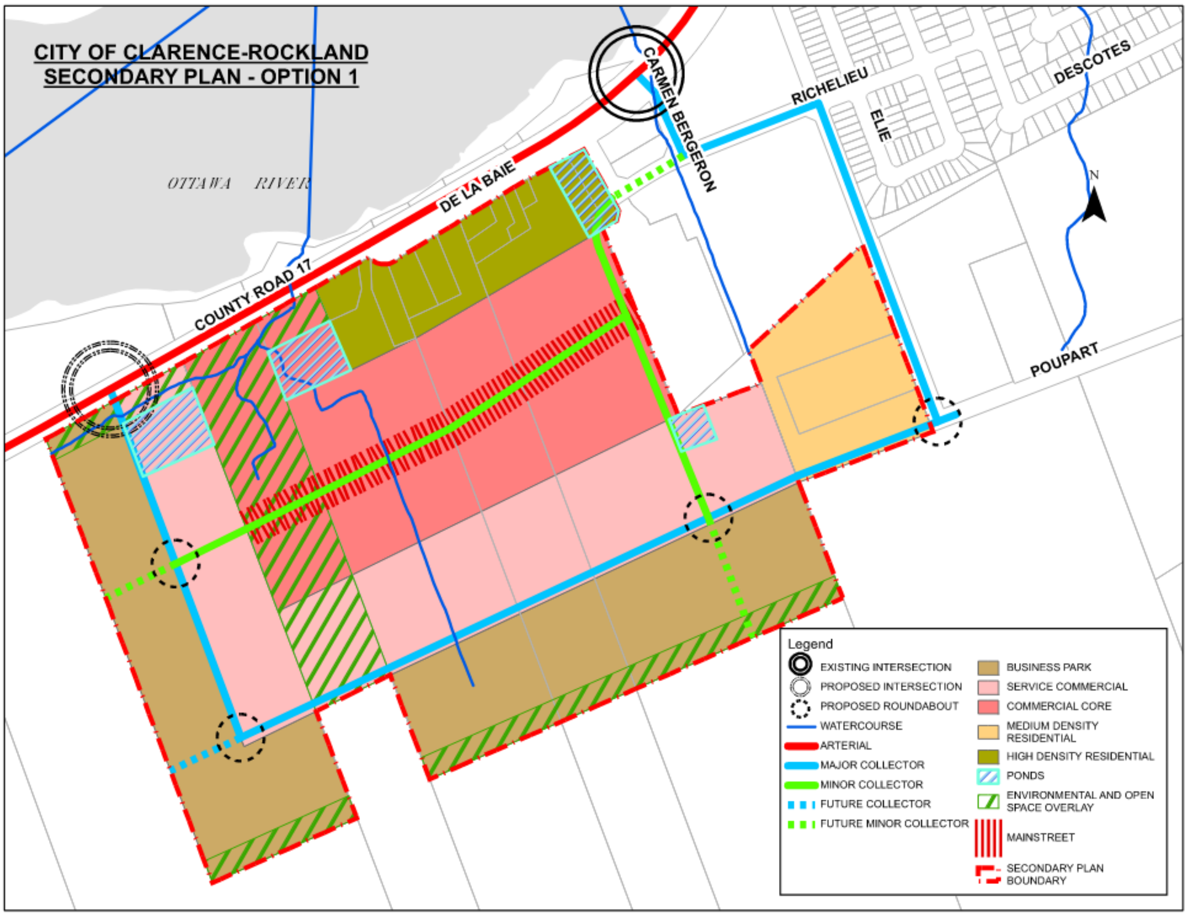

Figure 2: Rocklands Secondary Plan Land-use Concept Option 1

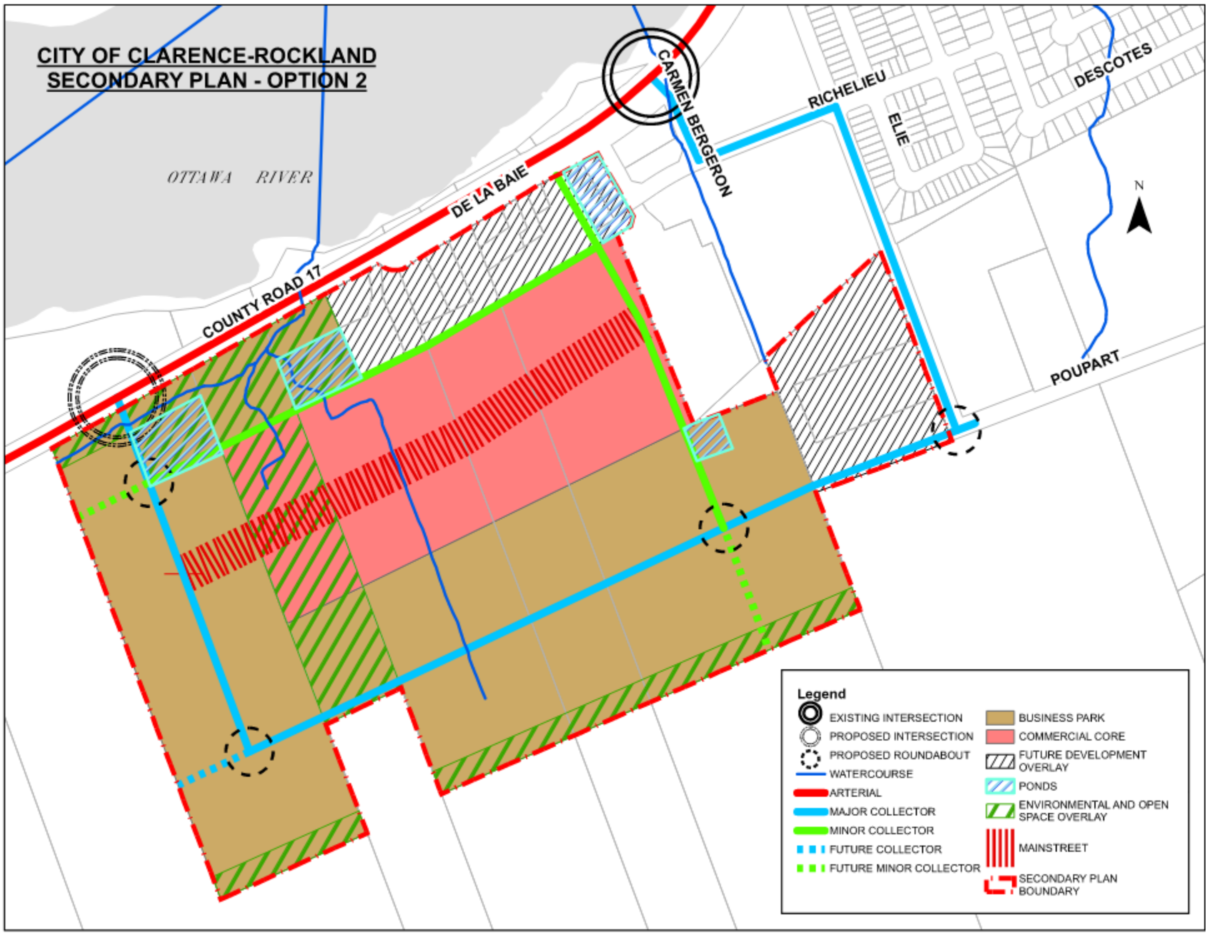

Figure 3: Rocklands Secondary Plan Land-use Concept Option 2

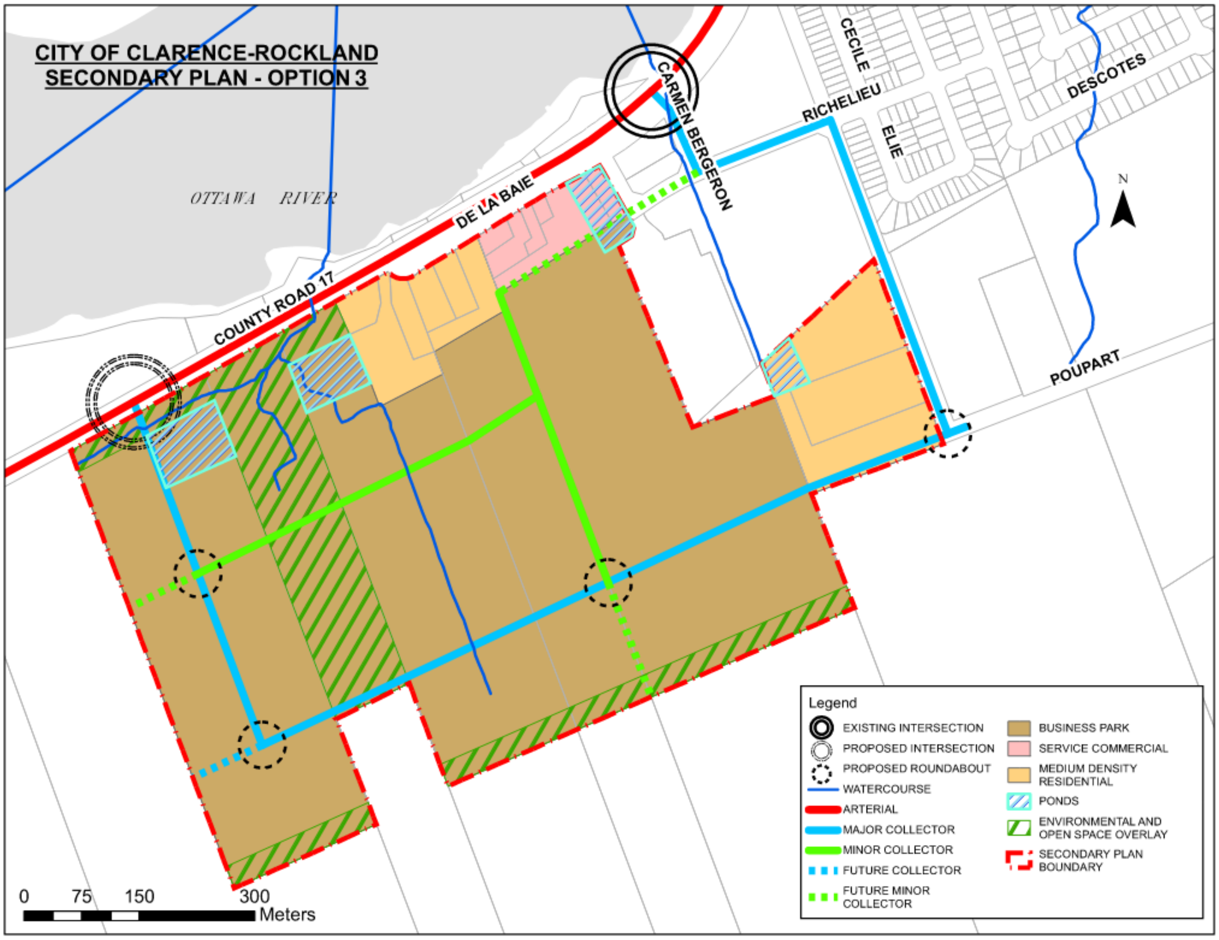

Figure 4: Rocklands Secondary Plan Land-use Concept Option 3

2.2.1 Summary of Phase 1 Findings

The Secondary Plan Phase 1 report (Appendix A) evaluated the four concept options to shortlist the alternative solutions as per the evaluation criteria described in Section 2.1. From this analysis, concept options 1 and 3 were selected to proceed to the detailed analysis stage. These concept options were selected as they most align with the objectives of the Secondary Plan, address gaps outlined in the Market Study, and align with the vision of City Council. The shortlisted options would increase the amount of business park and commercial space available in Clarence-Rockland which are land-uses with high-demand in the region and would provide opportunities for medium to high density residential development.

The detailed analysis phase consisted of developing and comparing high-level transportation, water, sanitary, and stormwater servicing solutions. The analyses were supported by the existing conditions review completed in Phase 1. From the detailed analysis, a single preferred solution was recommended as the suggested land-use breakdown for SSA1.

Each servicing solution carried forward for detailed evaluation was reviewed in terms of its impact on the natural and cultural environment, engineering and technical considerations, social and community well-being, and economic environment in accordance with the evaluation methodology described in Section 2.1. Modelling of each servicing solution was undertaken for the existing and future demand scenarios.

3.0 Transportation

3.1 Context

The following studies and plans were consulted to understand the context of this transportation study:

- Expansion Lands Secondary Plan Transportation Impact Assessment, June 2019 prepared by CIMA+
- Morris/Rockland Transportation Impact Study, December 2018 prepared by Castleglenn Consultants Inc.
- St-Jean Street – Montée Poupart Side Road Municipal Environmental Assessment (Draft Report), March 2024 prepared by Castleglenn Consultants Inc.
- Multi-Modal Transportation Master Plan – The City of Clarence-Rockland (Draft Final Report), June 2019 prepared by Stantec
- Environmental Study Report – Ottawa Road 174/County Road 17 Environmental Assessment Study, June 2016 prepared by AECOM

3.2 Horizon Years and Analysis Scenarios

For the purpose of this assessment, the following development timeline was assumed for the preferred concept plan:

- 2025 – construction start year
- 2045 – estimated build-out, 20 years from the construction start year
- 2055 – 10 years beyond build-out

Therefore, the following scenarios will be analyzed for the study area intersections:

- 2023 existing traffic conditions
- 2024 background traffic conditions (i.e. background traffic at the time of the study)
- 2045 background traffic conditions (i.e. background traffic at build-out)
- 2045 total traffic conditions (i.e. background traffic + new trips at build-out)
- 2055 background traffic conditions (i.e. background traffic at build-out plus 10 years)
- 2055 total traffic conditions (i.e. background traffic + new trips at build-out plus 10 years)

3.3 Traffic Volumes

Detailed turning movement counts (TMCs) were collected between June 15th and June 23rd, 2021, and are provided in Appendix B.

It should be noted that at the time of data collection the province had just moved to the first stage of the Ontario three-staged COVID-19 reopening plan prior to field observations. While the province still encouraged working from home as much as possible, the first stage allowed for non-essential retail operations to open. Therefore, it should be understood that the TMCs conducted between June 15th and June 23rd, 2021 do not represent a sample of typical conditions. Based on this, a pandemic projection factor of 50% was used to conservatively project the traffic volumes for typical conditions. This factor was based on 2023 traffic counts on County Road 17 provided by the UCPR. To determine the 2023 existing traffic volumes, the projection factor was applied to all of the turning movements in the study area. The following Figure 5 depicts the weekday morning and afternoon peak hour vehicular movements at SSA1 intersections.

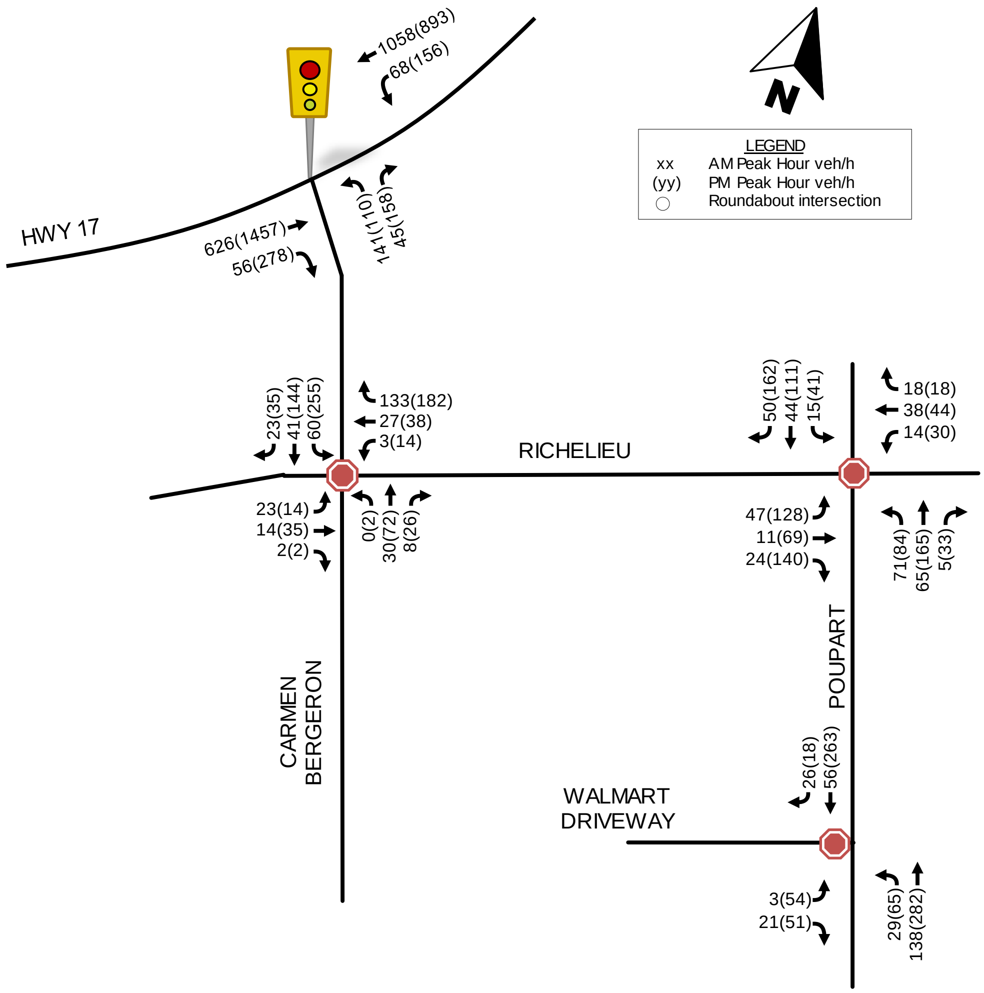

Figure 5: Existing 2023 Vehicular Volumes AM(PM)

3.4 Intersection Capacity Analysis – Existing Conditions

Using the intersection capacity analysis software Synchro (v11), SSA1 intersections were assessed in terms of vehicle delay (seconds), 95th percentile queues (meters), a volume-to-capacity ratio (V/C ratio) and a corresponding Level of Service (LOS). It should be noted that the overall performance of a signalized intersection is calculated as a weighted V/C ratio and assigned a corresponding LOS, and individual vehicular movements are assigned a LOS based on their respective V/C ratio. The overall performance of an unsignalized intersection is a ratio output from Synchro which is based on the Highway Capacity Manual Intersection Capacity

Utilization (ICU) method and is assigned a corresponding LOS. The LOS of individual vehicular movements at unsignalized intersections are also assigned a LOS based on their respective V/C ratio.

The following Table 3 summarizes existing conditions at SSA1 intersections, in the absence of any development. Detailed Synchro output data for existing conditions is provided in Appendix C.

Table 3: Study Area Intersection Operations – Existing 2023 Conditions

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	1 T	-	0.65	17.2	B	134	1.84	404.3	F	#611.1
EBR	1 R	80	0.07	3.0	A	6	0.38	8.6	A	40
WBL	1 L	125	0.18	5.3	A	9	0.69	33.2	B	42
WBT	1 T	-	0.91	23.9	E	#297.1	0.84	18.1	D	#262.7
NBL	1 L	-	0.55	43.4	A	48	0.58	48.9	A	41
NBR	1 R	-	0.17	12.1	A	10	0.52	11.6	A	18
Overall			**0.79**	**21.7**	**C**	**-**	**1.66**	**203.2**	**F**	**-**
Carmen Bergeron/Richelieu - Unsignalized										
EBL	1 L	-	0.04	7.6	A	1	0.03	9.1	A	1
EB	1 T/R	-	0.02	7.0	A	1	0.07	8.9	A	2
WBL	1 L	-	0.00	7.4	A	0	0.03	8.8	A	1
WB	1 T/R	-	0.21	7.4	A	6	0.39	11.0	A	14
NB	1 T/L &1 T/R	-	0.03	7.0	A	1	0.11	8.3	A	3
SB	1 T/L	-	0.16	8.2	A	1	0.73	21.8	C	47
SBR	1 R	-	0.03	6.3	A	1	0.05	7.0	A	2
Overall			**0.36**	**7.5**	**A**	**-**	**0.54**	**15.7**	**A**	**-**
Poupart/Richelieu - Unsignalized										
EBL	1 L	20	0.08	8.0	A	2	0.28	11.8	A	8
EB	1 T/R	-	0.05	6.8	A	2	0.40	12.1	A	14
WB	1 L/T/R	-	0.10	8.1	A	2	0.19	11.4	A	5
NB	1 L/T/R	-	0.19	8.6	A	5	0.52	15.3	A	22
SB	1 L/T/R	-	0.14	7.9	A	4	0.55	15.4	A	25
Overall			**0.32**	**8.1**	**A**	**-**	**0.64**	**13.9**	**B**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	8.9	A	1	0.25	15.1	A	8
NB	1 T/L	-	0.02	1.4	A	1	0.06	2.0	A	2
SB	1 T/R	-	0.05	0.0	A	0	0.18	0.0	A	0

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Overall			**0.26**	**1.7**	**A**	**-**	**0.56**	**3.1**	**A**	**-**

As shown in Table 3, SSA1 existing intersections are currently operating with an overall LOS 'C' or better during weekday morning and afternoon peak hours, with the exception of the Carmen Bergeron/County Road 17 intersection, which is currently operating over capacity with an overall LOS 'F' during the afternoon peak hour.

With regard to 'critical' movements (i.e., the worst performing movement at each intersection per peak period), they are operating with a LOS 'D' or better during both peak hours with the exception of the eastbound through movement at the Carmen Bergeron/County Road 17 intersection, operating with a LOS 'F' during the afternoon peak hour.

In terms of 95th percentile queues, existing storage capacity is not exceeded.

<u>Planned Transportation Network Improvements</u>

A summary of the previously planned transportation network improvements as outlined in the aforementioned plans and studies associated with SSA1 (Section 3.1) can be seen in Table 4. It is assumed that these planned improvements would be completed by the build-out year, 2045. As such, the roadway network with the following improvements have been applied in all future background and total analysis for the horizon years 2045 and 2055. This is consistent with other Transportation Impact Study (TIS) reports for the developments identified in Table 5.

Table 4: Planned Transportation Network Improvements

ID	Intersection Improvements	Source
Carmen Bergeron/County Road 17		
CTR-1	Widening of County Road 17 from two to four lanes (two per direction) on both sides of the road within Rockland	Ottawa Road 174/County Road 17 Environmental Study Report – AECOM 2016
Carmen Bergeron/Richelieu		
CTR-2	Upgrade existing stop-controlled intersection with a signalized intersection.	Stantec MMTMP 2019
Poupart/Richelieu		
CTR-3	Upgrade existing stop-controlled intersection with a signalized intersection.	Stantec MMTMP 2019
CTR-4	Widening of Poupart Road between Richelieu Street and St. Jean Street from two lanes to four lanes	Castleglenn 2018 - Morris Village Development TIS
Poupart/Walmart Driveway		
CTR-4	Widening of Poupart Road between Richelieu Street and St. Jean Street from two lanes to four lanes	Castleglenn 2018 - Morris Village Development TIS
Poupart Extension/County Road 17		

CTR-5	Roadway extension west of Poupart Road to connect with County Road 17	Castleglenn 2018 - Morris Village Development TIS

With regards to CTR-5, the roadway extension at County Road 17 is designated as ‘Street 1’ in this study. Note that the new Street 1/County Road 17 intersection design was proposed as a signalized intersection. It is assumed that the Street 1/County Road 17 intersection would consist of two through lanes with auxiliary turning lanes in the eastbound and westbound approaches, similar to the future lane configuration for the Carmen Bergeron/County Road 17. The northbound approach will consist of a single left-turn lane and right-turn lane. However, alignment and design are to be confirmed at the detailed design stage of County Road 17 widening.

Figure 6 depicts the locations for the planned transportation network improvements.

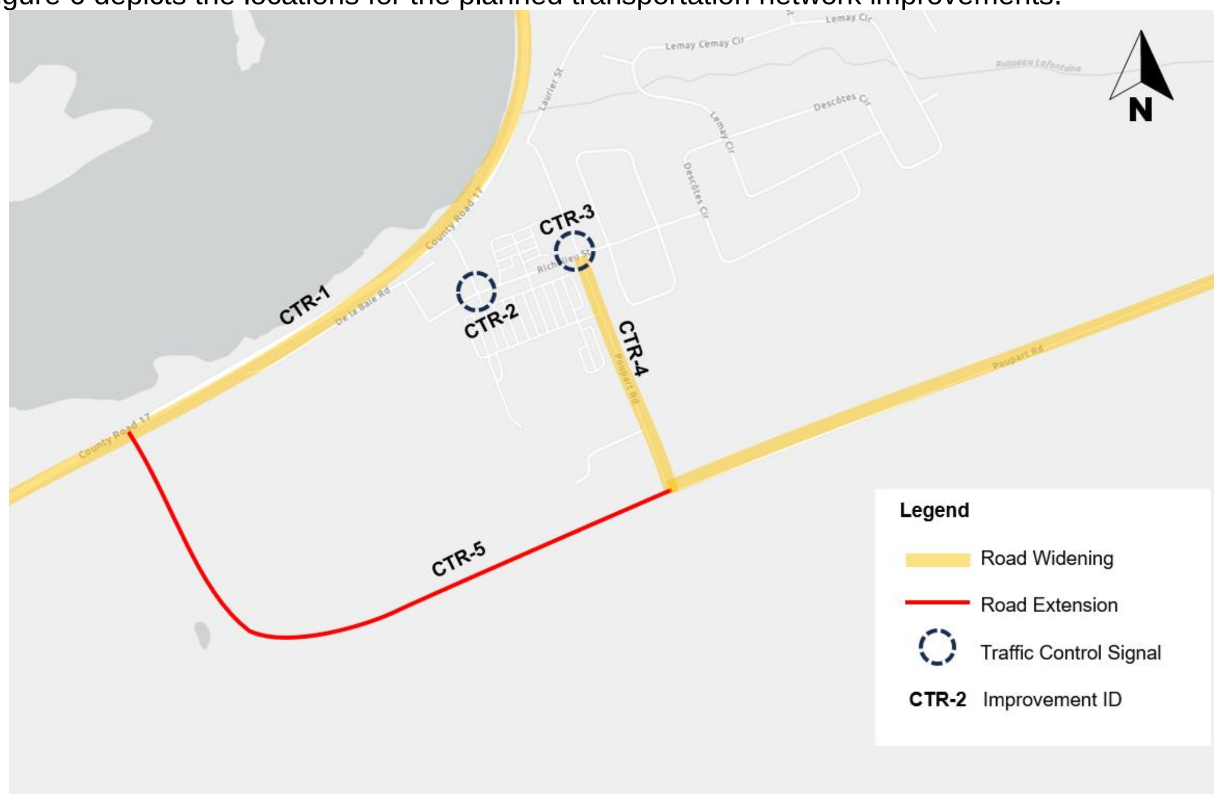

Figure 6: Location of Planned Transportation Network Improvements

3.5 Background Network Travel Demands

<u>General Background Growth</u>

To be consistent with previous studies within the study area, and based on consultation with UCPR staff, a 2% per annum growth rate was applied to County Road 17 to capture projected impacts of background traffic. The growth rate was applied to the County Road 17 eastbound and westbound through movements only. The resulting general background growth volumes for 2045 and 2055 are shown in Figure 7 and Figure 8.

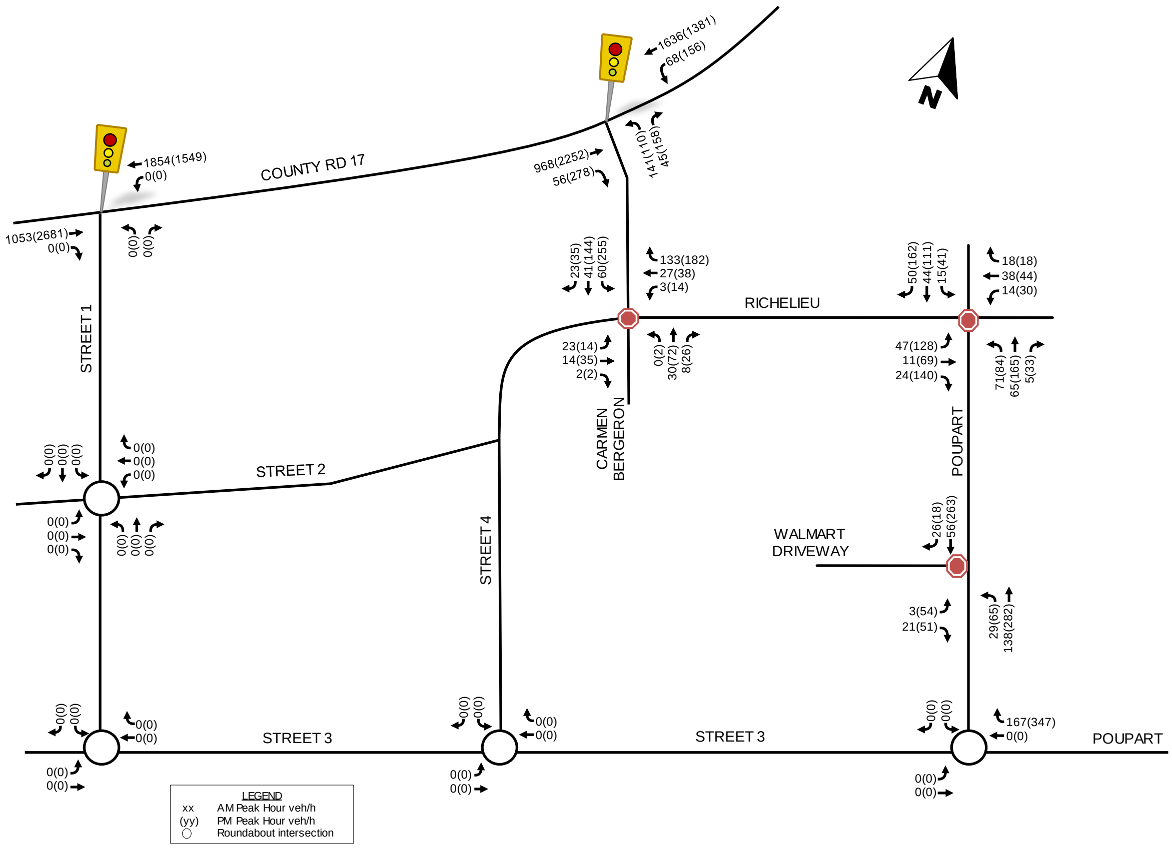

Figure 7: 2045 County Road 17 Background Growth

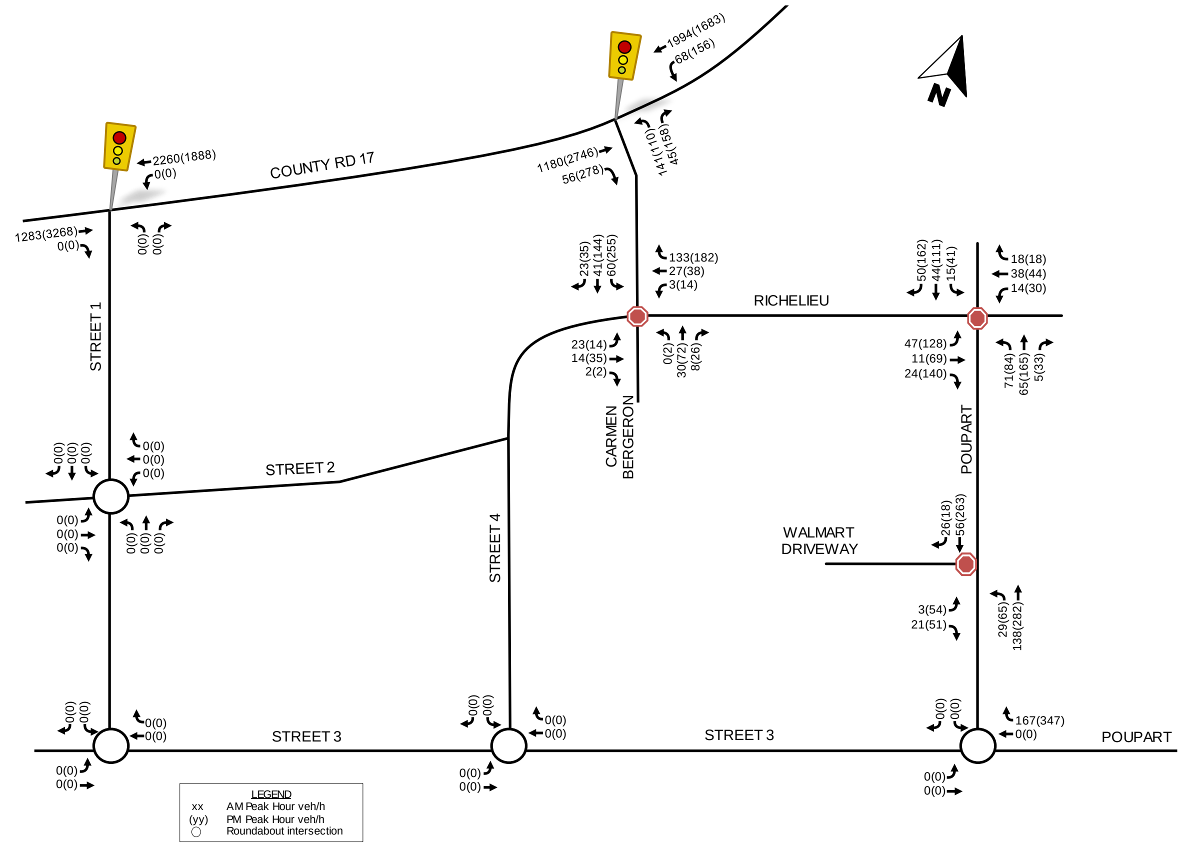

Figure 8: 2055 County Road 17 Background Growth

Other Planned Developments

In addition to the general background growth, planned and on-going developments within and surrounding the SSA1 were identified, Table 5 outlines the available information for each development. It has been assumed that all the developments in Table 5 will be constructed by the horizon year, 2045, for the purposes of estimating future traffic volumes.

Table 5: Other Planned Developments Summary

Development	Type	Area	Development Projection
Morris Other Planned Developments	Residential	430 ha	Short Term: 2023 to 2028 Medium Term: 2028 to 2038 Ultimate build-out: Undefined
Secondary Plan Lands	Residential Commercial Institutional	137.23 ha	Phase 1: 2029 Phase 2: 2039 Full build-out: 2044

The location of the planned and ongoing developments within and surrounding SSA1 are shown in Figure 9.

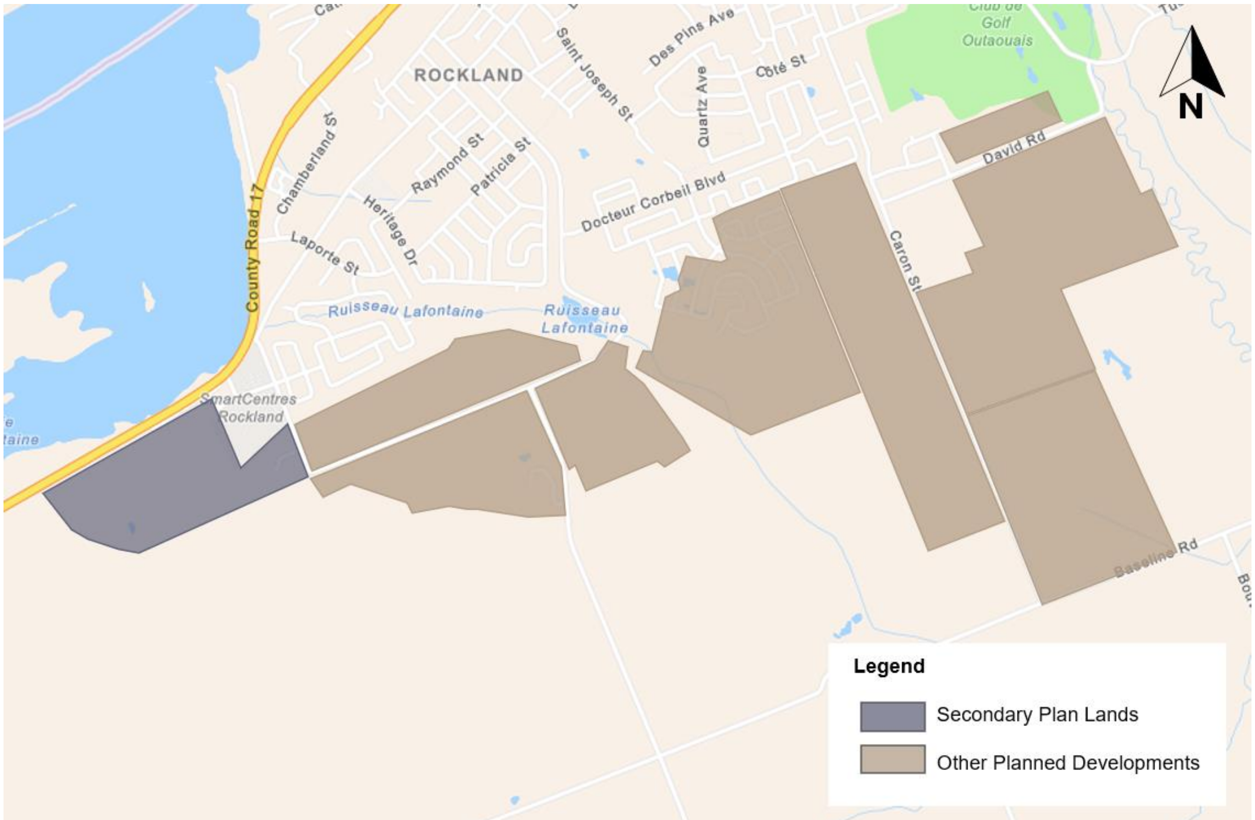

Figure 9: Planned and On-going Developments

The trips generated from the developments listed in Table 5 were extracted from their respective Transportation Impact Assessment reports and are included in the background traffic volumes for each horizon. Figure 10 illustrates the traffic volumes associated from these two planned developments.

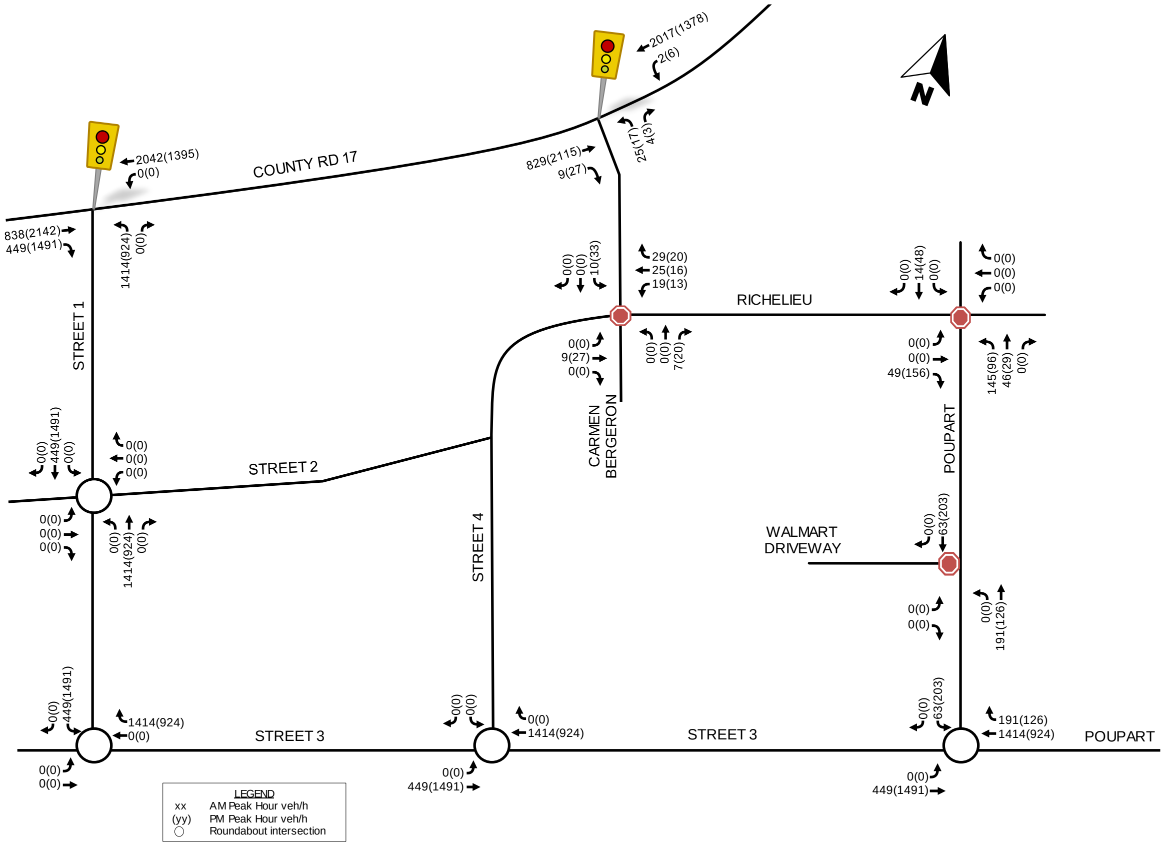

Figure 10: Other Planned Developments - Traffic Volumes

In the absence of any new or background developments and a 2% background traffic growth rate on County Road 17, the following Figure 11 depicts the projected background traffic volumes for the 2024 horizon year.

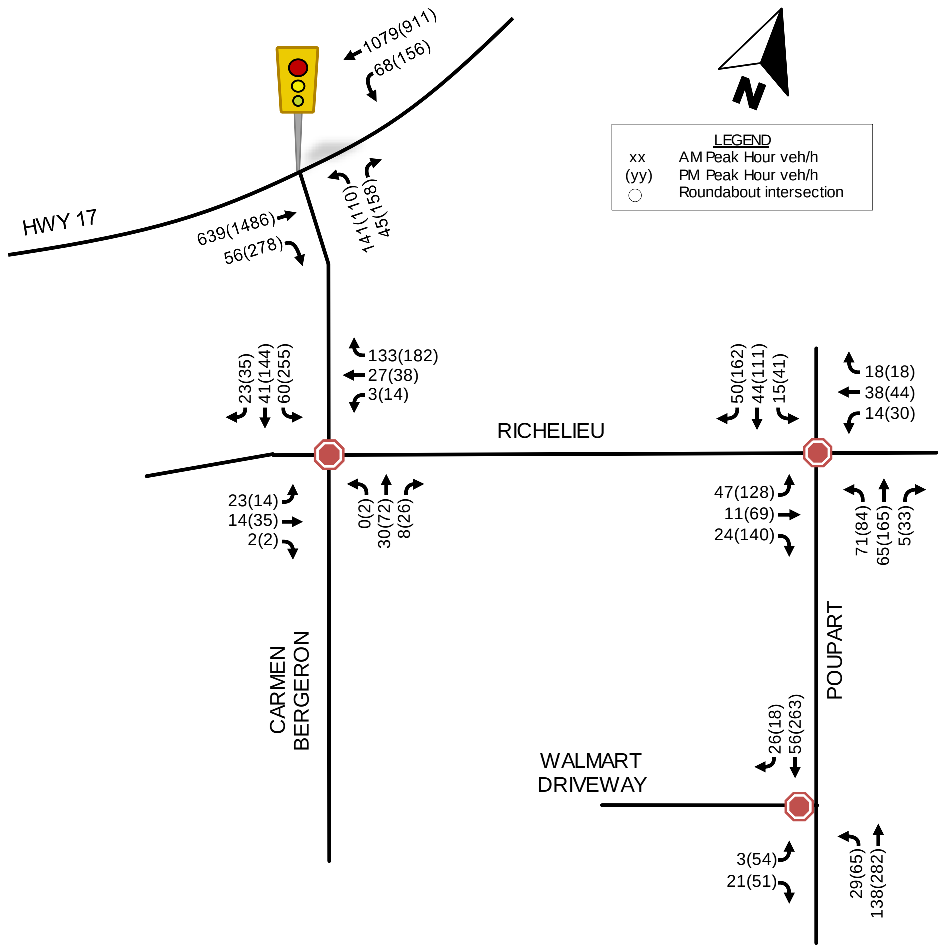

Figure 11: 2024 County Road 17 Background Traffic Volumes

In the absence of new developments for the Secondary Plan Lands, the following Figure 12 presents the background volumes for the horizon year of 2045, which were derived by superimposing 2045 County Road 17 general background traffic volumes onto traffic volumes from other planned developments (i.e. summing together volumes depicted in Figure 7 and Figure 10, resulting in Figure 12).

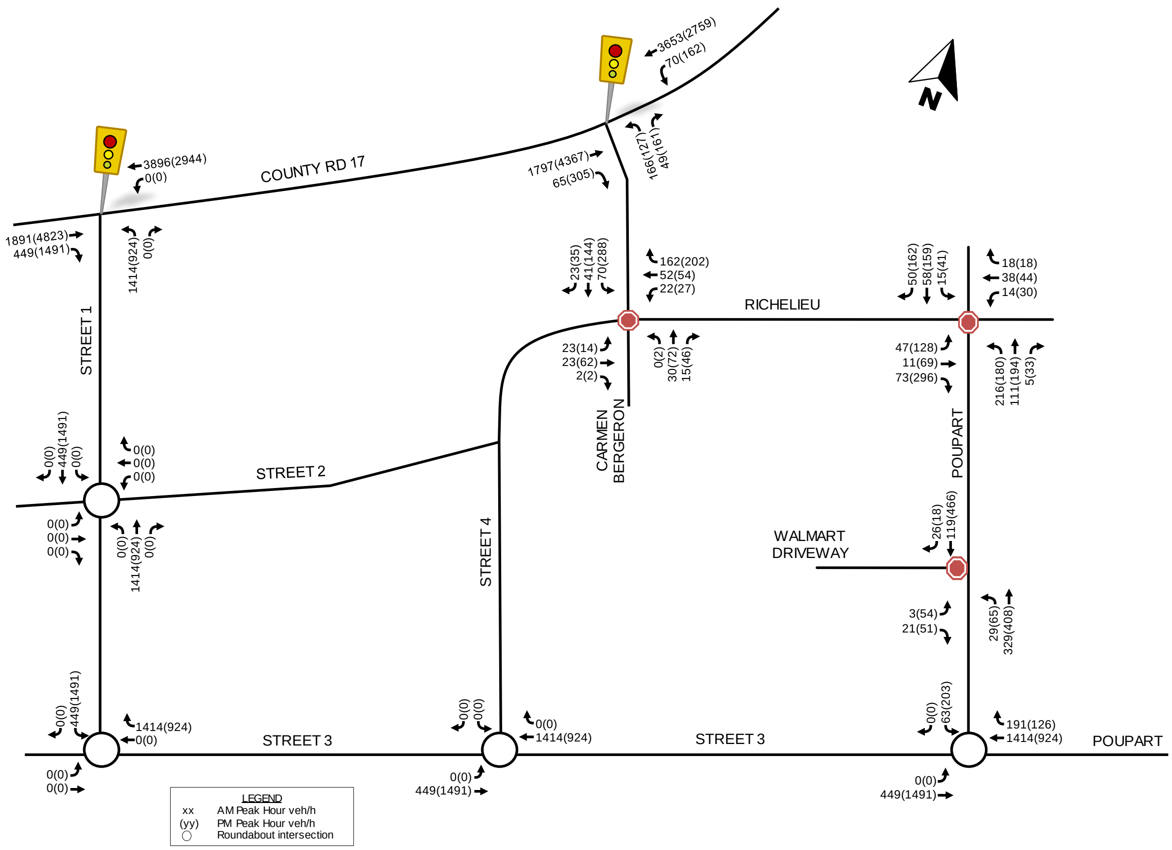

Figure 12: 2045 County Road 17 Background Plus Planned Developments Traffic Volumes

In the absence of new developments for the Secondary Plan Lands, the following Figure 13 presents the background volumes for the horizon year of 2055, which were derived by superimposing 2055 general background traffic volumes on County Road 17 onto traffic volumes from other planned developments (i.e. summing together volumes depicted in Figure 8 and Figure 10, resulting in Figure 13).

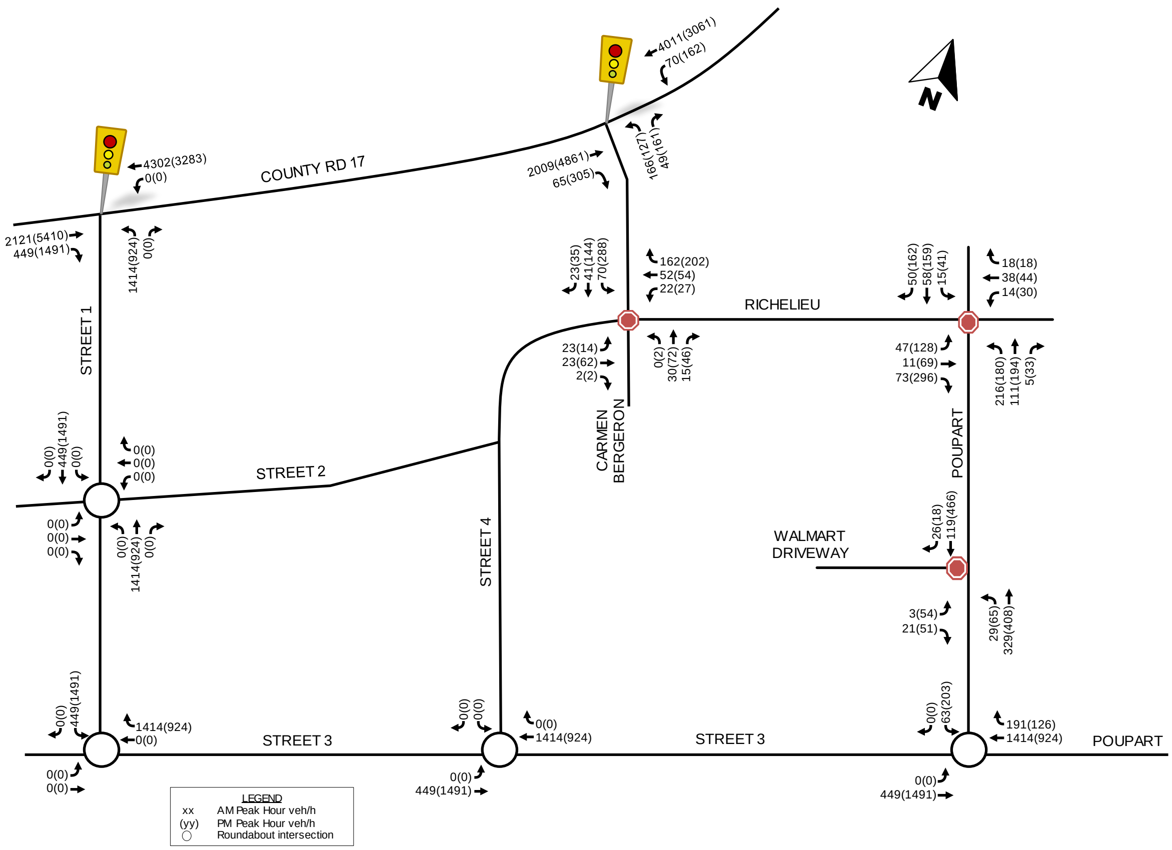

Figure 13: 2055 County Road 17 Background Plus Planned Developments Traffic Volumes

The following Table 6 summarizes the projected background traffic volumes on County Road 17, in the absence of new development from the Rockland West Secondary Plan for each horizon year.

Table 6: Projected County Road 17 Background Plus Planned Developments Traffic Growth

Approach Leg of Intersection	2024		2045		2055	
	AM	PM	AM	PM	AM	PM
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal						
EB	695	1764	1862	4672	2074	5166
WB	1147	1067	3723	2921	4081	3223
Street 1/County Road 17 - Actuated-Uncoordinated Signal						
EB	695(1)	1769(1)	1882	4796	2112	5383
WB	1223(1)	1022(1)	3871	2927	4277	3266

Notes:
(1) Traffic volumes at Street 1/County Road 17 in the 2024 horizon year represent only the through traffic on that portion of County Road 17 given that Street 1 is yet to be constructed.

As shown in Table 6, with no site-generated traffic from the SSA1, the background traffic on County Road 17 between Carmen Bergeron and future Street 1 is projected to grow by approximately 1000 to 3000 veh/h during the morning peak hour and approximately 2000 to 3000 veh/h during the afternoon peak hour from 2024 to 2045. Between 2045 and 2055, the background traffic is expected to grow by approximately 200 to 400 veh/h during the morning peak hour and approximately to 300 to 600 veh/h during the afternoon peak hour.

It should be noted that County Road 17 would experience a significant increase in traffic volumes by 2045 as a result of other area developments and general background growth. Beyond 2045, background traffic is expected to grow moderately.

Background 2024 Operational Analysis

Table 7 summarizes intersection operations for the 2024 horizon year with the addition of 2024 background traffic volumes only (**Error! Reference source not found.**). This future background s cenario assumes no intersection or network improvements for comparison purposes. Detailed Synchro output data for background conditions is provided in Appendix C.

Table 7: Study Area Intersection Operations - 2024 Background Conditions

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	1 T	-	0.65	17.0	B	139	1.88	420.4	F	#624.9
EBR	1 R	80	0.07	3.0	A	6	0.38	8.8	A	41
WBL	1 L	125	0.18	5.2	A	9	0.69	33.2	B	42
WBT	1 T	-	0.92	24.5	E	#306.7	0.86	19.3	D	#272.2
NBL	1 L	-	0.56	44.9	A	48	0.58	48.9	A	41
NBR	1 R	-	0.17	12.1	A	10	0.52	11.6	A	18
Overall			**0.80**	**22.0**	**C**	**-**	**1.69**	**212.1**	**F**	**-**
Carmen Bergeron/Richelieu - Unsignalized										
EBL	1 L	-	0.04	7.6	A	1	0.03	9.1	A	0
EB	1 T/R	-	0.02	6.9	A	1	0.07	8.9	A	1
WBL	1 L	-	0.00	7.3	A	0	0.03	8.9	A	2
WBT	1 T/R	-	0.21	7.4	A	6	0.39	11.0	A	3
NB	1 T/L & 1 T/R	-	0.03	7.0	A	1	0.11	8.3	A	1
SB	1 T/L	-	0.16	8.2	A	5	0.73	21.8	C	5
SBR	1 R	-	0.03	6.3	A	1	0.05	7.0	A	0
Overall			**0.36**	**7.5**	**A**	**-**	**0.54**	**15.7**	**A**	**-**
Poupart/Richelieu - Unsignalized										

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
EBL	1 L	20	0.08	8.0	A	2	0.28	11.8	A	8
EB	1 T/R	-	0.05	6.8	A	2	0.40	12.1	A	14
WB	1 L/T/R	-	0.10	8.1	A	2	0.19	11.4	A	5
NB	1 L/T/R	-	0.19	8.6	A	5	0.52	15.3	A	22
SB	1 L/T/R	-	0.14	7.9	A	4	0.55	15.4	A	25
Overall			**0.32**	**8.1**	**A**	**-**	**0.64**	**13.9**	**B**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	8.9	A	1	0.25	15.1	A	8
NB	1 T/L	-	0.02	1.4	A	1	0.06	2.0	A	2
SB	1 T/R	-	0.05	0.0	A	0	0.18	0.0	A	0
Overall			**0.26**	**1.7**	**A**	**-**	**0.56**	**3.1**	**A**	**-**

As shown in Table 7, assuming no transportation network improvements for the 2024 horizon year, study area intersections are projected to continue operating with an overall LOS ‘C’ or better during the weekday morning and afternoon peak hours, with the exception of the Carmen Bergeron/County Road 17 intersection, which is projected to operate over capacity with an overall LOS ‘F’ during the afternoon peak hour.

With regard to ‘critical’ movements, they are projected to operate with an LOS ‘D’ or better during both peak hours with the exception of the eastbound through movement of the Carmen Bergeron/County Road 17 intersection, which is projected to operate over capacity with an LOS ‘F’ during the afternoon peak hour, similar to existing conditions.

In terms of 95th percentile queues, the existing storage capacity is not exceeded.

Background 2045 Operational Analysis

Table 8 summarizes intersection operations for the 2045 horizon year with the addition of 2045 County Road 17 background plus planned developments’ traffic volumes only (**Error! Reference source not found.**). This future background scenario assumes that the previously planned transportation network improvements outlined in Table 4 are now in place. This includes the Poupart extension to County Road 17, which is designated as future Street 1. It should be noted that this analysis scenario does not include site-generated traffic coming out of Street 1 (i.e. the northbound approach of Street 1/County Road 17 intersection).

Refer to Appendix C for Detailed Synchro output data for background conditions.

Table 8: Study Area Intersection Operations - 2045 Background Conditions

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	8.16	3228.9	F	#81.5	23.34	10052.1	F	#182.8
EBR	1 R	80	0.41	14.7	A	#5.2	0.90	39.3	D	#16.1
WBL	1 L	125	0.30	8.3	A	3	0.56	12.2	A	6
WBT	2 T	-	8.23	3267.5	F	#133.7	3.23	1017.7	F	#98.7
NBL	1 L	-	1.51	288.5	F	#21.0	1.35	240.2	F	#16.9
NBR	1 R	-	0.34	12.7	A	#4.4	0.68	22.6	B	#9.5
Overall			**8.01**	**3066.7**	**F**	**-**	**21.95**	**5932.5**	**F**	**-**
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	0.06	6.4	A	3	0.05	10.4	A	3
EB	1 T/R	-	0.04	5.9	A	3	0.13	10.5	A	9
WBL	1 L	-	0.05	6.3	A	2	0.08	10.5	A	5
WB	1 T/R	-	0.34	3.9	A	7	0.44	6.1	A	14
NB	1 T/L & 1 T/R	-	0.03	4.7	A	2	0.07	3.6	A	4
SB	1 T/L	-	0.16	7.1	A	8	0.60	13.0	A	#58.3
SBR	1 R	-	0.03	3.3	A	2	0.04	2.5	A	3
Overall			**0.25**	**5.0**	**A**	**-**	**0.38**	**9.3**	**A**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.11	7.2	A	5	0.31	10.7	A	16
EB	1 T/R	-	0.15	3.4	A	4	0.52	5.3	A	16
WB	1 L/T/R	-	0.13	5.9	A	5	0.19	7.8	A	10
NB	1 T/L & 1 T/R	-	0.23	5.8	A	10	0.46	8.7	A	17
SB	1 L/T/R	-	0.13	4.4	A	7	0.58	9.4	A	28
Overall			**0.17**	**5.3**	**A**	**-**	**0.41**	**8.1**	**A**	**-**
Poupart/Walmart Driveway - Unsignalized										
EBL	1 L/R	-	0.03	9.1	A	1	0.28	17.4	A	8
NB	1 T & 1 T/L	-	0.14	0.0	A	0	0.17	0.0	A	0
SB	1 T & 1 T/R	-	0.05	0.0	A	0	0.19	0.0	A	0
Overall			**0.28**	**0.9**	**A**	**-**	**0.45**	**2.3**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	0.84	11.3	D	182	2.13	529.2	F	#1312.4
WBT	2 T	-	1.72	346.2	F	#998.3	1.30	157.3	F	#673.5
Overall			**1.43**	**236.8**	**F**	**-**	**1.82**	**388.2**	**F**	**-**

As shown in Table 8, with the planned roadway changes and background 2045 traffic volumes, SSA1 intersections are projected to operate with an excellent overall LOS ‘A’ with the exception of the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS ‘F’ during both peak hours. This is consistent with other studies and plans within the study area and is expected as a result of the significant traffic volumes on County Road 17 generated from the other area developments.

The critical movements which are operating over capacity with an LOS ‘F’ include:

Carmen Bergeron/County Road 17

- Eastbound through movement during both peak hours
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Street 1/County Road 17

- Eastbound through movement during the afternoon peak hour
- Westbound through movement during both peak hours

In terms of 95th percentile queues, the existing storage capacity is not exceeded.

<u>Background 2055 Operational Analysis</u>

Table 9 summarizes intersection operations for the 2055 horizon year with the addition of 2055 County Road 17 background plus planned developments’ traffic volumes only. This future background scenario assumes that the previously planned transportation network improvements outlined in Table 4 are now in place. This includes the Poupart extension to County Road 17 which is designated as future Street 1. It should be noted that this analysis scenario does not include site-generated traffic coming out of Street 1 (i.e. the northbound approach of Street 1/County Road 17 intersection).

Refer to Appendix C for Detailed Synchro output data for background conditions.

Table 9: Study Area Intersection Operations - 2055 Background Conditions

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	9.12	3659.9	F	#90.1	25.97	11238.4	F	#201.8
EBR	1 R	80	0.41	14.7	A	#5.2	0.98	58.0	E	#18.2
WBL	1 L	125	0.30	8.3	A	3	0.56	12.2	A	6
WBT	2 T	-	9.04	3630.4	F	#147.6	3.58	1175.6	F	#110.6
NBL	1 L	-	1.51	288.5	F	#21.0	1.35	240.2	F	#16.9
NBR	1 R	-	0.34	12.7	A	#4.4	0.68	22.6	B	#9.5
Overall			**8.28**	**3447.8**	**F**	**-**	**24.56**	**6716.8**	**F**	**-**

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	0.06	6.4	A	3	0.05	10.4	A	3
EB	1 T/R	-	0.04	5.9	A	3	0.13	10.5	A	9
WBL	1 L	-	0.05	6.3	A	2	0.08	10.5	A	5
WB	1 T/R	-	0.34	3.9	A	7	0.44	6.1	A	14
NB	1 T/L & 1 T/R	-	0.03	4.7	A	2	0.07	3.6	A	4
SB	1 T/L	-	0.16	7.1	A	8	0.60	13.0	A	#58.3
SBR	1 R	-	0.03	3.3	A	2	0.04	2.5	A	3
Overall			**0.25**	**5.0**	**A**	**-**	**0.38**	**9.3**	**A**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.11	7.2	A	5	0.31	10.6	A	16
EB	1 T/R	-	0.15	3.4	A	4	0.52	5.3	A	16
WB	1 L/T/R	-	0.13	5.9	A	5	0.19	7.8	A	10
NB	1 T/L & 1 T/R	-	0.23	5.8	A	10	0.46	8.7	A	17
SB	1 L/T/R	-	0.13	4.4	A	7	0.58	9.4	A	28
Overall			**0.17**	**5.3**	**A**	**-**	**0.41**	**8.1**	**A**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	9.1	A	1	0.28	17.4	A	8
NB	1 T & 1 T/L	-	0.14	0.0	A	0	0.17	0.0	A	0
SB	1 T & 1 T/R	-	0.05	0.0	A	0	0.19	0.0	A	0
Overall			**0.28**	**0.9**	**A**	**-**	**0.45**	**2.3**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	0.94	19.3	E	292	2.39	644.9	F	#1510.4
WBT	2 T	-	1.90	426.3	F	#1136.0	1.45	224.8	F	#789.7
Overall			**1.58**	**291.9**	**F**	**-**	**2.03**	**486.2**	**F**	**-**

Similar to background 2045 conditions, Table 9 shows that with the planned roadway improvements and background 2055 traffic volumes. SSA1 intersections are projected to continue operating with an excellent overall LOS ‘A’ or better during the weekday morning and afternoon peak hours except for the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS ‘F’ during both peak hours. This is due to the large traffic volumes on County Road 17 generated from the other area developments.

The critical movements which are operating over capacity with an LOS ‘F’ include:

Carmen Bergeron/County Road 17
- Eastbound through movement during both peak hours
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Street 1/County Road 17
- Eastbound through movement during the afternoon peak hour
- Westbound through movement during both peak hours

In terms of 95th percentile queues, the existing storage capacity is not exceeded.

3.6 Concept Option 1

Projected Site Trip Generation

To complete a projected trip generation for the business park and commercial uses, land use areas were converted to ground floor areas (GFA), assuming approximately 70% of the land would be developed. For the residential land uses, the density ratios outlined in Section 5.6 of the Official Plan of the Urban Area of the City of Clarence-Rockland were used to determine the maximum projected medium and high-density units for each option. These land use statistics are summarized in Table 10.

Table 10: Statistics for Secondary Plan Concept Options 1 and 3

Land Use	Option 1			Option 3		
	Area (ha)	GFA (ft^2)	Units	Area (ha)	GFA (ft^2)	Units
Business Park	16.3	307,043 ft^2	-	45.8	862,735 ft^2	-
Service Commercial	14.3	335,449 ft^2	-	1.4	31,646 ft^2	-
Commercial Core	15.9	323,243 ft^2	-	0	-	-
Medium Density Residential	4.0	-	220	6.5	-	358
High Density Residential	4.1	-	513	0	-	-

The projected site-generated traffic was then estimated using appropriate trip generation rates from the 10th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. Based on the location and type of development envisioned, Table 11 summarizes the appropriate trip generation rates for estimating projected site-generated traffic for concept options 1 and 3.

Table 11: ITE Peak Hour Trip Generation Rates

Land Use	ITE Land Use Code	AM Peak Hour (1)(2)(3)(4)	PM Peak Hour (1)(2)(3)(4)
Business Park	ITE 770	$T_A = 1.35(X)$; $Ln(T_F) = 0.94\,Ln(X) + 0.59$	$T_A = 1.22(X)$; $Ln(T_F) = 0.88\,Ln(X) + 0.93$
Medium Density Residential	ITE 215	$T_A = 0.48(U)$; $T_F = 0.52(X) – 5.70$	$T_A = 0.57(U)$; $T_F = 0.60(X) – 3.93$
High Density Residential	ITE 220	$T_A = 0.40(U)$; $T_F = 0.31(X) + 22.85$	$T_A = 0.51(U)$; $T_F = 0.43(X) + 20.55$
High-turnover Sit-Down	ITE 932	$T_A = 9.57(X)$	$T_A = 6.00(X)$
Shopping Plaza	ITE 821	$T_A = 3.53(X)$	$T_A = 9.03(X)$;

Land Use	ITE Land Use Code	AM Peak Hour (1)(2)(3)(4)	PM Peak Hour (1)(2)(3)(4)
			$Ln(T_F)$= 7.67 Ln(X) + 118.86
Pharmacy	ITE 880	T_A = 2.94(X) T_F = 10.22(X) – 75.70	T_A = 8.51(X)
Liquor Store	ITE 899	T_A = 0.59(X)	T_A = 16.62(X) T_F = 0.50(X) + 151.78
Fast-Food with Drive Thru	ITE 934	T_A = 44.61(X)	T_A = 33.03(X)
Coffee Shop with Drive-thru	ITE 937	T_A = 85.88(X)	T_A = 38.99(X)
Drive-In Bank	ITE 912	T_A = 9.95(X)	T_A = 21.01(X)
Variety Store	ITE 814	T_A = 3.04(X)	T_A = 3.08(X)
Clinic	ITE 630	T_A = 2.75(X) T_F = 2.19(X) + 8.68	T_A = 3.69(X); T_F = 3.53(X) + 2.98
Strip Retail Plaza	ITE 822	T_A = 1.59(X)	T_A = 2.25(X)
Home Improvement Superstore	ITE 862	T_A = 1.51(X)	T_A = 2.29(X)
Supermarket	ITE 850	T_A = 2.86(X)	T_A = 8.95(X); $Ln(T_F)$= 0.81 Ln(X) + 2.92

Notes:
(1) T_A = Average Vehicle Trips
(2) T_F = Vehicle Trips by Fitted Curve
(3) X = 1,000 ft² of Gross Floor Area (GFA)
(4) U = Per Unit

With respect to ITE trip generation rates, the data used to develop these rates only included vehicle trips (i.e. walking, cycling and transit trips were not captured in this data). To consider the multi-modal trips generated by the proposed development, projected site-generated traffic (estimated using the ITE trip generation rates) were converted to projected site-generated person trips, which could then be subdivided into different transportation modes based on area travel patterns and available facilities/network connections (e.g., the availability of transit, walking and cycling facilities). To convert projected ITE vehicle trips to person trips, an auto occupancy factor and non-auto trip factor was applied to the ITE trip generation rates. Based on available American Census data, the typical modal share of non-auto person trips was approximately 10% and the typical auto occupancy was 1.15. Therefore, when combined, a factor of 1.28 was used to convert vehicle trips to person trips. To account for multi-purpose trips for mixed-use developments, a percent reduction was applied to the total projected site-generated trips.

Based on the foregoing, the projected weekday morning and afternoon peak hour person trip generation for concept option 1 is summarized in Table 12.

Table 12: Option 1 Modified Peak Period Person Trips

Land Use	Area	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Business Park	305,000 ft²	299	53	352	91	260	351

Land Use	Area	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Service Commercial & Commercial Core	660,000 ft^2	3,354	2,837	6,191	2,809	2,849	5,658
Medium Density Residential	220	10	32	42	29	21	50
High Density Residential	513	11	36	47	31	18	49
Total Person Trips		5,247	4,223	9,470	4,232	4,498	8,730
30% Multi-Purpose Trip Reduction		-1,574	-1,267	-2,841	-1,270	-1,349	-2,619
Total 'New' Person Trips		**3,673**	**2,956**	**6,629**	**2,962**	**3,149**	**6,111**

Directional splits (i.e., inbound vs outbound trips) were obtained from the ITE Trip Generation Manual. Given the proposed development was considered mixed-use, a 'multi-purpose' trip reduction of 30% was assumed to account for the internal trips between residential and commercial land uses. This trip reduction rate was consistent with the Expansion Lands Secondary Plan Transportation Impact Assessment report completed in June 2019 by CIMA+ for the City of Clarence-Rockland for the southern expansion lands.

Travel Mode Shares

To determine the number of person trips arriving/departing by each travel mode, total projected person trips were subdivided by percent mode shares. With respect to the TRANS Trip Generation Manual Summary Report, mode shares were developed for select land uses, specific to the City. These were referenced from the 2019 Expansion Lands Secondary Plan prepared by CIMA+ and the 2018 Transportation Impact Study Draft Plan of Subdivision prepared by Castleglenn Consultants to remain consistent with previous analyses completed for the City. As such, the following modal splits were assumed:

Auto Driver	80%
Auto Passenger	5%
Transit	10%
Non-motorized	5%
Total Person Trips	100%

The following Table 13, Table 14, Table 15, and Table 16 summarize the appropriate mode share values as used for the analysis based on the proposed land uses. Table 17 summarizes the total modal share values for option 1.

Table 13: Option 1 Projected Modal Site Generated Trips – Business Park

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	240	43	283	73	208	281
Auto Passenger	5%	15	3	18	5	13	18

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Transit	10%	30	5	35	9	26	35
Non-motorized	5%	14	2	16	4	13	17
Total Person Trips	100%	299	53	352	91	260	351
Total 'New' Vehicle Trips		**240**	**43**	**283**	**73**	**208**	**281**

As summarized in Table 13, the business park land use was projected to generate approximately 283 and 281 veh/h during weekday morning and afternoon peak hours, respectively.

Table 14: Option 1 Projected Modal Site Generated Trips – Service Commercial & Commercial Core

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	2,689	2,274	4,963	2,253	2,285	4,538
Auto Passenger	5%	169	146	315	144	146	290
Transit	10%	332	282	614	277	281	558
Non-motorized	5%	164	135	299	135	137	272
Total Person Trips	100%	3,354	2,837	6,191	2,809	2,849	5,658
Total 'New' Vehicle Trips		**2,689**	**2,274**	**4,963**	**2,253**	**2,285**	**4,538**

As summarized in Table 14, the service commercial and commercial core land uses were projected to generate approximately 4,963 and 4,538 veh/h during weekday morning and afternoon peak hours, respectively.

Table 15: Option 1 Projected Modal Site Generated Trips – Medium Density Residential

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	20	60	80	54	39	93
Auto Passenger	5%	1	4	5	4	3	7
Transit	10%	2	7	9	6	4	10
Non-motorized	5%	1	3	4	3	2	5
Total Person Trips	100%	24	74	98	67	48	115
Total 'New' Vehicle Trips		**20**	**60**	**80**	**54**	**39**	**93**

As summarized in Table 15, the medium density residential land use was projected to generate approximately 283 and 281 veh/h during weekday morning and afternoon peak hours, respectively.

Table 16: Option 1 Projected Modal Site Generated Trips – High Density Residential

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	47	148	195	126	75	201
Auto Passenger	5%	3	9	12	8	5	13
Transit	10%	6	18	24	16	9	25
Non-motorized	5%	2	9	11	7	4	11
Total Person Trips	100%	58	184	242	157	93	250
Total 'New' Vehicle Trips		**47**	**148**	**195**	**126**	**75**	**201**

As summarized in Table 16, the high-density residential land use was projected to generate approximately 283 and 281 veh/h during weekday morning and afternoon peak hours, respectively.

Table 17: Option 1 Projected Modal Site Generated Trips

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	2,946	2,372	5,318	2,375	2,525	4,900
Auto Passenger	5%	186	153	339	153	161	314
Transit	10%	364	294	658	291	311	602
Non-motorized	5%	178	139	317	141	151	292
Total Person Trips	100%	3,674	2,958	6,632	2,960	3,148	6,108
Total 'New' Vehicle Trips		**2,946**	**2,372**	**5,318**	**2,375**	**2,525**	**4,900**

As summarized in Table 17, concept option 1 was projected to generate approximate two-way vehicle volumes of 5,318 veh/h and 4,900 veh/h during weekday morning and afternoon peak hours, respectively. With regard to active modes, option 1 was projected to generate approximate two-way person trips of 317 trips/h and 292 trips/h, during weekday morning and afternoon peak hours, respectively, and site-generated transit trips were projected to be in the order of 658 trips/h and 602 trips/h, during weekday morning and afternoon peak hours, respectively.

It should be noted that the above trip generation assumed a high degree of density within SSA1. The number of trips outlined in Table 17 were a conservative estimate of the total potential trip generation that may be experienced with the option 1 land-use statistics as summarized in Table 2.

Trip Distribution

The projected distribution of site-generated traffic was derived based on existing travel patterns, the site's connections to/from the surrounding road network, our local area knowledge (e.g., the location and proximity of employment, other area shopping, communities, recreational opportunities, etc.). For analysis purposes and to be consistent with the 2019 Secondary Plan and 2018 TIS, the following approximate distribution of projected site-generated traffic was assumed:

65%	to/from the west (Ottawa) via County Road 17;
15%	to/from the south via Baseline Road;
10%	to/from the east (Hawkesbury) via County Road 17; and
10%	to/from the City of Clarence Rockland via Laurier Street.
100%	

Trip Assignment

Based on the above assumed distribution, projected 'new' Secondary Plan site-generated traffic was assigned to the study area network and is depicted in the following Figure 14.

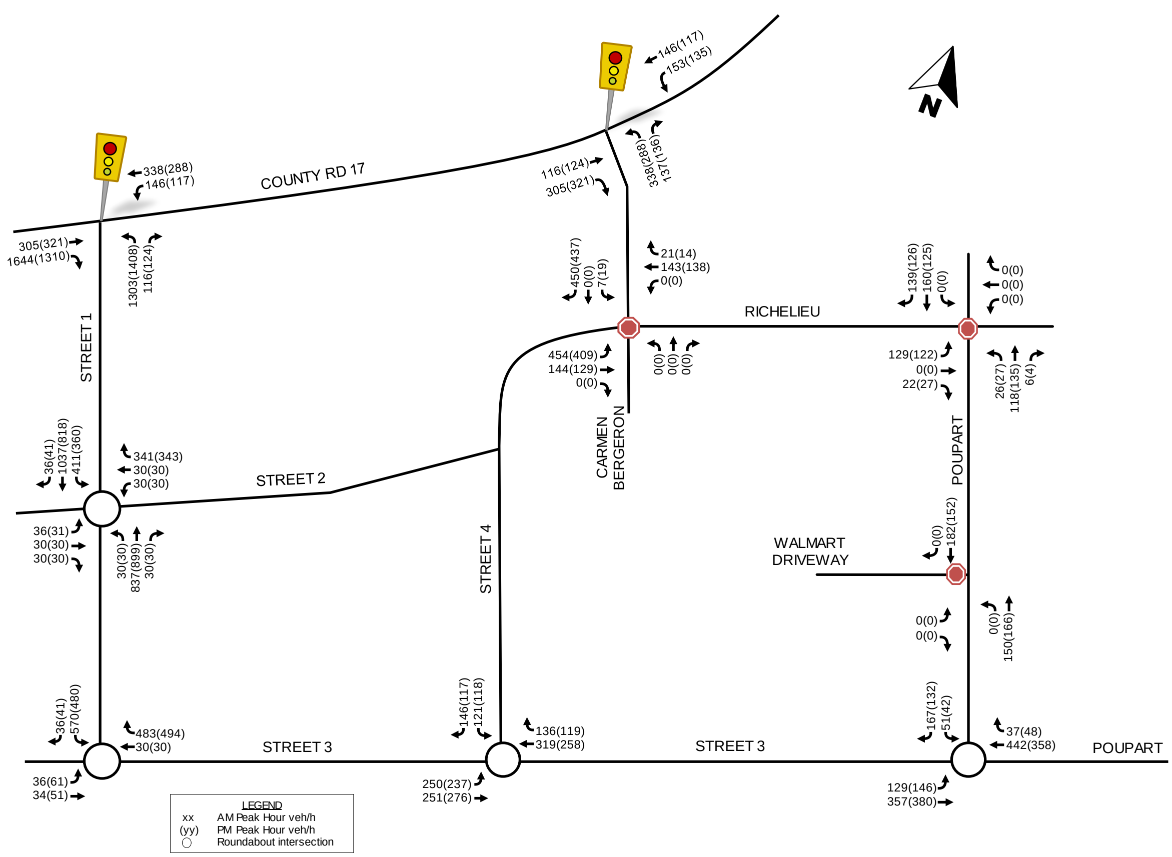

Figure 14: Option 1 'New' Secondary Plan Site-Generated Traffic

The following Figure 15 depicts total projected volumes for the build-out year of 2045, which were derived by superimposing 'new' Secondary Plan site-generated traffic volumes onto 2045 projected County Road 17 background plus developments traffic volumes (i.e. summing together volumes depicted in Figure 12, and Figure 14, resulting in Figure 15).

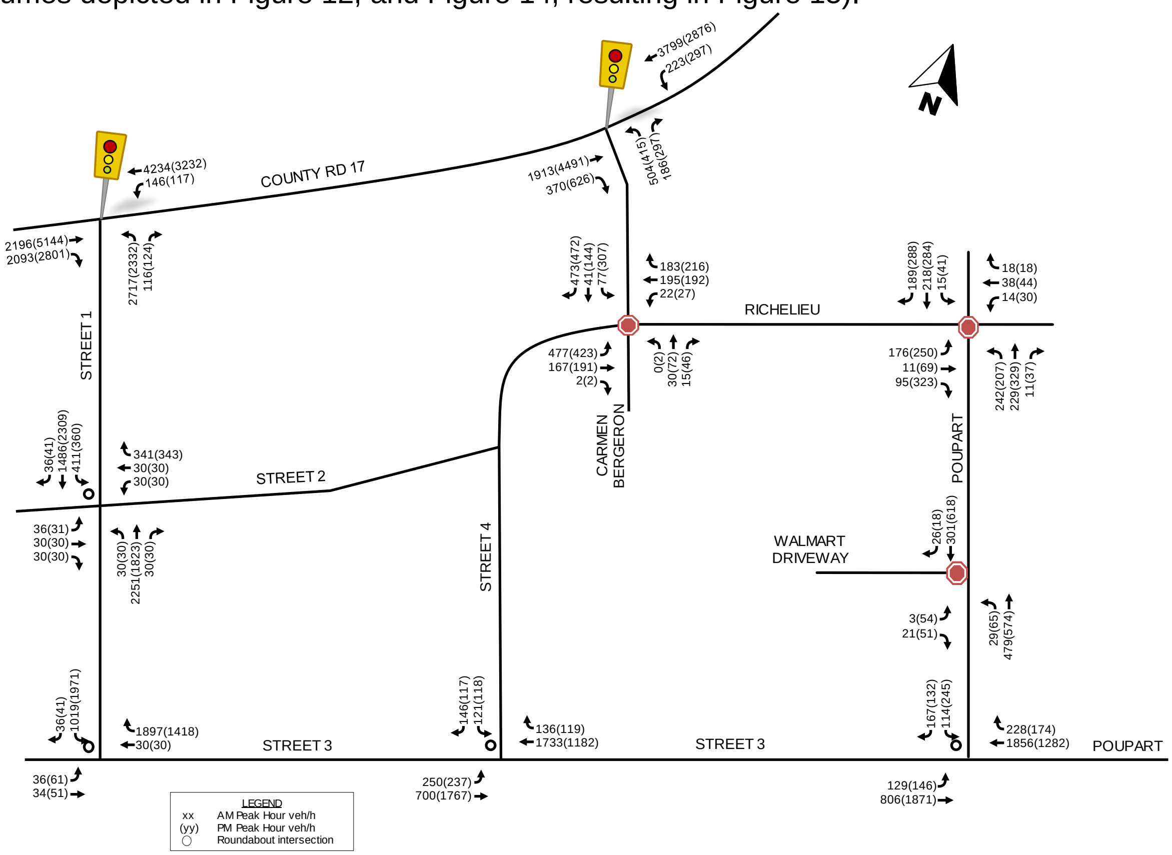

Figure 15: 2045 Total Projected Traffic Volumes – Option 1

Ten years beyond full build-out, the following Figure 16 depicts total projected volumes for the horizon year of 2055, which were derived by superimposing 'new' Secondary Plan site-generated traffic volumes onto 2055 projected County Road 17 background plus planned developments traffic volumes (i.e. summing together volumes depicted in Figure 14 , and Figure 13, resulting in Figure 16).

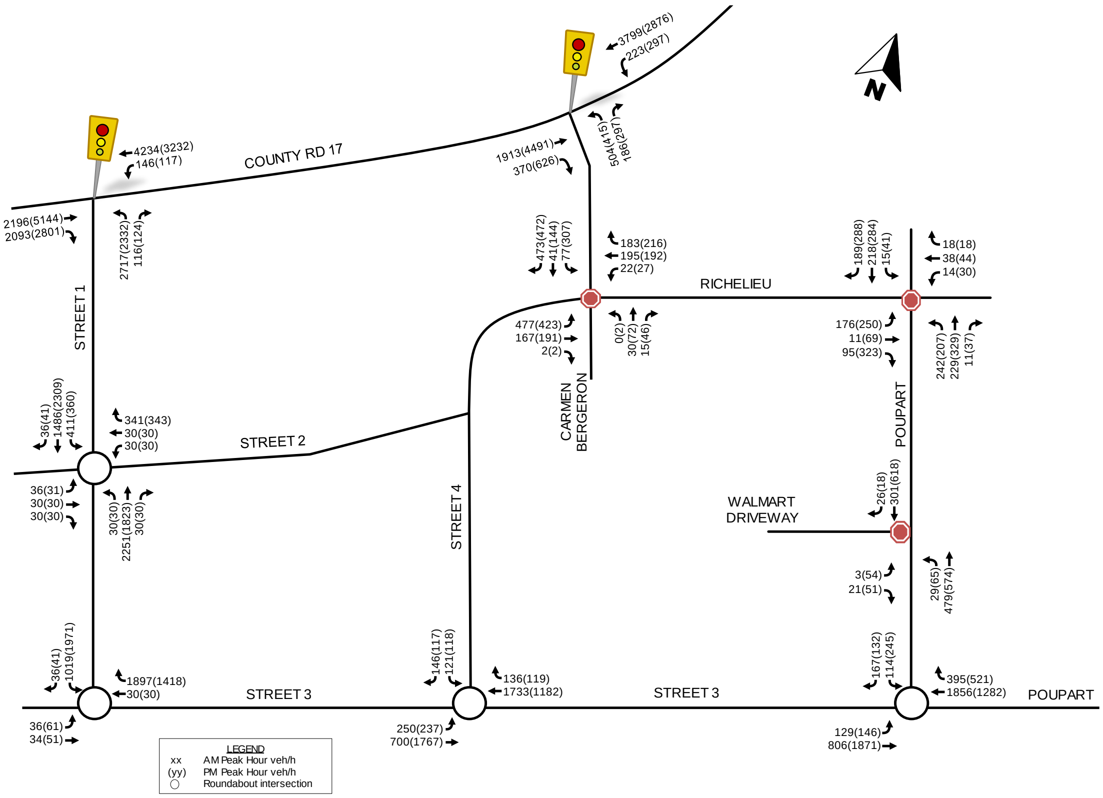

Figure 16: 2055 Total Projected Traffic Volumes – Option 1

<u>Roundabout Feasibility Screening of New Intersections</u>

Based on discussions with the City, roundabouts were the preferred design option for the following new internal intersections within SSA1:

- Street 1/Street 2
- Street 1/Street 3
- Street 3/Street 4
- Street 3/Poupart

The following guideline and tools were used to determine roundabout feasibility: TAC Canadian Roundabout Design Guide (2017), City of Ottawa Roundabout Initial Feasibility Screening Tool (2013), and the Waterloo Roundabout Traffic Flow Sheet (2009).

Based on the results of the Screening Tool and TAC Roundabout Design Guide, roundabouts were found to be feasible for the internal intersections identified within the Secondary Plan. As intersection control was warranted, there were no geometric constraints, and the land was generally flat, roundabouts would be an appropriate intersection control measure. The completed screening forms are included as Appendix D.

3.7 Roundabout Conceptual Design

Using the Roundabout Traffic Flow Sheet and to be consistent with the proposed roundabout designs presented in the St-Jean Street/Montee Poupart Environmental Assessment Report (March 2024), the following Table 18 shows the elements included in the conceptual design of the proposed roundabout configuration for the future intersections.

Table 18: Roundabout Design Parameters

Street 1/Street 2	Street 1/Street 3	Street 3/Street 4	Street 3/Poupart
Double circulating lane, 10.0 m width	Double circulating lane, 10.0 m width	Double circulating lane, 10.0 m width	Double circulating lane, 10.0 m width
Island diameter of 40.0 m	Island diameter of 40.0 m	Island diameter of 40.0 m	Island diameter of 40.0 m
Double entry and exit lanes for all approaches	Double entry and exit lanes for all approaches	Double entry and exit lanes for the east-west approaches, single entry and exit lane for the north approach	Double entry and exit lanes for the east-west approaches, single entry and exit lane for the north approach
Entry radius of 20.0 m	Entry radius of 20.0 m	Entry radius of 20.0 m	Entry radius of 20.0 m

The completed flow sheets can be found in Appendix E and the conceptual designs for each intersection are included in Appendix F.

3.8 Roundabout Operational Analysis

Using the intersection capacity analysis software SIDRA Intersection (v9.1), SSA1 intersections were assessed in terms of volume-to-capacity ratio (V/C ratio), 95th percentile queues (meters), a vehicle delay (seconds), and a corresponding Level of Service (LOS). Based on the conceptual geometry and total projected volumes (Figure 15), the following Table 19 summarizes the output results from SIDRA. Detailed SIDRA output data for concept option 1 can be found in Appendix G.

Additionally, the following parameters were assumed for the roundabout operational analysis:
- Environmental factor: 1.1
- Pedestrian crossings on all legs
- 25 ped/hr crossing each leg, morning and afternoon peak periods
- PHF 0.90 similar to the 2019 Secondary Plan report
- Assumed speed limit 50 km/h for new roadways

Table 19: Option 1 SIDRA Roundabout Analysis Results

Intersection	AM Peak (PM Peak)					
	Critical Movement				Intersection	
	LOS	avg. delay (s)	Movement	Queue (m)	Delay (s)	LOS
Street 1 / Street 2	F(D)	97.6(43.0)	NBL(WBR)	517.0(89.6)	50.8(26.1)	E(C)
Street 1 / Street 3	A(B)	9.1(13.5)	EBL(EBL)	0.9(3.8)	4.1(5.6)	A(A)
Street 3 / Street 4	C(B)	20.9(11.3)	SBL(SBL)	35.7(12.2)	5.7(2.7)	A(A)

Street 3 / Poupart	C(B)	28.0(18.4)	SBL(SBL)	43.4(39.6)	4.3(4.7)	A(A)

With the proposed geometry the study area intersections were projected to operate 'as a whole' with a LOS 'A' during morning and afternoon peak hours. The exception was the Street 1/Street 2 intersection which was projected to operate at an LOS 'E' during the morning peak hour and LOS 'C' during the afternoon peak hour. Critical movements were projected to operate with a LOS 'C' or better during both peak hours. However, the critical northbound left-turn movement at the Street 1/Street 2 intersection is projected to operate at an LOS 'F' during both the morning peak hour.

As for 95th percentile queues, the projected queues of the critical movements were not considered critical with the exception northbound left-turn movement at the Street 1/Street 2 intersection. These were projected to be 517 m during the morning peak hours (approximately equal to 70 vehicles).

3.9 Assessment of Existing Traffic System with Total Projected Volumes for Concept Option 1

Total 2045 Conditions – Option 1

Similar to existing and future background conditions, total projected conditions were assessed using the intersection capacity analysis software Synchro (v11). Metrics such as LOS, V/C ratio, 95th percentile queues (metres) and vehicular delay (seconds) were analyzed. With the planned network changes outlined in Table 4, the following Table 20 summarizes the intersection operational analysis of the study area intersections for the total projected 2045 horizon year.

Detailed Synchro output data for 2045 future total projected conditions is provided in Appendix H.

Table 20: 2045 Total Projected Operations – Option 1

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	11.19	4612.1	F	#86.2	29.18	12694.0	F	#187.6
EBR	1 R	80	0.87	27.6	D	#15.0	1.08	68.3	F	#25.8
WBL	1 L	125	0.65	13.6	B	#7.8	0.74	19.9	C	#13.8
WBT	2 T	-	3.58	1175.6	F	#139.4	2.27	589.5	F	#103.3
NBL	1 L	-	5.90	2243.5	F	#52.8	5.40	2014.1	F	#44.8
NBR	1 R	-	0.74	24.9	C	#10.3	0.85	28.6	D	#13.3
Overall			**9.29**	**2064.1**	**F**	**-**	**25.66**	**6619.8**	**F**	**-**
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	1.22	137.8	F	#94.2	1.58	299.9	F	#92.7
EB	1 T/R	-	0.21	7.1	A	17	0.28	10.4	A	21
WBL	1 L	-	0.04	6.5	A	4	0.06	8.9	A	5

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
WB	1 T/R	-	0.47	7.1	A	30	0.57	10.3	A	35
NB	1 T/L & 1 T/R	-	0.05	6.9	A	3	0.10	5.7	A	5
SB	1 T/L	-	0.29	11.8	A	14	0.91	39.6	E	#76.8
SBR	1 R	-	0.62	5.2	B	13	0.55	3.8	A	12
Overall			**0.79**	**43.9**	**C**	**-**	**0.95**	**73.4**	**E**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.42	12.4	A	21	0.61	17.7	B	31
EB	1 T/R	-	0.19	3.9	A	7	0.54	5.4	A	16
WB	1 L/T/R	-	0.13	7.2	A	8	0.19	8.6	A	10
NB	1 T/L & 1 T/R	-	0.43	8.7	A	23	0.67	14.1	B	#33.3
SB	1 L/T/R	-	0.49	8.2	A	36	0.86	24.5	D	#89.8
Overall			**0.34**	**8.6**	**A**	**-**	**0.60**	**15.9**	**B**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	10.0	A	1	0.38	24.6	A	13
NB	1 T & 1 T/L	-	0.20	0.0	A	0	0.24	0.0	A	0
SB	1 T & 1 T/R	-	0.12	0.0	A	0	0.26	0.0	A	0
Overall			**0.38**	**0.6**	**A**	**-**	**0.54**	**2.4**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	0.97	24.6	E	#415.6	2.28	592.5	F	#1421.0
EBR	1 R	-	1.77	366.4	F	#1038.3	2.53	705.4	F	#1558.8
WBL	1 L	-	3.77	1312.5	F	#120.5	3.10	1016.9	F	#97.4
WBT	2 T	-	1.87	412.8	F	#1112.9	1.43	214.6	F	#772.1
NBL	1 L	-	16.59	7028.7	F	#1840.7	14.24	5971.2	F	#1588.2
NBR	1 R	-	0.74	82.0	C	#64.6	0.85	103.3	D	#78.1
Overall			**9.44**	**1901.2**	**F**	**-**	**5.97**	**1438.0**	**F**	**-**

As shown in Table 20, with the planned network improvements and total projected 2045 traffic volumes, SSA1 intersections are projected to operate with an overall LOS 'E' or better with the exception of the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS 'F' during both peak hours.

The critical movements which are operating over capacity with an LOS 'F' include:

Carmen Bergeron/County Road 17

- Eastbound through movement during both peak hours

- Eastbound right-turn movement during the afternoon peak hour
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Carmen Bergeron/Richelieu

- Eastbound left-turn movement during both peak hours

Street 1/County Road 17

- Eastbound through movement during the afternoon peak hour
- Eastbound right-turn movement during both peak hours
- Westbound left-turn movement during both peak hours
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Under peak period conditions, the existing storage capacity generally accommodates 95th percentile queues adequately except for the eastbound left-turn movement at the Poupart/Richelieu intersection, where the existing storage capacity is exceeded by 11 m, equivalent to the length of only one vehicle (not considered critical).

<u>Total 2055 Conditions – Option 1</u>

The following Table 21 summarizes the intersection operational analysis of the study area intersections for the total projected 2055 conditions. Detailed Synchro output data for 2045 future total projected conditions is provided in Appendix H.

Table 21: 2055 Total Projected Operations – Option 1

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	12.43	5170.3	F	#94.7	32.39	14138.3	F	#206.5
EBR	1 R	80	0.87	27.6	D	#15.0	1.18	109.8	F	#29.8
WBL	1 L	125	0.65	13.6	B	#7.8	0.74	19.9	C	#13.8
WBT	2 T	-	3.92	1326.6	F	#153.3	2.51	696.0	F	#115.2
NBL	1 L	-	5.90	2243.5	F	#52.8	5.40	2014.1	F	#44.8
NBR	1 R	-	0.74	24.9	C	#10.3	0.85	28.6	D	#13.3
Overall			**10.35**	**2333.2**	**F**	**-**	**28.77**	**7512.0**	**F**	**-**
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	1.22	137.8	F	#94.2	1.58	299.9	F	#92.7
EB	1 T/R	-	0.21	7.1	A	17	0.28	10.4	A	21
WBL	1 L	-	0.04	6.5	A	4	0.06	8.9	A	5
WB	1 T/R	-	0.47	7.1	A	30	0.57	10.3	A	35

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
NB	1 T/L & 1 T/R	-	0.05	6.9	A	3	0.10	5.7	A	5
SB	1 T/L	-	0.29	11.8	A	14	0.91	39.6	E	#76.8
SBR	1 R	-	0.62	5.2	B	13	0.55	3.8	A	12
Overall			**0.79**	**43.9**	**C**	**-**	**0.95**	**73.4**	**E**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.42	12.4	A	21	0.61	17.7	B	31
EB	1 T/R	-	0.19	3.9	A	7	0.54	5.4	A	16
WB	1 L/T/R	-	0.13	7.2	A	8	0.19	8.6	A	10
NB	1 T/L & 1 T/R	-	0.43	8.7	A	23	0.67	14.1	B	#33.3
SB	1 L/T/R	-	0.49	8.2	A	36	0.86	24.5	D	#89.8
Overall			**0.34**	**8.6**	**A**	**-**	**0.60**	**15.9**	**B**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	10.0	A	1	0.38	24.6	A	13
NB	1 T & 1 T/L	-	0.20	0.0	A	0	0.24	0.0	A	0
SB	1 T & 1 T/R	-	0.12	0.0	A	0	0.26	0.0	A	0
Overall			**0.38**	**0.6**	**A**	**-**	**0.54**	**2.4**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	1.07	56.4	F	#495.4	2.54	708.3	F	#1618.6
EBR	1 R	-	1.80	377.8	F	#1049.5	2.55	715.7	F	#1565.7
WBL	1 L	-	3.86	1353.6	F	#121.5	3.10	1016.9	F	#97.4
WBT	2 T	-	2.05	493.1	F	#1251.0	1.58	281.9	F	#887.7
NBL	1 L	-	16.59	7028.7	F	#1840.7	14.24	5971.2	F	#1588.2
NBR	1 R	-	0.75	83.0	C	#65.2	0.85	103.3	D	#78.1
Overall			**9.12**	**1855.2**	**F**	**-**	**5.88**	**1439.5**	**F**	**-**

Similar to the 2045 total projected conditions, Table 21 shows that with the planned network improvements and total projected 2055 traffic volumes, study area intersections are projected to continue operating with an overall LOS 'E' or better with the exception of the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS 'F' during both peak hours.

The critical movements which are operating over capacity with an LOS 'F' include:

Carmen Bergeron/County Road 17

- Eastbound through movement during both peak hours
- Eastbound right-turn movement during the afternoon peak hour

- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Carmen Bergeron/Richelieu

- Eastbound left-turn movement during both peak hours

Street 1/County Road 17

- Eastbound through movement during the afternoon peak hour
- Eastbound right-turn movement during both peak hours
- Westbound left-turn movement during both peak hours
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Under peak period conditions, the existing storage capacity generally accommodates 95th percentile queues adequately except for the eastbound left-turn movement at the Poupart/Richelieu intersection, where the existing storage capacity is exceeded by 11 m, equivalent to the length of only one vehicle (not considered critical).

3.10 Concept Option 3

3.10.1 Transportation

The projected site-trip generated traffic was derived using the same trip generation rates outlined in Table 11. The projected weekday morning and afternoon peak hour person trip generation for concept option 3 were summarized in Table 22.

Table 22: Option 3 Modified Peak Period Person Trips

Land Use	Area	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Business Park	863,000 ft^2	790	140	930	226	645	871
Service Commercial	32,000 ft^2	189	157	346	136	153	289
Medium Density Residential	358 units	40	122	162	111	78	189
Total Person Trips		1,456	598	2,054	676	1,250	1,926
30% Multi-Purpose Trip Reduction		-437	-179	-616	-203	-375	-578
Total 'New' Person Trips		**1,019**	**419**	**1,438**	**473**	**875**	**1,348**

Concept option 3 was projected to generate an approximate two-way total of 1,438 and 1,348 person trips/h during weekday morning and afternoon peak hours, respectively. These trips were then broken down by the same modal splits previously identified. The following Table 23, Table 24, and Table 25 summarize the appropriate mode share values that were used for analysis purposes, based on the proposed land uses. Table 26 summarizes the total modal share values for option 3.

Table 23: Option 3 Projected Modal Site Generated Trips – Business Park

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	632	112	744	181	516	697
Auto Passenger	5%	40	7	47	12	33	45
Transit	10%	79	14	93	22	64	86
Non-motorized	5%	39	7	46	11	32	43
Total Person Trips	100%	790	140	930	226	645	871
Total 'New' Vehicle Trips		**632**	**112**	**744**	**181**	**516**	**697**

The business park land use was projected to generate approximately 744 and 697 veh/h during weekday morning and afternoon peak hours, respectively.

Table 24: Option 3 Projected Modal Site Generated Trips – Service Commercial

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	153	127	280	111	123	234
Auto Passenger	5%	10	9	19	7	9	16
Transit	10%	18	14	32	13	14	27
Non-motorized	5%	8	7	15	5	7	12
Total Person Trips	100%	189	157	346	136	153	289
Total 'New' Vehicle Trips		**153**	**127**	**280**	**111**	**123**	**234**

The service commercial and commercial core land uses were projected to generate approximately 280 and 234 veh/h during weekday morning and afternoon peak hours, respectively.

Table 25: Option 3 - Projected Modal Site Generated Trips – Medium Density Residential

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	32	98	130	89	63	152
Auto Passenger	5%	2	6	8	6	4	10
Transit	10%	4	12	16	11	8	19
Non-motorized	5%	2	6	8	5	3	8
Total Person Trips	100%	40	122	162	111	78	189
Total 'New' Vehicle Trips		**32**	**98**	**130**	**89**	**63**	**152**

The medium density residential land use was projected to generate approximately 130 and 152 veh/h during weekday morning and afternoon peak hours, respectively.

Table 26: Option 3 Projected Modal Site Generated Trips

Travel Mode	Mode Share	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	80%	817	337	1,154	381	702	1,083
Auto Passenger	5%	52	22	74	25	46	71
Transit	10%	101	40	141	46	86	132
Non-motorized	5%	49	20	69	21	42	63
Total Person Trips	100%	1,019	419	1,438	473	876	1,349
Total 'New' Vehicle Trips		**817**	**337**	**1,154**	**381**	**702**	**1,083**

Option 3 was projected to generate approximate two-way vehicle volumes of 1,154 veh/h and 1,083 veh/h during weekday morning and afternoon peak hours, respectively. With regard to active modes, option 3 was projected to generate approximate two-way person trips of 69 trips/h and 63 trips/h, during weekday morning and afternoon peak hours, respectively, and site-generated transit trips were projected to be in the order of 141 trips/h and 132 trips/h, during weekday morning and afternoon peak hours, respectively.

Trip Distribution and Assignment

Using the same assumed distribution and assignment approach as option 1, the projected 'new' Secondary Plan site-generated traffic for option 3 was assigned to the SSA1 network and is depicted in the following Figure 17.

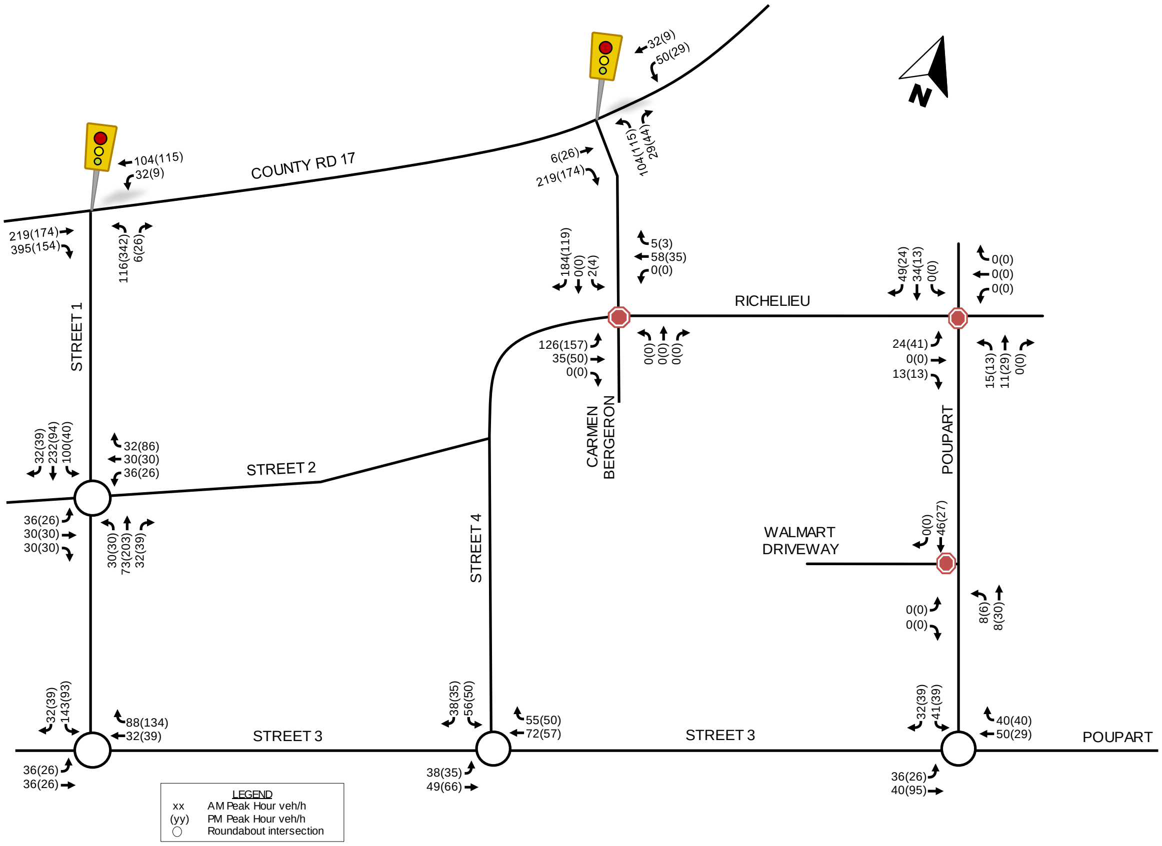

Figure 17: Option 3 'New' Secondary Plan Site-Generated Traffic

The following Figure 18 depicts total projected volumes for the horizon year of 2045, which were derived by superimposing new site-generated traffic volumes onto projected background traffic volumes (i.e. summing together volumes depicted in Figure 12 and Figure 17 resulting in Figure 18).

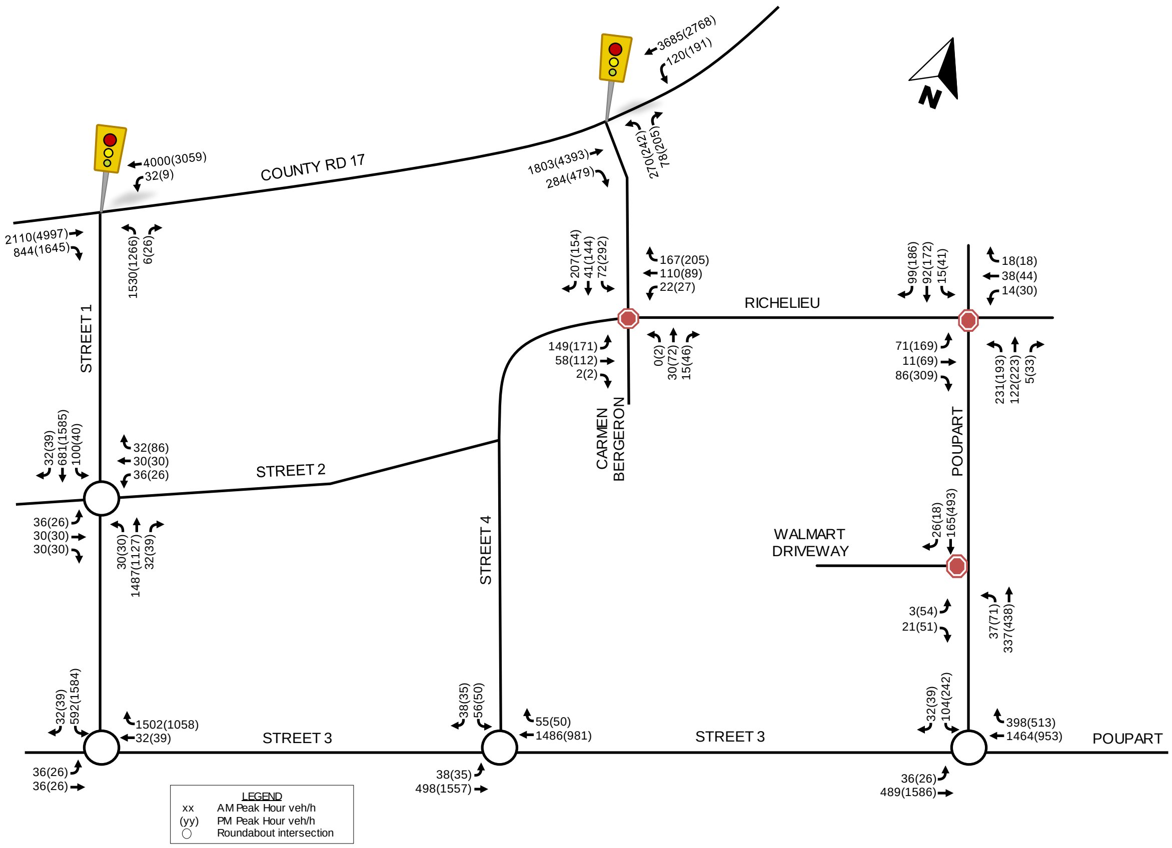

Figure 18: 2045 Total Projected Traffic Volumes – Option 3

Ten years beyond full build-out, the following Figure 19 depicts total projected volumes for the horizon year of 2055, which were derived by superimposing new site-generated traffic volumes onto 2055 projected background traffic volumes (i.e. summing together volumes depicted in Figure 13 and Figure 17 resulting in Figure 19).

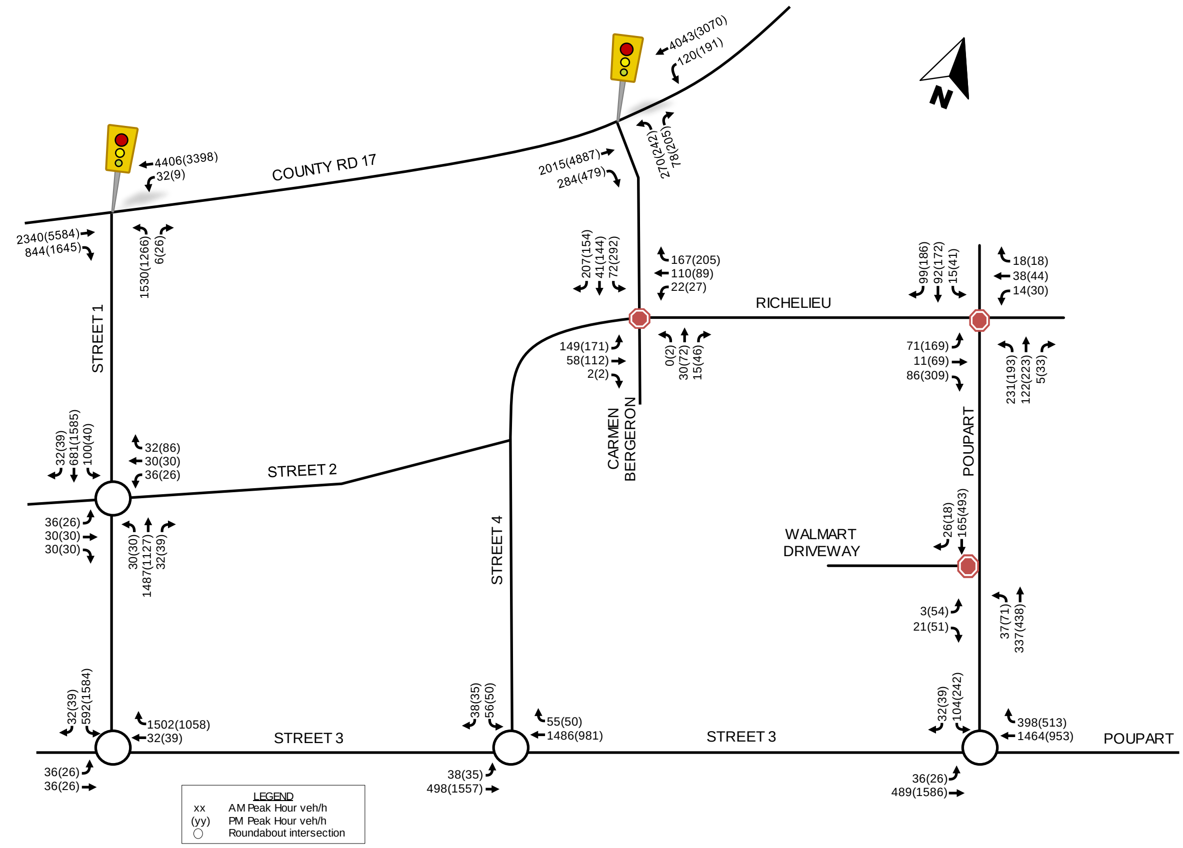

Figure 19: 2055 Total Projected Traffic Volumes – Option 3

<u>Roundabout Feasibility Screening of New Intersections</u>
Based on the results of the Screening Tool and TAC Roundabout Design Guide, roundabouts were found to be feasible for the internal intersections identified within SSA1. As intersection control was warranted, there are no geometric constraints, and the land is generally flat roundabouts would be an appropriate intersection control measure. See the completed screening forms in Appendix D.

3.11 Roundabout Conceptual Design

Using the Roundabout Traffic Flow Sheet and to be consistent with the proposed roundabout designs presented in the St-Jean Street/Montee Poupart Environmental Assessment report (March 2024), the conceptual design of the proposed roundabout configuration included the roundabout design elements as outlined in Table 18.

The completed flow sheets can be found in Appendix E and the conceptual designs for each intersection are included in Appendix F.

3.12 Roundabout Operational Analysis

Using the intersection capacity analysis software SIDRA Intersection (v9.1), SSA1 intersections were assessed in terms of volume-to-capacity ratio (V/C ratio), 95th percentile queues (meters), a vehicle delay (seconds), and a corresponding Level of Service (LOS). With the conceptual geometry and total projected volumes shown in Figure 18, Table 27 summarizes the output results from SIDRA. Detailed SIDRA output data for option 3 can be found in Appendix G.

The following parameters were assumed for the operational analysis:

- Environmental factor: 1.1
- Pedestrian crossings on all legs
- 25 ped/hr crossing each leg, morning and afternoon peak periods
- PHF 0.90 similar to the 2019 Secondary Plan report
- Assumed speed limit 50 km/h for new roadways

Table 27: Option 3 SIDRA Roundabout Analysis Results

Intersection	AM Peak (PM Peak)					
	Critical Movement				Intersection	
	LOS	avg. delay (s)	Movement	Queue (m)	Delay (s)	LOS
Street 1 / Street 2	B(B)	11.5(12.1)	WBL(EBL)	2.1(2.1)	2.4(2.1)	A(A)
Street 1 / Street 3	A(B)	8.5(11.7)	EBL(EBL)	0.7(1.2)	3.8(5.4)	A(A)
Street 3 / Street 4	B(A)	11.7(9.8)	SBL(SBL)	4.3(2.5)	1.8(1.5)	A(A)
Street 3 / Poupart	B(B)	12.5(11.4)	SBL(SBL)	6.9(12.5)	2.1(2.8)	A(A)

As with the proposed conceptual geometry, SSA1 intersections are projected to operate ‘as a whole’ with a LOS ‘A’ and with critical movements projected to operate with a LOS ‘B’ or better per Table 27. With regard to 95th percentile queues, the projected queues of the critical movements were not considered critical, and no additional storage was required.

3.13 Assessment of Existing Traffic System with Total Projected Volumes for Concept Option 3

Total 2045 Conditions – Option 3

Similar to existing and future background conditions, total projected conditions were assessed using the intersection capacity analysis software Synchro (v11) and SIDRA for the roundabouts. Metrics such as LOS, V/C ratio, 95th percentile queues (metres) and vehicular delay (seconds) were analyzed. Assuming no intersection improvements, the following Table 28 summarizes the intersection operational analysis of the study area intersections for the total projected 2045 horizon year.

Detailed Synchro output data for 2045 future total projected conditions is provided in Appendix H.

Table 28: 2045 Total Projected Operations – Option 3

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	8.83	3541.8	F	#81.7	25.69	11148.4	F	#183.8
EBR	1 R	80	0.80	23.9	C	#13.0	1.01	52.4	F	#21.3
WBL	1 L	125	0.51	12.6	A	4	0.55	10.7	A	7
WBT	2 T	-	5.67	2115.6	F	#135.0	2.61	741.4	F	#99.0
NBL	1 L	-	2.65	781.8	F	#31.3	2.83	873.4	F	#28.7
NBR	1 R	-	0.48	17.4	A	#6.0	0.76	25.4	C	#10.9
Overall			**7.61**	**2308.3**	**F**	**-**	**23.55**	**6193.2**	**F**	**-**
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	0.42	10.6	A	13	0.55	17.7	A	24
EB	1 T/R	-	0.10	6.0	A	5	0.19	9.6	A	13
WBL	1 L	-	0.05	5.9	A	3	0.06	8.9	A	5
WB	1 T/R	-	0.42	4.9	A	11	0.44	5.6	A	16
NB	1 T/L & 1 T/R	-	0.04	5.8	A	2	0.09	5.5	A	5
SB	1 T/L	-	0.22	8.8	A	12	0.82	27.8	D	#73.4
SBR	1 R	-	0.31	3.1	A	8	0.22	2.8	A	7
Overall			**0.38**	**6.1**	**A**	**-**	**0.48**	**14.6**	**A**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.17	7.6	A	7	0.40	11.9	A	20
EB	1 T/R	-	0.17	3.3	A	5	0.52	5.1	A	16
WB	1 L/T/R	-	0.13	5.9	A	6	0.18	7.8	A	10
NB	1 T/L & 1 T/R	-	0.26	5.9	A	11	0.52	10.1	A	22
SB	1 L/T/R	-	0.21	4.0	A	9	0.63	11.0	B	36
Overall			**0.19**	**5.3**	**A**	**-**	**0.43**	**9.2**	**A**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	9.3	A	1	0.30	18.7	A	9
NB	1 T & 1 T/L	-	0.14	0.0	A	0	0.18	0.0	A	0
SB	1 T & 1 T/R	-	0.07	0.0	A	0	0.20	0.0	A	0
Overall			**0.30**	**0.9**	**A**	**-**	**0.46**	**2.4**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	0.93	18.7	E	285	2.21	563.4	F	#1371.1

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBR	1 R	-	0.78	8.1	C	93	0.15	2.3	A	11
WBL	1 L	-	0.65	61.5	B	#12.8	0.24	17.2	A	4
WBT	2 T	-	1.77	366.6	F	#1033.5	1.35	180.3	F	#712.9
NBL	1 L	-	9.34	3770.8	F	#1057.5	2.09	538.0	F	#238.4
NBR	1 R	-	0.04	55.3	A	6	0.18	62.5	A	18
Overall			**3.05**	**854.8**	**F**	**-**	**2.20**	**413.8**	**F**	**-**

As shown in Table 28, with the planned network improvements and total projected 2045 traffic volumes, SSA1 intersections are projected to operate with an excellent overall LOS ‘A’ or better with the exception of the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS ‘F’ during both peak hours.

The critical movements which are operating over capacity with an LOS ‘F’ include:

Carmen Bergeron/County Road 17
- Eastbound through movement during both peak hours
- Eastbound right-turn movement during the afternoon peak hour
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Street 1/County Road 17
- Eastbound through movement during the afternoon peak hour
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

In terms of 95th percentile queues, the storage capacity is not exceeded.

Total 2055 Conditions – Option 3

The following Table 29 summarizes the intersection operational analysis of the study area intersections for the total projected 2055 conditions. Detailed Synchro output data for 2045 future total projected conditions is provided in Appendix H.

Table 29: 2055 Total Projected Operations – Existing Intersections – Option 3

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	9.87	4008.3	F	#90.3	28.58	12451.0	F	#202.8

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
EBR	1 R	80	0.80	23.9	C	#13.0	1.10	84.6	F	#24.4
WBL	1 L	125	0.51	12.6	A	4	0.55	10.7	A	7
WBT	2 T	-	6.22	2363.0	F	#148.9	2.89	868.6	F	#111.0
NBL	1 L	-	2.65	781.8	F	#31.3	2.83	873.4	F	#28.7
NBR	1 R	-	0.48	17.4	A	#6.0	0.76	25.4	C	#10.9
Overall			**8.59**	**2621.5**	**F**	**-**	**26.40**	**7027.7**	**F**	**-**
Carmen Bergeron/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	-	0.42	10.6	A	13	0.60	20.3	A	24
EB	1 T/R	-	0.10	6.0	A	5	0.20	10.1	A	13
WBL	1 L	-	0.05	5.9	A	3	0.07	9.2	A	5
WB	1 T/R	-	0.42	4.9	A	11	0.46	6.0	A	16
NB	1 T/L & 1 T/R	-	0.04	5.8	A	2	0.09	5.1	A	5
SB	1 T/L	-	0.22	8.8	A	12	0.79	24.1	C	#73.4
SBR	1 R	-	0.31	3.1	A	8	0.21	2.7	A	7
Overall			**0.38**	**6.1**	**A**	**-**	**0.49**	**13.8**	**A**	**-**
Poupart/Richelieu - Actuated-Uncoordinated Signal										
EBL	1 L	20	0.17	7.6	A	7	0.40	11.7	A	20
EB	1 T/R	-	0.17	3.3	A	5	0.52	5.1	A	16
WB	1 L/T/R	-	0.13	5.9	A	6	0.18	7.7	A	10
NB	1 T/L & 1 T/R	-	0.26	5.9	A	11	0.53	10.3	A	22
SB	1 L/T/R	-	0.21	4.0	A	9	0.64	11.2	B	36
Overall			**0.19**	**5.3**	**A**	**-**	**0.44**	**9.2**	**A**	**-**
Poupart/Walmart Driveway - Unsignalized										
EB	1 L/R	-	0.03	9.3	A	1	0.30	18.7	A	9
NB	1 T & 1 T/L	-	0.14	0.0	A	0	0.18	0.0	A	0
SB	1 T & 1 T/R	-	0.07	0.0	A	0	0.20	0.0	A	0
Overall			**0.30**	**0.9**	**A**	**-**	**0.46**	**2.4**	**A**	**-**
Street 1/County Road 17 - Actuated-Uncoordinated Signal										
EBT	2 T	-	1.04	42.0	F	#465.6	2.47	679.2	F	#1569.0
EBR	1 R	-	0.78	8.7	C	104	1.55	267.8	F	#818.7

Dir.	Lanes	Storage Length (m)	AM Peak Hour				PM Peak Hour			
			v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
WBL	1 L	-	0.86	121.8	D	#21.0	0.24	17.2	A	4
WBT	2 T	-	1.95	446.9	F	#1171.5	1.50	247.7	F	#828.8
NBL	1 L	-	9.34	3770.8	F	#1057.5	7.73	3048.0	F	#880.5
NBR	1 R	-	0.04	55.3	A	6	0.18	62.5	A	18
Overall			**3.06**	**856.9**	**F**	**-**	**3.44**	**749.1**	**F**	**-**

Similar to the 2045 total projected conditions, Table 29 shows that with the planned network improvements and total projected 2055 traffic volumes, study area intersections are projected to continue operating with an excellent overall LOS ‘A’ with the exception of the Carmen Bergeron/County Road 17 and Street 1/County Road 17 intersections which are projected to operate over capacity with an overall LOS ‘F’ during both peak hours.

The critical movements which are operating over capacity with an LOS ‘F’ include:

Carmen Bergeron/County Road 17

- Eastbound through movement during both peak hours
- Eastbound right-turn movement during the afternoon peak hour
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

Street 1/County Road 17

- Eastbound through movement during both peak hours
- Westbound through movement during both peak hours
- Northbound left-turn movement during both peak hours

In terms of 95th percentile queues, the storage capacity is not exceeded.

4.0 Water Servicing

4.1 Concept Option 1

Water servicing for SSA1 was evaluated under existing and future conditions, both scenarios require the addition of three (3) water connections to the existing system at the following locations:

- One (1) connection to the existing 150 mm watermain at the easterly cul-de-sac on De La Baie Road
- One (1) connection to the existing 300 mm watermain at the western extent of Richelieu Street
- One (1) connection to the existing 300 mm watermain at the intersection of Richelieu Street and Poupart Road.

The recommended maximum and minimum pressure requirements found within Clarence-Rockland's Design Guidelines were followed for this assessment. The guidelines state that for the maximum day demand plus fire flow scenario, a minimum pressure of 140 kPa (20 psi) shall be maintained at all points within the distribution system. Note that these guidelines are based on the requirements found in the Ministry of the Environment, Design Guidelines for Drinking Water Systems (2008).

Domestic water demands (see Appendix I) were estimated using two approaches. The first approach was based on the number of employees (85 employees per hectare per the Water Master Plan prepared by Jacobs in 2023). The second approach used the standard 28,000 L/ha/day which was in accordance with the City of Clarence-Rockland's design guidelines for water distribution systems. Given the uncertainty with the number of employees, the latter approach was used for this study. This approach projected lower demands which more closely align with the demands estimated in the Master Plan. The estimated demands for average day, maximum day and peak hour conditions are summarized in Table 30.

Table 30: Option 1 Estimated Domestic Demands

Demand Scenario	Total Demands (L/s)
Average Day Demand	17.39
Maximum Day Demand	31.31
Peak Hour Demand	46.96

The required fire flow target for the subject lands was 283 L/s as shown in the Master Plan. At the detailed design stage, an engineer would need to carry out detailed fire flow calculations respective to their critical site area.

Boundary conditions for the existing water distribution system were provided by Jacobs (Appendix I) at the three (3) proposed connection locations listed above. It was understood from this information that the maximum available fire flow in the system was approximately 189 L/s. Boundary conditions were also provided for maximum day plus fire flows of 130 L/s and 175 L/s. The hydraulic boundary conditions were summarized in Table 31.

Table 31: Option 1 Hydraulic Boundary Conditions

Demand Scenario	De La Baie Connection (m)	Richelieu Connection 1 (m)	Richelieu Connection 2 (m)
Average Day Demand	95.72	95.73	95.73
Peak Hour Demand	95.17	95.22	95.26
Max Day + Fire Flow (130 L/s)	80.71	84.54	87.19
Max Day + Fire Flow (175 L/s)	70.75	77.22	81.83

The proposed water servicing for the lands was a 300 mm diameter watermain loop which connects to the existing system as discussed above. For modelling purposes, the inner diameter was input as 300 mm and assigned a roughness coefficient (C-factor) of 120.

A hydraulic water model within the WaterCAD® software platform was used to carry out a hydraulic network analysis for SSA1. The water demands and boundary conditions reported in Table 30 and Table 31 were inputted into the model for each demand scenario. The site is generally flat east to west (52 to 53 m elevation) with a rapid increase in elevation at the southeast corner of SSA1 (+/- 64 m elevation adjacent to Poupart Street). The simulation results for existing conditions and topography are as follows (see Appendix I for model schematics):

- Under average day demands, the pressures were found to range between 311 kPa (45 psi) and 420 kPa (61 psi) which was generally within the recommended pressure range per the design guidelines. The high elevation at the southeast corner of the site was expected to experience pressures below 350 kPa (51 psi).
- Under the maximum day plus fire flow scenario for a fire flow of 130 L/s, it was expected that the entire distribution system would be able to provide 130 L/s with pressures above 140 kPa (20 psi).
- Under the maximum day plus fire flow scenario for a fire flow of 175 L/s, it was expected that the entire distribution system would be able to provide 175 L/s except at the southeast corner of the site. Given the high elevations in this area, the expected fire flow was between 130 L/s and 175 L/s. It was noted that the existing system was not capable of supplying 283 L/s of fire flow to the subject lands. In the absence of modifications to the existing system, the remaining fire flow would need to be supplemented from other sources.
- Under peak hour demands, the minimum pressure within the lands was found to be 306 kPa (44 psi) which occurs at the highest model elevation (southeast corner). The remaining pressures in the distribution system were expected to exceed 275 kPa (40 psi) as recommended in the design guidelines.

Under future conditions, the required fire flow for the subject lands was 283 L/s as stated in the Master Plan. Boundary conditions for future conditions were not provided for this assessment as future system modifications are actively being assessed by Jacobs. Therefore, conceptual water servicing for SSA1 under future conditions cannot be confirmed at this time. However, a theoretical servicing assessment was carried out using the model whereby the hydraulic grade line (HGL) at each connection was calculated to provide 283 L/s to most of SSA1. It was assumed that the HGL at each connection was the same. Model results are included in Appendix I which show that an HGL of 79.50 m at each connection location was expected to provide a fire flow of 283 L/s to most of SSA1. It was noted the boundary conditions for future conditions will need to be reviewed and re-assessed following confirmation by Jacobs.

4.2 Concept Option 2

As was done for concept option 1, water servicing for SSA1 was evaluated under existing and future conditions. Three connections to the existing water distribution system were required to meet both scenarios. The following were the proposed connection locations:

- One connection to the existing 150 mm watermain at the easterly cul-de-sac on De La Baie Road
- One connection to the existing 300 mm watermain at the western extent of Richelieu Street
- One connection to the existing 300 mm watermain at the intersection of Richelieu Street and Poupart Road.

The recommended maximum and minimum pressure requirements found within the City of Clarence-Rockland's Design Guidelines were followed for this assessment. The guidelines also state that for the maximum day demand plus fire flow scenario, a minimum pressure of 140 kPa (20 psi) shall be maintained at all points within the distribution system. Note that these guidelines are based on the requirements found in the Ministry of the Environment, Design Guidelines for Drinking Water Systems (2008).

Domestic water demands (included in Appendix I) were estimated using two approaches. The first approach was based on the number of employees (85 employees per hectare per the Master Plan prepared by Jacobs in 2023). The second approach used the standard 28,000 L/ha/day which was in accordance with the City's design guidelines for water distribution systems. Given the uncertainty with the number of employees, the latter approach was used for this study. This approach also projected lower demands which more closely aligned with the demands estimated in the Master Plan. The estimated demands for average day, maximum day and peak hour conditions were summarized in Table 32.

Table 32: Option 3 Estimated Domestic Demands

Demand Scenario	Total Demands (L/s)
Average Day Demand	16.52
Maximum Day Demand	29.73
Peak Hour Demand	44.60

The required fire flow target for SSA1 was 283 L/s as shown in the Master Plan. At the detailed design stage, an engineer would need to carry out detailed fire flow calculations respective to their critical site area.

Boundary conditions for the existing water distribution system were provided by Jacobs (Appendix I) at the three proposed connection locations listed above. It was understood from this information that the maximum available fire flow in the system was approximately 189 L/s. Boundary conditions were also provided for maximum day plus fire flows of 130 L/s and 175 L/s. See the hydraulic boundary conditions summarized in Table 33.

Table 33: Option 3 Hydraulic Boundary Conditions

Demand Scenario	De La Baie Connection (m)	Richelieu Connection 1 (m)	Richelieu Connection 2 (m)
Average Day Demand	95.72	95.73	95.73
Peak Hour Demand	95.17	95.22	95.26

Demand Scenario	De La Baie Connection (m)	Richelieu Connection 1 (m)	Richelieu Connection 2 (m)
Max Day + Fire Flow (130 L/s)	80.71	84.54	87.19
Max Day + Fire Flow (175 L/s)	70.75	77.22	81.83

The proposed water servicing for the lands was a 300 mm diameter watermain loop which connects to the existing system as discussed above. For modelling purposes, the inner diameter was input as 300 mm and assigned a roughness coefficient (C-factor) of 120.

A hydraulic water model within the WaterCAD® software platform was used to carry out a hydraulic network analysis for SSA1. The water demands and boundary conditions reported in Table 32 and Table 33 were inputted into the model for each demand scenario. As mentioned previously the site is generally flat east to west with a rapid increase in elevation at the southeast corner. The simulation results for existing conditions and topography were as follows:

- Under average day demands, the pressures were found to range between 311 kPa (45 psi) and 420 kPa (61 psi) which was generally within the recommended pressure range per the design guidelines. The high elevation at the southeast corner of the site was expected to experience pressures below 350 kPa (51 psi).
- Under the maximum day plus fire flow scenario for a fire flow of 130 L/s, it was expected that the entire distribution system would be able to provide 130 L/s with pressures above 140 kPa (20 psi).
- Under the maximum day plus fire flow scenario for a fire flow of 175 L/s, it was expected that the entire distribution system would be able to provide 175 L/s except at the southeast corner of the site. Given the high elevations in this area, the expected fire flow was between 130 L/s and 175 L/s. It was noted that the existing system was not capable of supplying 283 L/s of fire flow to the subject lands. In the absence of modifications to the existing system, the remaining fire flow would need to be supplemented from other sources.
- Under peak hour demands, the minimum pressure within the lands was found to be 306 kPa (44 psi) which was located at the highest model elevation (southeast corner). The remaining pressures in the distribution system were expected to exceed 275 kPa (40 psi) as recommended in the design guidelines.

Under future conditions, the required fire flow for the subject lands was 283 L/s as stated in the Master Plan. Boundary conditions for future conditions were not provided for this assessment as future system modifications are actively being assessed by Jacobs. Therefore, conceptual water servicing for the subject lands under future conditions cannot be confirmed at this time. However, a theoretical servicing assessment was carried out using the model whereby the hydraulic grade line (HGL) at each connection was calculated to provide 283 L/s to the majority of the site. It was assumed that the HGL at each connection was the same. Model results were included in Appendix I which showed that an HGL of 79.50 m at each connection location was expected to provide a fire flow of 283 L/s to most of SSA1. It was noted the boundary conditions for future conditions will need to be reviewed and re-assessed following confirmation by Jacobs.

5.0 Sanitary Servicing

5.1 Concept Option 1

The sanitary system conditions for SSA1 were evaluated for future servicing. Based on the Wastewater Master Plan by Jacobs (2023) for the City of Clarence-Rockland, wastewater for SSA1 was designed to outlet to a pumping station (SPS-3) northeast of Laurier Street and Laporte Street (refer to Appendix J for excerpts).

The proposed wastewater system was evaluated in accordance with the City of Clarence-Rockland's Design Guidelines. The wastewater residential unit rate used was 350 L/persons/day and 28,000 L/gross ha for commercial development. Based on the design criteria and site constraints, the total design peak flow for the development was 51.30 L/s (conceptual sanitary sewer layout and design sheet included in Appendix J).

The existing topography of the lands is generally flat east to west (52 to 53 m elevation) with a rapid increase in elevation at the southeast corner of the lands (+/- 64 m elevation adjacent to Poupart Street). A combination of 200 mm and 300 mm diameter pipes were proposed to service SSA1, with the 300 mm diameter pipes required for the downstream portions of SSA1. The invert elevation downstream at the pumping station (SPS-3) was determined by ensuring pipes were sized to convey flows while maintaining a minimum of 1.8 m of cover at the upstream locations. The current sewer invert elevation at the pumping station was estimated to be 46.5 m, which was approximately 4 m below the ground surface near the pumping station. Invert elevations provided were high-level and would need to be further refined at the detailed design stage. It was anticipated that a combination of steeper slopes and drops would be designed towards the southeast corner of the site to reduce the sewer depth given the high elevations in this area.

It was noted that the design for SSA1 should adhere to the latest Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) for the City of Clarence-Rockland and associated design criteria.

5.2 Concept Option 3

The sanitary system conditions for SSA1 were evaluated for future servicing. Similarly to option 1, wastewater for these lands was designed to outlet to a SPS-3 northeast of Laurier Street and Laporte Street (refer to Appendix J for excerpts) based on the Wastewater Master Plan by Jacobs (2023).

The proposed wastewater system was evaluated in accordance with the Clarence-Rockland Design Guidelines. The wastewater residential unit rate used for the study was 350 L/persons/day and 28,000 L/gross ha for commercial development. Based on the design criteria and site constraints, the total design peak flow for the development was 51.30 L/s (conceptual sanitary sewer layout and design sheet included in Appendix J).

The proposed servicing for the area was 200 mm and 300 mm diameter pipes, with the 300 mm pipes required for the downstream portions of SSA1. The invert elevation downstream at the pumping station (SPS-3) was determined by ensuring the pipes were sized to convey flows while maintaining a minimum of 1.8 m of cover at the upstream locations. The current sewer invert elevation at the pumping station was estimated to be 46.5 m, which was approximately 4 m below the ground surface near the pumping station. Proposed invert elevations were high-level and require further refinement at the detailed design stage. As discussed previously, elevations increase rapidly in the southeast corner of the site, it was anticipated that a combination of steeper slopes and drops will be designed towards the southeast corner to reduce the sewer depth.

It was noted that the design for the lands should adhere to the latest Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) for Clarence Rockland and associated design criteria.

6.0 Storm Water

6.1 Concept Option 1

Storm servicing for SSA1 is required to be consistent with the latest version of the City of Clarence-Rockland's Design Guidelines Subdivisions and Site Plans as well as the latest Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) for the City of Clarence-Rockland and associated Design Criteria.

The proposed storm sewer servicing network was sized to accommodate the minor system, 1:5-year event, plus any upstream inflow as required. Business Park and Commercial lands should detain up to the 1:100-year event on site, while residential lands would convey major overland flow to the downstream stormwater management facilities.

Stormwater servicing proposed for concept option 1 used the existing outlets for SSA1. Existing outlet locations are the culvert under County Road 17, the drainage channels along De La Baie Road and collection of upstream drainage into the RONA Site.

Two wet ponds were proposed to provide water quality and quantity control to pre-development levels for the western portion of SSA1 and most of the central lands and would discharge to the culvert under County Road 17. An additional wet pond at the Richelieu Street connection would provide water quality and quantity control for the eastern portion of SSA1. A dry pond located at the southern end of the RONA site would provide quantity control for major system overland flow from the eastern residential area; the minor system from this area was intended to drain via the minor system to the Richelieu wet pond. See the Pond area overlay shown on Figure 2 for concept option 1. Note that the Pond overlay demonstrates the approximate location of the proposed storm water ponds only, the underlying land-use for each storm pond location is the land-use designation for the area. A summary of the proposed stormwater management facilities for option 1 can be seen in Table 34.

Table 34: Option 1 Proposed Storm Water Management Facilities

Pond	Type	Outlet	Drainage Area (ha) (1)	Block Area (ha)	1:00 yr Allowable Release (l/s)
1	Wet Pond	County Road 17 Culvert	11.1	0.8	64
2	Wet Pond	County Road 17 Culvert	21.2	1.4	119
3	Wet Pond	De La Baie Road	13.7	0.6	1628
4	Dry Pond	RONA Site	4.0	0.1	290

Note:
(1) Drainage Area only includes development area. External drainage areas were accounted for in pond sizing and can be seen in Appendix K.

The allowable release rates for the wet ponds to the County Road 17 Culvert were pro-rated based on the contributing drainage areas and the overall pre-development flow rate to the culvert. This accounted for existing upstream drainage areas which would be conveyed via the open space lands. The flow rate to De La Baie Road was set to the pre-development release rate and assumes that upstream flows would be captured uncontrolled into the proposed storm sewer servicing. The dry pond discharges above the 1:5-year event to the existing drainage ditch at the 1:5-year design event for the ditch.

Pond sizing would be subject to change following a hydrogeological water balance assessment for the lands which will identify recharge requirements based on the ECA CLI. This may include providing recharge to meet pre-development conditions on the property or, if site constraints prevent recharge, controlling the runoff from the 90th percentile storm event. Other CLI ECA requirements related to water quality, erosion control, water quantity and flood control will also have to be met.

6.2 Concept Option 3

Storm servicing for SSA1 is required to be consistent with the latest version of the City of Clarence-Rockland's Design Guidelines Subdivisions and Site Plans as well as the latest Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA) for the City of Clarence-Rockland and associated Design Criteria.

The storm sewer servicing network should be sized to accommodate the minor system, 1:5-year event, plus any upstream inflow as required. Business Park and Commercial lands should detain up to the 1:100-year event on site, while residential lands would convey major overland flow to the downstream stormwater management facilities.

Stormwater servicing proposed for option 3 used the existing outlets for the lands. Existing outlets include the culvert under County Road 17, the drainage channels along De La Baie Road and collection of upstream drainage into the RONA Site.

Two wet ponds would provide water quality and quantity control to pre-development levels for the western portion of SSA1, across the central area of the site up to street 4 and would discharge to the culvert under County Road 17. A wet pond at the Richelieu Street connection would provide water quality and quantity control for the eastern portion of the site. A dry pond located at the southern end of the RONA site would provide quantity control for major system overland flow from the eastern residential area, the minor system from this area was intended to drain via the minor system to the Richelieu wet pond. See the Pond overlay shown on Figure 4 for concept option 3. Note that the Pond overlay demonstrates the approximate location of the proposed storm water ponds only, the underlying land-use for each storm pond location is the land-use designation for the area. A list of the proposed stormwater management facilities can be seen in Table 35.

Table 35: Option 3 Proposed Stormwater Management Facilities

Pond	Type	Outlet	Drainage Area (ha) (1)	Block Area (ha)	1:00 yr Allowable Release (l/s)
1	Wet Pond	County Road 17 Culvert	11.1	0.8	64
2	Wet Pond	County Road 17 Culvert	19.8	1.3	119
3	Wet Pond	De La Baie Road	15.2	0.6	1628
4	Dry Pond	RONA Site	3.8	0.1	290

Note:
(1) Drainage Area only included development area. External drainage areas were accounted for in pond sizing and can be seen in Appendix K.

The allowable release rates for the wet ponds to the County Road 17 Culvert were pro-rated based on the contributing drainage areas and the overall pre-development flow rate to the culvert. This approach accounted for existing upstream drainage areas which would be conveyed via the open space lands. The flow rate to De La Baie Road was set to the pre-development release rate and assumed that upstream flows would be captured uncontrolled into the proposed storm sewer servicing. The dry pond discharges above the 1:5-year event to the existing drainage ditch at the 1:5-year design event for the ditch.

Pond sizing may change following the hydrogeological water balance assessment for SSA1 which would identify recharge requirements based on the ECA CLI. This could include providing recharge to meet pre-development conditions on the property or, if site constraints prevent recharge, then controlling the runoff from the 90^{th} percentile storm event. Other CLI ECA requirements related to water quality, erosion control, water quantity and flood control would also have to be met.

7.0 Evaluation of Detailed Solution

7.1 Evaluation of Concept Options

The evaluation process consisted of a review of the short-listed land-use solutions in consideration of the criteria described in Table 36 and followed the evaluation and selection methodology described previously in Section 2.1.

Table 36: Summary of Evaluation Criteria

Criteria	Description
Natural Environment Considerations	Natural features, natural heritage areas, Areas of Natural and Significant Interest, designated natural areas, watercourses and aquatic habitat
Social and Cultural Environment Considerations	Proximity of facilities to residential, commercial and institutions, archeological and cultural features, designated heritage features, well or wellhead protection areas, land-use and planning designations
Technical Feasibility	Constructability, maintaining or enhancing water quality, reliability and security of drinking water system, ease of connection to existing infrastructure and operating and maintenance requirements, addresses aging infrastructure, expandability
Financial Considerations	Capital costs, Operation and Maintenance costs

The relative impact for each criterion to each potential solution was assessed based on whether the alternative was 'Preferred', 'Less Preferred', 'Least Preferred' or 'Not Feasible' with respect to that criterion. The four (4) evaluation criteria were assigned equal weights as they were considered to have equal importance in this evaluation at the EA stage. See the completed evaluation matrix in Table 37 below.

Table 37: Evaluation Matrix

	Option 1	Option 3
Natural Environment	• Greater waste generation and air and noise pollution (due to higher populations) • Minimal potential impact to natural heritage environment • Inclusion of environmental and open space overlay	• Minimal potential impact to natural heritage environment • Inclusion of environmental and open space overlay
Evaluation	**Less Preferred**	**Preferred**
Social and Cultural Environment	• Highest increase in traffic through Study Area • Inclusion of pedestrian friendly commercial main corridor (lesser demand land use)	• Greatest increase in highest-demand business park area
Evaluation	**Less Preferred**	**Preferred**
Technical Feasibility	• Three (3) water connections to existing distribution system • Expected max day water demand plus fire flow that the existing distribution system could accomplish was less than required target • Residential areas require dual drainage with minor system and major overland flow system for storm water • Business Park and Commercial areas would release to the minor system and detain the 1:100 year on-site • Four (4) stormwater ponds required • Single-lane roundabouts to manage traffic at all intersections except street 1/street 2 • Two-lane intersection to manage projected traffic at street 1/street 2	• Three (3) water connections to existing distribution system • Expected max day water demand plus fire flow that the existing distribution system could accomplish was less than required target • Residential areas require dual drainage with minor system and major overland flow system for storm water • Business Park and Commercial areas would release to the minor system and detain the 1:100 year on-site • Four (4) stormwater ponds required • Single-lane roundabouts to manage traffic at all intersections
Evaluation	**Less Preferred**	**Preferred**
Financial Considerations	• Increase in economic activity in region • High servicing and transit network capital cost	• Increase in economic activity in region • High servicing and transit network capital cost
Evaluation	**Less Preferred**	**Less Preferred**
Overall Evaluation	**Less Preferred**	**Preferred**

As per the matrix, option 3 was the preferred Secondary Plan land use concept option. This solution provides a large amount of business park area to increase and support industrial activity in the region, while providing a diverse mix of land uses to aid future development in the City of Clarence-Rockland.

The servicing solutions between options 1 and 3 had only marginal differences and hence the concept options had similar capital costs and technical challenges. A technical challenge that was found to be present for both concept options was the poor level of service projected for the Carmen Bergeron/County Road 17 intersection based on the transportation analysis findings. Further discussion and recommendations for this challenge have been provided in Section 7.2.

Both concept options have minimal potential impacts to the natural environment and had congruent environmental and open space overlays. While option 1 and 3 performed the same with respect to the Natural Environment Considerations, Technical Feasibility, and Financial Considerations, option 3 performed better in Social and Cultural Environment Considerations as it more closely aligned to the needs of the community and the vision of the City by providing more business park land use area. Hence option 3 was the preferred solution for the Secondary Plan.

7.2 Transportation Findings and Recommendations

Upon the completion of the transportation analysis for SSA1, the following transportation findings and recommendations are offered with respect to both conception option 1 and 3:

- Existing intersections are currently operating with acceptable Levels of Service during both weekday morning and afternoon peak hours. However, with the infill of background developments, Carmen Bergeron/County Road 17 is projected to operate over capacity.
- Based on the preferred Concept Plan (Option 3), full build-out is projected to generate new two-way vehicle volumes of 1,154 veh/h and 1,083 veh/h during weekday morning and afternoon peak hours, respectively.
- New site-generated trips from the SSA1 are not anticipated to cause significant impact on the existing and planned roadway network.

Potential mitigation measures to improve capacity or reduce travel demand on County Road 17 have yet to be developed and are beyond the scope of this report.

As new development occurs, it is expected that further operational analysis and be conducted at the development application level for each land use in the form of traffic impact studies to provide more detailed assessments of intersections within the study area and develop necessary transportation network measures.

8.0 Public and Stakeholder Consultation

Effective consultation was key to successful environmental assessment planning. Through an effective consultation program, the proponent can generate meaningful dialogue between project planners and stakeholders.

8.1 Stakeholder Consultation

A Notice of Study Commencement was issued on December 10th, 2021 and a meeting with the RWSP area landowners took place on December 22nd, 2021 (see Notice and presentation slides in Appendix L). The meeting introduced SSA1, explained the MCEA and the Planning Act processes and allowed landowners to ask questions about the processes and approvals. The meeting and subsequent meetings were posted on the City's website. A second meeting with SSA1 landowners occurred on April 7th, 2022 (see presentation slides in Appendix L) to present the Shore-Tanner Market Study findings and an initial evaluation on the development potential of SSA1.

A Notice of Public Meeting was issued for a public meeting held on May 4th, 2022. The Shore-Tanner market study summary completed for the Secondary plan was also included on the notice and posted on the City's website. See the link to the summary and Notice below, and see the Notice in Appendix L.
www.clarence-rockland.com/en/hotel-de-ville/Plan_Secondaire___Ouest_de_Rockland.aspx

8.2 Public Information Centre

A Public Information Centre (PIC) was held on December 5th, 2023, to discuss the Phase 1 and Phase 2 Secondary Plan Class EA findings. The PIC allowed for open discussions with the attendees on the project, including the presentation of the proposed preferred servicing solution. In advance of the PIC, a PIC Notice was posted on the City's website. See the link to the Notice below, and the PIC Notice and presentation slides in Appendix M.
https://www.clarence-rockland.com/en/nouvelles/Avis_de_centre_d_information_du_public_.aspx

Comments received during and following the PIC have been summarized in Table 38.

Table 38: Summary of PIC Comments

Stakeholder(s)	Comment[1]	Action
Landowner (2)	Expressed concerns and questions on the environmental overlay and how this would impact their land.	JLR and the City clarified during the PIC that the land was identified to have an environmental concern but would still be designated as Business Park with an overlay requiring further study such as an Environmental Impact Study at time of development. The natural heritage features were derived from available information including the United Counties of Prescott Official Plan and their mapping.

Stakeholder(s)	Comment[1]	Action
Landowner (3)	Expressed concern with the desktop Environmental Study completed. Individuals suggested a field study would have been more comprehensive.	JLR clarified during the PIC that a field investigation was not within the scope of the project and waterways on concept figures align with the Counties Official Plan and/or GIS data.
Landowners (3+)	Questions were received on the timing of the Secondary Plan, and on the overall development.	The City and JLR responded during the PIC that timing may vary as after report finalization, the UCPR will have a 6-month review window. For development, the final ultimate solution timing is unknown but will be greater than 10 years.
City Resident	Expressed preference for the commercial core, concept option 1, as it offers more diversity of land-use for the City.	Considered in evaluation.
Landowner	Expressed preference for the commercial core, concept option 1, as it would attract more people.	Considered in evaluation.
Landowners (2)	Expressed preference for the large business park area, concept option 3, as it is simpler.	Considered in evaluation.
Landowner (written response following PIC)	Watercourse data is incorrect, the north/south waterway shown in the land-use figures is not a waterway but a ditch that is not water filled for most of the year. Land should not be zoned environmental overlay.	Land under the environmental overlay is designated according to the underlying land use zone. This does not prevent the land from being developed. The watercourse location is in alignment with the UCPR Official Plan and their latest GIS data and the land was identified as having potential to be fish habitat according to the desktop environmental study. At the time of detailed design, further field studies will confirm presence of waterways and species.
Landowner (written response following PIC)	There is no access to a portion of our properties in the south of the proposed SSA1 area, creating a landlocked situation for the bigger portion of our properties. There should be a road that goes north-south up the ridge and another road going east-west to maintain access to the whole of the properties.	Roads were revised to incorporate a minor collector extending to the ridge on the southern edge of SSA1. It is also noted that roads in the Secondary Plan Phase 2 report only include major roadways to service the overall area. Small roads/driveways will be built off the major roadways that are not dictated on the land-use plans. This

Stakeholder(s)	Comment[1]	Action
	Expressed preference for option 1 as it zones the north part of the property as high-density residential and it is thought that this will attract more developers. The north/south minor collector is better situated in option 3 than option 1 as it services more properties to be developed.	will be established during detailed design. Option 3 allows for both medium and high-density residential development, this has been clarified within the report body following comment. Preference was noted and considered in evaluation.

Notes:
(1) Comments have been summarized from in-person conversations that took place during the PIC and written comments that were provided to the project team following the PIC.

8.3 Indigenous Communities

The following Indigenous communities were consulted during the MCEA Master planning process:
- Algonquins of Ontario
- Algonquins of Pikwàkanagàn First Nation
- Kitigan Zibi Anishnabeg First Nation

These communities were recommended for consultation by the MECP due to their proximity to the subject site, and the nature of the project in the case of Kitigan Zibi Anishnabeg First Nation as the project included stormwater projects with the potential to impact the Ottawa River.

These communities were contacted directly during Phase 2 to review the study findings and to offer comments and input on the recommendations. No comments were received during Phase 2 consultation. The Notice of Completion was also circulated directly to these communities to inform them of the completion of the planning process and of the initiation of the 30-day review period.

9.0 Project Description

This section provides a high-level description of the proposed project phasing, project impacts, and permit and approval requirements.

9.1 Project Overview

As identified in Section 7.0 concept option 3 was recommended as the preferred solution for the Secondary Plan. Generally, this solution would consist of the following infrastructure developments:

- Water distribution system composed of 300 mm watermain loop with connections to the existing water distribution system at the following three locations:
  - 150 mm watermain at the easterly cul-de-sac on De La Baie Road
  - 300 mm watermain at the western extent of Richelieu Street
  - 300 mm watermain at the intersection of Richelieu Street and Poupart Road
- Sanitary collection system composed of 200 mm and 300 mm diameter sewers connecting to SPS-3 located northeast of Laurier Street and Laporte Street
- Four stormwater ponds including (see approximate locations in **Figure 2**, pond size and locations are subject to modifications during detailed design):
  - Two wet ponds on either side of street 1 to the northwest of SSA1
  - One wet pond at the Richelieu Street connection
  - One dry pond at the southern end of the RONA site
- Construction of streets 1, 2, 3 and 4 with intersections to the existing Highway 17, Poupart Road, Richelieu Street, and interior intersections

See Sections 3.10, 4.2, 5.2, and 6.2 for detailed analysis and specifications for the proposed solution.

9.2 Project Phasing

It was proposed that SSA1 be developed in two phases to ultimately reach the preferred concept option. In Phase 1, all roads and infrastructure north of, and including, street 2 (the west/east minor collector) would be constructed, see the dotted hatched area representing Phase 1 in Figure 20. This would include water (all three proposed water connections) and sanitary servicing, and transit network construction as per Sections 3.10, 4.2, and 5.2. All storm water ponds would be constructed to full capacity in Phase 1 as per Section 6.2. Following the completion of Phase 1, businesses could begin to populate SSA1 prior to the complete development of SSA1. To allow construction for water servicing, all roads included in this area would be required to be constructed first - watermains would then be constructed to follow the road network. In Phase 1 the sanitary sewer connection would also be made to the identified pumping station (SPS-3) northeast of Laurier Street and Laporte Street as per Section 5.2.

Phase 2 of development would consist of constructing all the remaining roads and infrastructure south of the proposed street 2, see the diagonal-line hatched area representing Phase 2 in Figure 20, beginning with the proposed roads. Watermains and sewers would then be constructed to follow the roads and as described in Sections 4.2 and 5.2. Note, no stormwater infrastructure or water connections to the existing system would be included Phase 2.

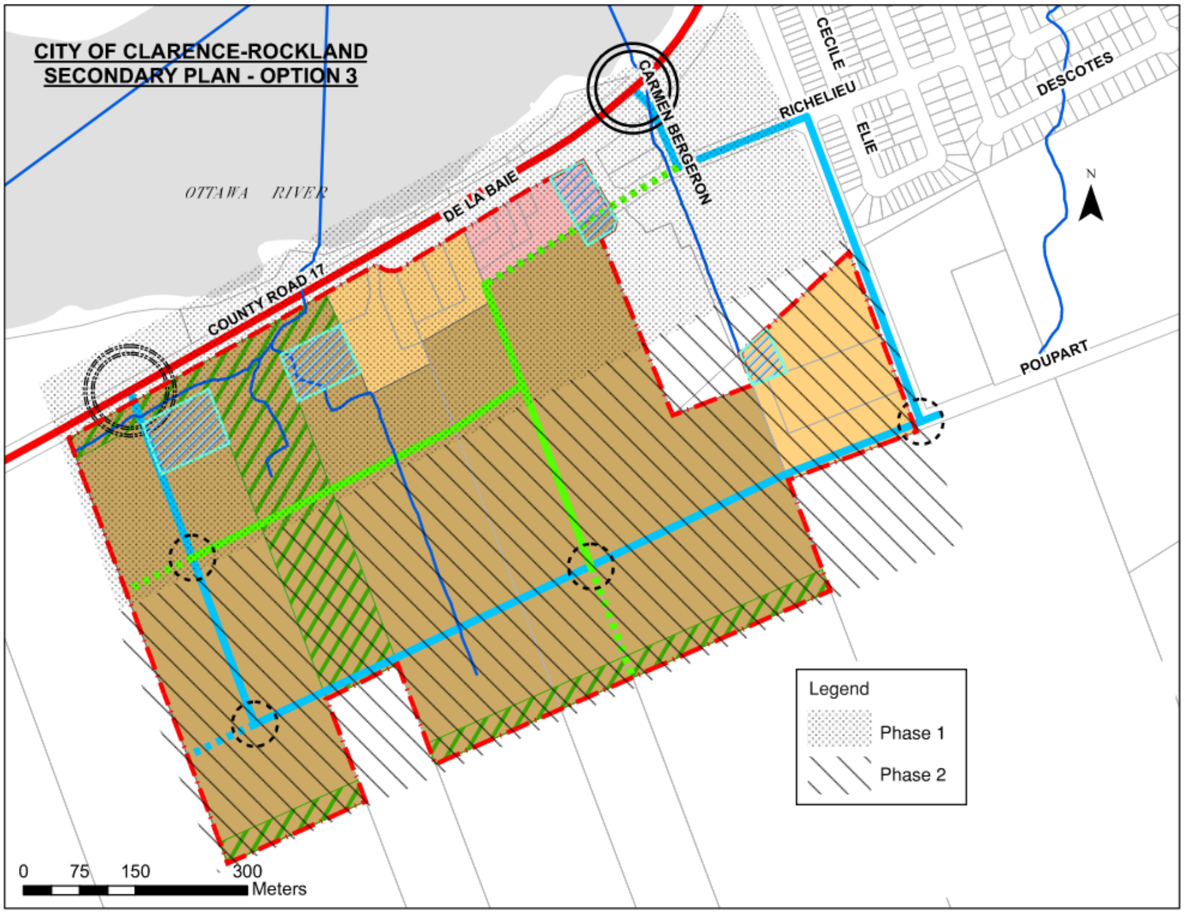

Figure 20: Phasing of Preferred Solution

Each phase of construction would be further broken down into individual projects for the water servicing, sanitary servicing, stormwater, and individual road construction. Each project would consist of the following stages: preliminary design, detailed design, finalize contract drawings and specifications, approvals, tender and contract award, and construction.

9.3 Impacts on the Natural, Social and Economic Environments

Construction and operation of the proposed works would lead to potential impacts, both positive and negative, upon the natural, social, and economic environments. The following section summarizes potential impacts and presents proposed mitigating measures to reduce any negative impacts.

Natural Heritage Environment

The Bowfin Environmental Study of the SSA1 found that the area does not contain any of the following natural heritage features:

- Provincially significant wetlands
- Unevaluated wetlands
- Coastal wetlands

- Valleylands
- Identified significant wildlife habitat
- Significant woodlands
- Areas of National and Scientific Interest

Hence there was determined to be minimal potential negative impact to natural heritage environment. There is a watercourse in SSA1 and negative impacts to the watercourse and subsequently the fish habitat could be mitigated by incorporating a development setback and landscaping interventions. Additionally, there are two large cultural forests which have the potential to be negatively impacted. A protected buffer could be made surrounding Endangered or Threatened species, including the Butternut tree, to mitigate negative impacts to forests. The application of these and all recommendations made in the Bowfin Environmental Assessment should be enacted.

It was noted that SSA1 does not fall within a source water protection vulnerable area. A portion of the area is classified as an Intake Protection Zone 2, which presents a lower degree of risk to the local drinking water supply. A geotechnical and hydrogeological study of the area is recommended to confirm risks associated with drinking water protection in the region at time of development.

Engineering and Technical Consideration

The current water distribution system for the City of Rockland-Clarence does not extend past Richelieu to the SSA1, hence the proposed solution would provide water to a greater number of potential businesses and residents within SSA1 following development. The fire flows achievable in SSA1 were found to be below the target required fire flows. Further investigation would be required to investigate alternatives for increasing fire flow in SSA1 (for example alternatives may include constructing reservoirs on individual properties within SSA1 or connecting to storm water ponds).

Traffic would increase through SSA1 as a result of more employment and residential opportunities. This would be managed with the construction of appropriate intersections discussed in Section 3.10. Single lane roundabouts were selected to minimize congestion through the region. As mentioned, the LOS for intersections with County Road 17 are expected to decrease over the development horizon, traffic originating from SSA1 is expected to contribute minimally to the overall traffic from County Road 17. Recommendations have been provided in Section 7.2 to mitigate negative traffic impacts.

Social/Community Well Being

Other than minor short-term negative impacts due to the noise and activity of construction, the social environment would be positively impacted by the proposed upgrades because of the increased access to water and sanitary servicing in SSA1, and the corresponding increase in commerce. SSA1 is currently not accessible to the community for commerce or dwelling due to zoning and servicing limitations, incorporating infrastructure for servicing and rezoning lands would invite businesses and residents to the area to further build out the community in the region.

Current landowners were included in the planning process; they may face negative impacts particularly during construction. The noise from construction could be mitigated via limiting the operation hours of noisy machinery and providing advance notice to the neighboring property owners. The reduced air quality could be mitigated by promoting offsite manufacturing and onsite assembling practices. Construction vehicles could be hosed down prior to leaving the site to reduce mud carry over onto the streets. The City should work with landowners throughout the development process and inform them of all upcoming works.

Economic Environment

The initial economic environment would be impacted negatively with the capital investment required to undertake the proposed construction. Long-term, the economic environment for residents of the City of Rockland-Clarence would be positively impacted as there would be more economic activity in the region through the development of the SSA1 as concluded by the Shore-Tanner Market Study.

9.4 Permits and Approvals

A number of approvals would be required prior to implementing the proposed works. These may include:

- Amendments to the Drinking Water Works Permit and Municipal Drinking Water License from the Ministry of the Environment, Conservation and Parks (MECP)
- Environmental Activity Sector Registry or Permit to Take Water for Construction dewatering from the MECP, if required
- Rezoning, Subdivision and Site Plan approval from the Municipality
- Building Permit from the Municipality
- Electrical Safety Authority (ESA) Permit
- Screening of the project in accordance with the requirements of the *Canadian Environmental Assessment Act*, should any Federal approvals be required or should funding be provided by the Federal Government for this project.

10.0 References

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Appendix A

Phase 1 Report

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City of Clarence-Rockland

Schedule B Municipal Class Environmental Assessment for Rockland West Secondary Plan – Phase 1 Report

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

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1.0 Introduction

1.1 Background

The Rockland West Secondary Plan area was identified for development during the 2015 United Counties Official Plan review. The review identified a localized shortage of industrial land supply in the City of Clarence-Rockland (the City) and resulted in a boundary expansion for the addition of approximately 41.1 ha of development land to the Rockland urban area.

Starting with a Notice of Commencement and landowners meeting, the City initiated the Rockland West Secondary Plan (RWSP) in December 2021 to establish a policy framework for the lands; to provide the basis for future development; and to ensure the efficient use of the land and infrastructure. Planning Act and Municipal Class Environmental Assessment (EA) processes are required to implement the Rockland West Secondary Plan.

As part of the Municipal Class EA process, meetings were held with landowners in the RWSP area on December 22, 2021 and April 7, 2022. These meetings provided landowners with an opportunity to provide input on the process and any findings from the supporting studies, which included:

- the market study by Shore-Tanner & Associates;
- environmental report by Bowfin Environmental Consulting; and
- the existing conditions report as part of Phase 1 of the EA process.

On April 20th 2022, staff presented the findings of the various studies and recommended a list of land uses for the RWSP lands.

Consultation with the UCPR during the drafting of their new OP informed a boundary change for the RWSP lands on July 8th, 2023. The changes resulted in a boundary limit that acknowledges the existing lot fabric, the bottom of the ridge, wooded areas, and the existing and continued use of parcels for farming. The boundary change added 13.5 hectares of land for a total land area of approximately 54.6 ha. Figure 1 shows the previous RWSP lands boundary outlined in black, and the current boundary outlined in dashed-red.

Figure 1: Map of the Secondary Plan Lands Boundaries

The RWSP area is currently designated “Urban Policy Area” in the United Counties of Prescott and Russell (UCPR) Official Plan and “Special Study Area 1” in the Official Plan of the Urban Area of the City of Clarence-Rockland. The lands are currently zoned “Special Study Area 1 (SSA1)” pursuant to Zoning By-law 2016-10. For the remainder of the Phase 1 report this area will be referred to as SSA1.

The RWSP is a new Secondary Plan that will be added to Section 8 of the Official Plan of the Urban Area for the City of Clarence-Rockland. The RWSP will provide area-specific policy direction to guide development within the RWSP area over the next 20+ years and ensures that future growth occurs in an efficient, orderly, and sustainable manner.

1.2 Phase 1 Report Objectives

The Phase 1 Report was prepared to summarize the findings from the first phase of the Master Plan process and to use as a basis for the identification and evaluation of alternative options during Phase 2.

Specifically, the Phase 1 Report has been prepared to address the following key aspects:

- To provide an overview of the Municipal Class EA process and the specific Master Plan process being followed for the Rockland West Secondary Plan;
- To outline the land use planning context to support the identification and assessment of the alternative solutions;
- To outline legislative framework related to transportation and servicing requirements;

- To establish the existing watermains, sanitary sewers, and stormwater infrastructure in the vicinity of the SSA1;
- To analyze transportation and transit networks in the SSA1 to support the development of alternative solutions;
- To complete an initial evaluation of alternative solutions and short list two to be carried forward for detailed evaluation in Phase 2;
- To develop a Problem and Opportunity Statement; and
- To confirm Phase 2 methodology and next steps.

1.3 SSA1 Overview

As shown in Figure 1, the SSA1 comprises a single irregularly shaped parcel of land. The land is situated between County Road No. 17 to the north, Part of Lots 33 and 34, Concession 1 to the west, the proposed major collector road to the south, and a portion of Part of Lot 32, Concession 1 to the east. Currently, the lands within the SSA1 are used primarily for agricultural uses and several dwellings are present along de la Baie Road on the south side of County Road No. 17.

Figure 2 depicts the current land-use designation for the Secondary Plan lands and the surrounding area. The RWSP land is currently designated as a Special Study Area, with designated service commercial land on the eastern boundary of the area.

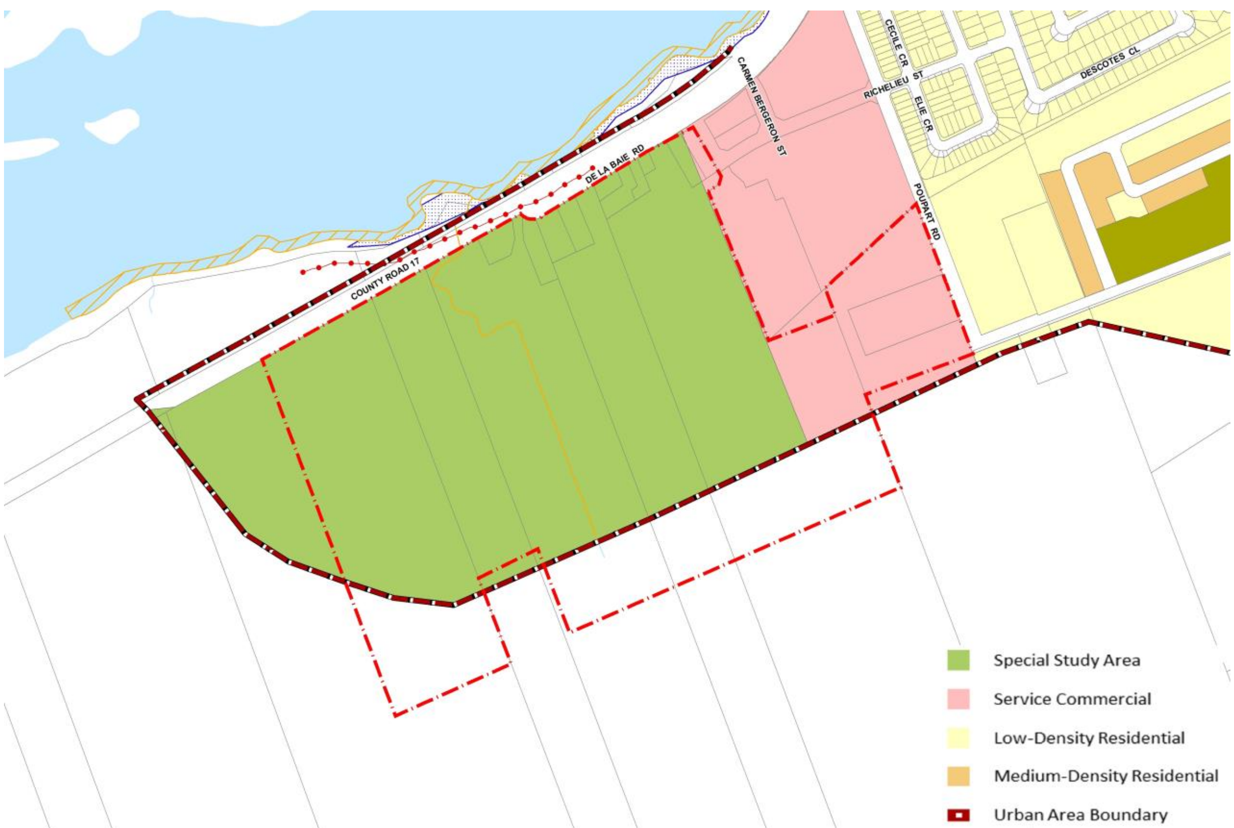

Figure 2: Current Land-use Designations of Secondary Plan Lands

1.4 Class Environmental Assessment Process

The Ontario Environmental Assessment Act (EA Act), enacted in 1976, formally recognizes the Municipal Class Environmental Assessment (Class EA) process and outlines requirements for EA approval. The Municipal Class EA applies to municipal infrastructure projects, including roads, water, and wastewater projects. To ensure that environmental impacts and effects are considered for each project per the EA Act, proponents are required to generally follow the planning process set out in the Municipal Class EA Guidelines, prepared by the Municipal Engineers Association (MEA) (2015) (www.municipalclassea.ca). The Class EA process includes the following stages:

Phase 1: Problem and opportunity identification.

Phase 2: Identification and evaluation of alternative solutions to determine a preferred solution to the problem or opportunity. This Phase also compiles an environmental 'inventory', identifies impacts, and outlines mitigation measures.

Phase 3: Identification and evaluation of design concepts for the preferred solution. A detailed evaluation of the environmental effects and mitigation measures will be addressed during this project Phase.

Phase 4: Complete and place Environmental Study Report on Public Record. The Report will document Phases 1 through 3 and summarize the consultation undertaken throughout the planning process and is considered valid for a 10 year period.

Phase 5: Implementation and monitoring.

Since projects may vary in their environmental impact, they are classified in terms of the following schedules:

- Schedule 'A' projects usually have minimal environmental effects and generally include normal or emergency operational and maintenance activities. These projects are pre-approved under the Class EA planning process. Projects within this category are subject to Phases 1 and 5.

- Schedule 'A+' projects are pre-approved projects similar to Schedule 'A', however, the public is to be advised prior to project implementation.

- Schedule 'B' projects have potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with affected parties. Generally, these projects include improvements and minor expansions to existing facilities. Projects within this category are subject to Phases 1, 2 and 5.

- Schedule 'C' projects have potential for greater environmental impacts and are subject to all five Class EA Phases. Generally, these projects include the construction of new facilities and major expansions to existing facilities.

1.5 Evaluation and Selection Methodology

To facilitate the evaluation and selection of the preferred solution during Phase 2, a transparent and logical three-part assessment process was established. This process includes:

1. Initial screening of alternative solutions;
2. Detailed evaluation of screened alternatives; and
3. Selection of a preferred alternative.

The first evaluation stage considers the overall feasibility of the potential solutions and identifies those alternatives that fully address the problem statement. This was completed as part of Phase 1. This step ensures that unrealistic alternatives are not carried forward to detailed evaluation. Based on the initial screening, a detailed assessment of the short-listed alternatives will be conducted. Evaluation criteria were developed based on a review of the background information, experience on similar assessments, and in consultation with City staff. The initial evaluation was conducted using criterion in the following four major criteria categories:

- Natural Environment and Archaeology
- Social and Community Well Being
- Engineering and Technical Considerations
- Financial Impacts

In Phase 2 a final preferred solution will be selected and presented to stakeholders to solicit input before finalizing.

1.6 Secondary Plan

The Rockland West Secondary Plan (RWSP) is a land use planning policy tool that will be adopted by the City of Clarence-Rockland's Council under authority of Section 16 of the Planning Act. The purpose of this Secondary Plan is to provide area-specific policy direction to guide development within these lands over the next 20+ years.

The RWSP area was identified for development during the 2015 United Counties of Prescott and Russell (UCPR) Official Plan. The review identified a localized shortage of industrial land supply in the City of Clarence-Rockland and to address the shortage, added approximately 54.6 ha of land to the Rockland Urban Policy Area. Following the addition of the lands to the Urban Policy Area designation, the City of Clarence-Rockland designated and rezoned these lands to "Special Study Area (SSA1)".

The intent of the Special Study Area designation and zone is to allow for further study to support the development of a Secondary Plan to provide land use policies and direction. In the interim, existing uses are permitted to continue, but no new uses are permitted.

1.6.1 Visioning

The RWSP is a logical destination to accommodate economic growth in the City of Clarence-Rockland over the next 20+ years while protecting and enhancing the natural character and established cultural forests that define this area. While residential development is flourishing throughout the City of Clarence-Rockland, commercial and industrial development has lagged.

The SSA1 location is prime for business park, commercial, light industrial, and tourism uses that may not be compatible with the City's existing residential communities or appropriate for the rural context. At the western edge of the City's urban boundary, the SSA1 lands are a logical gateway to the urban area where uses should be geared to visitors to the City. The lands must be planned and designed carefully to reinforce the established identity of the City as a whole.

The intent of the RWSP is to ensure all future development in Rockland West achieves a unified vision of a clean business park that attracts the highest order of employment uses and establishes a remarkable gateway to the City.

2.0 Planning Framework

2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) provides policy direction on matters of provincial interest related to land use planning and development. Municipalities are required to "be consistent with" the PPS with respect to any planning decisions. One of the directions includes long-term prosperity:

1.7.1 Long-term economic prosperity should be supported by:

- *a) promoting opportunities for economic development and community investment-readiness;*
- *c) optimizing the long-term availability and use of land, resources, infrastructure and public service facilities;*
- *d) maintaining and, where possible, enhancing the vitality and viability of downtowns and mainstreets;*
- *e) encouraging a sense of place, by promoting well-designed built form and cultural planning, and by conserving features that help define character, including built heritage resources and cultural heritage landscapes;*
- *g) providing for an efficient, cost-effective, reliable multimodal transportation system that is integrated with adjacent systems and those of other jurisdictions, and is appropriate to address projected needs to support the movement of goods and people;*
- *h) providing opportunities for sustainable tourism development;*
- *j) promoting energy conservation and providing opportunities for increased energy supply;*

2.2 United Counties of Prescott and Russell Official Plan, July 2023

The Urban Policy Area designation of the UCPR Official Plan applies to cities, towns, and villages with populations of 1,000 or more and which have been developed primarily on the basis of municipal water and sewer systems. The Urban Policy Area is intended to accommodate a significant portion of future employment growth in the United Counties.

2.3 Clarence- Rockland Official Plan

The City of Rockland Official Plan directs the future development of the Urban Area of the City of Clarence-Rockland to 2033. Through the RWSP, a section of the lands will be brought into the urban boundary and the Secondary Plan will be incorporated into the Official Plan.

One of the goals of the Official Plan of the Urban Area of Clarence-Rockland is to proactively encourage economic growth and development. Through the development of the City's Economic Development Strategy, it was identified that there is a lack of commercial and industrial development found in the City.

2.4 Clarence-Rockland Zoning By-law 2016-10

The RWSP land is zoned Special Study Area (SSA) Zone. The intent of the zone is to preserve land for development or redevelopment in accordance with the results and recommendations of a Secondary Plan. Currently, the only permitted uses in the SSA Zone are those which were in existence on the date of passing of the By-law and any other uses may be authorized by Committee of Adjustment or City Council under the provision of the Planning Act.

2.5 Multi-Modal Transportation Master Plan

This Multi-Modal Transportation Master Plan 2019 (MTMP) is a long-range strategic plan for the entirety of Clarence-Rockland that identifies transportation infrastructure requirements to address existing challenges and support growth, along with policies to guide transportation and land use decisions.

The MTMP has identified the roadway extension west of Poupart Road to connect with County Road 17. The alignment and design of this extension will be determined through this secondary plan. The MTMP also indicates that this road extension should include a continuation of the planned multi-use and pedestrian pathways on Poupart Road. Just outside the RWSP area, the MTMP also identifies the four way stop intersections at Richelieu Street at Carmen Bergeron Street and at Poupart Road as requiring updates to accommodate additional traffic by 2031.

3.0 Market and Environmental Studies

3.1 Shore-Tanner & Associates Market Study

To determine the desired land uses for the SSA1, the RFP for the RWSP required a Market Study to be completed by Shore-Tanner & Associates. The purpose of this Market Study was to determine the scope of market demand for retail, office and industrial businesses for the subject lands. The Final Market Study is provided in Appendix A.

The major findings of the study include:

- The effects of land prices for industrial lands in Ottawa will only direct businesses to more affordable land options in nearby urban centres, such as the City of Clarence-Rockland, where urban growth will need to be supported by a variety of industries, especially knowledge-based and innovative businesses.
- Industrial businesses, which are less compatible with sensitive land use and rely on efficient business logistics and transport, are most suitable for the subject lands due to its location at the edge (within) the urban area and its proximity to County Road 17.
- Many Clarence-Rockland residents still work in Ottawa, due to the range of employment opportunities found there. Subsequently, Clarence-Rockland residents spend a lot of money at Ottawa retailers. By creating more land for employment use (e.g. business park, office, innovation), residents will be encouraged to work and spend in Clarence-Rockland. The addition of "employment uses" will also create more demand for additional retail uses, which is already on the rise as per Shore-Tanner's Market Study. These uses are normally "considered" complementary to business park uses and will not complete with the uses found in the downtown core area.
- The City of Clarence-Rockland is under-stored for retail and service businesses.

Based on the findings above, Shore-Tanner & Associates recommended the following land uses for inclusion in the SSA1 lands, in the order of priority:

- Industrial/Business Park
- Office Buildings
- Shopping (Retail/ Commercial)

Shore-Tanner & Associates recommend a mix of modern and traditional industries:

- Modern knowledge-based industries: Information Technology (IT), life sciences, professional services,
- Land Intensive Light Industrial uses: storage, show rooms, sales display, and storage yards (e.g. construction-related industries).
- Complementary service commercial uses, such as retail with a focus on locally oriented food, convenience and service businesses, as well as recreation, entertainment and hospitality.

Since the studies reflects a 10 year projection / horizon, Shore-Tanner & Associates recommends 100, 000 sq.ft of new office space and 150, 000 sq.ft of retail (shopping centre) space. The lands are sufficient in size to accommodate both land intensive light industrial use and the amount of office and retail space proposed.

In tandem with the market study, the environmental study, public consultation, and meetings with the landowners determined that the SSA1 lands are well suited for commercial, retail, and light industrial uses due to their proximity to Ottawa and location along County Road No. 17. The development of these lands for the recommended land uses conforms to policy and aligns with the strategic vision for the City of Clarence-Rockland.

3.2 Bowfin Environmental Impact Study

To determine the desired land uses, on-site environmental factors must also be considered. Bowfin Environmental Consulting Inc. (now Cima +) has done a preliminary desktop review of the natural features of the SSA1 (see Appendix B) and has concluded that none of the following natural heritage features are present on the subject lands:

- Provincially significant wetlands
- Unevaluated wetlands
- Coastal wetlands
- Valleylands
- Identified significant wildlife habitat
- Significant woodlands
- Areas of National and Scientific Interest

There are watercourse features found on-site, and subsequently Fish Habitat, which is being recommended to be protected through the determination of an appropriate development setback (between 15-30 metres) through the Secondary Plan process and landscaping interventions that compliment both fish habitat and provide safe passage for other wildlife. There is therefore a potential north-south natural corridor in the heart of the subject lands.

There are also two (2) large cultural thickets / forests found on the subject lands which are opportunities to create a habitat for Endangered or Threatened species, such as the Butternut tree. A protected buffer for these plantings would be required.

Bowfin Environmental Consulting Inc. offers three (3) opportunities for enhancement and recommends considering combining these opportunity areas with more of an Urban Park type landscape and at least one with predominately native species and communities.

While more study is required through the Secondary Plan, we would recommend that it is appropriate to consider a land use designation that will reflect the preliminary findings from Bowfin Environmental Consulting Inc.

In the framework of the City's OP, an "Environmental Protection Area" is a land use designation that can be used to protect fish habitat and other natural heritage features.

Since Bowfin has offered three (3) enhancement opportunities and suggests integration with an Urban Park type landscape, we do not anticipate that all features and associated buffers will be designated "environmental protection area". Some of this land could be designated for "Parks and Open Space" and used to support the road hierarchy. The distinction between protected land and open space will be further studied and developed through the development of theRWSP.

4.0 Transportation and Servicing Review

4.1 Transportation

This section provides a review of existing roadways, intersections, and transit and transportation networks in the SSA1 and describes a capacity analysis that was undertaken to quantify intersection performance operations in the area.

4.1.1 Existing Area Road Network

The roads within the greater RWSP lands are under a combination of jurisdictions, including the Counties of Prescott and Russell, and the City of Clarence-Rockland. The following is a summary of the roads within and adjacent to the SSA1, and the role each of these roadways play.

County Road 17 is a two-lane arterial roadway (i.e., one travel lane per direction) along the subject site's frontage. It extends between Canaan Road in the west where it continues westerly as HWY 174 into the City of Ottawa, and towards the east, it extends to Gourley Road, where it continues as HWY 417, just east of Hawkesbury. Within the vicinity of the subject site, the posted speed limit is 70 km/h and on-street parking regulations are unposted.

Carmen Bergeron Street is a four-lane collector roadway (i.e., two travel lanes per direction), it extends between County Road 17 in the north and terminates at the Walmart parking lot in the south. Within the vicinity of the subject site the speed limit is unposted and therefore, is assumed to be 50 km/h. On-street parking regulations are unposted.

Richelieu Street is a two-lane local roadway (i.e., one travel lane per direction), it extends between De La Baie Road in the northwest and Cecile Crescent in the east. Within the vicinity of the subject site the speed limit is unposted and therefore, is assumed to be 50 km/h. On-street parking regulations are unposted.

Poupart Road is a two-lane collector roadway (i.e., one travel lane per direction), it extends approximately 220 m north of Richelieu Street where it continues as Laurier Street and St. Jean Street in the east where it continues as St. Jean Street. Within the vicinity of the subject site the posted speed limit is 50 km/h and on-street parking regulations are unposted.

4.1.2 Existing Area Intersections

County Road 17/Carmen Bergeron
The County Road 17/Carmen Bergeron intersection is a signalized three-legged intersection. The northbound approach (Carmen Bergeron Street) consists of one left-turn lane and one right-turn lane. The eastbound approach (County Road 17) consists of one left-turn lane and one through lane. The westbound approach (County Road 17) consists of one through lane and one right-turn lane. Crosswalks with pedestrian actuated signals are provided across the south and east legs of the intersection only.

All movements are permitted at this location.

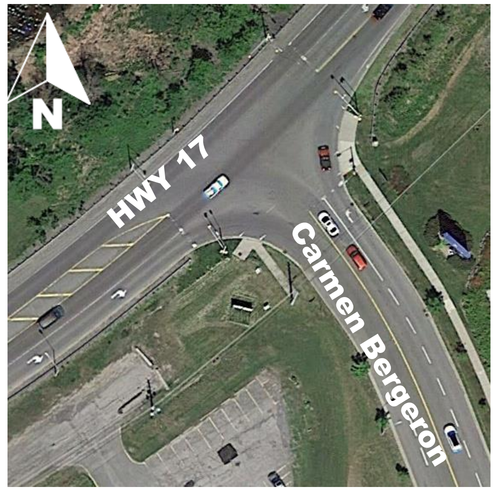

Figure 3: County Road 17/Carmen Bergeron Intersection

Carmen Bergeron/Richelieu
The Carmen Bergeron/Richelieu intersection is an unsignalized, four-legged intersection with a All-Way STOP control. The northbound approach (Carmen Bergeron Street) consists of one shared through/left-turn lane and one shared through right-turn lane. The southbound approach (Carmen Bergeron Street) consists of one shared through/left-turn lane and one right-turn lane. The east and westbound approaches (Richelieu Street) each consist of one left-turn lane and one shared through/right-turn lane. Crosswalks are provided for all directions.

All movements are permitted at this location.

Figure 4: Carmen Bergeron/Richelieu Intersection

Richelieu/Poupart

The Richelieu/Poupart intersection is an unsignalized, four-legged intersection with All-Way STOP control. The north and southbound approaches (Poupart Road) consist of a single lane that accommodates all possible movements. The westbound approach (Richelieu Street) consists of a single lane that accommodates all possible movements. The eastbound approach (Richelieu Street) consists of one left-turn lane and one through/right-turn lane. No pedestrian crosswalks are provided at the intersection.

All movements are permitted at this location.

Figure 5: Richelieu/Poupart Intersection

Poupart/Walmart Driveway

The Poupart/Walmart Driveway intersection is an unsignalized, three-legged intersection with STOP control on the minor approach only (Walmart Driveway). The north and southbound approaches (Poupart Road) each consist of a single lane that accommodates all possible movements. No pedestrian crosswalks are provided at the intersection.

All movements are permitted at this location.

Figure 6: Poupart/Walmart Driveway Intersection

4.1.3 Existing Active Transportation Network

Active transportation facilities were reviewed to gain an understanding of existing pedestrian and cycling facilities. The City acknowledges that protecting and expanding the existing pedestrian and bicycle network in the City is essential to creating quality of place.

The network for active modes within the vicinity of the subject development lands are fairly well developed. Sidewalks are provided along both sides of Richelieu Street between Carmen Bergeron Street and Poupart Road. Along Carmen Bergeron Street sidewalks are provided on the east side of the road only and on Poupart Road, sidewalks are provided on the west side of the road only.

With respect to cyclists, cycling facilities are fairly minimal. As depicted in Section 2.2.4 of the City of Clarence-Rockland Multi-Modal Transportation Master Plan (MMTMP), there are currently no segregated cycling facilities (i.e., bike lanes, paved shoulders etc.); cyclists are to ride on the road and share with motorists within the vicinity of SSA1.

The existing pedestrian/cycling network within the vicinity of SSA1, and how they connect to the greater network are depicted in Figure 7 and Figure 8**,** sourced from the Clarence-Rockland Multi-Modal Transportation Master Plan.

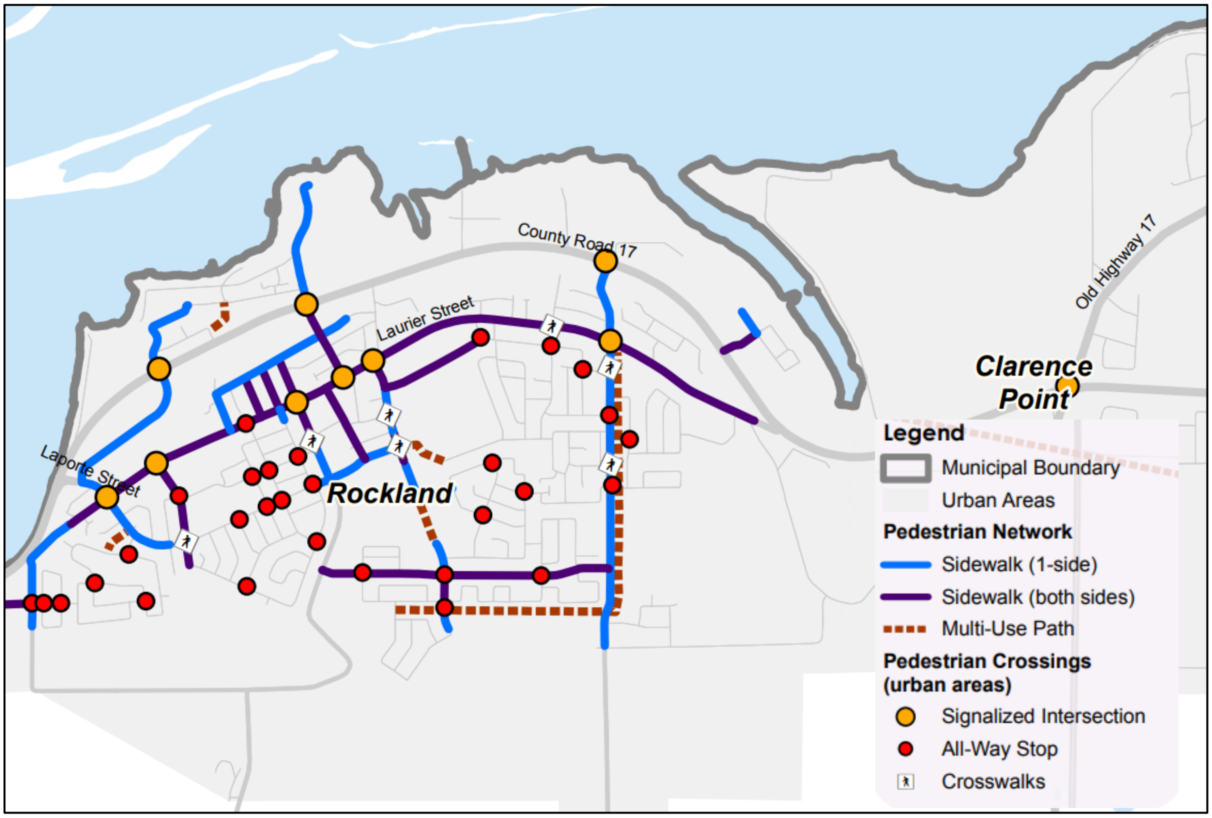

Figure 7: Existing Pedestrian Facilities (Sourced from the Clarence-Rockland MMTMP)

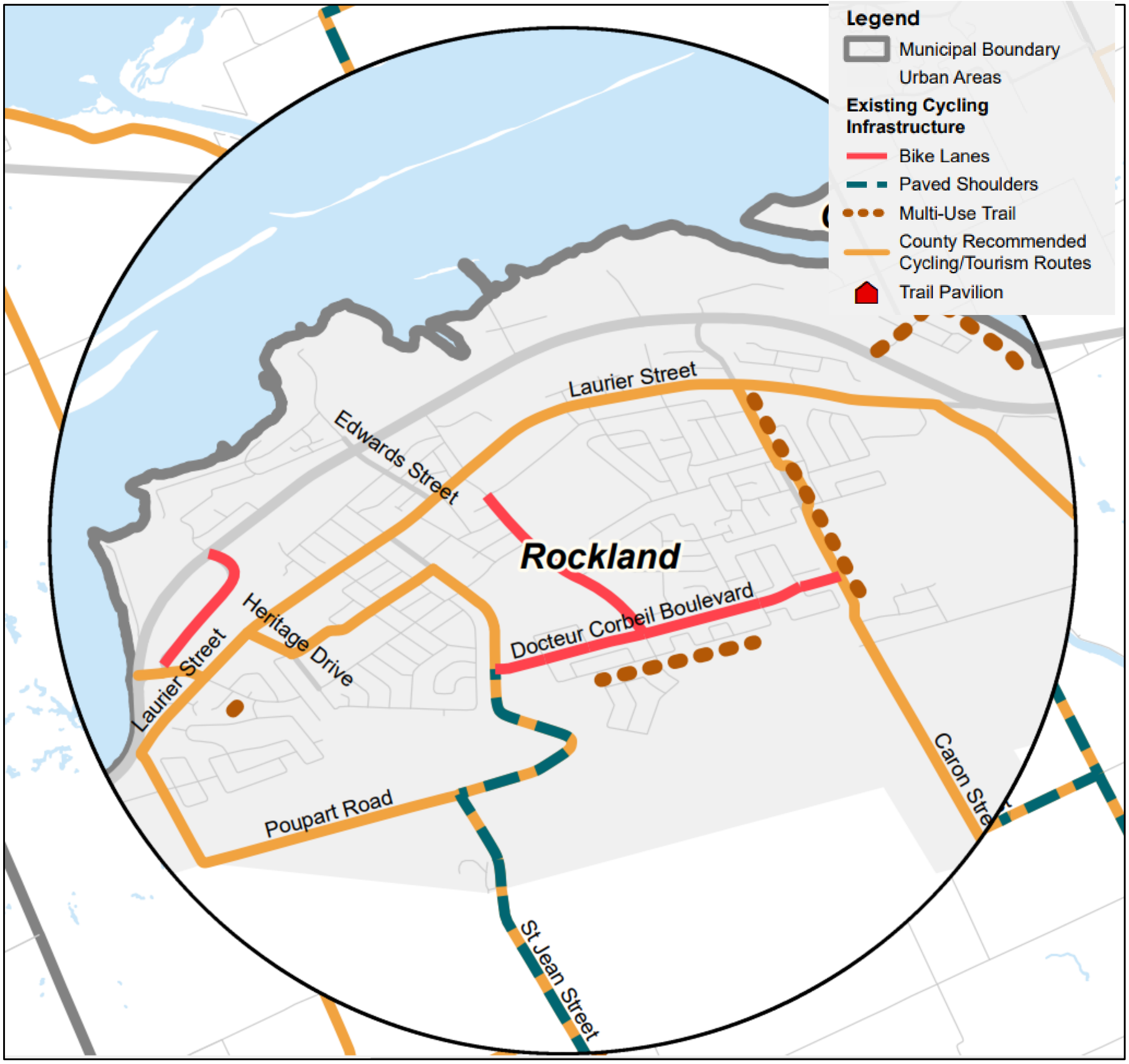

Figure 8: Existing Cycling Network (Sourced from the Clarence-Rockland MMTMP)

4.1.4 Existing Transit Network

Clarence-Rockland Transport (CR Transpo) operates three bus routes (route 530, 530A and 535) which connect the City of Clarence-Rockland and downtown Ottawa, with one stop in Gatineau. Route 530 directly serves the SSA1 travelling along Laurier Street and Docteur Corbeil Boulevard (to/from Clarence Creek) to Highway 174, while route 535 provides service to/from Bourget along Russell Road towards Highway 417. It should be noted that neither route provides internal connections between townships as these transit services are focused on external commuter travel. The following Table 1 provides additional information with respect to the CR Transpo routes.

Table 1: CR Transpo Route Information

Route	Origin/Destination	Direction	Peak Hour Headway
530	Clarence Creek (Laurier) ↔ Ottawa	Westbound/Inbound (AM) Eastbound/Outbound (PM)	Mon-Fri Peak periods only
530A	Clarence Creek (Docteur Corbeil) ↔ Ottawa	Westbound/Inbound (AM) Eastbound/Outbound (PM)	Mon-Fri Peak Periods Only
535	St-Pascal-Baylon ↔ Ottawa	Westbound/Inbound (AM) Eastbound/Outbound (PM)	Mon-Fri Peak Periods Only

It should be noted that as indicated on the Leduc Bus Lines Ltd website, route 535 is currently suspended until further notice and route 530 is currently operating on a 'Temporary Emergency Schedule' which only travels on Laurier Street.

Within the City of Clarence-Rockland, route 530 and 530A are understood to be a commuter transit route operating inbound to Ottawa in the morning and outbound to Clarence Rockland in the evening. On average these routes run between 8 and 11 times per day. In the recent MMTMP dated June 2019 prepared by Stantec it should be noted that that both routes have seen a decrease in transit ridership since 2015 resulting in 12% decrease. Additionally, only 25% of the City's urban area is within the 400m radius of transit stops; however, several stops are located at Park-n-Rides to provide an option for rural residents that do not live within proximity to the bus stops.

The following Figure 9 depicts existing CR Transpo Routes with stops and walking buffers as sourced from the City of Clarence-Rockland MMTMP.

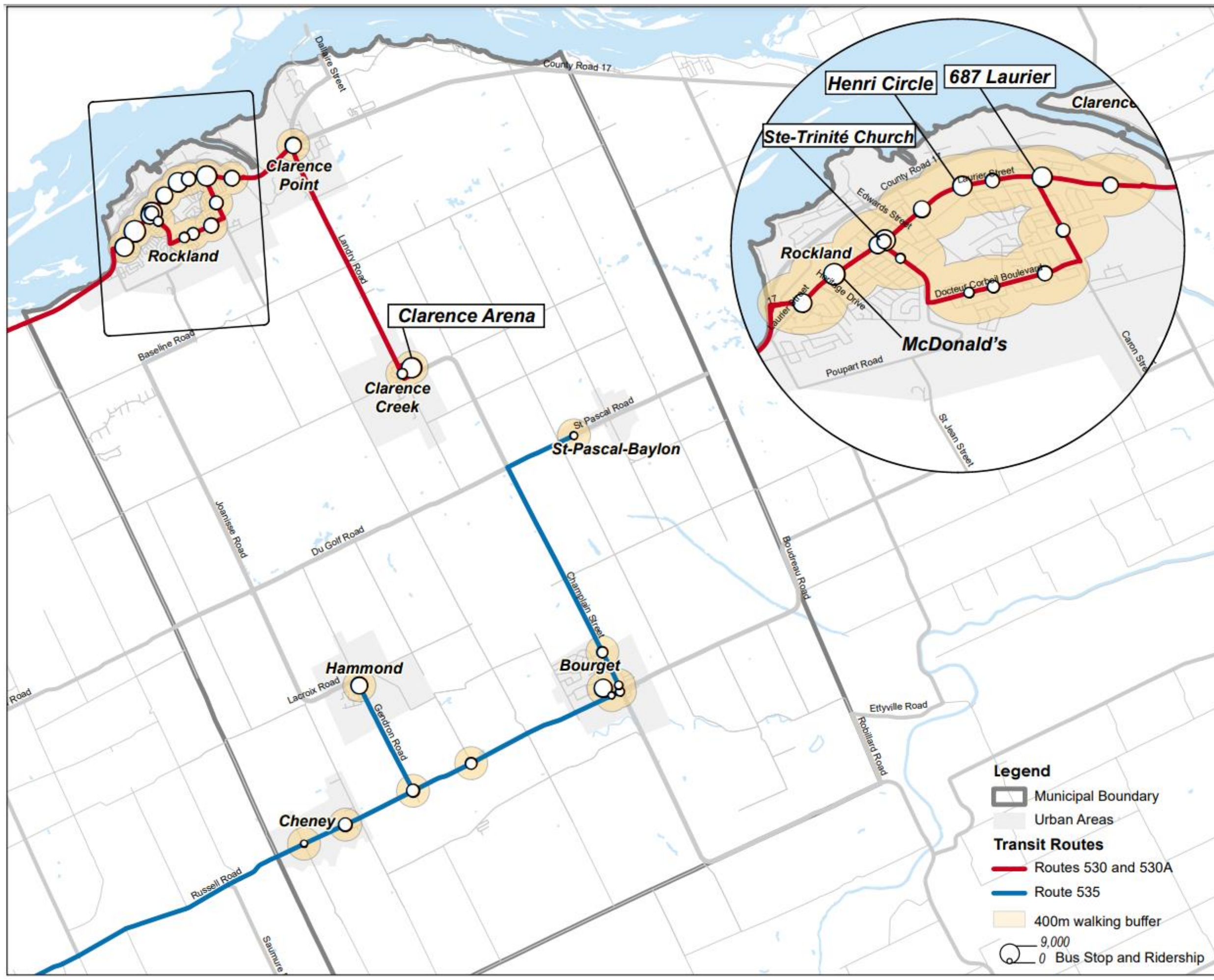

Figure 9: Existing CR Transpo Routes

4.1.5 Existing Network Operations

Using the intersection capacity analysis software Synchro (v11), a capacity analysis was undertaken to quantify intersection performance operations at signalized and unsignalized intersections in terms of vehicle delay (seconds), 95th percentile queues (meters), a volume-to-capacity ratio (V/C ratio) and a corresponding Auto Level of Service (LOS or Auto-LOS) as outlined in the Highway Capacity Manual (HCM). It should be noted that the overall performance of a signalized intersection is calculated as a weighted V/C ratio and assigned a corresponding Auto-LOS, and individual vehicular movements are assigned a LOS based on their respective V/C ratio. The overall performance of an unsignalized intersection is an Auto-LOS output from Synchro, which is based on an Intersection Capacity Utilization (ICU) method, and each movement is assigned an LOS based on delay.

The following Table 2 outlines the LOS criteria in terms of delay and Table 3 outlines the LOS criteria in terms of a V/C.

Table 2: LOS Criteria in Terms of Delay

LOS	Control Delay Per Vehicle (s/veh)	Interpretation
A	≤ 10	Excellent
B	10-20	Very Good
C	20-35	Good
D	35-55	Fair
E	55-80	Poor
F	> 80	Unsatisfactory

Table 3: LOS Criteria in Terms of Volume-to-Capacity

LOS	Control Delay Per Vehicle (s/veh)	Interpretation
A	≤ 0.60	Excellent
B	0.61-0.70	Very Good
C	0.71-0.80	Good
D	0.81-0.90	Fair
E	0.91-1.00	Poor
F	> 1.00	Unsatisfactory

LOS is a qualitative measure of operational performance based on control delay, and a v/c ratio is the ration between traffic volume and the theoretical capacity of an intersection or movement, and a v/c ratio of 1.00 indicates an at capacity condition. In terms of 95th percentile queues, it is a queue length that has a 5% probability of being exceeded during the analysis period (e.g., during peak hours).

For the purpose of this assessment, the following SSA1 intersections have been identified for intersection capacity analysis:

- County Road 17/Carmen Bergeron
- Richelieu/Carmen Bergeron
- Richelieu/Poupart
- Poupart/Walmart Driveway

The following Figure 10 depicts the observed weekday morning and afternoon peak hour vehicular movements at SSA1 intersections. Detailed turning movement counts (TMCs) were collected between June 15th and June 23rd, 2021, and are provided as Appendix C.

It should be noted that at the time of data collection and with respect to Ontario's three-staged COVID-19 reopening plan, the province had just moved to the first stage prior to field observations. While the province still encouraged working from home as much as possible, the first stage allowed for non-essential retail operations to open. Therefore, it should be understood that the TMCs conducted between June 15th and June 23rd, 2021, do not represent a sample of typical conditions; however, the conditions observed on these days were as close to typical as possible, given the ongoing impacts on travel behaviour related to the COVID-19 pandemic.

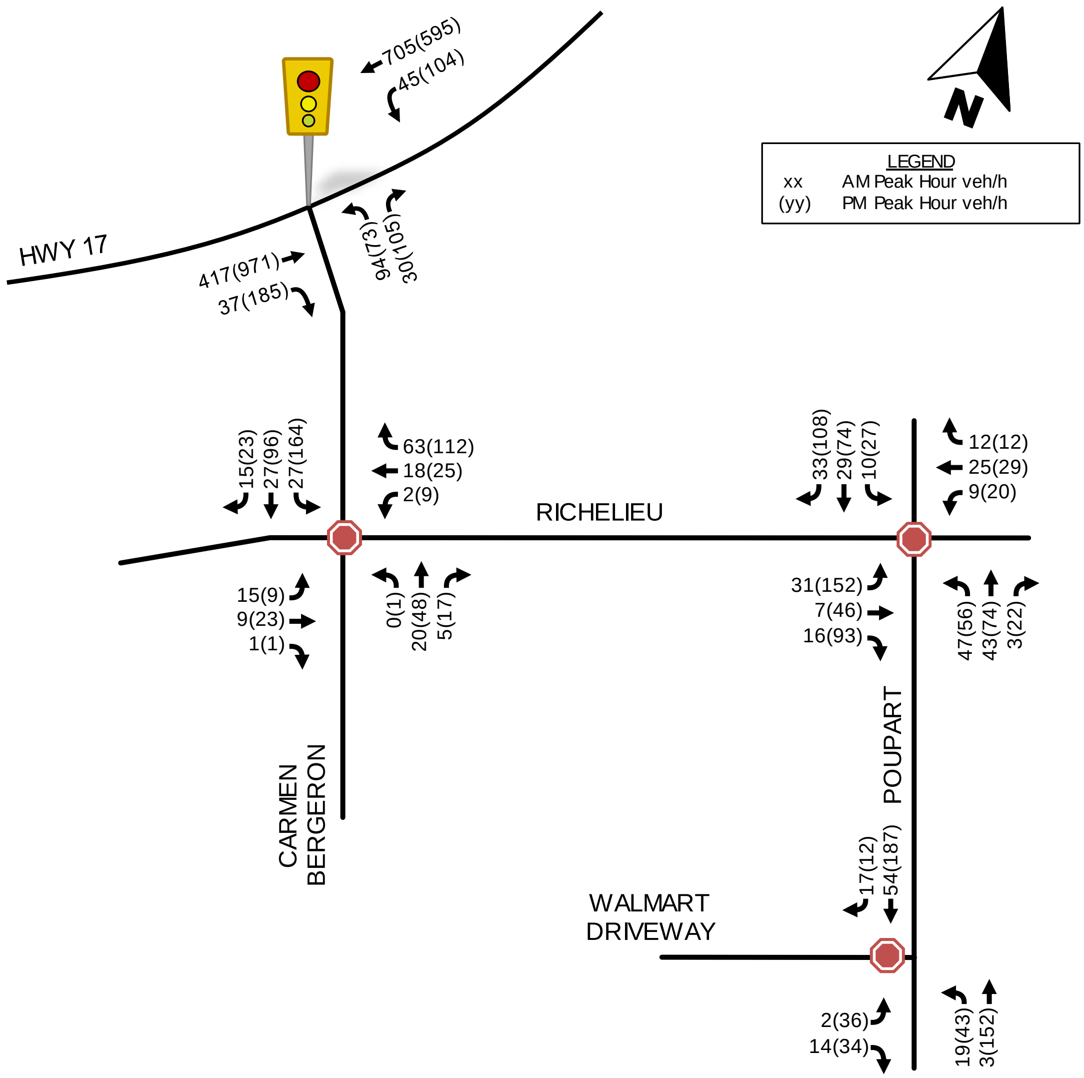

Figure 10: Existing Vehicular Volumes AM(PM)

The following Table 4 summarizes existing conditions at SSA1 intersections, in the absence of any development. The objective of this analysis is to determine if network improvements are, or will be required to support background traffic, or if projected future demand should be adjusted (e.g., once an auto network becomes saturated, a modal shift to active or transit modes can be expected). Detailed Synchro output data for existing conditions is provided in Appendix D.

Table 4: SSA1 Intersection Operations – Existing Conditions

Dir.	Lanes	AM Peak Hour				PM Peak Hour			
		v/c	Delay (s)	LOS	Queue (m)	v/c	Delay (s)	LOS	Queue (m)
Carmen Bergeron/County Road 17- Actuated-Uncoordinated Signal									
EBT	1 T	0.43	12.3	A	68	1.16	105.4	F	#344.8
EBR	1 R	0.04	4.6	A	5	0.24	4.5	A	17
WBL	1 L	0.09	4.9	A	5	0.52	19.7	A	23
WBT	1 T	0.64	10.2	B	86	0.55	7.0	A	77
NBL	1 L	0.26	21.6	A	23	0.46	44.8	A	29
NBR	1 R	0.09	9.6	A	6	0.45	13.1	A	15
Overall		**0.54**	**11.3**	**A**	**-**	**1.06**	**56.1**	**F**	**-**
Carmen Bergeron/Richelieu - Unsignalized									
EBL	1 L	0.03	7.3	A	0	0.02	8.1	A	0
EB	1 T/R	0.01	6.7	A	0	0.04	7.7	A	0
WBL	1 L	0.00	0.1	A	0	0.02	8.0	A	0
WB	1 T/R	0.11	6.6	A	0	0.21	8.1	A	0
NBL	1 L	0.00	0.0	A	0	0.00	7.7	A	0
NB	1 T/R	0.04	6.7	A	0	0.10	7.6	A	0
SB	1 T/L	0.08	7.3	A	0	0.44	11.4	B	0
SBR	1 R	0.02	6.0	A	0	0.03	6.4	A	0
Overall		**0.24**	**6.8**	**A**	**-**	**0.39**	**9.6**	**A**	**-**
Poupart/Richelieu - Unsignalized									
EBL	1 L	0.05	7.6	A	0	0.29	10.5	B	0
EB	1 T/R	0.03	6.5	A	0	0.22	8.5	A	0
WB	1 L/T/R	0.06	7.6	A	0	0.10	9.1	A	0
NB	1 L/T/R	0.12	8.0	A	0	0.25	10.0	A	0
SB	1 L/T/R	0.09	7.4	A	0	0.32	10.2	B	0
Overall		**0.28**	**7.6**	**A**	**-**	**0.45**	**9.8**	**A**	**-**
Poupart/Walmart - Unsignalized									
EB	L/R	0.02	8.7	A	0	0.12	11.4	B	3
NB	1 T/L	0.01	6.4	A	0	0.04	2.0	A	1
SB	1 T/R	0.04	0.0	A	0	0.13	0.0	A	0
Overall		**0.18**	**2.6**	**A**	**-**	**0.39**	**2.5**	**A**	**-**

As shown in Table 4, SSA1 intersections are currently operating with an excellent overall LOS ‘A’ during weekday morning and afternoon peak hours, with the exception of the Carmen Bergeron/County Road 17 intersection, which is currently operating over capacity with an overall LOS ‘F’ during the afternoon peak hour. With regard to ‘critical’ movements, they are operating with an LOS ‘B’ or better during both peak hours, with the exception of the eastbound through movement at the Carmen Bergeron/County Road 17 intersection, which is operating over capacity with an LOS ‘F’ during the afternoon peak hour.

In terms of 95th percentile queues, sufficient vehicle storage is provided, such that vehicle queues do not spill or block lanes or intersections, with the exception of the eastbound through movement at the Carmen Bergeron/County Road 17 intersection, which is operating with long 95th percentile queues and delays.

Possible measures to improve network performance will be discussed as part of subsequent projected conditions analysis.

4.2 Municipal Servicing

This section provides a review of existing services (watermain and sanitary) in the vicinity of the SSA1 as well as an assessment of the existing drainage condition based on site characteristics and existing outlet points.

4.2.1 Existing Water System

4.2.1.1 Background Information

A review of background information was carried out to identify watermains located in the vicinity of the SSA1 that could provide both domestic supply and fire flow protection. The following information was reviewed:

- The report entitled “City of Clarence-Rockland Water Master Plan Update”, prepared by Jacobs, dated January 23, 2023.
- The report entitled “TM-2 – Future Growth and Water Use Estimates – FINAL”, prepared by Jacobs dated August 18, 2021.
- Several “as-constructed” drawings from recent developments along the eastern boundary of the SSA1; and
- City of Clarence-Rockland GIS database of their linear infrastructure.

4.2.1.2 Water Inventory Review

Based on the review of the Water Master Plan Update, the SSA1 is next to the City’s Pressure Zone 1 (PZ 1) which receives its potable water from the Rockland Water Treatment Plant (WTP).

The GIS database was used to prepare a figure that depicts watermains in the vicinity of the SSA1 limits, this is provided in Appendix E. The following watermains are in proximity of the SSA1:

- An existing 150mm diameter watermain (unknown material) is located along De La Baie Road within the municipal ROW. As shown in Appendix E, this watermain spans midway along the northern frontage of the SSA1.
- An existing 300 mm diameter watermain (PVC) along Richelieu Street, which was installed to supply the SmartCentres development. The watermain abuts the eastern boundary of the SSA1 in the northeast corner.
- An existing privately owned 150 mm diameter watermain (PVC) constructed within the Rona development (within the lumber yard). Based on the information received, this watermain and hydrant is fully located within private property. Thus, an extension from this privately owned

watermain would not be recommended as it would require the execution of a maintenance agreement and easement connection.

4.2.1.3 Upcoming Phase 2 Works

Under Phase 2 of this Study, domestic water demands will be calculated under both maximum day and peak hour in accordance with the theoretical parameters outlined in the Water Master Plan Update and/or in the Clarence-Rockland Water Design Guidelines.

In terms of fire protection, the fire flow requirement was identified in Jacob's Water Master Plan Update for PZ1. If the SSA1 is found to be supplied by PZ 1, the fire flow target was identified by Jacob's as 283 L/s. It should be noted that the supply of 283 L/s by two (2) local 150 mm diameter watermains would generate a head loss for each watermain equivalent to 9.2 psi per 1000 linear meter. Based on this significant head loss, it is likely that system upgrades will be required to support the urbanization of the SSA1.

Based on the calculated demands and fire flow target noted above, boundary conditions (BCs) will be requested from the City at the connection points with the existing system or under a servicing upgrade. From the BCs received, internal functional servicing will be developed and evaluated against regulatory requirements.

4.2.2 Existing Sanitary System

4.2.2.1 Background Information

A review of background information was carried out to identify sanitary sewers and/or forcemains located in the vicinity of the SSA1 that could serve as an outlet for the Study's Area wastewater flows. The following information was reviewed:

- The report entitled "Wastewater Master Plan Update, TM-C2 – Wastewater Collection System Hydraulic Analysis Report – Final", Jacobs, dated May 17, 2022
- Servicing Plan (SW-S1) Commercial Development Building A (1060), prepared by CounterPoint Engineering Inc, dated May 2007, marked "As-Built Drawings", dated January 2008
- Site Servicing & Stormwater Management Report for Site Plan Control Application Proposed Commercial Development RONA -Rockland SmartCentres, prepared by LRL Associates, dated October 2014
- Proposed Commercial Development Site Servicing Plan C.401, prepared by LRL Associates Ltd, dated May 2014; and
- City of Clarence-Rockland GIS database of their linear infrastructure.

4.2.2.2 Sanitary Inventory Review

Based on the review of the Wastewater Master Plan Update, the SSA1 is next to a series of local sanitary sewers as depicted in Appendix E. The following sanitary sewers are in proximity of the SSA1:

- An existing 250mm diameter sanitary sewer is located along Richelieu Street, terminating immediately to the west of the Poupart Road intersection. This sewer flows in an easterly direction towards Descôtes Circle.
- Two (2) existing sanitary pump stations and forcemains are located at 2780 Chamberland Street and at 1191 St. Jacques Street.
- An existing 250mm sewer is located to the east of Poupart Road and flows into the sewershed east of the SmartCentres development. At that point, the captured flows proceed in an easternly direction towards the existing pump station on St. Jacques Street. Based on the City of Rockland GIS database, this is the current outlet for the SmartCentres development and Rona located to the east of the SSA1.
- Existing sanitary sewers within commercial developments (Rona and Walmart). Given that these sanitary sewers are privately owned, they would not serve as a dedicated outlet to the SSA1.

4.2.2.3 Upcoming Phase 2 Works

Under Phase 2 of this Study, peak wastewater flows will be calculated in accordance with the theoretical parameters and peaking factors outlined in the Wastewater Master Plan Update and/or in the Clarence-Rockland Sewer Design Guidelines. At such time, internal functional servicing will be developed and evaluated against regulatory requirements.

As identified in the Wastewater Master Plan Update, once peak wastewater flows have been calculated, the capacity of the existing 250mm diameter sanitary outlet on Richelieu Street flowing east across Poupart Road will be evaluated. This capacity analysis will determine the infrastructure needs, either replacing existing sewers, or constructing new sewers to accommodate the future wastewater flows from the SSA1.

4.2.3 Existing Storm Water System

4.2.3.1 Background Information

A review of background information was carried out to identify stormwater management and drainage infrastructure located in the vicinity of the SSA1 that could provide outlets for the proposed stormwater management systems. The following information was reviewed:

- Servicing Plan (SW-S1) Commercial Development Building A (1060), prepared by CounterPoint Engineering Inc, dated May 2007, marked “As-Built Drawings”, dated January 2008
- Servicing Record Drawing (SW-S1) Commercial Development Building A (1060), prepared by CounterPoint Engineering Inc, dated January 2010
- Site Servicing & Stormwater Management Report for Site Plan Control Application Proposed Commercial Development RONA - Rockland SmartCentres, prepared by LRL Associates, dated October 2014
- Proposed Commercial Development Grading and Drainage Plan C.301, prepared by LRL Associates Ltd, dated May 2014

- Proposed Commercial Development Site Servicing Plan C.401, prepared by LRL Associates Ltd, dated May 2014
- Serviceability Study, Stormwater Management Storm Sewer, Sanitary Sewer and Watermain Project No.: 150403 Poupart Subdivision, prepared by Atrel Engineering, dated June 2017

4.2.3.2 Existing Drainage Patterns

The SSA1 is currently undeveloped and does not include any storm sewers. All runoff is overland and conveyed via sheet flow or drainage ditches to downstream receivers. A digital elevation model (DEM) surface for the site was sourced from the Natural Resources Canada Ottawa River 2019-20 collection project. The DEM was run through the PCSWMM Watershed Delineation Tool with culverts burnt-in to assess drainage patterns for the site and develop catchment areas.

Four downstream receivers have been identified for the lands.

- SmartCentres Rockland, Walmart Site – at the turning circle behind the Walmart there are two ditch inlet structures which capture upstream flows. The October 2014 Site Servicing and Stormwater Management Report for the Rockland SmartCentres identified an upstream drainage area of 3.6 ha to these inlets. The captured flow is conveyed in the storm sewer system through the site to discharge into the existing stormwater management facility at the intersection of De La Baie Road and Poupart Road.

- SmartCentres Rockland, Rona Site – at the southwest corner of the Rona development there is a constructed ditch which collects flows from the upstream undeveloped area to the south. The October 2014 Site Servicing and Stormwater Management Report for the Rockland SmartCentres identified an upstream drainage area of 10ha to this ditch. The captured flow is conveyed in the storm sewer system through the site to discharge into the existing stormwater management facility at the intersection of De La Baie Road and Poupart Road.

- De La Baie Road Drainage System – part of the undeveloped site appears to drain via overland sheet flow through the Bergeron Greenhouses Garden Centre and onto De La Baie Road. The drainage area developed from the DEM is around 17 ha. No information was available on any stormwater management infrastructure through the site. A small catchment, 6.5 ha, to the east of this is collected via a drainage ditch which ends at the turning circle on De La Baie Road and enters via a culvert into the drainage system for De La Baie Road.

- County Road 17 Culvert – the largest drainage area, covering most of the site, is conveyed via overland sheet flow and ditch systems to the existing culvert under County Road 17. The upstream drainage area to the culvert is 240 ha and extents south to around 200m north of Baseline Road. No information was able to be sourced on the culvert.

The drainage areas and receiving points are shown in Appendix E.

4.2.3.3 Existing Downstream Capacity and Allowable Peak Flows

SmartCentres Rockland

The two (2) receiving points for the undeveloped flow from the site are defined in the Site Servicing & Stormwater Management Report, LRL Associates October 2014. The design sheet specifies receiving flow rates as shown in Table *5* below.

Table 5: Receiving Flow Rates

Inlet Receiver	Upstream Catchment Area (ha)	Peak Flow Rate (L/s)
DICB-26	3.2	149
DICB-27	0.36	53
DICB-1	10	300

De La Baie Road

No information is available on the capacity of the infrastructure on De La Baie Road. Due to only sheet flow being received from the undeveloped site, there is no formal outlet for point flow discharges onto De La Baie Road unless new infrastructure is constructed, and downstream capacity assessed.

County Road 17 Culvert

A PCSWMM model was developed to determine the flow rates to the County Road 17 Culvert. The catchment area, width parameter and slopes were calculated using the Watershed Delineation Tool in PCSWMM. The catchment imperviousness and CN value were determined from the Provincial Land Cover Database and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Soils Mapping Hydrological Soils Groups.

The simulation was completed under the 12-hour SCS, 24-hour SCS and 1 hour AES storm distributions with the City of Ottawa rainfall depths for the various return periods. The 24-hour SCS storm distribution produced the higher peak flows at the culvert and the results for the storm under various return period events is shown in Table 6 below.

Table 6: Results for the Storm at Various Return Periods

Return Period Event	Peak Flow (m^3/s)
1:2 year	0.18
1:5 year	0.42
1:10 year	0.64
1:25 year	0.99
1:50 year	1.34
1:100 year	1.75

Any changes to upstream flow rates due to the proposed developments will require quantity control to limit the post-development peak flows to pre-development levels.

4.2.3.4 Water Quality Requirements

Storm runoff from the SSA1 will be required to achieve an 80% TSS removal to meet the 'enhanced' protection level.

4.2.3.5 Source Water Protection

The site is not within an area mapped as providing significant groundwater recharge however there are parts of the site which overlay highly vulnerable aquifers and will require consideration during development.

5.0 Concepts

Three land-use concepts were developed for the SSA1 and are shown below in Figure 11-Figure 13. These options were designed by considering existing site conditions, potential servicing and transportation solutions, and optimal land uses (see Section 5.1 for land-use descriptions). The fourth option presented is the option to 'Do Nothing' as per the MCEA planning process specifications. The statistics for the four options are summarized in Table 7. Of options 1-4, two will be shortlisted and carried forward to the detailed evaluation phase in the Phase 2 report as described in Section 1.5. The primary objective of Phase 2 will be to identify a preferred solution of the options presented by evaluating the environmental, social, technical, and financial criteria for each option and further developing the preferred concept.

Table 7: Statistics for Development Options 1-4

Land Use	Option 1	Option 2	Option 3	Option 4 'Do Nothing'
Overall Area (ha)	54.6	54.6	54.6	54.6
Business Park (ha)	16.3	32.8	46.7	0
Service Commercial (ha)	14.3	0	1.4	0
Commercial Core (ha)	15.9	13.7	0	0
Future Development Overlay (ha)	0	8.1	0	0
Medium Density Residential (ha)	4.0	0	6.5	0
High Density Residential (ha)	4.1	0	0	0
Special Study Area (ha)	0	0	0	54.6

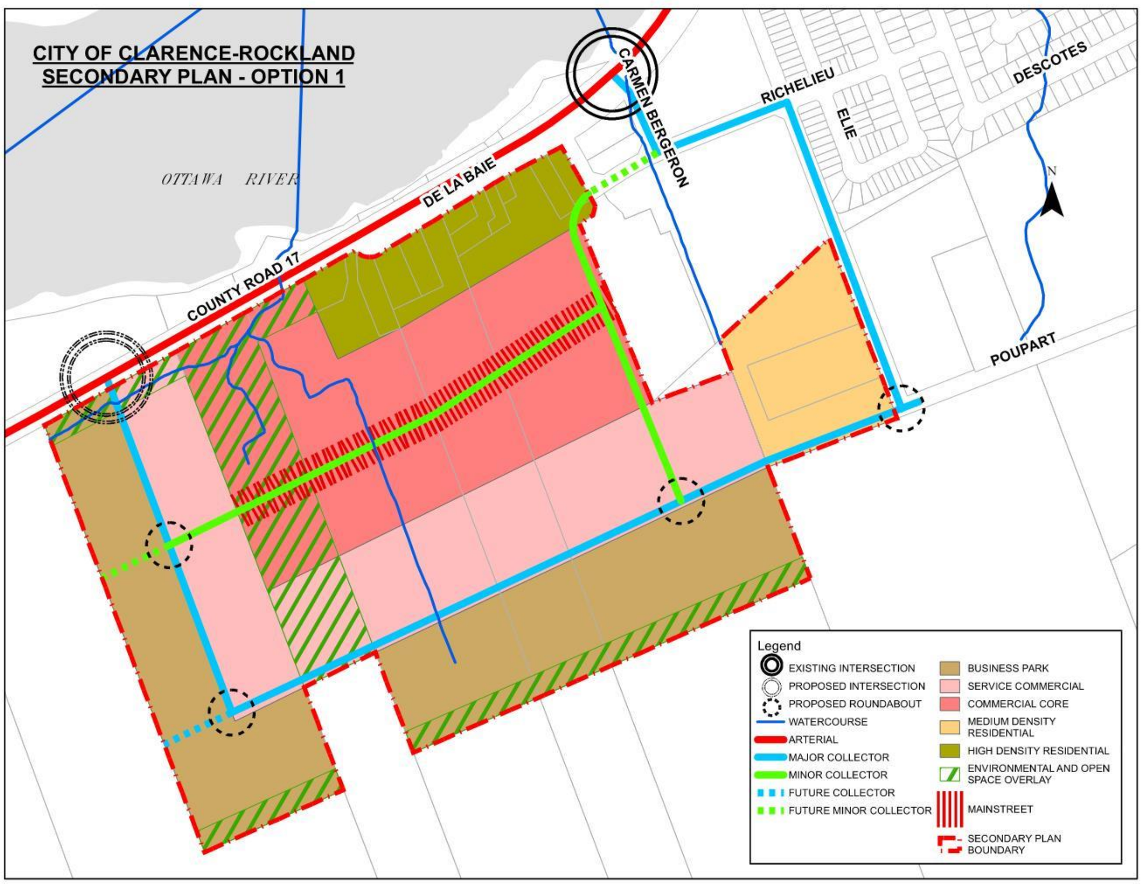

Figure 11: Rockland Secondary Plan Land-Use Concept Option 1

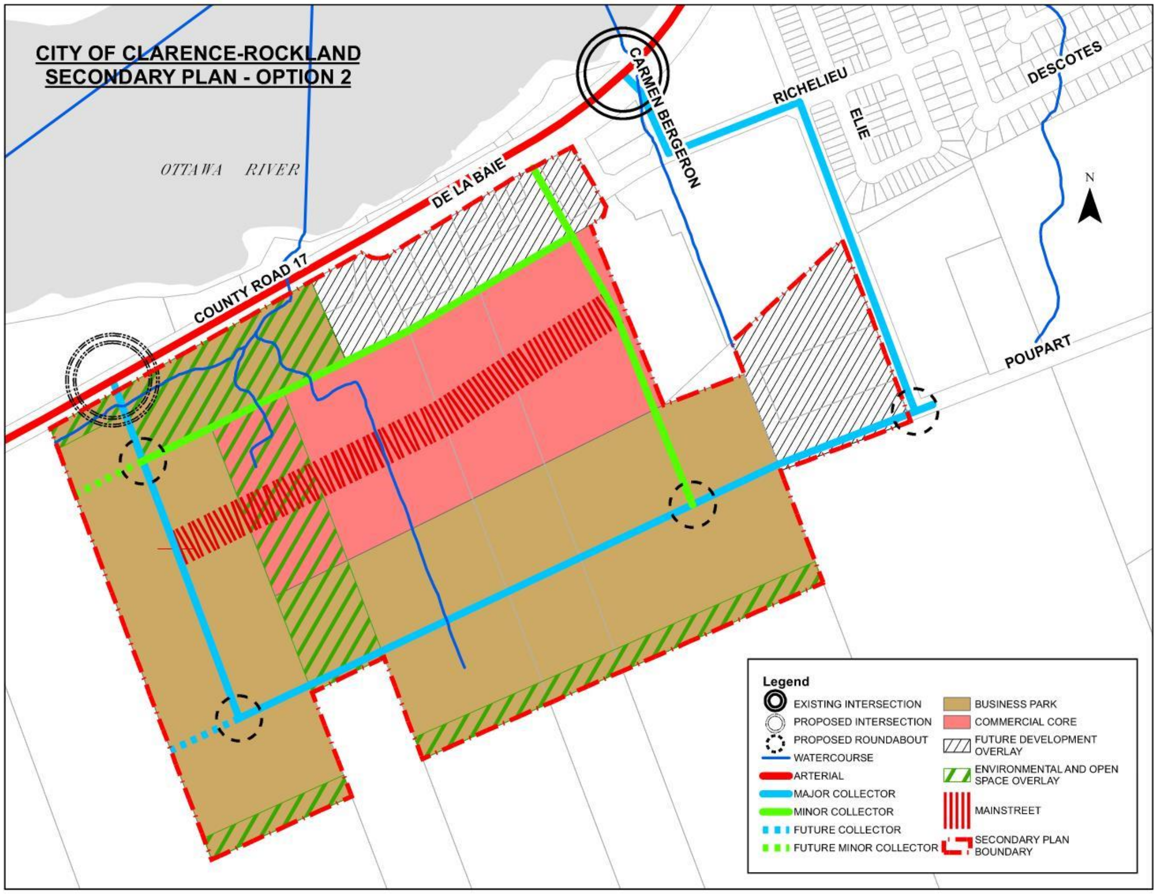

Figure 12: Rockland Secondary Plan Land-Use Concept Option 2

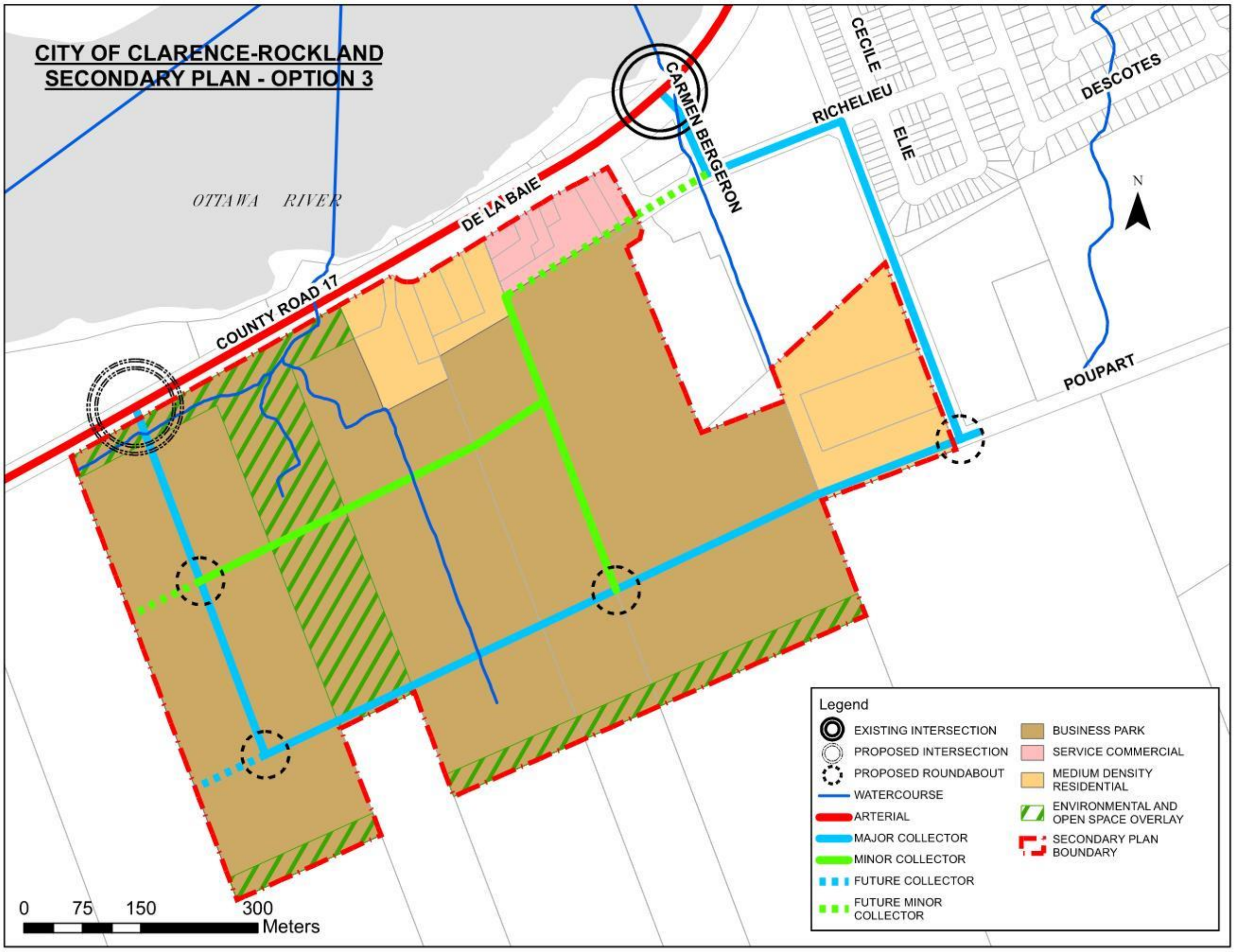

Figure 13: Rockland Secondary Plan Land-Use Concept Option 3

5.1 Land Use Designations

The intent of defining land use is to achieve a coherent and predictable pattern of development that can be adequately phased and serviced overtime. By grouping compatible uses together and separating incompatible ones, character areas can emerge as distinct places that accommodate the growing economic, environmental, and social needs of the City of Clarence-Rockland. Figure 11-Figure 12 divide SSA1 into varying land use combinations. The potential land uses for the Rockland West Secondary Plan are the following:

5.1.1 Business Park

The Business Park designation is intended to attract employment uses such as light industrial, offices and corporate headquarters. These uses generally prefer visibility from highways and they are normally separated from both major retail areas and traditional industrial uses. Uses within business parks are characterized by free standing buildings on individual lots in a planned subdivision setting. Some commercial uses that serve the business park would be desirable as long as they are minor in scale and accessory to the main business park use. Proximity to recreation facilities and open space would also be desirable to serve the employees.

5.1.2 Service Commercial

The area designated Service Commercial is intended to serve the needs of the various adjacent employment uses, residents of Clarence-Rockland, and the surrounding area. The uses within this area require relatively large parcels of land, large areas of surface parking, and access by major roads. To prevent or reduce conflicts, the Service Commercial uses will be required to provide adequate buffering to residential areas.

5.1.3 Commercial Core Area

The Commercial Core Area of the RWSP would be separate from and different in character to the Commercial Core Area located along Laurier Street. The Commercial Core Area of the RWSP is intended as a gateway to the City of Clarence-Rockland. The mixed-use area would provide a variety of functions, including retail, entertainment services, community facilities, tourist amenities, offices, parks and open spaces, and housing. It is also intended to make Rockland West a more complete community by providing amenities for residents, workers, and tourists, while integrating a mix of land uses over time. Given the high visibility of the Commercial Core Area, special attention must be given to the urban design guidelines as listed in Section 7.0 the City's Zoning By-Law No. 2016-10. Emphasis will be placed on creating a safe and attractive pedestrian-oriented environment.

5.1.4 Main Street

The Main Street of the SSA1 is intended to serve as the focal point of the Commercial Core Area. The Main Street will evolve as a lively, innovative community hub that prioritizes the pedestrian experience. This hub will be a live, work, play destination for residents and visitors of Clarence-Rockland.

5.1.5 Medium Density Residential

The Medium Density Residential designation is intended to permit residential uses such as semi-detached dwellings, duplex dwellings, linked dwellings, multiple unit residential uses such as townhouses, or back-to-back townhouses to a minimum density of 35 units per net hectare and a maximum of 55 units per net hectare and stacked dwellings and low-rise apartment buildings no more than five storeys in height to a maximum of 65 units per net hectare. Small scale commercial uses will also be permitted to serve the local residential area.

5.1.6 High Density Residential

The High Density Residential designation is intended to permit Multiple unit residential uses such as townhouses, back-to-back townhouses, stacked townhouses, low-rise and mid-rise apartment buildings no more than nine storeys in height between 65 and 125 units per net hectare. Small scale commercial uses will also be permitted to serve the local residential area.

5.1.7 Environmental and Open Space Overlay

The Environmental and Open Space Overlay is intended for lands that have natural heritage and could be developed for stormwater management (SWM) facilities, and parks and open space. Development within the overlay may proceed in accordance with the underlying land use designation once the natural heritage has been studied and once SWM facilities have been appropriately planned and designed.

5.1.8 Future Development Overlay

The Future Development Overlay consists of reserved land, to be consolidated for future use.

5.2 Evaluation of Proposed Concepts

The initial screening of alternatives produced the results summarized below in Table 8. Concept options were evaluated as per the evaluation and selection methodology presented in Section 1.5. Options 1 and 3 were selected to be carried forward to the detailed evaluation stage to be conducted in Phase 2.

Table 8: Initial Screening of Alternatives

Description	Advantages	Disadvantages	Carried Forward?
Option 1	• Preserves natural waterway corridor • Addition of business park, service commercial, commercial core, and high and medium density residential land use zones • High land-use diversity • Pedestrian focused main street included in commercial core	• Comparatively complex traffic flow • Increase in traffic with the addition of major and minor collector roads	✓
Option 2	• Addition of business park and commercial core land use zones • Pedestrian focused main street included in commercial core	• Small environmental and open space overlay • Increase in traffic with the addition of major and minor collector roads • Least land-use diversity • No land allotted to residential land use • Comparatively complex traffic flow • Future development overlay does not specify immediate land use	✗
Option 3	• Preserves natural waterway corridor • Addition of business park, service commercial land, and medium density residential land use • Comparatively simple traffic flow • Highest density of high-demand business park land use	• No pedestrian focused commercial core • Increase in traffic with the addition of major and minor collector roads • Minimal land-use diversity	✓
Option 4 - ‘Do Nothing’	• Preserves the natural environment of SSA1	• Does not support economic, social, or cultural growth in the City • Does not align with Secondary Plan objectives	✗

5.2.1 Option 1 Evaluation

Option 1 is presented in Figure 11 and recommends zoning the SSA1 for business park, service commercial, commercial core, and high and medium density residential land use. This array of land uses provides the opportunity for economic activity and cultural enrichment in the SSA1 with the largest amount of service commercial, and commercial core land use areas of the concept options. The commercial core and main street specifically allow for pedestrian focused design. The presence of residential land use supports future population growth in the region. Option 1 has the least amount of business park land use which is the highest demand land-use for the SSA1 (see Shore-Tanner & Associates Market Study, Section 3.1). An environmental and open space overlay is present which can conserve the natural north/south water corridor within the SSA1. In terms of traffic, one new intersection and four new roundabouts are proposed for this concept. From the above conclusions, it is recommended that this concept option be carried forward to the detailed evaluation phase for further consideration.

5.2.2 Option 2 Evaluation

Option 2 is presented in Figure 12, this option recommends zoning the SSA1 for business park and commercial core land uses. This option provides the opportunity for economic activity and cultural enrichment in the SSA1, with less business diversity then option 1 as there is no service commercial or residential land. Option 2 also has a future development overlay, this has the benefit of providing flexibility in the future to rezone this land, but it also prevents the concept option from completely addressing the objectives of the Secondary Plan (see Section 1.2). The overlay would not provide direction for immediate land use meaning only the present-day land uses would be permissible to continue on the land. Of options 1-3, option 2 also has the smallest environmental and open space overlay area. Like option 1, one new intersection and four new roundabouts are proposed. It was determined that option 2 does not satisfy the needs of the City as well as the other alternative solutions and therefore it will not be carried forward to the detailed evaluation phase.

5.2.3 Option 3 Evaluation

Option 3 is presented in Figure 13, this option recommends zoning the SSA1 for mainly business park land use, with smaller portions designated for service commercial and medium density residential zones. This design would allow for increased economic activity and cultural enrichment in the SSA1, with less land use diversity than option 1 as there is no commercial core, or high-density residential lands. As per discussion with the City of Rockland-Clarence and the Shore-Tanner Market Study (Section 3.1), there is a shortage of commercial and industrial development in the City. The high density of business park land use in option 3 would allow for the most industrial development of the concept options. Option 3 conserves the natural north/south water corridor with an environmental and open space overlay congruent to that of option 1. The street layout of option 3 varies from options 1 and 2 as the eastern minor collector begins where the current commercial lands end to allow for better traffic flow. Though similarly to the first two concept options, one new intersection and four new roundabouts are proposed. Due to the above-mentioned conclusions, concept option 3 will be carried forward to the detailed evaluation phase for further consideration.

5.2.4 Option 4 Evaluation

Option 4 is the option to ‘Do Nothing’, where the RWSP lands would remain classified as SSA1 and no further development would occur on the lands. This option would not solve the objective of the Secondary Plan, or the needs identified in the Shore-Tanner Market Study; no new land uses would be specified, and only current land use activities would be permissible. Not adding any infrastructure would preserve the natural environment which is the main benefit of this option. As per Bowfin’s Environmental Study in Section 3.2, the SSA1 does not contain any significant natural heritage features. Bowfin also provided recommendations to responsibly develop these lands with respect to the watercourses and forests/thickets. This option minimizes the capital costs for developing these lands but would not present additional economic, social, or cultural benefits to residents as is anticipated with options 1, 2 and 3. This solution does not address the problem as defined as part of this Secondary Plan, therefore it will not be carried forward for further evaluation in Phase 2.

6.0 Problem and Opportunities

The following Problem / Opportunity Statement will be used as the basis for proceeding to Phase 2 of this Class EA:

The Secondary Plan will follow the Municipal Class Environmental Assessment (EA) and Planning Act process to establish a coordinated planning solution for development of this area. A Secondary Plan could present economic opportunities for the city and its residents through the establishment of acceptable land use designations leading to an increase in business and commerce in the region. In developing the Secondary Plan, there is an opportunity to consider impacts to neighboring properties, impacts to natural and social environment, climate change, and growth opportunities.

7.0 Conclusion and Next Steps

This report has been developed to summarize the Phase 1 work undertaken as part of the Master Planning process. Phase 1 has been used to identify the site-specific conditions and constraints of the RWSP lands, to develop planning and design options, to clearly define the boundary conditions from legislative and regulatory framework perspective, and to shortlist alternative development solutions for the SSA1.

Phase 2 of the Master Plan process will investigate servicing solutions through review of existing infrastructure, preparation of supporting studies (including desktop review of natural heritage, hydrogeological information, etc.), identification of servicing constraints, evaluation of high-level servicing options, and public consultation. Transportation strategies will be developed for each land-use concept and will encompass transportation demand management and active transportation infrastructure as priorities. A final preferred concept will be identified and developed further for the RWSP.

This report has been prepared by J.L. Richards & Associates Limited for City of Clarence Rockland's exclusive use. Its discussions and conclusions are summary in nature and cannot properly be used, interpreted, or extended to other purposes without a detailed understanding and discussions with the client as to its mandated purpose, scope, and limitations. This report is based on information, drawings, data, or reports provided by the named client, its agents, and certain other suppliers or third parties, as applicable, and relies upon the accuracy and completeness of such information. Any inaccuracy or omissions in information provided, or changes to applications, designs, or materials may have a significant impact on the accuracy, reliability, findings, or conclusions of this report.

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J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:	Reviewed by:
Nikita Jariwala Planner	Marc Rivet Manager, Associate, MCIP, RPP

Appendix A

Shore-Tanner Market Study

COMMERCIAL AND INDUSTRIAL MARKET DEMAND STUDY: CLARENCE-ROCKLAND ONTARIO

Prepared for:

J. L. Richards & Associates Limited on Behalf of the City of Clarence-Rockland

Prepared by:

Shore-Tanner & Associates

February 4, 2022

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I. EXECUTIVE SUMMARY

On behalf of the **City of Clarence-Rockland**, and as a member of a multi-disciplinary team of consultants under the direction of **J.L. Richards & Associates Limited**, this study has been carried out by Shore-Tanner & Associates. **Its purpose is to determine the scope of market demand for retail, office, and industrial businesses in a new part of Rockland.** The main findings of the study are summarized below, followed by more detailed substantiation in the main body of the report.

A. Subject Site

The Subject Site is approximately 36 hectares (almost 90 acres) in size, adjacent to Rockland's existing Urban Area Boundary to the west. It is proposed to be added to the Rockland part of the City of Clarence-Rockland through an Expansion Lands Secondary Plan.

B. Major Socio-Demographic Findings

1. Rockland is a major commercial hub in Prescott and Russell United Counties (PRUC) and its businesses attract customers from within this area and beyond.
2. The total population of Clarence-Rockland increased by an average of 372 or 1.8%, and in PRUC by 915 or 1.1% per year from 2006 to 2016 (Table 3.1).
3. The 2021 population of Clarence-Rockland is estimated at 27,400 and that of PRUC at 96,500. Their estimated average annual growth to the year 2031 is 760 or 2.8% and 1,356 or 1.4% respectively (Table 4.3).
4. Considering that an overall average annual population growth of 1% represents a growing and balanced economy, the past and future growth of both of these areas have exceeded this generally accepted growth standard.
5. Due to the development of many housing units over $350,000 and attracting affluent families, including from Ottawa, incomes in both areas have significantly increased recently. As shown in Table 3.3, the 2016 **median** household incomes were:

    - Clarence-Rockland $88,823
    - PRUC $78,748
    - City of Ottawa $85,981

This is particularly important since the adjacent City of Ottawa's household incomes are often among the top three to five cities in Canada.

C. Industrial Sector

1. **Industrial and commercial businesses provide numerous economic benefits and spin-offs. They provide employment, increase municipal taxes, reduce work-related travel, and significantly contribute to the economic self-sufficiency of cities and towns.**
2. The City of Clarence-Rockland is a relatively rural, farming, but growing area. As shown in Table 10.1, the number of the working residents in industrial-type jobs are:
   - Clarence-Rockland 2,785 or 20.9% of total
   - PRUC 10,900 or 22.9% of total
3. Most of these industrial-type jobs are in construction, repair of trucks and farm machinery, light manufacturing and assembly. Some of these construction and other jobs in Table 10.1 are outside the City of Clarence-Rockland, or PRUC.
4. The existing industries in PRUC are limited to small manufacturing, food processing, repair and maintenance of farm equipment, tractors, cars and trucks.
5. As PRUC, especially its Rockland part, grow in population and become more urbanized, their need for various industries, especially knowledge-based, economic growth businesses will increase.
6. Due to the rapid absorption and price increases for industrial lands in the City of Ottawa, we expect that demand for industrial lands in PRUC will increase in the coming years from Ottawa and the rest of PRUC.
7. **Due to the nature of the products and services provided by industrial businesses, access to highways is ultimately essential for their success.**

D. Retail Spending

1. On average, each resident of Clarence-Rockland is estimated to have spent $18,110, and those of PRUC as a whole, $17,380 in 2018 at all retail and service businesses within and outside these areas (we have estimated and used per capita spending for 2021–2031 in this report).
2. The total spending of PRUC residents is estimated at $1.677 **billion** in 2021, and expected to increase by $23.4 million or 1.4% annually by the year 2031, to $1.911 **billion** (Table 6.2).

3. The estimated spending portion of the residents of Clarence-Rockland from PRUC's total is \$514.3 million in 2021, and \$632.2 million in 2031 (i.e., average annual growth in spending of \$11.9 million or 2.3% (Table 6.3).
4. At present, some of the spending of PRUC residents takes place at businesses in Ottawa and elsewhere. This leakage-out is due to the following factors:
   a) Some of the PRUC residents work in Ottawa and spend some of their retail dollars there.
   b) There are no senior department stores (i.e., Simons, The Bay, Nordstrom) or other new and popular/trendy stores (e.g., J. Crew, Michael Kors) within PRUC. These stores exist in Ottawa, and attract customers from PRUC and other cities and towns within 1-2 hours drive.
5. There are, as well, customers from outside PRUC who shop at businesses there, especially at those in Rockland (i.e., leakage-in).

As more, especially new, businesses are attracted to Rockland, the leakages of PRUC's shopping dollars to Ottawa will decrease, and the leakages into PRUC will increase.

E. Retail Demand Estimation

1. The spending of the residents of Clarence-Rockland is estimated to support a minimum total of 1.027 million sq. ft. of floor space in 2021, increasing by an average of 24,160 sq. ft. or 2.3% annually, to 1.266 million sq. ft. by 2031 (Table 7.1).
2. The supportable increase by time frame is (Table 7.1):
   - 2021–2023 73,600 sq. ft.
   - 2023–2026 21,600 sq. ft.
   - 2026–2031 143,400 sq. ft.
   - 2021–2031 238,600 sq. ft.
3. At present, some of the total supportable space is outside Clarence-Rockland since its residents spend some of their total shopping dollars at businesses outside.

F. Inventory of Existing Businesses

As of May 2018 and late 2021, there were 146 retail and service businesses in Rockland, and they occupied an estimated total of 538,000 sq. ft. of floor space.

Including the limited number of such businesses in the Clarence part, the overall average floor space per capita in Clarence-Rockland is estimated to be 20 sq. ft.

Based on the industry standard of 30 to 40 sq. ft. of floor space per capita, **the City of Clarence-Rockland is under-stored for retail and service businesses.**

Of the 146 existing stores, a total of 14 with a combined size of 29,200 sq. ft. or **5.4% were vacant in 2018, and this rate is within the industry range of 4% to 8%. The vacancy rate is now more than 10% due to the pandemic since late 2019.**

G. Recommendations

In the order of priority, and in the context of economic growth for the City of Clarence-Rockland, we recommend the following on the Subject Expansion Lands:

1. **Industrial/Business Park**
2. **Office Buildings**
3. **Shopping Centre**
4. **Due to the fact that there is already ample vacant land for residential developments in Clarence-Rockland, we do not recommend residential developments.**

Each of the above is further described below.

H. Recommended Industrial/Business Park

1. Demand for traditional land-intensive, as well as modern, knowledge-based industries is increasing due to the locational and other characteristics of Clarence-Rockland.
2. Historically, many industrial/business parks were started by land-intensive uses, such as warehouses, truck repair yards and low-tech manufacturing facilities.
3. Demand for land-intensive industries is generally declining. Due to farming in PRUC on the one hand, the growing need for industrial land including from the City of

Ottawa, we expect the demand for land-intensive businesses to grow in Clarence-Rockland.

4. The location of Clarence-Rockland, and economic growth expectations of its residents point to a growing demand for knowledge-based, digital, IT, life sciences and other such modern industries.
5. **These industries, furthermore, are needed for the present and long-term economic health and growth of the City of Clarence-Rockland.**
6. Therefore, we recommend as follows:
   a. At 90 acres, the Expansion Land is large and can accommodate a combination of the old and new industries.
   b. The new, modern, knowledge-based industries are mostly in office buildings, including some in industrial/business parks.
   c. From the perspective of economic growth and future prosperity of the City of Clarence-Rockland, the best jobs in the Expansion Land would be IT, digital, life science, and other such industries.
   d. In view of the increasing industrial land prices in the City of Ottawa, the resulting shortages and the adjacency of the City of Ottawa, some of the Expansion Land can be quickly used by the land-intensive industries in Ottawa who want to move out, but still be close to Ottawa.
7. **Samples of Traditional/Land-Intensive Uses for the Subject Site**
   a. RV dealership
   b. Micro-brewery
   c. Auto mall
   d. Show Room and Display
   e. Recreation, Entertainment, Hospitality
   f. Boat dealership & indoor winter facilities
   g. ATV, Snow Mobile
   h. Medical/dental businesses
   i. Truck parking/yard
   j. Auto mechanics
   k. Lumber & other home improvement supplies
   l. Low-technology manufacturing and assembly businesses

8. Samples of Modern Industries/Offices for the Subject Site

a. Information technology

b. Software engineering

c. Life science laboratories

d. Engineering firms

e. Environmental research facilities

f. Scientific testing, product safety & approval

g. Professional businesses (accounting, legal, health)

The above are typically in office buildings, open and enclosed yards, manufacturing, testing, and storage buildings.

I. Recommended Office Space for the Subject Site

1. The existing estimated total office floor space of approximately 300,000 sq. ft. is too low for Rockland's future office industry advancements.
2. We recommend promoting Rockland for modern, knowledge-based industries such as IT and life sciences.
3. With a successful promotion of the above industries, we recommend a total of approximately 100,000 sq. ft. of additional office floor space in Rockland.
4. **Being close to the City of Ottawa, the Subject Expansion Land is considered to be the best location in Rockland for new office space, in our opinion.**
5. Most to all 100,000 sq. ft. of new office space are thus recommended to be on the Subject Expansion Land.

J. Retail Business Recommendations For the Expansion Lands

An overall average of up to 40 sq. ft. of retail and service floor space is generally supportable on a per capita basis.[1] Due to leakages in and out, however, it is not always

[1] At a total population of 27,400 in Clarence-Rockland in 2021, the total supportable floor space of 967,000 sq. ft. in 2018 represents 36 sq. ft. per capita at businesses within, but also outside this city (i.e., total supportable space within and outside Clarence-Rockland).

possible to accurately calculate the actual floor space supported by each resident by location of shopping.

What would be most needed on the Subject Site are locally-oriented food, convenience, and service businesses in the first few years. Other businesses will also be in demand, but the risk of over-storing should be avoided. Based on these considerations, we recommend the businesses in Table 1.1 for Rockland:

1. **Total of approximately 100,000 sq. ft. of floor space by 2031.**
2. **Food, convenience, personal services: approximately 60,000 sq. ft. of above.**
3. **Specialty retail, fashion, gifts, others: approximately 40,000 sq. ft. of above.**
4. **No businesses offering durable or semi-durable products which already exist in Rockland (e.g., Walmart).**
5. **Review of the supply-demand dynamics in the entire expanded Rocklands once every five years in order to revise 1-4 above based on market forces.**

The stores in Table 1.1 are for the entire City of Clarence-Rockland. Most, however, would be in Rockland, which is already a commercial hub within the County.

Since Clarence-Rockland is already understored and can support up to 238,600 sq. ft. of additional retail and service businesses, and given the proximity of the Subject Land to the eastern parts of Ottawa, we recommend up to 150,000 sq. ft. shopping centre on this land to be gradually developed after 2023.[2]

The Rockland part of Clarence-Rockland is not geographically very large. New retail developments can thus be located in different places within Rockland. The Subject Expansion Land, however, is adjacent to Orleans, and other southeastern parts of the City of Ottawa. A new shopping centre on this land can, therefore, attract shoppers from the eastern parts of Ottawa as well**.**

Our recommendations are for the next 10 years which is normal for market demand studies. For the next 25 years, a lot more than our recommendations would be needed in Clarence-Rockland.

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[2] **For the next 1–2 years, it would be best to let the present vacant stores be occupied/absorbed before adding new stores.**

Table 1.1
Recommended Businesses
To Select For Rockland

Business Type	No.	Approximate Size (sq. ft.)
Supermarket	1	40,000-50,000
Convenience Stores	3	5,000-6,000
Specialty Food Stores	3	4,000-6,000
Pharmacies	2	8,000-12,000
Computer Supply & Services	1	1,000-2,000
Hardware Store	1	3,000-8,000
Fashion Stores	2	3,000-8,000
Specialty Retail	3	3,000-7,000
Table Service Restaurants[1]	3	5,000-7,000
Coffee Shops	2	3,000-4,000
Fast Food Eateries	3	5,000-8,000
Banks & Other Financial	3	6,000-10,000
Beauty Salons, Barber, Spa	3	4,000-6,000
Cannabis Stores	2	2,500–3,000
Miscellaneous	5	2,500–5,000
Office	5	5,000-8,000
Total: Up to 40 Businesses		**100,000-150,000**

[1] A destination-type restaurant (see pages 33-34).

Notes:

1. ***The above businesses are estimated to be needed and supported by the residents of Clarence-Rockland in the period 2021–2031.***
2. ***If not provided on the Subject Lands, or elsewhere in Clarence-Rockland, the residents will increase their shopping at businesses elsewhere.***

Source: Shore-Tanner & Associates

II. SUBJECT SITE AND ENVIRONS

A. Subject Site

The Subject Site is approximately 36 hectares (90 acres) in size, vacant, mostly flat, and located west of Rockland's existing Urban Area Boundary. There are several owners of this land, and it is proposed to be added to the City of Rockland through an Expansion Lands Secondary Plan.

B. Environs

At present, the Subject Site is being considered for low- and medium-density residential developments, commercial and industrial businesses.

Rockland is the more urban part of the City of Clarence-Rockland, and it includes most of the jobs, retail and office developments of the city. It is surrounded primarily by vacant and farming lands to the north, east, south and west extending to the City of Ottawa.

Another important factor about the future of the Subject Site, and more generally, the City of Clarence-Rockland, is the planned expansion of Highway 174. Its exact timing is still not known. When completed, it will make access from the eastern parts of Ottawa to Rockland much easier, faster and more convenient. **Similar to the expansion of Highway 7 for Carleton Place, the expanded Highway 174 is expected to be a major economic growth catalyst for Rockland.**

III. SOCIO-DEMOGRAPHIC ANALYSIS

A. Trade Area

The Subject Land would be most needed for retail, office and industrial businesses.

Based on the retail industry standards and practices, capture, market or trade area is one from which customers can be attracted for the purchase of the goods and services offered by the area's businesses. Primary Trade Area (PTA) typically provides at least 50% of the total sales of the businesses within. The rest of the area(s) which provide the balance of the total sales, is called Secondary Trade Area (STA). There can also be Tertiary Trade Areas (TTA) for businesses which attract/capture at least 10% of their total sales from outside the PTA and STA combined.

Based on field research, our knowledge of the area, and past studies, we have defined the following as the effective Market or Trade Area for non-residential developments on the Subject Site:

> ***The City of Clarence-Rockland as the Primary, and the rest of Prescott & Russell United Counties (PRUC) as the Secondary Trade Area. The focus of this study, however, is the City of Clarence-Rockland.***

Trade areas are not rigid, and change over time based on growth, transportation, competitive facilities, lifestyle, and other such changes and trends. A somewhat larger or smaller Trade Area would also be valid for the purposes of this study. However, we believe that what we have defined is quite reasonable for the commercial and industrial development objectives of this study.

B. Total Population: 2006-2016

1. The City of Clarence-Rockland and the rest of PRUC have continued to grow. For the 10-year period 2006-2016, their average annual growth was (Table 3.1):
    - Clarence-Rockland 372 or 1.8%
    - PRUC 915 or 1.1%

2. As of mid-2016, Statistics Canada's Census data show total populations of:

• Clarence-Rockland	24,512
• PRUC	89,333

C. Households

1. The City of Clarence-Rockland has continued to experience higher growth rates and be more family-dominated than the rest of PRUC.
2. In 2016, the median age of the residents of Clarence-Rockland was 42.2 years (44.3 in PRUC), its overall average household size was 2.63 (2.52 in PRUC), and 5.8 in 10 of its households (6.2 in PRUC) consisted of only one ro two persons (Table 3.2).

D. Incomes

In 2016, the median household income of Clarence-Rockland residents was $88,823, which is higher than the City of Ottawa's corresponding income of $85,981 and much higher than PRUC's $78,748. We believe that household incomes have increased significantly in Clarence-Rockland since 2016.

E. Growth Forecasts

Since 2016, residential and thus population growth have accelerated in Clarence-Rockland, and to a lesser extent, in the rest of PRUC. Based on the actual growth since 2016, under construction, planned, and proposed housing developments, the City of Clarence-Rockland, and Hemson Consulting Ltd. have provided population forecasts for both areas. Based on these forecasts, as well as housing starts in Table 4.2, we have prepared **Table 4.3, which demonstrates the following average annual population increases for the period 2021-2031:**

1. Clarence-Rockland	**760 or 2.8%**
2. PRUC	**1,350 or 1.4%**

Compared to the actual annual growth from 2006 to 2016, the figures in Table 4.3 appear to be too optimistic. However, for infrastructure planning purposes, it is prudent to use somewhat generous forecasts. As well, the actual 2016 population of PRUC was 89,333 (Table 3.3), whereas Hemson report's estimate was 88,700 (i.e., 633 or 0.7% lower than actual). Above all, as the City of Ottawa continues to expand eastward, while its housing costs continue to be much higher than in Rockland, growth in Rockland/ PRUC will only further intensify. From this perspective, the forecasts in Table 4.3 seem quite reasonable, and may even be somewhat too low for the period 2021-2031.

As population grows, demand for jobs, commercial and industrial developments also grow (in addition to housing, of course). **Our recommendations for the Subject Land are thus for the economic advancement of the present and future residents of Clarence-Rockland.**

Table 3.1 Historical Population Data		
Year	**Clarence-Rockland**	**Prescott and Russell United Counties (PRUC)**
2006	20,790	80,184
2011	23,185	85,381
2016	24,512	89,333
Average Annual Change: 2006-2016:		
Numeric	**372**	**915**
%	**1.8**	**1.1**

Notes:

[1] In 2016, the median age of the residents was 42.2 in Clarence-Rockland, and 44.3 in PRUC.

[2] Due to the development of large family-housing units since then, both median ages may be about the same in 2021, or possibly slightly lower.

[3] Generally, economists and planners consider an average annual population growth of 1.0% to represent an economically growing area.

Source: Shore-Tanner & Associates based on Statistics Canada's census data.

Table 3.2 Households By Size: 2016				
Household Size	**Clarence-Rockland**		**Prescott and Russell United Counties (PRUC)**	
	No.	**%**	**No.**	**%**
Single Person	1,810	19.4	8,125	23.0
Two Persons	3,635	40.0	13,880	39.2
Three Persons	1,590	17.0	5,665	16.0
Four or More Persons	2,295	24.6	7,720	21.8
Total	**9,330**	**100.0**	**35,390**	**100.0**
Average Size	**2.63**	**–**	**2.52**	**–**
Single and Two Persons Combined	**5,445**	**58.4**	**22,005**	**62.2**

Source: Shore-Tanner & Associates based on Statistics Canada's census data.

Table 3.3
Household Income Distribution: 2016

Income Class ($)	Clarence-Rockland		Prescott and Russell United Counties (PRUC)	
	No.	**%**	**No.**	**%**
Under 40,000	1,460	15.6	7,825	22.1
40,000-59,999	1,315	14.1	5,250	14.8
60,000-79,999	1,355	14.5	4,925	13.9
80,000-99,999	1,200	12.9	4,445	12.6
100,000-124,999	1,375	14.7	4,550	12.9
125,000-149,999	1,025	11.0	3,210	9.1
150,000 & over	1,600	17.1	5,185	14.6
Total	**9,330**	**100.0**	**35,390**	**100.0**
Median Household	88,823	–	78,748	–
Median Per Capita	33,773	–	31,249	–
Average Household Income ($):				
• Single Persons		47,855		43,317
• Two or More Persons		110,699		104,452

Note: The 2016 median income for the City of Ottawa was $85,981 and for the Province of Ontario it was $74,287.

Source: Shore-Tanner & Associates based on Statistics Canada’s census data.

IV. Housing Inventory and Growth Forecasts

The purpose of this chapter is mainly substantiation for Clarence-Rockland's population forecasts.

A. Existing Housing Inventory: 2016

1. Based on the 2016 data, there was a total of 35,390 housing units in PRUC, including 9,330 in Clarence-Rockland or 26.4% of the total (Table 4.1).
2. Ground-oriented units (i.e., singles, semis, rows, towns and duplexes) made up 87.8% in PRUC, and 88.0% in Clarence-Rockland.
3. In PRUC, owned units made up 77.3%, and in Clarence-Rockland, 81.3% of the total.
4. Rental housing units made up 22.7% of the PRUC, and 18.6% of the Clarence-Rockland units.

B. Housing Starts Since 2016

1. In the period 2015–2019, a total of 2,408 housing units were started in PRUC, including 808 or 33.5% of it in Clarence-Rockland.
2. The overall average number of housing starts in 2015–2019 was:
   - PRUC 482 or 1.36%
   - Clarence-Rockland 162 or 1.74%
3. **The figures in Tables 4.1 and 4.2 indicate that:**
   a. **The City of Clarence-Rockland has been more oriented towards ownership rather than rental housing units compared to PRUC as a whole.**
   b. **New housing developments in Clarence-Rockland have taken place at a slightly higher rate than in PRUC.**

C. Population Forecasts

The vast majority of the existing housing as well as those under construction are family-type units consisting of singles, semis, towns and rows. We expect this trend to be dominant in the next 10 years, while 3, 4 and more storey apartments will also continue to increase in number and percentage of total housing. These trends provide further substantiation for our average annual population growth forecasts of 760 in Table 4.3.

D. Household Forecasts

1. In 2016, the numbers of the single and two-person households combined were (Table 3.2):

   • PRUC 62.2% or 6.2 in 10

   • Clarence-Rockland 58.4% or 5.8 in 10

2. Based on the demographic characteristics of the residents of PRUC, as well as our experience with many other small towns and cities within up to two hours' driving distance from Ottawa,[3] we expect the number and proportion of small households in PRUC to be higher now than in 2016, and continue to increase at a higher rate than households consisting of 3 or more persons.

3. Table 4.4 presents our forecast of households by size. As shown:

   a. The total number of households in PRUC is estimated to increase by an average of 970 or 2.2%, including 460 of the total or 3.9% in Clarence-Rockland.

   b. **The total number of single and two-person households in PRUC is estimated to increase by an average of 620 or 2.3%, including 170 (3.9%) in Clarence-Rockland.**

E. Housing Unit Requirements

1. Due to sharing of units by some single-person households, we estimate 0.95 housing unit requirement per single and two-person household combined. For the 3-person and larger, we estimate one housing unit per household.

2. Based on the above assumptions, we estimate the following additional housing requirements for the 10-year period 2021–2031 (Table 4.5):

   • Clarence-Rockland Total of 4,455 or 445 per year

   • PRUC Total of 9,939 or 939 per year

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[3] We have carried out studies in the Township of Russell, Towns of Carleton Place, Perth, Mississippi Mills, Renfrew, Kemptville, Pembroke, Smiths Falls, Lindsay, and the City of Brockville in the last 5 years.

Table 4.1
Housing Inventory: 2016

Housing Type	Clarence-Rockland		PRUC	
	No.	%	No.	%
Single Detached	6,975	74.6	26,005	73.5
Semi-Detached	380	4.1	2,235	6.3
Rows, Towns & Duplexes	855	9.2	2,825	6.3
Apartments (up to 4 storeys)	940	10.0	3,985	11.3
Apartments (5 storeys and higher)	70	0.7	70	0.2
Other	110	1.2	270	0.8
Total	**9,330**	**100.0**	**35,390**	**100.0**
Tenure:				
1. Owned Units	**7,590**	**81.3**	**27,370**	**77.3**
• Condominiums	**495**	**5.3**	**2,010**	**5.7**
• Others	**7,095**	**76.0**	**25,360**	**71.6**
2. Rented Units	**1,740**	**18.6**	**8,020**	**22.7**

Source: Shore-Tanner & Associates based on Statistics Canada census data.

Table 4.2
Housing Starts, Clarence-Rockland

Year	
2015	112
2017	213
2018	179
2019	208
2020	318
Total	**1,030**
Average Annual	**206**

Source: Shore-Tanner & Associates based on Statistics Canada census data.

Table 4.3
Population Forecasts

Year	Clarence-Rockland	PRUC
2016 (actual)	**24,512**	**89,333**
2021	27,400	96,500
2023	28,700	99,700
2026	31,000	104,500
2031	35,000	110,000
Average Annual Increase: 2021–2031:		
Numeric	760	1,350
%	2.8	1.4

Source: Shore-Tanner & Associates based on partial estimates from the City of Clarence-Rockland.

Table 4.4
Household Forecasts

Year	Clarence-Rockland			PRUC		
	One & Two Persons	**Three & Larger**	**Total**	**One & Two Persons**	**Three & Larger**	**Total**
2016 (actual)	5,445	3,885	9,330	22,005	13,385	35,390
2021	7,200	4,700	11,900	26,400	16,900	43,300
2023	7,800	5,180	13,000	27,300	17,200	44,500
2026	8,200	5,400	13,600	30,400	18,100	48,500
2031	10,100	6,400	16,500	32,600	20,400	53,000
Average Annual Change: 2021–2031						
Numeric	290	170	460	620	350	970
%	4.0	3.6	3.9	2.3	2.1	2.2

Source: Shore-Tanner & Associates

Table 4.5 **Estimated Total Housing Requirements**						
Year	**Clarence-Rockland**			**PRUC**		
	Small Households [1]	**Large Households** [2]	**Total**	**Small Households**	**Large Households**	**Total**
2021	6,840	4,700	11,540	25,080	16,900	41,980
2023	7,410	5,180	12,590	25,935	17,200	43,135
2026	7,790	5,400	13,190	28,880	18,100	46,980
2031	9,595	6,400	15,995	30,970	20,400	51,370
Total	2,755	1,700	4,455	5,890	3,500	9,939
Average/Year	275	170	445	589	350	939
%/Year	4.0	3.6	3.9	2.3	2.1	2.2

1. Single and two-person households combined, at 0.95 units per household.
2. Three-person and larger households at 1.0 unit per household.
3. For all households combined, a total of 4,455 additional housing units of all types are estimated to be required for the growing population of Clarence-Rockland, and 9,939 for the residents of PRUC, including Clarence-Rockland.
4. For the single and two-person households combined, however, an average of 275 additional units is required per year, for a total of 2,755 units for Clarence-Rockland, and 589 units per year or a total of 5,890 units in PRUC.
5. **Due to the existing ample supply of vacant land for residential developments, we do not recommend any residential developments on the Subject Expansion Land. The above table has been used as a basis for the population forecasts in Table 4.3.**

Source: Shore-Tanner & Associates.

V. Retail Market Trends

This section presents a number of major trends and changes in shopping habits, patterns, and new retail facilities. While our recommended businesses for the Subject Land are mostly for the day to day local and convenience shopping, the knowledge of the retail industry trends provides additional understanding for this ever-changing and highly competitive industry.

A. Unprecedented Recent Changes

1. During approximately five years prior to the Covid-19 pandemic (2015–2019), shopping at large box stores, discount stores, luxury stores, and especially online shopping had increasingly become popular.
2. These trends had taken significant retail spending away from the mid-quality/mid-price retail businesses. As a result, many of these businesses in general, especially those on traditional main streets, were already struggling for survival.
3. **The pandemic of 2020–2021 has devastated most of the retail industry in unprecedented ways, resulting in high vacancy rates, especially on traditional main streets**.[4] In a significant way, the rapid increase in online shopping with free and/or quick delivery has been the cause of this sorry situation.
4. Appliance, furniture, hardware and sporting goods stores, supermarkets, and pharmacies have generally performed better during the pandemic. **Just about all other retail and service businesses, especially coffee shops, restaurants, bars, cinemas, musical, artistic and other performing businesses have suffered; a large number of them have closed down, or will be closing in the coming months.**
5. Since late July 2021, the pandemic has been weakened and businesses are slowly opening up with certain restrictions.
6. Due to various governmental assistance programs, as well as the pandemic limitations, the majority of people generally have lots of savings (i.e., unspent money).

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[4] For example, in February 2021, there were 19 vacant and for-lease stores on Richmond Road in Westboro, plus a number of vacant stores without “for lease” signs (based on a study for a business on Richmond Road, one of the most popular shopping districts in Ottawa).

7. **Starting in the fall of 2021, the retail industry began to recover strongly and fast. Hospitality and cultural industries, in particular, benefited significantly from this recovery until late November, when a new variant (Omicron) began to slow down the recovery.**
8. There are also a number of other new or strengthening trends which have been partially caused by the pandemic. They include:
   a. Continuation of the popularity of online shopping and free delivery of products. While weaker than during the pandemic, most experts believe that it will be used more often than in the pre-pandemic period.
   b. There is a new/stronger interest from consumers in buying local and supporting small businesses on traditional main streets.
   c. During the pandemic, people's sense of community, helping and socializing with neighbours has increased. This could contribute to more shopping at local, especially main street stores.
   d. Awareness and concern for the environment has also increased due to the pandemic, fires, record heatwaves, rapid weather changes, etc. These factors will impact consumption patterns, thus shopping habits.
9. **While retail spending will begin to get back to normal and likely increase in 2022, the retail industry in general is expected to be more challenging, especially for small businesses.**
10. The above points provide information about the recent past and near future of the retail industry. Below are more retail trends and their historical evolution.

B. Retail Stores

A number of new types of shopping facilities, most of which have their origins in the U.S., were introduced into the Canadian market in the late 1990s. The major new shopping facilities in this regard are:

1. **Box Stores:** Costco, Walmart, and The Home Depot fall into this category. These are often referred to as big-box stores, since they are typically larger than 100,000 sq. ft. There are also medium-sized box stores, such as Winner's (clothing), Staples (office products), and Globo shoes, which are typically between 20,000 to 50,000 sq. ft.;

2. **Large Format Stores** such as Canadian Tire and the Great Canadian Super Stores. These are mostly new versions of the same stores, but significantly larger (often between 70,000 to 150,000 sq. ft.), offering a much wider assortment of products and services;

3. **Dollar Stores** which are typically between 1,000 to 5,000 sq. ft., specializing in mostly low-cost imports priced at up to $5.00 per item (e.g., Dollarama, A Buck or Two, The Dollar Store);

4. **Power Centres** are typically between 200,000 to 1,000,000 sq. ft., consist of a variety of box and traditional stores in open malls, with each store having its own pad and parking in front to the extent possible;

5. **Specialty Stores** such as Starbucks (coffee shop), Mountain Equipment Coop (outdoors store), Lululemon (Yoga wear), Sassy Beads (jewellery, craft), and Brio (shoes, clothing, accessories);

6. **De-Malling**

   Another recent trend in the retail industry is the conversion of old and small enclosed shopping malls into open, uncovered shopping centres (referred to as de-malling). Malls which are over 20 years old and up to about 300,000 sq. ft. in size are usually targets for being de-malled. A de-malled shopping centre is less costly to operate since there are no indoor areas to be heated, cooled, cleaned or supervised. As well, the corridors and other public spaces are converted to leasable floor space.

7. **Store Enlargements**

   Another significant trend in the retail industry is the enlargement of existing stores at the same or a new location. Large stores are in a much better position than small and medium-sized stores to offer one-stop-shopping opportunities. Many supermarkets, hardware, furniture, electronics, department, and home improvement stores have in recent years expanded their size in the same or a new location within the National Capital Region. In some other cases, new stores from the same chain are built much larger.

8. **Walmart Supercentres**

   In the early 2000s, the Walmart chain stores finally won the right to offer food products at their stores. Called Supercentres, these new Walmart stores have the equivalent of a 50,000 sq. ft. supermarket within them, including produce, fresh meat, deli, dairy, as well as general merchandise (i.e., canned and boxed food products). The food section is usually on one side of these huge stores, and clothing, furniture, and other non-food products on the other side.

At these stores, the cost of food and other products are generally lower, but more importantly, perceived to be lower due to effective advertising, than at competitive stores.

9. Recent Entries Into the Ottawa Market

In September 2013, several (American) Target stores were opened in Ottawa in previously Zellers stores, and more were planned. Soon after, however, they were all closed down and to this date, some of them are still vacant. An H&M store was opened in Bayshore Shopping Centre in October 2013 and more since then elsewhere in Ottawa.

In February 2012, a Marshall's department store was opened in the Train Yards Shopping Centre, there are four of them now in Ottawa, and more are planned to open. In November 2011, the new and expanded IKEA store at approximately 410,000 sq. ft. was opened in Pinecrest Centre. In early 2011, a Forever 21 store was opened at the Rideau Centre. Since then, it has expanded and attracted a large number of luxury stores such as Michael Kors, Tiffany &Co., and Kate Spade.

A Whole Foods Supermarket and a large number of other retail and restaurants have opened at Lansdowne Park as part of its major redevelopment plan since 2014. Nordstrom, Topman, Simons and a few other American and European stores have also come to Ottawa in the last five years.

In addition to these new facilities, new methods of conducting business have been created. Purchasing through the Internet is one example. Twinning is another example which makes it possible for two businesses to complement each other, while saving on insurance, utilities, taxes, staff, and other costs. Examples in this regard include Chapter's book stores and Starbucks, Walmart and McDonald's restaurants, The Home Depot and Harvey's restaurants. **Online shopping has been growing very rapidly in the last five years, and expected to grow further from its estimated total market share of approximately 10% or more of total spending in Ottawa (it was about 5% pre-pandemic).**

C. Reasons For Success of the New Store Types

There are many reasons for the introduction and successful operation of these new stores, as well as the new merchandising formats. Chief among these are:

1. Population growth, affluence, and especially ethnic and economic diversity, create demand for new products, services, and methods of buying and selling.
2. Many retail markets in Canada including in Ottawa are considered to be still offering a limited variety of shopping facilities with primarily average quality products at above average prices. Choices at discount/value, as well as at upscale/high-quality ends of the shopping spectrum in particular, are still limited.
3. Power centres and stand-alone box stores have lower operating costs (e.g., little or no common-area charges compared to enclosed malls), provide ample parking situated very close to their entrances, offer one-stop-shopping opportunities, their prices are and/or are perceived to be lower than conventional stores, and they are very successful at selling large quantities of products.
4. For a wide variety of economic, demographic, and lifestyle reasons, many people seem to prefer shopping at these large, new-format and specialty stores.

D. Present Shopping Patterns and Habits

Based on knowledge, experience, observations, and **hundreds** of consumer research surveys, we believe that shopping patterns and habits are solidifying, as follows:

1. Power centres, big-box and other discount-oriented shopping facilities are here to stay. Their main advantages are real and/or perceived value, choice, and large quantities. Shoppers tend to go to these stores about once a month, and for the specific and pre-determined purpose of actual shopping (for household and/or office products), rather than browsing, window shopping, socializing or just passing time. Typically, they prepare a list of what they want to buy ahead of time, follow it through, buy and bring home large quantities of products.

   This type of shopping is rather arduous, especially for older people, those who do not have or wish to spend lots of time for shopping, and those who are affluent enough for whom discount/value is not that important. The amount of time, planning, and the energy required are the main reasons why shopping at these facilities is generally infrequent (although there are customers from all socio-economic classes who only or mostly shop at these stores).

2. **Shopping at regional, community shopping centres, and especially in downtown and on other pedestrian-friendly streets such as Bank Street, is often for fashion, specialty products and services, meeting, dining, socializing, entertainment and cultural activities.** There is frequently comparison-shopping, browsing, and cross-shopping at these facilities, especially during holidays and for special occasions (birthdays, anniversaries, etc.). Trips to these facilities do not necessarily always result in purchases due to the entertainment/socializing/dining factors, and also for purposes of comparison shopping. **Thus, the fun and multi-purpose functions of these trips, combined with the far more diverse, attractive, and comfortable atmospheres of these facilities, attract shoppers there more frequently than power centres and big-box stores do.**

3. Shopping at **highway commercial** facilities is also destination oriented and closer in function to shopping at power centres and big-box stores, than to shopping at regional and community shopping centres, or on main streets. Furniture, electronics, appliances, automotive, box stores, restaurants, and other services often dominate highway commercial strips. Shoppers typically go to these establishments for specific products and/or services, based on pre-determined shopping plan. While there may be comparison shopping, there is usually no window-shopping, socializing, browsing, or cross-shopping. Other than for restaurants, banks, gasoline, and other services, shopping at highway commercial stores is infrequent (furniture, electronics, appliances, and major auto repairs are normally needed less than once a year by most households).

4. The retail industry is dynamic and rapidly evolving. Shoppers demand choice, variety, convenience, value, and fun. In a healthy market, there is a balance between the traditional main street retail stores, suburban shopping centres, and the new and emerging retail facilities as described above.

5. **In the competitive environment of today, maintaining market share, and especially increasing it, is a major challenge for all shopping facilities and districts, requiring new thinking and approaches to merchandising and customer relationship. Targeted use of social media, online services, better understanding of the retail market trends, more awareness of competition from shopping centres and districts, and better recognition of the needs,**

preferences, and desires of the Trade Area residents are among the key elements of new thinking and approaches, which have to be considered for the planned retail market on the Subject Site, and more generally, in the City of Clarence-Rockland.

VI. RETAIL EXPENDITURE ANALYSIS

Spending at retail and service businesses depends on numerous socio-demographic, lifestyle, and locational factors. Based on hundreds of retail market studies by our firm and other research organizations, income is the most influential factor. Often, the higher their income, the more people shop, spend, and thus support the continuation and/or expansion of businesses.

The estimation of demand for supportable floor space is highly analytical and therefore numerically oriented. The detailed results of the analytical part of the demand estimation are presented in the next chapter, after the estimation of expenditure potentials below.

A. Base Year Spending Selection

Based on population growth, increasing incomes, additional employment and tourism, the overall average spending per person typically increases. There are, however, situations where the average spending stays static or even declines. The years 2000 and 2008 are two examples in this regard.

The most recent, longest lasting, and severest decline in retail spending since 2000 started in late 2019 due to the Covid-19 pandemic, which is still having an impact on shopping and spending. From late 2019 to September 2021, per capita spending has, overall, been declining and/or fluctuating. What is known in this respect is as follows:

1. Spending at supermarkets, most other food stores, hardware, furniture, sporting goods and appliance stores, pharmacies, psychotherapy, Zoom, Netflix and some other businesses has increased very significantly. These are mostly necessity, home-improvement, and mental health industries.

2. In areas with a large number of tourists, visitors, large government and/or corporate/industry centres (e.g., Town of Lindsay for its cottages, City of Ottawa for the Federal Government, and City of Toronto for the finance industry), the total spending (i.e., sales) at some of the businesses in number 1 above have actually declined since late 2019 due to the pandemic.

3. Spending at clothing, shoe, jewellery, gift, and specialty stores; restaurants, gasoline stations, dry cleaning, cultural, sports, entertainment facilities, and many other businesses have declined drastically.

The pandemic, in short, has caused too many changes in retail spending/sales since late 2019. As a result, the available data on retail expenditures for 2019–2021 are not considered valid as a base for future spending forecasts.

With the majority of residents in Canada having been twice vaccinated as of September 2021, businesses are slowly opening up. Assuming that the year 2022 will be the beginning of the return to normality as far as retail spending is concerned, we have decided to use the spending for the full year 2018 as the base year for forecasting purposes for this study, and estimated it for 2021–2031.

B. Per Capita Expenditures

Statistics Canada is the primary source for expenditure data at retail and service stores across Canada. For this study's Trade Area, the data are estimated based on income comparisons, since they are not available for Clarence-Rockland.

The overall median per capita income in 2016 of Trade Area residents was $33,773 and this was higher than Ontario's which was $28,572 in 2016. Incomes in both areas are higher now.

In Table 5.1, we have provided estimates of per capita expenditures by the residents of the Trade Area for a number of trade groups which are standard in the retail industry. As noted, **we estimate the overall average per capita spending of the TA residents to be $17,386 in 2018**. Of course, due to mortgages, family size and other factors, some individuals and families spend less, and others more than these averages, depending on their disposable income.

C. Total Retail and Service Expenditures

The estimated total expenditures of the residents of UCPR and Clarence-Rockland are provided in Tables 5.2 and 5.3.

Table 6.1
Estimated Per Capita Retail and Service Spending: 2018

Trade Group	UCPR Spending ($)	Clarence-Rockland Spending ($)
A. Retail Product Stores		
Supermarkets	2,290	2,400
Convenience Stores	220	235
Specialty Food	195	205
Beer, Wine & Liquor	670	700
Drugs & Patent Medicine*	1,105	1,160
Clothing	820	860
Shoes, Jewellery & Accessories	235	250
Home Furnishings	125	130
Electronics & Appliances	495	520
Furniture	285	300
Building Materials, Hardware & Garden Supplies	850	890
Sporting Goods, Hobbies, Music & Books	300	315
Used, Recreation & Other Vehicles	470	490
New Car Sales	2,800	2,900
Auto Parts & Accessories	190	200
Gasoline & Service Stations	1,410	1,400
General Merchandise	960	980
Department Stores	720	750
Other Retail Stores	350	370
Subtotal: Retail Products	**14,490**	**15,055**
B. Retail Service Businesses		
Restaurants, Bars & Other Eateries*	1,220	1,300
Personal Care Businesses*	215	225
Sports, Recreation & Entertainment*	1,455	1,530
Subtotal: Service Businesses	**2,890**	**3,055**
Grand Total: All Stores & Businesses	**17,380**	**18,110**

* Estimated
1. These figures have been estimated for the period 2021–2031 for the calculation of total spending potential in Tables 6.1–6.3.
2. Online spending is **not** included.

Source: Shore-Tanner & Associates based on CANSIM Tables 080-0030 and other relevant Statistics Canada data.

Table 6.2
Estimates of Total Spending By PRUC Residents

Trade Group	2021 ($M)	2023 ($M)	2026 ($M)	2031 ($M)
Population	**96,500**	**99,700**	**104,500**	**110,000**
A. Retail Product Stores				
Supermarkets	221.0	228.3	239.3	251.9
Convenience Stores	21.2	21.9	23.0	24.2
Specialty Food	18.8	19.4	20.4	21.4
Beer, Wine & Liquor	64.6	66.8	69.9	73.7
Drugs & Patent Medicine*	106.6	110.1	115.4	121.5
Clothing	79.1	81.7	85.6	90.2
Shoes, Jewellery & Accessories	22.7	23.3	24.5	25.8
Home Furnishings	12.1	12.5	13.1	13.7
Electronics & Appliances	47.8	46.2	51.7	54.4
Furniture	27.5	28.4	29.8	31.4
Building Materials, Hardware & Garden Supplies	82.0	84.7	88.7	93.5
Sporting Goods, Hobbies, Music & Books	29.0	29.8	31.3	32.9
Used, Recreation & Other Vehicles	45.3	46.8	49.1	51.7
New Car Sales	270.2	279.1	292.6	307.9
Auto Parts & Accessories	18.3	18.9	19.8	20.9
Gasoline & Service Stations	136.1	140.5	147.2	155.1
General Merchandise	92.6	95.6	100.4	105.5
Department Stores	69.5	71.8	77.2	79.2
Other Retail Stores	33.8	34.9	36.6	38.5
Subtotal: Retail Products	**1,398.3**	**1,444.2**	**1,513.8**	**1,593.6**
B. Retail Service Businesses				
Restaurants, Bars & Other Eateries*	117.7	121.6	127.5	134.1
Personal Care Businesses*	20.7	21.4	22.4	23.7
Sports, Recreation & Entertainment*	140.4	145.0	152.0	160.0
Subtotal: Service Businesses	**278.9**	**288.0**	**301.9**	**317.8**
Grand Total: All Stores & Businesses	**1,677.2**	**1,732.2**	**1,815.7**	**1,911.4**

* Estimated
1. Online spending is **not** included.

Note: The average annual percentage increases in spending are identical to the estimated population growth of 1.4% in Table 4.3. The dollar figures above are all in the constant value of the Canadian dollar in 2018. In other words, inflation is **not** included in order to avoid possible over-estimation.

Source: Shore-Tanner & Associates.

Table 6.3 **Estimates of Total Spending By Clarence-Rockland Residents**				
Trade Group	**2021 ($M)**	**2023 ($M)**	**2026 ($M)**	**2031 ($M)**
Population	**27,400**	**28,700**	**31,000**	**35,000**
A. Retail Product Stores				
Supermarkets	68.1	68.9	74.4	84.0
Convenience Stores	6.7	6.8	7.3	8.2
Specialty Food	5.8	5.9	6.3	7.2
Beer, Wine & Liquor	19.9	20.1	21.7	24.5
Drugs & Patent Medicine*	32.9	33.3	36.0	40.6
Clothing	24.4	24.7	26.6	30.1
Shoes, Jewellery & Accessories	7.1	7.1	7.8	8.8
Home Furnishings	3.7	3.8	4.0	4.6
Electronics & Appliances	14.7	14.9	16.1	18.2
Furniture	8.6	8.7	9.3	10.5
Building Materials, Hardware & Garden Supplies	25.3	25.6	27.6	30.5
Sporting Goods, Hobbies, Music & Books	8.9	9.1	9.8	11.0
Used, Recreation & Other Vehicles	13.9	14.1	15.2	17.1
New Car Sales	82.3	83.3	90.0	101.5
Auto Parts & Accessories	5.7	5.9	6.4	6.9
Gasoline & Service Stations	39.8	40.1	43.4	48.9
General Merchandise	27.8	28.1	30.4	34.3
Department Stores	21.3	21.5	23.2	26.2
Other Retail Stores	10.5	10.6	11.5	12.9
Subtotal: Retail Products	**427.2**	**432.1**	**476.0**	**526.4**
B. Retail Service Businesses				
Restaurants, Bars & Other Eateries*	37.1	38.7	43.5	45.5
Personal Care Businesses*	6.4	6.7	7.4	7.8
Sports, Recreation & Entertainment*	43.6	45.5	50.1	53.5
Subtotal: Service Businesses	**87.1**	**90.9**	**99.6**	**106.8**
Grand Total: All Stores & Businesses	**514.3**	**523.0**	**757.6**	**633.2**

* Estimated
1. Online spending is **not** included.

Note: The average annual percentage increases in spending are identical to the estimated population growth of 2.8% in Table 4.3. The dollar figures above are all in the **constant** value of the Canadian dollar in 2018. In other words, inflation is **not** included in order to avoid possible over-estimation of demand for additional floor space.

Source: Shore-Tanner & Associates.

VII. RETAIL DEMAND ESTIMATION

A. Productivity Rates

In Tables 5.1-5.3, we have provided estimates of the available spending by Trade Area residents. The next steps involve the estimation of how much floor space these expenditures can support. For these steps, productivity rates or sales per sq. ft. are needed.

Based on over 100 retail studies in the last 20 years, including in-person confidential meetings and surveys of at least 2,000 business managers and/or owners, we have obtained actual and closely estimated sales data. **Many of these studies have included presentations at the Ontario Municipal Board hearings where actual sales data were presented by opposing parties and analyzed.** Based on these studies, ongoing research, and review of retail trends, we have provided realistic ranges of annual sales per sq. ft. for the types of retail and service businesses most likely to be viable on the Subject Site. As shown in Table 6.1, the average annual sales per sq. ft. at food stores, for example, is estimated to be $559 at retail, and $329 at service businesses.[5]

B. Total Supportable Floor Space

Table 6.1 presents the total supportable floor space for each business for the years 2021–2031. As demonstrated, **Clarence-Rockland residents' spending is estimated to be supporting a total of 1.027 million sq. ft. of retail and service business floor space in 2021, at businesses within, but also outside this area.** The total supportable space will, of course, increase each year, based on population growth and affluence.

In Table 6.2, we have identified the increase in supportable demand for each business. As demonstrated, **the supportable increase in the total floor space is as follows by time periods by the residents of Clarence-Rockland:**

[5] As mentioned before, we have used the average per capita spending, as well as the annual average sales per sq. ft. for 2018, because the data for 2019–2021 represent the pandemic conditions which are not normal or valid for the period 2021–2031.

1.	**2021–2023**	**73,600 sq. ft.**
2.	**2023–2026**	**21,600 sq. ft.**
3.	**2026–2031**	**143,400 sq. ft.**
4.	**2021–2031**	**238,600 sq. ft.**

In other words, the available spending potential of Clarence-Rockland is estimated to generate demand for 238,600 sq. ft. of additional retail and floor space by the year 2031.

The demand generated from the residents of PRUC is, of course, much larger. As in the past, many residents of PRUC outside the City of Clarence-Rockland are expected to do much of their shopping at businesses in Rockland. It is therefore necessary to address their spending, in addition to the spending of the Clarence-Rockland residents.

As demonstrated in Table 5.1, the overall average spending of each resident of PRUC is estimated to be $17,380 in 2018. At this rate, the total spending of PRUC is estimated at $1.677 **billion** in 2021, increasing by an average of $23.4 million annually, to a total of $1.911 **billion** in 2031 (Table 5.2).

In view of the relative abundance of retail and service businesses in Rockland, and also in the City of Ottawa, much of the total spending of PRUC residents happens in these two cities. Regardless of where their spending takes place, it is necessary to first determine how much floor space can their spending support. Table 6.1 provides this answer by individual retail and service groups. As demonstrated in Table 6.1, the total spending of residents of Clarence-Rockland is estimated to support a total of at least 1,027,500 sq. ft. of retail and service floor space in 2021 or 37.5 sq. ft. per person. By 2031, an estimated 238,600 sq. ft. of additional floor space would be supported by the residents of Clarence-Rockland.

C. Market Demand and Spending Trends

Increased incomes, knowledge, and curiosity generate demand for new and/or different retail products and services. The retail industry is also dynamic, highly competitive, and follows as well as leads consumer needs and desires.

Many of the consumer products and services fall into the category of basic necessities (e.g., food, cleaning products, and banking). Others are for pleasure, entertainment recreation, and special events. There are also discretionary products and services. **Regardless of type, all retail products and services are subject to improvements, innovations, price, availability, and other changes.**

In recent years, consumers as well as producers of retail products and services have been increasingly paying more attention to, and promoting local, fresh, and environmentally improved shopping. The three Rs in consumption (i.e., reduce, re-use, and recycle) are increasingly being more followed. Organic, locally produced, other real and/or believed environmentally improved products and services are being increasingly more demanded by consumers. (In contrast, so is online shopping, which is mostly in opposition to the three Rs.)

Improved products and services are being increasingly more demanded by consumers. **One of the strongest and continuous expectations of consumers is new products and services.** In this regard, the number of new, specialty and unique retail businesses has been increasing rapidly in recent years. A few such businesses in Ottawa are *Seed to Sausage*, *Bargain Box*, *The Papery*, *Cats R Us*, *NU Grocery*, *Uncle Tetsu's Japanese Cheesecake Bakery*, and the many microbreweries and cannabis stores.

New York City in the U.S. is one of the largest centres of new fashion and other products and services. In a recent research tour of Manhattan (July & August 2021), we observed many vacant retail stores, many more kiosks on mid-town Manhattan streets than before the pandemic selling food, clothing and other retail products, and unusual sales at normally very exclusive stores in expensive/fancy shopping centres (some of these stores allowed customers in by appointment only in the past, not for safety reasons, but for the convenience and comfort of their ultra-wealthy clients. To us, this change represented the depth of the pandemic's damage to the retail industry.

Next, we travelled to the State of Vermont, which is known for the large number of tourists it normally attracts. The town of Woodstock in Vermont is charming, and highly popular for tourists. We found it to be busy, with no more vacant stores than before the pandemic. Its restaurants, bars, clothing and especially its gift stores were quite busy, and all had more sales signs than usual.

While in Vermont, we found out about a new and unique restaurant which had been nationally advertised. It was more than one hour drive from Woodstock in the village of Royalton. **As a new, unique, highly successful restaurant, we recommend this restaurant for the Subject Site.**

It is called *Worthy Burgers*, was opened about 6 years ago, and two more have been opened elsewhere since then. It is in a farming area, with unpretentious, average indoor seating. It has a large bar, more than 12 picnic tables outdoors, each providing up to 10 bench seats, and a small stage for live music.

It offers beef, turkey and chicken burgers, fresh cut French fries, fried chicken, fried tuna, normal soft drinks, and beer, all served on recycled paper in baskets (i.e., no dishes). **Everything, other than tuna and soft drinks, are produced and purchased from their own and/or the adjacent farms, and prices were between $12 and $18.** The beer is made onsite. In our opinion, this business is an excellent example of a new, unique, fresh, affordable, and environmentally low-impact restaurant. Other than farms, and a few farmhouses, there is nothing near this restaurant, and it is about 30 minutes' or longer drive from other parts of Vermont.

In another recent trip to the City of Montreal (Friday September 3: Labour Day Weekend), which is also a major centre of new retail trends, we visited Saint Denis and Sainte Catherine Streets. Both are highly popular with residents and tourists. On a Friday night, with ideal weather, Saint Denis was closed to traffic from Sherbrooke Street to Maisonneuve Street (i.e., the most popular part of Saint Denis). There were outdoor seats partially on sidewalks, and partially on the street, and a 3-person band played live music. The variety of the outdoor furniture, colours, lighting, and other visual creation could hardly have been better. The atmosphere was happy, festive, and ideal for browsing, dining, drinking and socializing.

Within these two blocks, there were 8 vacant and for-lease stores, which reflect the seriousness of the pandemic's damage on this highly popular street. Other new businesses on these two blocks were three vegetarian restaurants. At least two of them were not there a few years ago, reflecting changes in consumer habits and expectations.

On Sainte Catherine Street also, there were many vacant and for-lease stores. This street is known for its new, unusual, eccentric, as well as the normal retail and service businesses.

On our visit, we noted a large number of ethnic-type restaurants, including vegetarian ones, fashion stores, tourist product stores, nude/pornographic shows, and a large and busy erotic-products store.

In contrast to our visit of this street in the summer of 2020, Sainte Catherine Street was crowded, many pedestrians were walking there leisurely, and there were customers in most stores.

Table 7.1
Estimates of Minimum Total Supportable Floor Space
By Clarence-Rockland Residents: Square Feet

Trade Group	2021	2023	2026	2031
A. Retail Product Stores				
Supermarkets at $700/sq. ft.	97,300	98,400	106,600	120,000
Convenience Stores at $300/sq. ft.	22,300	22,700	24,300	27,300
Specialty Food at $450/sq. ft.	12,900	13,100	14,000	16,000
Beer, Wine & Liquor at $700/sq. ft.	28,400	28,700	31,000	35,000
Drugs & Patent Medicine* at $1,000/sq. ft.	32,900	33,300	36,000	40,600
Clothing at $350/sq. ft.	69,700	70,600	76,000	86,000
Shoes, Jewellery & Accessories at $400/sq. ft.	17,700	18,000	19,500	25,000
Home Furnishings at $350/sq. ft.	10,600	10,900	11,400	13,100
Electronics & Appliances at $700/sq. ft.	21,000	21,300	23,000	26,000
Furniture at $300/sq. ft.	28,700	29,000	31,000	35,000
Building Materials, Hardware & Garden Supplies at $250/sq. ft.	101,200	102,400	110,400	122,000
Sporting Goods, Hobbies, Music & Books at $300/sq. ft.	29,700	30,000	32,700	36,700
Used, Recreation & Other Vehicles at $1,000/sq. ft.	13,900	14,100	15,200	17,100
New Car Sales at $2,000/sq. ft.	41,100	41,700	45,000	50,700
Auto Parts & Accessories at $1,500/sq. ft.	3,800	3,900	4,300	4,600
Gasoline & Service Stations at $1,200/sq. ft.	33,200	33,500	36,200	40,700
General Merchandise at $350/sq. ft.	79,400	80,300	86,900	98,000
Department Stores at $250/sq. ft.	85,200	86,000	92,800	104,800
Other Retail Stores at $300/sq. ft.	35,000	35,500	38,300	34,000
Subtotal: Retail Products at $559/sq. ft.	**764,000**	**733,400**	**834,400**	**941,600**
B. Retail Service Businesses				
Restaurants, Bars & Other Eateries at $600/sq. ft.	61,500	62,200	67,200	75,800
Personal Car Businesses at $225/sq. ft.	28,400	28,900	31,100	34,700
Sports, Recreation & Entertainment[1] at $250/sq. ft.	173,600	175,600	190,000	214,000
Subtotal: Retail Services at $329/sq. ft.	**263,500**	**266,700**	**288,300**	**324,500**
Grand Total: All Stores & Businesses at $500/sq. ft.	**1,027,500**	**1,101,100**	**1,122,700**	**1,266,100**

[1] Includes cinemas, theatres, arenas and sports fields.

[2] It should also be noted that the sales per sq. ft. per year as well refer to the year 2018; i.e., both per capita spending and sales per sq. ft. refer to 2018. Therefore, the estimates of supportable additional floor space are consistent with the 2018 trends, which were normal, and expected to return from 2022.

Source: Shore-Tanner & Associates.

Table 7.2 Estimated Demand For Additional Floor Space By the Spending of Clarence-Rockland Residents	
Time Period	**Floor Space (sq. ft.)**
2021–2023	73,600
2023–2026	21,600
2026–2031	143,400
2021–2031	**238,600**

Source: Shore-Tanner & Associates.

VIII. Summary of Existing Businesses

A. Review of Businesses

In June and July 2021, we drove on the streets of Rockland to observe the impacts of the pandemic. We have a list of Rockland's retail and service businesses as of May 2018 (Appendix A). Also, in 2002–2003, we had carried out a detailed retail market demand study on behalf of the City of Clarence-Rockland and have its detailed inventory as of then. As well, in February and March of 2021, we carried out a residential market demand study for one of the developers in Morris Village, and noted that there was no retail or service business in this Village. **As of May 2018, there was a total of 146 retail and service businesses in Rockland with a total of approximately 538,000 sq. ft.** At that time, only 14 of the stores, with a total floor space of 29,200 sq. ft. or 5.4%, were vacant (Appendix A).

In the summer of 2021, the number of known vacant stores had increased to more than 25 (in addition, some stores were vacant but had no For Lease signs). There were also some business changes, without significant changes in their previous sizes.

We are certain that the number and floor size of the vacant stores are on the decline now, and that Rockland's retail industry is recovering from the worst of the pandemic. **The present (December 2021) occupied retail floor space is still lower than in 2018.** It may take up to one or more years before the total occupied floor space reaches the 500,000 sq. ft. mark. For the purposes of this study (and to avoid over-estimation of supportable retail floor space), we assume that the total occupied retail and service floor space in Rockland is approximately 500,000 sq. ft. as of September 2021.

B. Supportable Additional Floor Space

As demonstrated in Table 6.2, the spending of the residents of Clarence-Rockland can support a total of 1.266 million sq. ft. of space by 2031 or an additional 766,000 sq. ft. However, there are no department stores, or a number of other traditional or box stores in Clarence-Rockland. As well, a large number of the working residents of Clarence-Rockland actually work in the City of Ottawa, or elsewhere. **As a result, the residents of Clarence-Rockland and the rest of PRUC will most likely continue to shop at stores in Ottawa, and elsewhere for some of their needs/desires.**

As Clarence-Rockland's population increases, and becomes more diversified, more floor space than the current 500,000 sq. ft. would be supportable. The addition of new retail and service businesses in Clarence-Rockland can also potentially attract customers from Orleans and other parts of the City of Ottawa.

The main conclusion of this review is, therefore, as follows:

> **As/if the residents of Clarence-Rockland shop more locally, more retail floor space, up to 238,600 sq. ft. by 2031, would be locally supportable.**

The following is a description of the existing retail inventory of 2018 which is valid as of September 2021 as well.

C. Scope of Research

Several days in May 2018 we carried out extensive field research in Rockland. Every retail and service business was visited, its name and type identified, and its size visually estimated.

The field research was started at the Smart Centre, then continued on Laurier Street in the eastern direction to Highway 17. From there, all businesses in the western direction to Laurier Street were visited. There are a few scattered businesses on the intersecting roadways which were also visited, and their names, types, and estimated sizes recorded. The details of this research are presented in Appendix A.

D. Major Findings

As of May 2018, there was a total of 146 retail and service businesses in Rockland occupying an estimated 538,000 sq. ft. of floor space.

With the 2018 population of 26,746 in Clarence-Rockland, the overall average floor space per resident is 20.1 sq. ft. However, some of this space is supported by the spending of the other residents of the UCPR. Therefore, the effective floor space per resident is lower than 20.1 sq. ft. There are as well, a number of retail and service businesses in the Clarence part of the City of Clarence-Rockland and they may increase the per capita floor space to 21 or 22 sq. ft.

Based on the industry standard of 30 to 40 sq. ft. of floor space per capita, it is evident that the City of Clarence-Rockland is currently under-stored for retail and service businesses.

If the residents of Clarence-Rockland spend 100% of their shopping dollars at businesses within the City, still more floor space could be supported in 2018, and still more in future years. Due to the proximity of Ottawa and its variety of businesses, there will always be some shopping there by the residents of Clarence-Rockland. However, as its population grows, more retail and service businesses can be supported and will be attracted to Clarence-Rockland (as it has been the case in the 10-15 years).

At present, a total of 14 stores with a combined floor space of 29,200 sq. ft. or 5.4% of the total space of 538,000 sq. ft., are vacant in Rockland (industry standard vacancy rate is within 4% and 8%). .

IX. OFFICE MARKET DEMAND ANALYSIS

A. Overview of Office Market

In Clarence-Rockland, as in similar cities in size close to major urban areas, there is little office space, and not much data available. The existing space is almost entirely for local needs such as medical, insurance, and financial. To better address the supportable office space on the Subject Site, we have first analyzed Ottawa's rich office market.

Due to the presence of the Federal Government, the City of Ottawa's office market is unique. The various Federal Departments, Crown Corporations, and other government agencies own and occupy approximately 30 million sq. ft. of office space.

The privately-owned office space in the City of Ottawa is approximately 41 million sq. ft., most of which is also rented to and occupied by different Federal Government organizations. There are, as well, some 300 associations, major legal, accounting, auditing and consulting firms, most of whose work is government related.

At a total population of slightly more than one million, the City of Ottawa is the fourth largest in Canada, but its total office floor space of approximately 71 million sq. ft. is the third largest after Toronto and Montreal.

The Ottawa office market has historically been strong and stable. In the last five years, a number of new, large office towers have been developed, pushing its overall total vacancy rate close to 11%, then declining to under 10% in 2019. Due to the Covid-19 pandemic since early 2020, the office vacancy rate has again exceeded 10%.

B. Types of Office Space

Generally speaking, office spaces fall into the following categories:

- Government/Public Sector
- Corporate
- Professional
- Business

There is some overlap in the bottom three types.

A **Corporate** office is usually large, high quality, located in a Class A building in a prime location, and occupied by banks, insurance companies, other major and often national and/or international corporations. Prestige, visibility, luxury, access, status, and image are important for corporate occupants of this type of office space.

A **Professional** office can be of various sizes and locations, and mostly in a Class B or C building. Legal, accounting, medical, high technology, artificial intelligence, associations, and consultancies are typical occupants of this type of space. In terms of prestige, status, visibility, and access, this type of office is often between the corporate and the business types.

A **Business** office is typically small, occupied by locally-oriented companies, located in affordable areas, including business parks, and in Class B, C or lower buildings. Engineering, architectural, accounting, development, construction, transportation, retail, and other such businesses, mostly with up to about 10 employees, are typical occupants of this type of office space.

C. Most Important Office Space on the Subject Site

Government, and to some extent, Corporate offices, are not dependent on the economy or population of a city. Most professional and business office enterprises, however, serve the residents and local economy of a given area. **We believe that for the Subject Site, the most market viable types of office businesses would be those that serve the larger area residents, and ones which would be used for and by knowledge-based enterprises.** While government, corporate, or any specialty type office developments are also possible, they cannot be counted on.[6]

D. Demand Analysis

1. Locally-Oriented Office Space

Of the approximately 41 million sq. ft. of privately-owned office space in the City of Ottawa, we estimate that up to 8 million sq. ft. or almost 20.0% are used by professional and business tenants who primarily serve the residents and the local

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[6] The need for them is not locally or even city-wide generated. However, elected officials, business leaders, and/or connections may be able to influence the locational decisions of government and corporate officials.

economy.[7] These tenants, furthermore, are in Class B, C or lower buildings. The rest are occupied by various levels of governments, corporate, and prestigious professional/high technology tenants.

At 8 million sq. ft. of office space and a total City of Ottawa population of almost one million, the overall average office space associated per resident is about 8 sq. ft. Of course, parts of Ottawa have much higher, and others much lower averages.

In Clarence-Rockland, the total inventory of office space is now almost 0.3 million sq. ft., or approximately 11 sq. ft. per resident, based on a total population of over 27,400 (Table 4.3). Due to the mostly rural and agricultural characteristics of PRUC, its need for office space per capita is much less, and office businesses in Rockland tend to be used by its residents and employees. We have, therefore, used an estimate of 6 sq. ft. for PRUC. **The Trade Area is, therefore, concluded to generate an average annual demand for total additional office space of up to 8,000 sq. ft. in Clarence-Rockland, and 3,500 sq. ft. in the rest of PRUC, (i.e., total of up to 11,500 sq. ft.).**

2. Digital Age Office Space

Office space used for/by knowledge-based (i.e., Information Technology, Digital-Oriented, Health Care, Software Engineering, Life Sciences, and other modern industries) are economically most desirable for now and the future. **The products of these industries can be marketed and sold internationally. They are typically high-paying, and provide many spin-off jobs, services and incomes.**

The creation of these modern business/industrial parks often requires funds, leadership and foresight by various levels of government, as well as private sector champions. When successful, however, these parks generate far more municipal, provincial and federal benefits than their costs.[8] **For the economic advancement and future prosperity of Clarence-Rockland and diversification of its economy, we strongly recommend undertaking the needed activities, and providing the**

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[7] In other words, the combination of population and economic factors generate demand for 8 million sq. ft. of locally-oriented office floor space.

[8] The Colonnade Business Park is an example of these municipal government initiatives: it is now occupied by a large variety of health, research & development, IT, other modern as well as traditional industries, and large retail showrooms. The municipal taxes paid by the businesses in the park have been a significant source of income for the City of Ottawa in the last few decades, and already more than paid back the City's initial investments.

necessary budget to develop a modern, scientific/technology-oriented business park on the subject land in the expansion area. The promotion of this park, and recruitment of tenants/buyers are recommended to follow shortly after the City's decisions to proceed with the creation of this park.

E. Office Space Recommendations

1. The existing estimated total office floor space of approximately 300,000 sq. ft. is too low for Rockland's future office industry advancements.
2. We recommend promoting Rockland for modern, knowledge-based industries such as IT and life sciences.
3. With a successful promotion of the above industries, we recommend a total of approximately 100,000 sq. ft. of additional office floor space in Rockland.
4. Being close to the City of Ottawa, the Subject Expansion Land is considered to be the best location in Rockland for new office space, in our opinion.
5. Most to all 100,000 sq. ft. of new office space are thus recommended to be on the Subject Expansion Land.

X. Industrial Market Demand Analysis

In this chapter, we have addressed issues related to employment of the working residents of Clarence-Rockland and PRUC by type, location and other characteristics. This information, along with trends in future jobs, provide useful clues to future demand for industrial lands. **In this regard, it should be kept in mind that in the last 2-4 years, the price of industrial land, as well as rental rates for buildings on industrial lands in Ottawa have been increasing very rapidly. This trend is expected to continue, and one result of it is likely to be increased interest and demand for industrial land in areas within up to one hour drive from Ottawa.**

A. Employed Labour Force

1. As of mid-2016 (the latest census), the total number of the working residents was (Table 10.1):

• Clarence-Rockland	13,315
• PRUC	46,535

2. The 5 largest occupations of these working residents were:

Clarence-Rockland		PRUC	
Government	17.7%	Government	14.5%
Retail	13.2%	Retail	14.1%
Construction	12.7%	Healthcare	11.2%
Education	8.7%	Education	8.2%
Total	63.1%		59.0%

3. **The 5 largest occupations of the residents of Clarence-Rockland and PRUC are thus the same.** In Clarence-Rockland, however, 6.3 and in PRUC, 5.9 in 10 of all of their working residents worked in these five occupations.

4. People’s occupations do not change much in 5 years. The percentages in Table 10.1 are therefore valid today with minor changes.

B. Place of Work

1. Not all of the working residents of Clarence-Rockland or PRUC work within each of their respective areas. As well, some of the people who work in each of these two areas live elsewhere.

2. In Table 10.7, we have identified the places where the labour force of each area work: As noted:

   a. **Some 7,170 or 53.8% of the Clarence-Rockland, and 20,370 or 42.8% of the PRUC working residents work outside of their respective areas.**

   b. Depending on where those with no fixed work address work, the numbers of those who work and live in each area are:

      • Clarence-Rockland 4,095 to 5,699 or 30.5% to 42.9%

      • PRUC 20,050 to 23,555 or 45.5% to 53.5%

3. The data in Table 10.1 and 10.2, combined with our knowledge of PRUC indicate that:

   a. The working residents of Clarence-Rockland are more mobile than the working residents of the rest of PRUC.

   b. Most of those who work outside Clarence-Rockland or outside the rest of PRUC work in Ottawa.

   c. While specific data for 3b above are not available, we believe that Federal Government, knowledge-based industries such as Information Technology, and Construction account for most of those who work in Ottawa, but live within PRUC.

C. Traditional Industrial Jobs

Traditional industrial jobs are typically land-intensive, are concentrated in the extraction of the earth’s resources, storage, transportation, processing and manufacturing of the resources into products needed by households, businesses, and institutions. Many of these jobs require heavy machinery, the use of enormous amounts of energy, and transportation. However, they are the typical starting businesses in many new industrial parks.

Forestry, mining, quarrying, warehousing, transportation and construction yards require vast land areas, but little built floor space. Processing and manufacturing, as well, require large land areas, but also some built floor space. **Traditional industries generate very few jobs, and historically, a ratio of 20 jobs per acre of land has been used to estimate their job creation.**

In Table 10.3, we have presented the number of the working residents who work in the main traditional industrial jobs. There are also other traditional industrial jobs, such as truck and boat storage and repair yards, included in the Other category in Table 10.3.

As noted in Table 10.3, in Clarence-Rockland a total of 2,596 or 19.5%, and in PRUC 9,868 or 20.6% of their entire labour force work in traditional industrial jobs.

D. Modern Industrial Jobs

1. Most of the traditional industries emerged approximately 250 years ago in England, and quickly spread into other Western countries.
2. Since about 1960, the need for some of these industries began to decline or be eliminated. More importantly, however, many of the extracting, processing, and manufacturing jobs started to be sent to Mexico, China and other low-wage countries.
3. **As traditional industries started to decline, service, and particularly knowledge-based industries started to grow, and now dominate the western as well as a number of Asian countries.**
4. The new and expanding services have been primarily in the health, education, wellness, and cultural industries.
5. The knowledge-based industries include some of the above, but mostly the enormously large and **all-encompassing Information Technology industry, dominated by companies such as Google, Microsoft, Twitter, Amazon, Apple** and many other lesser known enterprises.
6. The new industrial jobs include software engineering, computer architectural designers, high-level soft and hardware programmers and designers, automation engineers, supply-chain designers, communication engineers, and other highly technical experts.

7. The IT industries apply to every aspect of life and economies, from agriculture, health and entertainment to manufacturing, business, military and space explorations.[9]
8. **IT industries require very little land and generate incomparably more jobs than the traditional industries**
9. While traditional industrial jobs will continue to exist, their number of employees, economic contributions and relevance will continue to decline. The IT industries, on the other hand, will continue to further dominate economies, industries and the quality of life.
10. **In Clarence-Rockland, a total of 230, and in PRUC, 838 of the working residents are employed in the general IT industry jobs.**

E. Employed Labour Force

Labour force figures by type of occupation are presented in Table 10.1 for Clarence-Rockland and PRUC. As noted:

1. There was a total of 13,315 working residents in Clarence-Rockland and 47,535 in PRUC in 2016 (Table 10.1).
2. The largest number of jobs for these residents were in Retail, Health Care, Construction, Government, Education, and Accommodation & Food Services. These occupations accounted for 7,035 or 52.8% in Clarence-Rockland and 26,615 or 56.0% in PRUC.
3. People's occupations do not generally change much in a few years. Therefore, we believe that the distribution of the working residents' occupations in 2021 is very close to those identified in Tables 10.1 and 10.2, with minor percentage fluctuations.
4. **The majority of the working residents in Clarence-Rockland as well as in PRUC work in various service industries:**

   - **Clarence-Rockland 8,315 or 62.4% of total**
   - **PRUC 25,970 or 54.6% of total**

[9] Of course, some of these tasks were being done prior to the dominance of the IT industries. It is the rapidly faster, and the new applications of IT which have dominated economies, and life in general.

5. Primary, Utilities, Manufacturing, Transportation, Warehousing, and Logistics are the main industries which are land intensive. These occupations account for only 1,340 or 10.0% in Clarence-Rockland and 7,410 or 15.6% in PRUC.
6. Many residents of Clarence-Rockland and PRUC work in Ottawa or elsewhere. The numbers and types of jobs within each of these areas is not known. Based on our knowledge of the towns and counties within a couple of hours' driving distance of Ottawa, we firmly believe that the number of jobs in these areas is smaller than the number of their respective labour force, and this is the main reason for the working residents of these areas to commute to Ottawa/elsewhere to work.

F. Growth Industries

1. **In today's economy, major job growths are in various services, information technology, social media, automation, research & development, robotics, pharmacology, communication, and other knowledge-based and high technology industries. Typically, these industries are office-based.**
2. Most manufacturing jobs, which are land-intensive, have either been transferred to Mexico, Asia and other low-wage countries, or simply disappeared by one of the above growth industries (e.g., music records, Kodak-type cameras).
3. **Internet-based companies such as Ottawa's Shopify, and international companies such as Amazon, have been the fastest growth companies in recent years, and their future growth prospects are quite favourable. These jobs, again, are mostly office-based.**

   Various health, alternative medicine, leisure, recreational, cultural, sports, travel, wellness products and services have also been growing in popularity, and employing large numbers of people.
4. New, exotic, organic food items, unique restaurants, and ethnic recipes particularly, have become popular in about the last five years, creating an increasing number of small, friendly, attractive, and specialty businesses (e.g., Seed to Sausage in Ottawa and Chocolat Favouris in Gatineau). Many of the owners of these businesses are in their 20s and 30s, including some who have left their lucrative employment in Finance, IT or Government to open up their own businesses.
5. There is a large number of industries and businesses everywhere for the basic necessities of life. Banks, supermarkets, beauty salons, pharmacies, legal, financial,

insurance and most retail stores are among them. While there is innovation and modernization in these industries, they do not change significantly in their basic functions, and their growth depends simply on the growth of their market areas' population. These businesses are often in small shopping plazas, main-street or highway commercial locations.

6. **As noted, other than manufacturing, utilities, farming and warehousing, industries/businesses function mostly in small retail stores, shopping plazas, and office buildings. Manufacturing, warehousing and other land-intensive industries have been on a declining course in the last 20+ years, and their future prospects are also dim. These declines, furthermore, have been negatively impacting Clarence-Rockland, PRUC, the City of Ottawa, Canada and other western industrial countries, and the future is likely to be even worse (i.e., further job losses, and thus declining demand for traditional and land-intensive industrial lands).**

7. As part of the research for this study, we also reviewed an extensive report for the Town of Milton called:

    Employment Land Needs Assessment Study
    by MHBC Planning and Watson & Associates,
    Dated October 13, 2016.

8. A number of key take-aways from this report are:

    a) From "protection of land," the Town of Milton should move to "job creation."

    b) Employment land uses should be more intensified and diversified, resulting in higher densities.

    c) Employment nodes should be planned for the next 30 years.

    d) The Town of Milton's economy is heavily dependent on manufacturing, warehousing and logistics industries, all of which are highly land-intensive.

G. Clarence-Rockland's Future Land Requirements

1. Land-Intensive Industries' Land Needs

a. The estimated growth in the number of land-intensive jobs in Clarence-Rockland or PRUC is moderate. This is due to expected further declines in Manufacturing, and low growth in other land-intensive industries.

b. The traditional estimate of land requirement for land-intensive industrial jobs is one acre per 20 employees. This number, however, can no longer be used in a valid way since land-intensive jobs will continue to decline, based on our knowledge.

c. Industrial and business park lands are now best used for the new economy knowledge-based jobs, from the viewpoints of prosperity, diversity, and modernization.

2. Retail Commercial Land Needs

a. Demand for commercial land for retail (e.g., clothing) and service (e.g., beauty salons) businesses is based on the number of residents and employees within the Trade Area of businesses.

b. Based on the retail industry standards, the spending of/for every man, woman and child supports 30 to 40 sq. ft. of retail and service businesses in urban areas (less in rural areas/small towns).

c. In addition, employees often shop at businesses at or near their workplaces (coffee shops, restaurants, banks, food items, etc.). The spending of each employee is estimated to support up to 5 sq. ft. of commercial space at/near their place of work.

d. Clarence-Rockland is a commercial hub for the residents of some of the nearby towns and villages. Its existing and future businesses, therefore, have a larger Trade Area than only Clarence-Rockland by itself.

e. The 30 to 40 sq. ft. of supportable space per resident includes department stores, furniture stores, specialty retail, ethnic restaurants, and various box stores. Department stores, and a number of other businesses require well over 100,000 residents, and therefore do not exist in Clarence-Rockland now, and likely not in the future either.

f. Under the generous assumption of 30 sq. ft. of retail and service floor space per resident, and an estimated population of 27,400 in 2021, the total supportable retail and service floor space in Clarence-Rockland is 822,000 sq. ft. This number is much larger than the approximately 500,000 sq. ft. of the existing floor space.

g. Retail development normally takes place on one-quarter of commercial land (the rest is for various setbacks, and especially for surface parking).

h. The estimated additional supportable floor space of 238,600 sq. ft. would thus need 954.400 sq. ft. of land or approximately 21 acres by 2031.

i. Of course, more commercial developments will be needed after 2031, due to continued population growth. Since the nearby villages and towns will also grow in population, and thus likely to add to their own existing retail businesses, they will not need to shop as much in Clarence-Rockland as they do now.

3. Office Land Needs

a. Most if not all of the following jobs usually require office space, including in industrial/business parks:
- Information & Culture
- Finance & Insurance
- Real Estate
- Professional, Scientific & Technical
- Management
- Administration & Support
- Health Care & Social Services
- Public Administration

b. Some of the above office jobs are in buildings in business or industrial parks, and parts of others are in more than one industry/business (e.g., some Administration & Support jobs are in retail, restaurants and health care). To avoid double counting, we have included all of the above in office jobs.

c. The industry standard office space per employee is 200 to 300 sq. ft.

d. The portion of vacant land which can be built for one-storey office buildings is about 50%. The total amount of vacant commercial land for 8,000 sq. ft. of office space per year would thus be 16,000 sq. ft., plus land for parking (160,000 sq. ft. for the period 2021-2931)..

e. One-storey office buildings are not efficient or economical. Even in many business/industrial parks, developers build two or three-storey office buildings.

f. **From the perspectives of economic growth, prosperity and attraction of modern/21st Century industries, the best use of the subject industrial land in Clarence-Rockland is thus knowledge-based jobs, especially those in the digital industries.**

4. **Recommended Industrial Park**

a. At 90 acres, the Expansion Land is large and can accommodate a combination of the old and new industries.

b. The new, modern, knowledge-based industries are mostly in office buildings, including some in industrial/business parks.

c. **From the perspective of economic growth and future prosperity of the City of Clarence-Rockland, the best jobs in the Expansion Land would be IT, digital, and life science industries.**

d. In view of the increasing industrial land prices in the City of Ottawa, the resulting shortages and the adjacency of the City of Ottawa, some of the Expansion Land can be quickly used by the land-intensive industries in Ottawa who want to move out, but still be close to Ottawa.

Table 10.1
Occupations of Working Residents: 2016

Occupation Categories	Clarence-Rockland		PRUC	
	No.	%	No.	%
Agriculture, Forestry, Fishing & Hunting	250	1.9	1,740	3.7
Mining, Quarrying, and Oil & Gas Exploration[1]	15	Neg.	95	0.2
Utilities[1]	40	0.3	150	0.3
Construction[1]	1,695	12.7	5,230	11.0
Manufacturing[1]	470	3.5	3,160	6.6
Retail Trade	1,760	13.2	6,700	14.1
Transportation & Warehousing[1]	565	4.2	2,265	4.8
Information & Culture	185	1.4	590	1.2
FIRE[2]	495	3.7	1,870	3.9
Professional & Scientific	580	4.3	2,095	4.4
Administrative & Support	745	5.6	2,075	4.4
Education	1,155	8.7	3,900	8.2
Health Care	1,435	10.8	5,345	11.2
Arts & Entertainment	185	1.4	775	1.6
Accommodation & Food	700	5.2	2,440	5.1
Government (all levels)	2,355	17.7	6,900	14.5
Other	685	5.1	2,205	4.6
Total	**13,315**	**100.0**	**47,535**	**100.0**
Industrial-Type	**2,785**	**20.9**	**10,900**	**22.9**

[1] Industrial

[2] Finance, Insurance & Real Estate

Source: Shore-Tanner & Associates based on the 2016 census data.

Table 10.2
Place of Work of the Working Residents: 2016

Locations	Clarence-Rockland		PRUC	
	No.	%	No.	%
At Home	845	6.3	3,435	7.2
Within Each Area	3,200	24.0	16,615	34.9
Outside	6,650	49.9	17,900	37.6
Other Province(s)	510	3.8	2,395	5.0
Outside Canada	10	Neg.	75	0.2
No Fixed Work Address	1,654	12.4	3,610	7.6
Not Working	446	3.3	3,505	7.4
Total	**13,315**	**100.0**	**46,535**	**100.0**

Note:

In Clarence-Rockland, a total of 10,645 or 82.7%, and in PRUC, a total of 38,470 or 87.4% of all working residents used cars, vans or trucks to go to their places of work.

Source: Shore-Tanner & Associates based on the 2016 census data.

Table 10.3
2016 Labour Force By Selected Industrial Occupations

Industrial Occupations	Clarence-Rockland		PRUC	
	No.	%	No.	%
Forestry[1]	25	1.0	174	1.8
Mining & Quarrying	15	0.6	95	1.0
Utilities	40	1.5	150	1.5
Construction	1,695	65.3	5,230	53.0
Manufacturing[2] & Processing	188	7.2	1,264	12.8
Transportation & Warehousing	565	21.8	2,265	2.4
Other[3]	68	2.6	690	7.0
Total	**2,596**	**100.0**	**9,868**	**100.0**

[1] Estimated at 10% of Agriculture, Forestry, Fishing & Hunting category.

[2] Estimated at 40% of Manufacturing category.

[3] Estimated at 10% of Other category.

Source: Shore-Tanner & Associates based on the 2016 census data.

APPENDIX A

List of Retail and Service Businesses In Rockland		
Business Name	**Type**	**Approximate Size (sq. ft.)**
Smart Centre[1]		
Rona	Hardware	40,000
Walmart	Department Store	110,000
• Quizno Subs		
• Hair Salon		
• Pharmacy		
• Garden Supplies		
• Grocery		
• Fashion		
Source	Electronics	2,000
Bulk Barn	Specialty Food	3,000
Boston Pizza	Table Service Restaurant	4,000
Dollarama	General Merchandise	6,000
LBCO	Liquor Store	3,000
Laurier Street		
Ford Dealership	Automotive	6,000
Snap Fitness	Fitness	3,000
Tim Horton's	Coffee Shop	1,800
Royal Plaza (on Laurier St.)		
Vapeking	Smoke Shop	2,000
Aqua Life	Sporting Goods	2,000
Rosalynn's	Table Service Restaurant	2,000
New Wave (pool accessories)	Sporting Goods	2,500
RBC	Financial	3,000
Vacant (2)	Vacant	4,000

[1] Started from this shopping centre, walked and/or drove eastward on Laurier Street to Highway 17, then westward on Laurier Street

List of Retail and Service Businesses In Rockland, continued		
Business Name	**Type**	**Approximate Size (sq. ft.)**
Laurier Street, continued		
First Choice	Barber	1,000
Rockland Sports	Sporting Goods	3,000
M&M Foods Market	Specialty Foods	1,500
Shawarma Rockland	Table Service Restaurant	1,500
Youngster Salon	Beauty Salon	1,500
Hitices	Clothing	1,500
La Bella Salon	Beauty Salon	1,500
Accent	Furniture	8,000
Touch of Distinction	Flooring Supplies	2,000
Rising Sun	Martial Arts	2,000
Vitrerie Glass & Mirror	Furnishings	2,000
Derma Skin Care	Beauty Salon	1,500
Vacant	Vacant	1,500
Domino's Pizza	Pizza Shop	1,500
Mortgage Intelligence	Financial	1,500
Chiro Fashion	Specialty Retail	1,500
Rockland Pharmacy	Pharmacy	3,000
Pronature Sporting	Sporting Goods	2,000
Tiny Hopper	Daycare	2,500
Salon Tete O Pieds	Beauty Salon	1,500
Shoppers Drug Mart	Pharmacy	4,000
Ultramar	Gas Station & Car Wash	2,000
Your Independent Grocer	Supermarket	50,000
Spartas	Mediterranean Restaurant	1,500
Scotiabank	Financial	3,000
Beer Store	Beer Store	3,000
Napa Auto	Automotive	2,500
McDonald's	Fast Food	2,200
Sullyteck	Phone Repair	600
Bytown Lumber	Building Supplies	10,000
The Thimble	Tailor	800
Envy	Spa	2,000
Vacant	Vacant	3,000
Jumbo Pizza	Pizza Shop	2,000

List of Retail and Service Businesses In Rockland, continued		
Business Name	**Type**	**Approximate Size (sq. ft.)**
Laurier Street, continued		
Dunn's Deli	Table Service Restaurant	2,500
Rama	Martial Arts	1,200
Royal Photo	Photo Shop	1,500
Rockland Music	Specialty Retail	1,500
Anne Travel	Travel Agency	1,500
Martel Mortgage	Financial	1,000
Sublime Salon	Beauty Salon	1,000
Christine Raymond Salon	Beauty Salon	1,000
Auto Morin	Automotive	3,000
Sienna Faming	Specialty Retail	2,000
Sacred Art	Tattoo Shop	1,000
The Brunet Funeral	Funeral Services	3,000
L'Atelier Salon	Beauty Salon	2,000
Vacant (several stores)	Vacant	5,000
Rockland Pizza	Pizza Shop	1,200
H & R Block	Financial	1,200
Rockland Variety	Convenience Store	1,500
Vacant	Vacant	1,500
Jean Coutu	Pharmacy	4,500
Post Office	Specialty Retail	2,000
Vacant	Vacant	1,500
Rockland Marine	Boating Supplies	3,000
Giant Tiger	General Merchandise	11,000
Fashion Sports	Clothing	2,000
New Ruby	Chinese Restaurant	3,000
Second Hand Centre	Clothing	1,500
Modelo Salon	Beauty Salon	1,500
Dalrymple Salon	Beauty Salon	1,500
Subway	Fast Food	1,500
Marie-Jo	Table Service Restaurant	2,000
RDS Laundromat	Laundromat	1,200
Chamberland Garage	Automotive	5,000
Rockland Optometry	Specialty Retail	2,000

List of Retail and Service Businesses In Rockland, continued		
Business Name	**Type**	**Approximate Size (sq. ft.)**
Laurier Street, continued		
Rockland Barber	Beauty Salon	600
Bourbonnais Electric	Electronic Shop	1,500
Vacant	Vacant	1,200
Friendly Restaurant	Table Service Restaurant	2,000
Big Boss Burgers	Table Service Restaurant	1,600
Vacant	Vacant	1,500
Sonx Plus	Electronics	1,500
National Bank	Financial	3,000
QV Spa	Beauty Salon	1,500
DCV Heating/Cooling	Heating/Cooling Supplies	2,000
Lavolette	Flower Shop	1,500
Café Joyeux	Table Service Restaurant	1,500
Desjardins	Financial	4,000
Maison de Xin	Table Service Restaurant	4,000
Spa Mauve	Beauty Salon	1,500
Extravadance	Specialty Fashion	2,000
Chez L'Bonlanger	Bakery	2,000
Studio Aqua (bronzage)	Beauty Salon	1,500
Main Street Pizza	Pizza Shop	1,500
Vacant	Vacant	1,500
Le Mieux	Convenience Store	1,500
GAB Sports Bar	Table Service Restaurant	2,000
Beautiful Clinic	Beauty Salon	1,500
QV Spa, Nails	Beauty Salon	1,000
Café La Roche	Table Service Restaurant	2,000
Espada	Tattoo Shop	500
Ryan's Auto	Automotive	2,000
SS Chip Wagon	Eatery	200
Vacant	Vacant	2,000
Vacant	Vacant	2,000
Belanger Dodge Dealer	Automotive	2,000
Vacant	Vacant	3,000
Harmony Hyundai	Automotive	2,000
Mr. Gas	Gas Station	100
Tim Horton's	Coffee Shop	1,000
Canadian Tire Station	Gas Station	100
TD	Financial	2,000
Shell Station	Gas Station	100
Circle K	Convenience Store	2,000

List of Retail and Service Businesses In Rockland, continued		
Business Name	**Type**	**Approximate Size (sq. ft.)**
Plaza Rockland		
Top Mode Depot	Fashion	11,000
A & W	Fast Food	1,800
Pet Valu	Specialty Retail	2,500
Brown Cleaner	Dry Cleaning	1,200
Super Cut	Barber Shop	1,200
Pop Shoes	Shoe Store	2,500
Gabriel Pizza	Pizza Shop	1,200
Broadway Bar & Grill	Table Service Restaurant	2,500
Subway	Fast Food	1,500
Vacant	Vacant	1,500
Dollar Tree	General Merchandise	5,000
TSC	General Merchandise	25,000
Mark's	Clothing	10,000
St. Hubert	Table Service Restaurant	3,000
Oil Changer	Automotive	4,000
Speedy Glass	Automotive	4,000
Benson Auto Parts	Automotive	3,000
Grand Total	**146**	**538,000**

Source: Shore-Tanner & Associates based on field research and visual estimates in late May 2018.

Appendix B

Bowfin Desktop Environmental Impact Study

Secondary Plan - Rockland West

Background Review Summary

Prepared for:
J.L. Richards & Associates Limited
700 - 1565 Carling Avenue
Ottawa, Ontario
K1Z 8R1

Prepared by:
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168 Montreal Road
Cornwall, Ontario
K6H 1B3

February 2022

List of Acronyms and Definitions

ABBO - Atlas of Breeding Birds of Ontario
ANSI – Area of Natural and Scientific Interest
BHA - Butternut Health Assessments
DBH - Diameter at breast height
DFO – Fisheries and Oceans Canada
EIS – Environmental Impact Study
ELC - Ecological Land Classification
    CUT – Cultural Thicket
    FOD – Deciduous Forest
    FOM – Mixed Forest
ESA - *Endangered Species Act* (Provincial)
GPS – Global Positioning System
        NAD 83: North American Datum 1983
        UTM: Universal Transverse Mercator
LIO - Land Information Ontario
NHIC – Natural Heritage Information Centre
NHRM - Natural Heritage Reference Manual
MTO – Ministry of Transportation Ontario
OMNR/MNRF/NDMNRF - Ontario Ministry of Natural Resources (old name)
        -Ministry of Natural Resources and Forestry (old name)
        -Ministry of Northern Development, Mines, Natural Resources, and Forestry (new name)
OP – Official Plan
OWES - Ontario Wetland Evaluation System
PPS - Provincial Policy Statement
PSW - Provincially Significant Wetland
SAR - Species at Risk (in this report they refer to species that are provincially or federally listed as endangered or threatened and receive protection under ESA or SARA)
SARA - *Species at Risk Act* (Federal)
SARO - Species at Risk in Ontario
SNC – South Nation Conservation
SWH - Significant Wildlife Habitat
SWHCS – Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E
SWHTG - Significant Wildlife Habitat Technical Guide
UCPR – United Counties of Prescot and Russell

SRANK DEFINITIONS

S1 Critically Imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

S2 Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3 Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 Apparently Secure; uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 Secure; Common, widespread, and abundant in the nation or state/province.
? Inexact Numeric Rank—Denotes inexact numeric rank
SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#B Breeding
S#N Non-Breeding

SARA STATUS DEFINITIONS

END Endangered: a wildlife species facing imminent extirpation or extinction.
THR Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC Special Concern, a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

SARO STATUS DEFINITIONS

END Endangered: A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC Special concern: A species with characteristics that make it sensitive to human activities or natural events.

Coefficient of Conservatism Ranking Criteria

0 Obligate to ruderal areas.
1 Occurs more frequently in ruderal areas than natural areas.
2 Facultative to ruderal and natural areas.
3 Occurs less frequent in ruderal areas than natural areas.
4 Occurs much more frequently in natural areas than ruderal areas.
5 Obligate to natural areas (quality of area is low).
6 Weak affinity to high-quality natural areas.
7 Moderate affinity to high-quality natural areas.
8 High affinity to high-quality natural areas.
9 Very high affinity to high-quality natural areas.
10 Obligate to high-quality natural areas.

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1.0 INTRODUCTION

The City of Clarence-Rockland is completing a Secondary Plan for lands situated to the west of Rockland. The Secondary Plan would be adopted as an amendment to the Urban Area of the City of Clarence-Rockland's Official Plan. The process is to be integrated with the Class Environmental Assessment (EA) which is required in the planning of infrastructure and environmental management.

The goals of the Secondary Plan includes addressing natural heritage features and systems. To this end, Bowfin Environmental Consulting (Bowfin) was engaged by J.L. Richards & Associates Limited to provide a review of known natural heritage features and to identify opportunities, constraints, or areas with issues that could be addressed through this process.

The study area is approximately 36 ha situated on parts of Lot 32-34, Concession 1, in the City of Clarence-Rockland. It is bordered by Highway 17 and the Ottawa River to the north, agricultural land to the south and west, and commercial area to the east (Figure 1 and Figure 2). A majority of lands have been cleared for either agriculture or development and there is an unnamed feature which flows into the Ottawa River (Figure 2).

Bowfin's review considered natural heritage features that would be protected under the *Planning Act*, *Endangered Species Act*, *Fish and Wildlife Conservation* Act, *Species at Risk* Act, and *Fisheries Act*. The natural features and areas are those as set out in the Provincial Policy Statement (PPS) (MMAH, 2020) in which there are several natural features and areas identified as needing protection. These are:

- Significant habitat of Endangered and Threatened Species (SAR);
- Significant wetlands;
- Significant coastal wetlands or coastal wetlands;
- Significant valleylands;
- Significant woodlands;
- Significant wildlife habitat;
- Significant Areas of Natural and Scientific Interest; and
- Fish habitat.

This Secondary Plan will also reference the locations of significant features along with other locally significant features (identified as part of the regions' Natural Heritage System) as identified on OP schedules A of the City of Clarence Rockland and B of the United Counties of Prescott and Russell. To protect the species and their habitats, the presence/absence of habitat for endangered (END) or threatened (THR) species are not depicted on the OP schedules. The habitat of endangered or threatened species must be determined based on the criteria outlined in provincial guidance documents and is species-specific. The UCPR have identified all Significant Wildlife Habitat (SWH) found within the settlement areas. These are either deer wintering area or wildlife travel corridor.

The following report provides a summary of our review and a desktop assessment of the functions and values of the natural features on site. This is followed by our recommendations for natural heritage constraints and identification of natural heritage opportunities for consideration.

Figure 1: General Location of Study Area

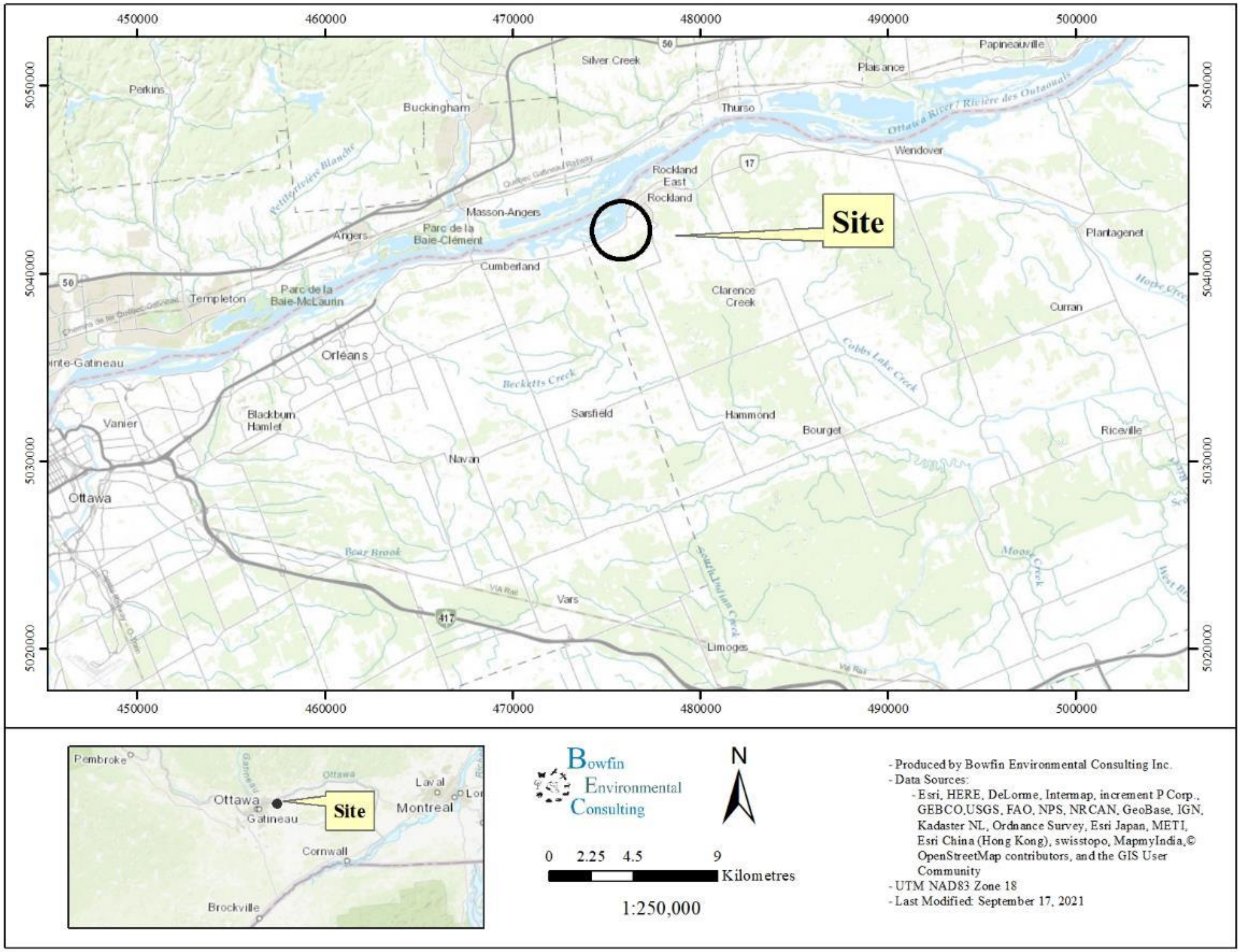
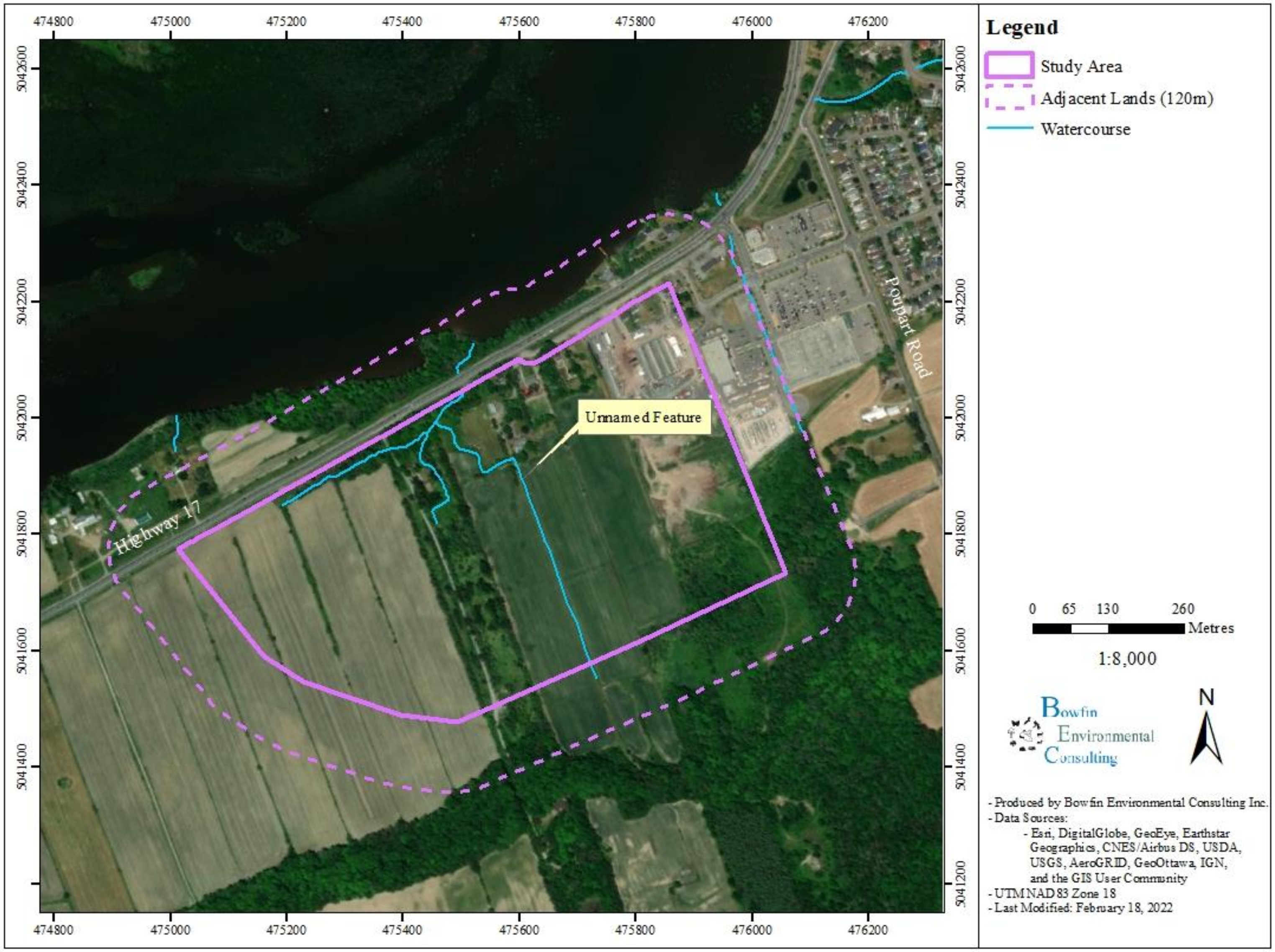


Figure 2: Study Area Detail



2.0 METHODS

2.1 Study Area

For the most part, the OP calls for an evaluation of the study area and the adjacent 120 m. This is widened when analysing the potential for species at risk (SAR) as their protected habitats vary with the species being considered.

2.2 Background Review

Information presented in the Clarence-Rockland and the United Counties of Prescott and Russell Official Plans was reviewed along with information collected from outside sources. The goal was to help inform the functions of known or potential features. Outside sources included: Natural Heritage Information Centre (NHIC) database, iNaturalist, Atlas of Breeding Birds of Ontario (ABBO), Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Mapping, Make-a-Map Land Information Ontario (LIO), and LIO databases. Information from personal knowledge and observations of the area for other unrelated projects has also been included as appropriate.

3.0 BACKGROUND INFORMATION

3.1 Location

These lands are situated of South of Highway 17, just west of Poupart Road. It is in part of Lot 32-34, Concession 1 (O.S), in the City of Clarence-Rockland (centroid - UTM 18T 475630 m E; 5042010 m N, and Latitude 45.53169 Longitude -75.31147). It is bordered by Highway 17 and the Ottawa River to the north, agricultural land to the south and west, and commercial area to the east.

3.2 Review of Official Plans and Provincial Mapping of Natural Heritage Features

The schedules associated with the Clarence-Rockland Official Plan Schedule A and UCPR Official Plan Schedule B do not identify any natural features within the study area. They do note the following within the adjacent lands:

- Fish habitat 60 m north of County Road 17, along the Ottawa River
- Candidate: Life Sciences ANSI Baie Lafountaine Islands 30 m north along County Road 17, in the Ottawa River.
- Significant woodlands 20 m south-west.

No other significant natural features are noted on the schedules, in or within 120 m of the site.

Further afield, UCPR Schedule B identifies a wildlife travel corridor (1 km south), wintering area, and provincially significant wetland (Baie Lafountaine) (290 m to the north).

Table 1: Summary of Available Background Information on the Identified Natural Features (PSW, Woodlands, Valleylands, ANSIs, ESA, SWH, and Fish Habitat)

Natural Heritage Feature	Present within Site	Present within 120 m of Site	Additional Notes
Provincially Significant Wetlands (PSW)	No		Baie Lafountaine (290 m north)
Areas of Natural and Scientific Interest (ANSIs)	No	Baie Lafountaine Islands, Candidate ANSI, Life Sciences (30 m north)	None
Habitats or species designated by ESA (Provincial)	Potential for endangered or threatened species needs to be determined following assessment of the suitable habitats in or near the site. See section 5 of this report for more information.		None
Significant Woodlands	No	Schedule B identifies significant woodlands 20 m southeast of site	None
Significant Valleylands	None identified on OP		None
Significant Wildlife Habitat (SWH)	UCPR indicates none (settlement area as such no site specific review needed during future EIS processes) City of Clarence-Rockland OP does not identify any.		None
Fish Habitat	There is one unnamed feature to the Ottawa River, with several branches extending into the Study Area as well as a pond. These along with any other aquatic feature (natural or artificial) are assumed to be fish habitat.	Ottawa River 70 m north	None

Figure 3: Official Plan Schedule A (City of Clarence-Rockland)

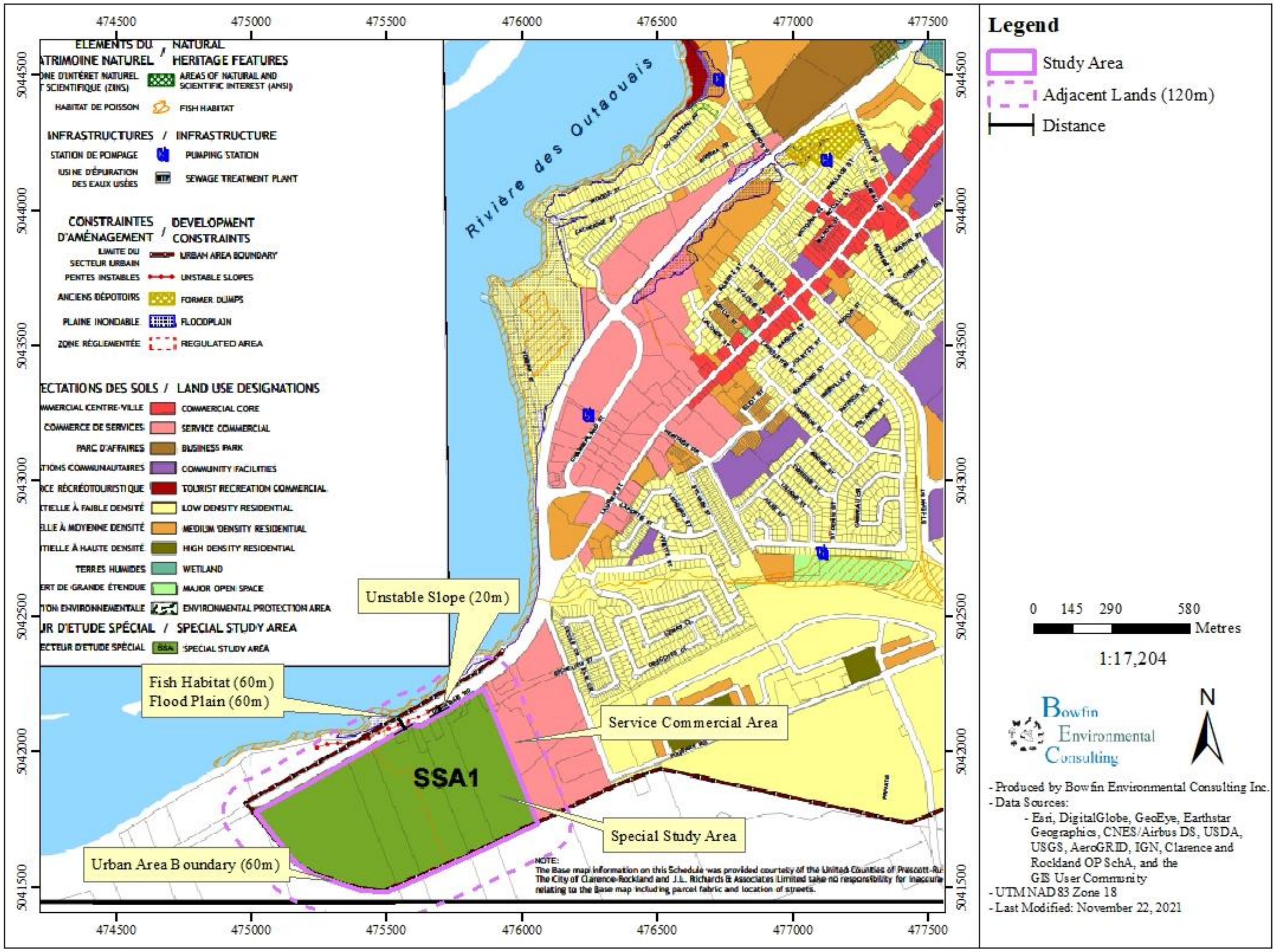
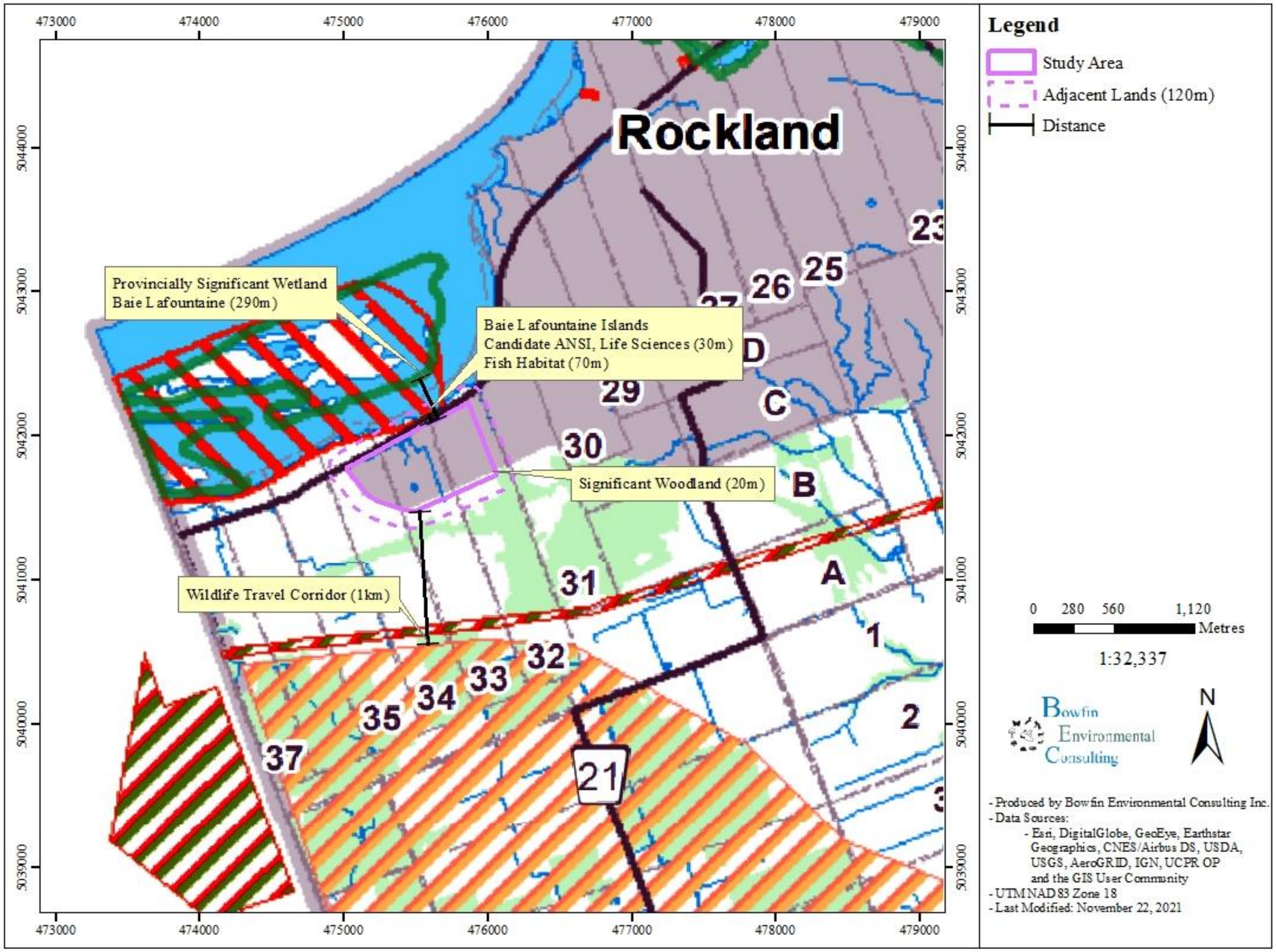


Figure 4: Official Plan Schedule B (United Counties of Prescott and Russell)

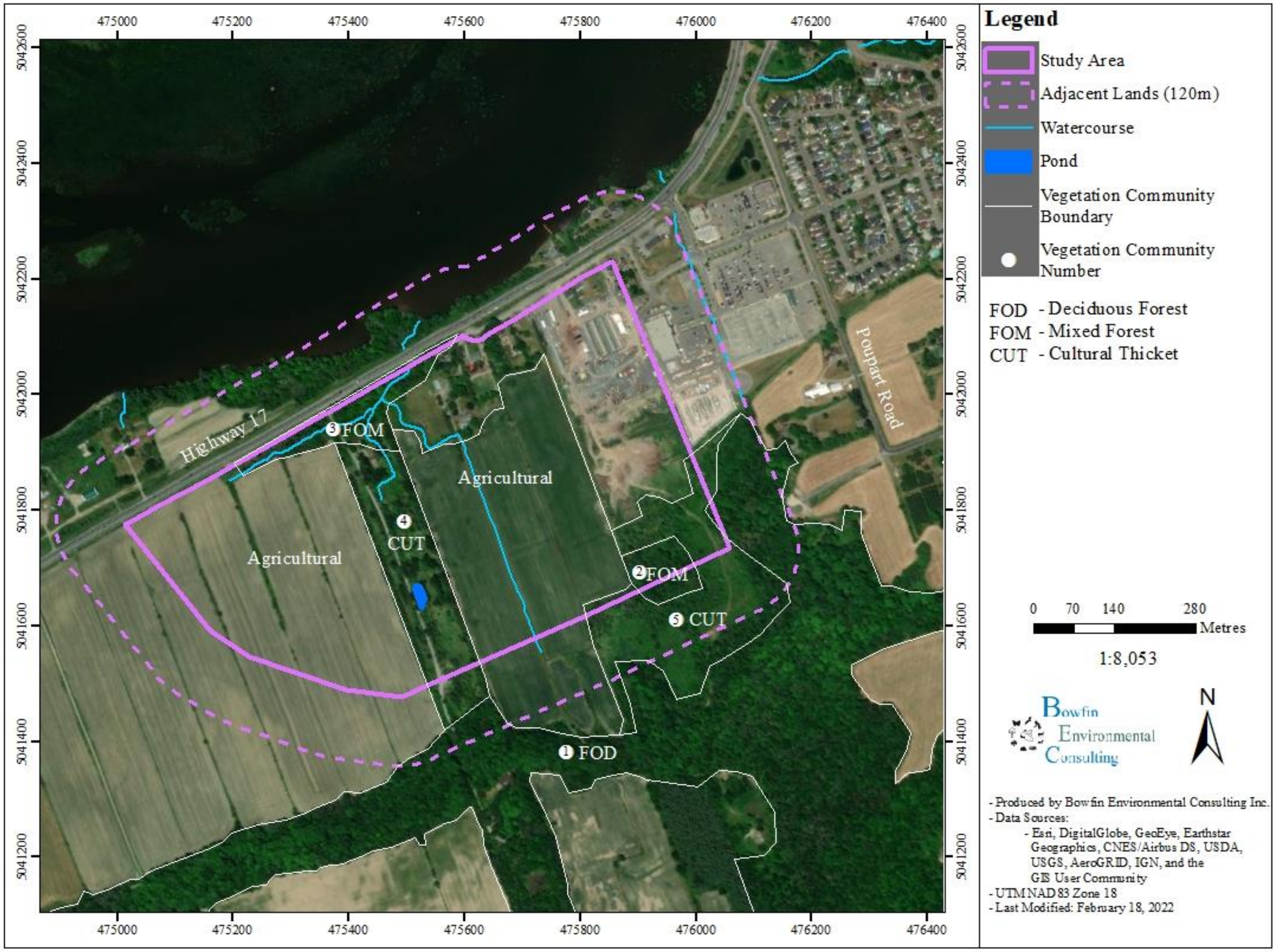


3.3 Desktop Review of Vegetation Communities

Since this was completed via a desktop review it is difficult to distinguish between very young forests or woodlands and thickets. That distinction is based on the species of woody vegetation, where tree species (any age, including seedlings) providing 35-60% cover would be woodland and those with 60% or more cover would be classed as forest. Whereas habitats that did not contain trees (of any ages) but had more than 25% cover by shrub species would be cultural thickets.

The study area is primarily agricultural fields and developed. In the center of the study area there appears to be cultural thicket community bordered by mixed forest to its north and deciduous forest to its south. A small pond feature is seen on images, immediately east of the private laneway, in the cultural thicket. Another cultural thicket could be present on the southeast corner of the study area which surrounds a deciduous forest then extends into the adjacent lands (Figure 2).

Figure 5: Desktop Vegetation Community Analysis



Deciduous Forest

Community 1

This community has a small section on the southeast side of the site and the adjacent lands but extends offsite covering an area of 120 ha. The satellite imagery suggests a closed-canopy deciduous forest dominates the site. The general feel was for a deciduous forest that provided 80% canopy cover. Much of this community forms part of the Significant Woodland as shown on the OP schedules.

Mixed Forest

Community 2

This small mixed forest is surrounded by agricultural land to the east and cultural thicket on the north, south, and west. It is entirely within the Settlement Area and appears to be separated from the above discussed Significant Woodland by a Cultural Thicket. This little community is estimated to be 1.1 ha in size. The tree canopy appears to provide around 70% canopy cover. Being within the Settlement Area, it is not part of the Significant Woodland layer.

Community 3

This narrow 2.2 ha community borders the Highway 17 to the north and Community 4 to the south. There is a single lot development immediately south of this community. On its western side is a mixed patch which is separated from the eastern side by a driveway. On the east is a narrow strip of conifers along the north separated from a patch of deciduous trees to the south by an area cleared for power lines. The community is in the Settlement Area and is not part of a Significant Woodland. While narrow (width between 20 m and 85 m), the background mapping does show potential fish habitat travelling through this community as such the vegetation may provide buffer to fish habitat.

Cultural Thicket

Community 4

This 4.8 ha community runs down the center of the site between agricultural fields. It has coniferous hedgerows on its eastern and western edges with patchy shrub cover in between. There are a few pockets of what appears to be trees species (deciduous forest or cultural woodlands), but overall this appears to be an old agricultural field that is naturalizing. There is a pond and a fish habitat (watercourse) shown within this community in the OP schedules.

Community 5

This 7.0 ha cultural thicket community is on the southeastern edge of site. It borders agricultural fields to the northwest and deciduous forest to the southeast. Review of the satellite images for the area notes this is also an old agricultural field that is naturalizing. It has been listed as a thicket but depending on the actual species may form part of a woodland or forest.

3.4 Fish Habitat and Fish Communities

As shown on Figure 6, the background review identified the Ottawa River and one unnamed feature flowing into the Ottawa River. LIO identified 75 species as occurring this section of the Ottawa River (Table 2).

There was no information available on the tributary (labelled as Unnamed Feature) to the Ottawa River's classification or its fish community.

The DFO National Aquatic Species at Risk Mapping (NASAR) also indicates that there are no recordings of federal endangered, threatened, or special concern in this area (Appendix A).

Table 2: Background Fish Community Information from LIO Databases

Species Name	**Scientific Name**	**Trophic Class**	**Thermal Regime**	**SRank**	**ESA Reg. 230/08 SARO List Status**	**SARA Schedule 1 List of Wildlife SAR Status**	**Ottawa River**	Reference
Northern Brook Lamprey	*Ichthyomyzon fossor*	nonfeeding, herbivore	cool	SNR	SC	SC	Y	LIO, 2018
Silver Lamprey	*Ichthyomyzon unicuspis*	Parasite, herbivore/ detrivore	cool	S3	SC	SC	Y	LIO, 2018
American Brook Lamprey	*Lethenteron appendix*	nonparasitic filterer, adults do not feed, herbivore	cold	S3			Y	LIO, 2018
Lake Sturgeon	*Acipenser fulvescens*	invertivore herbivore	cool	S2	END		Y	LIO, 2018
Longnose Gar	*Lepisosteus osseus*	carnivore	warm	S4			Y	LIO, 2018
American Eel	*Anguilla rostrata*	invertivore carnivore	cool	S1?	END		Y	LIO, 2018
Alewife	*Alosa pseudoharengus*	planktivore	cold	SNA			Y	LIO, 2018
American Shad	*Alosa sapidissima*	planktivore	cool	S1			Y	LIO, 2018
Mooneye	*Hiodon tergisus*	invertivore	cool	S4			Y	LIO, 2018
Brown Trout	*Salmo trutta*	invertivore carnivore	cold/cool	SNA			Y	LIO, 2018
Cisco (Lake Herring)	*Coregonus artedii*	planktivore invertivore	cold	S5			Y	LIO, 2018
Rainbow Smelt	*Osmerus mordax*	invertivore carnivore	cold	S5			Y	LIO, 2018
Northern Pike	*Esox lucius*	carnivore	cool	S5			Y	LIO, 2018
Muskellunge	*Esox masquinongy*	carnivore	warm	S4			Y	LIO, 2018
Central Mudminnow	*Umbra limi*	invertivore	cool	S5			Y	LIO, 2018
Spotfin Shiner	*Cyprinella spiloptera*	invertivore herbivore	warm	S4			Y	LIO, 2018
Common Carp	*Cyprinus carpio*	invertivore detritivore	warm	SNA			Y	LIO, 2018
Cutlip Minnow	*Exoglossum maxillingua*	invertivore	warm	S1S2	THR	SC	Y	LIO, 2018
Brassy Minnow	*Hybognathus hankinsoni*	planktivore detritivore	cool	S5			Y	LIO, 2018
Eastern Silvery Minnow	*Hybognathus regius*	herbivore detritivore	warm	S2	NAR		Y	LIO, 2018
Common Shiner	*Luxilus cornutus*	invertivore	cool	S5			Y	LIO, 2018

Species Name	Scientific Name	Trophic Class	Thermal Regime	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status	Ottawa River	Reference
Northern Pearl Dace	*Margariscus nachtriebi*	invertivore carnivore	cool	S5			Y	LIO, 2018
Golden Shiner	*Notemigonus crysoleucas*	invertivore herbivore	cool	S5			Y	LIO, 2018
Emerald Shiner	*Notropis atherinoides*	planktivore	cool	S5			Y	LIO, 2018
Blackchin Shiner	*Notropis heterodon*	invertivore	cool	S4	NAR		Y	LIO, 2018
Spottail Shiner	*Notropis hudsonius*	invertivore planktivore	cool	S5			Y	LIO, 2018
Rosyface Shiner	*Notropis rubellus*	invertivore detritivore herbivore	warm	S4	NAR		Y	LIO, 2018
Sand Shiner	*Notropis stramineus*	invertivore detritivore	warm	S4			Y	LIO, 2018
Mimic Shiner	*Notropis volucellus*	invertivore herbivore	warm	S5			Y	LIO, 2018
Northern Redbelly Dace	*Chrosomus eos*	invertivore planktivore	cool	S5			Y	LIO, 2018
Finescale Dace	*Chrosomus neogaeus*	invertivore planktivore	cool	S5			Y	LIO, 2018
Bluntnose Minnow	*Pimephales notatus*	detritivore	warm	S5	NAR		Y	LIO, 2018
Fathead Minnow	*Pimephales promelas*	detritivore invertivore	warm	S5			Y	LIO, 2018
Western Blacknose Dace	*Rhinichthys obtusus*	invertivore	cool	S5			Y	LIO, 2018
Longnose Dace	*Rhinichthys cataractae*	invertivore	cool	S5			Y	LIO, 2018
Creek Chub	*Semotilus atromaculatus*	invertivore carnivore	cool	S5			Y	LIO, 2018
Fallfish	*Semotilus corporalis*	invertivore carnivore	cool	S4			Y	LIO, 2018
Longnose Sucker	*Catostomus catostomus*	invertivore	cold	S5			Y	LIO, 2018
White Sucker	*Catostomus commersonii*	invertivore detritivore	cool	S5			Y	LIO, 2018
Quillback	*Carpiodes cyprinus*	invertivore detritivore	cool	S4			Y	LIO, 2018
Silver Redhorse	*Moxostoma anisurum*	invertivore	cool	S4			Y	LIO, 2018
River Redhorse	*Moxostoma carinatum*	invertivore	cool	S2	SC	SC	Y	LIO, 2018

Species Name	Scientific Name	Trophic Class	Thermal Regime	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status	Ottawa River	Reference
Shorthead Redhorse	*Moxostoma macrolepidotum*	invertivore	warm	S5			Y	LIO, 2018
Greater Redhorse	*Moxostoma valenciennesi*	invertivore	warm	S3			Y	LIO, 2018
Yellow Bullhead	*Ameiurus natalis*	invertivore carnivore	warm	S4			Y	LIO, 2018
Brown Bullhead	*Ameiurus nebulosus*	invertivore herbivore carnivore	warm	S5			Y	LIO, 2018
Channel Catfish	*Ictalurus punctatus*	invertivore carnivore	warm	S4			Y	LIO, 2018
Stonecat	*Noturus flavus*	invertivore carnivore	warm	S4			Y	LIO, 2018
Tadpole Madtom	*Noturus gyrinus*	invertivore planktivore	warm	S4			Y	LIO, 2018
Margined Madtom	*Noturus insignis*	invertivore	warm	SU			Y	LIO, 2018
Trout-perch	*Percopsis omiscomaycus*	invertivore carnivore	cold	S5			Y	LIO, 2018
Burbot	*Lota lota*	invertivore carnivore	cold	S5			Y	LIO, 2018
Banded Killifish	*Fundulus diaphanus*	invertivore planktivore	cool	S5	NAR		Y	LIO, 2018
Brook Silverside	*Labidesthes sicculus*	planktivore invertivore	warm	S4			Y	LIO, 2018
Brook Stickleback	*Culaea inconstans*	planktivore invertivore	cool	S5			Y	LIO, 2018
Ninespine Stickleback	*Pungitius pungitus*	planktivore	cool	S5			Y	LIO, 2018
Mottled Sculpin	*Cottus bairdii*	invertivore	cool	S5			Y	LIO, 2018
Slimy Sculpin	*Cottus cognatus*	invertivore	cold	S5			Y	LIO, 2018
Rock Bass	*Ambloplites rupestris*	invertivore carnivore	cool	S5			Y	LIO, 2018
Pumpkinseed	*Lepomis gibbosus*	invertivore carnivore	warm	S5			Y	LIO, 2018
Bluegill	*Lepomis macrochirus*	invertivore	warm	S5			Y	LIO, 2018
Northern Sunfish	*Lepomis peltastes*	invertivore	warm	S3	SC	SC	Y	LIO, 2018
Smallmouth Bass	*Micropterus dolomieu*	invertivore carnivore	cool	S5			Y	LIO, 2018

Species Name	Scientific Name	Trophic Class	Thermal Regime	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status	Ottawa River	Reference
Largemouth Bass	*Micropterus salmoides*	invertivore carnivore	warm	S5			Y	LIO, 2018
White Crappie	*Pomoxis annularis*	invertivore carnivore	warm	S4			Y	LIO, 2018
Black Crappie	*Pomoxis nigromaculatus*	invertivore carnivore	cool	S4			Y	LIO, 2018
Iowa darter	*Etheostoma exile*	invertivore	cool	S5			Y	LIO, 2018
Fantail Darter	*Etheostoma flabellare*	invertivore	cool	S4			Y	LIO, 2018
Johnny Darter	*Etheostoma nigrum*	invertivore	cool	S5			Y	LIO, 2018
Tessellated Darter	*Etheostoma olmstedi*	invertivore	cool	S4	NAR		Y	LIO, 2018
Yellow Perch	*Perca flavescens*	invertivore carnivore	cool	S5			Y	LIO, 2018
Logperch	*Percina caprodes*	invertivore	warm	S5			Y	LIO, 2018
Sauger	*Sander canadensis*	invertivore carnivore	cool	S4			Y	LIO, 2018
Walleye	*Sander vitreus*	invertivore carnivore	cool	S5			Y	LIO, 2018
Freshwater Drum	*Aplodinotus grunniens*	invertivore carnivore	warm	S5			Y	LIO, 2018
Number of Species							75	
Y	Represents a species present in the respective watercourse							

(DFO, 2019; Bowfin, 2018; Eakins, 2018; LIO, 2018; MNRF, 2017; MTO, 2006)

Status Updated: October 2, 2018

SRANK DEFINITIONS

S1 Critically Imperiled, Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

S2 Imperiled, Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3 Vulnerable, Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

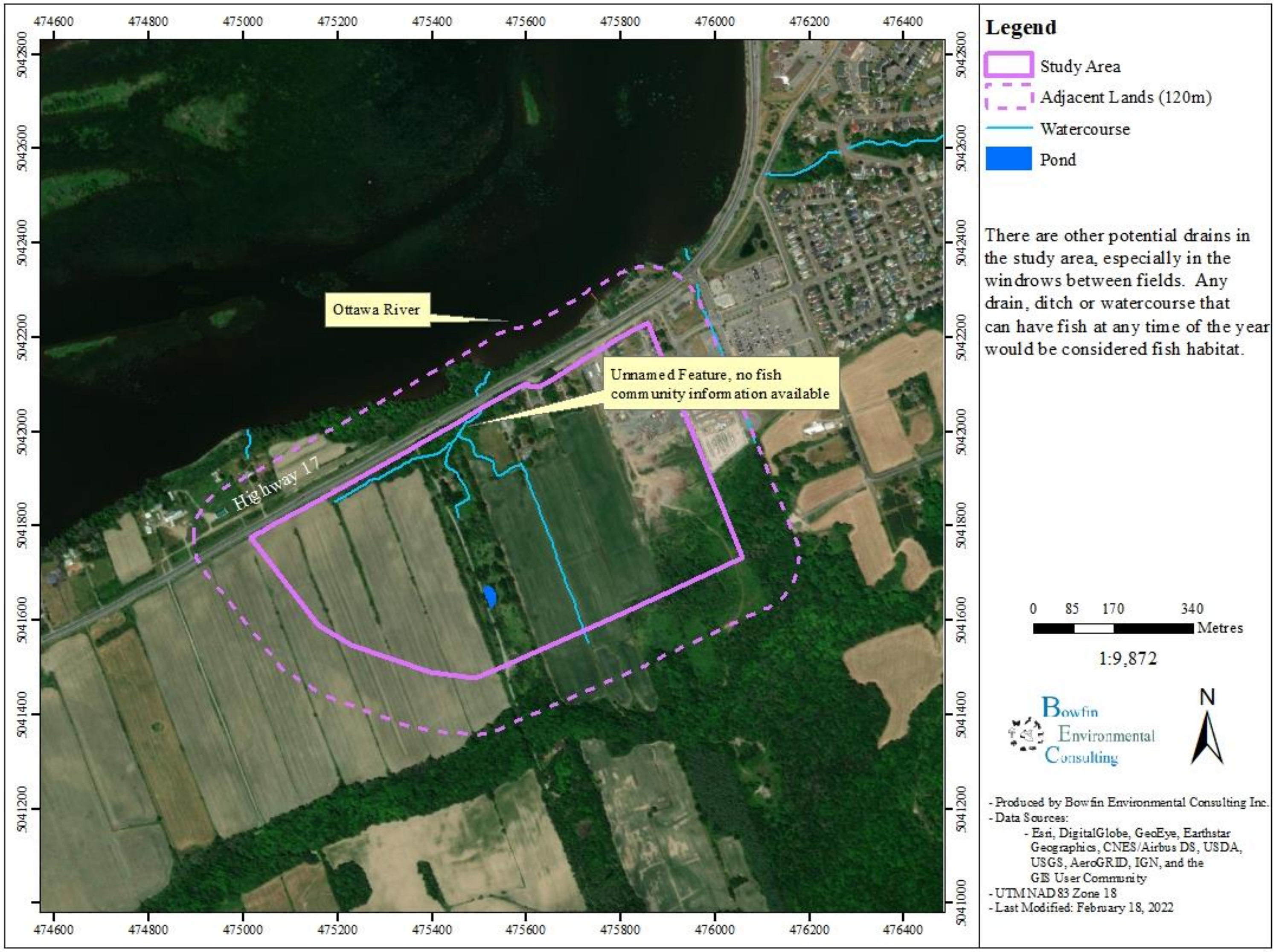
S4 Apparently Secure, Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 Secure, Common, widespread, and abundant in the nation or state/province.
SNR Unranked, Nation or state/province conservation status not yet assessed.
SU Unrankable, Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

SARO STATUS DEFINITIONS
END Endangered: A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

SARA STATUS DEFINITIONS
SC Special Concern, a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Figure 6: Background Fish Community and Habitat



4.0 REVIEW OF NATURAL HERITAGE FEATURES

The desktop review found that **<u>none</u>** of the following features were identified in the study area:

- provincially significant wetlands
- unevaluated wetlands
- coastal wetlands
- valleylands
- identified significant wildlife habitat
- Significant woodlands
- ANSIs

The UCPR identifies a significant woodland in the adjacent lands to the south of the proposed collector road. UCPR notes that only wildlife corridors and deer wintering yards are considered significant wildlife area in this area, and these are absent from the study area and adjacent lands.

Future Environmental Impact Studies (EIS) that will be required for proponents wishing to work within the study area will need to also look at the adjacent lands. With that in mind, the desktop identified significant woodlands to the south and, fish habitat, PSW, and an ANSI to the north of County Road 17 (in/on the Ottawa River).

The only identified **<u>potential natural heritage features in the study area were:</u>**

- Fish habitat in two identified watercourses and, while not mapped, any other permanent or seasonal ditch/drain that is connected to downstream fish habitat. If the pond is connected to downstream habitat, then it too could provide direct fish habitat. Confirmation of all potential fish habitat would require a site investigations.

Finally, with respect to Endangered and Threatened species/habitat, this will be an aspect that will need to be assessed by site specific investigations. However, we note that there maybe some opportunities associated with Endangered and Threatened that the City may wish to investigate now. These are discussed further in the sections below.

4.1 Endangered and Threatened Species

4.1.1 Species Discussion

Terrestrial and wetland Endangered and Threatened Species at Risk, on private land, are protected under provincial *Endangered Species Act* (ESA). It is noted that bird species protected under the *Species at Risk Act* (SARA) are protected by the *Migratory Bird Convention Act* (MBCA) on private lands. Fish (fish and mussels) Endangered and Threatened species are protected in all watercourses under ESA and SARA. To identified potential opportunities, databases were consulted to create a list of Endangered and Threatened species that would be considered for this study area. <u>It is important to note that this is based on the species listed in Ontario Regulation 230/08 (last updated August 1, 2018).</u> The purpose of this section is to consider the habitats in the study area and make recommendations on opportunities. The opportunities could involve the dedication of property or purchasing property that could be used to support endangered and threatened species and their habitat. It is noted that when this is done, and implemented, these lands would be subject to constraints under ESA, as applicable to the species.

As discussed in the methods, the list was compiled using various sources. The NHIC database provides information available to the public on those SAR documented as occurring within the general area. It should be noted that not all information for all species is available to the public. Furthermore, the absence of a recording does not necessarily indicate that the species is absent from the area. The purpose of the NHIC database is to serve as a guide to help determine the potential species which may occur within the project area. The background review included looking at the list of birds observed as part of the Atlas of Breeding Birds of Ontario (ABBO) and any SAR species listed on these lists were considered as potentially occurring within the study area. Added to this list were species that based on personal experience, often occur within the general area. Species that would be restricted to the Ottawa River are not included (i.e. hickorynut (a mollusc), lake sturgeon, American eel and cutlip minnow (all fish)). The resulting list includes 11 SAR: 6 birds (eastern whip-poor-will, chimney swift, bank swallow, barn swallow, bobolink, and eastern meadowlark), 4 mammals (little brown myotis, northern myotis, eastern small-footed myotis, and the tri-colored bat), and 1 plant (butternut) (Table 3).

Birds

Through the background review, five species of birds were listed as potentially occurring: eastern whip-poor-will, chimney swift, barn swallow, bobolink, and eastern meadowlark. These species are discussed below.

Eastern Whip-poor-will

The whip-poor-will is a well camouflaged species can be found in a multitude of forest types. Its requirements consist of areas that are semi-open forests or sites with a closed forest intermixed with other open habitats. It also needs some areas with little ground cover. Its minimum habitat size requirement is 9 ha (COSEWIC, 2009b). The G*eneral Habitat Description for Eastern Whip-poor-will* (MNRF on-line document) indicates that the protected habitat for this species includes three categories:

Category 1 known nests and 20 m of the nest

Category 2	the area between 20 m and 170 m from the nest or the approximate centre of the defended territory
Category 3	the area of suitable habitat between 170 m and 500 m of the nest or approximate centre of the defended territory

While the presence of eastern whip-poor-will in the UCPR is low, it is known to occur much further to the south and east of Rockland. There is very little woodlands in the study area, and these have mostly been impacted by the previous clearing activity and consist of very young, regenerating stands. Any woodland or treed area (regardless of whether it is classed as a significant woodland could provide habitat to this species. Typically the minimum stand size is roughly 9 ha, but this is not a firm rule. While the remnant stands within the study area are too small, those in the adjacent lands are appropriate. These include the lands that would need to be cleared for the Collector Road. If the species is present, this could result in restrictions on land uses in the study area. The restrictions would be dependent on the approximate location of the defended territories in relation to the study area (see distances associated with the Category 1-3 habitats).

Chimney Swift

There are no occurrences noted for this species within 10 km; its nearest sightings are by Sarsfield and Navan. The Chimney Swift can often be found in developed areas and prefers to utilize structures such as large (>50 cm diameter) trees or man-made structures such as chimneys for its nesting habitat (COSEWIC, 2007). The use of large trees is now considered a rare event and the documented occurrences have all been in trees that were <1 km from a waterbody (large enough to be shown on 1:50,000 topographical maps) (COSEWIC, 2007). While this Study Area is within 1 km of the Ottawa River, there appear to be few trees. That said, the woodland to be disturbed for the Collector Road would need to be investigated for this species. It is noted that Category 1 Chimney Swift habitat is the nesting structure (tree or chimney) and 90 m surrounding the structure (COSEWIC, 2007). Note that there is no Category 2 or 3 for this species.

Barn Swallow

The barn swallow can often be found nesting on man-made structures. Due to the structures on site this species nesting habitat could be present. Surveys would be required prior to impacting this species or its nest.

Category 1	The nest
Category 2	Area within 5 m of the nest.
Category 3	Area between 5 m and 200 m of the nest

Bobolink (*Dolichonyx oryzivorus*)

This species is grassland-breeding-bird typically requiring a minimum of 4 ha of uncut meadow or field. The *Bobolink General Habitat Description* (OMNRF, 2018) indicates that the protected habitat for this species includes three categories:

Category 1	known nests and 10 m of the nest
Category 2	the area between 10 m and 60 m from the nest or the approximate centre of the defended territory
Category 3	the area of continuous suitable habitat between 60 m and 300 m of the nest or approximate centre of the defended territory

This is a commonly observed species in UCPR. The background images showed that there were no meadow communities and much of the study area cropland which are not considered breeding habitat while under active agricultural uses. As such, this species and its habitat are considered absent while the lands are under active agricultural uses.

Eastern Meadowlark

Like the bobolink, this is a grassland breeding birds requiring a minimum of 4 ha of uncut meadow or field. The *General Habitat Description for Eastern Meadowlark* (OMNRF, 2018) indicates that the protected habitat for this species includes three categories:

Category 1	known nests and 10 m of the nest
Category 2	the area between 10 m and 100 m from the nest or the approximate centre of the defended territory
Category 3	the area of continuous suitable habitat between 100 m and 300 m of the nest or approximate centre of the defended territory

This is a commonly observed species in UCPR. The background images showed that there were no meadow communities and much of the study area cropland which are not considered breeding habitat while under active agricultural uses. As such, this species and its habitat are considered absent while the lands are under active agricultural uses.

Bats

The potential SAR bats within the general area are: little brown myotis, northern myotis, eastern small-footed myotis and tri-colored bat. There are three types of habitats required by bats: hibernation, maternity sites and day-roost sites. The latter is not considered critical habitat.

These four bats species prefer to hibernate in caves or mines. They can hibernate in buildings but that is rare for these species (COSEWIC, 2013a). No caves or mines were present.

The northern myotis tends to prefer larger expanses of older forests (late successional or primary forests) and chose maternity sites in snags that are in the mid-stage of decay. They prefer habitat with intact interior habitat and is shown to be negatively correlated with edge habitat (Menzel et al., 2002; Broders et al., 2006; Yates et al., 2006; OMNRF, 2015). This habitat is absent from the study area.

The recovery strategy for the eastern small-footed myotis indicates that the preferred maternity habitat of this species consists of open rock habitats and that it rarely uses old buildings as roosting/maternity sites (Humphrey, 2017). There was no suitable rocky habitat present. Based on this information, this species' maternity sites are considered absent.

The Atlas of Mammals of Ontario (Dobbyn, 1994) suggests that the tri-colored bat is not present within this part of Ontario however, the NatureServe mapping in the COSSARO (2015) includes all of southeastern Ontario. Though there is also a new recording of a potential individual across the river in Quebec on iNaturalist. They prefer caves for hibernacula and use old trees or buildings for summer maternity colonies (COSEWIC 2013). Based on this information, this species is considered to have a low potential of occurring, unless suitable habitat is bound in the ridge of the adjacent lands.

Finally, the little brown myotis has a potential for using the study area for maternity sites. Current guidance from MECP for this area is that habitat is not a limiting factor and that provided that avoidance measures can be implemented, that there would be no contravention of ESA for the removal of maternity or candidate maternity habitat. Note that this recommendation is subject to change.

There also remains the potential for various species to utilise the trees on-site for day-roosts. The current bat active season is April 1 to September 30 and restrictions to activities that could impact these species are in force during this period. Also note that should the ridge line provide cavities in rock, then there could be a potential for hibernacula (or as mentioned above breeding habitat for tri-colored bat). These are very sensitive and strictly protected. That habitat is outside of the study area but within the adjacent lands.

Plants

Butternuts

This species is common in UCPR. Butternut is listed as an endangered species federally signifying that it is at risk of becoming Extinct or Extirpated in Ontario and in Canada. Butternut is a shade intolerant species that is often found along edge habitats on rich, moist, well-drained loams or well-drained gravels (COESWIC, 2003). The butternut is threatened by a canker for which there is no known control (COESWIC, 2003). There is a potential for butternuts in any habitat that is not under active crop uses or mowed.

4.1.2 SAR Conclusion

The background review were able to confirm the lack of suitable habitat for some of the potential SAR for the area. Those that remain are:

- Eastern whip-poor-will could use the deciduous forests to the southeast
- Chimney swifts and barn swallow could use the structures on site
- Bobolink and eastern meadowlark only if any of the agricultural fields are planted in hay or cereal crop, and ESA would apply if they were left fallow.
- Potential for bats remain in the larger forested areas and larger individual trees as well as in the ridge line is caves are present.
- Butternuts in any communities that are not actively and annually maintained through mowing or crops

Table 3: Summary of Potential SAR

Common Name	Scientific Name	Preferred Habitat	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status	References	MECP Guidelines/Triggers for Review	Brought Forward (Yes/No)
BIRDS								
Eastern Whip-poor-will	*Antrostomus vociferus*	Rock or sand barrens with scattered trees, savannahs, old burns or other disturbed sites in a state of early to mid-forest succession, or open conifer plantations.	S4B	THR	THR	COSEWIC, 2013; Menzel et al., 2002; Broders et al., 2006; OMNRF, 2015	Forests to the south east may provide habitat for this species	Yes
Chimney Swift	*Chaetura pelagica*	Cities, towns, villages, rural, and wooded areas.	S4B, S4N	THR	THR	COSEWIC 2007a	May use structures within the study area	Yes
Bank Swallow	*Riparia riparia*	This species nests within vertical banks, with a preference for sand-silt substrate. Nesting sites may be near open upland habitats.	S4B	THR	THR	Eder 2002	No suitable banks within the study area	No
Barn Swallow	*Hirundo rustica*	Open or semi-open lands: farms, field, marshes.	S4B	SC	THR	COSEWIC 2017	May use structures within the study area	Yes
Bobolink	*Dolichonyx oryzivorus*	Primarily in forage crops, and grassland habitat.	S4B	THR	THR	COSEWIC 2010	May occur if agricultural fields are planted in hay or cereal crop but are only protected under the Act if not in active use	Yes
Eastern Meadowlark	*Sturnella magna*	Fields, meadows and prairies.	S4B	THR	THR	COSEWIC 2011		
MAMMALS								
Little Brown Myotis	*Myotis lucifugus*	Buildings, attics, roof crevices and loose bark on trees or under bridges. Always roost near waterbodies.	S4	END	END	COSEWIC 2013a	MECP recommends the use of avoidance timing window for clearing of trees (>10 cm in diameter) if this can be accomplished then no impacts. Ridge line to the south (adjacent lands) has the	Yes
Northern Myotis	*Myotis septentrionalis*	Older (late successional or primary forests) with large interior habitat.	S3	END	END	COSEWIC 2013a, Broders et al 2006, Menzel et al. 2002		

Common Name	Scientific Name	Preferred Habitat	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status	References	MECP Guidelines/Triggers for Review	Brought Forward (Yes/No)
Eastern Small-footed Myotis	*Myotis leibii*	Found within deciduous or coniferous forests in hilly areas.	S2, S3	END		Eder 2002	potential to offer more sensitive bat habitat if caves/crevices are present.	
Tri-colored Bat	*Perimyotis subflavus*	Prefers shrub habitat or open woodland near water.	S3?	END	END	COSEWIC 2013a		
PLANTS								
Butternut	*Juglans cinerea*	Variety of sites, grows best on well-drained fertile soils in shallow valleys and on gradual slopes	S2?	END	END	COSEWIC 2003	May be present in any communities outside of the crop or mowed lawns	Yes

Status Updated August 1, 2020

SRANK DEFINITIONS

S1 Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

S2 Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3 Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 Apparently Secure, Uncommon but not rare; some cause for long-term concern due to declines or other factors.

? Inexact Numeric Rank—Denotes inexact numeric rank

S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

S#B Breeding

SARO STATUS DEFINITIONS

END Endangered: A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.

THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

SARA STATUS DEFINITIONS

END Endangered, a wildlife species facing imminent extirpation or extinction.

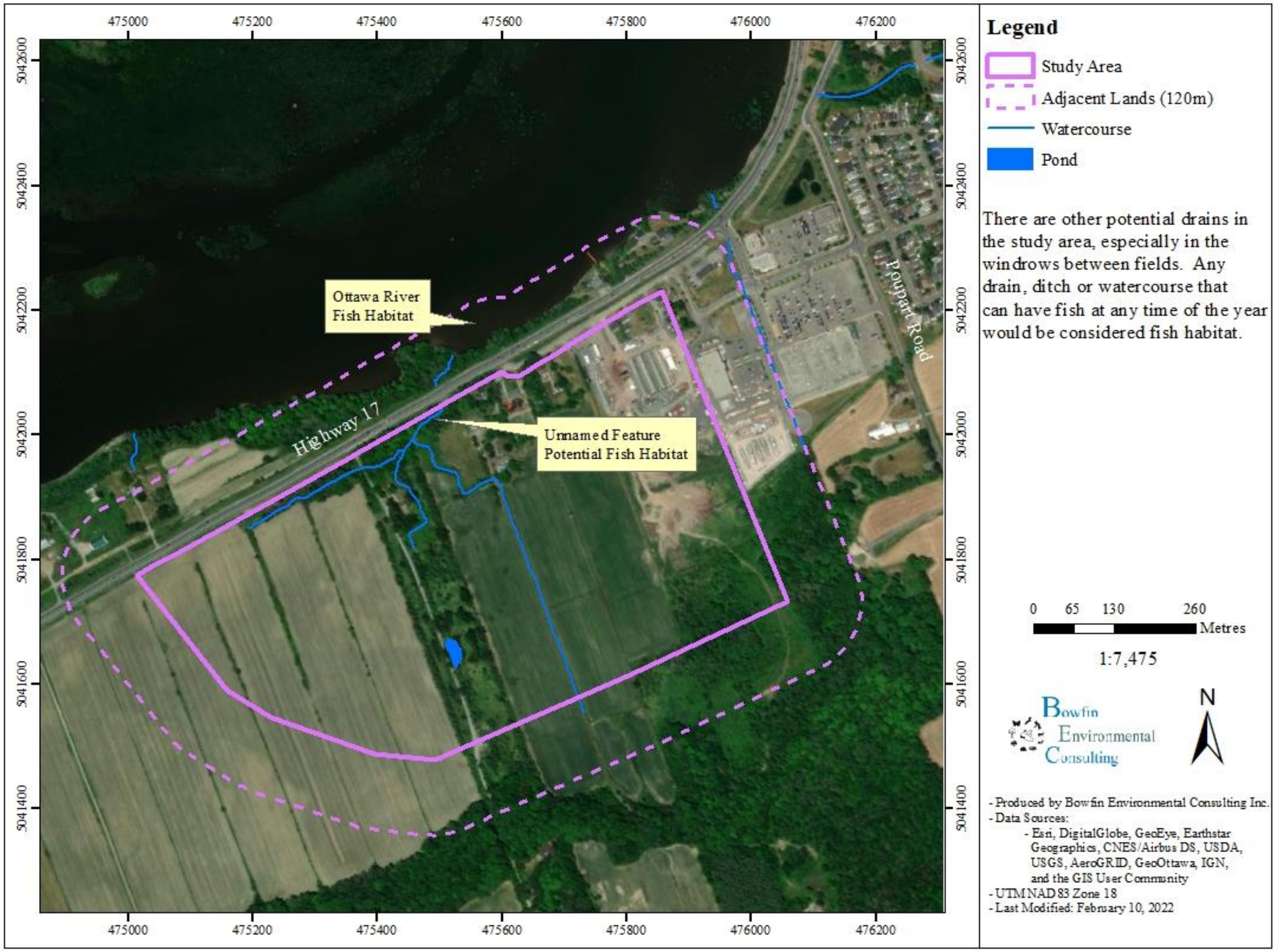
THR Threatened, a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC Special Concern, a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

4.2 Fish Habitat

The potential fish habitat within the study area includes the Unnamed Feature, its branches, the pond (if connected to fish habitat), and any smaller (not identified herein) agricultural drains/ditches. The potential use of these by fish, any species, at any time of the year, is unknown. They have all assumed to be fish habitat.

The PPS states that development will not take place within fish habitat unless provincial and federal requirements are met (PPS, 2020). The NHRM specifies that the minimum natural vegetation buffer to fish habitat can be reduced from 30 m to 15 m for warm water systems and to 20 m for cool water systems.

Figure 7: Potential Fish Habitat



4.4 Areas of Natural and Scientific Interest

The Baie Lafountaine Islands, Candidate ANSI, Life Sciences are located 30 m north of the site, in the adjacent lands. The information provided by LIO is summarized below (Table 4). As it is across Highway 17 and listed as non sensitive it is unlikely to be affected by any work conducted in the Study Area. It overlaps with the Baie Fountaine provincially significant wetland which is located 290 m north of site.

Table 4: ANSI Information

Name	Type	Significance	Sensitivity
Baie Lafountaine Islands	Candidate, Life Sciences	Regional	Non-Sensitive

5.0 CONSTRAINTS and OPPORTUNITIES

There are two larger communities that are naturalizing; the old agricultural field that was labelled as Cultural Thicket (labelled as Opportunity A on Figure 8), and the Cultural Thicket/Forest on the southeast side (labelled as Opportunity C). Opportunity A also has the pond feature. In addition, there is the setback from what is labelled the Unnamed Features which are assumed to be fish habitat (Opportunity B). The functions of these three opportunities should be carefully considered and are discussed below.

The following comments are based on the evaluation process under the *Natural Heritage Reference Manual* (OMNR, 2005) on the **suitability of opportunities as Significant Woodland.**

- A separation of 20 m in canopy between the opportunities and the existing Significant Woodland to the south would create a separation in stands.
- If the collector road is 20 m wide or greater, then the value of any woodland to the north would be based on that stand and a minimum size to be considered. The available area is <5 ha for all three opportunities. In this area the existing cover is 26%. As such, the minimum stand size is 20 ha for the size criteria. Also note that the minimum width of a treed area to be considered part of a woodland stand is 40-60 m (depending on the size of the stand).
- Functions such as proximity, linkages, water protection, and woodland diversity all have a minimum stand size to be considered significant. The woodland interior for an area with 26% cover is stated as 2 ha in the NHRM, which none of these will meet (after a 100 m edge is removed). And the NHRM is not as clear on the other functions, simply provides an example of 0.5-20.0 ha. The recent guideline from the City of Ottawa suggest a minimum size of 5 ha in areas with 26% cover (see the City of Ottawa's

Significant Woodlands: Guidelines for Identification, Evaluation, and Impact Assessment).

- For the opportunities labelled as A and B, the north end includes an existing single lot and there is the County Road 17. The County Road, and the proposed Collector Road, make a linkage function for wildlife (apart from birds) undesirable because of the potential for road mortality. Options for wildlife passage culverts for smaller species at County Road 17 and the collector road could be explored.
- Based on the above, the opportunities would not likely result in a Significant Woodland being created.

The potential to create habitat for Endangered or Threatened species is another opportunity. The species most suitable for these lands would be Butternut. An area could be set aside for compensation habitat to be used by the City or Developers. Other jurisdictions have used this opportunity to help attract developers. To be suitable, the location of the Butternut plantings would need to be determined in advance and meet the minimum requirements under the Ontario Regulations 242/08. Currently this O.Reg states (April 1, 2021):

> *"i. the soil must be greater than one metre deep, moist but well-drained and have a fine to medium texture with a recognizable organic layer and with a pH ranging from 6.8 to 7.2, and*
>
> *ii. the area must provide full sunlight conditions to the butternut seedlings.*
>
> *6. In order to avoid a monoculture of butternut, the person shall plant deciduous trees and shrubs that are not butternut seedlings and that are native to the area in which the seedlings are planted in such numbers to ensure that there are an equal number of butternut trees and other native Ontario species in the area.*
>
> *8. No more than 200 butternut seedlings shall be planted in a hectare.*
>
> *9. Butternut seedlings must be planted at least,*
>
> *i. three metres from other planted butternut seedlings,*
>
> *ii. two metres from other trees or shrubs that are likely to be the same height or shorter than the butternut tree at full growth,*
>
> *iii. four metres from other trees or shrubs that are likely to be taller than the butternut tree at full growth,*
>
> *iv. five metres from the canopy drip line of trees that are greater than four metres in heights at the time of planting, and*
>
> *v. 100 metres from a highway consisting of two or more lanes in either direction."*

Further, the Category Habitat for Butternuts extend 50 m (radius) from the planting. As such, a protected buffer for the plantings would be required. Note that the protected buffer for the companion trees would be much smaller, simply sufficient to protect their critical root zones.

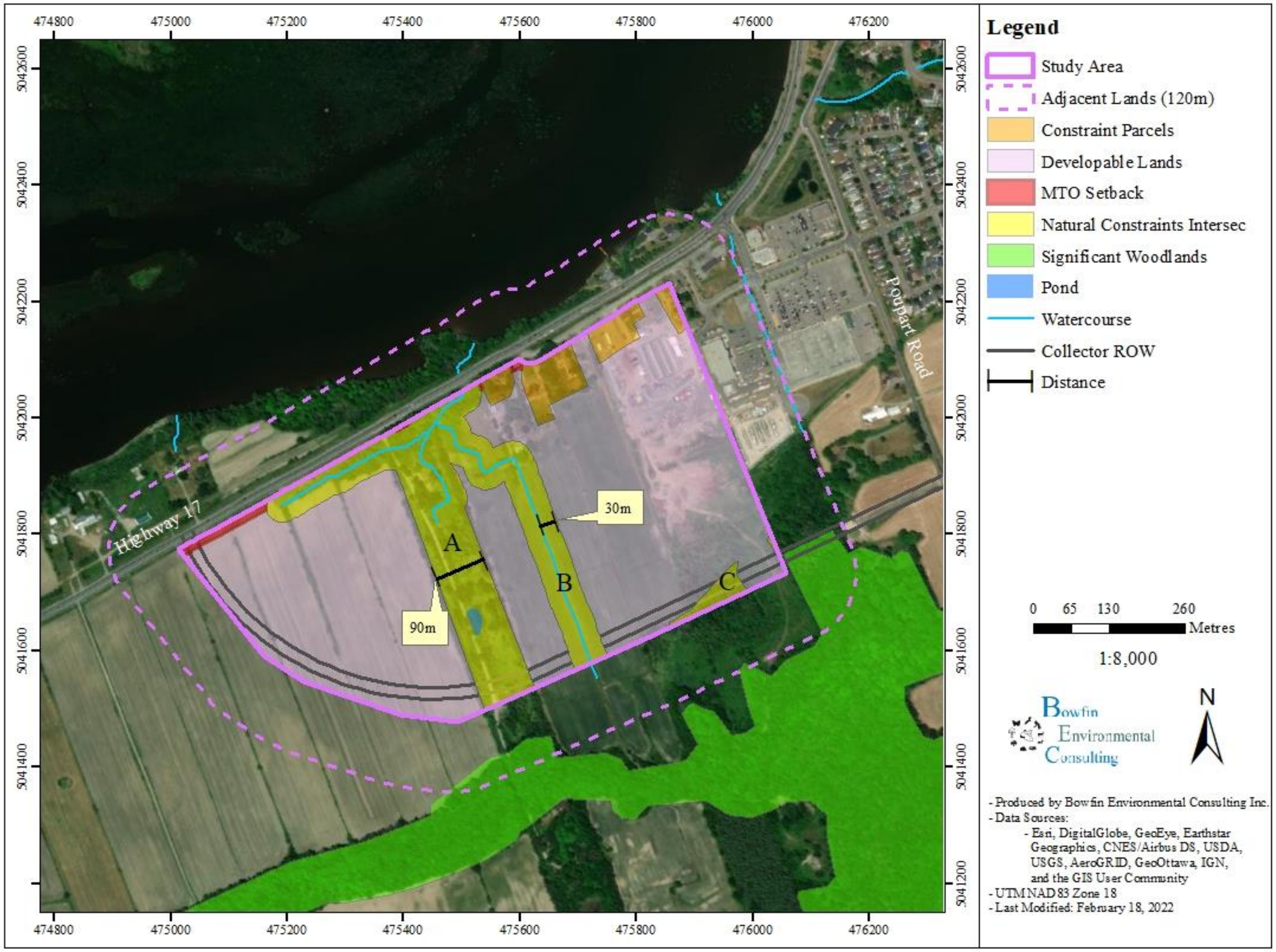
What may be more appropriate in this location is:

- Opportunities A and B also provide protection to possible fish habitat. The guidelines for constraints is 30 m (NRHF; OMNR, 2005) with an ability to reduce this to 15 m for warm-water features and 20 m for cool water system. It is recommended that this Secondary Plan determine whether 15 m or 20 m, as appropriate, would be acceptable and publish this within the Plan to provide clear guidance. Of course, if upon investigations, these features are found not to contain fish at anytime of year, then the minimum buffers would no longer apply in terms of Fish Habitat.

- Opportunities A and B would both, likely benefit, from a landscaping plan that would be focused on native species (including native herbaceous seed mixes). This would line up nicely with the UPCR policy 5.5.6 with respect to Vegetation Cover. A minimum buffer could be established, regardless of the presence of fish, to serve as protection to the water quality. If may be necessary to indicate whether the potential for relocating these features and constraints would be acceptable (this would be acceptable from a Fish Habitat perspective provided that it was approved by DFO).
- Any of these communities could be enhanced with native species and vegetation including natural meadow communities including those that include butterflies such as Monarch.
- As mentioned above, while the opportunities would not meet the Significant Woodland criteria, safe linkages for small mammals could still be created between the Ottawa River and the Significant Woodland south of the site if the County Road 17 culverts offer Small Mammal/Reptile Passage. This could help discourage wildlife from crossing that busy roadway. If this is completed during the widening, then any culverts that may be placed in the Collector Road could also consider small mammal passage.

In conclusion, other than the Fish Habitat, there are no confirmed natural constraints. Again, the presence of Endangered or Threatened Species or their Habitat is not mapped or confirmed, though a list of potential species is discussed herein. But three opportunities for enhancements are shown. The City is encouraged to consider these areas for enhancements. This could be combined with more of an Urban Park type of landscapes but one with native species and communities.

Figure 8: Constraints and Opportunities



I trust that this report will meet your requirements. Should you have any questions or comments, please contact the undersigned.

Sincerely,

____

Michelle Lavictoire, Biologist

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Appendix A: Background Information

Atlas of the Breeding Birds of Ontario

Squares: 18VR74, 18VR64, 18VR63, 18VR73

Common Name	Scientific Name	ABBO Category	SRANK	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status
Canada Goose	*Branta canadensis*	Probable	S5	no status	no status
Wood Duck	*Aix sponsa*	Confirmed	S5	no status	no status
Gadwall	*Anas strepera*	Probable	S4	no status	no status
American Black Duck	*Anas rubripes*	Probable	S4	no status	no status
Mallard	*Anas platyrhynchos*	Confirmed	S5	no status	no status
Northern Shoveler	*Anas clypeata*	Possible	S4	no status	no status
Northern Pintail	*Anas acuta*	Possible	S5	no status	no status
Green-winged Teal	*Anas crecca*	Probable	S4	no status	no status
Blue-winged Teal	*Anas discors*	Probable	S4	no status	no status
Lesser Scaup	*Aythya affinis*	Probable	S4	no status	no status
Hooded Merganser	*Lophodytes cucullatus*	Possible	S5B,S5N	no status	no status
Common Merganser	*Mergus merganser*	Probable	S5B,S5N	no status	no status
Gray Partridge	*Perdix perdix*	Possible	SNA	no status	no status
Ruffed Grouse	*Bonasa umbellus*	Confirmed	S4	no status	no status
Wild Turkey	*Meleagris gallopava*	Confirmed	S5	no status	no status
Pied-billed Grebe	*Podilymbus podiceps*	Possible	S4B, S4N	no status	no status
American Bittern	*Botaurus lentiginosus*	Confirmed	S4B	no status	no status
Great Blue Heron	*Ardea herodias*	Confirmed	S4	no status	no status
Green Heron	*Butorides virescens*	Probable	S4B	no status	no status
Turkey Vulture	*Cathartes aura*	Possible	S5B	no status	no status
Osprey	*Pandion haliaetus*	Confirmed	S5B	no status	no status
Northern Harrier	*Circus cyaneus*	Confirmed	S4B	no status	no status
Sharp-shinned Hawk	*Accipiter striatus*	Possible	S5	no status	no status
Cooper's Hawk	*Accipiter cooperii*	Confirmed	S4	no status	no status
Northern Goshawk	*Accipiter gentilis*	Possible	S4	no status	no status
Broad-winged Hawk	*Buteo platypterus*	Possible	S5B	no status	no status
Red-tailed Hawk	*Buteo jamaicensis*	Probable	S5	no status	no status
American Kestrel	*Falco sparverius*	Confirmed	S4	no status	no status
Virginia Rail	*Rallus limicola*	Confirmed	S5B	no status	no status
Sora	*Porzana carolina*	Probable	S4B	no status	no status
American Coot	*Fulica americana*	Possible	S4B	no status	no status
Killdeer	*Charadrius vociferus*	Confirmed	S5B, S5N	no status	no status
Spotted Sandpiper	*Actitis macularia*	Confirmed	S5	no status	no status
Upland Sandpiper	*Bartramia longicauda*	Confirmed	S4B	no status	no status
Common Snipe	*Gallinago delicata*	Probable	S5B	no status	no status
American Woodcock	*Scolopax minor*	Probable	S4B	no status	no status
Black Tern	*Chlidonias niger*	Confirmed	S3B	SC	no status

Common Name	Scientific Name	ABBO Category	SRANK	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status
Rock Pigeon	*Columba livia*	Confirmed	SNA	no status	no status
Mourning Dove	*Zenaida macroura*	Confirmed	S5	no status	no status
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Confirmed	S5B	no status	no status
Eastern Screech-Owl	*Megascops asio*	Possible	S4	no status	no status
Great Horned Owl	*Bubo virginianus*	Confirmed	S4	no status	no status
Short-eared Owl	*Asio flammeus*	Confirmed	S2N, S4B	SC	SC
Northern Saw-whet Owl	*Aegolius acadicus*	Possible	S4	no status	no status
Whip-poor-will	*Caprimulgus vociferus*	Possible	S4B	THR	THR
Chimney Swift	*Chaetura pelagica*	Possible	S4B, S4N	THR	THR
Ruby-throated Hummingbird	*Archilochus colubris*	Probable	S5B	no status	no status
Belted Kingfisher	*Ceryle alcyon*	Confirmed	S4B	no status	no status
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Confirmed	S5B	no status	no status
Downy Woodpecker	*Picoides pubescens*	Confirmed	S5	no status	no status
Hairy Woodpecker	*Picoides villosus*	Confirmed	S5	no status	no status
Northern Flicker	*Colaptes auratus*	Probable	S4B	no status	no status
Pileated Woodpecker	*Dryocopus pileatus*	Probable	S5	no status	no status
Eastern Wood-Pewee	*Contopus virens*	Confirmed	S4B	SC	SC
Alder Flycatcher	*Empidonax alnorum*	Probable	S5B	no status	no status
Willow Flycatcher	*Empidonax traillii*	Probable	S5B	no status	no status
Least Flycatcher	*Empidonax minimus*	Probable	S4B	no status	no status
Eastern Phoebe	*Sayornis phoebe*	Confirmed	S5B	no status	no status
Great Crested Flycatcher	*Myiarchus crinitus*	Confirmed	S4B	no status	no status
Eastern Kingbird	*Tyrannus tyrannus*	Confirmed	S4B	no status	no status
Blue-headed Vireo	*Vireo solitarius*	Possible	S5B	no status	no status
Blue-gray Gnatcatcher	*Polioptila caerulea*	Confirmed	S4B	no status	no status
Warbling Vireo	*Vireo gilvus*	Probable	S5B	no status	no status
Red-eyed Vireo	*Vireo olivaceus*	Confirmed	S5B	no status	no status
Blue Jay	*Cyanocitta cristata*	Confirmed	S5	no status	no status
American Crow	*Corvus brachyrhynchos*	Confirmed	S5B	no status	no status
Common Raven	*Corvus corax*	Confirmed	S5	no status	no status
Horned Lark	*Eremophila alpestris*	Probable	S5B	no status	no status
Purple Martin	*Progne subis*	Confirmed	S3S4B	no status	no status
Tree Swallow	*Tachycineta bicolor*	Confirmed	S4B	no status	no status
Bank Swallow	*Riparia riparia*	Confirmed	S4B	THR	THR
Cliff Swallow	*Petrochelidon pyrrhonota*	Confirmed	S4B	no status	no status
Barn Swallow	*Hirundo rustica*	Confirmed	S4B	THR	THR
Black-capped Chickadee	*Poecile atricapilla*	Confirmed	S5	no status	no status
Red-breasted Nuthatch	*Sitta canadensis*	Probable	S5	no status	no status
White-breasted Nuthatch	*Sitta carolinensis*	Confirmed	S5	no status	no status
Brown Creeper	*Certhia familiaris*	Possible	S5B	no status	no status
House Wren	*Troglodytes aedon*	Confirmed	S5B	no status	no status

Common Name	Scientific Name	ABBO Category	SRANK	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status
Winter Wren	*Troglodytes troglodytes*	Probable	S5B	no status	no status
Marsh Wren	*Cistothorus palustris*	Probable	S4B	no status	no status
Golden-crowned Kinglet	*Regulus satrapa*	Possible	S5B	no status	no status
Eastern Bluebird	*Sialia sialis*	Confirmed	S5B	no status	no status
Veery	*Catharus fuscescens*	Probable	S4B	no status	no status
Swainson's Thrush	*Catharus ustulatus*	Confirmed	S4B	no status	no status
Hermit Thrush	*Catharus guttatus*	Probable	S5B	no status	no status
Wood Thrush	*Hylocichla mustelina*	Probable	S4B	SC	THR
American Robin	*Turdus migratorius*	Confirmed	S5B	no status	no status
Gray Catbird	*Dumetella carolinensis*	Confirmed	S4B	no status	no status
Brown Thrasher	*Toxostoma rufum*	Probable	S4B	no status	no status
European Starling	*Sturnus vulgaris*	Confirmed	SNA	no status	no status
Cedar Waxwing	*Bombycilla cedrorum*	Confirmed	S5B	no status	no status
Nashville Warbler	*Vermivora ruficapilla*	Confirmed	S5B	no status	no status
Yellow Warbler	*Dendroica petechia*	Confirmed	S5B	no status	no status
Chestnut-sided Warbler	*Dendroica pensylvanica*	Confirmed	S5B	no status	no status
Black-throated Blue Warbler	*Dendroica caerulescens*	Probable	S5B	no status	no status
Yellow-rumped Warbler	*Dendroica coronata*	Confirmed	S5B	no status	no status
Black-throated Green Warbler	*Dendroica virens*	Probable	S5B	no status	no status
Blackburnian Warbler	*Dendroica fusca*	Possible	S5B	no status	no status
Pine Warbler	*Dendroica pinus*	Probable	S5B	no status	no status
Black-and-white Warbler	*Mniotilta varia*	Probable	S5B	no status	no status
American Redstart	*Setophaga ruticilla*	Confirmed	S5B	no status	no status
Ovenbird	*Seiurus aurocapillus*	Confirmed	S4B	no status	no status
Northern Waterthrush	*Seiurus noveboracensis*	Possible	S5B	no status	no status
Mourning Warbler	*Oporornis philadelphia*	Probable	S4B	no status	no status
Common Yellowthroat	*Geothlypis trichas*	Confirmed	S5B	no status	no status
Canada Warbler	*Wilsonia canadensis*	Possible	S4B	SC	THR
Chipping Sparrow	*Spizella passerina*	Confirmed	S5B	no status	no status
Field Sparrow	*Spizella pusilla*	Probable	S4B	no status	no status
Vesper Sparrow	*Pooecetes gramineus*	Possible	S4B	no status	no status
Savannah Sparrow	*Passerculus sandwichensis*	Confirmed	S4B	no status	no status
Song Sparrow	*Melospiza melodia*	Confirmed	S5B	no status	no status
Swamp Sparrow	*Melospiza georgiana*	Confirmed	S5B	no status	no status
White-throated Sparrow	*Zonotrichia albicollis*	Confirmed	S5B	no status	no status
Dark-eyed Junco	*Junco hyemalis*	Possible	S5B	no status	no status
Scarlet Tanager	*Piranga olivacea*	Confirmed	S4B	no status	no status
Northern Cardinal	*Cardinalis cardinalis*	Confirmed	S5	no status	no status
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Confirmed	S4B	no status	no status
Indigo Bunting	*Passerina cyanea*	Probable	S4B	no status	no status
Bobolink	*Dolichonyx oryzivorus*	Confirmed	S4B	THR	THR

Common Name	Scientific Name	ABBO Category	SRANK	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status
Red-winged Blackbird	*Agelaius phoeniceus*	Confirmed	S4	no status	no status
Eastern Meadowlark	*Sturnella magna*	Confirmed	S4B	THR	THR
Common Grackle	*Quiscalus quiscula*	Confirmed	S5B	no status	no status
Brown-headed Cowbird	*Molothrus ater*	Confirmed	S4B	no status	no status
Baltimore Oriole	*Icterus galbula*	Confirmed	S4B	no status	no status
Purple Finch	*Carpodacus purpureus*	Probable	S4B	no status	no status
House Finch	*Carpodacus mexicanus*	Confirmed	SNA	no status	no status
Pine Siskin	*Carduelis pinus*	Possible	S4B	no status	no status
American Goldfinch	*Carduelis tristis*	Confirmed	S5B	no status	no status
House Sparrow	*Passer domesticus*	Confirmed	SNA	no status	no status

Status Updated March 25, 2021

SRANK DEFINITIONS

S4 Apparently Secure, Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 Secure, Common, widespread, and abundant in the nation or state/province.

SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#B Breeding

S#N Non-Breeding

SARO STATUS DEFINITIONS

THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

SARA STATUS DEFINITIONS

THR Threatened, a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

SC Special Concern, a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Species of Conservation Value

Common Name	Scientific Name	Preferred Habitat	SRank	ESA Reg. 230/08 SARO List Status	SARA Schedule 1 List of Wildlife SAR Status
INSECTS					
Monarch	*Danaus plexippus*	Old fields, meadows, roadsides confined to places were milkweed sp. grow.	S2N, S4B	SC	SC
Elusive Clubtail	*Stylurus notatus*	Occur along streams or shores of large lakes.	S2	none	none
REPTILES					
Snapping Turtle	*Chelydra serpentina*	Exclusively aquatic, except when females nest. Found in lakes, marshes, large rivers, large ponds, slow streams, with abundant vegetation, soft bottom substrate, and stagnant water.	S2N, S4B	SC	none
BIRDS					
Bald Eagle	*Haliaeetus leucocephalus*	Associated with large lakes and rivers. Frequently observed on dead branches overlooking water.	S3S4B	SC	SC
Red-necked Phalarope	*Phalaropus lobatus*		S3B	SC	none
Black Tern	*Chlidonias niger*	Breed in freshwater marshes.	S4B	SC	SC
Eastern Wood-Pewee	*Contopus virens*	Breed mostly in mature and intermediate-age deciduous and mixed forests having an open understory.	S4B	SC	THR
Wood Thrush	*Hylocichla mustelina*	Found in moist, deciduous hardwood or mixed stands, often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches.	S4B	SC	SC
Evening Grosbeak	*Coccothraustes vespertinus*		S1	none	none
PLANTS					
Large Purple-fringed Orchid	*Platanthera grandiflora*	Moist habitat, deciduous or coniferous forest and swamps, grassy meadows and ditches.	S2N, S4B	SC	SC

Status Updated March 25, 2021

SRANK DEFINITIONS

S1 Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

S2 Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3 Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 Apparently Secure, Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

S#B Breeding

S#N Non-Breeding

SARO STATUS DEFINITIONS

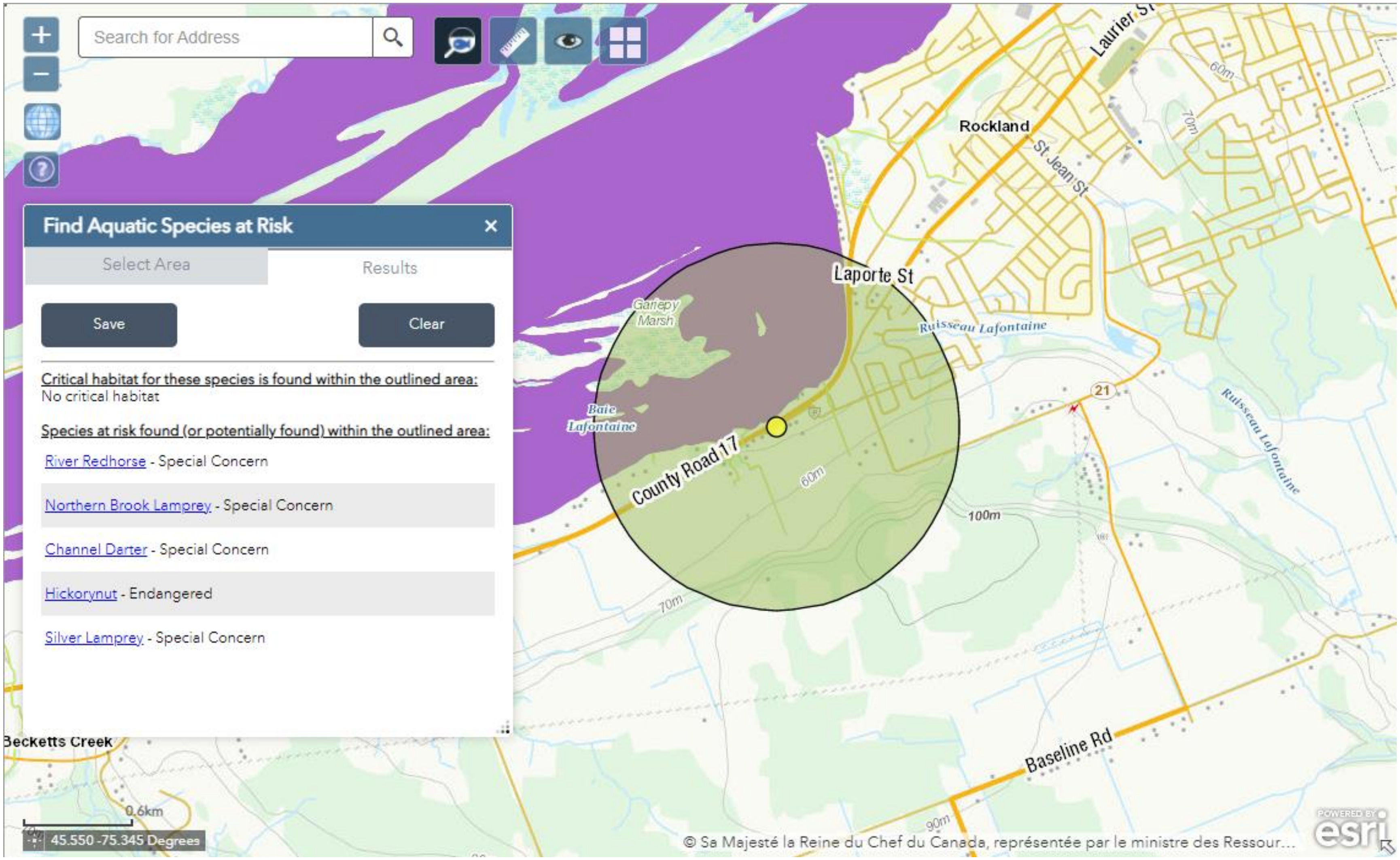
SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

SARA STATUS DEFINITIONS

THR Threatened, a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

SC Special Concern, a wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

DFO Aquatic Species at Risk Mapping



Appendix C

Turning Movement Counts

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Overcast
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	4	3	4	1	5	18	0	4	3	3	0	0	45
07:45	5	4	7	1	9	16	0	5	1	1	4	0	53
08:00	6	11	1	0	1	20	0	5	1	8	0	1	54
08:15	12	9	3	0	3	9	0	6	0	3	5	0	50
08:30	0	0	0	0	0	2	0	1	0	0	0	0	3

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	4	3	4	1	5	18	0	4	3	3	0	0	45
07:45	5	4	7	1	9	16	0	5	1	1	4	0	53
08:00	6	11	1	0	1	20	0	5	1	8	0	1	54
08:15	12	9	3	0	3	9	0	6	0	3	5	0	50
08:30	0	0	0	0	0	2	0	1	0	0	0	0	3

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	2	2	0	0	0	0	0	0	0	0	0	2
08:15	0	0	0	0	0	0	0	1	1	1	0	1	2
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	27	15	2	18	63	0	20	5	15	9	1	202
Factor	0.56	0.61	0.54	0.50	0.50	0.79	0.00	0.83	0.42	0.47	0.45	0.25	0.94
Approach Factor	0.72			0.80			0.89			0.69			

Peak Hour Vehicle Summary

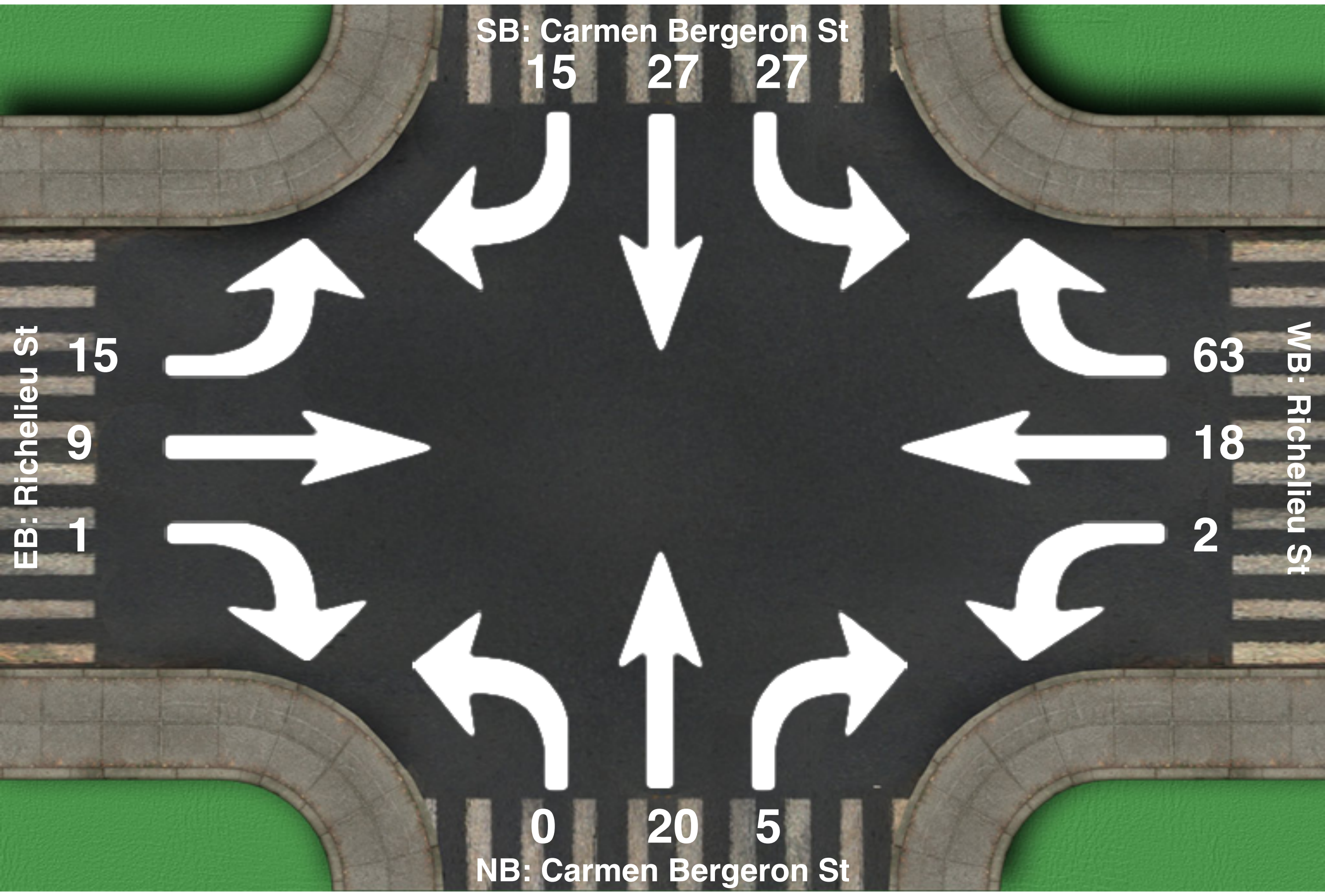
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	27	27	15	2	18	63	0	20	5	15	9	1	202
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	2	2	0	0	0	0	1	1	1	0	1	4

Intersection Peak Hour

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Overcast
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	27	15	2	18	63	0	20	5	15	9	1	202
Factor	0.56	0.61	0.54	0.50	0.50	0.79	0.00	0.83	0.42	0.47	0.45	0.25	0.94
Approach Factor	0.72			0.80			0.89			0.69			

Turn Count Summary

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Partly Cloudy
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	45	31	2	0	9	30	0	11	1	5	4	0	138
16:15	36	21	6	3	5	30	0	15	7	0	6	1	130
16:30	39	25	8	5	6	24	1	9	4	1	9	0	131
16:45	44	19	7	1	5	28	0	13	5	3	4	0	129
17:00	0	0	0	0	0	1	0	0	0	0	0	0	1

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	45	31	2	0	9	30	0	11	1	5	4	0	138
16:15	36	21	6	3	5	30	0	15	7	0	6	1	130
16:30	39	25	8	5	6	24	1	9	4	1	9	0	131
16:45	44	19	7	1	5	28	0	13	5	3	4	0	129
17:00	0	0	0	0	0	1	0	0	0	0	0	0	1

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	1	1	0	0	0	1
16:30	0	2	2	0	0	0	0	0	0	0	0	0	2
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	164	96	23	9	25	112	1	48	17	9	23	1	528
Factor	0.91	0.77	0.72	0.45	0.69	0.93	0.25	0.80	0.61	0.45	0.64	0.25	0.96
Approach Factor	0.91			0.94			0.75			0.82			

Peak Hour Vehicle Summary

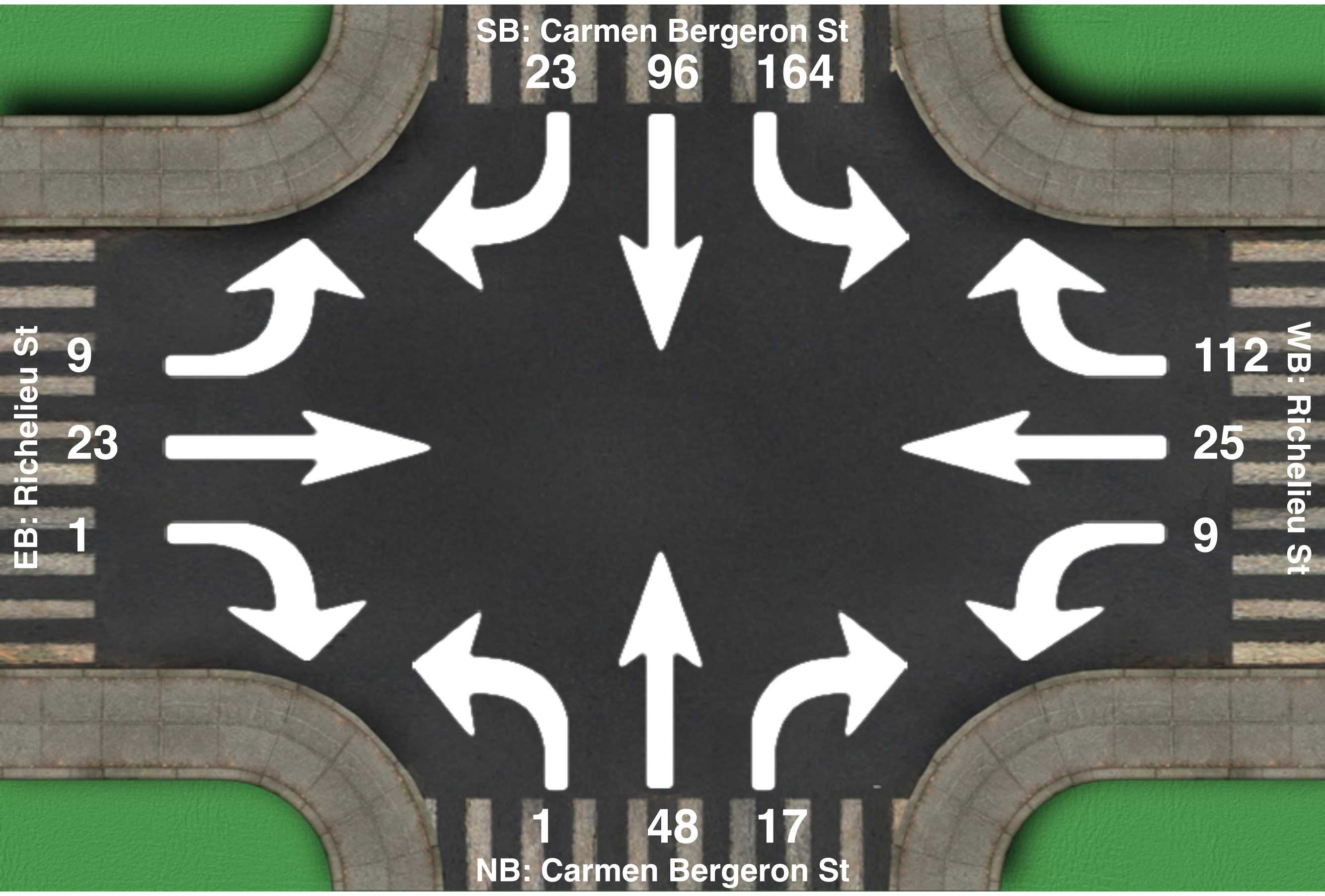
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	164	96	23	9	25	112	1	48	17	9	23	1	528
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	2	2	0	0	0	0	1	1	0	0	0	3

Intersection Peak Hour

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Partly Cloudy
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	164	96	23	9	25	112	1	48	17	9	23	1	528
Factor	0.91	0.77	0.72	0.45	0.69	0.93	0.25	0.80	0.61	0.45	0.64	0.25	0.96
Approach Factor	0.91			0.94			0.75			0.82			

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	2	7	8	3	5	1	23	5	0	4	4	1	63
07:45	4	5	7	1	9	4	7	11	1	9	2	5	65
08:00	3	6	6	4	6	4	9	15	0	5	0	5	63
08:15	1	11	12	1	5	3	8	12	2	13	1	5	74
08:30	0	0	0	0	0	0	0	0	1	0	0	0	1

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	2	7	8	3	5	1	23	5	0	4	4	1	63
07:45	4	5	7	1	9	4	7	11	1	9	2	5	65
08:00	3	6	6	4	6	4	9	15	0	5	0	5	63
08:15	1	11	12	1	5	3	8	12	2	13	1	5	74
08:30	0	0	0	0	0	0	0	0	1	0	0	0	1

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	2	1	3	0	0	0	3
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	1	1	1	0	1	0	0	0	0	0	0	2
08:15	0	2	2	0	0	0	0	1	1	4	0	4	7
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	10	29	33	9	25	12	47	43	3	31	7	16	265
Factor	0.62	0.66	0.69	0.56	0.69	0.75	0.51	0.72	0.38	0.60	0.44	0.80	0.90
Approach Factor	0.75			0.82			0.83			0.71			

Peak Hour Vehicle Summary

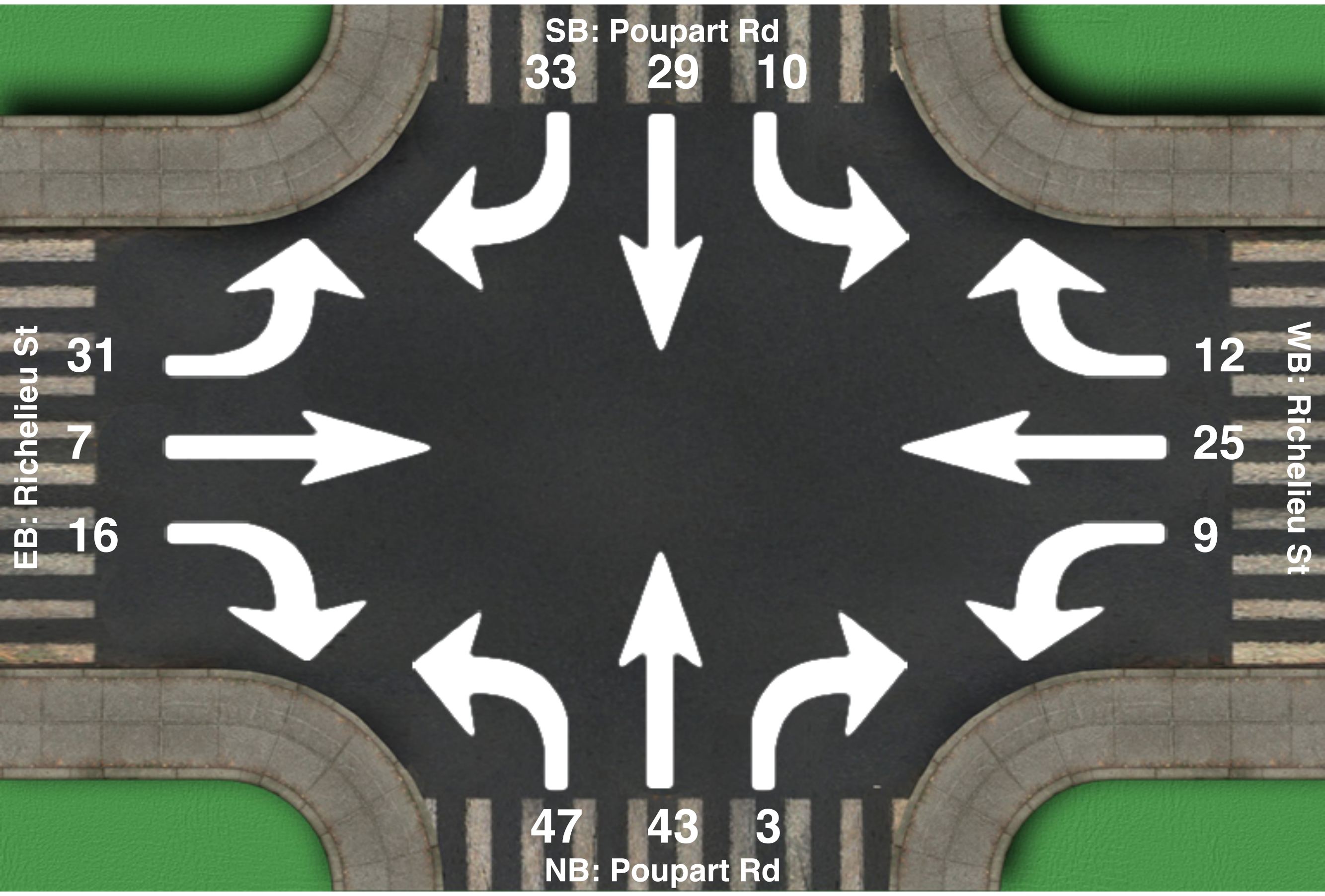
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	10	29	33	9	25	12	47	43	3	31	7	16	265

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	3	3	1	0	1	2	2	4	4	0	4	12

Intersection Peak Hour

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	10	29	33	9	25	12	47	43	3	31	7	16	265
Factor	0.62	0.66	0.69	0.56	0.69	0.75	0.51	0.72	0.38	0.60	0.44	0.80	0.90
Approach Factor	0.75			0.82			0.83			0.71			

Turn Count Summary

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	5	22	30	8	5	3	14	21	9	42	11	14	184
16:15	10	20	32	6	7	6	8	24	5	38	12	18	186
16:30	7	16	28	4	12	1	16	15	5	34	8	30	176
16:45	5	16	18	2	5	2	18	14	3	38	15	31	167
17:00	0	1	0	1	0	0	0	1	0	0	0	0	3

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	5	22	30	8	5	3	14	21	9	42	11	14	184
16:15	10	20	32	6	7	6	8	24	5	38	12	18	186
16:30	7	16	28	4	12	1	16	15	5	34	8	30	176
16:45	5	16	18	2	5	2	18	14	3	38	15	31	167
17:00	0	1	0	1	0	0	0	1	0	0	0	0	3

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	1	1	0	0	0	0	0	0	0	0	0	1
16:15	0	0	0	0	0	0	0	0	0	2	0	2	2
16:30	0	1	1	0	0	0	0	2	2	0	0	0	3
16:45	0	2	2	1	0	1	0	0	0	2	0	2	5
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	74	108	20	29	12	56	74	22	152	46	93	713
Factor	0.68	0.84	0.84	0.62	0.60	0.50	0.78	0.77	0.61	0.90	0.77	0.75	0.96
Approach Factor	0.84			0.80			0.86			0.87			

Peak Hour Vehicle Summary

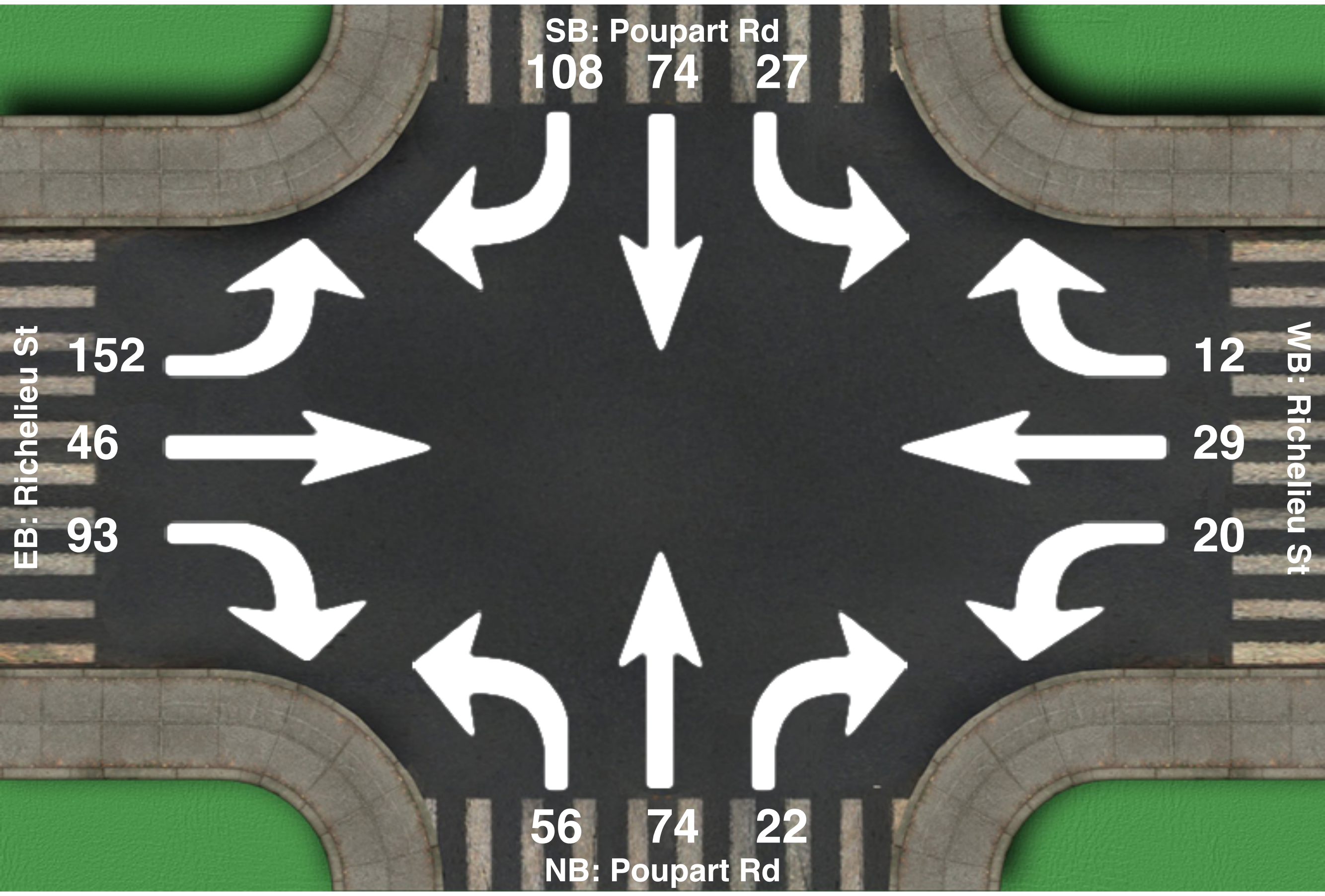
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	27	74	108	20	29	12	56	74	22	152	46	93	713

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	4	4	1	0	1	0	2	2	4	0	4	11

Intersection Peak Hour

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	74	108	20	29	12	56	74	22	152	46	93	713
Factor	0.68	0.84	0.84	0.62	0.60	0.50	0.78	0.77	0.61	0.90	0.77	0.75	0.96
Approach Factor	0.84			0.80			0.86			0.87			

Turn Count Summary

Location: Carmen Bergeron Street at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	7	199	0	25	0	3	0	89	6	329
07:45	0	0	0	9	172	0	30	0	12	0	113	9	345
08:00	0	0	0	12	148	0	15	0	6	0	113	10	304
08:15	0	0	0	17	186	0	24	0	9	0	102	12	350

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	7	199	0	25	0	3	0	89	6	329
07:45	0	0	0	9	172	0	30	0	12	0	113	9	345
08:00	0	0	0	12	148	0	15	0	6	0	113	10	304
08:15	0	0	0	17	186	0	24	0	9	0	102	12	350

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	45	705	0	94	0	30	0	417	37	1328
Factor	0.00	0.00	0.00	0.66	0.89	0.00	0.78	0.00	0.62	0.00	0.92	0.77	0.95
Approach Factor	0.00			0.91			0.74			0.92			

Peak Hour Vehicle Summary

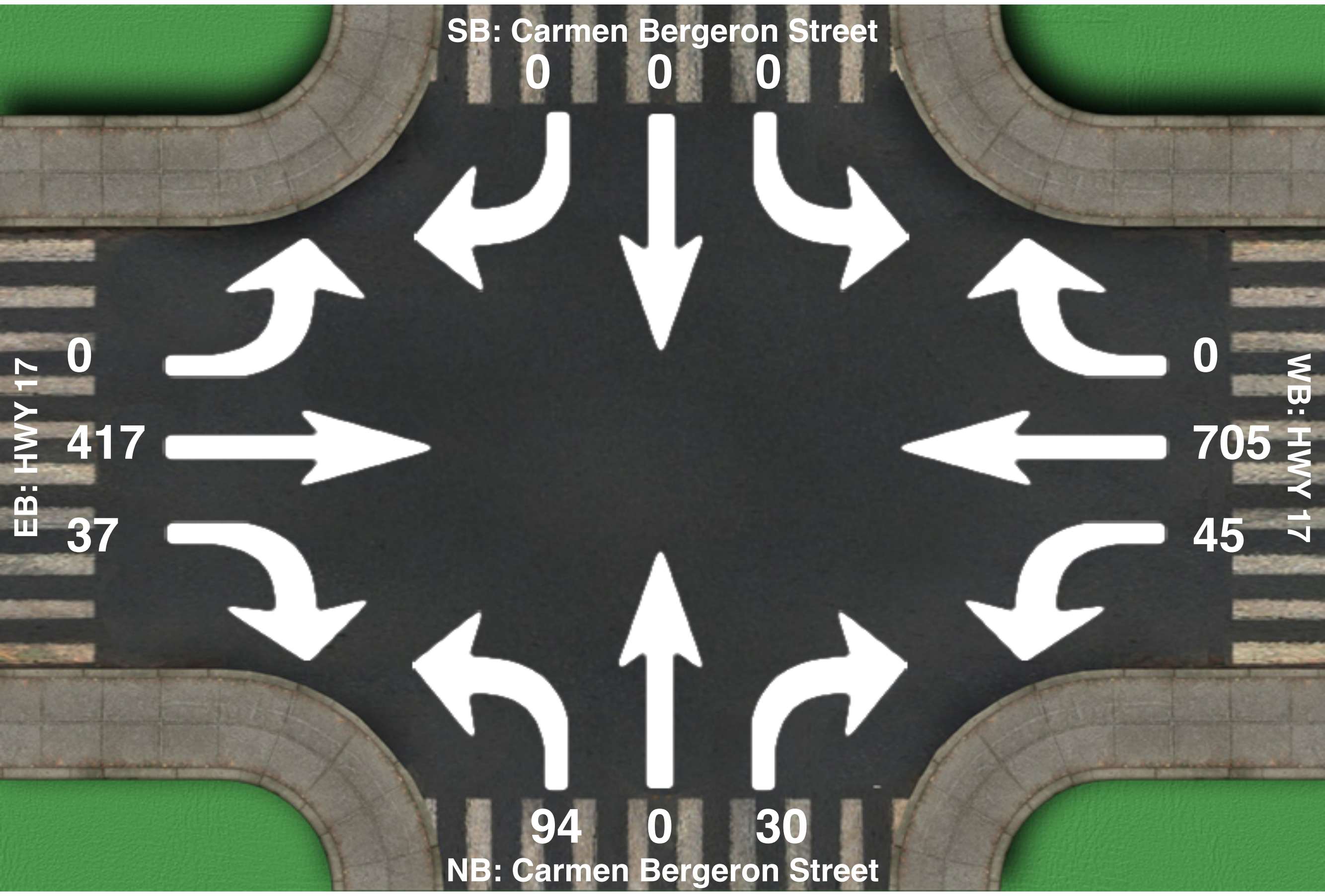
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	0	0	0	45	705	0	94	0	30	0	417	37	1328

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Carmen Bergeron Street at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	45	705	0	94	0	30	0	417	37	1328
Factor	0.00	0.00	0.00	0.66	0.89	0.00	0.78	0.00	0.62	0.00	0.92	0.77	0.95
Approach Factor	0.00			0.91			0.74			0.92			

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Carmen Bergeron St at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Partly Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	21	156	0	24	0	26	0	235	34	496
16:15	0	0	0	25	139	0	17	0	25	0	239	44	489
16:30	0	0	0	30	147	0	17	0	29	0	273	49	545
16:45	0	0	0	28	153	0	15	0	25	0	224	58	503
17:00	0	0	0	0	0	0	0	0	0	0	2	0	2

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	21	156	0	24	0	26	0	235	34	496
16:15	0	0	0	25	139	0	17	0	25	0	239	44	489
16:30	0	0	0	30	147	0	17	0	29	0	273	49	545
16:45	0	0	0	28	153	0	15	0	25	0	224	58	503
17:00	0	0	0	0	0	0	0	0	0	0	2	0	2

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	1	1	0	0	0	1
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	104	595	0	73	0	105	0	971	185	2033
Factor	0.00	0.00	0.00	0.87	0.95	0.00	0.76	0.00	0.91	0.00	0.89	0.80	0.93
Approach Factor	0.00			0.97			0.89			0.90			

Peak Hour Vehicle Summary

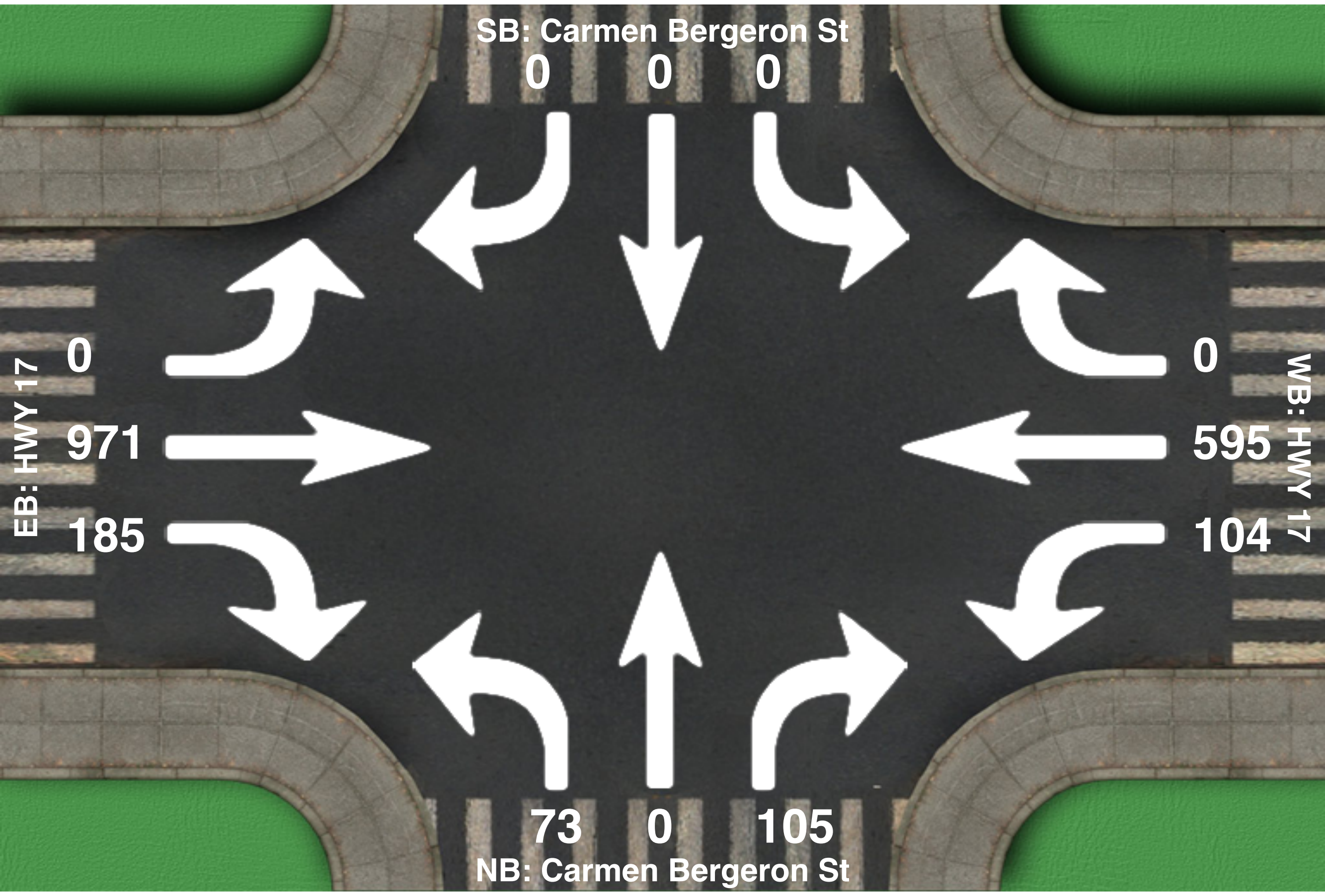
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	0	0	0	104	595	0	73	0	105	0	971	185	2033

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	1	1	0	0	0	1

Intersection Peak Hour

Location: Carmen Bergeron St at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Partly Sunny
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	104	595	0	73	0	105	0	971	185	2033
Factor	0.00	0.00	0.00	0.87	0.95	0.00	0.76	0.00	0.91	0.00	0.89	0.80	0.93
Approach Factor	0.00			0.97			0.89			0.90			

Appendix D

Detailed Synchro Output Data

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	417	37	45	705	94	30
Future Volume (vph)	417	37	45	705	94	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	463	41	50	783	104	33
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	30.2	30.2	32.7	36.5	11.3	11.3
Actuated g/C Ratio	0.58	0.58	0.62	0.70	0.22	0.22
v/c Ratio	0.50	0.05	0.10	0.70	0.32	0.10
Control Delay	14.5	4.0	4.9	12.1	27.5	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.5	4.0	4.9	12.1	27.5	11.5
LOS	B	A	A	B	C	B
Approach Delay	13.6			11.6	23.6	
Approach LOS	B			B	C	
Queue Length 50th (m)	39.6	0.0	1.7	50.9	9.6	0.0
Queue Length 95th (m)	79.8	4.7	5.8	118.7	31.0	7.6
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	1375	1174	738	1545	743	682
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.03	0.07	0.51	0.14	0.05

Intersection Summary

Cycle Length: 103
Actuated Cycle Length: 52.4
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 13.4 Intersection LOS: B
Intersection Capacity Utilization 58.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Carmen Bergeron & HWY 17/HW 17

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	9	1	2	18	63	0	20	5	27	27	15
Future Volume (vph)	15	9	1	2	18	63	0	20	5	27	27	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	11	0	2	90	0	0	28	0	0	60	17
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 24.3%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	15	9	1	2	18	63	0	20	5	27	27	15
Future Volume (vph)	15	9	1	2	18	63	0	20	5	27	27	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	17	10	1	2	20	70	0	22	6	30	30	17

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	17	11	2	90	0	28	60	17
Volume Left (vph)	17	0	2	0	0	0	30	0
Volume Right (vph)	0	1	0	70	0	6	0	17
Hadj (s)	0.53	-0.03	0.53	-0.51	0.00	-0.12	0.28	-0.67
Departure Headway (s)	5.4	4.8	5.3	4.3	4.8	4.7	5.1	4.1
Degree Utilization, x	0.03	0.01	0.00	0.11	0.00	0.04	0.08	0.02
Capacity (veh/h)	655	724	652	815	738	735	683	840
Control Delay (s)	7.3	6.7	7.1	6.6	6.6	6.7	7.3	6.0
Approach Delay (s)	7.1		6.6		6.7		7.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.8		
Level of Service	A		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	7	16	9	25	12	47	43	3	10	29	33
Future Volume (vph)	31	7	16	9	25	12	47	43	3	10	29	33
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	26	0	0	51	0	0	103	0	0	80	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 28.7%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	31	7	16	9	25	12	47	43	3	10	29	33
Future Volume (vph)	31	7	16	9	25	12	47	43	3	10	29	33
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	34	8	18	10	28	13	52	48	3	11	32	37

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	34	26	51	103	80
Volume Left (vph)	34	0	10	52	11
Volume Right (vph)	0	18	13	3	37
Hadj (s)	0.53	-0.45	-0.08	0.12	-0.22
Departure Headway (s)	5.5	4.5	4.4	4.4	4.1
Degree Utilization, x	0.05	0.03	0.06	0.12	0.09
Capacity (veh/h)	622	760	770	796	855
Control Delay (s)	7.6	6.5	7.7	8.0	7.5
Approach Delay (s)	7.1		7.7	8.0	7.5
Approach LOS	A		A	A	A

Intersection Summary			
Delay	7.6		
Level of Service	A		
Intersection Capacity Utilization	28.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	2	14	19	3	54	17
Future Volume (vph)	2	14	19	3	54	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	0	24	79	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 18.1%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	14	19	3	54	17
Future Volume (Veh/h)	2	14	19	3	54	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2	16	21	3	60	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	114	70	79			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	114	70	79			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	99			
cM capacity (veh/h)	870	993	1519			
Direction, Lane #	**EB 1**	**NB 1**	**SB 1**			
Volume Total	18	24	79			
Volume Left	2	21	0			
Volume Right	16	0	19			
cSH	978	1519	1700			
Volume to Capacity	0.02	0.01	0.05			
Queue Length 95th (m)	0.4	0.3	0.0			
Control Delay (s)	8.8	6.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.8	6.5	0.0			
Approach LOS	A					

Intersection Summary			
Average Delay	2.6		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	971	185	104	595	73	105
Future Volume (vph)	971	185	104	595	73	105
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1079	206	116	661	81	117
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	50.0	50.0	64.6	64.6	9.9	9.9
Actuated g/C Ratio	0.58	0.58	0.75	0.75	0.12	0.12
v/c Ratio	1.16	0.24	0.52	0.55	0.46	0.45
Control Delay	105.4	4.5	19.7	7.0	44.8	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	105.4	4.5	19.7	7.0	44.8	13.1
LOS	F	A	B	A	D	B
Approach Delay	89.2			8.9	26.1	
Approach LOS	F			A	C	
Queue Length 50th (m)	~217.5	4.3	4.5	38.1	13.1	0.0
Queue Length 95th (m)	#344.8	17.4	23.2	76.6	28.6	15.2
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	930	850	328	1323	369	418
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.16	0.24	0.35	0.50	0.22	0.28

Intersection Summary

Cycle Length: 103
Actuated Cycle Length: 86
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.16
Intersection Signal Delay: 56.1 Intersection LOS: E
Intersection Capacity Utilization 84.8% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & HWY 17/HW 17

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	23	1	9	25	112	1	48	17	164	96	23
Future Volume (vph)	9	23	1	9	25	112	1	48	17	164	96	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	27	0	10	152	0	1	72	0	0	289	26
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 39.1%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	9	23	1	9	25	112	1	48	17	164	96	23
Future Volume (vph)	9	23	1	9	25	112	1	48	17	164	96	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	10	26	1	10	28	124	1	53	19	182	107	26

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	10	27	10	152	1	72	289	26
Volume Left (vph)	10	0	10	0	1	0	182	0
Volume Right (vph)	0	1	0	124	0	19	0	26
Hadj (s)	0.53	0.01	0.53	-0.54	0.53	-0.15	0.35	-0.67
Departure Headway (s)	6.2	5.7	6.1	5.0	5.9	5.2	5.4	4.4
Degree Utilization, x	0.02	0.04	0.02	0.21	0.00	0.10	0.44	0.03
Capacity (veh/h)	537	587	555	675	585	661	643	780
Control Delay (s)	8.1	7.7	8.0	8.1	7.7	7.6	11.4	6.4
Approach Delay (s)	7.8		8.1		7.6		10.9	
Approach LOS	A		A		A		B	

Intersection Summary			
Delay	9.6		
Level of Service	A		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	46	93	20	29	12	56	74	22	27	74	108
Future Volume (vph)	152	46	93	20	29	12	56	74	22	27	74	108
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	169	154	0	0	67	0	0	168	0	0	232	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 44.9%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	152	46	93	20	29	12	56	74	22	27	74	108
Future Volume (vph)	152	46	93	20	29	12	56	74	22	27	74	108
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	169	51	103	22	32	13	62	82	24	30	82	120

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	169	154	67	168	232
Volume Left (vph)	169	0	22	62	30
Volume Right (vph)	0	103	13	24	120
Hadj (s)	0.53	-0.43	-0.02	0.02	-0.25
Departure Headway (s)	6.2	5.2	5.5	5.3	4.9
Degree Utilization, x	0.29	0.22	0.10	0.25	0.32
Capacity (veh/h)	553	655	585	636	684
Control Delay (s)	10.5	8.5	9.2	10.0	10.2
Approach Delay (s)	9.5		9.2	10.0	10.2
Approach LOS	A		A	B	B

Intersection Summary			
Delay	9.8		
Level of Service	A		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	36	34	43	152	187	12
Future Volume (vph)	36	34	43	152	187	12
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	78	0	0	217	221	0
Sign Control	Stop			Free	Free	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 38.8%	ICU Level of Service A
Analysis Period (min) 15	

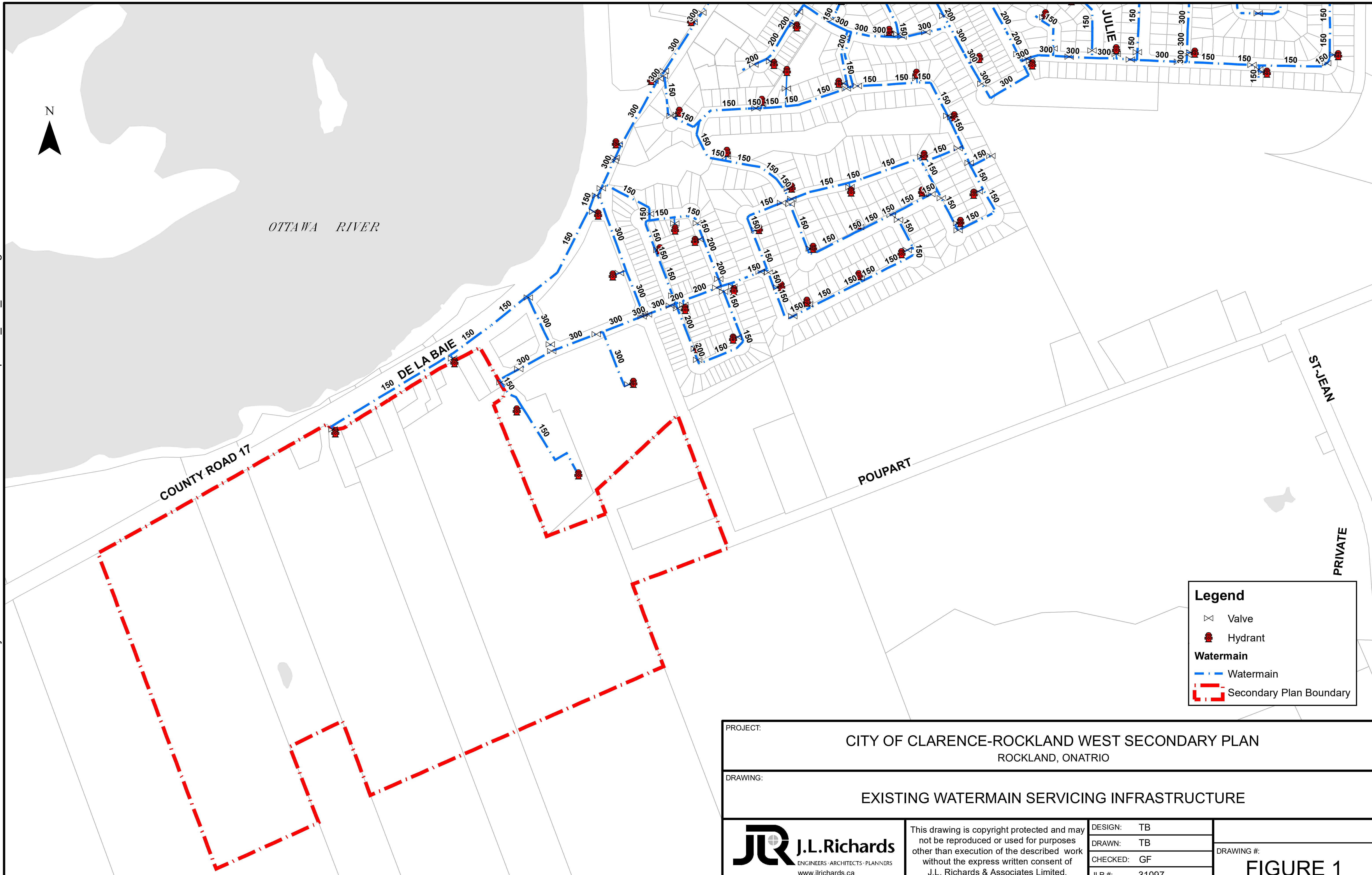
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	36	34	43	152	187	12
Future Volume (Veh/h)	36	34	43	152	187	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	40	38	48	169	208	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	480	214	221			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	480	214	221			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	95	96			
cM capacity (veh/h)	526	825	1348			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	78	217	221
Volume Left	40	48	0
Volume Right	38	0	13
cSH	639	1348	1700
Volume to Capacity	0.12	0.04	0.13
Queue Length 95th (m)	3.3	0.9	0.0
Control Delay (s)	11.4	2.0	0.0
Lane LOS	B	A	
Approach Delay (s)	11.4	2.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E

Existing Watermain, Sanitary, and Storm Servicing



PROJECT:

CITY OF CLARENCE-ROCKLAND WEST SECONDARY PLAN

ROCKLAND, ONATRIO

DRAWING:

EXISTING WATERMAIN SERVICING INFRASTRUCTURE

J.L.Richards
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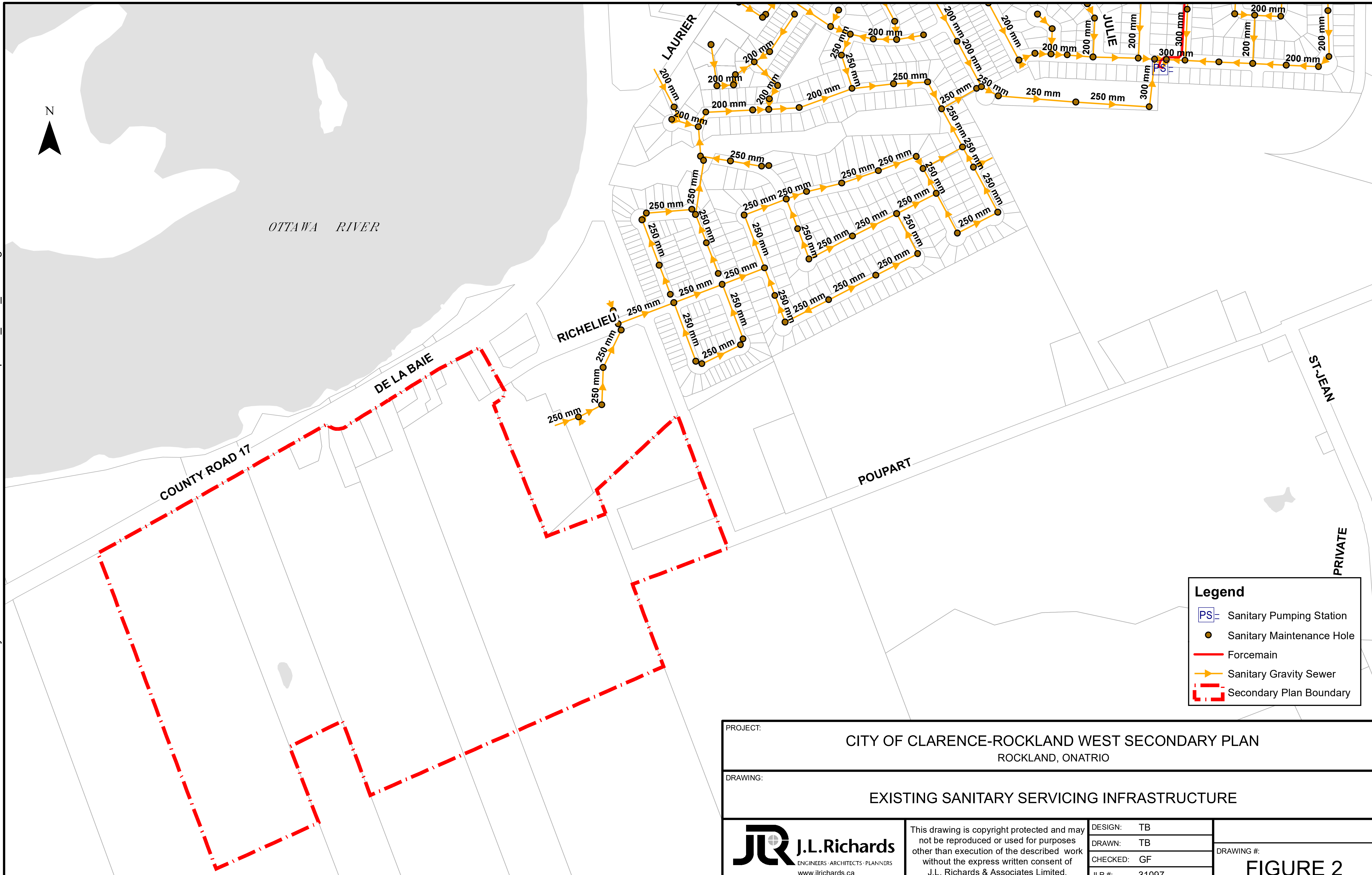
DESIGN:	TB
DRAWN:	TB
CHECKED:	GF
JLR #:	31097

DRAWING #:

FIGURE 1

File Location: P:\31000\31097-000 - Secondary Plan - Rockland West\6-Production\2-Plan\31097 Option1_WM_servicing.mxd

Plot Date: March 17, 2023 2:45:06 PM



PROJECT:

CITY OF CLARENCE-ROCKLAND WEST SECONDARY PLAN

ROCKLAND, ONATRIO

DRAWING:

EXISTING SANITARY SERVICING INFRASTRUCTURE

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DESIGN:	TB
DRAWN:	TB
CHECKED:	GF
JLR #:	31097

DRAWING #: FIGURE 2

File Location: P:\31000\31097-000 - Secondary Plan - Rockland West\6-Production\2-Plan\31097 Option1_SAN_servicing.mxd

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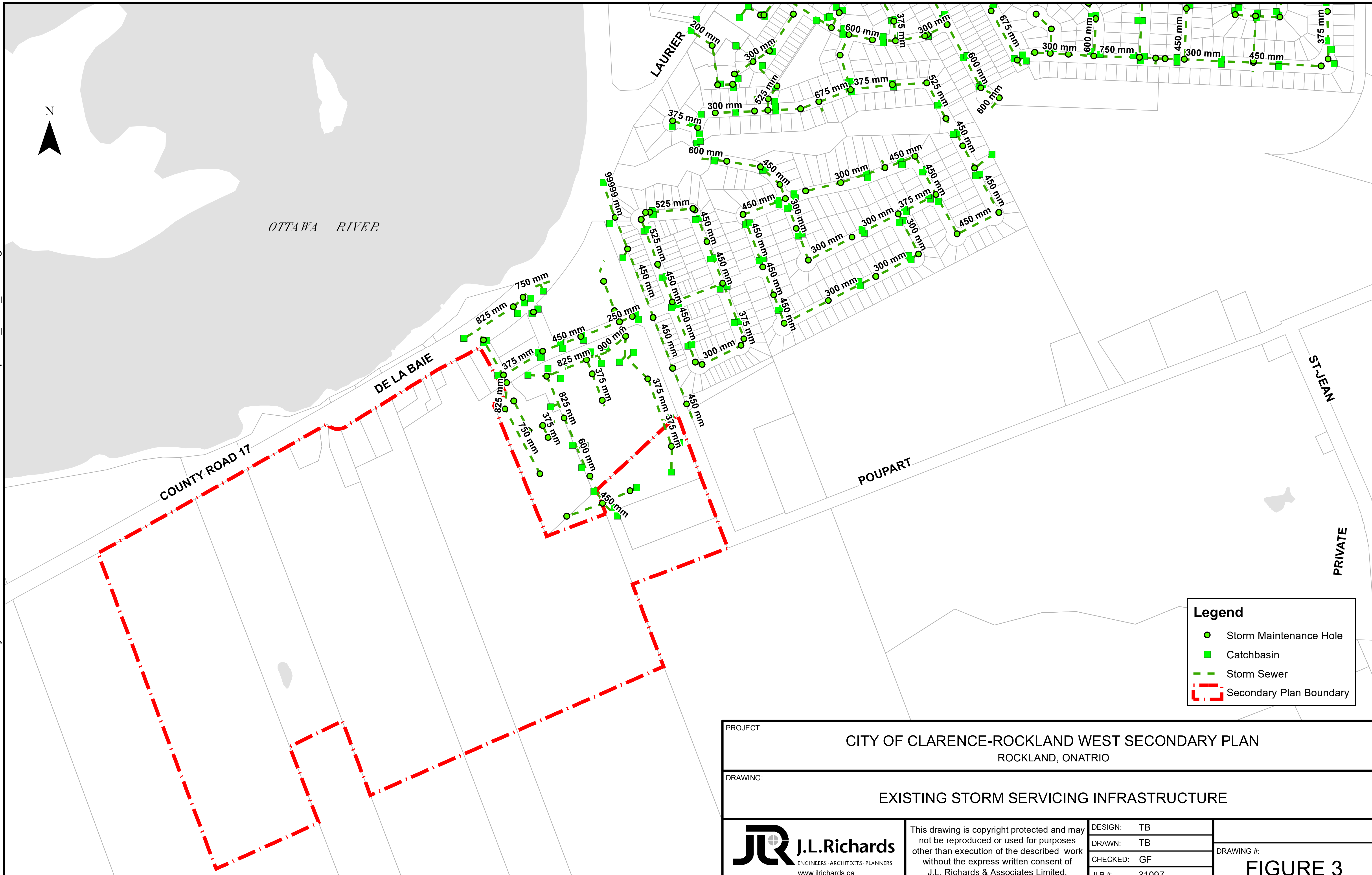

PROJECT:

CITY OF CLARENCE-ROCKLAND WEST SECONDARY PLAN

ROCKLAND, ONATRIO

DRAWING:

EXISTING STORM SERVICING INFRASTRUCTURE

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DESIGN:	TB
DRAWN:	TB
CHECKED:	GF
JLR #:	31097

DRAWING #:

FIGURE 3

Plot Date: March 17, 2023 2:44:53 PM

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Appendix B

Detailed Turning Movement Counts June 15th and June 23rd, 2021

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Overcast
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	4	3	4	1	5	18	0	4	3	3	0	0	45
07:45	5	4	7	1	9	16	0	5	1	1	4	0	53
08:00	6	11	1	0	1	20	0	5	1	8	0	1	54
08:15	12	9	3	0	3	9	0	6	0	3	5	0	50
08:30	0	0	0	0	0	2	0	1	0	0	0	0	3

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	4	3	4	1	5	18	0	4	3	3	0	0	45
07:45	5	4	7	1	9	16	0	5	1	1	4	0	53
08:00	6	11	1	0	1	20	0	5	1	8	0	1	54
08:15	12	9	3	0	3	9	0	6	0	3	5	0	50
08:30	0	0	0	0	0	2	0	1	0	0	0	0	3

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	2	2	0	0	0	0	0	0	0	0	0	2
08:15	0	0	0	0	0	0	0	1	1	1	0	1	2
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	27	15	2	18	63	0	20	5	15	9	1	202
Factor	0.56	0.61	0.54	0.50	0.50	0.79	0.00	0.83	0.42	0.47	0.45	0.25	0.94
Approach Factor	0.72			0.80			0.89			0.69			

Peak Hour Vehicle Summary

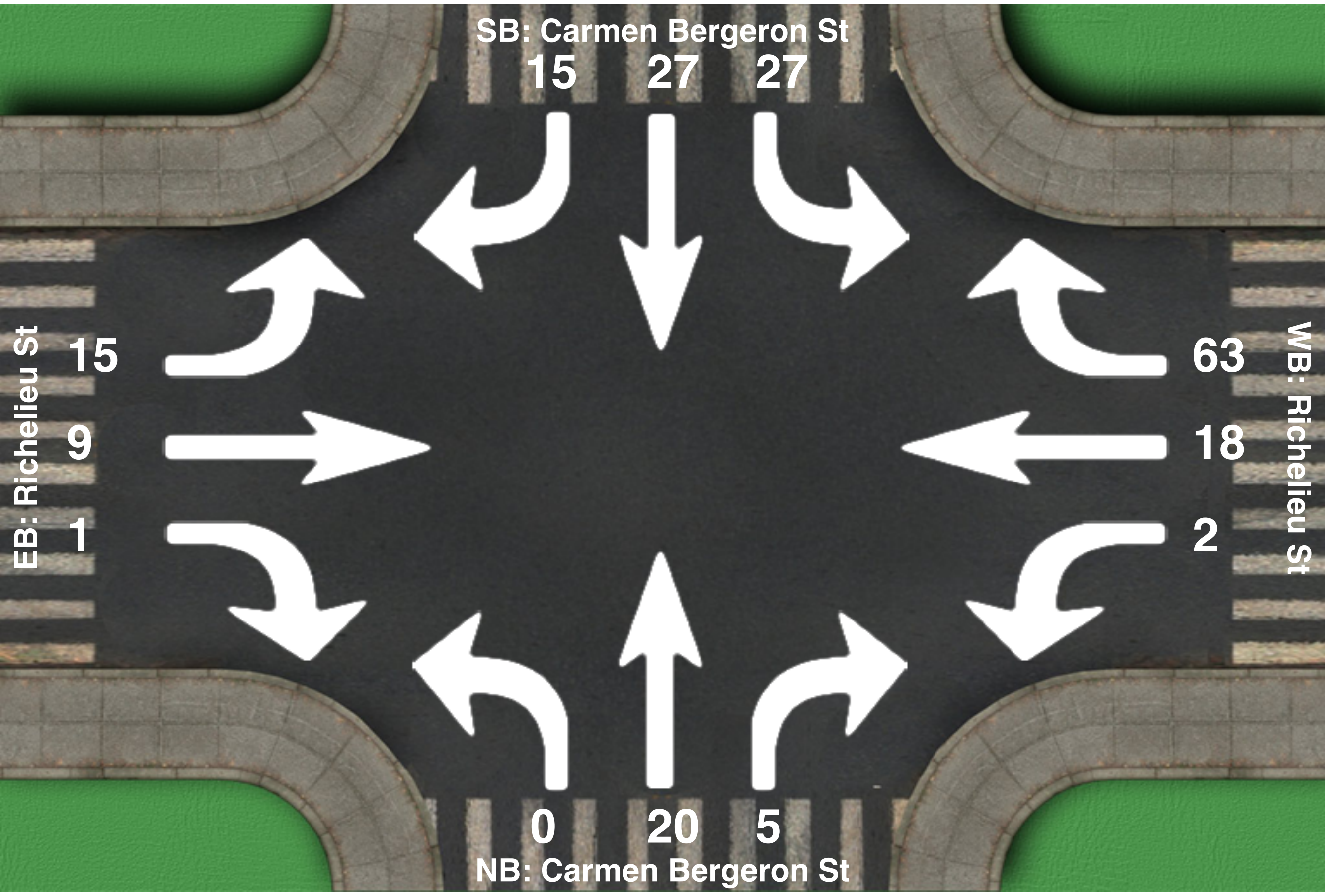
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	27	27	15	2	18	63	0	20	5	15	9	1	202
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	2	2	0	0	0	0	1	1	1	0	1	4

Intersection Peak Hour

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Overcast
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	27	15	2	18	63	0	20	5	15	9	1	202
Factor	0.56	0.61	0.54	0.50	0.50	0.79	0.00	0.83	0.42	0.47	0.45	0.25	0.94
Approach Factor	0.72			0.80			0.89			0.69			

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Partly Cloudy
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	45	31	2	0	9	30	0	11	1	5	4	0	138
16:15	36	21	6	3	5	30	0	15	7	0	6	1	130
16:30	39	25	8	5	6	24	1	9	4	1	9	0	131
16:45	44	19	7	1	5	28	0	13	5	3	4	0	129
17:00	0	0	0	0	0	1	0	0	0	0	0	0	1

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	45	31	2	0	9	30	0	11	1	5	4	0	138
16:15	36	21	6	3	5	30	0	15	7	0	6	1	130
16:30	39	25	8	5	6	24	1	9	4	1	9	0	131
16:45	44	19	7	1	5	28	0	13	5	3	4	0	129
17:00	0	0	0	0	0	1	0	0	0	0	0	0	1

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	1	1	0	0	0	1
16:30	0	2	2	0	0	0	0	0	0	0	0	0	2
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	164	96	23	9	25	112	1	48	17	9	23	1	528
Factor	0.91	0.77	0.72	0.45	0.69	0.93	0.25	0.80	0.61	0.45	0.64	0.25	0.96
Approach Factor	0.91			0.94			0.75			0.82			

Peak Hour Vehicle Summary

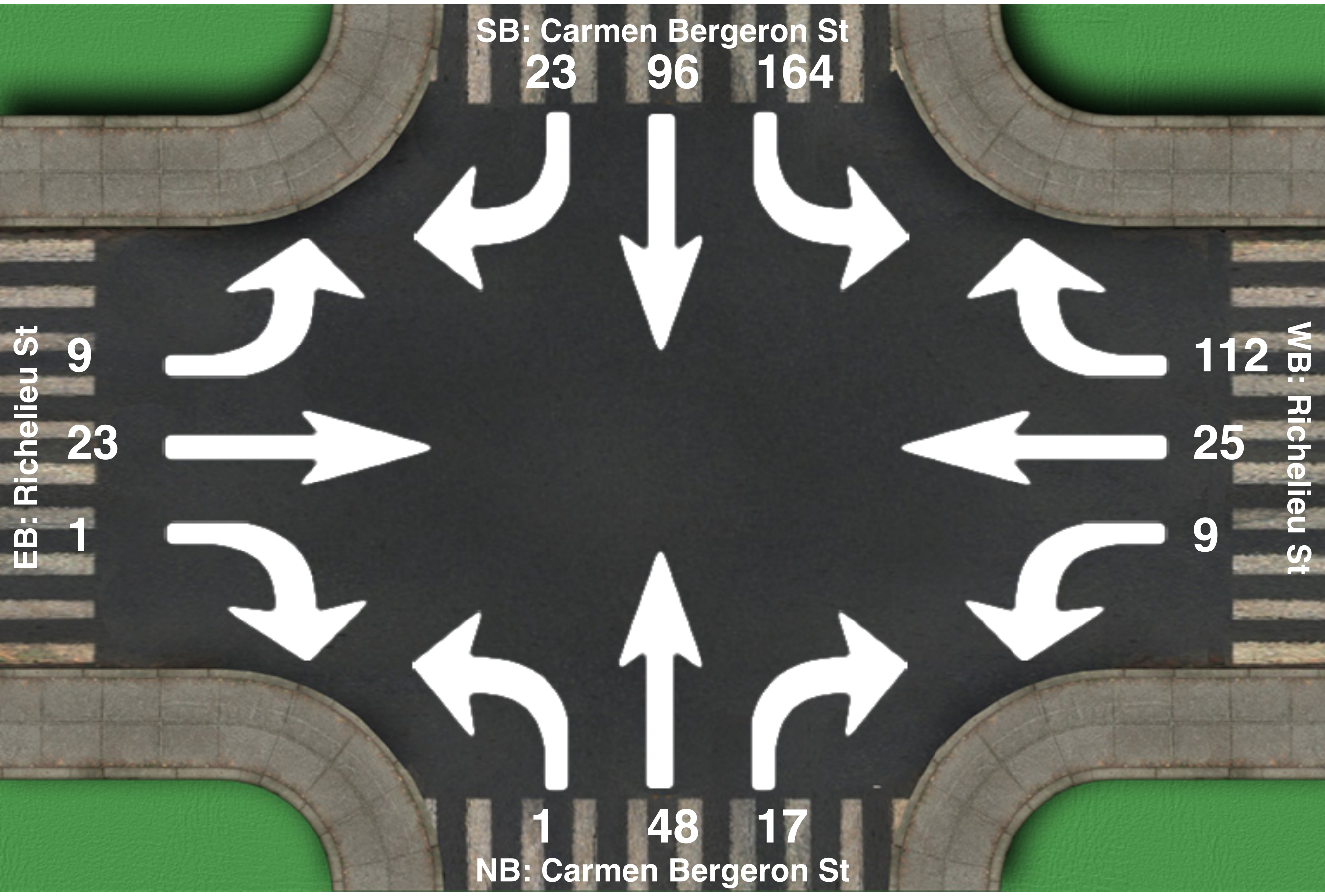
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	164	96	23	9	25	112	1	48	17	9	23	1	528
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	2	2	0	0	0	0	1	1	0	0	0	3

Intersection Peak Hour

Location: Carmen Bergeron St at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-15
Day of week: Tuesday
Weather: Partly Cloudy
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	164	96	23	9	25	112	1	48	17	9	23	1	528
Factor	0.91	0.77	0.72	0.45	0.69	0.93	0.25	0.80	0.61	0.45	0.64	0.25	0.96
Approach Factor	0.91			0.94			0.75			0.82			

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	2	7	8	3	5	1	23	5	0	4	4	1	63
07:45	4	5	7	1	9	4	7	11	1	9	2	5	65
08:00	3	6	6	4	6	4	9	15	0	5	0	5	63
08:15	1	11	12	1	5	3	8	12	2	13	1	5	74
08:30	0	0	0	0	0	0	0	0	1	0	0	0	1

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	2	7	8	3	5	1	23	5	0	4	4	1	63
07:45	4	5	7	1	9	4	7	11	1	9	2	5	65
08:00	3	6	6	4	6	4	9	15	0	5	0	5	63
08:15	1	11	12	1	5	3	8	12	2	13	1	5	74
08:30	0	0	0	0	0	0	0	0	1	0	0	0	1

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	2	1	3	0	0	0	3
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	1	1	1	0	1	0	0	0	0	0	0	2
08:15	0	2	2	0	0	0	0	1	1	4	0	4	7
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	10	29	33	9	25	12	47	43	3	31	7	16	265
Factor	0.62	0.66	0.69	0.56	0.69	0.75	0.51	0.72	0.38	0.60	0.44	0.80	0.90
Approach Factor	0.75			0.82			0.83			0.71			

Peak Hour Vehicle Summary

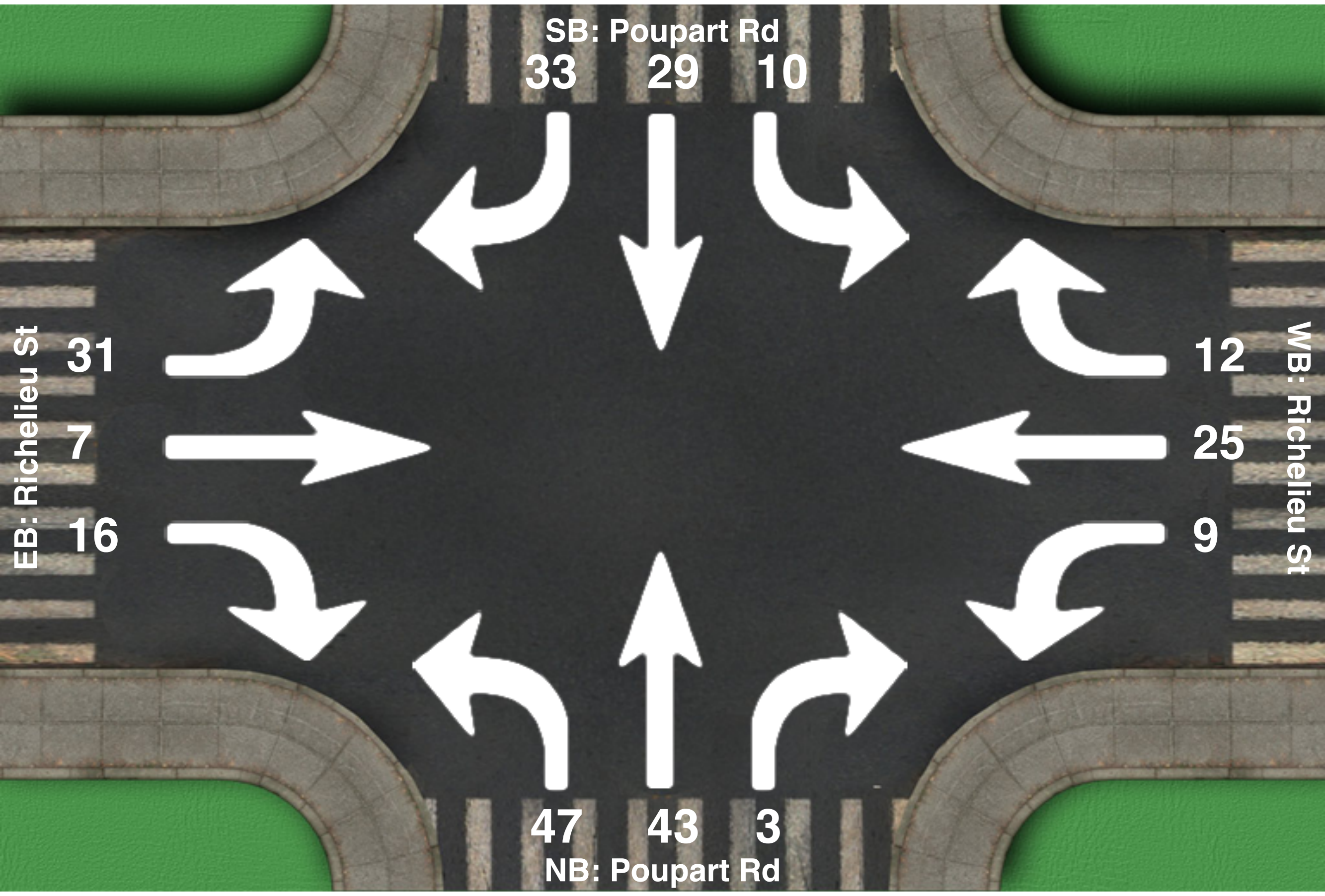
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	10	29	33	9	25	12	47	43	3	31	7	16	265

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	3	3	1	0	1	2	2	4	4	0	4	12

Intersection Peak Hour

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	10	29	33	9	25	12	47	43	3	31	7	16	265
Factor	0.62	0.66	0.69	0.56	0.69	0.75	0.51	0.72	0.38	0.60	0.44	0.80	0.90
Approach Factor	0.75			0.82			0.83			0.71			

J.L. Richards

Ottawa, Ontario,

Turn Count Summary

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	5	22	30	8	5	3	14	21	9	42	11	14	184
16:15	10	20	32	6	7	6	8	24	5	38	12	18	186
16:30	7	16	28	4	12	1	16	15	5	34	8	30	176
16:45	5	16	18	2	5	2	18	14	3	38	15	31	167
17:00	0	1	0	1	0	0	0	1	0	0	0	0	3

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	5	22	30	8	5	3	14	21	9	42	11	14	184
16:15	10	20	32	6	7	6	8	24	5	38	12	18	186
16:30	7	16	28	4	12	1	16	15	5	34	8	30	176
16:45	5	16	18	2	5	2	18	14	3	38	15	31	167
17:00	0	1	0	1	0	0	0	1	0	0	0	0	3

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	1	1	0	0	0	0	0	0	0	0	0	1
16:15	0	0	0	0	0	0	0	0	0	2	0	2	2
16:30	0	1	1	0	0	0	0	2	2	0	0	0	3
16:45	0	2	2	1	0	1	0	0	0	2	0	2	5
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	74	108	20	29	12	56	74	22	152	46	93	713
Factor	0.68	0.84	0.84	0.62	0.60	0.50	0.78	0.77	0.61	0.90	0.77	0.75	0.96
Approach Factor	0.84			0.80			0.86			0.87			

Peak Hour Vehicle Summary

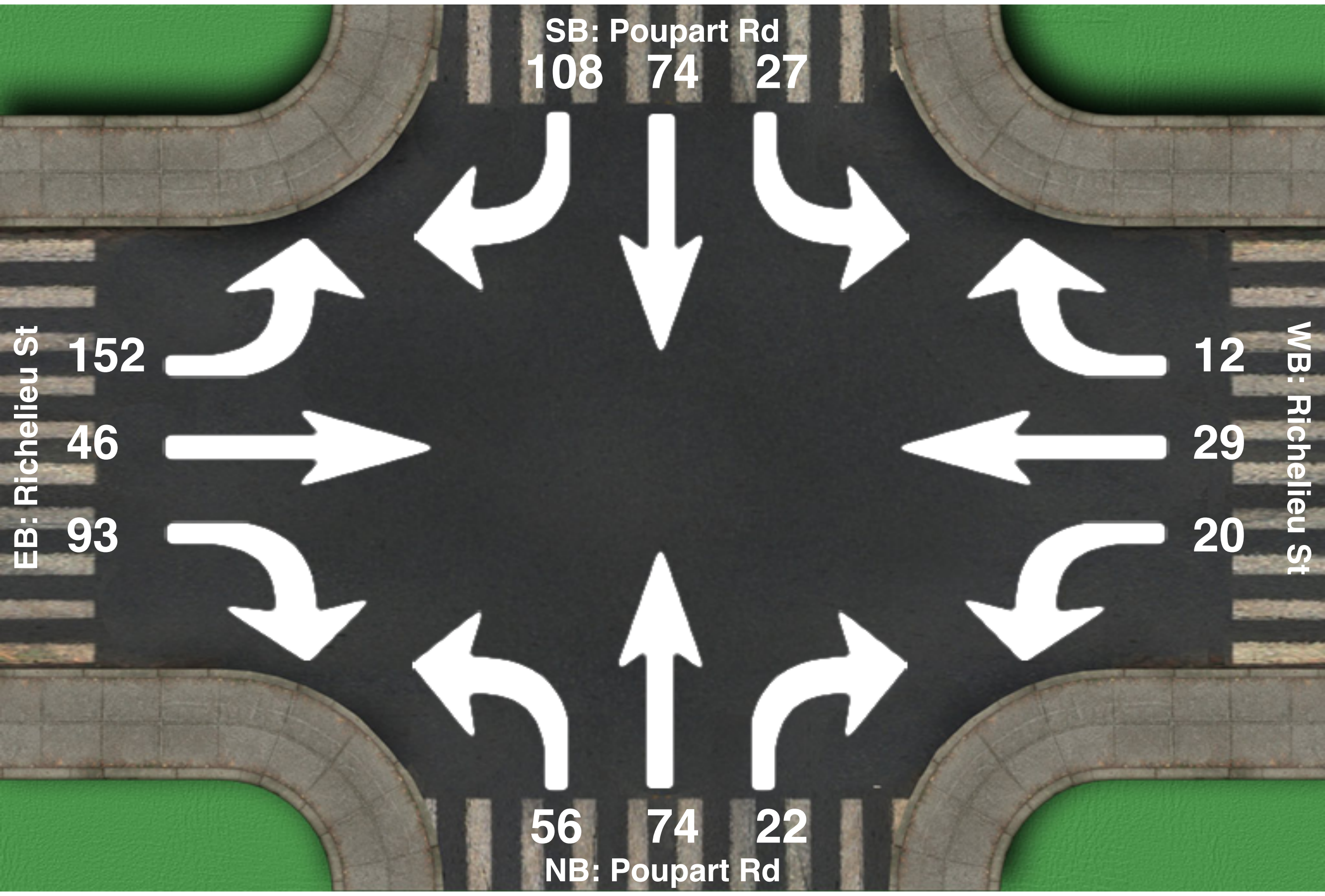
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	27	74	108	20	29	12	56	74	22	152	46	93	713

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	4	4	1	0	1	0	2	2	4	0	4	11

Intersection Peak Hour

Location: Poupart Rd at Richelieu St, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-16
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	27	74	108	20	29	12	56	74	22	152	46	93	713
Factor	0.68	0.84	0.84	0.62	0.60	0.50	0.78	0.77	0.61	0.90	0.77	0.75	0.96
Approach Factor	0.84			0.80			0.86			0.87			

Turn Count Summary

Location: Carmen Bergeron Street at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	7	199	0	25	0	3	0	89	6	329
07:45	0	0	0	9	172	0	30	0	12	0	113	9	345
08:00	0	0	0	12	148	0	15	0	6	0	113	10	304
08:15	0	0	0	17	186	0	24	0	9	0	102	12	350

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	0	0	7	199	0	25	0	3	0	89	6	329
07:45	0	0	0	9	172	0	30	0	12	0	113	9	345
08:00	0	0	0	12	148	0	15	0	6	0	113	10	304
08:15	0	0	0	17	186	0	24	0	9	0	102	12	350

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	45	705	0	94	0	30	0	417	37	1328
Factor	0.00	0.00	0.00	0.66	0.89	0.00	0.78	0.00	0.62	0.00	0.92	0.77	0.95
Approach Factor	0.00			0.91			0.74			0.92			

Peak Hour Vehicle Summary

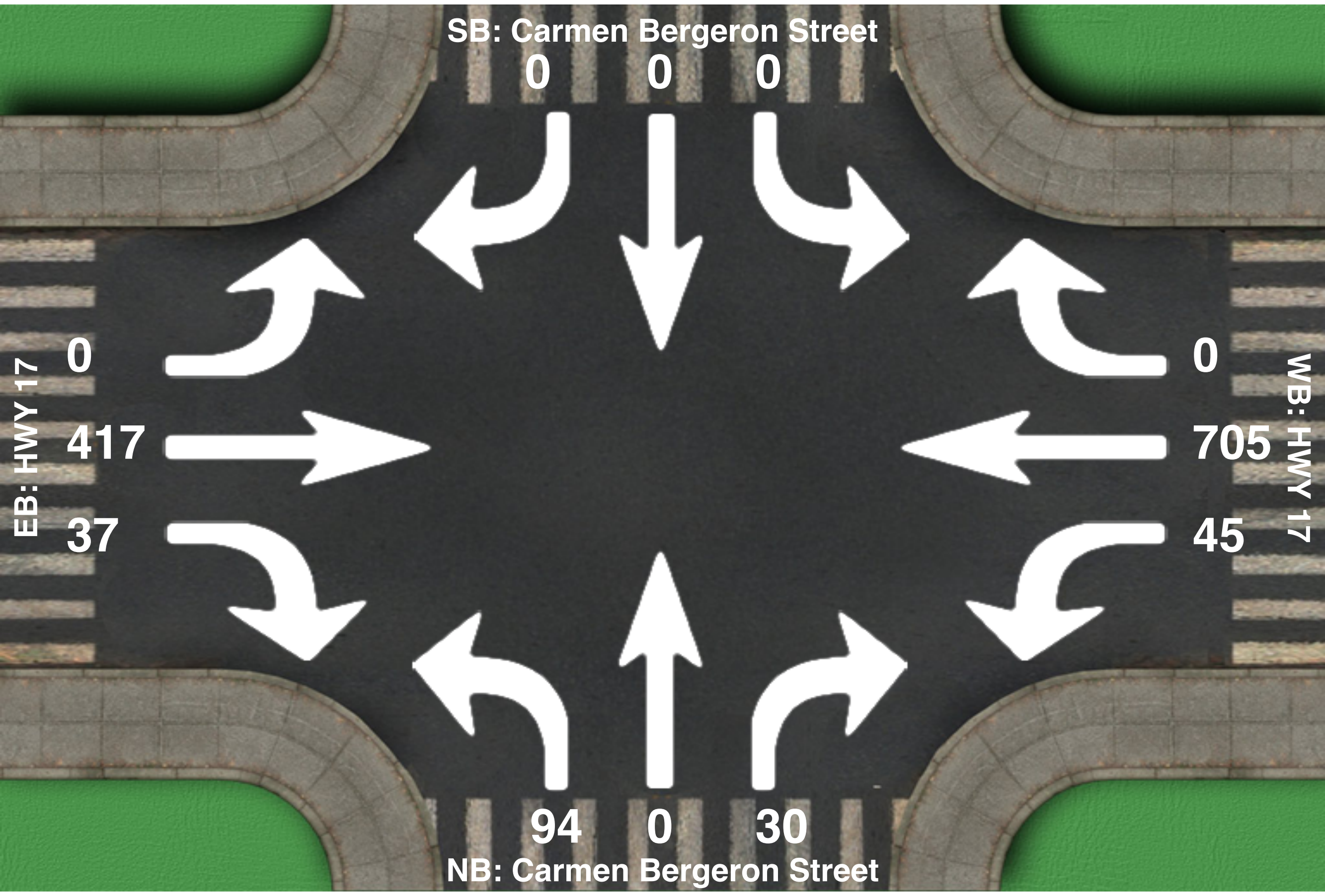
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	0	0	0	45	705	0	94	0	30	0	417	37	1328

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Carmen Bergeron Street at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Sunny
Analyst: Paige Harrison



Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	45	705	0	94	0	30	0	417	37	1328
Factor	0.00	0.00	0.00	0.66	0.89	0.00	0.78	0.00	0.62	0.00	0.92	0.77	0.95
Approach Factor	0.00			0.91			0.74			0.92			

Turn Count Summary

Location: Carmen Bergeron St at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Partly Sunny
Analyst: Paige Harrison

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	21	156	0	24	0	26	0	235	34	496
16:15	0	0	0	25	139	0	17	0	25	0	239	44	489
16:30	0	0	0	30	147	0	17	0	29	0	273	49	545
16:45	0	0	0	28	153	0	15	0	25	0	224	58	503
17:00	0	0	0	0	0	0	0	0	0	0	2	0	2

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	0	0	21	156	0	24	0	26	0	235	34	496
16:15	0	0	0	25	139	0	17	0	25	0	239	44	489
16:30	0	0	0	30	147	0	17	0	29	0	273	49	545
16:45	0	0	0	28	153	0	15	0	25	0	224	58	503
17:00	0	0	0	0	0	0	0	0	0	0	2	0	2

Pedestrian volumes

Interval starts	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	1	1	0	0	0	1
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	104	595	0	73	0	105	0	971	185	2033
Factor	0.00	0.00	0.00	0.87	0.95	0.00	0.76	0.00	0.91	0.00	0.89	0.80	0.93
Approach Factor	0.00			0.97			0.89			0.90			

Peak Hour Vehicle Summary

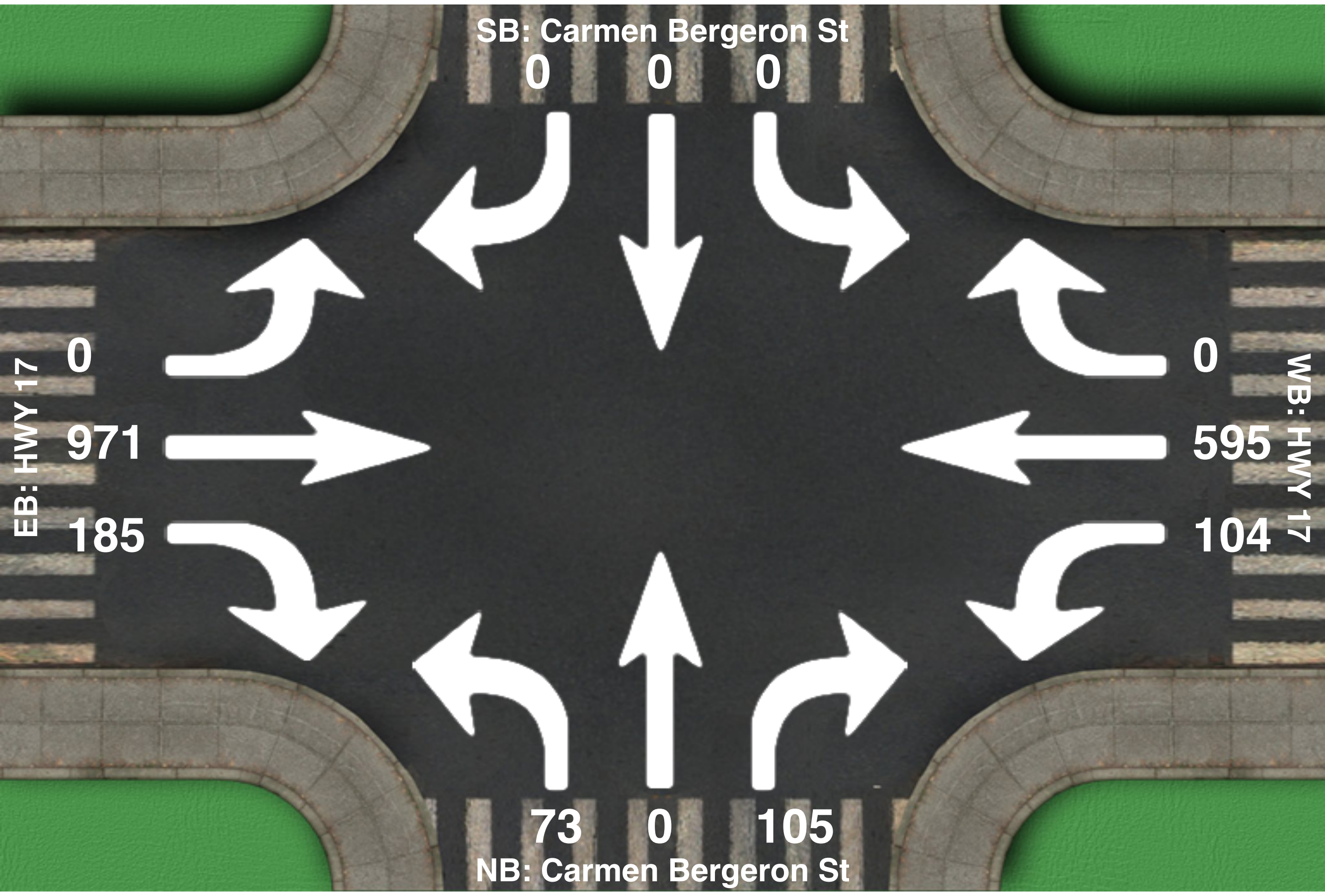
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	0	0	0	104	595	0	73	0	105	0	971	185	2033

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	1	1	0	0	0	1

Intersection Peak Hour

Location: Carmen Bergeron St at HWY 17, Clarence-Rockland
GPS Coordinates:
Date: 2021-06-23
Day of week: Wednesday
Weather: Partly Sunny
Analyst: Paige Harrison



Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	104	595	0	73	0	105	0	971	185	2033
Factor	0.00	0.00	0.00	0.87	0.95	0.00	0.76	0.00	0.91	0.00	0.89	0.80	0.93
Approach Factor	0.00			0.97			0.89			0.90			

Appendix C

Detailed Synchro Output
Data for Existing Conditions

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	626	56	68	1058	141	45
Future Volume (vph)	626	56	68	1058	141	45
Lane Group Flow (vph)	659	59	72	1114	148	47
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	47.1	47.1	56.9	56.9	13.2	13.2
Actuated g/C Ratio	0.57	0.57	0.69	0.69	0.16	0.16
v/c Ratio	0.65	0.07	0.18	0.91	0.55	0.17
Control Delay	17.2	3.0	5.3	23.9	43.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	3.0	5.3	23.9	43.4	12.1
LOS	B	A	A	C	D	B
Approach Delay	16.1			22.8	35.9	
Approach LOS	B			C	D	
Queue Length 50th (m)	74.6	0.0	3.2	128.6	24.7	0.0
Queue Length 95th (m)	134.1	5.7	8.5	#297.1	47.5	9.9
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	1186	1027	543	1489	449	436
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.06	0.13	0.75	0.33	0.11

Intersection Summary

Cycle Length: 103
Actuated Cycle Length: 82.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 21.7 Intersection LOS: C
Intersection Capacity Utilization 76.5% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & HWY 17/HW 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	23	14	3	27	30	41	23
Future Volume (vph)	23	14	3	27	30	41	23
Lane Group Flow (vph)	24	17	3	168	40	106	24
Sign Control		Stop		Stop	Stop	Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 35.9%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	14	2	3	27	133	0	30	8	60	41	23
Future Volume (vph)	23	14	2	3	27	133	0	30	8	60	41	23
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	24	15	2	3	28	140	0	32	8	63	43	24

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	24	17	3	168	16	24	106	24
Volume Left (vph)	24	0	3	0	0	0	63	0
Volume Right (vph)	0	2	0	140	0	8	0	24
Hadj (s)	0.53	-0.05	0.53	-0.55	0.03	-0.20	0.33	-0.67
Departure Headway (s)	5.6	5.0	5.5	4.4	5.1	4.9	5.4	4.4
Degree Utilization, x	0.04	0.02	0.00	0.21	0.02	0.03	0.16	0.03
Capacity (veh/h)	611	685	626	784	665	695	642	784
Control Delay (s)	7.6	6.9	7.3	7.4	7.1	6.9	8.2	6.3
Approach Delay (s)	7.3		7.4		7.0		7.8	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	7.5		
Level of Service	A		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	47	11	38	65	44
Future Volume (vph)	47	11	38	65	44
Lane Group Flow (vph)	49	37	74	148	115
Sign Control		Stop	Stop	Stop	Stop

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 32.2%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	47	11	24	14	38	18	71	65	5	15	44	50
Future Volume (vph)	47	11	24	14	38	18	71	65	5	15	44	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	49	12	25	15	40	19	75	68	5	16	46	53

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	49	37	74	148	115
Volume Left (vph)	49	0	15	75	16
Volume Right (vph)	0	25	19	5	53
Hadj (s)	0.53	-0.44	-0.08	0.12	-0.21
Departure Headway (s)	5.7	4.7	4.7	4.5	4.3
Degree Utilization, x	0.08	0.05	0.10	0.19	0.14
Capacity (veh/h)	591	712	720	759	799
Control Delay (s)	8.0	6.8	8.1	8.6	7.9
Approach Delay (s)	7.5		8.1	8.6	7.9
Approach LOS	A		A	A	A

Intersection Summary			
Delay	8.1		
Level of Service	A		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	138	56
Future Volume (vph)	3	138	56
Lane Group Flow (vph)	25	176	86
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 26.0%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	138	56	26
Future Volume (Veh/h)	3	21	29	138	56	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	145	59	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	280	72	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280	72	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	696	990	1510			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	25	176	86
Volume Left	3	31	0
Volume Right	22	0	27
cSH	942	1510	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.7	0.5	0.0
Control Delay (s)	8.9	1.4	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	1.4	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1457	278	156	893	110	158
Future Volume (vph)	1457	278	156	893	110	158
Lane Group Flow (vph)	1619	309	173	992	122	176
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	50.2	50.2	67.3	67.3	12.6	12.6
Actuated g/C Ratio	0.55	0.55	0.74	0.74	0.14	0.14
v/c Ratio	1.84	0.38	0.69	0.84	0.58	0.52
Control Delay	404.3	8.6	33.2	18.1	48.9	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	404.3	8.6	33.2	18.1	48.9	11.6
LOS	F	A	C	B	D	B
Approach Delay	340.9			20.3	26.9	
Approach LOS	F			C	C	
Queue Length 50th (m)	~459.9	15.1	16.2	105.9	21.4	0.0
Queue Length 95th (m)	#611.1	40.3	41.7	#262.7	40.8	18.1
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	879	811	313	1247	348	447
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.84	0.38	0.55	0.80	0.35	0.39

Intersection Summary

Cycle Length: 103
Actuated Cycle Length: 91.4
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.84
Intersection Signal Delay: 203.2 Intersection LOS: F
Intersection Capacity Utilization 119.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & HWY 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	14	35	14	38	72	144	35
Future Volume (vph)	14	35	14	38	72	144	35
Lane Group Flow (vph)	16	41	16	244	111	443	39
Sign Control		Stop		Stop	Stop	Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 53.5%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	35	2	14	38	182	2	72	26	255	144	35
Future Volume (vph)	14	35	2	14	38	182	2	72	26	255	144	35
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	39	2	16	42	202	2	80	29	283	160	39

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	16	41	16	244	42	69	443	39
Volume Left (vph)	16	0	16	0	2	0	283	0
Volume Right (vph)	0	2	0	202	0	29	0	39
Hadj (s)	0.53	0.00	0.53	-0.55	0.06	-0.26	0.35	-0.67
Departure Headway (s)	7.1	6.5	6.8	5.7	6.1	5.8	5.9	4.9
Degree Utilization, x	0.03	0.07	0.03	0.38	0.07	0.11	0.73	0.05
Capacity (veh/h)	465	501	496	596	555	584	597	705
Control Delay (s)	9.1	8.9	8.8	11.0	8.3	8.3	21.8	7.0
Approach Delay (s)	8.9		10.8		8.3		20.6	
Approach LOS	A		B		A		C	

Intersection Summary			
Delay	15.6		
Level of Service	C		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	128	69	44	165	111
Future Volume (vph)	128	69	44	165	111
Lane Group Flow (vph)	142	233	102	313	349
Sign Control		Stop	Stop	Stop	Stop

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 63.9%	ICU Level of Service B
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	128	69	140	30	44	18	84	165	33	41	111	162
Future Volume (vph)	128	69	140	30	44	18	84	165	33	41	111	162
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	142	77	156	33	49	20	93	183	37	46	123	180

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	142	233	102	313	349
Volume Left (vph)	142	0	33	93	46
Volume Right (vph)	0	156	20	37	180
Hadj (s)	0.53	-0.43	-0.02	0.02	-0.25
Departure Headway (s)	7.2	6.2	6.8	6.0	5.7
Degree Utilization, x	0.28	0.40	0.19	0.52	0.55
Capacity (veh/h)	470	533	447	564	599
Control Delay (s)	11.8	12.1	11.4	15.3	15.4
Approach Delay (s)	12.0		11.4	15.3	15.4
Approach LOS	B		B	C	C

Intersection Summary			
Delay	13.9		
Level of Service	B		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	282	263
Future Volume (vph)	54	282	263
Lane Group Flow (vph)	117	385	312
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 55.5%	ICU Level of Service B
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	282	263	18
Future Volume (Veh/h)	54	51	65	282	263	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	57	72	313	292	20
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	759	302	312			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	759	302	312			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	92	94			
cM capacity (veh/h)	353	738	1248			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	117	385	312
Volume Left	60	72	0
Volume Right	57	0	20
cSH	473	1248	1700
Volume to Capacity	0.25	0.06	0.18
Queue Length 95th (m)	7.7	1.5	0.0
Control Delay (s)	15.1	2.0	0.0
Lane LOS	C	A	
Approach Delay (s)	15.1	2.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	639	56	68	1079	141	45
Future Volume (vph)	639	56	68	1079	141	45
Lane Group Flow (vph)	673	59	72	1136	148	47
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	49.7	49.7	59.6	59.6	13.3	13.3
Actuated g/C Ratio	0.59	0.59	0.70	0.70	0.16	0.16
v/c Ratio	0.65	0.07	0.18	0.92	0.56	0.17
Control Delay	17.0	3.0	5.2	24.5	44.9	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.0	3.0	5.2	24.5	44.9	12.1
LOS	B	A	A	C	D	B
Approach Delay	15.9			23.3	37.0	
Approach LOS	B			C	D	
Queue Length 50th (m)	77.3	0.0	3.2	135.5	26.7	0.0
Queue Length 95th (m)	138.5	5.7	8.5	#306.7	47.5	9.9
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	1161	1007	537	1453	431	421
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.06	0.13	0.78	0.34	0.11

Intersection Summary	
Cycle Length: 103	
Actuated Cycle Length: 84.9	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 77.7%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	

Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	23	14	3	27	30	41	23
Future Volume (vph)	23	14	3	27	30	41	23
Lane Group Flow (vph)	24	17	3	168	40	106	24
Sign Control		Stop		Stop	Stop	Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 35.9%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	14	2	3	27	133	0	30	8	60	41	23
Future Volume (vph)	23	14	2	3	27	133	0	30	8	60	41	23
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	24	15	2	3	28	140	0	32	8	63	43	24

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	24	17	3	168	16	24	106	24
Volume Left (vph)	24	0	3	0	0	0	63	0
Volume Right (vph)	0	2	0	140	0	8	0	24
Hadj (s)	0.53	-0.05	0.53	-0.55	0.03	-0.20	0.33	-0.67
Departure Headway (s)	5.6	5.0	5.5	4.4	5.1	4.9	5.4	4.4
Degree Utilization, x	0.04	0.02	0.00	0.21	0.02	0.03	0.16	0.03
Capacity (veh/h)	611	685	626	784	665	695	642	784
Control Delay (s)	7.6	6.9	7.3	7.4	7.1	6.9	8.2	6.3
Approach Delay (s)	7.3		7.4		7.0		7.8	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	7.5		
Level of Service	A		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	47	11	38	65	44
Future Volume (vph)	47	11	38	65	44
Lane Group Flow (vph)	49	37	74	148	115
Sign Control		Stop	Stop	Stop	Stop

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 32.2%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	47	11	24	14	38	18	71	65	5	15	44	50
Future Volume (vph)	47	11	24	14	38	18	71	65	5	15	44	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	49	12	25	15	40	19	75	68	5	16	46	53

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	49	37	74	148	115
Volume Left (vph)	49	0	15	75	16
Volume Right (vph)	0	25	19	5	53
Hadj (s)	0.53	-0.44	-0.08	0.12	-0.21
Departure Headway (s)	5.7	4.7	4.7	4.5	4.3
Degree Utilization, x	0.08	0.05	0.10	0.19	0.14
Capacity (veh/h)	591	712	720	759	799
Control Delay (s)	8.0	6.8	8.1	8.6	7.9
Approach Delay (s)	7.5		8.1	8.6	7.9
Approach LOS	A		A	A	A

Intersection Summary			
Delay	8.1		
Level of Service	A		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	138	56
Future Volume (vph)	3	138	56
Lane Group Flow (vph)	25	176	86
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 26.0%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	138	56	26
Future Volume (Veh/h)	3	21	29	138	56	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	145	59	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	280	72	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280	72	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	696	990	1510			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	25	176	86
Volume Left	3	31	0
Volume Right	22	0	27
cSH	942	1510	1700
Volume to Capacity	0.03	0.02	0.05
Queue Length 95th (m)	0.7	0.5	0.0
Control Delay (s)	8.9	1.4	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	1.4	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1486	278	156	911	110	158
Future Volume (vph)	1486	278	156	911	110	158
Lane Group Flow (vph)	1651	309	173	1012	122	176
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	56.0	56.0	21.0	77.0	26.0	26.0
Total Split (%)	54.4%	54.4%	20.4%	74.8%	25.2%	25.2%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	50.2	50.2	67.3	67.3	12.6	12.6
Actuated g/C Ratio	0.55	0.55	0.74	0.74	0.14	0.14
v/c Ratio	1.88	0.38	0.69	0.86	0.58	0.52
Control Delay	420.4	8.8	33.2	19.3	48.9	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	420.4	8.8	33.2	19.3	48.9	11.6
LOS	F	A	C	B	D	B
Approach Delay	355.5			21.4	26.9	
Approach LOS	F			C	C	
Queue Length 50th (m)	~472.3	15.4	16.2	111.7	21.4	0.0
Queue Length 95th (m)	#624.9	40.7	41.7	#272.2	40.8	18.1
Internal Link Dist (m)	139.0			181.3	95.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	879	810	313	1247	348	447
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.88	0.38	0.55	0.81	0.35	0.39

Intersection Summary	
Cycle Length: 103	
Actuated Cycle Length: 91.4	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.88	
Intersection Signal Delay: 212.1	Intersection LOS: F
Intersection Capacity Utilization 121.7%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

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

Splits and Phases: 1: Carmen Bergeron & HWY 17/HW 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	14	35	14	38	72	144	35
Future Volume (vph)	14	35	14	38	72	144	35
Lane Group Flow (vph)	16	41	16	244	111	443	39
Sign Control		Stop		Stop	Stop	Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 53.5%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	35	2	14	38	182	2	72	26	255	144	35
Future Volume (vph)	14	35	2	14	38	182	2	72	26	255	144	35
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	16	39	2	16	42	202	2	80	29	283	160	39

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	16	41	16	244	42	69	443	39
Volume Left (vph)	16	0	16	0	2	0	283	0
Volume Right (vph)	0	2	0	202	0	29	0	39
Hadj (s)	0.53	0.00	0.53	-0.55	0.06	-0.26	0.35	-0.67
Departure Headway (s)	7.1	6.5	6.8	5.7	6.1	5.8	5.9	4.9
Degree Utilization, x	0.03	0.07	0.03	0.38	0.07	0.11	0.73	0.05
Capacity (veh/h)	465	501	496	596	555	584	597	705
Control Delay (s)	9.1	8.9	8.8	11.0	8.3	8.3	21.8	7.0
Approach Delay (s)	8.9		10.8		8.3		20.6	
Approach LOS	A		B		A		C	

Intersection Summary			
Delay	15.6		
Level of Service	C		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	128	69	44	165	111
Future Volume (vph)	128	69	44	165	111
Lane Group Flow (vph)	142	233	102	313	349
Sign Control		Stop	Stop	Stop	Stop

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 63.9%	ICU Level of Service B
Analysis Period (min) 15	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	128	69	140	30	44	18	84	165	33	41	111	162
Future Volume (vph)	128	69	140	30	44	18	84	165	33	41	111	162
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	142	77	156	33	49	20	93	183	37	46	123	180

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	142	233	102	313	349
Volume Left (vph)	142	0	33	93	46
Volume Right (vph)	0	156	20	37	180
Hadj (s)	0.53	-0.43	-0.02	0.02	-0.25
Departure Headway (s)	7.2	6.2	6.8	6.0	5.7
Degree Utilization, x	0.28	0.40	0.19	0.52	0.55
Capacity (veh/h)	470	533	447	564	599
Control Delay (s)	11.8	12.1	11.4	15.3	15.4
Approach Delay (s)	12.0		11.4	15.3	15.4
Approach LOS	B		B	C	C

Intersection Summary			
Delay	13.9		
Level of Service	B		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	282	263
Future Volume (vph)	54	282	263
Lane Group Flow (vph)	117	385	312
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 55.5%	ICU Level of Service B
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	282	263	18
Future Volume (Veh/h)	54	51	65	282	263	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	57	72	313	292	20
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	759	302	312			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	759	302	312			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	92	94			
cM capacity (veh/h)	353	738	1248			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	117	385	312
Volume Left	60	72	0
Volume Right	57	0	20
cSH	473	1248	1700
Volume to Capacity	0.25	0.06	0.18
Queue Length 95th (m)	7.7	1.5	0.0
Control Delay (s)	15.1	2.0	0.0
Lane LOS	C	A	
Approach Delay (s)	15.1	2.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1797	65	70	3653	166	49
Future Volume (vph)	1797	65	70	3653	166	49
Lane Group Flow (vph)	1892	68	74	3845	175	52
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	2.1	2.1	1.0	1.0
Actuated g/C Ratio	0.07	0.07	0.14	0.14	0.07	0.07
v/c Ratio	8.16	0.41	0.30	8.23	1.51	0.34
Control Delay	3228.9	14.7	8.3	3267.5	288.5	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3228.9	14.7	8.3	3267.5	288.5	12.7
LOS	F	B	A	F	F	B
Approach Delay	3117.4			3206.0	225.3	
Approach LOS	F			F	F	
Queue Length 50th (m)	~36.6	0.0	1.0	~77.1	~4.4	0.0
Queue Length 95th (m)	#81.5	#5.2	2.8	#133.7	#21.0	#4.4
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	232	167	245	1908	116	152
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	8.16	0.41	0.30	2.02	1.51	0.34

Intersection Summary

Cycle Length: 20.6
Actuated Cycle Length: 14.8
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 8.23
Intersection Signal Delay: 3066.7 Intersection LOS: F
Intersection Capacity Utilization 125.8% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.

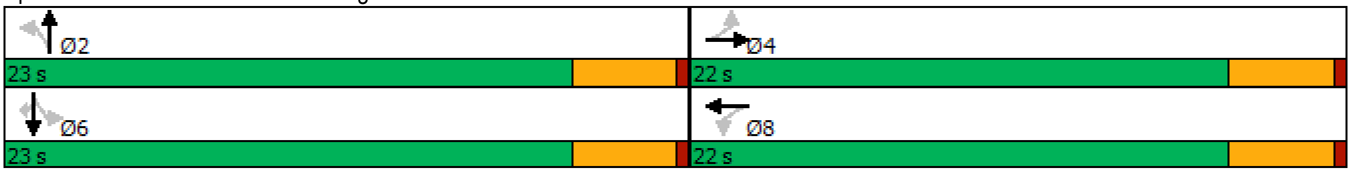
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	23	23	22	52	30	70	41	23
Future Volume (vph)	23	23	22	52	30	70	41	23
Lane Group Flow (vph)	24	26	23	226	48	0	117	24
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	10.0	10.0	10.0	10.0	13.9		13.9	13.9
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.49		0.49	0.49
v/c Ratio	0.06	0.04	0.05	0.34	0.03		0.16	0.03
Control Delay	6.4	5.9	6.3	3.9	4.7		7.1	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	6.4	5.9	6.3	3.9	4.7		7.1	3.3
LOS	A	A	A	A	A		A	A
Approach Delay		6.1		4.1	4.7		6.4	
Approach LOS		A		A	A		A	
Queue Length 50th (m)	0.6	0.6	0.6	1.4	0.4		3.2	0.0
Queue Length 95th (m)	2.5	2.5	2.4	7.2	1.6		7.8	1.7
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	690	1106	827	1055	2355		1079	1113
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.03	0.02	0.03	0.21	0.02		0.11	0.02

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 28.4	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.34	
Intersection Signal Delay: 5.0	Intersection LOS: A
Intersection Capacity Utilization 40.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Carmen Bergeron & Richelieu

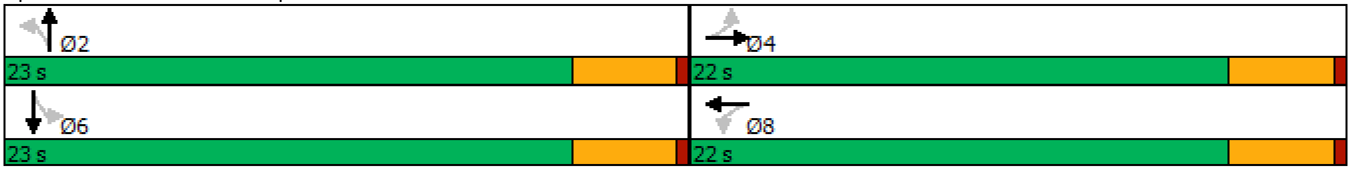


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	47	11	14	38	216	111	15	58
Future Volume (vph)	47	11	14	38	216	111	15	58
Lane Group Flow (vph)	49	89	0	74	0	349	0	130
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	10.0	10.0		10.0		17.8		17.8
Actuated g/C Ratio	0.35	0.35		0.35		0.62		0.62
v/c Ratio	0.11	0.15		0.13		0.23		0.13
Control Delay	7.2	3.4		5.9		5.8		4.4
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	7.2	3.4		5.9		5.8		4.4
LOS	A	A		A		A		A
Approach Delay		4.7		5.9		5.8		4.4
Approach LOS		A		A		A		A
Queue Length 50th (m)	1.3	0.3		1.4		5.2		2.0
Queue Length 95th (m)	4.5	4.2		5.3		9.8		6.5
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	785	991		987		1963		1277
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.06	0.09		0.07		0.18		0.10

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 28.7
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.23
Intersection Signal Delay: 5.3 Intersection LOS: A
Intersection Capacity Utilization 36.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	329	119
Future Volume (vph)	3	329	119
Lane Group Flow (vph)	25	377	152
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 28.2%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	329	119	26
Future Volume (Veh/h)	3	21	29	329	119	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	346	125	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	374	76	152			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	374	76	152			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	98			
cM capacity (veh/h)	587	970	1426			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	146	231	83	69
Volume Left	3	31	0	0	0
Volume Right	22	0	0	0	27
cSH	899	1426	1700	1700	1700
Volume to Capacity	0.03	0.02	0.14	0.05	0.04
Queue Length 95th (m)	0.6	0.5	0.0	0.0	0.0
Control Delay (s)	9.1	1.7	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.1	0.7		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	Ø2	Ø5
Lane Configurations				
Traffic Volume (vph)	1891	3896		
Future Volume (vph)	1891	3896		
Lane Group Flow (vph)	2101	4329		
Turn Type	NA	NA		
Protected Phases	4	8	2	5
Permitted Phases				
Detector Phase	4	8		
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	15%	15%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		
Total Lost Time (s)	4.0	4.0		
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
Act Effct Green (s)	124.0	124.0		
Actuated g/C Ratio	0.83	0.83		
v/c Ratio	0.84	1.72		
Control Delay	11.3	346.2		
Queue Delay	0.0	0.0		
Total Delay	11.3	346.2		
LOS	B	F		
Approach Delay	11.3	346.2		
Approach LOS	B	F		
Queue Length 50th (m)	149.4	~984.2		
Queue Length 95th (m)	181.7	#998.3		
Internal Link Dist (m)	116.5	194.0		
Turn Bay Length (m)				
Base Capacity (vph)	2512	2512		
Starvation Cap Reductn	0	0		
Spillback Cap Reductn	0	0		
Storage Cap Reductn	0	0		
Reduced v/c Ratio	0.84	1.72		

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.72	
Intersection Signal Delay: 236.8	Intersection LOS: F
Intersection Capacity Utilization 127.3%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4367	305	162	2759	127	161
Future Volume (vph)	4367	305	162	2759	127	161
Lane Group Flow (vph)	4597	321	171	2904	134	169
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	4.8	4.8	1.0	1.0
Actuated g/C Ratio	0.06	0.06	0.27	0.27	0.06	0.06
v/c Ratio	23.34	0.90	0.56	3.23	1.35	0.68
Control Delay	10052.1	39.3	12.2	1017.7	240.2	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10052.1	39.3	12.2	1017.7	240.2	22.6
LOS	F	D	B	F	F	C
Approach Delay	9398.6			961.8	118.8	
Approach LOS	F			F	F	
Queue Length 50th (m)	~164.8	1.1	2.6	~81.6	~6.5	0.0
Queue Length 95th (m)	#182.8	#16.1	5.7	#98.7	#16.9	#9.5
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	197	355	304	1621	99	247
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	23.34	0.90	0.56	1.79	1.35	0.68

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 17.7	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 23.34	
Intersection Signal Delay: 5932.5	Intersection LOS: F
Intersection Capacity Utilization 159.0%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

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

Splits and Phases: 1: Carmen Bergeron & County Rd 17

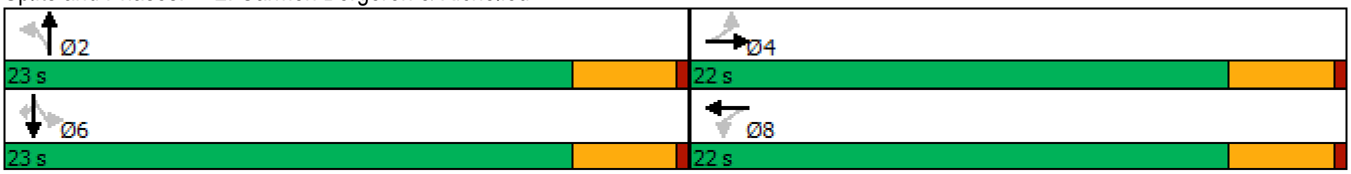
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	14	62	27	54	2	72	288	144	35
Future Volume (vph)	14	62	27	54	2	72	288	144	35
Lane Group Flow (vph)	15	67	28	270	0	126	0	455	37
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	10.5	10.5	10.5	10.5		21.1		21.1	21.1
Actuated g/C Ratio	0.30	0.30	0.30	0.30		0.60		0.60	0.60
v/c Ratio	0.05	0.13	0.08	0.44		0.07		0.60	0.04
Control Delay	10.4	10.5	10.5	6.1		3.6		13.0	2.5
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	10.4	10.5	10.5	6.1		3.6		13.0	2.5
LOS	B	B	B	A		A		B	A
Approach Delay		10.5		6.5		3.6		12.2	
Approach LOS		B		A		A		B	
Queue Length 50th (m)	0.7	3.0	1.3	2.6		1.0		17.8	0.0
Queue Length 95th (m)	3.2	8.5	4.8	13.7		3.6		#58.3	2.5
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	475	907	648	905		1862		779	934
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.03	0.07	0.04	0.30		0.07		0.58	0.04

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 35.3
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 9.3 Intersection LOS: A
Intersection Capacity Utilization 54.3% ICU Level of Service A
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

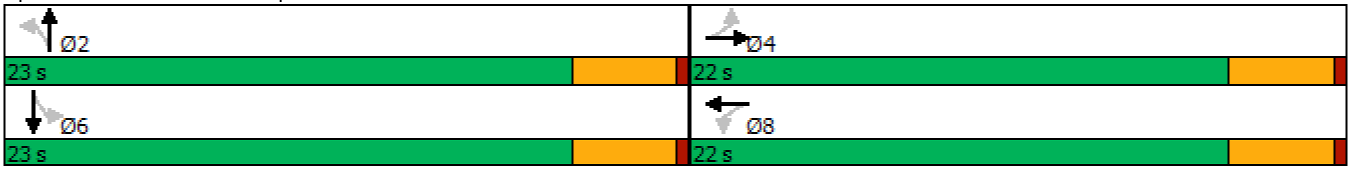
Splits and Phases: 2: Carmen Bergeron & Richelieu



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	128	69	30	44	180	194	41	159
Future Volume (vph)	128	69	30	44	180	194	41	159
Lane Group Flow (vph)	135	385	0	97	0	428	0	381
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.2	11.2		11.2		12.3		12.3
Actuated g/C Ratio	0.35	0.35		0.35		0.39		0.39
v/c Ratio	0.31	0.52		0.19		0.46		0.58
Control Delay	10.6	5.3		7.8		8.7		9.4
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	10.6	5.3		7.8		8.7		9.4
LOS	B	A		A		A		A
Approach Delay		6.7		7.8		8.7		9.4
Approach LOS		A		A		A		A
Queue Length 50th (m)	3.9	2.0		2.1		6.3		8.2
Queue Length 95th (m)	15.8	16.4		10.4		17.2		28.4
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	713	1032		835		1456		979
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.19	0.37		0.12		0.29		0.39

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 31.7	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 76.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	407	467
Future Volume (vph)	54	407	467
Lane Group Flow (vph)	111	496	511
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 44.6%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	407	467	18
Future Volume (Veh/h)	54	51	65	407	467	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	68	428	492	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	852	256	511			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	852	256	511			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	93	94			
cM capacity (veh/h)	280	744	1050			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	211	285	328	183
Volume Left	57	68	0	0	0
Volume Right	54	0	0	0	19
cSH	401	1050	1700	1700	1700
Volume to Capacity	0.28	0.06	0.17	0.19	0.11
Queue Length 95th (m)	8.3	1.6	0.0	0.0	0.0
Control Delay (s)	17.4	3.2	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.4	1.4		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	Ø2	Ø5
Lane Configurations	↑↑	↑↑		
Traffic Volume (vph)	4823	2944		
Future Volume (vph)	4823	2944		
Lane Group Flow (vph)	5359	3271		
Turn Type	NA	NA		
Protected Phases	4	8	2	5
Permitted Phases				
Detector Phase	4	8		
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	15%	15%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		
Total Lost Time (s)	4.0	4.0		
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
Act Effct Green (s)	124.0	124.0		
Actuated g/C Ratio	0.83	0.83		
v/c Ratio	2.13	1.30		
Control Delay	529.2	157.3		
Queue Delay	0.0	0.0		
Total Delay	529.2	157.3		
LOS	F	F		
Approach Delay	529.2	157.3		
Approach LOS	F	F		
Queue Length 50th (m)	~1314.1	~645.3		
Queue Length 95th (m)	#1312.4	#673.5		
Internal Link Dist (m)	116.5	194.0		
Turn Bay Length (m)				
Base Capacity (vph)	2512	2512		
Starvation Cap Reductn	0	0		
Spillback Cap Reductn	0	0		
Storage Cap Reductn	0	0		
Reduced v/c Ratio	2.13	1.30		

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 2.13	
Intersection Signal Delay: 388.2	Intersection LOS: F
Intersection Capacity Utilization 156.9%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2009	65	70	4011	166	49
Future Volume (vph)	2009	65	70	4011	166	49
Lane Group Flow (vph)	2115	68	74	4222	175	52
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	2.1	2.1	1.0	1.0
Actuated g/C Ratio	0.07	0.07	0.14	0.14	0.07	0.07
v/c Ratio	9.12	0.41	0.30	9.04	1.51	0.34
Control Delay	3659.9	14.7	8.3	3630.4	288.5	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3659.9	14.7	8.3	3630.4	288.5	12.7
LOS	F	B	A	F	F	B
Approach Delay	3546.4			3568.0	225.3	
Approach LOS	F			F	F	
Queue Length 50th (m)	~41.2	0.0	1.0	~84.8	~4.4	0.0
Queue Length 95th (m)	#90.1	#5.2	2.8	#147.6	#21.0	#4.4
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	232	167	245	1908	116	152
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	9.12	0.41	0.30	2.21	1.51	0.34

Intersection Summary

Cycle Length: 20.6
Actuated Cycle Length: 14.8
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 9.12
Intersection Signal Delay: 3447.8 Intersection LOS: F
Intersection Capacity Utilization 136.2% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

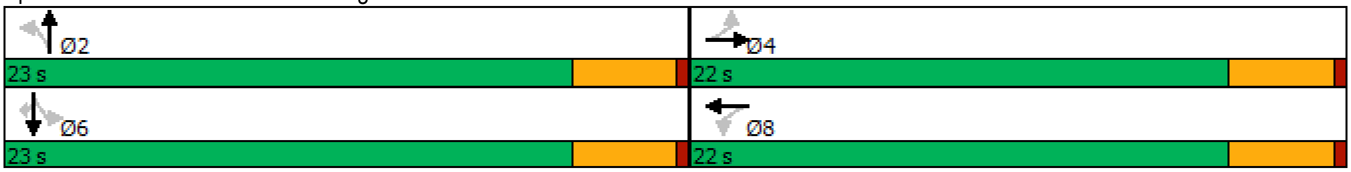
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	23	23	22	52	30	70	41	23
Future Volume (vph)	23	23	22	52	30	70	41	23
Lane Group Flow (vph)	24	26	23	226	48	0	117	24
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	10.0	10.0	10.0	10.0	13.9		13.9	13.9
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.49		0.49	0.49
v/c Ratio	0.06	0.04	0.05	0.34	0.03		0.16	0.03
Control Delay	6.4	5.9	6.3	3.9	4.7		7.1	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	6.4	5.9	6.3	3.9	4.7		7.1	3.3
LOS	A	A	A	A	A		A	A
Approach Delay		6.1		4.1	4.7		6.4	
Approach LOS		A		A	A		A	
Queue Length 50th (m)	0.6	0.6	0.6	1.4	0.4		3.2	0.0
Queue Length 95th (m)	2.5	2.5	2.4	7.2	1.6		7.8	1.7
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	690	1106	827	1055	2355		1079	1113
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.03	0.02	0.03	0.21	0.02		0.11	0.02

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 28.4	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.34	
Intersection Signal Delay: 5.0	Intersection LOS: A
Intersection Capacity Utilization 40.1%	ICU Level of Service A
Analysis Period (min) 15	

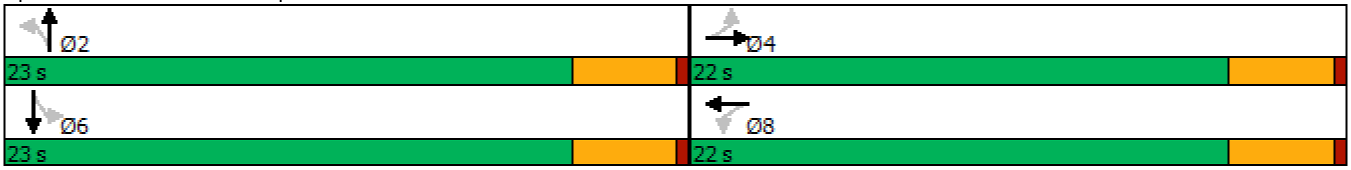
Splits and Phases: 2: Carmen Bergeron & Richelieu



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	47	11	14	38	216	111	15	58
Future Volume (vph)	47	11	14	38	216	111	15	58
Lane Group Flow (vph)	49	89	0	74	0	349	0	130
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	10.0	10.0		10.0		17.8		17.8
Actuated g/C Ratio	0.35	0.35		0.35		0.62		0.62
v/c Ratio	0.11	0.15		0.13		0.23		0.13
Control Delay	7.2	3.4		5.9		5.8		4.4
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	7.2	3.4		5.9		5.8		4.4
LOS	A	A		A		A		A
Approach Delay		4.7		5.9		5.8		4.4
Approach LOS		A		A		A		A
Queue Length 50th (m)	1.3	0.3		1.4		5.2		2.0
Queue Length 95th (m)	4.5	4.2		5.3		9.8		6.5
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	785	991		987		1963		1277
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.06	0.09		0.07		0.18		0.10

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 28.7	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.23	
Intersection Signal Delay: 5.3	Intersection LOS: A
Intersection Capacity Utilization 36.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	329	119
Future Volume (vph)	3	329	119
Lane Group Flow (vph)	25	377	152
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 28.2%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	329	119	26
Future Volume (Veh/h)	3	21	29	329	119	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	346	125	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	374	76	152			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	374	76	152			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	98			
cM capacity (veh/h)	587	970	1426			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	146	231	83	69
Volume Left	3	31	0	0	0
Volume Right	22	0	0	0	27
cSH	899	1426	1700	1700	1700
Volume to Capacity	0.03	0.02	0.14	0.05	0.04
Queue Length 95th (m)	0.6	0.5	0.0	0.0	0.0
Control Delay (s)	9.1	1.7	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.1	0.7		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	Ø2
Lane Configurations	↑↑	↑↑	
Traffic Volume (vph)	2121	4302	
Future Volume (vph)	2121	4302	
Lane Group Flow (vph)	2357	4780	
Turn Type	NA	NA	
Protected Phases	4	8	2
Permitted Phases			
Detector Phase	4	8	
Switch Phase			
Minimum Initial (s)	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0
Total Split (s)	128.0	128.0	22.0
Total Split (%)	85.3%	85.3%	15%
Yellow Time (s)	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	
Total Lost Time (s)	4.0	4.0	
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	None	None	Max
Act Effct Green (s)	124.0	124.0	
Actuated g/C Ratio	0.83	0.83	
v/c Ratio	0.94	1.90	
Control Delay	19.3	426.3	
Queue Delay	0.0	0.0	
Total Delay	19.3	426.3	
LOS	B	F	
Approach Delay	19.3	426.3	
Approach LOS	B	F	
Queue Length 50th (m)	230.9	~1128.6	
Queue Length 95th (m)	292.1	#1136.0	
Internal Link Dist (m)	116.5	194.0	
Turn Bay Length (m)			
Base Capacity (vph)	2512	2512	
Starvation Cap Reductn	0	0	
Spillback Cap Reductn	0	0	
Storage Cap Reductn	0	0	
Reduced v/c Ratio	0.94	1.90	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.90	
Intersection Signal Delay: 291.9	Intersection LOS: F
Intersection Capacity Utilization 140.3%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4861	305	162	3061	127	161
Future Volume (vph)	4861	305	162	3061	127	161
Lane Group Flow (vph)	5117	321	171	3222	134	169
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	4.8	4.8	1.0	1.0
Actuated g/C Ratio	0.06	0.06	0.27	0.27	0.06	0.06
v/c Ratio	25.97	0.98	0.56	3.58	1.35	0.68
Control Delay	11238.4	58.0	12.2	1175.6	240.2	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11238.4	58.0	12.2	1175.6	240.2	22.6
LOS	F	E	B	F	F	C
Approach Delay	10578.5			1117.0	118.8	
Approach LOS	F			F	F	
Queue Length 50th (m)	~183.8	~2.2	2.6	~93.2	~6.5	0.0
Queue Length 95th (m)	#201.8	#18.2	5.7	#110.6	#16.9	#9.5
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	197	328	304	1621	99	247
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	25.97	0.98	0.56	1.99	1.35	0.68

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 17.7	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 25.97	
Intersection Signal Delay: 6716.8	Intersection LOS: F
Intersection Capacity Utilization 161.9%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

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

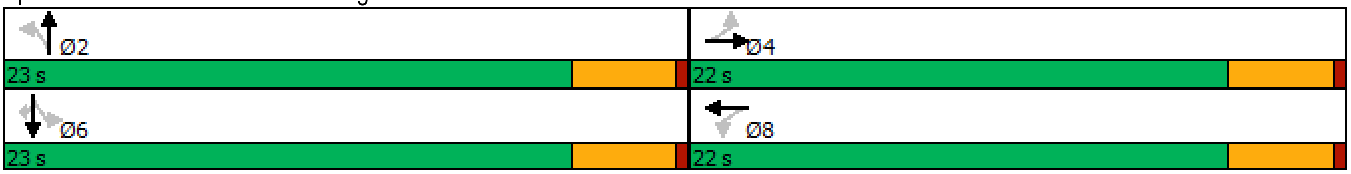
Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	14	62	27	54	2	72	288	144	35
Future Volume (vph)	14	62	27	54	2	72	288	144	35
Lane Group Flow (vph)	15	67	28	270	0	126	0	455	37
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	10.5	10.5	10.5	10.5		21.1		21.1	21.1
Actuated g/C Ratio	0.30	0.30	0.30	0.30		0.60		0.60	0.60
v/c Ratio	0.05	0.13	0.08	0.44		0.07		0.60	0.04
Control Delay	10.4	10.5	10.5	6.1		3.6		13.0	2.5
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	10.4	10.5	10.5	6.1		3.6		13.0	2.5
LOS	B	B	B	A		A		B	A
Approach Delay		10.5		6.5		3.6		12.2	
Approach LOS		B		A		A		B	
Queue Length 50th (m)	0.7	3.0	1.3	2.6		1.0		17.8	0.0
Queue Length 95th (m)	3.2	8.5	4.8	13.7		3.6		#58.3	2.5
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	475	907	648	905		1862		779	934
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.03	0.07	0.04	0.30		0.07		0.58	0.04

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 35.3	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 9.3	Intersection LOS: A
Intersection Capacity Utilization 54.3%	ICU Level of Service A
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	

Queue shown is maximum after two cycles.

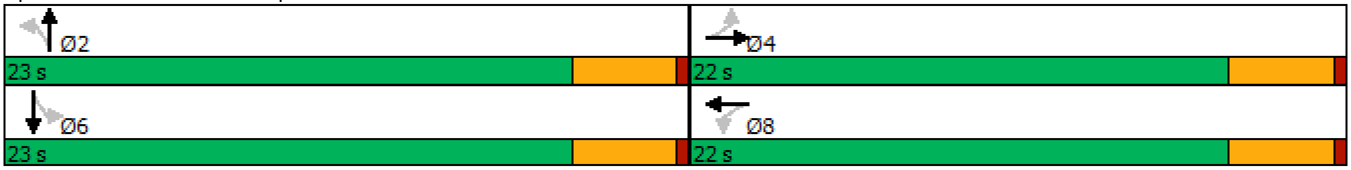
Splits and Phases: 2: Carmen Bergeron & Richelieu



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	128	69	30	44	180	194	41	159
Future Volume (vph)	128	69	30	44	180	194	41	159
Lane Group Flow (vph)	135	385	0	97	0	428	0	381
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.2	11.2		11.2		12.3		12.3
Actuated g/C Ratio	0.35	0.35		0.35		0.39		0.39
v/c Ratio	0.31	0.52		0.19		0.46		0.58
Control Delay	10.6	5.3		7.8		8.7		9.4
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	10.6	5.3		7.8		8.7		9.4
LOS	B	A		A		A		A
Approach Delay		6.7		7.8		8.7		9.4
Approach LOS		A		A		A		A
Queue Length 50th (m)	3.9	2.0		2.1		6.3		8.2
Queue Length 95th (m)	15.8	16.4		10.4		17.2		28.4
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	713	1032		835		1456		979
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.19	0.37		0.12		0.29		0.39

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 31.7	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 76.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	407	467
Future Volume (vph)	54	407	467
Lane Group Flow (vph)	111	496	511
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 44.6%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	407	467	18
Future Volume (Veh/h)	54	51	65	407	467	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	68	428	492	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	852	256	511			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	852	256	511			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	93	94			
cM capacity (veh/h)	280	744	1050			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	211	285	328	183
Volume Left	57	68	0	0	0
Volume Right	54	0	0	0	19
cSH	401	1050	1700	1700	1700
Volume to Capacity	0.28	0.06	0.17	0.19	0.11
Queue Length 95th (m)	8.3	1.6	0.0	0.0	0.0
Control Delay (s)	17.4	3.2	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.4	1.4		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT	Ø2	Ø5
Lane Configurations	↑↑	↑↑		
Traffic Volume (vph)	5410	3283		
Future Volume (vph)	5410	3283		
Lane Group Flow (vph)	6011	3648		
Turn Type	NA	NA		
Protected Phases	4	8	2	5
Permitted Phases				
Detector Phase	4	8		
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	15%	15%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		
Total Lost Time (s)	4.0	4.0		
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max
Act Effct Green (s)	124.0	124.0		
Actuated g/C Ratio	0.83	0.83		
v/c Ratio	2.39	1.45		
Control Delay	644.9	224.8		
Queue Delay	0.0	0.0		
Total Delay	644.9	224.8		
LOS	F	F		
Approach Delay	644.9	224.8		
Approach LOS	F	F		
Queue Length 50th (m)	~1522.9	~766.1		
Queue Length 95th (m)	#1510.4	#789.7		
Internal Link Dist (m)	116.5	194.0		
Turn Bay Length (m)				
Base Capacity (vph)	2512	2512		
Starvation Cap Reductn	0	0		
Spillback Cap Reductn	0	0		
Storage Cap Reductn	0	0		
Reduced v/c Ratio	2.39	1.45		

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 2.39	
Intersection Signal Delay: 486.2	Intersection LOS: F
Intersection Capacity Utilization 175.5%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Appendix D

Roundabout Feasibility
Screening Tool

City of Ottawa
Roundabout Initial Feasibility Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 1
2	Intersection:	Street 1 / Street 2
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control.	4-legged intersection Estimated intersection AADT of 29,000 Approximately 250 m south of CR-17
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Two circulating lanes, two entry and exit lanes for all approaches
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

7 Are there contra-indications for a roundabout?

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a roundabout is not possible, just that there may be difficulties or high costs.

No.	Contra-Indication	Outcome	
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐	No ☑
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐	No ☑
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome	
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1injury crash per 1 million vehicles entering (MVE)?	Yes ☐	No ☑
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐	No ☑
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with two circulating lanes, two entry and exit lanes for all approaches is sufficient for the projected trip generation of Land-Use Option 1.

City of Ottawa
Roundabout Initial Feasibility Screening Tool

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 1
2	Intersection:	Street 1 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged ‘T’ intersection Estimated intersection AADT of 11,500 Approximately 450 m south of CR-17
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Two circulating lanes, two entry and exit lanes for all approaches.
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

7 Are there contra-indications for a roundabout?

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1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐	No ☑
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐	No ☑
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

8 Are there suitability factors for a roundabout?

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No.	Suitability Factor	Outcome	
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1injury crash per 1 million vehicles entering (MVE)?	Yes ☐	No ☑
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐	No ☑
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with two circulating lanes, two entry and exit lanes for all approaches is sufficient for the projected trip generation of Land-Use Option 1.

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 1
2	Intersection:	Street 4 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged 'T' intersection Estimated intersection AADT of 12,000 Approximately 300 m west of Poupart Road
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Double circulating lane with single lane entry and single lane exit on the North approach and two entry and exit lanes for the E/W approaches.
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

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3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

8 Are there suitability factors for a roundabout?

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No.	Suitability Factor	Outcome	
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1injury crash per 1 million vehicles entering (MVE)?	Yes ☐	No ☑
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐	No ☑
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with double circulating lanes and single lane entry/exit on the North approach and two entry and exit lanes for the E/W approaches is sufficient for the projected trip generation of Land-Use Option 1.

City of Ottawa
Roundabout Initial Feasibility Screening Tool

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 1
2	Intersection:	Street 4 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged 'T' intersection Estimated intersection AADT of 11,500 Where Poupart turns from an E/W roadway to a N/S roadway
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Double circulating lane with single lane entry and single lane exit on the North approach and two entry and exit lanes for the E/W approaches.
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

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1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐	No ☑
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐	No ☑
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☐	No ☑
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome	
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1injury crash per 1 million vehicles entering (MVE)?	Yes ☐	No ☑
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐	No ☑
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with double circulating lanes and single lane entry/exit on the North approach and two entry and exit lanes for the E/W approaches is sufficient for the projected trip generation of Land-Use Option 1.

City of Ottawa
Roundabout Initial Feasibility Screening Tool

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 3
2	Intersection:	Street 1 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged ‘T’ intersection Estimated intersection AADT of 4,000 Approximately 450 m south of CR-17
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Two circulating lanes, two entry and exit lanes for all approaches. .
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

7 Are there contra-indications for a roundabout?

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No.	Contra-Indication	Outcome	
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐	No ☑
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐	No ☑
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection.

No.	Suitability Factor	Outcome	
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1injury crash per 1 million vehicles entering (MVE)?	Yes ☐	No ☑
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐	No ☑
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with two circulating lanes, two entry and exit lanes for all approaches is sufficient for the projected trip generation of Land-Use Option 3.

City of Ottawa
Roundabout Initial Feasibility Screening Tool

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 3
2	Intersection:	Street 1 / Street 2
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control.	4-legged intersection Estimated intersection AADT of 7,000 Approximately 250 m south of CR-17
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Movement control for a new intersection.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet.	Two circulating lanes, two entry and exit lanes for all approaches
6	Why is a roundabout being considered?	To remain consistent with other major intersections within Clarence-Rockland.

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No.	Contra-Indication	Outcome	
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐	No ☑
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐	No ☑
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 3
2	Intersection:	Street 4 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged 'T' intersection Estimated intersection AADT of 3,000 Approximately 300 m west of Poupart Road
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4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☑	No ☐
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1	Project Name:	Rockland Secondary Plan Land-Use Concept Option 3
2	Intersection:	Street 4 / Street 3
3	Location and Description of Intersection: Lane configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection, then indicate type of control.	3-legged 'T' intersection Estimated intersection AADT of 2,500 Where Poupart turns from an E/W roadway to a N/S roadway
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3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐	No ☑
4	Is the intersection located within a coordinated signal system?	Yes ☐	No ☑
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐	No ☑
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☐	No ☑
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐	No ☑

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3	Are capacity problems currently being experienced, or expected in the future?	Yes ☑	No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☑	No ☐
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐	No ☑
6	Will planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐	No ☑
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☑	No ☐

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	Based on the contra-indicators and suitability factors, a roundabout is feasible at this location. SIDRA analysis indicates a roundabout with double circulating lanes and single lane entry/exit on the North approach and two entry and exit lanes for the E/W approaches is sufficient for the projected trip generation of Land-Use Option 3.

Appendix E

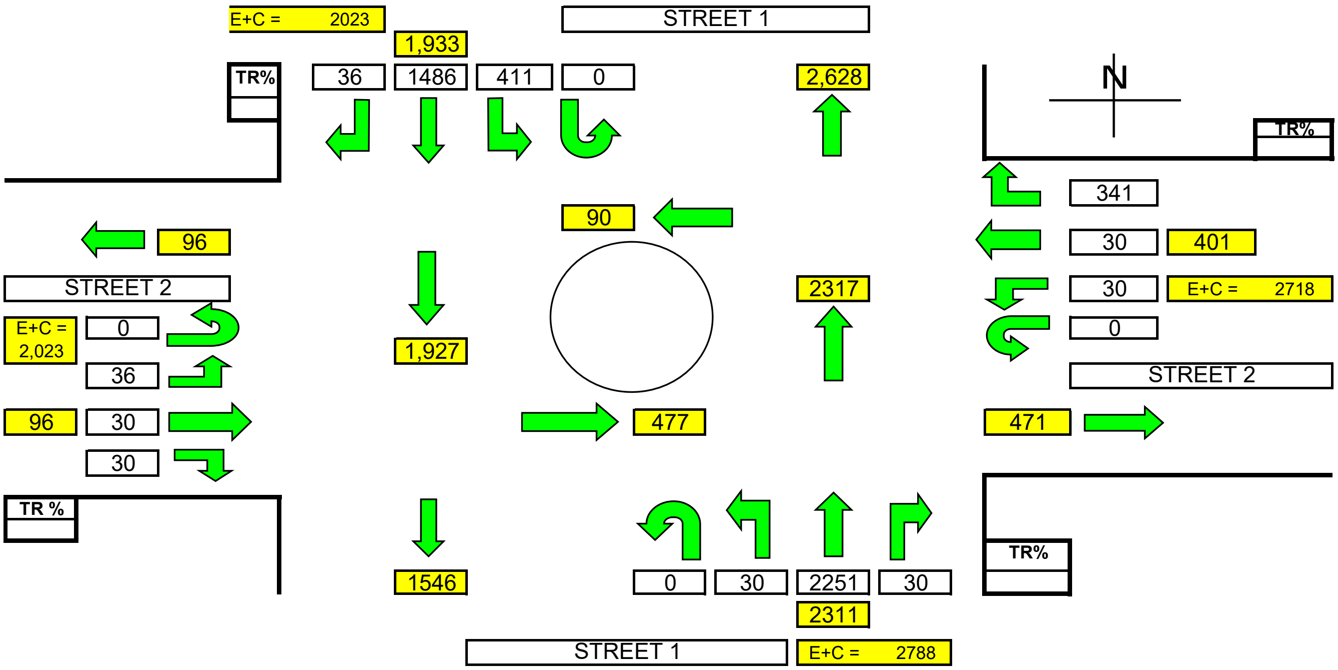
Roundabout Traffic Flow Sheets

REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 2 OPT1
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 1 **of** 8

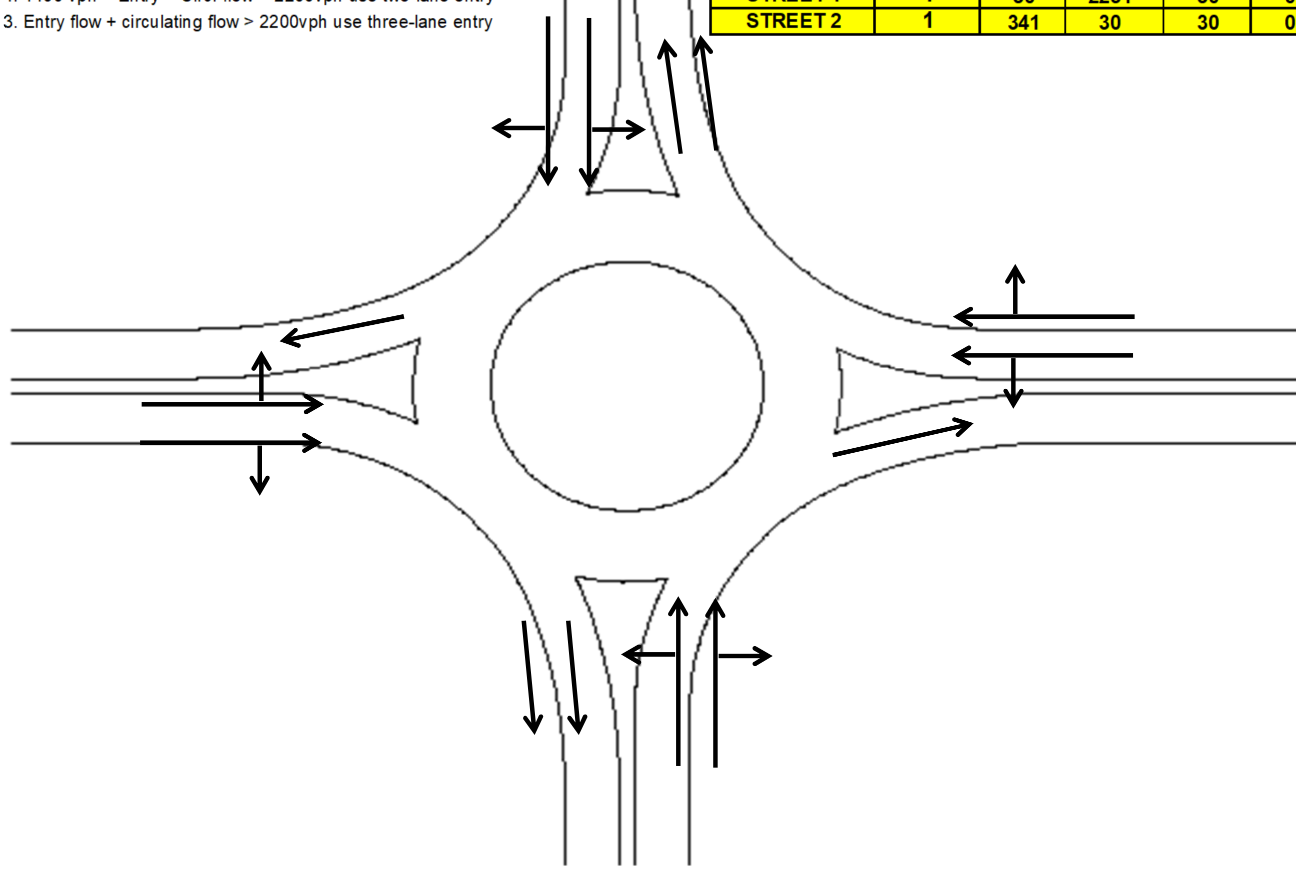


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	36	1486	411	0
STREET 2	1	30	30	36	0
STREET 1	1	30	2251	30	0
STREET 2	1	341	30	30	0

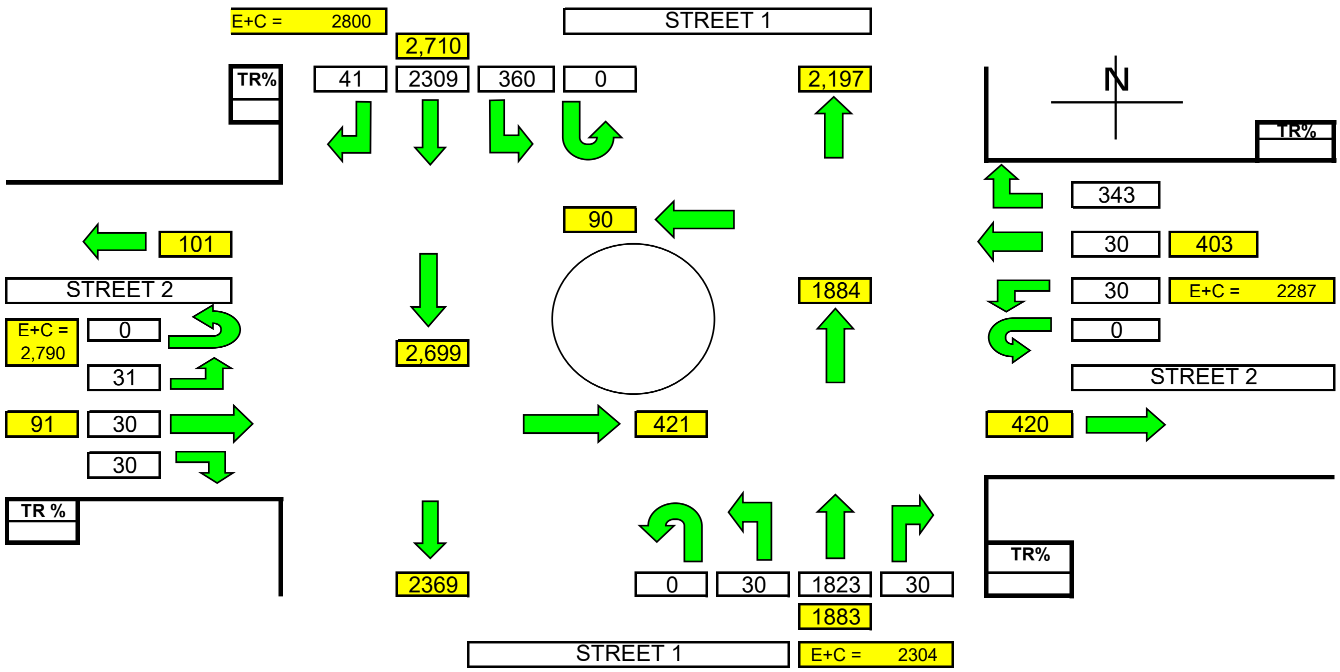


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 2 OPT1
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 2 of 8



Capacity Guidelines

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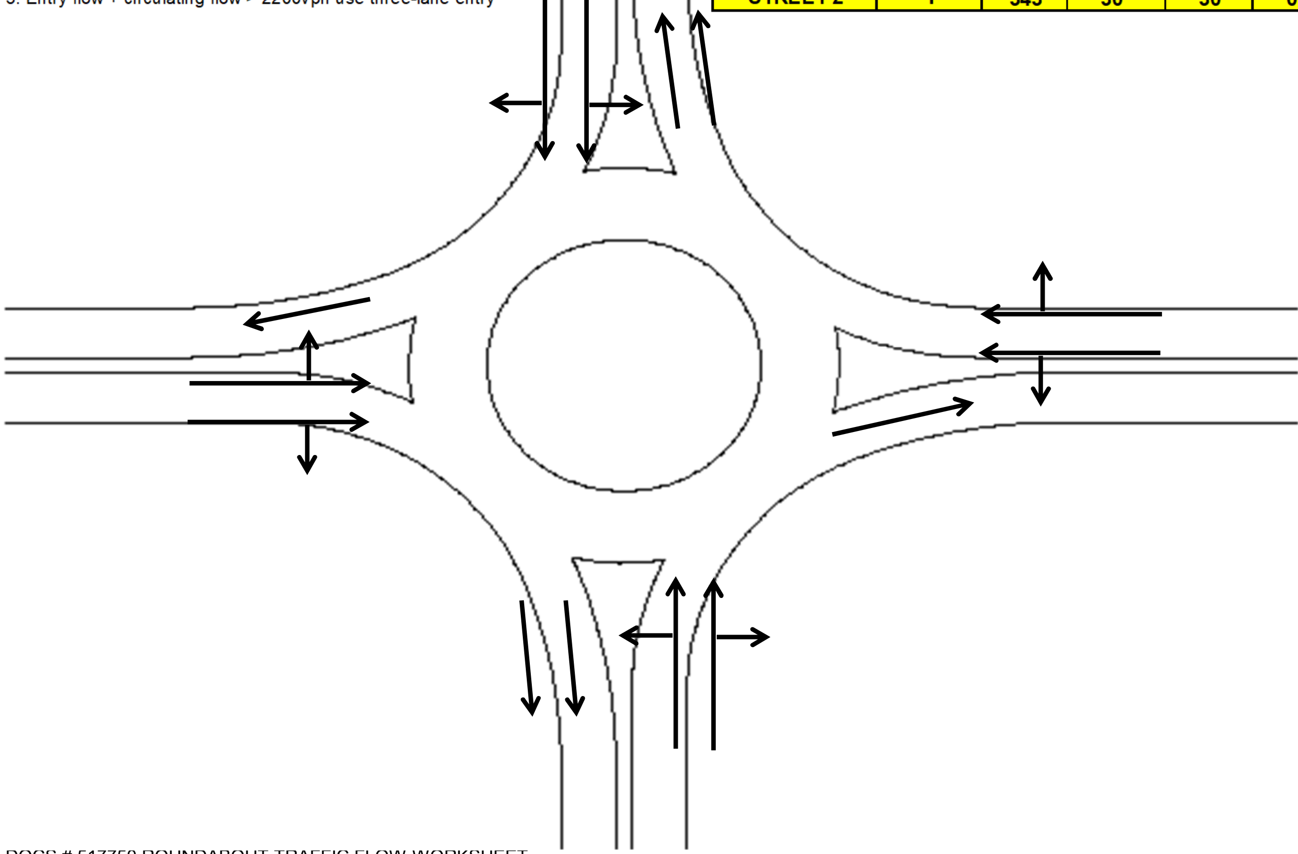
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	41	2309	360	0
STREET 2	1	30	30	31	0
STREET 1	1	30	1823	30	0
STREET 2	1	343	30	30	0

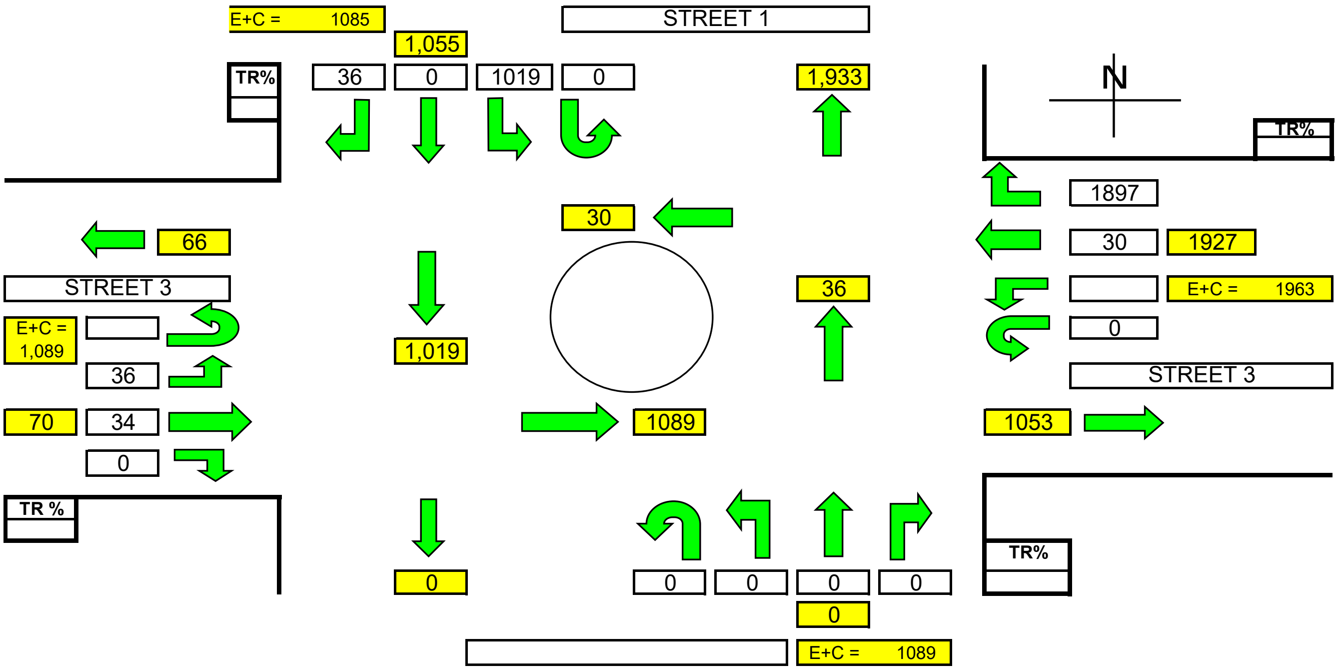


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 3 OPT1
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 3 **of** 8

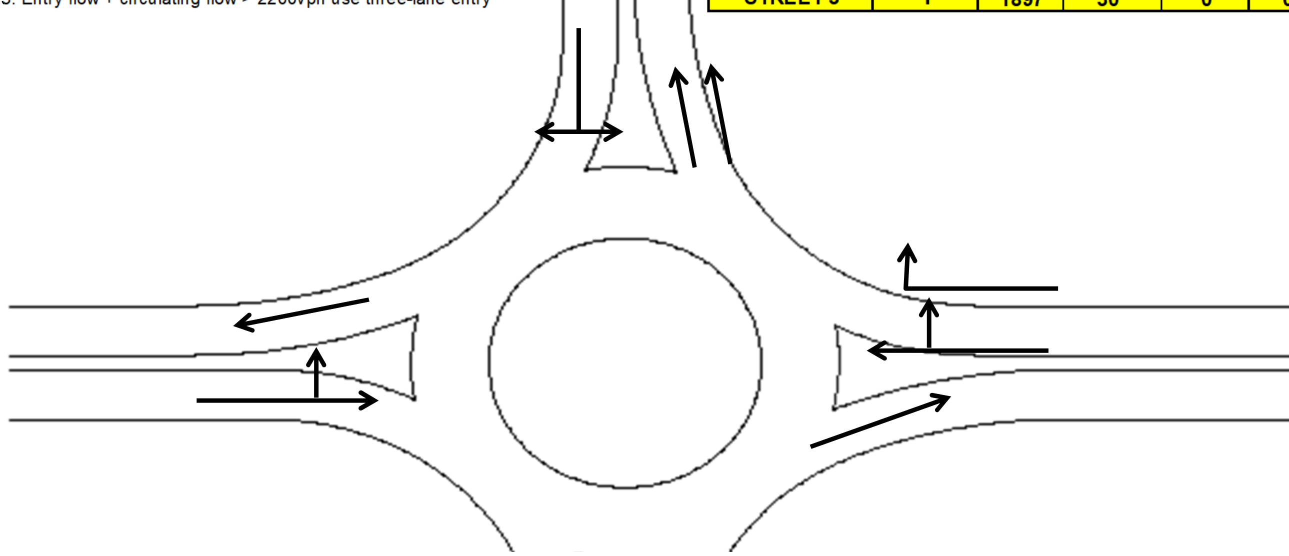


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	36	0	1019	0
STREET 3	1	0	34	36	0
0	1	0	0	0	0
STREET 3	1	1897	30	0	0

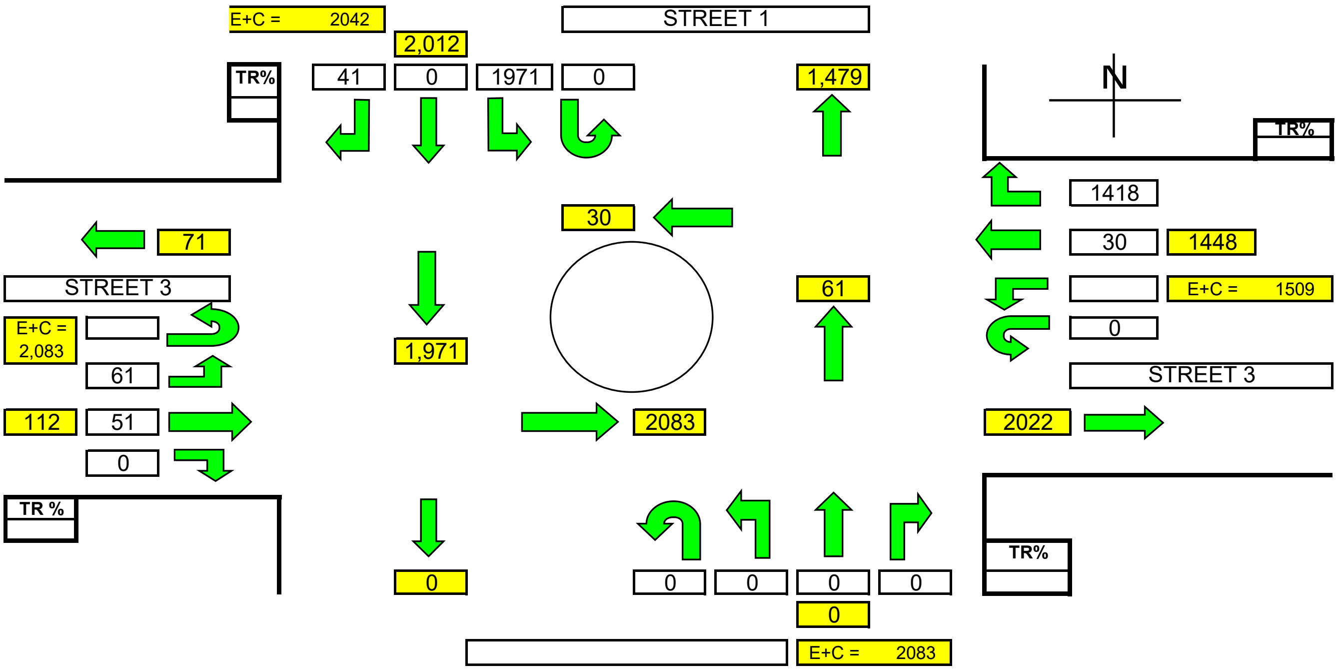


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 3 OPT1
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 4 **of** 8

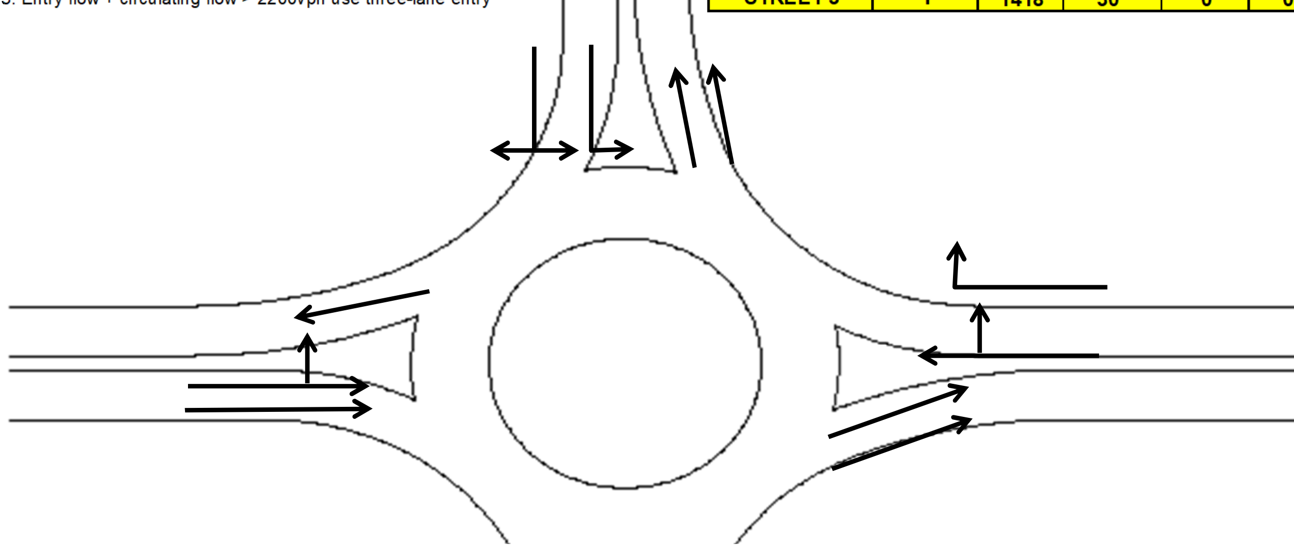


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	41	0	1971	0
STREET 3	1	0	51	61	0
0	1	0	0	0	0
STREET 3	1	1418	30	0	0



DOCS # 517750 ROUNDABOUT TRAFFIC FLOW WORKSHEET

REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan

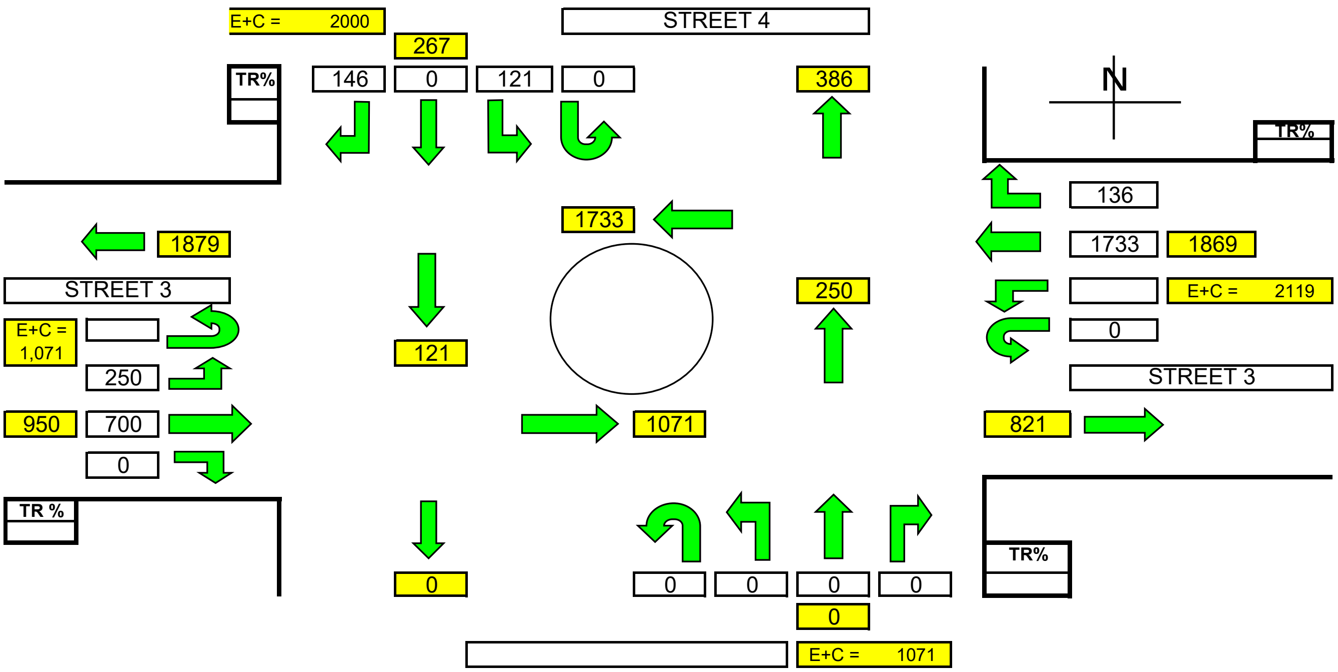
Project No.: 31097

Intersection: STREET 4/STREET 3 OPT1

Time Period: **AM**/PM PEAK

Drawn By: BD

Sheet 5 of 8

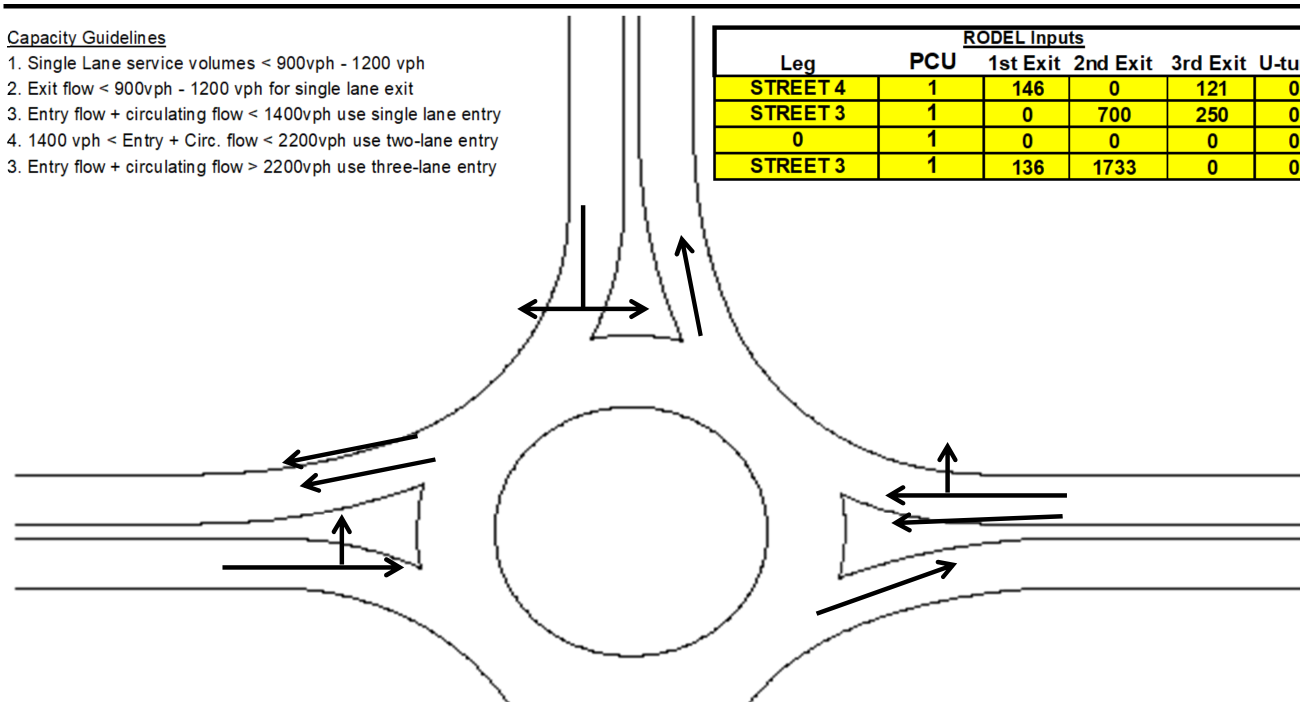


<u>Capacity Guidelines</u>

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

<u>RODEL Inputs</u>

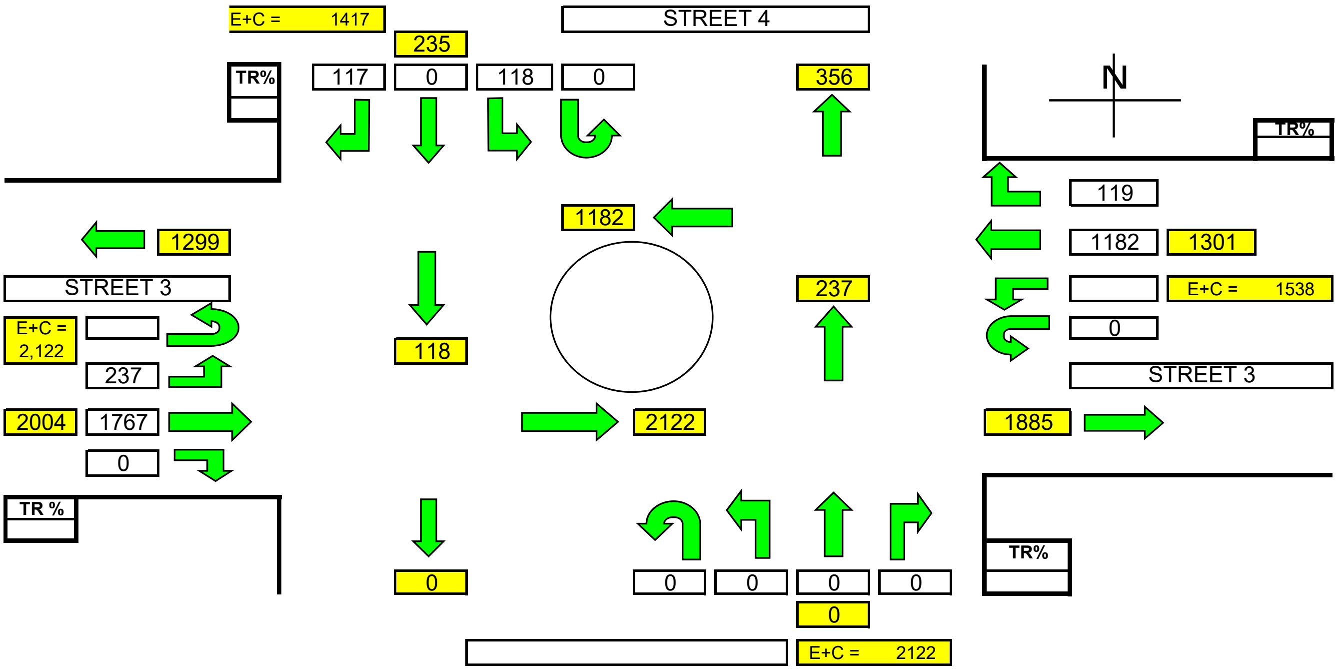
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 4	1	146	0	121	0
STREET 3	1	0	700	250	0
0	1	0	0	0	0
STREET 3	1	136	1733	0	0



REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 4/STREET 3 OPT1
Time Period: AM/PM PEAK
Drawn By: BD
Sheet 6 **of** 8

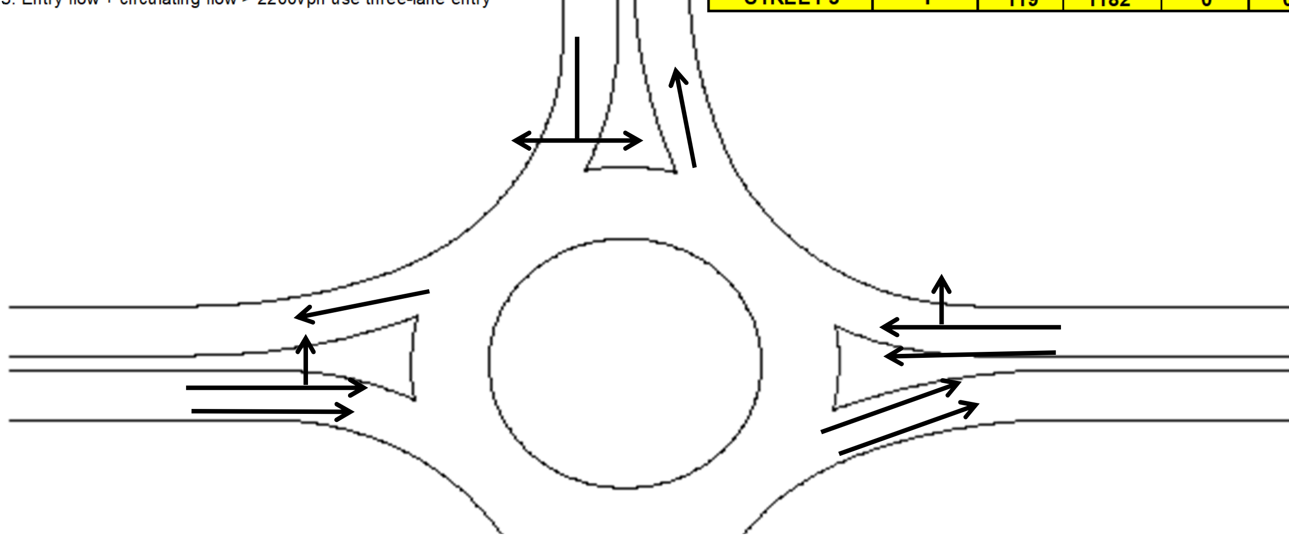


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 4	1	117	0	118	0
STREET 3	1	0	1767	237	0
0	1	0	0	0	0
STREET 3	1	119	1182	0	0

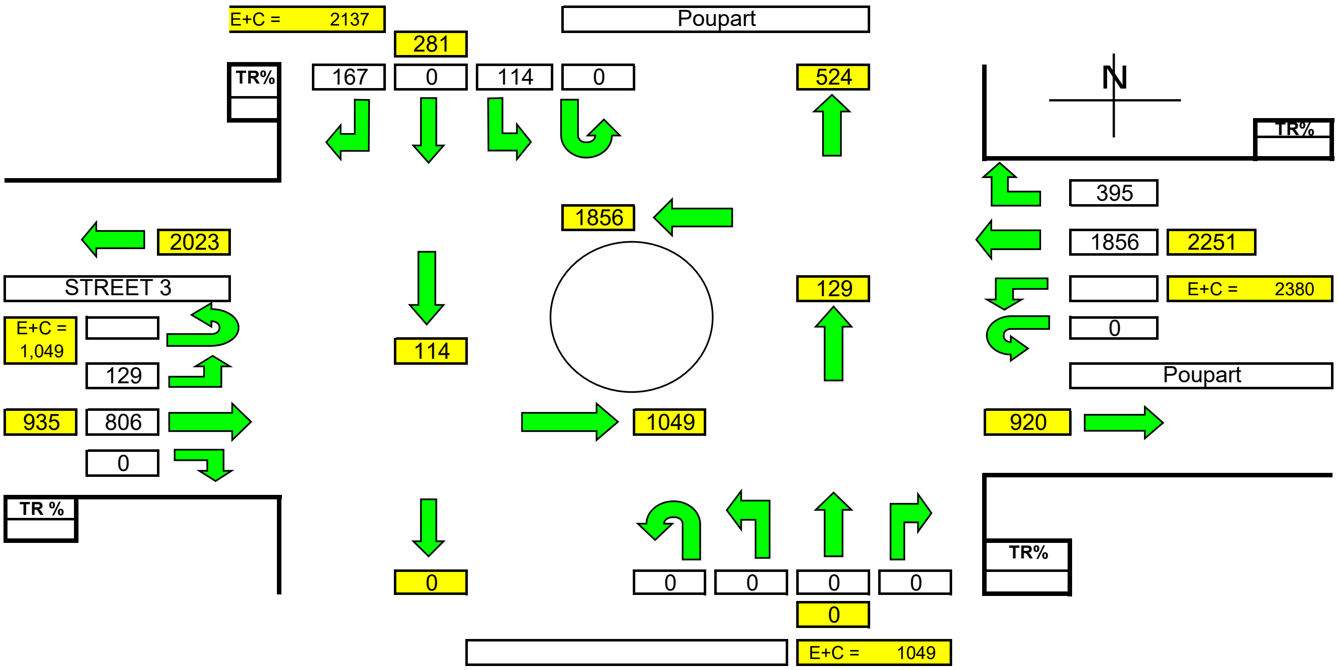


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: Poupart/STREET 3 OPT1
Time Period: **AM**/PM PEAK

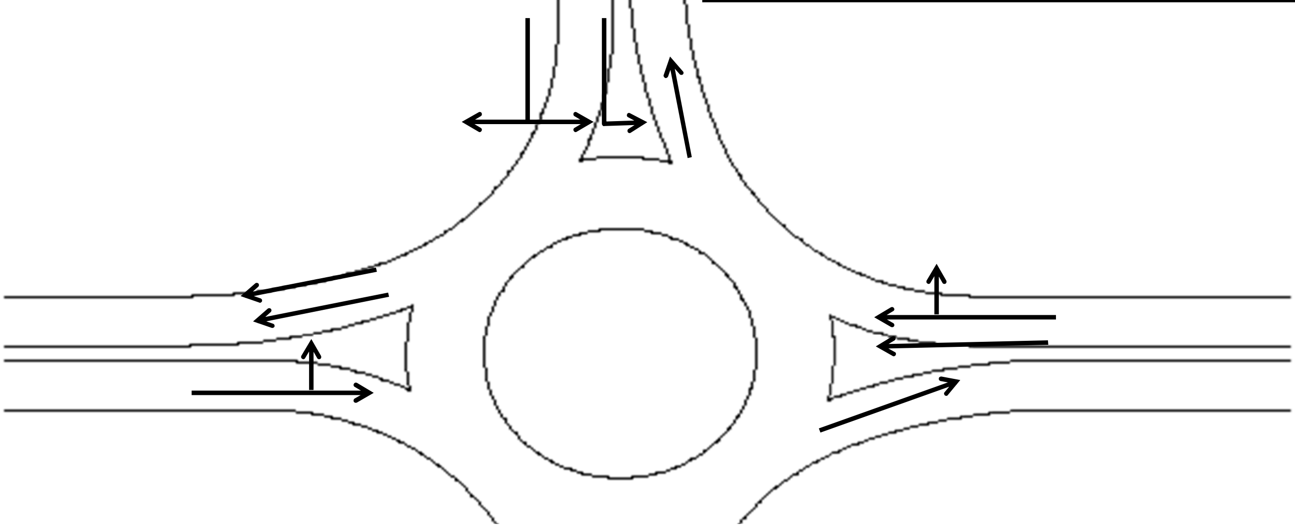
Drawn By: BD
Sheet 7 **of** 8



Capacity Guidelines
1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Poupart	1	167	0	114	0
STREET 3	1	0	806	129	0
0	1	0	0	0	0
Poupart	1	395	1856	0	0

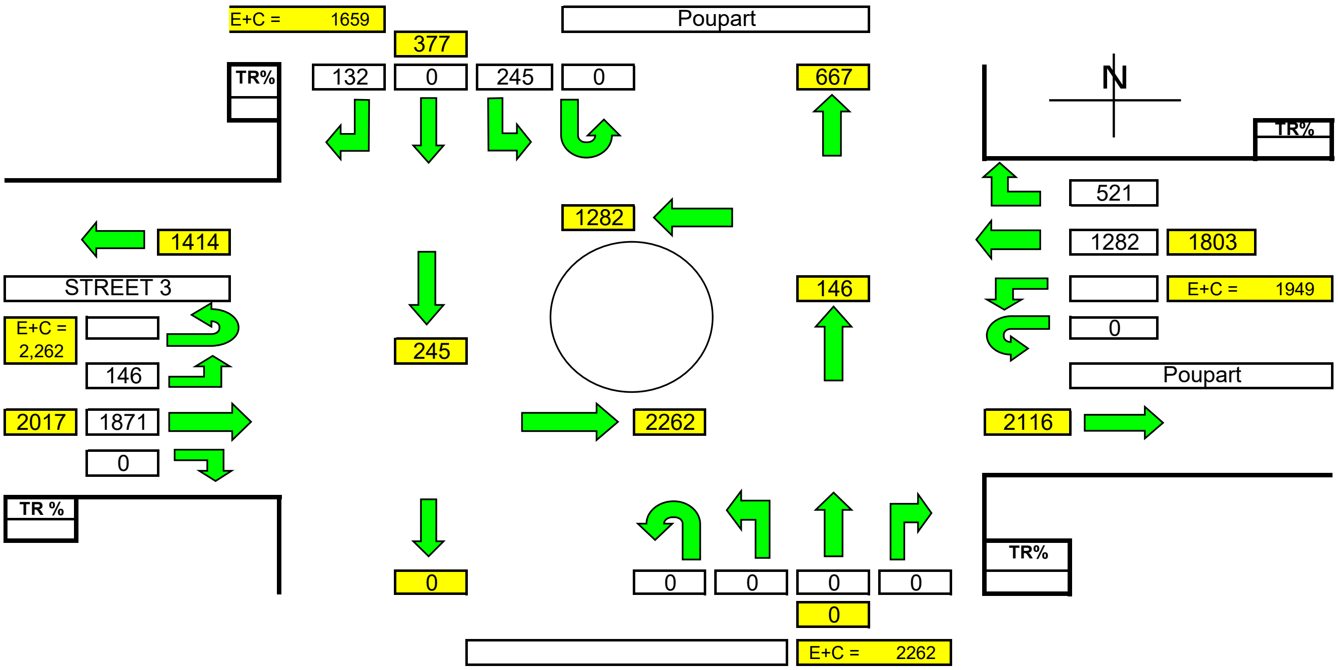


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: Poupart/STREET 3 OPT1
Time Period: AM/PM PEAK

Drawn By: RN
Sheet 8 **of** 8

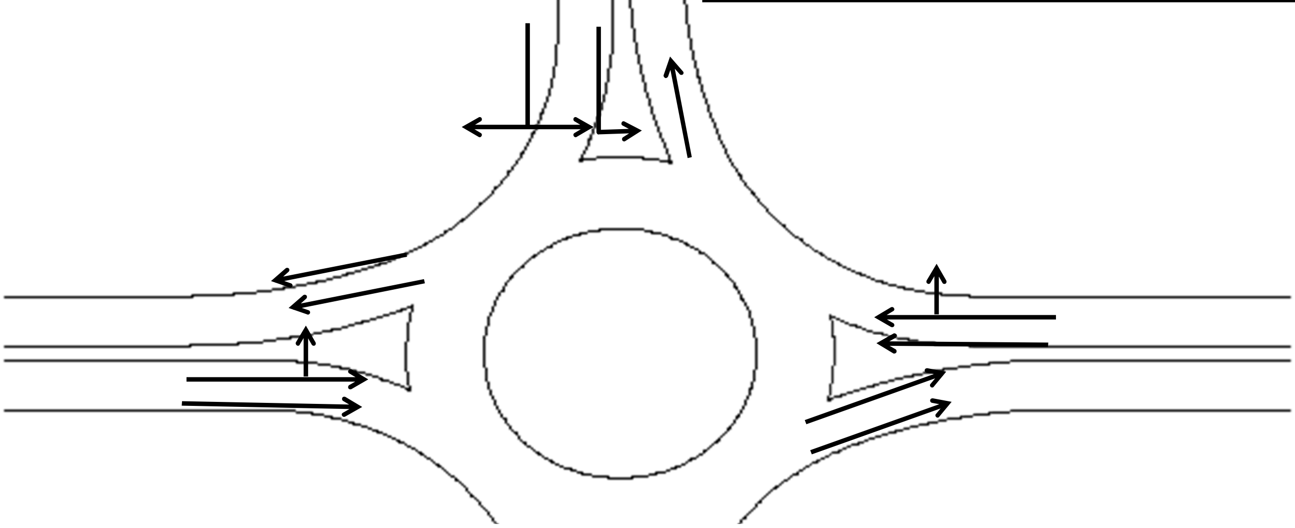


Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Poupart	1	132	0	245	0
STREET 3	1	0	1871	146	0
0	1	0	0	0	0
Poupart	1	521	1282	0	0

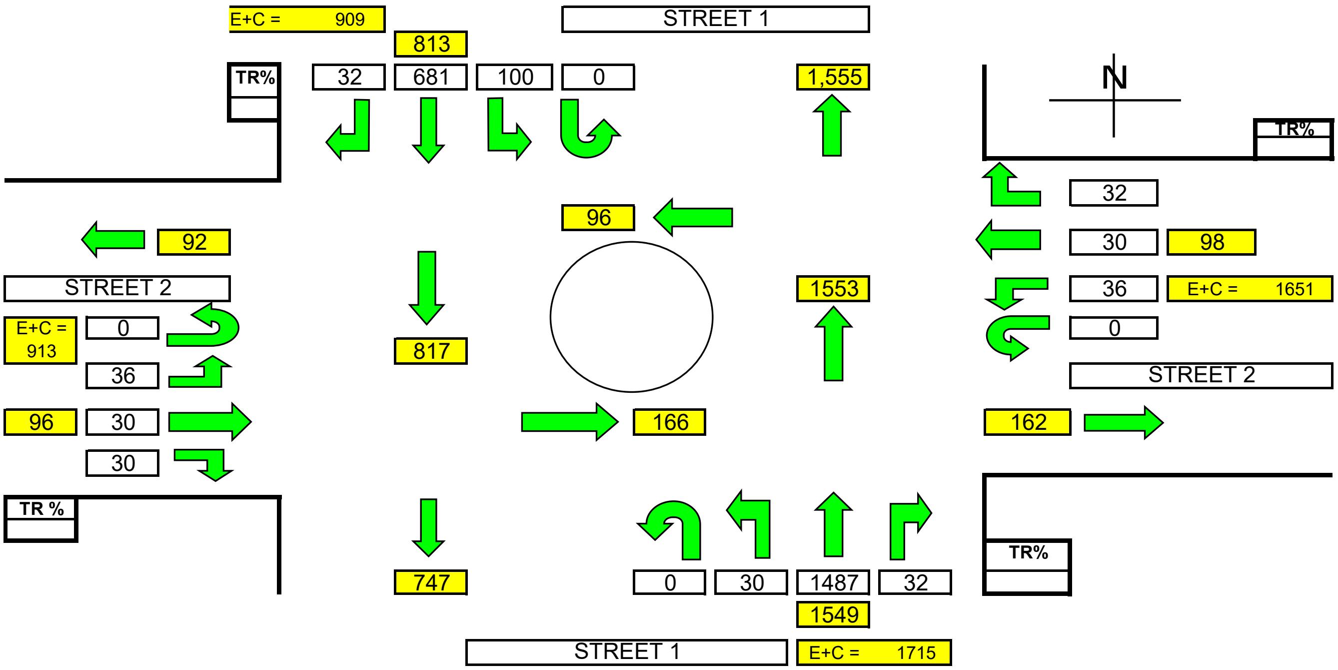


REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 2 OPT3
Time Period: **AM**/PM PEAK

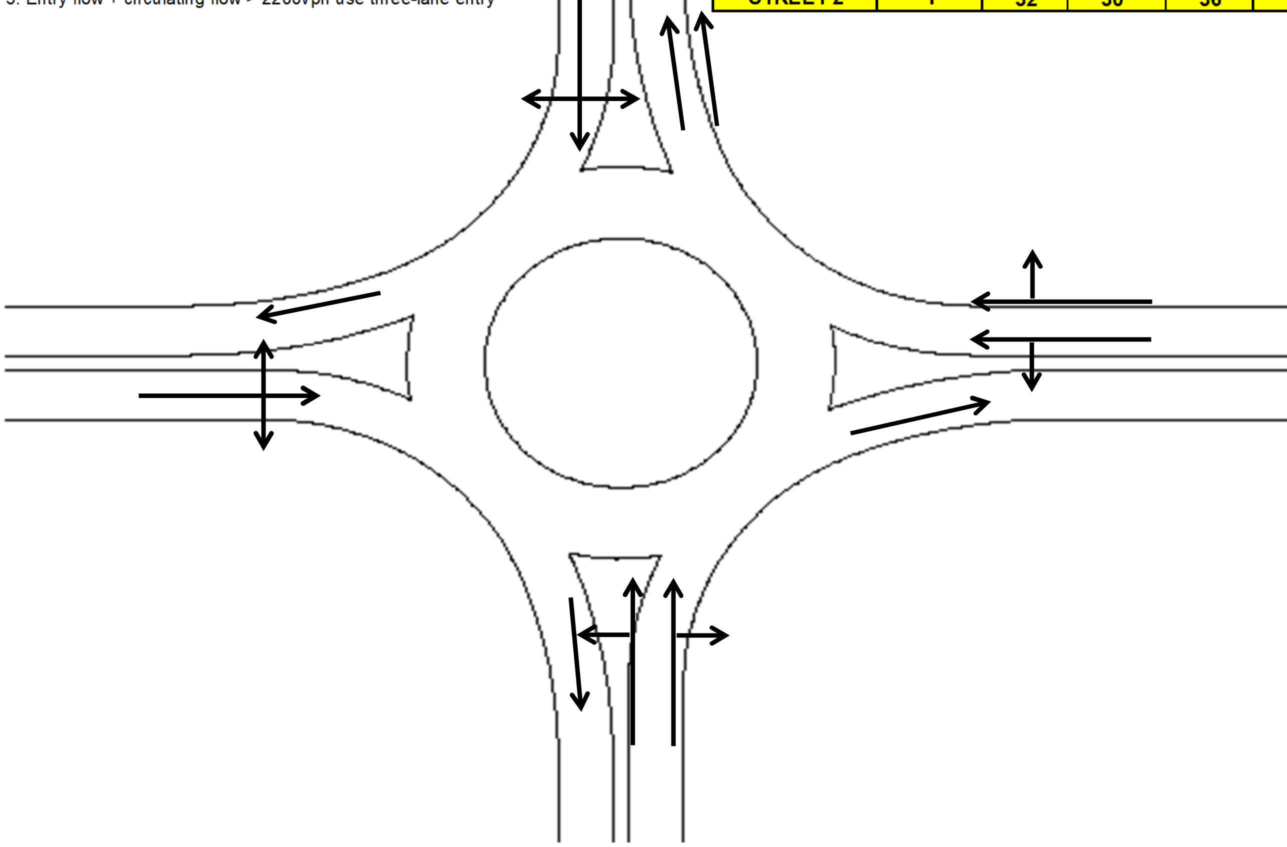
Drawn By: BD
Sheet 1 **of** 8



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs					
Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	32	681	100	0
STREET 2	1	30	30	36	0
STREET 1	1	32	1487	30	0
STREET 2	1	32	30	36	0



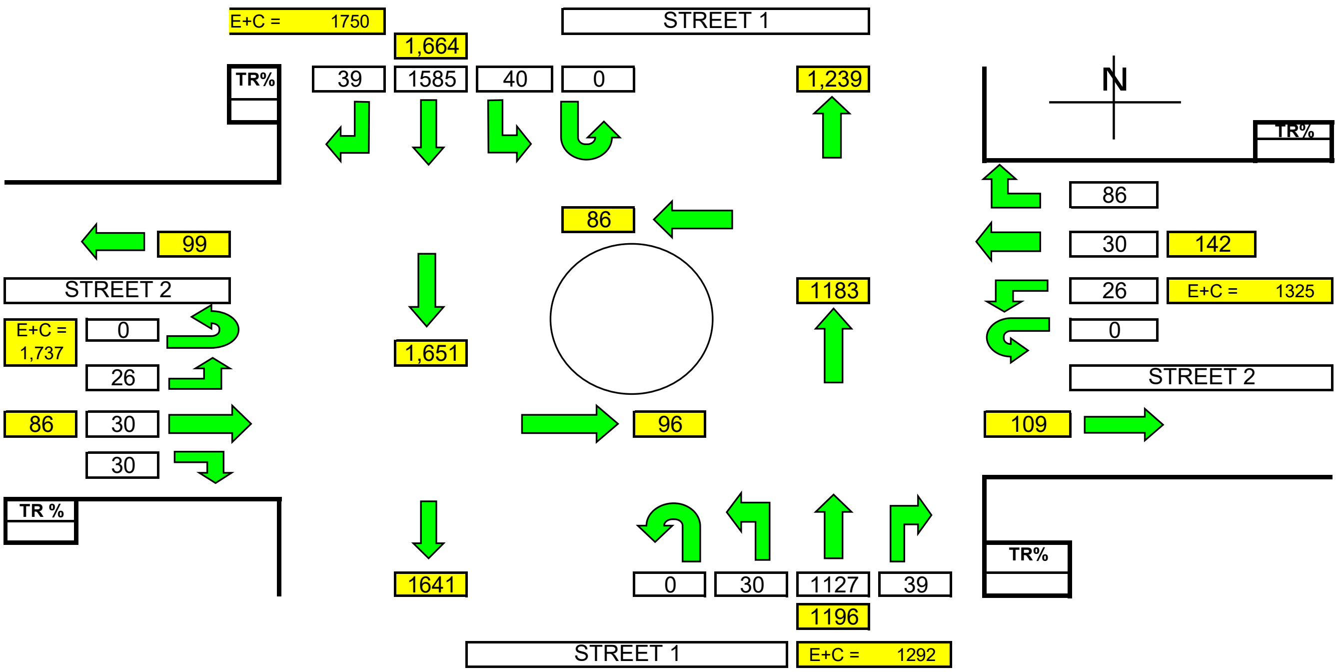
DOCS # 517750 ROUNDABOUT TRAFFIC FLOW WORKSHEET

REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 2 OPT3
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 2 **of** 8



Capacity Guidelines

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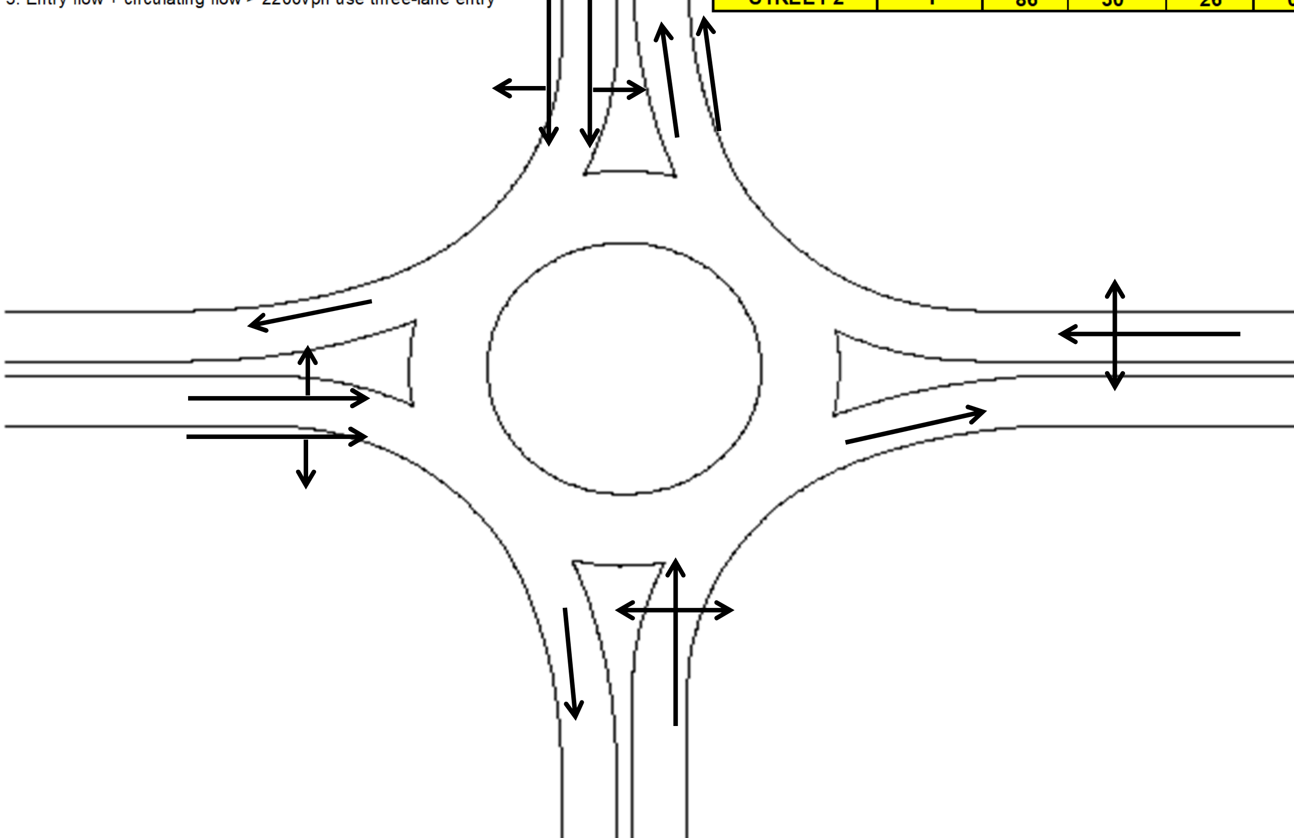
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	39	1585	40	0
STREET 2	1	30	30	26	0
STREET 1	1	39	1127	30	0
STREET 2	1	86	30	26	0

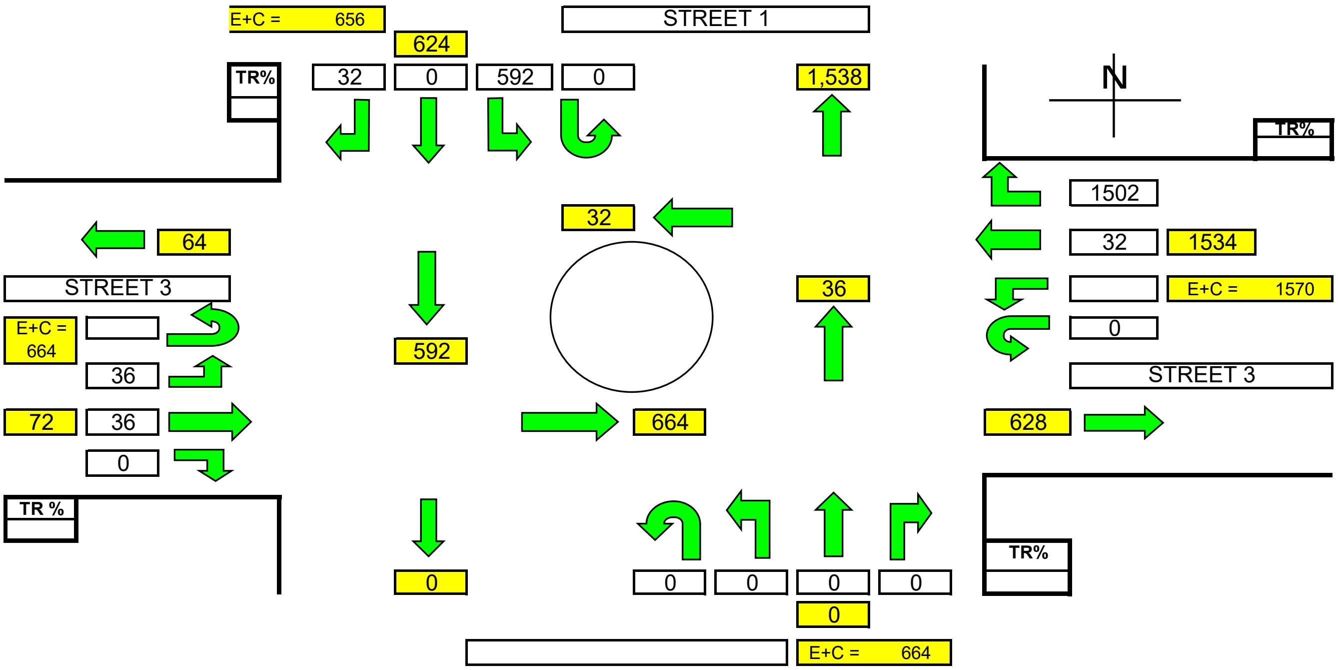


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 3 OPT3
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 3 **of** 8



Capacity Guidelines

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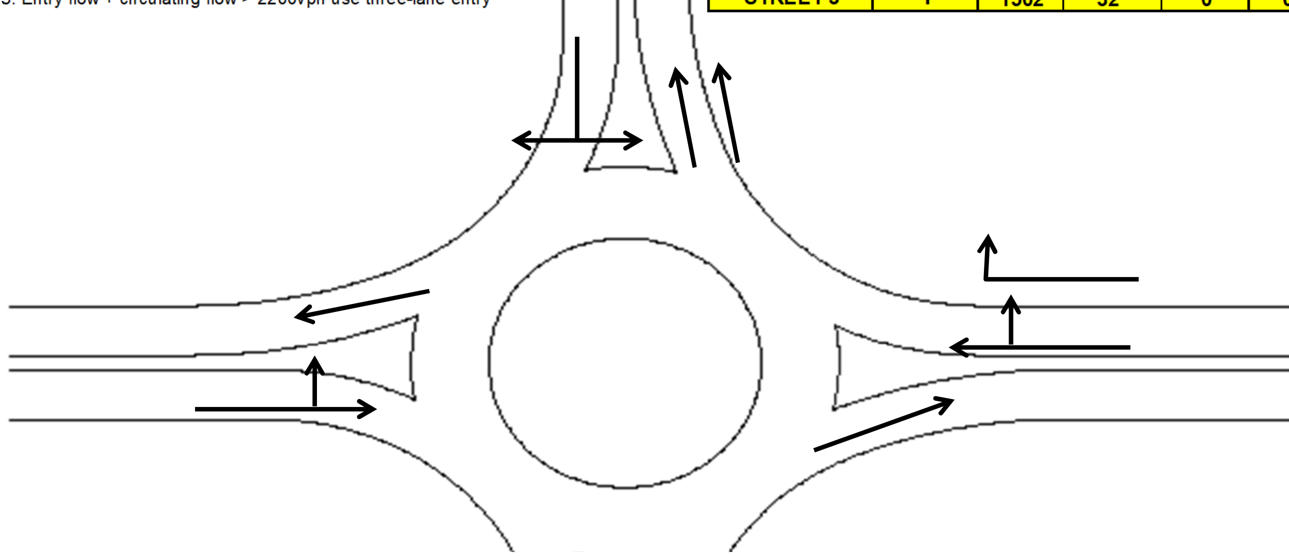
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	32	0	592	0
STREET 3	1	0	36	36	0
0	1	0	0	0	0
STREET 3	1	1502	32	0	0

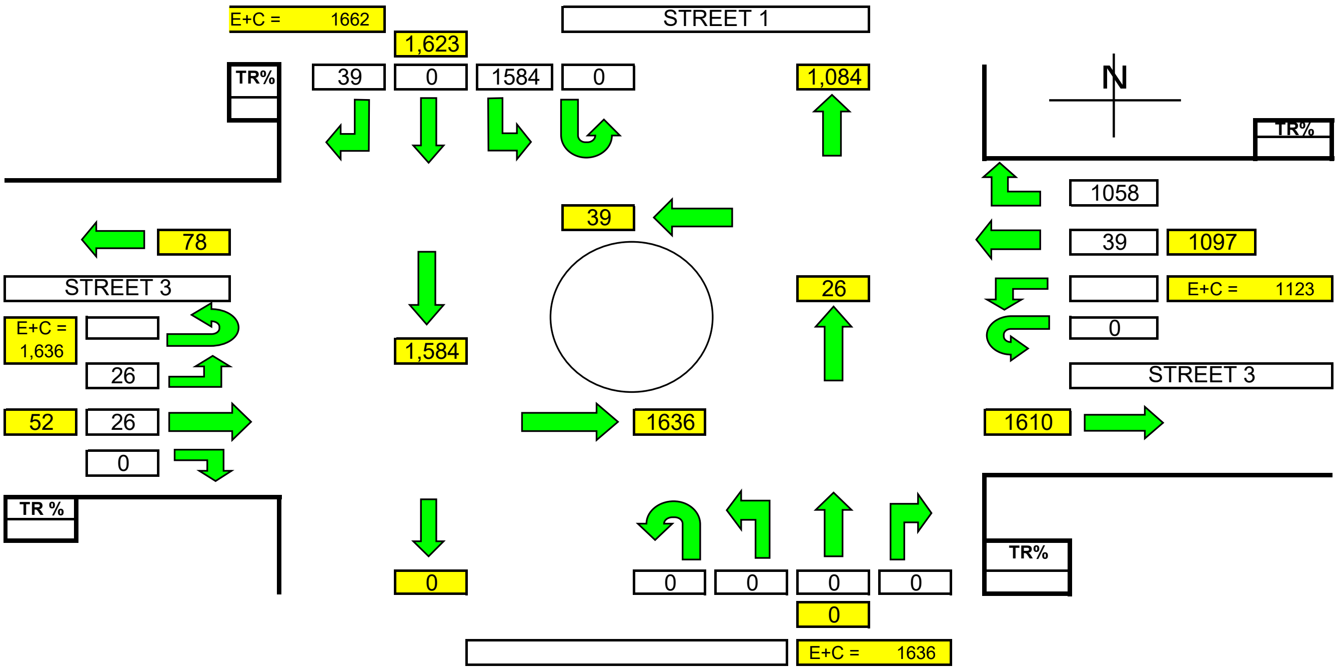


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 1/STREET 3 OPT3
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 4 **of** 8



Capacity Guidelines

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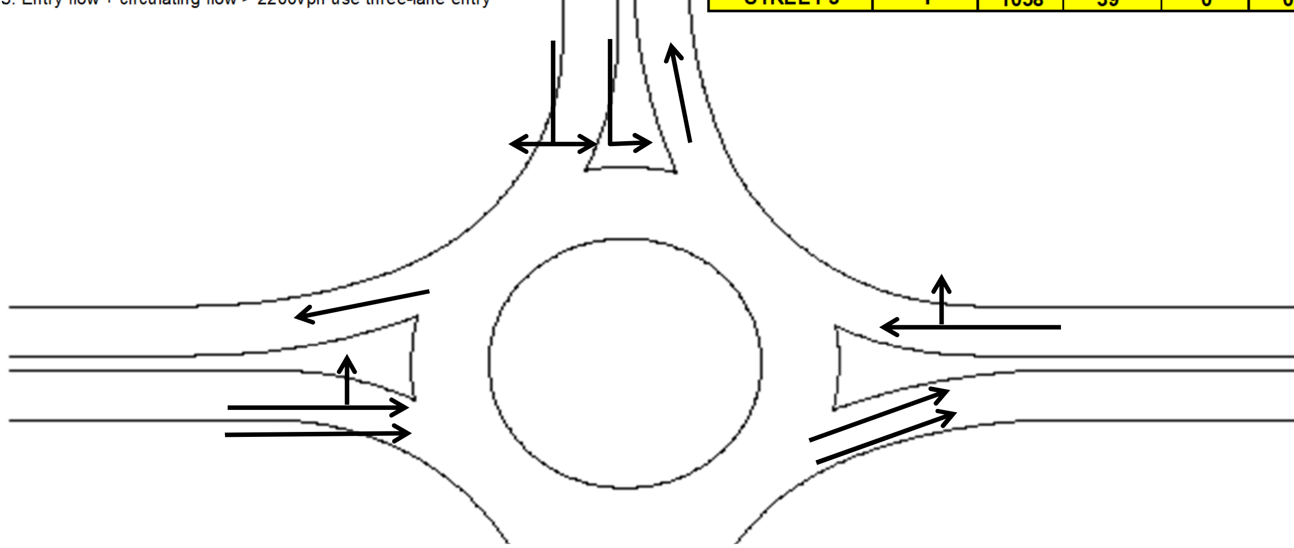
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 1	1	39	0	1584	0
STREET 3	1	0	26	26	0
0	1	0	0	0	0
STREET 3	1	1058	39	0	0

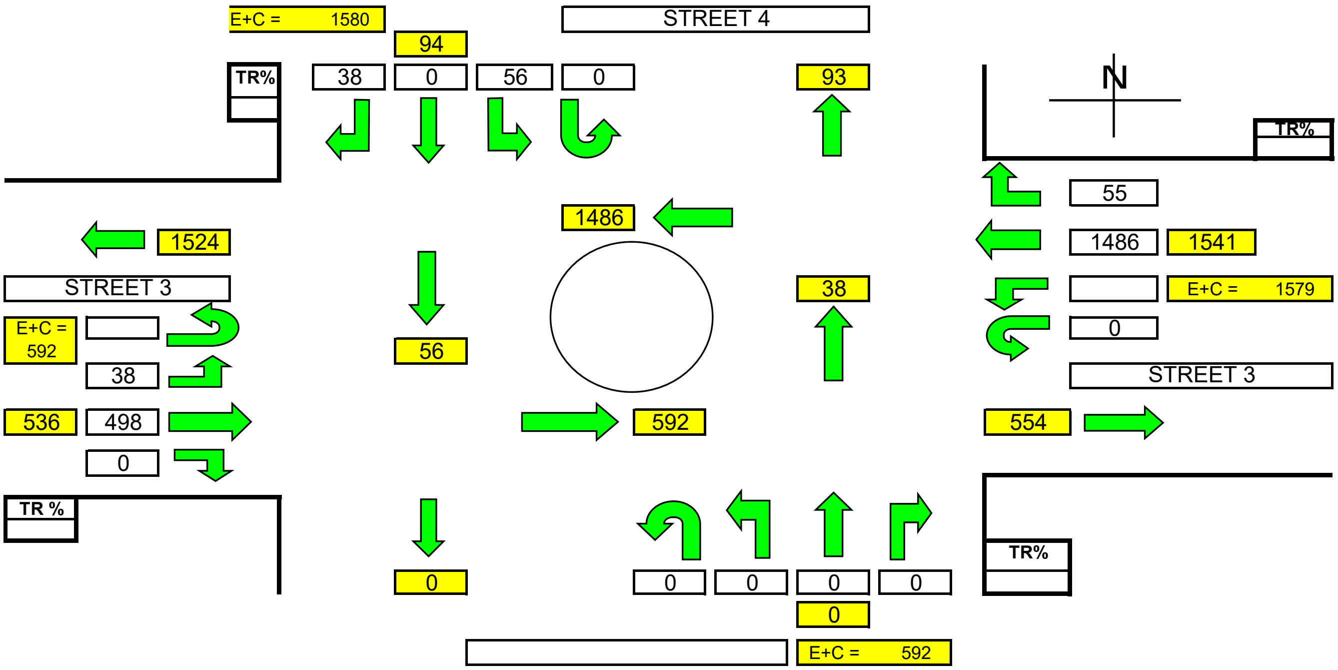


REGION OF WATERLOO
ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 4/STREET 3 OPT3
Time Period: **AM**/PM PEAK

Drawn By: BD
Sheet 5 of 8



Capacity Guidelines

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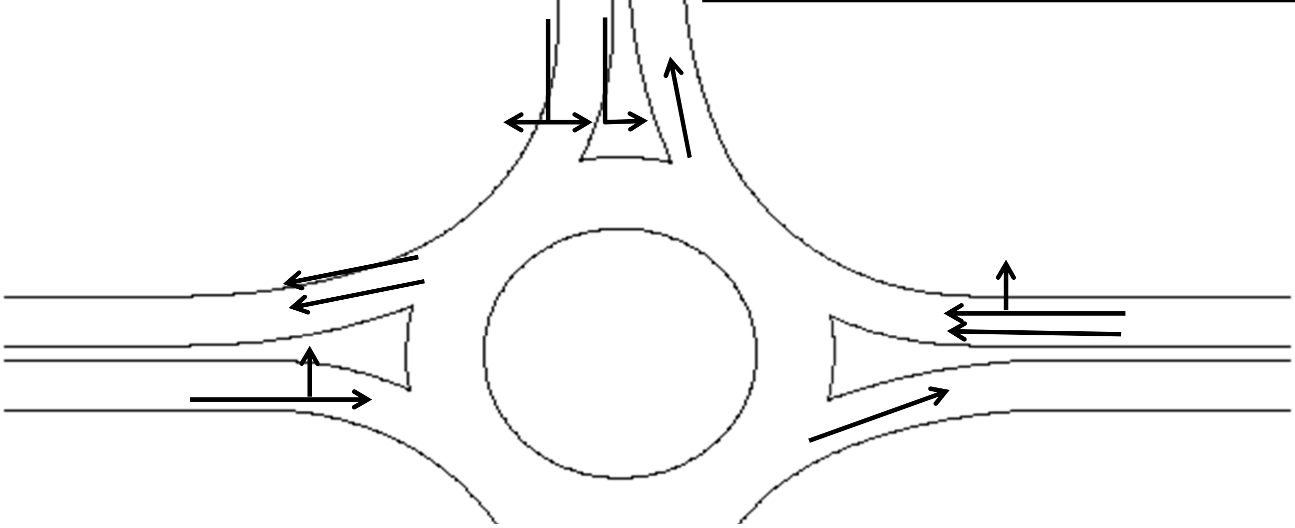
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 4	1	38	0	56	0
STREET 3	1	0	498	38	0
0	1	0	0	0	0
STREET 3	1	55	1486	0	0

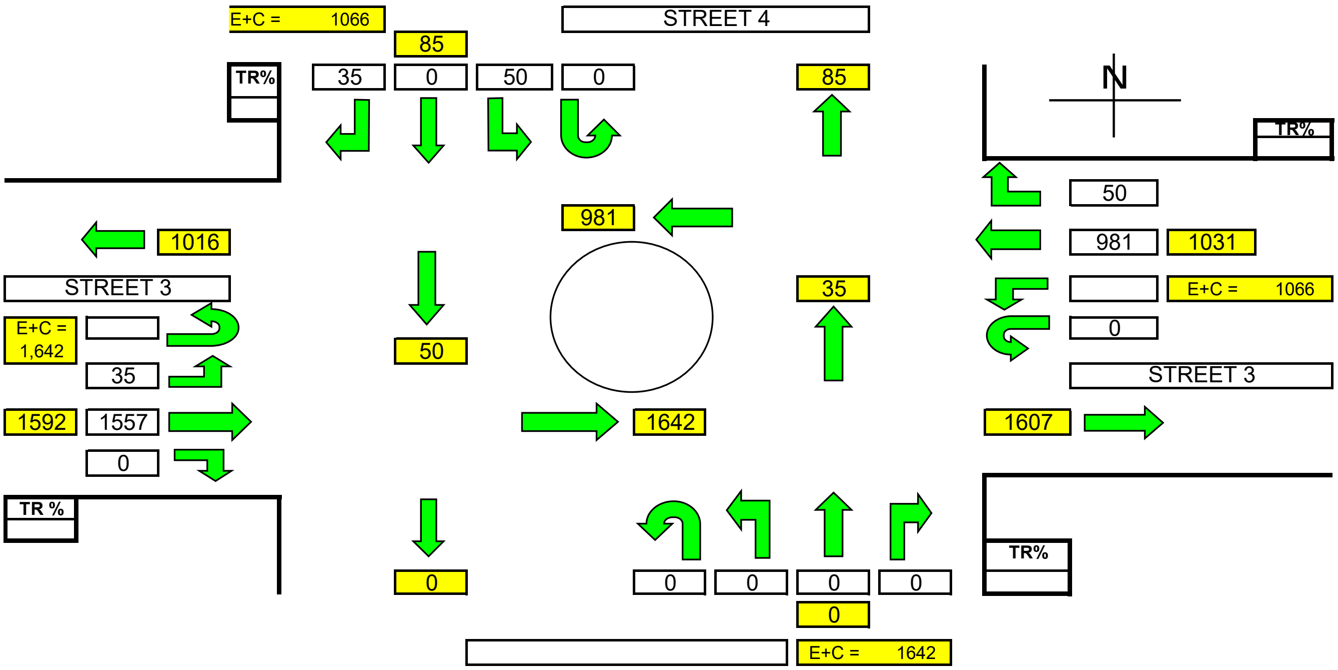


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: STREET 4/STREET 3 OPT3
Time Period: AM/**PM** PEAK

Drawn By: BD
Sheet 6 **of** 8



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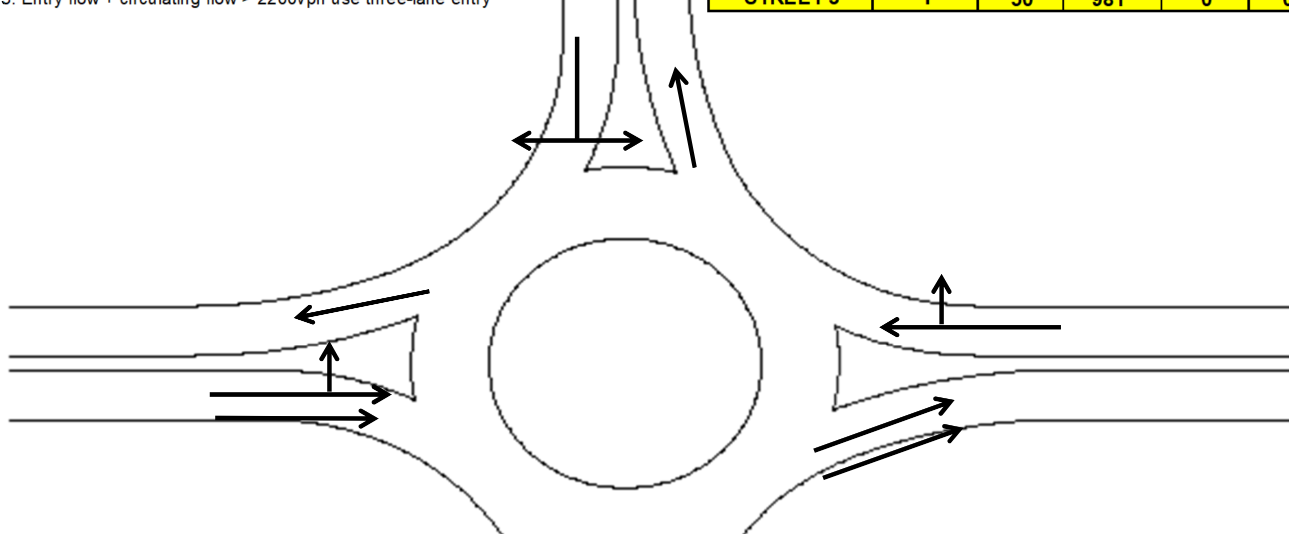
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
STREET 4	1	35	0	50	0
STREET 3	1	0	1557	35	0
0	1	0	0	0	0
STREET 3	1	50	981	0	0

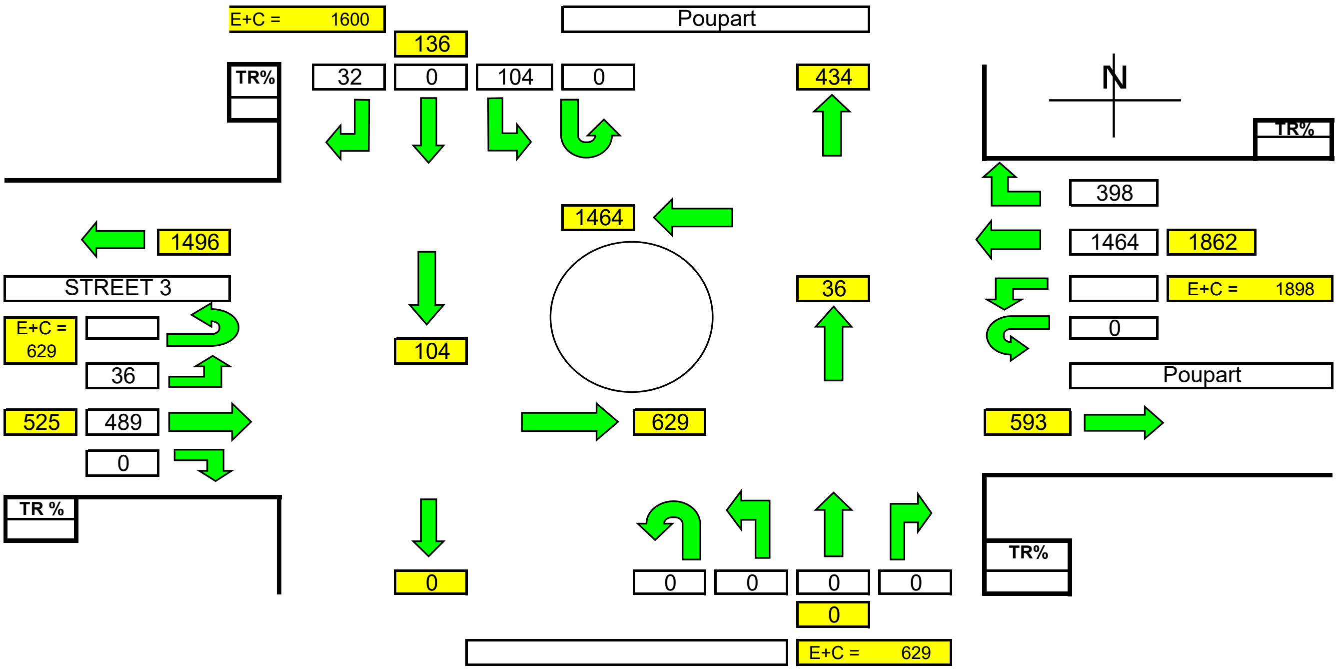


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: Poupart/STREET 3 OPT3
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 7 **of** 8



Capacity Guidelines

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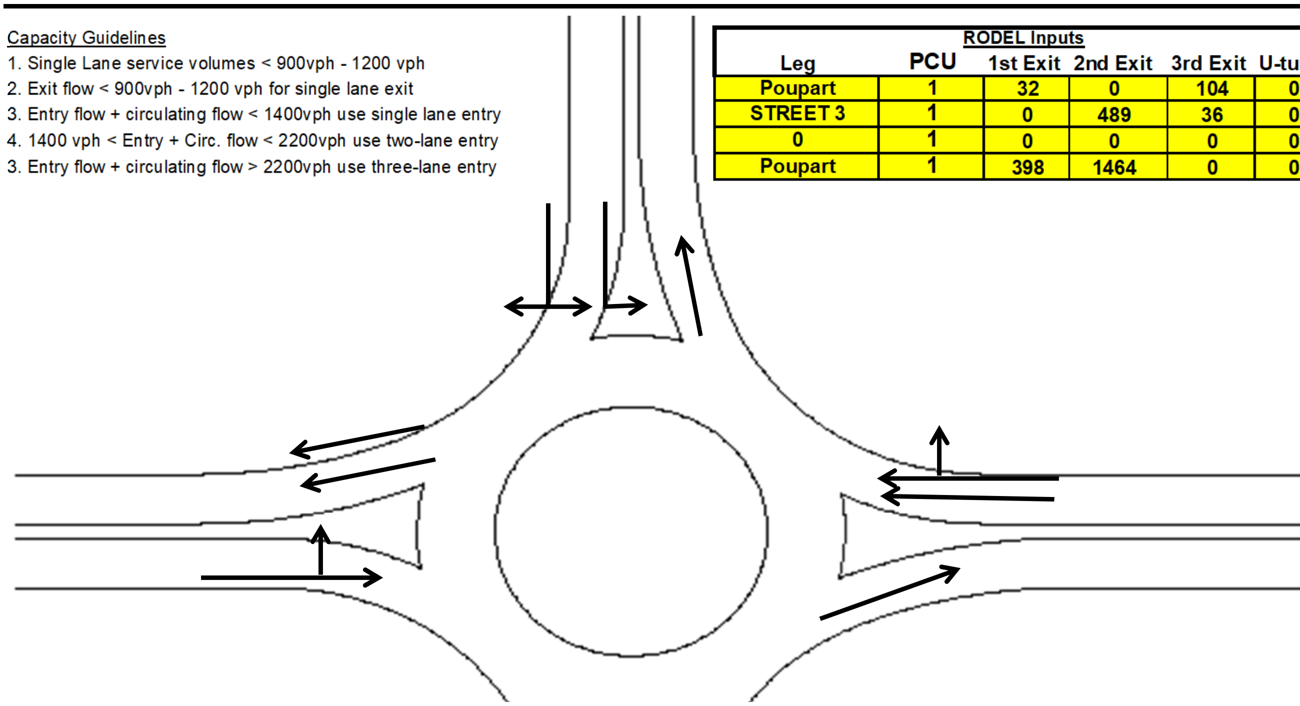
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Poupart	1	32	0	104	0
STREET 3	1	0	489	36	0
0	1	0	0	0	0
Poupart	1	398	1464	0	0

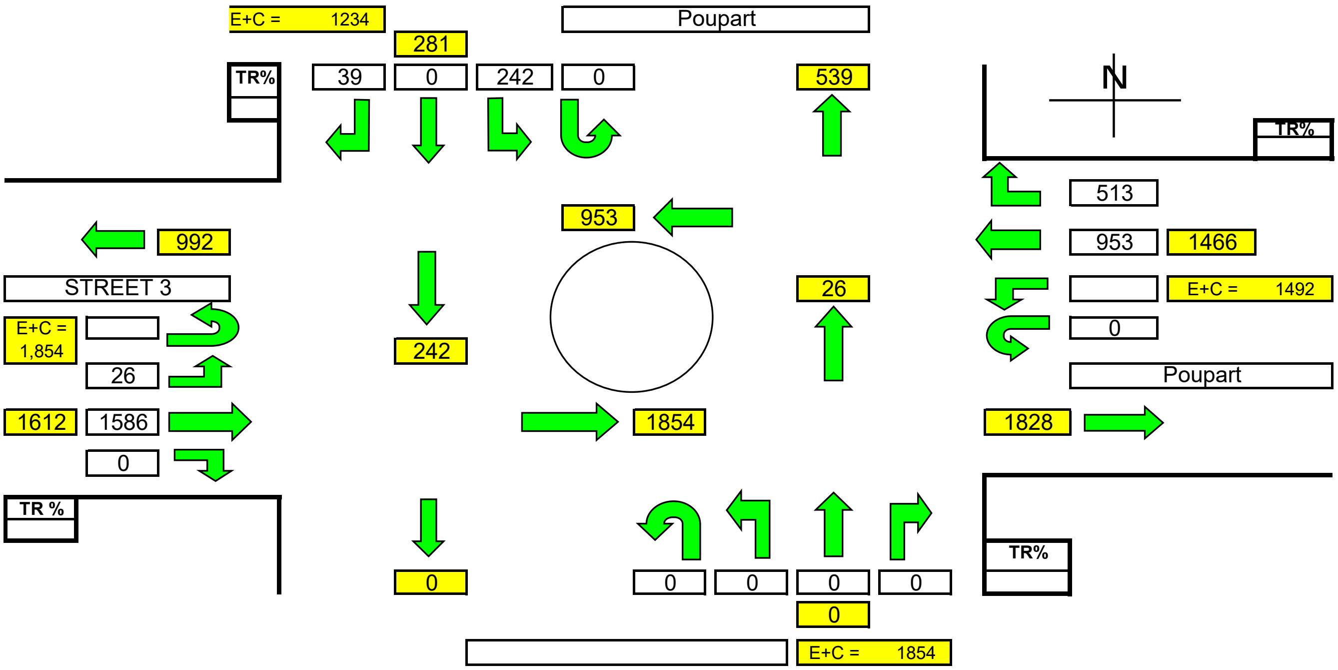


REGION OF WATERLOO ROUNDABOUT TRAFFIC FLOW SHEET

VERSION 1.1 MARCH 12, 2009

Project: Rockland Secondary Plan
Project No.: 31097
Intersection: Poupart/STREET 3 OPT3
Time Period: AM/PM PEAK

Drawn By: BD
Sheet 8 **of** 8



Capacity Guidelines

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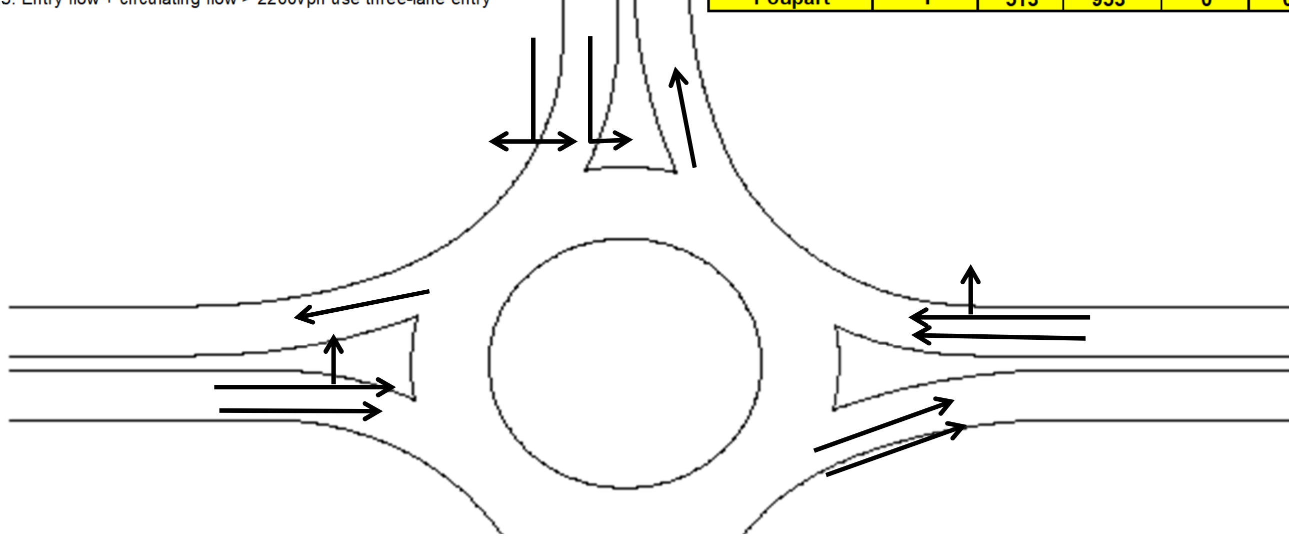
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

RODEL Inputs

Leg	PCU	1st Exit	2nd Exit	3rd Exit	U-turn
Poupart	1	39	0	242	0
STREET 3	1	0	1586	26	0
0	1	0	0	0	0
Poupart	1	513	953	0	0



DOCS # 517750 ROUNDABOUT TRAFFIC FLOW WORKSHEET

Appendix F

Roundabout Conceptual Designs

Appendix G

SIDRA Operational Analysis Results

Appendix H

Detailed Synchro Output
Data for 2045

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1913	370	223	3799	504	186
Future Volume (vph)	1913	370	223	3799	504	186
Lane Group Flow (vph)	2014	389	235	3999	531	196
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	6.4	6.4	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.33	0.33	0.05	0.05
v/c Ratio	11.19	0.87	0.65	3.58	5.90	0.74
Control Delay	4612.1	27.6	13.6	1175.6	2243.5	24.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4612.1	27.6	13.6	1175.6	2243.5	24.9
LOS	F	C	B	F	F	C
Approach Delay	3870.0			1111.1	1645.3	
Approach LOS	F			F	F	
Queue Length 50th (m)	~70.5	0.0	3.7	~121.6	~34.0	0.0
Queue Length 95th (m)	#86.2	#15.0	#7.8	#139.4	#52.8	#10.3
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	180	448	364	1477	90	266
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	11.19	0.87	0.65	2.71	5.90	0.74

Intersection Summary

Cycle Length: 20.6
Actuated Cycle Length: 19.2
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 11.19
Intersection Signal Delay: 2064.1 Intersection LOS: F
Intersection Capacity Utilization 149.8% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	477	167	22	195	30	77	41	473
Future Volume (vph)	477	167	22	195	30	77	41	473
Lane Group Flow (vph)	502	178	23	398	48	0	124	498
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	18.1	18.1	18.1	18.1	11.4		11.4	11.4
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.30		0.30	0.30
v/c Ratio	1.22	0.21	0.04	0.47	0.05		0.29	0.62
Control Delay	137.8	7.1	6.5	7.1	6.9		11.8	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	137.8	7.1	6.5	7.1	6.9		11.8	5.2
LOS	F	A	A	A	A		B	A
Approach Delay		103.6		7.0	6.9		6.5	
Approach LOS		F		A	A		A	
Queue Length 50th (m)	~38.5	4.9	0.6	8.2	0.7		5.7	0.0
Queue Length 95th (m)	#94.2	16.7	3.7	30.1	2.7		13.5	12.6
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	412	850	549	854	1629		715	1007
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	1.22	0.21	0.04	0.47	0.03		0.17	0.49

Intersection Summary

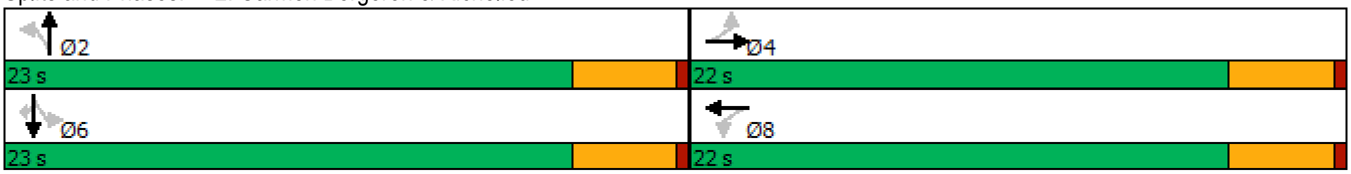
Cycle Length: 45
Actuated Cycle Length: 37.5
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 43.9 Intersection LOS: D
Intersection Capacity Utilization 74.0% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Carmen Bergeron & Richelieu

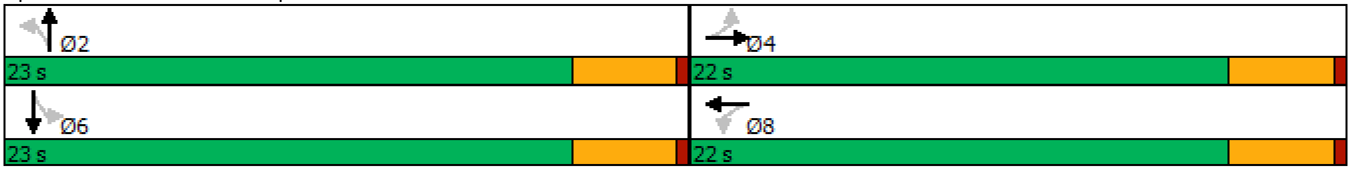


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	176	11	14	38	242	229	15	218
Future Volume (vph)	176	11	14	38	242	229	15	218
Lane Group Flow (vph)	185	112	0	74	0	508	0	444
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.7	11.7		11.7		17.5		17.5
Actuated g/C Ratio	0.35	0.35		0.35		0.53		0.53
v/c Ratio	0.42	0.19		0.13		0.43		0.49
Control Delay	12.4	3.9		7.2		8.7		8.2
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	12.4	3.9		7.2		8.7		8.2
LOS	B	A		A		A		A
Approach Delay		9.2		7.2		8.7		8.2
Approach LOS		A		A		A		A
Queue Length 50th (m)	6.5	0.4		1.7		8.5		10.5
Queue Length 95th (m)	21.3	6.9		8.0		23.1		35.8
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	693	892		891		1464		1099
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.27	0.13		0.08		0.35		0.40

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 33.3
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 8.6 Intersection LOS: A
Intersection Capacity Utilization 66.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	479	301
Future Volume (vph)	3	479	301
Lane Group Flow (vph)	25	535	344
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 37.9%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	479	301	26
Future Volume (Veh/h)	3	21	29	479	301	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	504	317	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	644	172	344			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	172	344			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	97			
cM capacity (veh/h)	395	842	1212			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	199	336	211	133
Volume Left	3	31	0	0	0
Volume Right	22	0	0	0	27
cSH	741	1212	1700	1700	1700
Volume to Capacity	0.03	0.03	0.20	0.12	0.08
Queue Length 95th (m)	0.8	0.6	0.0	0.0	0.0
Control Delay (s)	10.0	1.4	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.0	0.5		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2196	2093	146	4234	2717	116
Future Volume (vph)	2196	2093	146	4234	2717	116
Lane Group Flow (vph)	2440	2326	162	4704	3019	129
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	0.97	1.77	3.77	1.87	16.59	0.74
Control Delay	24.6	366.4	1312.5	412.8	7028.7	82.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	366.4	1312.5	412.8	7028.7	82.0
LOS	C	F	F	F	F	F
Approach Delay	191.4			442.8	6744.0	
Approach LOS	F			F	F	
Queue Length 50th (m)	272.2	~965.5	~73.0	~1104.3	~1781.7	33.5
Queue Length 95th (m)	#415.6	#1038.3	#120.5	#1112.9	#1840.7	#64.6
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1312	43	2512	182	174
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.97	1.77	3.77	1.87	16.59	0.74

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 16.59	
Intersection Signal Delay: 1901.2	Intersection LOS: F
Intersection Capacity Utilization 314.8%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4491	626	297	2876	415	297
Future Volume (vph)	4491	626	297	2876	415	297
Lane Group Flow (vph)	4727	659	313	3027	437	313
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	8.2	8.2	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.40	0.40	0.05	0.05
v/c Ratio	29.18	1.08	0.74	2.27	5.40	0.85
Control Delay	12694.0	68.3	19.9	589.5	2014.1	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12694.0	68.3	19.9	589.5	2014.1	28.6
LOS	F	E	B	F	F	C
Approach Delay	11149.2			536.1	1185.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~169.6	~4.8	5.2	~86.1	~27.5	0.0
Queue Length 95th (m)	#187.6	#25.8	#13.8	#103.3	#44.8	#13.3
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	162	613	424	1334	81	370
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	29.18	1.08	0.74	2.27	5.40	0.85

Intersection Summary

Cycle Length: 20.6
Actuated Cycle Length: 20.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 29.18
Intersection Signal Delay: 6619.8 Intersection LOS: F
Intersection Capacity Utilization 187.3% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	423	191	27	192	2	72	307	144	472
Future Volume (vph)	423	191	27	192	2	72	307	144	472
Lane Group Flow (vph)	445	203	28	429	0	126	0	475	497
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.3		18.3	18.3
Actuated g/C Ratio	0.41	0.41	0.41	0.41		0.41		0.41	0.41
v/c Ratio	1.58	0.28	0.06	0.57		0.10		0.91	0.55
Control Delay	299.9	10.4	8.9	10.3		5.7		39.6	3.8
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	299.9	10.4	8.9	10.3		5.7		39.6	3.8
LOS	F	B	A	B		A		D	A
Approach Delay		209.2		10.2		5.7		21.3	
Approach LOS		F		B		A		C	
Queue Length 50th (m)	~52.4	10.0	1.3	14.8		1.7		31.7	0.0
Queue Length 95th (m)	#92.7	20.6	4.5	34.6		5.0		#76.8	12.3
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	281	717	452	750		1317		542	927
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	1.58	0.28	0.06	0.57		0.10		0.88	0.54

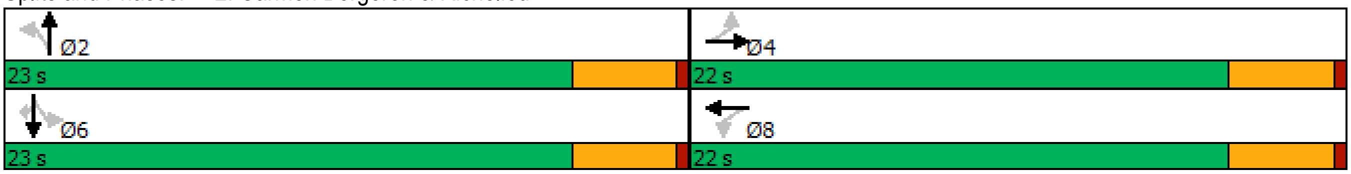
Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 44.3	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.58	
Intersection Signal Delay: 73.4	Intersection LOS: E
Intersection Capacity Utilization 92.0%	ICU Level of Service F
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Carmen Bergeron & Richelieu

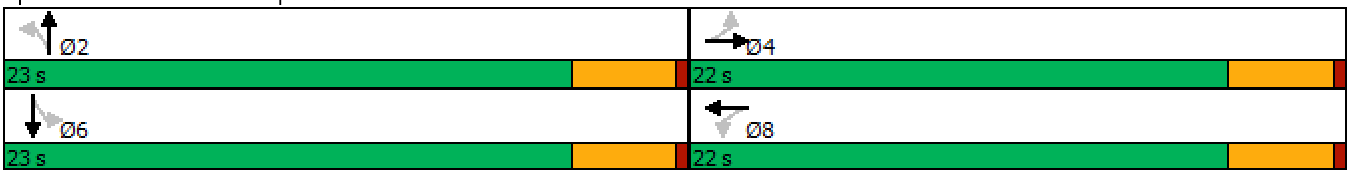


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	250	69	30	44	207	329	41	284
Future Volume (vph)	250	69	30	44	207	329	41	284
Lane Group Flow (vph)	263	413	0	97	0	603	0	645
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	14.0	14.0		14.0		17.5		17.5
Actuated g/C Ratio	0.35	0.35		0.35		0.44		0.44
v/c Ratio	0.61	0.54		0.19		0.67		0.86
Control Delay	17.7	5.4		8.6		14.1		24.5
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	17.7	5.4		8.6		14.1		24.5
LOS	B	A		A		B		C
Approach Delay		10.2		8.6		14.1		24.5
Approach LOS		B		A		B		C
Queue Length 50th (m)	14.7	3.4		3.6		15.0		28.2
Queue Length 95th (m)	31.3	16.4		10.2		#33.3		#89.8
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	567	899		668		993		820
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.46	0.46		0.15		0.61		0.79

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 39.7	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 96.3%	ICU Level of Service F
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	

Queue shown is maximum after two cycles.

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	574	618
Future Volume (vph)	54	574	618
Lane Group Flow (vph)	111	672	670
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 53.8%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	574	618	18
Future Volume (Veh/h)	54	51	65	574	618	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	68	604	651	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	1098	335	670			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1098	335	670			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	92	93			
cM capacity (veh/h)	192	661	916			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	269	403	434	236
Volume Left	57	68	0	0	0
Volume Right	54	0	0	0	19
cSH	293	916	1700	1700	1700
Volume to Capacity	0.38	0.07	0.24	0.26	0.14
Queue Length 95th (m)	12.8	1.8	0.0	0.0	0.0
Control Delay (s)	24.6	2.9	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	24.6	1.2		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Volume (vph)	5144	2801	117	3232	2332	124
Future Volume (vph)	5144	2801	117	3232	2332	124
Lane Group Flow (vph)	5716	3112	130	3591	2591	138
Turn Type	NA	Perm	Perm	NA	pm+pt	Perm
Protected Phases	4			8	5	
Permitted Phases		4	8		2	2
Detector Phase	4	4	8	8	5	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	2.28	2.53	3.10	1.43	14.24	0.85
Control Delay	592.5	705.4	1016.9	214.6	5971.2	103.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	592.5	705.4	1016.9	214.6	5971.2	103.3
LOS	F	F	F	F	F	F
Approach Delay	632.3			242.6	5674.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~1428.4	~1500.8	~54.3	~747.8	~1521.2	40.3
Queue Length 95th (m)	#1421.0	#1558.8	#97.4	#772.1	#1588.2	#78.1
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1231	42	2512	182	163
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.28	2.53	3.10	1.43	14.24	0.85

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 14.24	
Intersection Signal Delay: 1438.0	Intersection LOS: F
Intersection Capacity Utilization 319.2%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

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

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2125	370	223	4157	504	186
Future Volume (vph)	2125	370	223	4157	504	186
Lane Group Flow (vph)	2237	389	235	4376	531	196
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	6.4	6.4	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.33	0.33	0.05	0.05
v/c Ratio	12.43	0.87	0.65	3.92	5.90	0.74
Control Delay	5170.3	27.6	13.6	1326.6	2243.5	24.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5170.3	27.6	13.6	1326.6	2243.5	24.9
LOS	F	C	B	F	F	C
Approach Delay	4408.5			1259.7	1645.3	
Approach LOS	F			F	F	
Queue Length 50th (m)	~78.7	0.0	3.7	~135.4	~34.0	0.0
Queue Length 95th (m)	#94.7	#15.0	#7.8	#153.3	#52.8	#10.3
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	180	448	364	1477	90	266
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	12.43	0.87	0.65	2.96	5.90	0.74

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 19.2	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 12.43	
Intersection Signal Delay: 2333.2	Intersection LOS: F
Intersection Capacity Utilization 160.3%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

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

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	477	167	22	195	30	77	41	473
Future Volume (vph)	477	167	22	195	30	77	41	473
Lane Group Flow (vph)	502	178	23	398	48	0	124	498
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	18.1	18.1	18.1	18.1	11.4		11.4	11.4
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.30		0.30	0.30
v/c Ratio	1.22	0.21	0.04	0.47	0.05		0.29	0.62
Control Delay	137.8	7.1	6.5	7.1	6.9		11.8	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	137.8	7.1	6.5	7.1	6.9		11.8	5.2
LOS	F	A	A	A	A		B	A
Approach Delay		103.6		7.0	6.9		6.5	
Approach LOS		F		A	A		A	
Queue Length 50th (m)	~38.5	4.9	0.6	8.2	0.7		5.7	0.0
Queue Length 95th (m)	#94.2	16.7	3.7	30.1	2.7		13.5	12.6
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	412	850	549	854	1629		715	1007
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	1.22	0.21	0.04	0.47	0.03		0.17	0.49

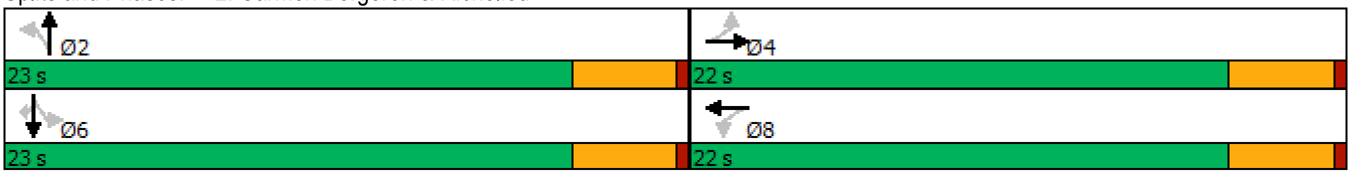
Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 37.5	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 43.9	Intersection LOS: D
Intersection Capacity Utilization 74.0%	ICU Level of Service D
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

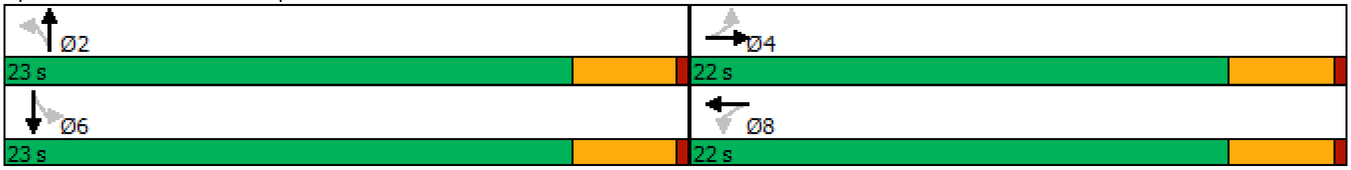
Splits and Phases: 2: Carmen Bergeron & Richelieu



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	176	11	14	38	242	229	15	218
Future Volume (vph)	176	11	14	38	242	229	15	218
Lane Group Flow (vph)	185	112	0	74	0	508	0	444
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	11.7	11.7		11.7		17.5		17.5
Actuated g/C Ratio	0.35	0.35		0.35		0.53		0.53
v/c Ratio	0.42	0.19		0.13		0.43		0.49
Control Delay	12.4	3.9		7.2		8.7		8.2
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	12.4	3.9		7.2		8.7		8.2
LOS	B	A		A		A		A
Approach Delay		9.2		7.2		8.7		8.2
Approach LOS		A		A		A		A
Queue Length 50th (m)	6.5	0.4		1.7		8.5		10.5
Queue Length 95th (m)	21.3	6.9		8.0		23.1		35.8
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	693	892		891		1464		1099
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.27	0.13		0.08		0.35		0.40

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 33.3	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 66.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	479	301
Future Volume (vph)	3	479	301
Lane Group Flow (vph)	25	535	344
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 37.9%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	29	479	301	26
Future Volume (Veh/h)	3	21	29	479	301	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	31	504	317	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	644	172	344			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	172	344			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	97			
cM capacity (veh/h)	395	842	1212			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	199	336	211	133
Volume Left	3	31	0	0	0
Volume Right	22	0	0	0	27
cSH	741	1212	1700	1700	1700
Volume to Capacity	0.03	0.03	0.20	0.12	0.08
Queue Length 95th (m)	0.8	0.6	0.0	0.0	0.0
Control Delay (s)	10.0	1.4	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.0	0.5		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2426	2093	146	4640	2717	116
Future Volume (vph)	2426	2093	146	4640	2717	116
Lane Group Flow (vph)	2696	2326	162	5156	3019	129
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	1.07	1.80	3.86	2.05	16.59	0.75
Control Delay	56.4	377.8	1353.6	493.1	7028.7	83.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.4	377.8	1353.6	493.1	7028.7	83.0
LOS	E	F	F	F	F	F
Approach Delay	205.3			519.3	6744.1	
Approach LOS	F			F	F	
Queue Length 50th (m)	~461.1	~976.7	~74.0	~1249.1	~1781.7	33.8
Queue Length 95th (m)	#495.4	#1049.5	#121.5	#1251.0	#1840.7	#65.2
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1294	42	2512	182	173
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.07	1.80	3.86	2.05	16.59	0.75

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 16.59	
Intersection Signal Delay: 1855.2	Intersection LOS: F
Intersection Capacity Utilization 327.7%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4985	626	297	3178	415	297
Future Volume (vph)	4985	626	297	3178	415	297
Lane Group Flow (vph)	5247	659	313	3345	437	313
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	8.2	8.2	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.40	0.40	0.05	0.05
v/c Ratio	32.39	1.18	0.74	2.51	5.40	0.85
Control Delay	14138.3	109.8	19.9	696.0	2014.1	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14138.3	109.8	19.9	696.0	2014.1	28.6
LOS	F	F	B	F	F	C
Approach Delay	12572.9			638.1	1185.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~188.6	~8.8	5.2	~97.7	~27.5	0.0
Queue Length 95th (m)	#206.5	#29.8	#13.8	#115.2	#44.8	#13.3
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	162	559	424	1334	81	370
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	32.39	1.18	0.74	2.51	5.40	0.85

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 20.6	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 32.39	
Intersection Signal Delay: 7512.0	Intersection LOS: F
Intersection Capacity Utilization 201.8%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

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

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	423	191	27	192	2	72	307	144	472
Future Volume (vph)	423	191	27	192	2	72	307	144	472
Lane Group Flow (vph)	445	203	28	429	0	126	0	475	497
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.3		18.3	18.3
Actuated g/C Ratio	0.41	0.41	0.41	0.41		0.41		0.41	0.41
v/c Ratio	1.58	0.28	0.06	0.57		0.10		0.91	0.55
Control Delay	299.9	10.4	8.9	10.3		5.7		39.6	3.8
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	299.9	10.4	8.9	10.3		5.7		39.6	3.8
LOS	F	B	A	B		A		D	A
Approach Delay		209.2		10.2		5.7		21.3	
Approach LOS		F		B		A		C	
Queue Length 50th (m)	~52.4	10.0	1.3	14.8		1.7		31.7	0.0
Queue Length 95th (m)	#92.7	20.6	4.5	34.6		5.0		#76.8	12.3
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	281	717	452	750		1317		542	927
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	1.58	0.28	0.06	0.57		0.10		0.88	0.54

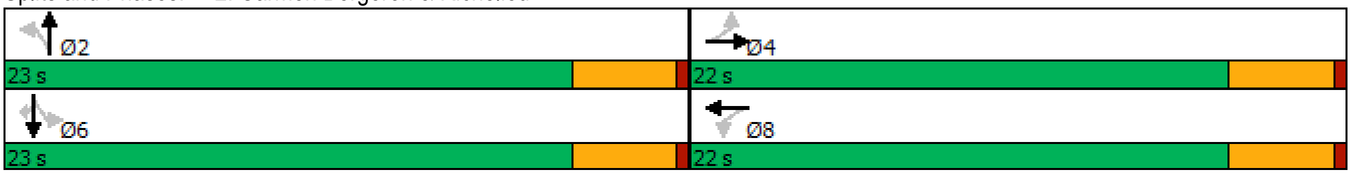
Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 44.3	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.58	
Intersection Signal Delay: 73.4	Intersection LOS: E
Intersection Capacity Utilization 92.0%	ICU Level of Service F
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Carmen Bergeron & Richelieu



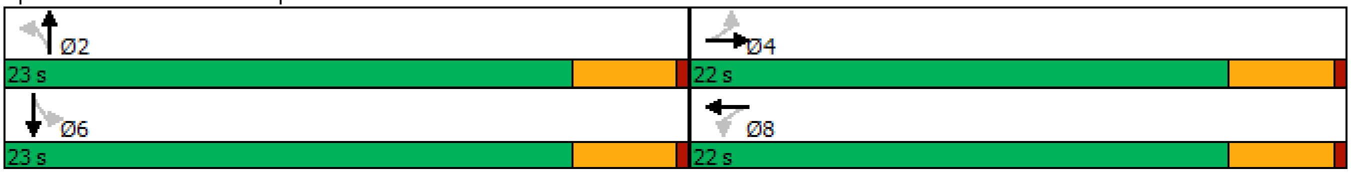
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	250	69	30	44	207	329	41	284
Future Volume (vph)	250	69	30	44	207	329	41	284
Lane Group Flow (vph)	263	413	0	97	0	603	0	645
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	14.0	14.0		14.0		17.5		17.5
Actuated g/C Ratio	0.35	0.35		0.35		0.44		0.44
v/c Ratio	0.61	0.54		0.19		0.67		0.86
Control Delay	17.7	5.4		8.6		14.1		24.5
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	17.7	5.4		8.6		14.1		24.5
LOS	B	A		A		B		C
Approach Delay		10.2		8.6		14.1		24.5
Approach LOS		B		A		B		C
Queue Length 50th (m)	14.7	3.4		3.6		15.0		28.2
Queue Length 95th (m)	31.3	16.4		10.2		#33.3		#89.8
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	567	899		668		993		820
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.46	0.46		0.15		0.61		0.79

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 39.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 15.9 Intersection LOS: B
Intersection Capacity Utilization 96.3% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	574	618
Future Volume (vph)	54	574	618
Lane Group Flow (vph)	111	672	670
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 53.8%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	65	574	618	18
Future Volume (Veh/h)	54	51	65	574	618	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	68	604	651	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	1098	335	670			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1098	335	670			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	92	93			
cM capacity (veh/h)	192	661	916			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	269	403	434	236
Volume Left	57	68	0	0	0
Volume Right	54	0	0	0	19
cSH	293	916	1700	1700	1700
Volume to Capacity	0.38	0.07	0.24	0.26	0.14
Queue Length 95th (m)	12.8	1.8	0.0	0.0	0.0
Control Delay (s)	24.6	2.9	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	24.6	1.2		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	5731	2801	117	3571	2332	124
Future Volume (vph)	5731	2801	117	3571	2332	124
Lane Group Flow (vph)	6368	3112	130	3968	2591	138
Turn Type	NA	Perm	Perm	NA	pm+pt	Perm
Protected Phases	4			8	5	
Permitted Phases		4	8		2	2
Detector Phase	4	4	8	8	5	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	2.54	2.55	3.10	1.58	14.24	0.85
Control Delay	708.3	715.7	1016.9	281.9	5971.2	103.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	708.3	715.7	1016.9	281.9	5971.2	103.3
LOS	F	F	F	F	F	F
Approach Delay	710.7			305.2	5674.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~1637.2	~1507.7	~54.3	~868.5	~1521.2	40.3
Queue Length 95th (m)	#1618.6	#1565.7	#97.4	#887.7	#1588.2	#78.1
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1220	42	2512	182	163
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.54	2.55	3.10	1.58	14.24	0.85

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 14.24
Intersection Signal Delay: 1439.5 Intersection LOS: F
Intersection Capacity Utilization 337.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

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

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1803	284	120	3685	270	78
Future Volume (vph)	1803	284	120	3685	270	78
Lane Group Flow (vph)	1898	299	126	3879	284	82
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	3.3	3.3	1.0	1.0
Actuated g/C Ratio	0.06	0.06	0.20	0.20	0.06	0.06
v/c Ratio	8.83	0.80	0.51	5.67	2.65	0.48
Control Delay	3541.8	23.9	12.6	2115.6	781.8	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3541.8	23.9	12.6	2115.6	781.8	17.4
LOS	F	C	B	F	F	B
Approach Delay	3063.0			2049.4	610.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~36.7	0.0	~1.9	~77.7	~8.7	0.0
Queue Length 95th (m)	#81.7	#13.0	4.3	#135.0	#31.3	#6.0
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	215	376	245	1764	107	172
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	8.83	0.80	0.51	2.20	2.65	0.48

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 16.3	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 8.83	
Intersection Signal Delay: 2308.3	Intersection LOS: F
Intersection Capacity Utilization 132.8%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

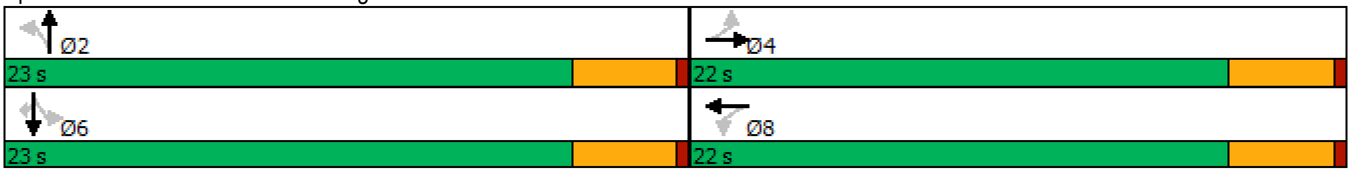
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	149	58	22	110	30	72	41	207
Future Volume (vph)	149	58	22	110	30	72	41	207
Lane Group Flow (vph)	157	63	23	292	48	0	119	218
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	11.4	11.4	11.4	11.4	11.7		11.7	11.7
Actuated g/C Ratio	0.37	0.37	0.37	0.37	0.38		0.38	0.38
v/c Ratio	0.42	0.10	0.05	0.42	0.04		0.22	0.31
Control Delay	10.6	6.0	5.9	4.9	5.8		8.8	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	10.6	6.0	5.9	4.9	5.8		8.8	3.1
LOS	B	A	A	A	A		A	A
Approach Delay		9.3		5.0	5.8		5.2	
Approach LOS		A		A	A		A	
Queue Length 50th (m)	4.6	1.6	0.6	3.1	0.4		3.3	0.0
Queue Length 95th (m)	12.7	5.1	2.6	11.4	2.4		11.5	7.7
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	597	1025	737	1010	1967		885	1007
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.26	0.06	0.03	0.29	0.02		0.13	0.22

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 31.2	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.42	
Intersection Signal Delay: 6.1	Intersection LOS: A
Intersection Capacity Utilization 48.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Carmen Bergeron & Richelieu

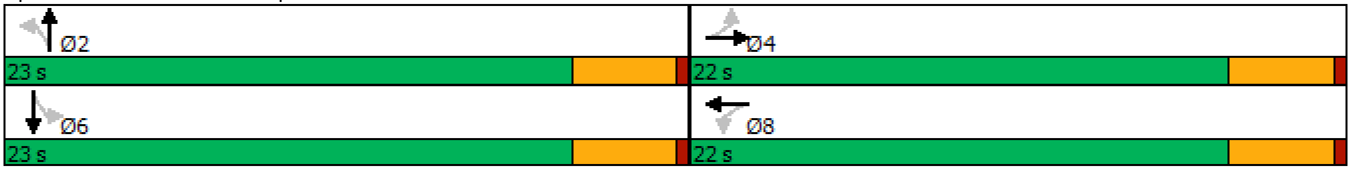


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	71	11	14	38	231	122	15	92
Future Volume (vph)	71	11	14	38	231	122	15	92
Lane Group Flow (vph)	75	103	0	74	0	376	0	217
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	10.1	10.1		10.1		17.4		17.4
Actuated g/C Ratio	0.36	0.36		0.36		0.63		0.63
v/c Ratio	0.17	0.17		0.13		0.26		0.21
Control Delay	7.6	3.3		5.9		5.9		4.0
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	7.6	3.3		5.9		5.9		4.0
LOS	A	A		A		A		A
Approach Delay		5.1		5.9		5.9		4.0
Approach LOS		A		A		A		A
Queue Length 50th (m)	2.0	0.3		1.4		5.8		3.1
Queue Length 95th (m)	6.6	4.7		5.6		10.7		9.2
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	815	1028		1018		1870		1290
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.09	0.10		0.07		0.20		0.17

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 27.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.26
Intersection Signal Delay: 5.3 Intersection LOS: A
Intersection Capacity Utilization 46.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	337	165
Future Volume (vph)	3	337	165
Lane Group Flow (vph)	25	394	201
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 30.0%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	37	337	165	26
Future Volume (Veh/h)	3	21	37	337	165	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	39	355	174	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	443	100	201			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	443	100	201			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	97			
cM capacity (veh/h)	528	935	1368			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	157	237	116	85
Volume Left	3	39	0	0	0
Volume Right	22	0	0	0	27
cSH	856	1368	1700	1700	1700
Volume to Capacity	0.03	0.03	0.14	0.07	0.05
Queue Length 95th (m)	0.7	0.7	0.0	0.0	0.0
Control Delay (s)	9.3	2.1	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.3	0.8		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2110	844	32	4000	1530	6
Future Volume (vph)	2110	844	32	4000	1530	6
Lane Group Flow (vph)	2344	938	36	4444	1700	7
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	0.93	0.78	0.65	1.77	9.34	0.04
Control Delay	18.7	8.1	61.5	366.6	3770.8	55.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	8.1	61.5	366.6	3770.8	55.3
LOS	B	A	E	F	F	E
Approach Delay	15.6			364.2	3755.6	
Approach LOS	B			F	F	
Queue Length 50th (m)	225.5	46.7	3.2	~1021.0	~979.0	1.6
Queue Length 95th (m)	284.5	92.6	#12.8	#1033.5	#1057.5	6.4
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1203	55	2512	182	164
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.78	0.65	1.77	9.34	0.04

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 9.34	
Intersection Signal Delay: 854.8	Intersection LOS: F
Intersection Capacity Utilization 231.6%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4393	479	191	2768	242	205
Future Volume (vph)	4393	479	191	2768	242	205
Lane Group Flow (vph)	4624	504	201	2914	255	216
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	6.4	6.4	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.33	0.33	0.05	0.05
v/c Ratio	25.69	1.01	0.55	2.61	2.83	0.76
Control Delay	11148.4	52.4	10.7	741.4	873.4	25.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11148.4	52.4	10.7	741.4	873.4	25.4
LOS	F	D	B	F	F	C
Approach Delay	10057.9			694.3	484.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~165.8	~2.1	3.1	~82.0	~14.9	0.0
Queue Length 95th (m)	#183.8	#21.3	6.6	#99.0	#28.7	#10.9
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	180	500	364	1477	90	285
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	25.69	1.01	0.55	1.97	2.83	0.76

Intersection Summary

Cycle Length: 20.6
Actuated Cycle Length: 19.2
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 25.69
Intersection Signal Delay: 6193.2 Intersection LOS: F
Intersection Capacity Utilization 168.2% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

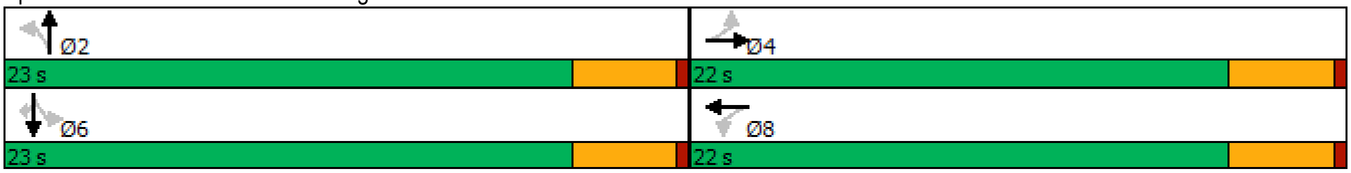
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	171	112	27	89	2	72	292	144	154
Future Volume (vph)	171	112	27	89	2	72	292	144	154
Lane Group Flow (vph)	180	120	28	310	0	126	0	459	162
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	13.1	13.1	13.1	13.1		18.1		18.1	18.1
Actuated g/C Ratio	0.33	0.33	0.33	0.33		0.46		0.46	0.46
v/c Ratio	0.60	0.20	0.07	0.46		0.09		0.79	0.21
Control Delay	20.3	10.1	9.2	6.0		5.1		24.1	2.7
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	20.3	10.1	9.2	6.0		5.1		24.1	2.7
LOS	C	B	A	A		A		C	A
Approach Delay		16.2		6.3		5.1		18.5	
Approach LOS		B		A		A		B	
Queue Length 50th (m)	9.8	5.6	1.3	4.4		1.3		22.0	0.0
Queue Length 95th (m)	23.8	12.8	4.5	16.0		5.0		#73.4	7.1
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	416	815	555	847		1493		620	815
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.43	0.15	0.05	0.37		0.08		0.74	0.20

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 39.3
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 13.8 Intersection LOS: B
Intersection Capacity Utilization 70.0% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

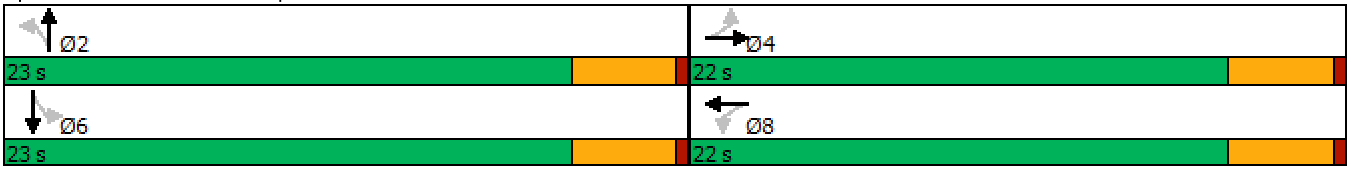
Splits and Phases: 2: Carmen Bergeron & Richelieu



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	169	69	30	44	193	223	41	172
Future Volume (vph)	169	69	30	44	193	223	41	172
Lane Group Flow (vph)	178	398	0	97	0	473	0	420
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	12.1	12.1		12.1		12.8		12.8
Actuated g/C Ratio	0.36	0.36		0.36		0.39		0.39
v/c Ratio	0.40	0.52		0.18		0.53		0.64
Control Delay	11.7	5.1		7.7		10.3		11.2
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	11.7	5.1		7.7		10.3		11.2
LOS	B	A		A		B		B
Approach Delay		7.1		7.7		10.3		11.2
Approach LOS		A		A		B		B
Queue Length 50th (m)	5.7	2.1		2.3		7.3		9.3
Queue Length 95th (m)	20.4	16.2		10.2		21.9		36.0
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	687	1011		805		1356		949
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.26	0.39		0.12		0.35		0.44

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 33.2	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 9.2	Intersection LOS: A
Intersection Capacity Utilization 79.9%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	438	493
Future Volume (vph)	54	438	493
Lane Group Flow (vph)	111	536	538
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 46.4%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	71	438	493	18
Future Volume (Veh/h)	54	51	71	438	493	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	75	461	519	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	909	269	538			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	269	538			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	78	93	93			
cM capacity (veh/h)	254	729	1026			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	229	307	346	192
Volume Left	57	75	0	0	0
Volume Right	54	0	0	0	19
cSH	372	1026	1700	1700	1700
Volume to Capacity	0.30	0.07	0.18	0.20	0.11
Queue Length 95th (m)	9.2	1.8	0.0	0.0	0.0
Control Delay (s)	18.7	3.4	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	18.7	1.4		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4997	1645	9	3059	1266	26
Future Volume (vph)	4997	1645	9	3059	1266	26
Lane Group Flow (vph)	5552	1828	10	3399	1407	29
Turn Type	NA	Perm	Perm	NA	pm+pt	Perm
Protected Phases	4			8	5	
Permitted Phases		4	8		2	2
Detector Phase	4	4	8	8	5	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	2.21	1.54	0.24	1.35	7.73	0.18
Control Delay	563.4	263.5	17.2	180.3	3048.0	62.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	563.4	263.5	17.2	180.3	3048.0	62.5
LOS	F	F	B	F	F	E
Approach Delay	489.1			179.8	2987.7	
Approach LOS	F			F	F	
Queue Length 50th (m)	~1375.8	~735.5	0.5	~686.3	~800.7	7.8
Queue Length 95th (m)	#1371.1	#814.5	3.6	#712.9	#880.5	17.9
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1189	42	2512	182	163
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.21	1.54	0.24	1.35	7.73	0.18

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 7.73	
Intersection Signal Delay: 696.4	Intersection LOS: F
Intersection Capacity Utilization 246.5%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

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

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Volume (vph)	2015	284	120	4043	270	78
Future Volume (vph)	2015	284	120	4043	270	78
Lane Group Flow (vph)	2121	299	126	4256	284	82
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	3.3	3.3	1.0	1.0
Actuated g/C Ratio	0.06	0.06	0.20	0.20	0.06	0.06
v/c Ratio	9.87	0.80	0.51	6.22	2.65	0.48
Control Delay	4008.3	23.9	12.6	2363.0	781.8	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4008.3	23.9	12.6	2363.0	781.8	17.4
LOS	F	C	B	F	F	B
Approach Delay	3516.0			2295.4	610.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~41.3	0.0	~1.9	~85.6	~8.7	0.0
Queue Length 95th (m)	#90.3	#13.0	4.3	#148.9	#31.3	#6.0
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	215	376	245	1764	107	172
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	9.87	0.80	0.51	2.41	2.65	0.48

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 16.3	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 9.87	
Intersection Signal Delay: 2621.5	Intersection LOS: F
Intersection Capacity Utilization 143.3%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

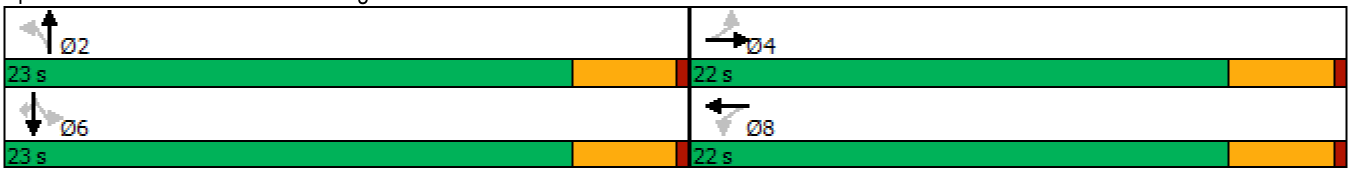
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBT	SBL	SBT	SBR
Lane Configurations								
Traffic Volume (vph)	149	58	22	110	30	72	41	207
Future Volume (vph)	149	58	22	110	30	72	41	207
Lane Group Flow (vph)	157	63	23	292	48	0	119	218
Turn Type	Perm	NA	Perm	NA	NA	Perm	NA	Perm
Protected Phases		4		8	2		6	
Permitted Phases	4		8			6		6
Detector Phase	4	4	8	8	2	6	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min
Act Effct Green (s)	11.4	11.4	11.4	11.4	11.7		11.7	11.7
Actuated g/C Ratio	0.37	0.37	0.37	0.37	0.38		0.38	0.38
v/c Ratio	0.42	0.10	0.05	0.42	0.04		0.22	0.31
Control Delay	10.6	6.0	5.9	4.9	5.8		8.8	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	10.6	6.0	5.9	4.9	5.8		8.8	3.1
LOS	B	A	A	A	A		A	A
Approach Delay		9.3		5.0	5.8		5.2	
Approach LOS		A		A	A		A	
Queue Length 50th (m)	4.6	1.6	0.6	3.1	0.4		3.3	0.0
Queue Length 95th (m)	12.7	5.1	2.6	11.4	2.4		11.5	7.7
Internal Link Dist (m)		33.9		74.5	69.2		94.8	
Turn Bay Length (m)			25.0					
Base Capacity (vph)	597	1025	737	1010	1967		885	1007
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.26	0.06	0.03	0.29	0.02		0.13	0.22

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 31.2	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.42	
Intersection Signal Delay: 6.1	Intersection LOS: A
Intersection Capacity Utilization 48.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Carmen Bergeron & Richelieu

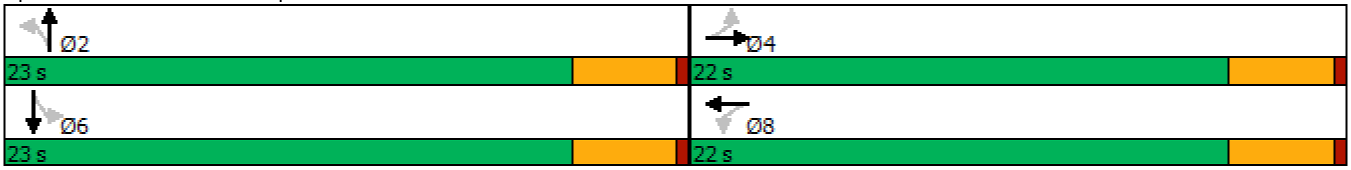


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	71	11	14	38	231	122	15	92
Future Volume (vph)	71	11	14	38	231	122	15	92
Lane Group Flow (vph)	75	103	0	74	0	376	0	217
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	10.1	10.1		10.1		17.4		17.4
Actuated g/C Ratio	0.36	0.36		0.36		0.63		0.63
v/c Ratio	0.17	0.17		0.13		0.26		0.21
Control Delay	7.6	3.3		5.9		5.9		4.0
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	7.6	3.3		5.9		5.9		4.0
LOS	A	A		A		A		A
Approach Delay		5.1		5.9		5.9		4.0
Approach LOS		A		A		A		A
Queue Length 50th (m)	2.0	0.3		1.4		5.8		3.1
Queue Length 95th (m)	6.6	4.7		5.6		10.7		9.2
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	815	1028		1018		1870		1290
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.09	0.10		0.07		0.20		0.17

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 27.8
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.26
Intersection Signal Delay: 5.3 Intersection LOS: A
Intersection Capacity Utilization 46.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	3	337	165
Future Volume (vph)	3	337	165
Lane Group Flow (vph)	25	394	201
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 30.0%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	21	37	337	165	26
Future Volume (Veh/h)	3	21	37	337	165	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	3	22	39	355	174	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	443	100	201			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	443	100	201			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	97			
cM capacity (veh/h)	528	935	1368			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	157	237	116	85
Volume Left	3	39	0	0	0
Volume Right	22	0	0	0	27
cSH	856	1368	1700	1700	1700
Volume to Capacity	0.03	0.03	0.14	0.07	0.05
Queue Length 95th (m)	0.7	0.7	0.0	0.0	0.0
Control Delay (s)	9.3	2.1	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.3	0.8		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2340	844	32	4406	1530	6
Future Volume (vph)	2340	844	32	4406	1530	6
Lane Group Flow (vph)	2600	938	36	4896	1700	7
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	1.04	0.78	0.86	1.95	9.34	0.04
Control Delay	42.0	8.7	121.8	446.9	3770.8	55.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	8.7	121.8	446.9	3770.8	55.3
LOS	D	A	F	F	F	E
Approach Delay	33.1			444.6	3755.6	
Approach LOS	C			F	F	
Queue Length 50th (m)	~430.4	54.4	5.1	~1165.7	~979.0	1.6
Queue Length 95th (m)	#465.6	103.9	#21.0	#1171.5	#1057.5	6.4
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1195	42	2512	182	164
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.04	0.78	0.86	1.95	9.34	0.04

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 9.34

Intersection Signal Delay: 856.9 Intersection LOS: F

Intersection Capacity Utilization 244.5% ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	4887	479	191	3070	242	205
Future Volume (vph)	4887	479	191	3070	242	205
Lane Group Flow (vph)	5144	504	201	3232	255	216
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	27.2	27.2	11.2	27.2	23.2	23.2
Total Split (s)	7.2	7.2	7.2	7.2	6.2	6.2
Total Split (%)	35.0%	35.0%	35.0%	35.0%	30.1%	30.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	3.3	3.3
All-Red Time (s)	1.6	1.6	1.6	1.6	1.9	1.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	1.0	1.0	6.4	6.4	1.0	1.0
Actuated g/C Ratio	0.05	0.05	0.33	0.33	0.05	0.05
v/c Ratio	28.58	1.10	0.55	2.89	2.83	0.76
Control Delay	12451.0	84.6	10.7	868.6	873.4	25.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12451.0	84.6	10.7	868.6	873.4	25.4
LOS	F	F	B	F	F	C
Approach Delay	11347.5			818.4	484.5	
Approach LOS	F			F	F	
Queue Length 50th (m)	~184.8	~5.5	3.1	~93.6	~14.9	0.0
Queue Length 95th (m)	#202.8	#24.4	6.6	#111.0	#28.7	#10.9
Internal Link Dist (m)	194.0			273.3	94.8	
Turn Bay Length (m)		80.0	125.0			
Base Capacity (vph)	180	458	364	1477	90	285
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	28.58	1.10	0.55	2.19	2.83	0.76

Intersection Summary	
Cycle Length: 20.6	
Actuated Cycle Length: 19.2	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 28.58	
Intersection Signal Delay: 7027.7	Intersection LOS: F
Intersection Capacity Utilization 182.6%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

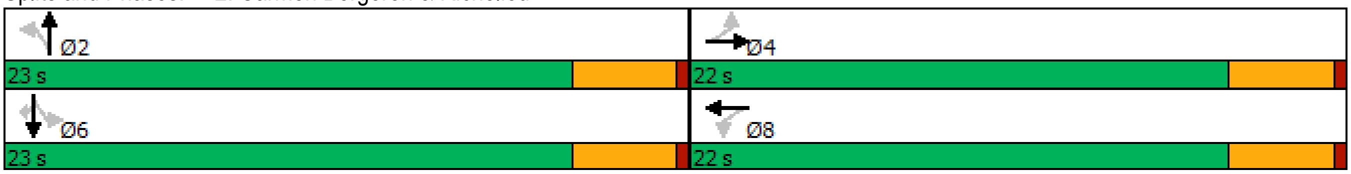
Splits and Phases: 1: Carmen Bergeron & County Rd 17

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	171	112	27	89	2	72	292	144	154
Future Volume (vph)	171	112	27	89	2	72	292	144	154
Lane Group Flow (vph)	180	120	28	310	0	126	0	459	162
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phase	4	4	8	8	2	2	6	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)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	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	Min	Min	Min	Min	Min
Act Effct Green (s)	13.1	13.1	13.1	13.1		18.1		18.1	18.1
Actuated g/C Ratio	0.33	0.33	0.33	0.33		0.46		0.46	0.46
v/c Ratio	0.60	0.20	0.07	0.46		0.09		0.79	0.21
Control Delay	20.3	10.1	9.2	6.0		5.1		24.1	2.7
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	20.3	10.1	9.2	6.0		5.1		24.1	2.7
LOS	C	B	A	A		A		C	A
Approach Delay		16.2		6.3		5.1		18.5	
Approach LOS		B		A		A		B	
Queue Length 50th (m)	9.8	5.6	1.3	4.4		1.3		22.0	0.0
Queue Length 95th (m)	23.8	12.8	4.5	16.0		5.0		#73.4	7.1
Internal Link Dist (m)		33.9		74.5		69.2		94.8	
Turn Bay Length (m)			25.0						
Base Capacity (vph)	416	815	555	847		1493		620	815
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.43	0.15	0.05	0.37		0.08		0.74	0.20

Intersection Summary	
Cycle Length: 45	
Actuated Cycle Length: 39.3	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 13.8	Intersection LOS: B
Intersection Capacity Utilization 70.0%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	

Queue shown is maximum after two cycles.

Splits and Phases: 2: Carmen Bergeron & Richelieu

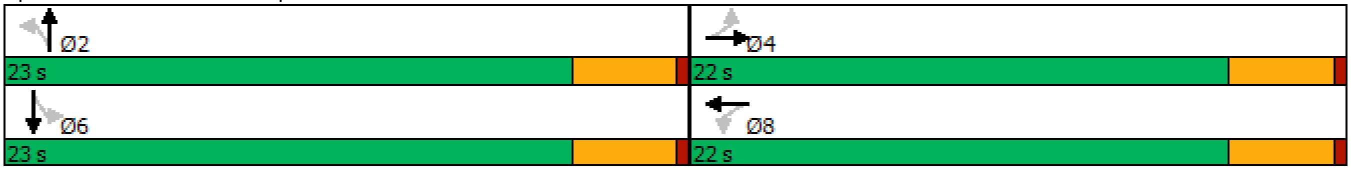


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	169	69	30	44	193	223	41	172
Future Volume (vph)	169	69	30	44	193	223	41	172
Lane Group Flow (vph)	178	398	0	97	0	473	0	420
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	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
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	4.0	4.0		4.0		4.0		4.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Min	Min	Min	Min
Act Effct Green (s)	12.1	12.1		12.1		12.8		12.8
Actuated g/C Ratio	0.36	0.36		0.36		0.39		0.39
v/c Ratio	0.40	0.52		0.18		0.53		0.64
Control Delay	11.7	5.1		7.7		10.3		11.2
Queue Delay	0.0	0.0		0.0		0.0		0.0
Total Delay	11.7	5.1		7.7		10.3		11.2
LOS	B	A		A		B		B
Approach Delay		7.1		7.7		10.3		11.2
Approach LOS		A		A		B		B
Queue Length 50th (m)	5.7	2.1		2.3		7.3		9.3
Queue Length 95th (m)	20.4	16.2		10.2		21.9		36.0
Internal Link Dist (m)		59.9		24.8		77.8		42.7
Turn Bay Length (m)	20.0							
Base Capacity (vph)	687	1011		805		1356		949
Starvation Cap Reductn	0	0		0		0		0
Spillback Cap Reductn	0	0		0		0		0
Storage Cap Reductn	0	0		0		0		0
Reduced v/c Ratio	0.26	0.39		0.12		0.35		0.44

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 33.2
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 9.2 Intersection LOS: A
Intersection Capacity Utilization 79.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Poupart & Richelieu



Lane Group	EBL	NBT	SBT
Lane Configurations			
Traffic Volume (vph)	54	438	493
Future Volume (vph)	54	438	493
Lane Group Flow (vph)	111	536	538
Sign Control	Stop	Free	Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 46.4%	ICU Level of Service A
Analysis Period (min) 15	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	51	71	438	493	18
Future Volume (Veh/h)	54	51	71	438	493	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	57	54	75	461	519	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					102	
pX, platoon unblocked						
vC, conflicting volume	909	269	538			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	269	538			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	78	93	93			
cM capacity (veh/h)	254	729	1026			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	111	229	307	346	192
Volume Left	57	75	0	0	0
Volume Right	54	0	0	0	19
cSH	372	1026	1700	1700	1700
Volume to Capacity	0.30	0.07	0.18	0.20	0.11
Queue Length 95th (m)	9.2	1.8	0.0	0.0	0.0
Control Delay (s)	18.7	3.4	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	18.7	1.4		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	5584	1645	9	3398	1266	26
Future Volume (vph)	5584	1645	9	3398	1266	26
Lane Group Flow (vph)	6204	1828	10	3776	1407	29
Turn Type	NA	Perm	Perm	NA	pm+pt	Perm
Protected Phases	4			8	5	
Permitted Phases		4	8		2	2
Detector Phase	4	4	8	8	5	2
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	128.0	128.0	128.0	128.0	22.0	22.0
Total Split (%)	85.3%	85.3%	85.3%	85.3%	14.7%	14.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	124.0	124.0	124.0	124.0	18.0	18.0
Actuated g/C Ratio	0.83	0.83	0.83	0.83	0.12	0.12
v/c Ratio	2.47	1.55	0.24	1.50	7.73	0.18
Control Delay	679.2	267.8	17.2	247.7	3048.0	62.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	679.2	267.8	17.2	247.7	3048.0	62.5
LOS	F	F	B	F	F	E
Approach Delay	585.5			247.1	2987.7	
Approach LOS	F			F	F	
Queue Length 50th (m)	~1584.7	~739.7	0.5	~807.1	~800.7	7.8
Queue Length 95th (m)	#1569.0	#818.7	3.6	#828.8	#880.5	17.9
Internal Link Dist (m)	116.5			194.0	73.0	
Turn Bay Length (m)		25.0	25.0			
Base Capacity (vph)	2512	1182	42	2512	182	163
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.47	1.55	0.24	1.50	7.73	0.18

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 7.73	
Intersection Signal Delay: 749.1	Intersection LOS: F
Intersection Capacity Utilization 265.2%	ICU Level of Service H
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Street 1 & County Rd 17

Appendix I

Domestic Water Demands, Boundary Conditions, and Hydraulic

Clarence-Rockland Hydraulics Engineering Services
West Secondary Plan Boundary Conditions

Active Scenario: Form1-2-MDD+FIRE-SS

CR-WDS_Model-2023-10-24.wtg
11/8/2023

Clarence-Rockland Hydraulics Engineering Services
West Secondary Plan Boundary Conditions

Active Scenario: Form1-2-MDD+FIRE-SS

Jacobs

CR-WDS_Model-2023-10-24.wtg
11/8/2023

Clarence-Rockland Hydraulics Engineering Services
West Secondary Plan Boundary Conditions

Active Scenario: Form1-1-PHD-SS

CR-WDS_Model-2023-10-24.wtg
10/25/2023

Clarence-Rockland Hydraulics Engineering Services
West Secondary Plan Boundary Conditions

Active Scenario: Form1-3-ADD-SS

Jacobs

CR-WDS_Model-2023-10-24.wtg
10/25/2023

DOMESTIC WATER DEMAND CALCULATION SHEET
Rockland West - Secondary Plan
City Clarence-Rockalnd
Option 1

Land Use	Area (sq-m)	Area (ha)	No. Employee (85 per ha)	No. Units	Pop (res) 1.8 ppu	AVG Demand (L/s)			MAX Day Demand (L/s)			Peak Hour Demand (L/s)		
						Non-Res	Res	Total	Non-Res	Res	Total	Non-Res	Res	Total
Service Commercial	143502.10	14.35	1220			4.94		4.94	8.89		8.89	13.34		13.34
Business Park	162546.60	16.25	1382			5.60		5.60	10.07		10.07	15.11		15.11
Commerical Core	158537.90	15.85	1348			5.46		5.46	9.83		9.83	14.74		14.74
Commerical Core (res)	0.00	0.00		161	290		0.65	0.65		1.17	1.17		1.76	1.76
Medium Density Res	40238.40	4.02		141	254		0.57	0.57		1.03	1.03		1.54	1.54
High Density Res	41397.80	4.14		275	496		1.12	1.12		2.01	2.01		3.01	3.01
SUB-TOTAL		54.622	3949	577	1039	16.00	2.34	18.33	29	4.21	33.00	43.19	6.31	49.50

DESIGN ASSUMPTIONS (per Jacobs)

Non-Residential Land Use	Design Criteria
Service Commercial	28000 L/ha/day
Service Commercial*	85 employee/ha
Business Park	28000 L/ha/day
Business Park*	85 employee/ha
Commercial Core	28000 L/ha/day
Commercial Core*	85 employee/ha
Employment Usage	75 L/empl/day

Note *: 75% of development at 80 persons/ha & 25% at 100 person per ha
: Commercial/Employment Usage of 75 L/day (Ottawa)
: Res Density - 1.8 person/unit (apt)

AVG Demand (L/s)			MAX Day Demand (L/s)			Peak Hour Demand (L/s)		
Non-Res	Res	Total	Non-Res	Res	Total	Non-Res	Res	Total
4.65		4.65	8.37		8.37	12.56		12.56
5.27		5.27	9.48		9.48	14.22		14.22
5.14		5.14	9.25		9.25	13.87		13.87
	0.65	0.65		1.17	1.17		1.76	1.76
	0.57	0.57		1.03	1.03		1.54	1.54
	1.12	1.12		2.01	2.01		3.01	3.01
15.06	2.34	17.39	27.10	4.21	31.31	40.65	6.31	46.96

Residential Land Use	Design Criteria
Medium Density	350 L/cap/day
High Density	350 L/cap/day
Commercial Core (residential)	350 L/cap/day

Residential Land Use	Average Unit Density**
Medium Density	50 units/ha
High Density	95 units/ha
Commercial Core (residential)	72.5 units/ha

Note **: ha is referring to developable land area not gross area.

Peaking Factor	Design Criteria
Res: Max Day to Avg Day	1.8 Section 6.2.1
Res: Peak Hr to Max Day	1.5 Section 6.2.1
ICI: Avg to Max	1.8 Section 6.2.1
ICI: Max to Peak	1.5 Section 6.2.1

DOMESTIC WATER DEMAND CALCULATION SHEET
Rockland West - Secondary Plan
City Clarence-Rockalnd
Option 3

Land Use	Area (sq-m)	Area (ha)	No. Employee (85 per ha)	No. Units	Pop (res) 1.8 ppu	AVG Demand (L/s)			MAX Day Demand (L/s)			Peak Hour Demand (L/s)		
						Non-Res	Res	Total	Non-Res	Res	Total	Non-Res	Res	Total
Service Commercial	14525.30	1.45	123			0.50		0.50	0.90		0.90	1.35		1.35
Business Park	466794.00	46.68	3968			16.07		16.07	28.93		28.93	43.40		43.40
Commerical Core	0.00	0.00				0.00		0.00	0.00		0.00	0.00		0.00
Commerical Core (res)	0.00	0.00		0	0		0.00	0.00		0.00	0.00		0.00	0.00
Medium Density Res	64903.60	6.49		227	409		0.92	0.92		1.66	1.66		2.48	2.48
High Density Res	0.00	0.00		0	0		0.00	0.00		0.00	0.00		0.00	0.00
SUB-TOTAL		54.622	4091	227	409	16.57	0.92	17.49	30	1.66	31.49	44.75	2.48	47.23

DESIGN ASSUMPTIONS (per Jacobs)

Non-Residential Land Use	Design Criteria
Service Commercial	28000 L/ha/day
Service Commercial*	85 employee/ha
Business Park	28000 L/ha/day
Business Park*	85 employee/ha
Commercial Core	28000 L/ha/day
Commercial Core*	85 employee/ha
Employment Usage	75 L/empl/day

Note *: 75% of development at 80 persons/ha & 25% at 100 person per ha
: Commercial/Employment Usage of 75 L/day (Ottawa)
: Res Density - 1.8 person/unit (apt)

AVG Demand (L/s)			MAX Day Demand (L/s)			Peak Hour Demand (L/s)		
Non-Res	Res	Total	Non-Res	Res	Total	Non-Res	Res	Total
0.47		0.47	0.85		0.85	1.27		1.27
15.13		15.13	27.23		27.23	40.84		40.84
0.00		0.00	0.00		0.00	0.00		0.00
	0.00	0.00		0.00	0.00		0.00	0.00
	0.92	0.92		1.66	1.66		2.48	2.48
	0.00	0.00		0.00	0.00		0.00	0.00
15.60	0.92	16.52	28.08	1.66	29.73	42.12	2.48	44.60

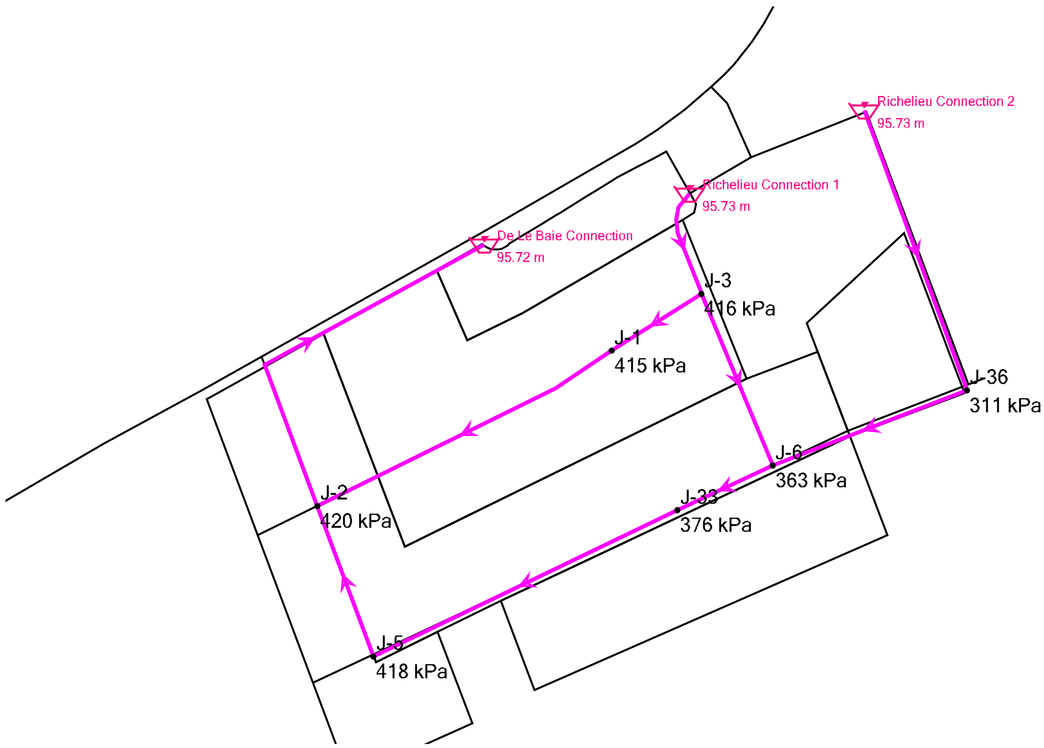
Residential Land Use	Design Criteria
Medium Density	350 L/cap/day
High Density	350 L/cap/day
Commercial Core (residential)	350 L/cap/day

Residential Land Use	Average Unit Density**
Medium Density	50 units/ha
High Density	95 units/ha
Commercial Core (residential)	72.5 units/ha

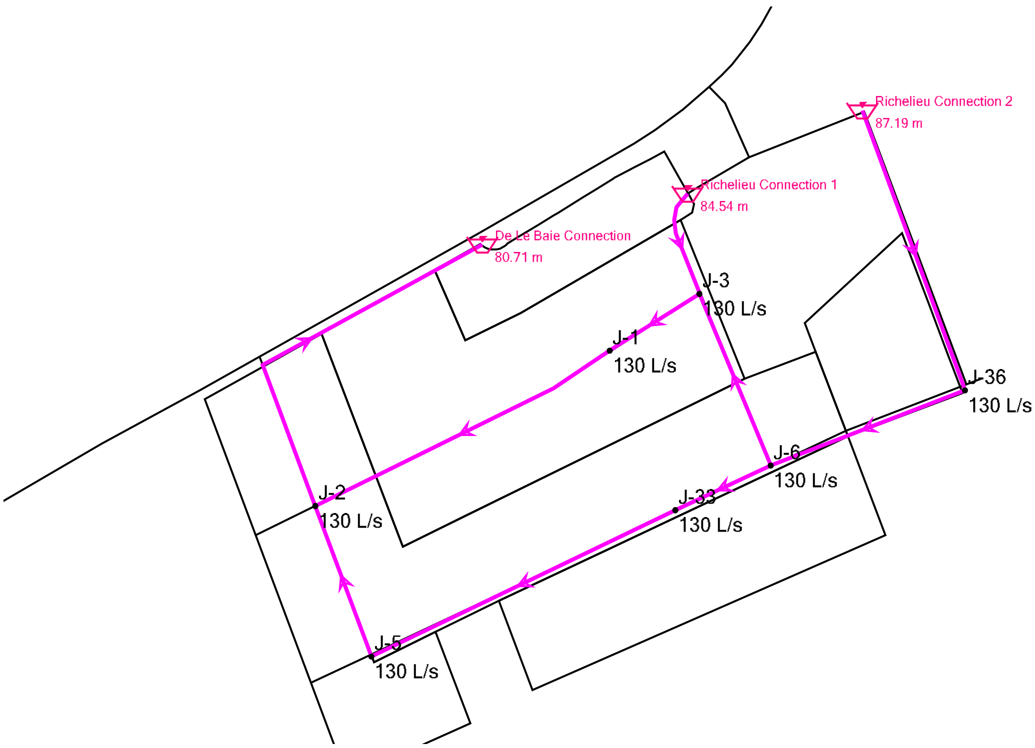
Note **: ha is referring to developable land area not gross area.

Peaking Factor	Design Criteria
Res: Max Day to Avg Day	1.8 Section 6.2.1
Res: Peak Hr to Max Day	1.5 Section 6.2.1
ICI: Avg to Max	1.8 Section 6.2.1
ICI: Max to Peak	1.5 Section 6.2.1

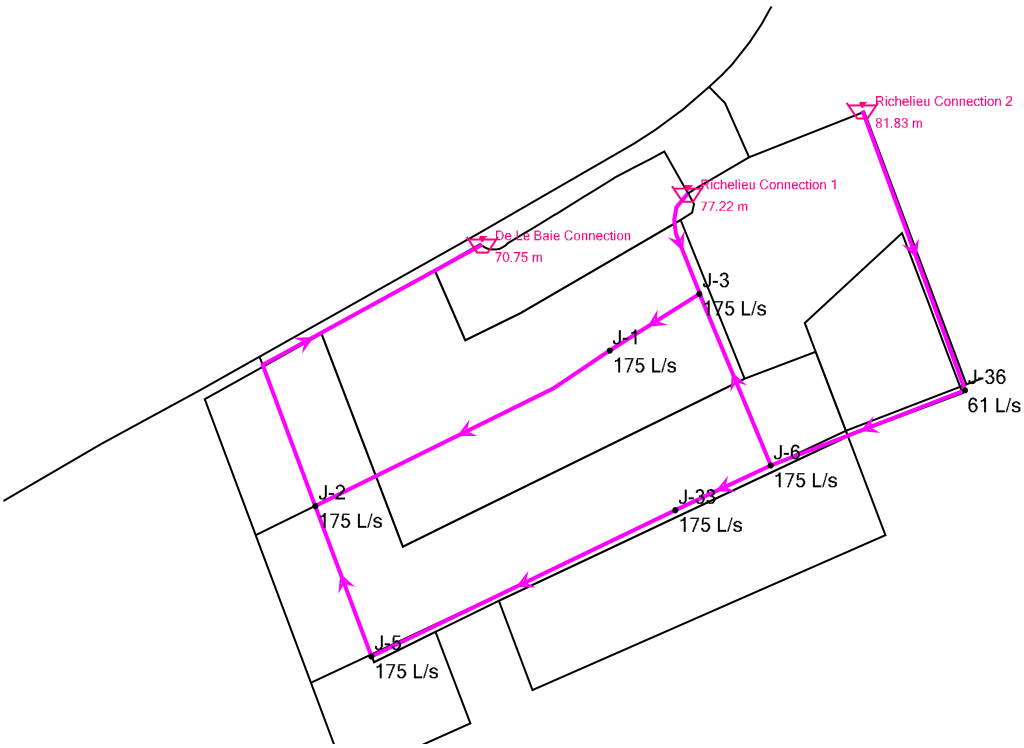
ROCKLAND SECONDARY PLAN
OPTION 1
EXISTING AVERAGE DAY DEMAND



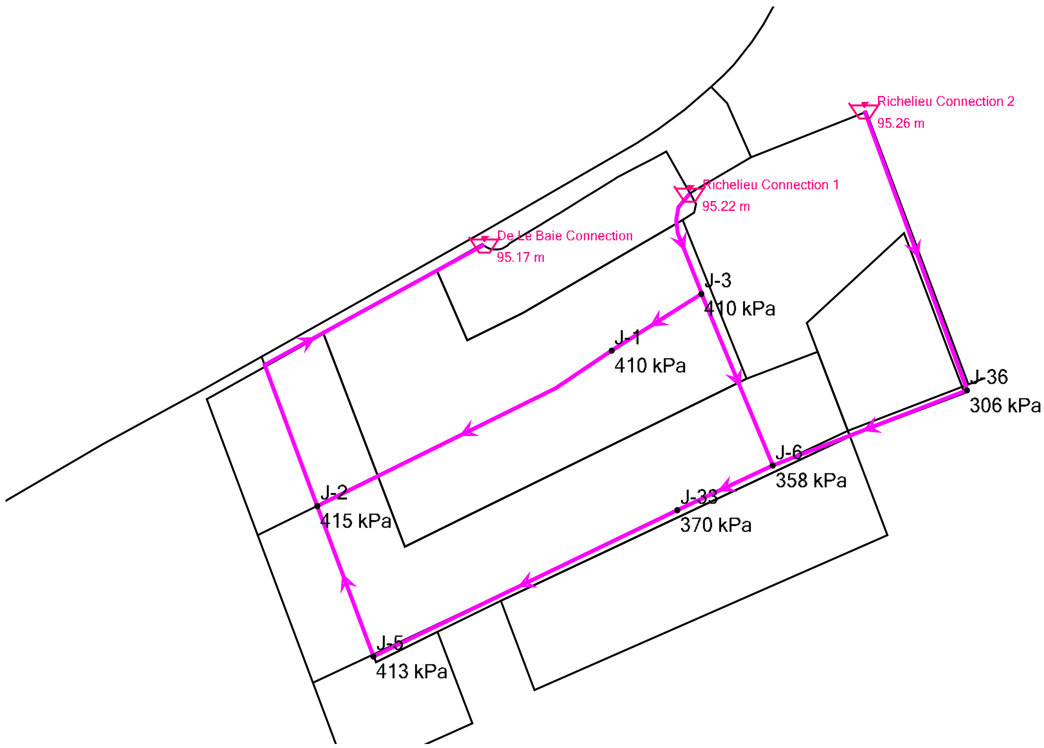
ROCKLAND SECONDARY PLAN
OPTION 1
EXISTING MAXIMUM DAY DEMAND
PLUS FIRE FLOW (130 L/s)



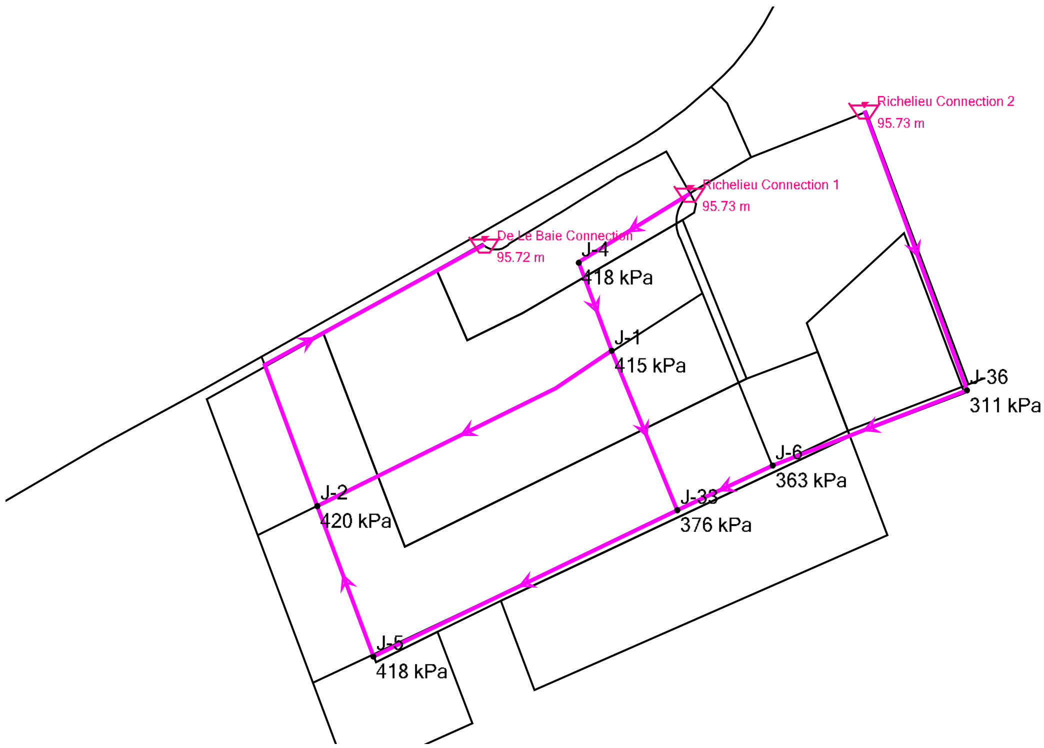
ROCKLAND SECONDARY PLAN
OPTION 1
EXISTING MAXIMUM DAY DEMAND
PLUS FIRE FLOW (175 L/s)



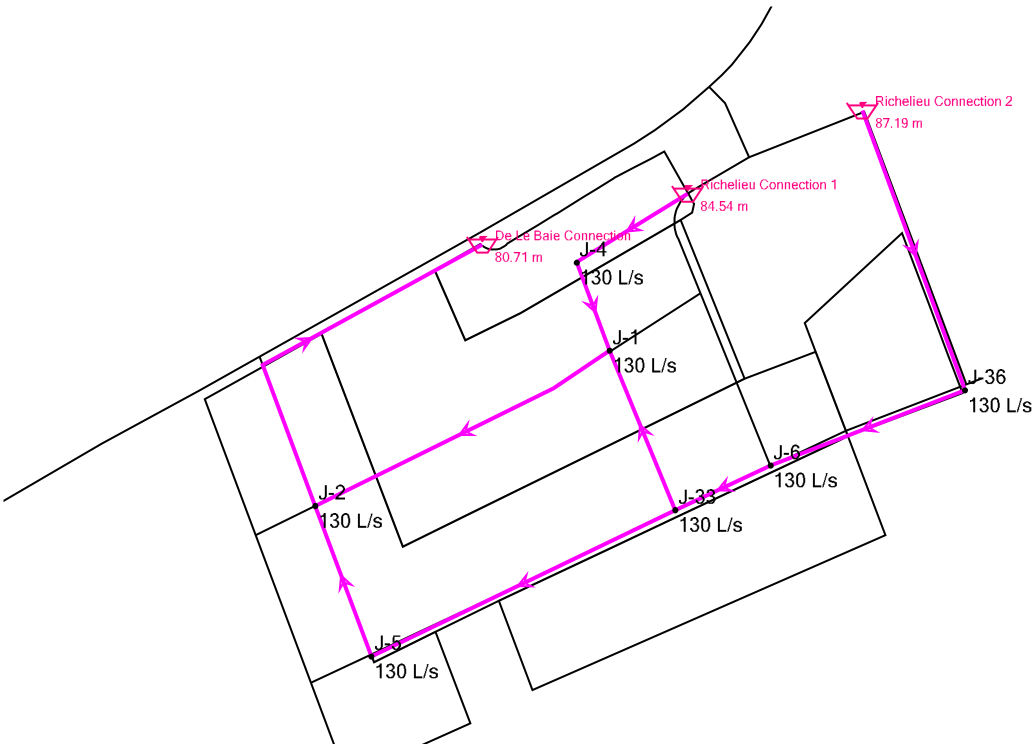
ROCKLAND SECONDARY PLAN
OPTION 1
EXISTING PEAK HOUR DEMAND



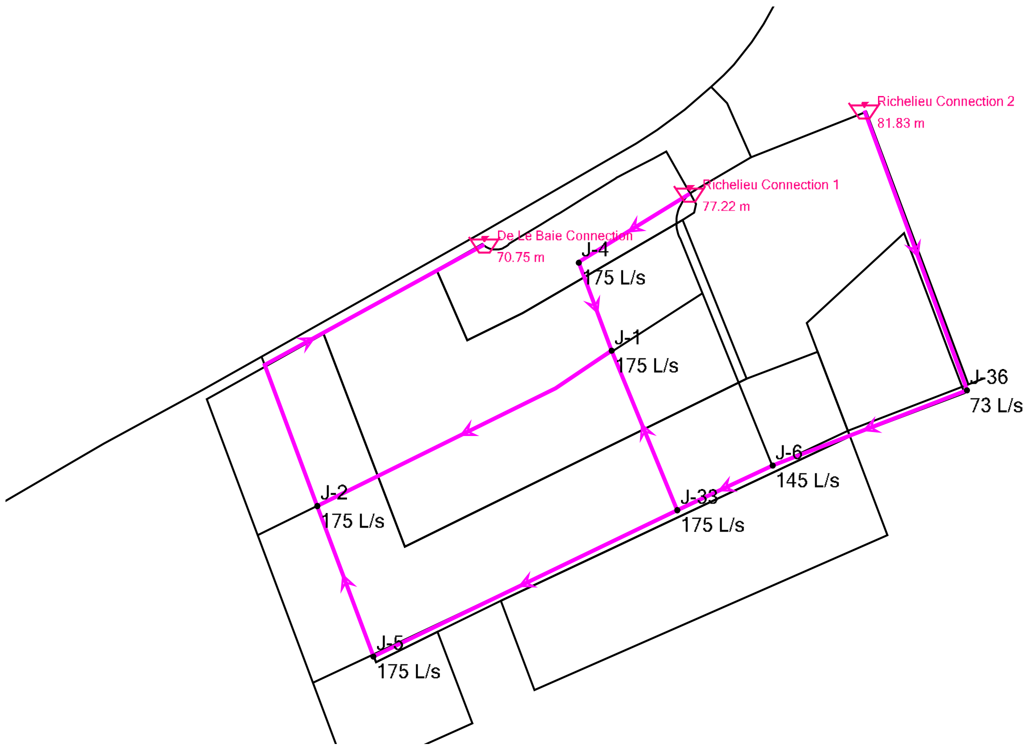
ROCKLAND SECONDARY PLAN
OPTION 3
EXISTING AVERAGE DAY DEMAND



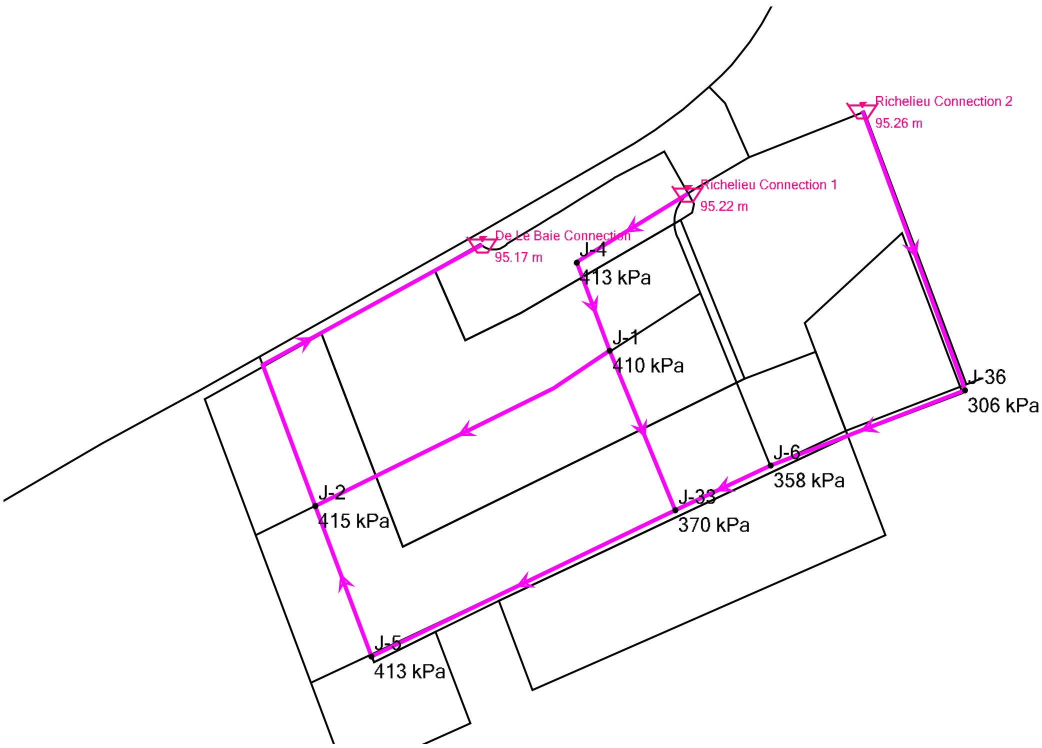
ROCKLAND SECONDARY PLAN
OPTION 3
EXISTING MAXIMUM DAY DEMAND
PLUS FIRE FLOW (130 L/s)



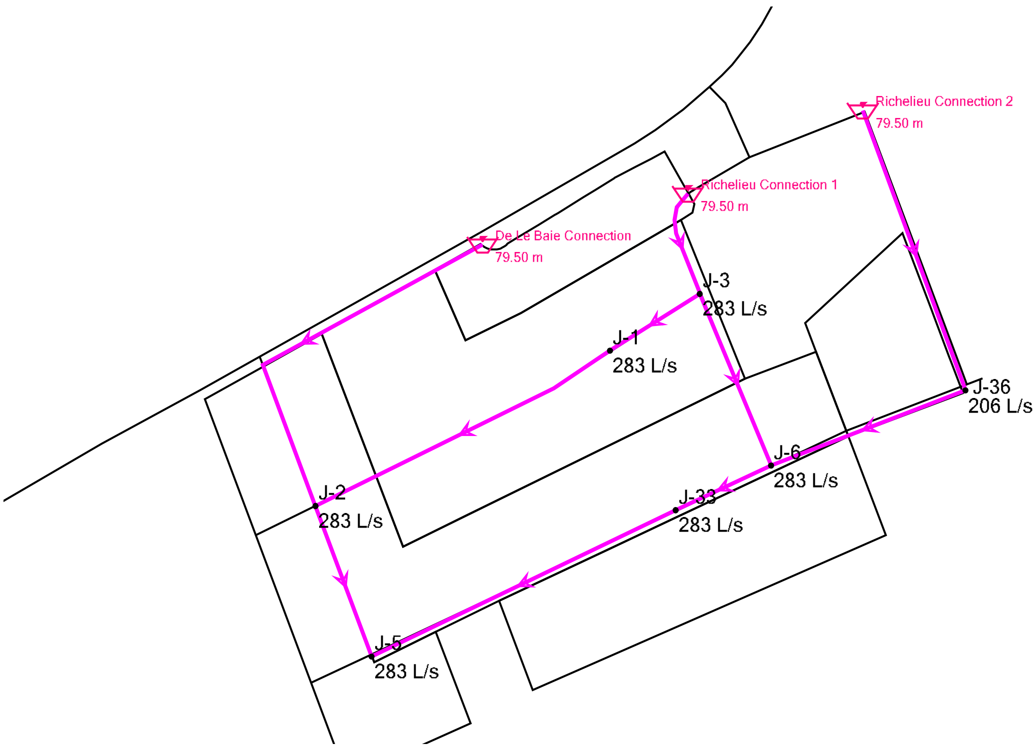
ROCKLAND SECONDARY PLAN
OPTION 3
EXISTING MAXIMUM DAY DEMAND
PLUS FIRE FLOW (175 L/s)



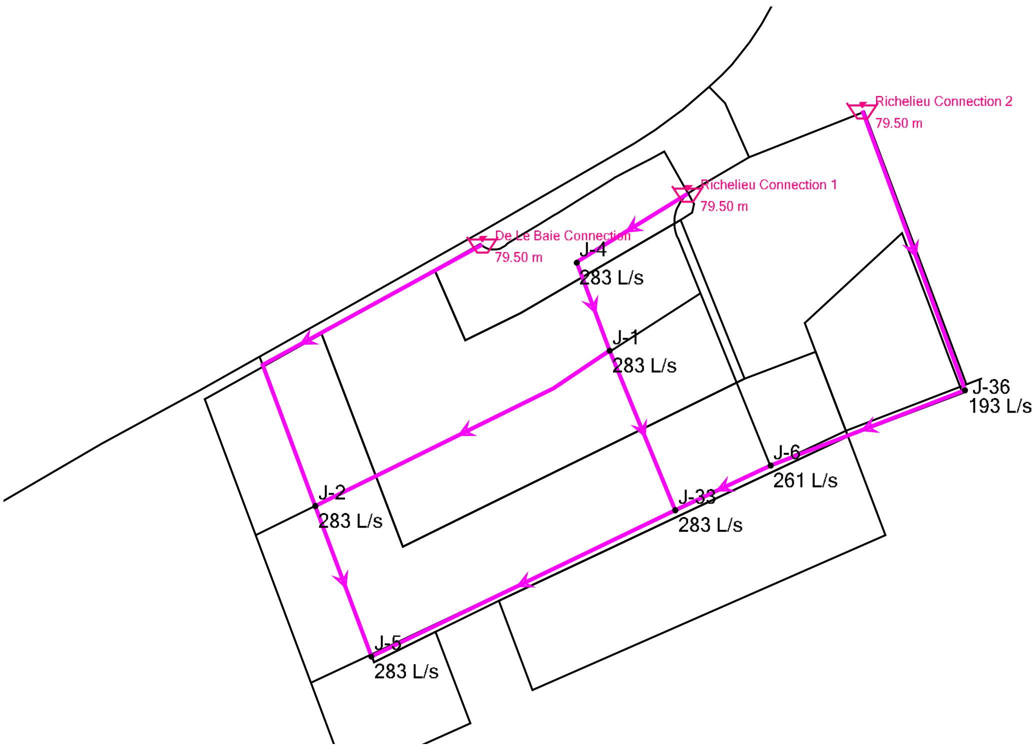
ROCKLAND SECONDARY PLAN
OPTION 3
EXISTING PEAK HOUR DEMAND



ROCKLAND SECONDARY PLAN
OPTION 1
FUTURE MAXIMUM DAY DEMAND PLUS FIRE FLOW



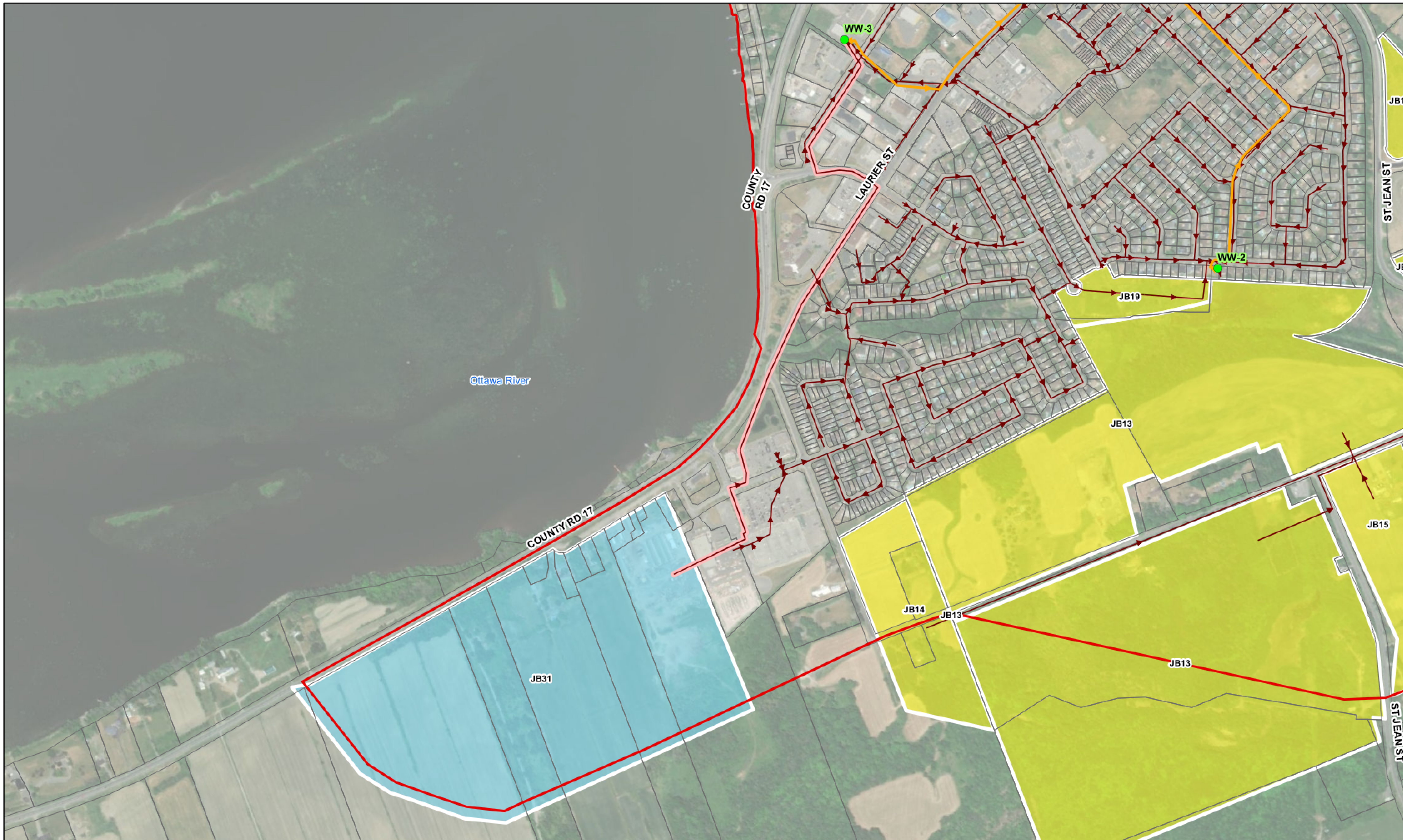
ROCKLAND SECONDARY PLAN
OPTION 3
FUTURE MAXIMUM DAY DEMAND PLUS FIRE FLOW



Appendix J

Sanitary Sewer Design Sheets

Scenario	Recommendations
2031	**Trunk Sewers:** No new surcharge issues. A new gravity sewer is required to convey flows from the Special Study Area west of Walmart to SPS-3. The alignment is shown in Appendix C. **Local Sewers:** No new surcharge issues. **MH Freeboard:** No new freeboard issues.



N

0 40 80
Metres

- Pump Station
- Forcemain
- Sanitary Sewer
- Proposed Gravity 300
- Parcel
- Clarence-Rockland Boundary

Future Development Area
- Employment
- Residential

Notes:
1. Aerial Source: Vivid, 2020.

DRAFT

Appendix C
Special Study Area
Wastewater Collection System Summary Report
City of Clarance Rockland
Clarance-Rockland, Ontario

Jacobs

\\DC1VS01\GISPROJ\C\CLARENCEROCKLANDCITYOF\660549CRSOWDSHYRAULI\MAPFILES\WASTEWATERSUMMARYREPORT\SPECIALSTUDYAREA.MXD VM048279 2/11/2022 1:59:03 PM

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

SANITARY SEWER DESIGN SHEET

Prepared By: MM
Reviewed By: AW

PROJECT: SECONDARY PLAN - ROCKLAND WEST - OPTION 1

JLR NO.: 31097-000

LOCATION			Residential Flows							Commercial/Institutional Flows				Infiltration Flows			
						Cumulative											
Street Name	From MH	To MH	Area (ha)	Units (1.8 ppu)	Pop.	Area	Pop.	Peaking Factor	Residential Flows (L/s)	Area (ha)	Cum. Area (ha)	Peaking Factor	Comm/Inst. Flows (L/s)	Total Infiltration Areas (ha)	Total Cum. Infiltration Areas (ha)	Infiltration Flows (L/s)	TOTAL EST. PEAK FLOW (L/s)
OPTION 1	MH5	MH4			0	0.00	0	3.80	0.00	7.37	7.37	1.50	3.58	7.37	7.37	2.06	**5.64**
OPTION 1	MH7	MH6			0	0.00	0	3.80	0.00	15.87	15.87	1.50	7.71	15.87	15.87	4.44	**12.16**
OPTION 1	MH6	MH4			0	0.00	0	3.80	0.00	7.37	23.24	1.50	11.30	7.37	23.24	6.51	**17.80**
OPTION 1	MH4	MH3		159	286	0.00	286	3.47	4.02	15.85	46.46	1.50	22.58	15.85	46.46	13.01	**39.62**
OPTION 1	MH8	MH7	4.02	144	259	4.02	259	3.48	3.66		0.00	1.50	0.00	4.02	4.02	1.13	**4.78**
OPTION 1	MH7	MH3			0	4.02	259	3.48	3.66		0.00	1.50	0.00	0.00	4.02	1.13	**4.78**
OPTION 1	MH3	MH2	4.14	266	479	8.16	1024	3.23	13.42		46.46	1.50	22.58	4.14	54.62	15.29	**51.30**
OPTION 1	MH2	EX PS			0	**8.16**	**1024**	3.23	13.42		**46.46**	1.50	22.58	0.00	**54.62**	15.29	**51.30**

LOCATION			Sewer Data									Upstream Geometry				Downstream Geometry				
Street Name	From MH	To MH	Type	Nominal Dia. (mm)	Actual Dia. (mm)	Slope	Length (m)	Q Full (L/s)	V Full (m/s)	Residual Capacity (L/s)	% Full	TG From	Obvert	Invert	Cover	TG To	Drop	Obvert	Invert	Cover
OPTION 1	MH5	MH4	PVC	200	203.20	0.40%	75.00	21.64	0.67	16.00	26%	52.330	**50.520**	**50.317**	1.810	52.800		**50.220**	**50.017**	2.580
OPTION 1	MH7	MH6	PVC	200	203.20	3.00%	200.00	59.26	1.83	47.11	21%	58.640	**56.520**	**56.317**	2.120	52.990		**50.520**	**50.317**	2.470
OPTION 1	MH6	MH4	PVC	200	203.20	0.40%	75.00	21.64	0.67	3.84	82%	52.990	**50.520**	**50.317**	2.470	52.800		**50.220**	**50.017**	2.580
OPTION 1	MH4	MH3	PVC	300	304.80	0.30%	200.00	55.26	0.76	15.64	72%	52.800	**50.220**	**49.915**	2.580	53.270		**49.620**	**49.315**	3.650
OPTION 1	MH8	MH7	PVC	200	203.20	6.00%	100.00	83.81	2.58	79.03	6%	63.940	**60.420**	**60.217**	3.520	58.640		**54.420**	**54.217**	4.220
OPTION 1	MH7	MH3	PVC	200	203.20	6.00%	80.00	83.81	2.58	79.03	6%	58.640	**54.420**	**54.217**	4.220	53.270		**49.620**	**49.417**	3.650
OPTION 1	MH3	MH2	PVC	300	304.80	0.30%	40.00	55.26	0.76	3.96	93%	53.270	**49.620**	**49.315**	3.650	52.000		**49.500**	**49.195**	2.500
OPTION 1	MH2	EX PS	PVC	300	304.80	0.30%	1000.00	55.26	0.76	3.96	93%	52.000	**49.500**	**49.195**	**2.500**	50.500		**46.500**	**46.195**	**4.000**

Design Parameters (Per OSDG and ISTB-2018-01)		
Residential Avg. Flows =	350	L/Cap/d
Comm./Instit. Avg. Flows =	28000	L/ha/d
Infiltration Allowance =	0.28	L/s/ha
Manning Coefficient =	0.013	unitless

Legend	
89.232	Proposed Mainline Sewers
89.232	Ex. (As-Built Information)

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

SANITARY SEWER DESIGN SHEET

PROJECT: SECONDARY PLAN - ROCKLAND WEST - OPTION 3

JLR NO.: 31097-000

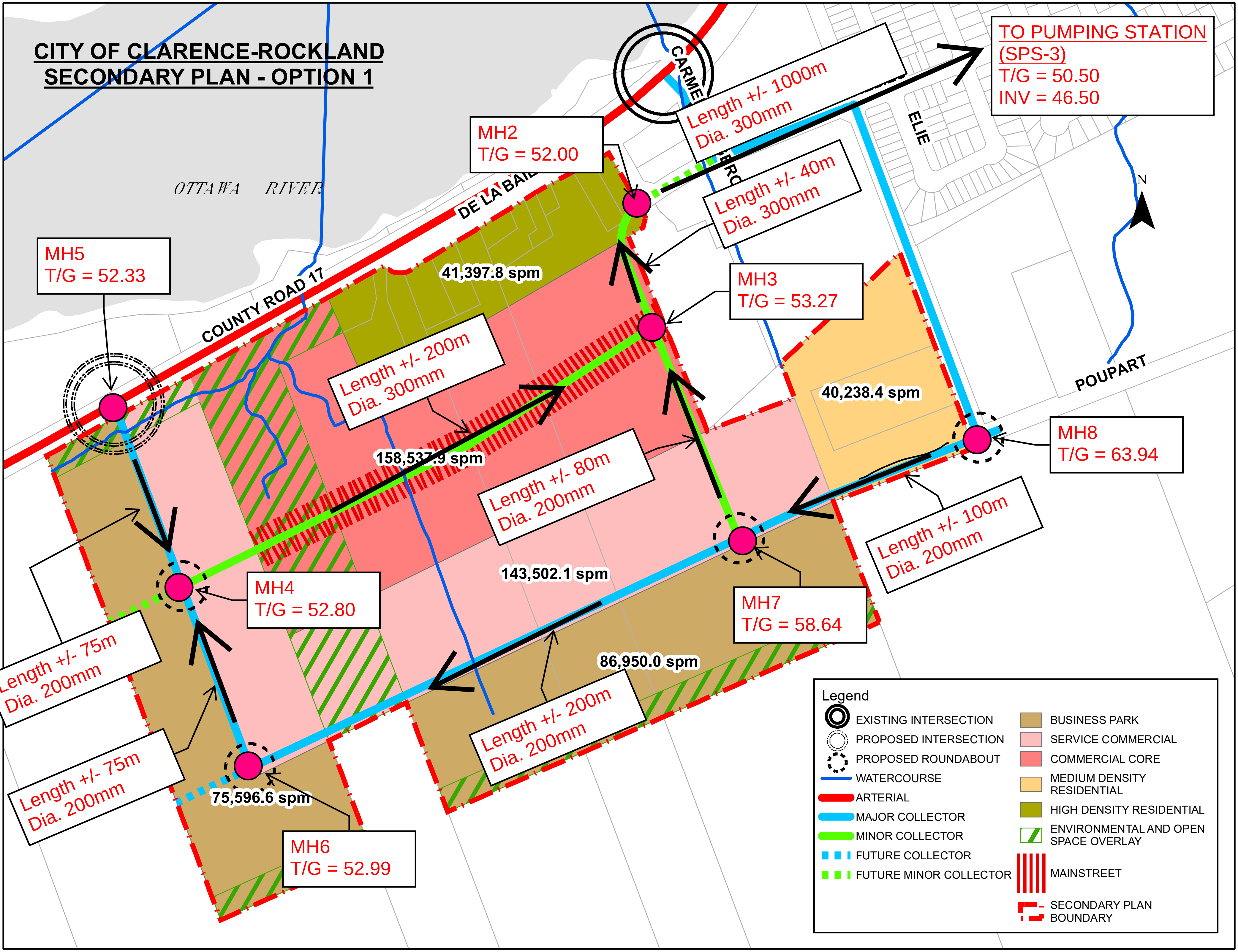
Prepared By: MM
Reviewed By: AW

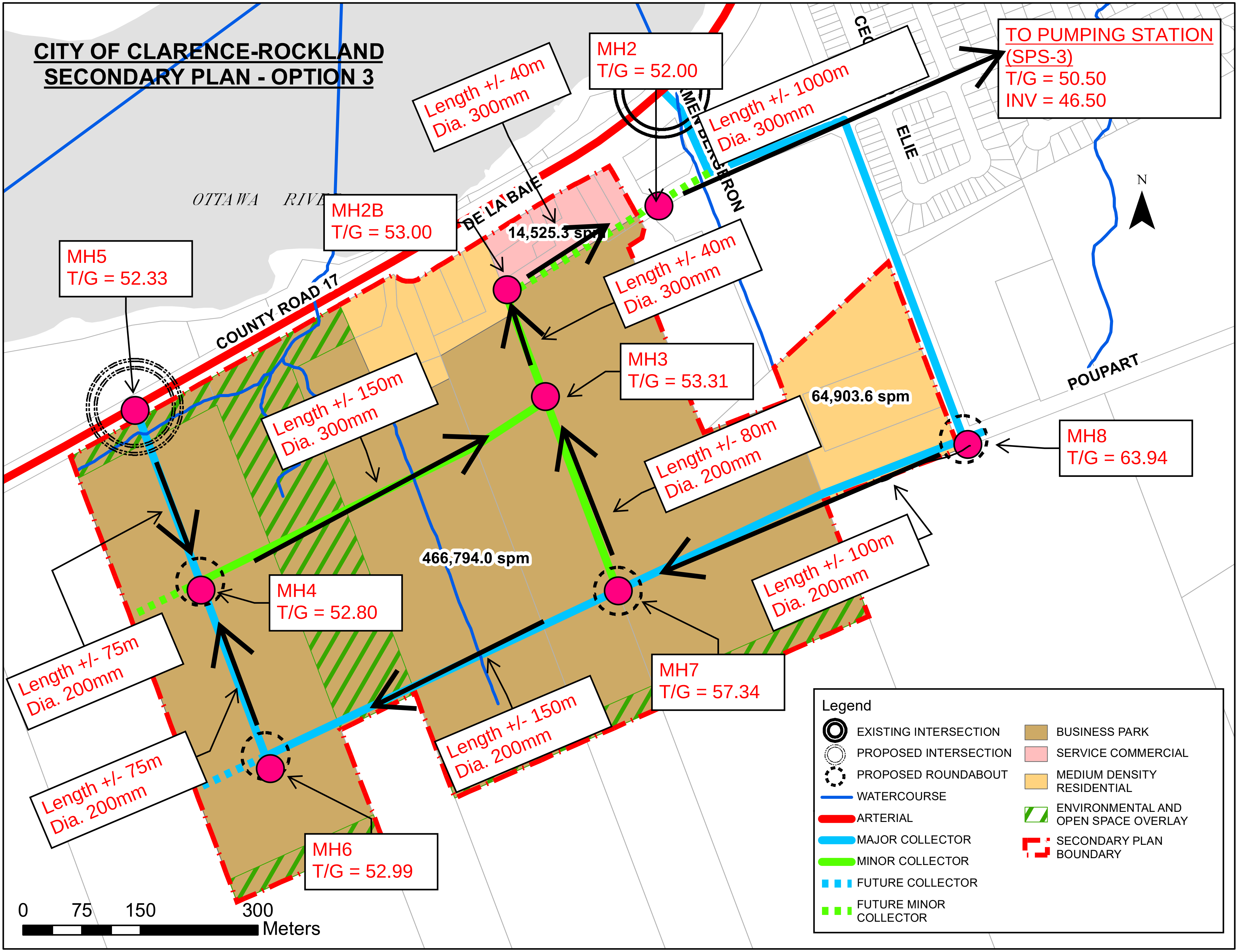
LOCATION			Residential Flows							Commercial/Institutional Flows				Infiltration Flows			
						Cumulative											
Street Name	From MH	To MH	Area (ha)	Units (1.8 ppu)	Pop.	Area	Pop.	Peaking Factor	Residential Flows (L/s)	Area (ha)	Cum. Area (ha)	Peaking Factor	Comm/Inst. Flows (L/s)	Total Infiltration Areas (ha)	Total Cum. Infiltration Areas (ha)	Infiltration Flows (L/s)	TOTAL EST. PEAK FLOW (L/s)
OPTION 1	MH5	MH4			0	0.00	0	3.80	0.00	7.37	7.37	1.50	3.58	7.37	7.37	2.06	**5.64**
OPTION 1	MH7	MH6			0	0.00	0	3.80	0.00	15.87	15.87	1.50	7.71	15.87	15.87	4.44	**12.16**
OPTION 1	MH6	MH4			0	0.00	0	3.80	0.00	7.37	23.24	1.50	11.30	7.37	23.24	6.51	**17.80**
OPTION 1	MH4	MH3		159	286	0.00	286	3.47	4.02	15.85	46.46	1.50	22.58	15.85	46.46	13.01	**39.62**
OPTION 1	MH8	MH7	4.02	144	259	4.02	259	3.48	3.66		0.00	1.50	0.00	4.02	4.02	1.13	**4.78**
OPTION 1	MH7	MH3			0	4.02	259	3.48	3.66		0.00	1.50	0.00	0.00	4.02	1.13	**4.78**
OPTION 1	MH3	MH2B	4.14	266	479	8.16	1024	3.23	13.42		46.46	1.50	22.58	4.14	54.62	15.29	**51.30**
OPTION 1	MH2B	MH2			0	8.16	1024	3.23	13.42		46.46	1.50	22.58	0.00	54.62	15.29	**51.30**
OPTION 1	MH2	EX PS				**8.16**	**1024**	3.23	13.42		**46.46**	1.50	22.58	0.00	**54.62**	15.29	**51.30**

LOCATION		Sewer Data									Upstream Geometry				Downstream Geometry				
From MH	To MH	Type	Nominal Dia. (mm)	Actual Dia. (mm)	Slope	Length (m)	Q Full (L/s)	V Full (m/s)	Residual Capacity (L/s)	% Full	TG From	Obvert	Invert	Cover	TG To	Drop	Obvert	Invert	Cover
MH5	MH4	PVC	200	203.20	0.40%	75.00	21.64	0.67	16.00	26%	52.330	**50.490**	**50.287**	1.840	52.800		**50.190**	**49.987**	2.610
MH7	MH6	PVC	200	203.20	3.00%	150.00	59.26	1.83	47.11	21%	58.640	**54.990**	**54.787**	3.650	52.990		**50.490**	**50.287**	2.500
MH6	MH4	PVC	200	203.20	0.40%	75.00	21.64	0.67	3.84	82%	52.990	**50.490**	**50.287**	2.500	52.800		**50.190**	**49.987**	2.610
MH4	MH3	PVC	300	304.80	0.30%	150.00	55.26	0.76	15.64	72%	52.800	**50.190**	**49.885**	2.610	53.270		**49.740**	**49.435**	3.530
MH8	MH7	PVC	200	203.20	6.00%	100.00	83.81	2.58	79.03	6%	63.940	**60.540**	**60.337**	3.400	58.640		**54.540**	**54.337**	4.100
MH7	MH3	PVC	200	203.20	6.00%	80.00	83.81	2.58	79.03	6%	58.640	**54.540**	**54.337**	4.100	53.270		**49.740**	**49.537**	3.530
MH3	MH2B	PVC	300	304.80	0.30%	40.00	55.26	0.76	3.96	93%	53.270	**49.740**	**49.435**	3.530	52.000		**49.620**	**49.315**	2.380
MH2B	MH2	PVC	300	304.80	0.30%	40.00	55.26	0.76	3.96	93%	53.270	**49.620**	**49.315**	3.650	53.000		**49.500**	**49.195**	3.500
MH2	EX PS	PVC	300	304.80	0.30%	1000.00	55.26	0.76	3.96	93%	52.000	**49.500**	**49.195**	**2.500**	50.500		**46.500**	**46.195**	**4.000**

Design Parameters (Per OSDG and ISTB-2018-01)		
Residential Avg. Flows =	350	L/Cap/d
Comm./Instit. Avg. Flows =	28000	L/ha/d
Infiltration Allowance =	0.28	L/s/ha
Manning Coefficient =	0.013	unitless

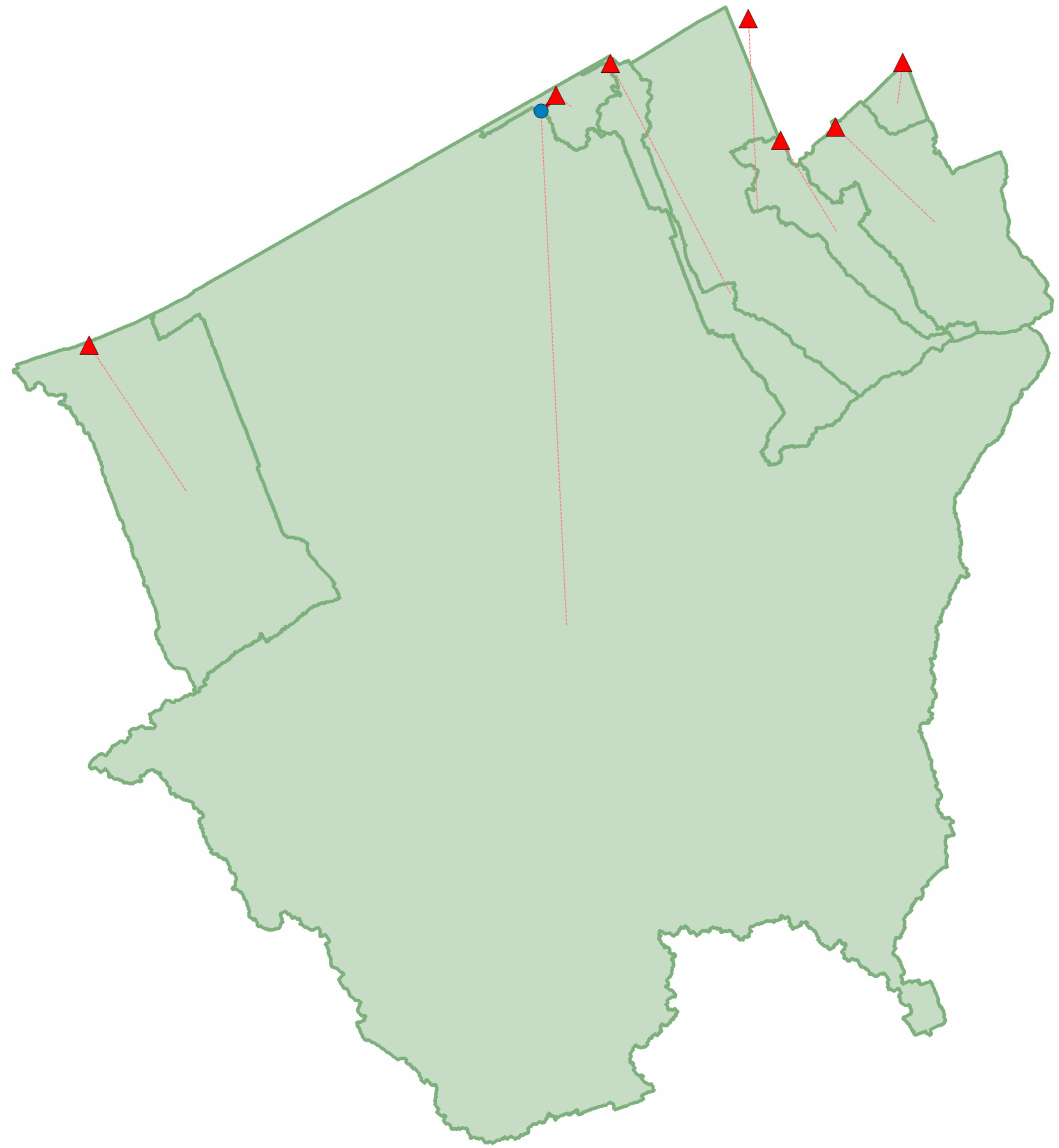
Legend	
89.232	Proposed Mainline Sewers
89.232	Ex. (As-Built Information)


CITY OF CLARENCE-ROCKLAND
SECONDARY PLAN - OPTION 1
OTTAWA RIVER
COUNTY ROAD 17
DE LA BAIE
ELIE
POUPART
TO PUMPING STATION (SPS-3)
T/G = 50.50
INV = 46.50
Length +/- 1000m
Dia. 300mm
MH2
T/G = 52.00
Length +/- 40m
Dia. 300mm
MH3
T/G = 53.27
MH5
T/G = 52.33
41,397.8 spm
Length +/- 200m
Dia. 300mm
40,238.4 spm
MH8
T/G = 63.94
158,537.9 spm
Length +/- 80m
Dia. 200mm
Length +/- 100m
Dia. 200mm
MH4
T/G = 52.80
143,502.1 spm
MH7
T/G = 58.64
Length +/- 75m
Dia. 200mm
86,950.0 spm
Length +/- 200m
Dia. 200mm
Length +/- 75m
Dia. 200mm
75,596.6 spm
MH6
T/G = 52.99
Legend
EXISTING INTERSECTION
PROPOSED INTERSECTION
PROPOSED ROUNDABOUT
WATERCOURSE
ARTERIAL
MAJOR COLLECTOR
MINOR COLLECTOR
FUTURE COLLECTOR
FUTURE MINOR COLLECTOR
BUSINESS PARK
SERVICE COMMERCIAL
COMMERCIAL CORE
MEDIUM DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
ENVIRONMENTAL AND OPEN SPACE OVERLAY
MAINSTREET
SECONDARY PLAN BOUNDARY


CITY OF CLARENCE-ROCKLAND
SECONDARY PLAN - OPTION 3
OTTAWA RIVER
COUNTY ROAD 17
DE LA BAIE
POUPART
ELIE
MH2
T/G = 52.00
MH2B
T/G = 53.00
MH3
T/G = 53.31
MH4
T/G = 52.80
MH5
T/G = 52.33
MH6
T/G = 52.99
MH7
T/G = 57.34
MH8
T/G = 63.94
TO PUMPING STATION (SPS-3)
T/G = 50.50
INV = 46.50
Length +/- 40m
Dia. 300mm
Length +/- 1000m
Dia. 300mm
Length +/- 40m
Dia. 300mm
Length +/- 150m
Dia. 300mm
Length +/- 80m
Dia. 200mm
Length +/- 100m
Dia. 200mm
Length +/- 75m
Dia. 200mm
Length +/- 75m
Dia. 200mm
Length +/- 150m
Dia. 200mm
14,525.3 spm
64,903.6 spm
466,794.0 spm
N
0 75 150 300
Meters
Legend
EXISTING INTERSECTION
PROPOSED INTERSECTION
PROPOSED ROUNDABOUT
WATERCOURSE
ARTERIAL
MAJOR COLLECTOR
MINOR COLLECTOR
FUTURE COLLECTOR
FUTURE MINOR COLLECTOR
BUSINESS PARK
SERVICE COMMERCIAL
MEDIUM DENSITY RESIDENTIAL
ENVIRONMENTAL AND OPEN SPACE OVERLAY
SECONDARY PLAN BOUNDARY

Appendix K

Storm Water Pond Sizing



Legend

- Junctions
- Outfalls
- Conduits
- Subcatchments

N

0.5 km

PROJECT:

ROCKLAND WEST SECONDARY STUDY
Rockland, ON

DRAWING:

Existing Drainage Conditions

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	ID	JLR NO.:	31097-000
DRAWN:	ID	DRAWING NO.:	FIGURE 1
CHECKED:	BP		

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/02/2000
END_TIME             00:00:00
SWEEP_START          1/1
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              8

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
24SCS002         INTENSITY 0:15     1.0      TIMESERIES 24SCS002
24SCS005         INTENSITY 0:15     1.0      TIMESERIES 24SCS005
24SCS010         INTENSITY 0:15     1.0      TIMESERIES 24SCS010
24SCS025         INTENSITY 0:15     1.0      TIMESERIES 24SCS025
24SCS050         INTENSITY 0:15     1.0      TIMESERIES 24SCS050
24SCS120         INTENSITY 0:15     1.0      TIMESERIES 24SCS120
3CHI002          INTENSITY 0:10     1.0      TIMESERIES 3CHI002
3CHI005          INTENSITY 0:10     1.0      TIMESERIES 3CHI005
3CHI010          INTENSITY 0:10     1.0      TIMESERIES 3CHI010
3CHI025          INTENSITY 0:10     1.0      TIMESERIES 3CHI025
3CHI050          INTENSITY 0:10     1.0      TIMESERIES 3CHI050
3CHI100          INTENSITY 0:10     1.0      TIMESERIES 3CHI100
3CHI120          INTENSITY 0:10     1.0      TIMESERIES 3CHI120
Rainfall         INTENSITY 0:15     1.0      TIMESERIES 24SCS100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    
%Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- ---
----- -------- ----------------
S1               Rainfall         OF7              1.0882   30       105.4    
2.093    0
S10              Rainfall         J2               238.018  0.296    1690     
1.55     0
S2               Rainfall         OF4              6.53085  1.546    132.493  
4.98     0
S3               Rainfall         OF1              1.89426  7.391    190.345  
7.62     0
S4               Rainfall         OF2              12.509   0        343.225  
9.74     0
S5               Rainfall         OF3              4.98951  2.511    137.91   
8.69     0
S6               Rainfall         OF5              23.09131 0.671    368.322  
5.78     0
S9               Rainfall         OF6              17.82248 20.441   217.02   
5.44     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo   
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------
- ----------
S1               0.013      0.25       1.57       4.67       0          OUTLET
S10              0.013      0.25       1.57       4.67       0          OUTLET
S2               0.013      0.25       1.57       4.67       0          OUTLET
S3               0.013      0.25       1.57       4.67       0          OUTLET
S4               0.013      0.25       1.57       4.67       0          OUTLET
S5               0.013      0.25       1.57       4.67       0          OUTLET
S6               0.013      0.25       1.57       4.67       0          OUTLET
S9               0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S1               76.2       13.2       4.14       7          0
S10              76.2       13.2       4.14       7          0
S2               76.2       13.2       4.14       7          0
S3               76.2       13.2       4.14       7          0
S4               76.2       13.2       4.14       7          0
S5               76.2       13.2       4.14       7          0
S6               76.2       13.2       4.14       7          0
S9               76.2       13.2       4.14       7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J2               45.777     0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              0          FREE                        NO
OF2              0          FREE                        NO
OF3              0          FREE                        NO
OF4              0          FREE                        NO
OF5              0          FREE                        NO
OF6              49         FREE                        NO
OF7              53.24      FREE                        NO

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- --------
-- ---------- ---------- ----------
C1               J2               OF1              46.462     0.01       0
0          0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4     
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- -
--------- ----------
C1               CIRCULAR     1                0          0          0          1

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
24SCS002         01/01/2000 00:00:00   0.72
24SCS002         01/01/2000 00:15:00   0.72
24SCS002         01/01/2000 00:30:00   0.72
24SCS002         01/01/2000 00:45:00   0.72
24SCS002         01/01/2000 01:00:00   0.336
24SCS002         01/01/2000 01:15:00   0.336
24SCS002         01/01/2000 01:30:00   0.336
24SCS002         01/01/2000 01:45:00   0.336
24SCS002         01/01/2000 02:00:00   0.624
24SCS002         01/01/2000 02:15:00   0.624
24SCS002         01/01/2000 02:30:00   0.624
24SCS002         01/01/2000 02:45:00   0.624
24SCS002         01/01/2000 03:00:00   0.624
24SCS002         01/01/2000 03:15:00   0.624
24SCS002         01/01/2000 03:30:00   0.624
24SCS002         01/01/2000 03:45:00   0.624
24SCS002         01/01/2000 04:00:00   0.816
24SCS002         01/01/2000 04:15:00   0.816
24SCS002         01/01/2000 04:30:00   0.816
24SCS002         01/01/2000 04:45:00   0.816
24SCS002         01/01/2000 05:00:00   0.72
24SCS002         01/01/2000 05:15:00   0.72
24SCS002         01/01/2000 05:30:00   0.72
24SCS002         01/01/2000 05:45:00   0.72
24SCS002         01/01/2000 06:00:00   0.96
24SCS002         01/01/2000 06:15:00   0.96
24SCS002         01/01/2000 06:30:00   0.96
24SCS002         01/01/2000 06:45:00   0.96
24SCS002         01/01/2000 07:00:00   0.96
24SCS002         01/01/2000 07:15:00   0.96
24SCS002         01/01/2000 07:30:00   0.96
24SCS002         01/01/2000 07:45:00   0.96
24SCS002         01/01/2000 08:00:00   1.296
24SCS002         01/01/2000 08:15:00   1.296
24SCS002         01/01/2000 08:30:00   1.296
24SCS002         01/01/2000 08:45:00   1.296
24SCS002         01/01/2000 09:00:00   1.536
24SCS002         01/01/2000 09:15:00   1.536
24SCS002         01/01/2000 09:30:00   1.728
24SCS002         01/01/2000 09:45:00   1.728
24SCS002         01/01/2000 10:00:00   2.208
24SCS002         01/01/2000 10:15:00   2.208
24SCS002         01/01/2000 10:30:00   2.976
24SCS002         01/01/2000 10:45:00   2.976
24SCS002         01/01/2000 11:00:00   4.608
24SCS002         01/01/2000 11:15:00   4.608
24SCS002         01/01/2000 11:30:00   19.968
24SCS002         01/01/2000 11:45:00   52.992
24SCS002         01/01/2000 12:00:00   6.912
24SCS002         01/01/2000 12:15:00   6.912
24SCS002         01/01/2000 12:30:00   3.552
24SCS002         01/01/2000 12:45:00   3.552
24SCS002         01/01/2000 13:00:00   2.592
24SCS002         01/01/2000 13:15:00   2.592
24SCS002         01/01/2000 13:30:00   2.016
24SCS002         01/01/2000 13:45:00   2.016
24SCS002         01/01/2000 14:00:00   1.536
24SCS002         01/01/2000 14:15:00   1.536
24SCS002         01/01/2000 14:30:00   1.536
24SCS002         01/01/2000 14:45:00   1.536
24SCS002         01/01/2000 15:00:00   1.344
24SCS002         01/01/2000 15:15:00   1.344
24SCS002         01/01/2000 15:30:00   1.344
24SCS002         01/01/2000 15:45:00   1.344
24SCS002         01/01/2000 16:00:00   1.056
24SCS002         01/01/2000 16:15:00   1.056
24SCS002         01/01/2000 16:30:00   1.056
24SCS002         01/01/2000 16:45:00   1.056
24SCS002         01/01/2000 17:00:00   1.104
24SCS002         01/01/2000 17:15:00   1.104
24SCS002         01/01/2000 17:30:00   1.104
24SCS002         01/01/2000 17:45:00   1.104
24SCS002         01/01/2000 18:00:00   0.72
24SCS002         01/01/2000 18:15:00   0.72
24SCS002         01/01/2000 18:30:00   0.72
24SCS002         01/01/2000 18:45:00   0.72
24SCS002         01/01/2000 19:00:00   0.576
24SCS002         01/01/2000 19:15:00   0.576
24SCS002         01/01/2000 19:30:00   0.576
24SCS002         01/01/2000 19:45:00   0.576
24SCS002         01/01/2000 20:00:00   0.816
24SCS002         01/01/2000 20:15:00   0.816
24SCS002         01/01/2000 20:30:00   0.816
24SCS002         01/01/2000 20:45:00   0.816
24SCS002         01/01/2000 21:00:00   0.528
24SCS002         01/01/2000 21:15:00   0.528
24SCS002         01/01/2000 21:30:00   0.528
24SCS002         01/01/2000 21:45:00   0.528
24SCS002         01/01/2000 22:00:00   0.48
24SCS002         01/01/2000 22:15:00   0.48
24SCS002         01/01/2000 22:30:00   0.48
24SCS002         01/01/2000 22:45:00   0.48
24SCS002         01/01/2000 23:00:00   0.48
24SCS002         01/01/2000 23:15:00   0.48
24SCS002         01/01/2000 23:30:00   0.48
24SCS002         01/01/2000 23:45:00   0.48
24SCS002         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS005         01/01/2000 00:00:00   0.936
24SCS005         01/01/2000 00:15:00   0.936
24SCS005         01/01/2000 00:30:00   0.936
24SCS005         01/01/2000 00:45:00   0.936
24SCS005         01/01/2000 01:00:00   0.4368
24SCS005         01/01/2000 01:15:00   0.4368
24SCS005         01/01/2000 01:30:00   0.4368
24SCS005         01/01/2000 01:45:00   0.4368
24SCS005         01/01/2000 02:00:00   0.8112
24SCS005         01/01/2000 02:15:00   0.8112
24SCS005         01/01/2000 02:30:00   0.8112
24SCS005         01/01/2000 02:45:00   0.8112
24SCS005         01/01/2000 03:00:00   0.8112
24SCS005         01/01/2000 03:15:00   0.8112
24SCS005         01/01/2000 03:30:00   0.8112
24SCS005         01/01/2000 03:45:00   0.8112
24SCS005         01/01/2000 04:00:00   1.0608
24SCS005         01/01/2000 04:15:00   1.0608
24SCS005         01/01/2000 04:30:00   1.0608
24SCS005         01/01/2000 04:45:00   1.0608
24SCS005         01/01/2000 05:00:00   0.936
24SCS005         01/01/2000 05:15:00   0.936
24SCS005         01/01/2000 05:30:00   0.936
24SCS005         01/01/2000 05:45:00   0.936
24SCS005         01/01/2000 06:00:00   1.248
24SCS005         01/01/2000 06:15:00   1.248
24SCS005         01/01/2000 06:30:00   1.248
24SCS005         01/01/2000 06:45:00   1.248
24SCS005         01/01/2000 07:00:00   1.248
24SCS005         01/01/2000 07:15:00   1.248
24SCS005         01/01/2000 07:30:00   1.248
24SCS005         01/01/2000 07:45:00   1.248
24SCS005         01/01/2000 08:00:00   1.6848
24SCS005         01/01/2000 08:15:00   1.6848
24SCS005         01/01/2000 08:30:00   1.6848
24SCS005         01/01/2000 08:45:00   1.6848
24SCS005         01/01/2000 09:00:00   1.9968
24SCS005         01/01/2000 09:15:00   1.9968
24SCS005         01/01/2000 09:30:00   2.2464
24SCS005         01/01/2000 09:45:00   2.2464
24SCS005         01/01/2000 10:00:00   2.8704
24SCS005         01/01/2000 10:15:00   2.8704
24SCS005         01/01/2000 10:30:00   3.8688
24SCS005         01/01/2000 10:45:00   3.8688
24SCS005         01/01/2000 11:00:00   5.9904
24SCS005         01/01/2000 11:15:00   5.9904
24SCS005         01/01/2000 11:30:00   25.9584
```

```
24SCS005         01/01/2000 11:45:00   68.8896
24SCS005         01/01/2000 12:00:00   8.9856
24SCS005         01/01/2000 12:15:00   8.9856
24SCS005         01/01/2000 12:30:00   4.6176
24SCS005         01/01/2000 12:45:00   4.6176
24SCS005         01/01/2000 13:00:00   3.3696
24SCS005         01/01/2000 13:15:00   3.3696
24SCS005         01/01/2000 13:30:00   2.6208
24SCS005         01/01/2000 13:45:00   2.6208
24SCS005         01/01/2000 14:00:00   1.9968
24SCS005         01/01/2000 14:15:00   1.9968
24SCS005         01/01/2000 14:30:00   1.9968
24SCS005         01/01/2000 14:45:00   1.9968
24SCS005         01/01/2000 15:00:00   1.7472
24SCS005         01/01/2000 15:15:00   1.7472
24SCS005         01/01/2000 15:30:00   1.7472
24SCS005         01/01/2000 15:45:00   1.7472
24SCS005         01/01/2000 16:00:00   1.3728
24SCS005         01/01/2000 16:15:00   1.3728
24SCS005         01/01/2000 16:30:00   1.3728
24SCS005         01/01/2000 16:45:00   1.3728
24SCS005         01/01/2000 17:00:00   1.4352
24SCS005         01/01/2000 17:15:00   1.4352
24SCS005         01/01/2000 17:30:00   1.4352
24SCS005         01/01/2000 17:45:00   1.4352
24SCS005         01/01/2000 18:00:00   0.936
24SCS005         01/01/2000 18:15:00   0.936
24SCS005         01/01/2000 18:30:00   0.936
24SCS005         01/01/2000 18:45:00   0.936
24SCS005         01/01/2000 19:00:00   0.7488
24SCS005         01/01/2000 19:15:00   0.7488
24SCS005         01/01/2000 19:30:00   0.7488
24SCS005         01/01/2000 19:45:00   0.7488
24SCS005         01/01/2000 20:00:00   1.0608
24SCS005         01/01/2000 20:15:00   1.0608
24SCS005         01/01/2000 20:30:00   1.0608
24SCS005         01/01/2000 20:45:00   1.0608
24SCS005         01/01/2000 21:00:00   0.6864
24SCS005         01/01/2000 21:15:00   0.6864
24SCS005         01/01/2000 21:30:00   0.6864
24SCS005         01/01/2000 21:45:00   0.6864
24SCS005         01/01/2000 22:00:00   0.624
24SCS005         01/01/2000 22:15:00   0.624
24SCS005         01/01/2000 22:30:00   0.624
24SCS005         01/01/2000 22:45:00   0.624
24SCS005         01/01/2000 23:00:00   0.624
24SCS005         01/01/2000 23:15:00   0.624
24SCS005         01/01/2000 23:30:00   0.624
24SCS005         01/01/2000 23:45:00   0.624
24SCS005         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS010         01/01/2000 00:00:00   1.08
24SCS010         01/01/2000 00:15:00   1.08
24SCS010         01/01/2000 00:30:00   1.08
24SCS010         01/01/2000 00:45:00   1.08
24SCS010         01/01/2000 01:00:00   0.504
24SCS010         01/01/2000 01:15:00   0.504
24SCS010         01/01/2000 01:30:00   0.504
24SCS010         01/01/2000 01:45:00   0.504
24SCS010         01/01/2000 02:00:00   0.936
24SCS010         01/01/2000 02:15:00   0.936
24SCS010         01/01/2000 02:30:00   0.936
24SCS010         01/01/2000 02:45:00   0.936
24SCS010         01/01/2000 03:00:00   0.936
24SCS010         01/01/2000 03:15:00   0.936
24SCS010         01/01/2000 03:30:00   0.936
24SCS010         01/01/2000 03:45:00   0.936
24SCS010         01/01/2000 04:00:00   1.224
24SCS010         01/01/2000 04:15:00   1.224
24SCS010         01/01/2000 04:30:00   1.224
24SCS010         01/01/2000 04:45:00   1.224
24SCS010         01/01/2000 05:00:00   1.08
24SCS010         01/01/2000 05:15:00   1.08
24SCS010         01/01/2000 05:30:00   1.08
24SCS010         01/01/2000 05:45:00   1.08
24SCS010         01/01/2000 06:00:00   1.44
24SCS010         01/01/2000 06:15:00   1.44
24SCS010         01/01/2000 06:30:00   1.44
24SCS010         01/01/2000 06:45:00   1.44
24SCS010         01/01/2000 07:00:00   1.44
24SCS010         01/01/2000 07:15:00   1.44
24SCS010         01/01/2000 07:30:00   1.44
24SCS010         01/01/2000 07:45:00   1.44
24SCS010         01/01/2000 08:00:00   1.944
24SCS010         01/01/2000 08:15:00   1.944
24SCS010         01/01/2000 08:30:00   1.944
24SCS010         01/01/2000 08:45:00   1.944
24SCS010         01/01/2000 09:00:00   2.304
24SCS010         01/01/2000 09:15:00   2.304
24SCS010         01/01/2000 09:30:00   2.592
24SCS010         01/01/2000 09:45:00   2.592
24SCS010         01/01/2000 10:00:00   3.312
24SCS010         01/01/2000 10:15:00   3.312
24SCS010         01/01/2000 10:30:00   4.464
24SCS010         01/01/2000 10:45:00   4.464
24SCS010         01/01/2000 11:00:00   6.912
24SCS010         01/01/2000 11:15:00   6.912
24SCS010         01/01/2000 11:30:00   29.952
24SCS010         01/01/2000 11:45:00   79.488
24SCS010         01/01/2000 12:00:00   10.368
24SCS010         01/01/2000 12:15:00   10.368
24SCS010         01/01/2000 12:30:00   5.328
24SCS010         01/01/2000 12:45:00   5.328
24SCS010         01/01/2000 13:00:00   3.888
24SCS010         01/01/2000 13:15:00   3.888
24SCS010         01/01/2000 13:30:00   3.024
24SCS010         01/01/2000 13:45:00   3.024
24SCS010         01/01/2000 14:00:00   2.304
24SCS010         01/01/2000 14:15:00   2.304
24SCS010         01/01/2000 14:30:00   2.304
24SCS010         01/01/2000 14:45:00   2.304
24SCS010         01/01/2000 15:00:00   2.016
24SCS010         01/01/2000 15:15:00   2.016
24SCS010         01/01/2000 15:30:00   2.016
24SCS010         01/01/2000 15:45:00   2.016
24SCS010         01/01/2000 16:00:00   1.584
24SCS010         01/01/2000 16:15:00   1.584
24SCS010         01/01/2000 16:30:00   1.584
24SCS010         01/01/2000 16:45:00   1.584
24SCS010         01/01/2000 17:00:00   1.656
24SCS010         01/01/2000 17:15:00   1.656
24SCS010         01/01/2000 17:30:00   1.656
24SCS010         01/01/2000 17:45:00   1.656
24SCS010         01/01/2000 18:00:00   1.08
24SCS010         01/01/2000 18:15:00   1.08
24SCS010         01/01/2000 18:30:00   1.08
24SCS010         01/01/2000 18:45:00   1.08
24SCS010         01/01/2000 19:00:00   0.864
24SCS010         01/01/2000 19:15:00   0.864
24SCS010         01/01/2000 19:30:00   0.864
24SCS010         01/01/2000 19:45:00   0.864
24SCS010         01/01/2000 20:00:00   1.224
24SCS010         01/01/2000 20:15:00   1.224
24SCS010         01/01/2000 20:30:00   1.224
24SCS010         01/01/2000 20:45:00   1.224
24SCS010         01/01/2000 21:00:00   0.792
24SCS010         01/01/2000 21:15:00   0.792
24SCS010         01/01/2000 21:30:00   0.792
24SCS010         01/01/2000 21:45:00   0.792
24SCS010         01/01/2000 22:00:00   0.72
24SCS010         01/01/2000 22:15:00   0.72
24SCS010         01/01/2000 22:30:00   0.72
24SCS010         01/01/2000 22:45:00   0.72
24SCS010         01/01/2000 23:00:00   0.72
24SCS010         01/01/2000 23:15:00   0.72
24SCS010         01/01/2000 23:30:00   0.72
24SCS010         01/01/2000 23:45:00   0.72
24SCS010         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS025         01/01/2000 00:00:00   1.26
24SCS025         01/01/2000 00:15:00   1.26
24SCS025         01/01/2000 00:30:00   1.26
24SCS025         01/01/2000 00:45:00   1.26
24SCS025         01/01/2000 01:00:00   0.588
24SCS025         01/01/2000 01:15:00   0.588
24SCS025         01/01/2000 01:30:00   0.588
24SCS025         01/01/2000 01:45:00   0.588
24SCS025         01/01/2000 02:00:00   1.092
24SCS025         01/01/2000 02:15:00   1.092
24SCS025         01/01/2000 02:30:00   1.092
24SCS025         01/01/2000 02:45:00   1.092
24SCS025         01/01/2000 03:00:00   1.092
24SCS025         01/01/2000 03:15:00   1.092
24SCS025         01/01/2000 03:30:00   1.092
24SCS025         01/01/2000 03:45:00   1.092
24SCS025         01/01/2000 04:00:00   1.428
24SCS025         01/01/2000 04:15:00   1.428
24SCS025         01/01/2000 04:30:00   1.428
24SCS025         01/01/2000 04:45:00   1.428
24SCS025         01/01/2000 05:00:00   1.26
24SCS025         01/01/2000 05:15:00   1.26
24SCS025         01/01/2000 05:30:00   1.26
24SCS025         01/01/2000 05:45:00   1.26
24SCS025         01/01/2000 06:00:00   1.68
24SCS025         01/01/2000 06:15:00   1.68
24SCS025         01/01/2000 06:30:00   1.68
24SCS025         01/01/2000 06:45:00   1.68
24SCS025         01/01/2000 07:00:00   1.68
24SCS025         01/01/2000 07:15:00   1.68
24SCS025         01/01/2000 07:30:00   1.68
24SCS025         01/01/2000 07:45:00   1.68
24SCS025         01/01/2000 08:00:00   2.268
24SCS025         01/01/2000 08:15:00   2.268
24SCS025         01/01/2000 08:30:00   2.268
24SCS025         01/01/2000 08:45:00   2.268
24SCS025         01/01/2000 09:00:00   2.688
24SCS025         01/01/2000 09:15:00   2.688
24SCS025         01/01/2000 09:30:00   3.024
24SCS025         01/01/2000 09:45:00   3.024
24SCS025         01/01/2000 10:00:00   3.864
24SCS025         01/01/2000 10:15:00   3.864
24SCS025         01/01/2000 10:30:00   5.208
24SCS025         01/01/2000 10:45:00   5.208
24SCS025         01/01/2000 11:00:00   8.064
24SCS025         01/01/2000 11:15:00   8.064
24SCS025         01/01/2000 11:30:00   34.944
24SCS025         01/01/2000 11:45:00   92.736
24SCS025         01/01/2000 12:00:00   12.096
24SCS025         01/01/2000 12:15:00   12.096
24SCS025         01/01/2000 12:30:00   6.216
24SCS025         01/01/2000 12:45:00   6.216
24SCS025         01/01/2000 13:00:00   4.536
24SCS025         01/01/2000 13:15:00   4.536
24SCS025         01/01/2000 13:30:00   3.528
24SCS025         01/01/2000 13:45:00   3.528
24SCS025         01/01/2000 14:00:00   2.688
24SCS025         01/01/2000 14:15:00   2.688
24SCS025         01/01/2000 14:30:00   2.688
24SCS025         01/01/2000 14:45:00   2.688
24SCS025         01/01/2000 15:00:00   2.352
24SCS025         01/01/2000 15:15:00   2.352
24SCS025         01/01/2000 15:30:00   2.352
24SCS025         01/01/2000 15:45:00   2.352
24SCS025         01/01/2000 16:00:00   1.848
24SCS025         01/01/2000 16:15:00   1.848
24SCS025         01/01/2000 16:30:00   1.848
24SCS025         01/01/2000 16:45:00   1.848
24SCS025         01/01/2000 17:00:00   1.932
24SCS025         01/01/2000 17:15:00   1.932
24SCS025         01/01/2000 17:30:00   1.932
24SCS025         01/01/2000 17:45:00   1.932
24SCS025         01/01/2000 18:00:00   1.26
24SCS025         01/01/2000 18:15:00   1.26
24SCS025         01/01/2000 18:30:00   1.26
24SCS025         01/01/2000 18:45:00   1.26
24SCS025         01/01/2000 19:00:00   1.008
24SCS025         01/01/2000 19:15:00   1.008
24SCS025         01/01/2000 19:30:00   1.008
24SCS025         01/01/2000 19:45:00   1.008
24SCS025         01/01/2000 20:00:00   1.428
24SCS025         01/01/2000 20:15:00   1.428
24SCS025         01/01/2000 20:30:00   1.428
24SCS025         01/01/2000 20:45:00   1.428
24SCS025         01/01/2000 21:00:00   0.924
24SCS025         01/01/2000 21:15:00   0.924
24SCS025         01/01/2000 21:30:00   0.924
24SCS025         01/01/2000 21:45:00   0.924
24SCS025         01/01/2000 22:00:00   0.84
24SCS025         01/01/2000 22:15:00   0.84
24SCS025         01/01/2000 22:30:00   0.84
24SCS025         01/01/2000 22:45:00   0.84
24SCS025         01/01/2000 23:00:00   0.84
24SCS025         01/01/2000 23:15:00   0.84
24SCS025         01/01/2000 23:30:00   0.84
24SCS025         01/01/2000 23:45:00   0.84
24SCS025         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS050         01/01/2000 00:00:00   1.404
24SCS050         01/01/2000 00:15:00   1.404
24SCS050         01/01/2000 00:30:00   1.404
24SCS050         01/01/2000 00:45:00   1.404
24SCS050         01/01/2000 01:00:00   0.6552
24SCS050         01/01/2000 01:15:00   0.6552
24SCS050         01/01/2000 01:30:00   0.6552
24SCS050         01/01/2000 01:45:00   0.6552
24SCS050         01/01/2000 02:00:00   1.2168
24SCS050         01/01/2000 02:15:00   1.2168
24SCS050         01/01/2000 02:30:00   1.2168
24SCS050         01/01/2000 02:45:00   1.2168
24SCS050         01/01/2000 03:00:00   1.2168
24SCS050         01/01/2000 03:15:00   1.2168
24SCS050         01/01/2000 03:30:00   1.2168
24SCS050         01/01/2000 03:45:00   1.2168
24SCS050         01/01/2000 04:00:00   1.5912
24SCS050         01/01/2000 04:15:00   1.5912
24SCS050         01/01/2000 04:30:00   1.5912
24SCS050         01/01/2000 04:45:00   1.5912
24SCS050         01/01/2000 05:00:00   1.404
24SCS050         01/01/2000 05:15:00   1.404
24SCS050         01/01/2000 05:30:00   1.404
24SCS050         01/01/2000 05:45:00   1.404
24SCS050         01/01/2000 06:00:00   1.872
24SCS050         01/01/2000 06:15:00   1.872
24SCS050         01/01/2000 06:30:00   1.872
24SCS050         01/01/2000 06:45:00   1.872
24SCS050         01/01/2000 07:00:00   1.872
24SCS050         01/01/2000 07:15:00   1.872
24SCS050         01/01/2000 07:30:00   1.872
24SCS050         01/01/2000 07:45:00   1.872
24SCS050         01/01/2000 08:00:00   2.5272
24SCS050         01/01/2000 08:15:00   2.5272
24SCS050         01/01/2000 08:30:00   2.5272
24SCS050         01/01/2000 08:45:00   2.5272
24SCS050         01/01/2000 09:00:00   2.9952
24SCS050         01/01/2000 09:15:00   2.9952
24SCS050         01/01/2000 09:30:00   3.3696
24SCS050         01/01/2000 09:45:00   3.3696
24SCS050         01/01/2000 10:00:00   4.3056
24SCS050         01/01/2000 10:15:00   4.3056
24SCS050         01/01/2000 10:30:00   5.803199
24SCS050         01/01/2000 10:45:00   5.803199
24SCS050         01/01/2000 11:00:00   8.9856
24SCS050         01/01/2000 11:15:00   8.9856
24SCS050         01/01/2000 11:30:00   38.9376
24SCS050         01/01/2000 11:45:00   103.3344
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24SCS050          01/01/2000 12:00:00    13.4784
24SCS050          01/01/2000 12:15:00    13.4784
24SCS050          01/01/2000 12:30:00    6.9264
24SCS050          01/01/2000 12:45:00    6.9264
24SCS050          01/01/2000 13:00:00    5.0544
24SCS050          01/01/2000 13:15:00    5.0544
24SCS050          01/01/2000 13:30:00    3.9312
24SCS050          01/01/2000 13:45:00    3.9312
24SCS050          01/01/2000 14:00:00    2.9952
24SCS050          01/01/2000 14:15:00    2.9952
24SCS050          01/01/2000 14:30:00    2.9952
24SCS050          01/01/2000 14:45:00    2.9952
24SCS050          01/01/2000 15:00:00    2.6208
24SCS050          01/01/2000 15:15:00    2.6208
24SCS050          01/01/2000 15:30:00    2.6208
24SCS050          01/01/2000 15:45:00    2.6208
24SCS050          01/01/2000 16:00:00    2.0592
24SCS050          01/01/2000 16:15:00    2.0592
24SCS050          01/01/2000 16:30:00    2.0592
24SCS050          01/01/2000 16:45:00    2.0592
24SCS050          01/01/2000 17:00:00    2.1528
24SCS050          01/01/2000 17:15:00    2.1528
24SCS050          01/01/2000 17:30:00    2.1528
24SCS050          01/01/2000 17:45:00    2.1528
24SCS050          01/01/2000 18:00:00    1.404
24SCS050          01/01/2000 18:15:00    1.404
24SCS050          01/01/2000 18:30:00    1.404
24SCS050          01/01/2000 18:45:00    1.404
24SCS050          01/01/2000 19:00:00    1.1232
24SCS050          01/01/2000 19:15:00    1.1232
24SCS050          01/01/2000 19:30:00    1.1232
24SCS050          01/01/2000 19:45:00    1.1232
24SCS050          01/01/2000 20:00:00    1.5912
24SCS050          01/01/2000 20:15:00    1.5912
24SCS050          01/01/2000 20:30:00    1.5912
24SCS050          01/01/2000 20:45:00    1.5912
24SCS050          01/01/2000 21:00:00    1.0296
24SCS050          01/01/2000 21:15:00    1.0296
24SCS050          01/01/2000 21:30:00    1.0296
24SCS050          01/01/2000 21:45:00    1.0296
24SCS050          01/01/2000 22:00:00    0.936
24SCS050          01/01/2000 22:15:00    0.936
24SCS050          01/01/2000 22:30:00    0.936
24SCS050          01/01/2000 22:45:00    0.936
24SCS050          01/01/2000 23:00:00    0.936
24SCS050          01/01/2000 23:15:00    0.936
24SCS050          01/01/2000 23:30:00    0.936
24SCS050          01/01/2000 23:45:00    0.936
24SCS050          01/02/2000 00:00:00    0

;Rainfall (mm/hr)
24SCS100          01/01/2000 00:00:00    1.548
24SCS100          01/01/2000 00:15:00    1.548
24SCS100          01/01/2000 00:30:00    1.548
24SCS100          01/01/2000 00:45:00    1.548
24SCS100          01/01/2000 01:00:00    0.7224
24SCS100          01/01/2000 01:15:00    0.7224
24SCS100          01/01/2000 01:30:00    0.7224
24SCS100          01/01/2000 01:45:00    0.7224
24SCS100          01/01/2000 02:00:00    1.3416
24SCS100          01/01/2000 02:15:00    1.3416
24SCS100          01/01/2000 02:30:00    1.3416
24SCS100          01/01/2000 02:45:00    1.3416
24SCS100          01/01/2000 03:00:00    1.3416
24SCS100          01/01/2000 03:15:00    1.3416
24SCS100          01/01/2000 03:30:00    1.3416
24SCS100          01/01/2000 03:45:00    1.3416
24SCS100          01/01/2000 04:00:00    1.7544
24SCS100          01/01/2000 04:15:00    1.7544
24SCS100          01/01/2000 04:30:00    1.7544
24SCS100          01/01/2000 04:45:00    1.7544
24SCS100          01/01/2000 05:00:00    1.548
24SCS100          01/01/2000 05:15:00    1.548
24SCS100          01/01/2000 05:30:00    1.548
24SCS100          01/01/2000 05:45:00    1.548
24SCS100          01/01/2000 06:00:00    2.064
24SCS100          01/01/2000 06:15:00    2.064
24SCS100          01/01/2000 06:30:00    2.064
24SCS100          01/01/2000 06:45:00    2.064
24SCS100          01/01/2000 07:00:00    2.064
24SCS100          01/01/2000 07:15:00    2.064
24SCS100          01/01/2000 07:30:00    2.064
24SCS100          01/01/2000 07:45:00    2.064
24SCS100          01/01/2000 08:00:00    2.7864
24SCS100          01/01/2000 08:15:00    2.7864
24SCS100          01/01/2000 08:30:00    2.7864
24SCS100          01/01/2000 08:45:00    2.7864
24SCS100          01/01/2000 09:00:00    3.3024
24SCS100          01/01/2000 09:15:00    3.3024
24SCS100          01/01/2000 09:30:00    3.7152
24SCS100          01/01/2000 09:45:00    3.7152
24SCS100          01/01/2000 10:00:00    4.7472
24SCS100          01/01/2000 10:15:00    4.7472
24SCS100          01/01/2000 10:30:00    6.3984
24SCS100          01/01/2000 10:45:00    6.3984
24SCS100          01/01/2000 11:00:00    9.9072
24SCS100          01/01/2000 11:15:00    9.9072
24SCS100          01/01/2000 11:30:00    42.9312
24SCS100          01/01/2000 11:45:00    113.9328
24SCS100          01/01/2000 12:00:00    14.8608
24SCS100          01/01/2000 12:15:00    14.8608
24SCS100          01/01/2000 12:30:00    7.6368
24SCS100          01/01/2000 12:45:00    7.6368
24SCS100          01/01/2000 13:00:00    5.5728
24SCS100          01/01/2000 13:15:00    5.5728
24SCS100          01/01/2000 13:30:00    4.3344
24SCS100          01/01/2000 13:45:00    4.3344
24SCS100          01/01/2000 14:00:00    3.3024
24SCS100          01/01/2000 14:15:00    3.3024
24SCS100          01/01/2000 14:30:00    3.3024
24SCS100          01/01/2000 14:45:00    3.3024
24SCS100          01/01/2000 15:00:00    2.8896
24SCS100          01/01/2000 15:15:00    2.8896
24SCS100          01/01/2000 15:30:00    2.8896
24SCS100          01/01/2000 15:45:00    2.8896
24SCS100          01/01/2000 16:00:00    2.2704
24SCS100          01/01/2000 16:15:00    2.2704
24SCS100          01/01/2000 16:30:00    2.2704
24SCS100          01/01/2000 16:45:00    2.2704
24SCS100          01/01/2000 17:00:00    2.3736
24SCS100          01/01/2000 17:15:00    2.3736
24SCS100          01/01/2000 17:30:00    2.3736
24SCS100          01/01/2000 17:45:00    2.3736
24SCS100          01/01/2000 18:00:00    1.548
24SCS100          01/01/2000 18:15:00    1.548
24SCS100          01/01/2000 18:30:00    1.548
24SCS100          01/01/2000 18:45:00    1.548
24SCS100          01/01/2000 19:00:00    1.2384
24SCS100          01/01/2000 19:15:00    1.2384
24SCS100          01/01/2000 19:30:00    1.2384
24SCS100          01/01/2000 19:45:00    1.2384
24SCS100          01/01/2000 20:00:00    1.7544
24SCS100          01/01/2000 20:15:00    1.7544
24SCS100          01/01/2000 20:30:00    1.7544
24SCS100          01/01/2000 20:45:00    1.7544
24SCS100          01/01/2000 21:00:00    1.1352
24SCS100          01/01/2000 21:15:00    1.1352
24SCS100          01/01/2000 21:30:00    1.1352
24SCS100          01/01/2000 21:45:00    1.1352
24SCS100          01/01/2000 22:00:00    1.032
24SCS100          01/01/2000 22:15:00    1.032
24SCS100          01/01/2000 22:30:00    1.032
24SCS100          01/01/2000 22:45:00    1.032
24SCS100          01/01/2000 23:00:00    1.032
24SCS100          01/01/2000 23:15:00    1.032
24SCS100          01/01/2000 23:30:00    1.032
24SCS100          01/01/2000 23:45:00    1.032
24SCS100          01/02/2000 00:00:00    0

;Rainfall (mm/hr)
24SCS120          01/01/2000 00:00:00    1.8576
24SCS120          01/01/2000 00:15:00    1.8576
24SCS120          01/01/2000 00:30:00    1.8576
24SCS120          01/01/2000 00:45:00    1.8576
24SCS120          01/01/2000 01:00:00    0.86688
24SCS120          01/01/2000 01:15:00    0.86688
24SCS120          01/01/2000 01:30:00    0.86688
24SCS120          01/01/2000 01:45:00    0.86688
24SCS120          01/01/2000 02:00:00    1.60992
24SCS120          01/01/2000 02:15:00    1.60992
24SCS120          01/01/2000 02:30:00    1.60992
24SCS120          01/01/2000 02:45:00    1.60992
24SCS120          01/01/2000 03:00:00    1.60992
24SCS120          01/01/2000 03:15:00    1.60992
24SCS120          01/01/2000 03:30:00    1.60992
24SCS120          01/01/2000 03:45:00    1.60992
24SCS120          01/01/2000 04:00:00    2.10528
24SCS120          01/01/2000 04:15:00    2.10528
24SCS120          01/01/2000 04:30:00    2.10528
24SCS120          01/01/2000 04:45:00    2.10528
24SCS120          01/01/2000 05:00:00    1.8576
24SCS120          01/01/2000 05:15:00    1.8576
24SCS120          01/01/2000 05:30:00    1.8576
24SCS120          01/01/2000 05:45:00    1.8576
24SCS120          01/01/2000 06:00:00    2.4768
24SCS120          01/01/2000 06:15:00    2.4768
24SCS120          01/01/2000 06:30:00    2.4768
24SCS120          01/01/2000 06:45:00    2.4768
24SCS120          01/01/2000 07:00:00    2.4768
24SCS120          01/01/2000 07:15:00    2.4768
24SCS120          01/01/2000 07:30:00    2.4768
24SCS120          01/01/2000 07:45:00    2.4768
24SCS120          01/01/2000 08:00:00    3.34368
24SCS120          01/01/2000 08:15:00    3.34368
24SCS120          01/01/2000 08:30:00    3.34368
24SCS120          01/01/2000 08:45:00    3.34368
24SCS120          01/01/2000 09:00:00    3.96288
24SCS120          01/01/2000 09:15:00    3.96288
24SCS120          01/01/2000 09:30:00    4.45824
24SCS120          01/01/2000 09:45:00    4.45824
24SCS120          01/01/2000 10:00:00    5.69664
24SCS120          01/01/2000 10:15:00    5.69664
24SCS120          01/01/2000 10:30:00    7.67808
24SCS120          01/01/2000 10:45:00    7.67808
24SCS120          01/01/2000 11:00:00    11.88864
24SCS120          01/01/2000 11:15:00    11.88864
24SCS120          01/01/2000 11:30:00    51.51744
24SCS120          01/01/2000 11:45:00    136.7193
24SCS120          01/01/2000 12:00:00    17.83296
24SCS120          01/01/2000 12:15:00    17.83296
24SCS120          01/01/2000 12:30:00    9.16416
24SCS120          01/01/2000 12:45:00    9.16416
24SCS120          01/01/2000 13:00:00    6.68736
24SCS120          01/01/2000 13:15:00    6.68736
24SCS120          01/01/2000 13:30:00    5.20128
24SCS120          01/01/2000 13:45:00    5.20128
24SCS120          01/01/2000 14:00:00    3.96288
24SCS120          01/01/2000 14:15:00    3.96288
24SCS120          01/01/2000 14:30:00    3.96288
24SCS120          01/01/2000 14:45:00    3.96288
24SCS120          01/01/2000 15:00:00    3.46752
24SCS120          01/01/2000 15:15:00    3.46752
24SCS120          01/01/2000 15:30:00    3.46752
24SCS120          01/01/2000 15:45:00    3.46752
24SCS120          01/01/2000 16:00:00    2.72448
24SCS120          01/01/2000 16:15:00    2.72448
24SCS120          01/01/2000 16:30:00    2.72448
24SCS120          01/01/2000 16:45:00    2.72448
24SCS120          01/01/2000 17:00:00    2.84832
24SCS120          01/01/2000 17:15:00    2.84832
24SCS120          01/01/2000 17:30:00    2.84832
24SCS120          01/01/2000 17:45:00    2.84832
24SCS120          01/01/2000 18:00:00    1.8576
24SCS120          01/01/2000 18:15:00    1.8576
24SCS120          01/01/2000 18:30:00    1.8576
24SCS120          01/01/2000 18:45:00    1.8576
24SCS120          01/01/2000 19:00:00    1.48608
24SCS120          01/01/2000 19:15:00    1.48608
24SCS120          01/01/2000 19:30:00    1.48608
24SCS120          01/01/2000 19:45:00    1.48608
24SCS120          01/01/2000 20:00:00    2.10528
24SCS120          01/01/2000 20:15:00    2.10528
24SCS120          01/01/2000 20:30:00    2.10528
24SCS120          01/01/2000 20:45:00    2.10528
24SCS120          01/01/2000 21:00:00    1.36224
24SCS120          01/01/2000 21:15:00    1.36224
24SCS120          01/01/2000 21:30:00    1.36224
24SCS120          01/01/2000 21:45:00    1.36224
24SCS120          01/01/2000 22:00:00    1.2384
24SCS120          01/01/2000 22:15:00    1.2384
24SCS120          01/01/2000 22:30:00    1.2384
24SCS120          01/01/2000 22:45:00    1.2384
24SCS120          01/01/2000 23:00:00    1.2384
24SCS120          01/01/2000 23:15:00    1.2384
24SCS120          01/01/2000 23:30:00    1.2384
24SCS120          01/01/2000 23:45:00    1.2384
24SCS120          01/02/2000 00:00:00    0

;Rainfall (mm/hr)
3CHI002           01/01/2000 00:00:00    2.491
3CHI002           01/01/2000 00:10:00    2.966
3CHI002           01/01/2000 00:20:00    3.696
3CHI002           01/01/2000 00:30:00    4.976
3CHI002           01/01/2000 00:40:00    7.828
3CHI002           01/01/2000 00:50:00    19.966
3CHI002           01/01/2000 01:00:00    76.805
3CHI002           01/01/2000 01:10:00    22.777
3CHI002           01/01/2000 01:20:00    11.852
3CHI002           01/01/2000 01:30:00    8.025
3CHI002           01/01/2000 01:40:00    6.096
3CHI002           01/01/2000 01:50:00    4.938
3CHI002           01/01/2000 02:00:00    4.165
3CHI002           01/01/2000 02:10:00    3.613
3CHI002           01/01/2000 02:20:00    3.197
3CHI002           01/01/2000 02:30:00    2.873
3CHI002           01/01/2000 02:40:00    2.613
3CHI002           01/01/2000 02:50:00    2.4
3CHI002           01/01/2000 03:00:00    0

;Rainfall (mm/hr)
3CHI005           01/01/2000 00:00:00    3.256
3CHI005           01/01/2000 00:10:00    3.881
3CHI005           01/01/2000 00:20:00    4.844
3CHI005           01/01/2000 00:30:00    6.532
3CHI005           01/01/2000 00:40:00    10.308
3CHI005           01/01/2000 00:50:00    26.792
3CHI005           01/01/2000 01:00:00    103.93
3CHI005           01/01/2000 01:10:00    30.286
3CHI005           01/01/2000 01:20:00    15.655
3CHI005           01/01/2000 01:30:00    10.568
3CHI005           01/01/2000 01:40:00    8.013
3CHI005           01/01/2000 01:50:00    6.482
3CHI005           01/01/2000 02:00:00    5.462
3CHI005           01/01/2000 02:10:00    4.733
3CHI005           01/01/2000 02:20:00    4.186
3CHI005           01/01/2000 02:30:00    3.76
3CHI005           01/01/2000 02:40:00    3.418
3CHI005           01/01/2000 02:50:00    3.137
3CHI005           01/01/2000 03:00:00    0

;Rainfall (mm/hr)
3CHI010           01/01/2000 00:00:00    3.755
3CHI010           01/01/2000 00:10:00    4.478
3CHI010           01/01/2000 00:20:00    5.593
3CHI010           01/01/2000 00:30:00    7.551
3CHI010           01/01/2000 00:40:00    11.936
3CHI010           01/01/2000 00:50:00    30.856
3CHI010           01/01/2000 01:00:00    122.142
```
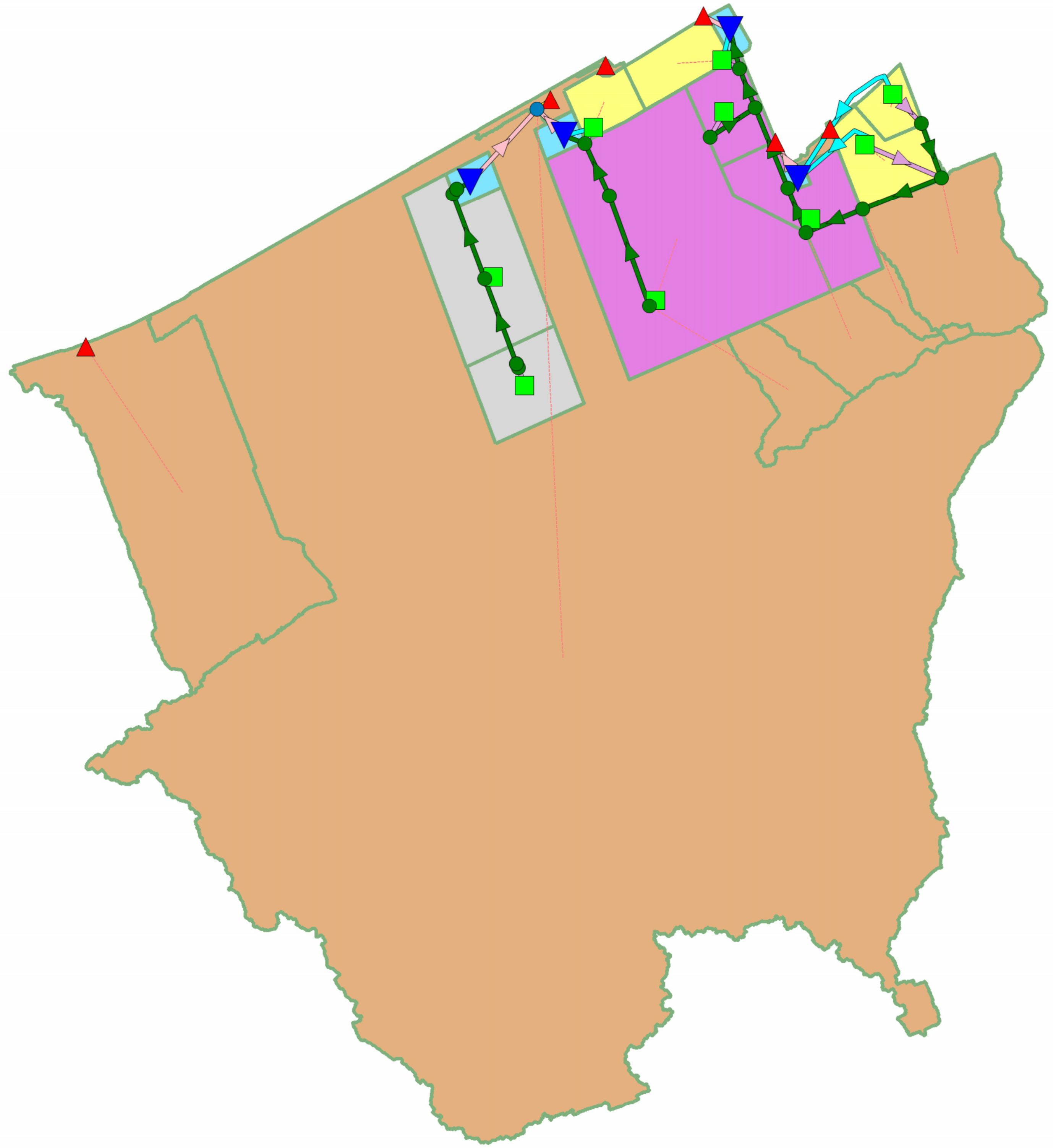

```
3CHI010          01/01/2000 01:10:00   35.237
3CHI010          01/01/2000 01:20:00   18.159
3CHI010          01/01/2000 01:30:00   12.238
3CHI010          01/01/2000 01:40:00   9.269
3CHI010          01/01/2000 01:50:00   7.492
3CHI010          01/01/2000 02:00:00   6.309
3CHI010          01/01/2000 02:10:00   5.465
3CHI010          01/01/2000 02:20:00   4.831
3CHI010          01/01/2000 02:30:00   4.338
3CHI010          01/01/2000 02:40:00   3.942
3CHI010          01/01/2000 02:50:00   3.617
3CHI010          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI025          01/01/2000 00:00:00   4.358
3CHI025          01/01/2000 00:10:00   5.202
3CHI025          01/01/2000 00:20:00   6.506
3CHI025          01/01/2000 00:30:00   8.801
3CHI025          01/01/2000 00:40:00   13.954
3CHI025          01/01/2000 00:50:00   36.302
3CHI025          01/01/2000 01:00:00   144.693
3CHI025          01/01/2000 01:10:00   41.479
3CHI025          01/01/2000 01:20:00   21.286
3CHI025          01/01/2000 01:30:00   14.308
3CHI025          01/01/2000 01:40:00   10.818
3CHI025          01/01/2000 01:50:00   8.732
3CHI025          01/01/2000 02:00:00   7.345
3CHI025          01/01/2000 02:10:00   6.356
3CHI025          01/01/2000 02:20:00   5.615
3CHI025          01/01/2000 02:30:00   5.038
3CHI025          01/01/2000 02:40:00   4.576
3CHI025          01/01/2000 02:50:00   4.197
3CHI025          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI050          01/01/2000 00:00:00   4.828
3CHI050          01/01/2000 00:10:00   5.766
3CHI050          01/01/2000 00:20:00   7.214
3CHI050          01/01/2000 00:30:00   9.763
3CHI050          01/01/2000 00:40:00   15.496
3CHI050          01/01/2000 00:50:00   40.401
3CHI050          01/01/2000 01:00:00   161.471
3CHI050          01/01/2000 01:10:00   46.17
3CHI050          01/01/2000 01:20:00   23.66
3CHI050          01/01/2000 01:30:00   15.89
3CHI050          01/01/2000 01:40:00   12.006
3CHI050          01/01/2000 01:50:00   9.687
3CHI050          01/01/2000 02:00:00   8.146
3CHI050          01/01/2000 02:10:00   7.047
3CHI050          01/01/2000 02:20:00   6.224
3CHI050          01/01/2000 02:30:00   5.583
3CHI050          01/01/2000 02:40:00   5.07
3CHI050          01/01/2000 02:50:00   4.649
3CHI050          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI100          01/01/2000 00:00:00   5.339
3CHI100          01/01/2000 00:10:00   6.376
3CHI100          01/01/2000 00:20:00   7.977
3CHI100          01/01/2000 00:30:00   10.797
3CHI100          01/01/2000 00:40:00   17.136
3CHI100          01/01/2000 00:50:00   45.128
3CHI100          01/01/2000 01:00:00   178.107
3CHI100          01/01/2000 01:10:00   51.056
3CHI100          01/01/2000 01:20:00   26.163
3CHI100          01/01/2000 01:30:00   17.571
3CHI100          01/01/2000 01:40:00   13.277
3CHI100          01/01/2000 01:50:00   10.712
3CHI100          01/01/2000 02:00:00   9.008
3CHI100          01/01/2000 02:10:00   7.793
3CHI100          01/01/2000 02:20:00   6.883
3CHI100          01/01/2000 02:30:00   6.174
3CHI100          01/01/2000 02:40:00   5.607
3CHI100          01/01/2000 02:50:00   5.142
3CHI100          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI120          01/01/2000 00:00:00   6.406801
3CHI120          01/01/2000 00:10:00   7.6512
3CHI120          01/01/2000 00:20:00   9.572401
3CHI120          01/01/2000 00:30:00   12.9564
3CHI120          01/01/2000 00:40:00   20.5632
3CHI120          01/01/2000 00:50:00   54.1536
3CHI120          01/01/2000 01:00:00   213.7284
3CHI120          01/01/2000 01:10:00   61.2672
3CHI120          01/01/2000 01:20:00   31.3956
3CHI120          01/01/2000 01:30:00   21.0852
3CHI120          01/01/2000 01:40:00   15.9324
3CHI120          01/01/2000 01:50:00   12.8544
3CHI120          01/01/2000 02:00:00   10.8096
3CHI120          01/01/2000 02:10:00   9.351601
3CHI120          01/01/2000 02:20:00   8.259601
3CHI120          01/01/2000 02:30:00   7.4088
3CHI120          01/01/2000 02:40:00   6.7284
3CHI120          01/01/2000 02:50:00   6.170401
3CHI120          01/01/2000 03:00:00   0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   S1               Residential
Subcatch   S10              WDT
Subcatch   S2               WDT
Subcatch   S3               WDT
Subcatch   S4               WDT
Subcatch   S5               WDT
Subcatch   S6               WDT
Subcatch   S9               WDT
Node       J2               WDT
Link       C1               WDT

[MAP]
DIMENSIONS       474269.92365     5039754.217      476642.45535     5042348.699
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 14
  Number of subcatchments ... 8
  Number of nodes ........... 8
  Number of links ........... 1
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                               Data       Recording
  Name                 Data Source                             Type       Interval
  ------------------------------------------------------------------------------------
  24SCS002             24SCS002                                INTENSITY   15 min.
  24SCS005             24SCS005                                INTENSITY   15 min.
  24SCS010             24SCS010                                INTENSITY   15 min.
  24SCS025             24SCS025                                INTENSITY   15 min.
  24SCS050             24SCS050                                INTENSITY   15 min.
  24SCS120             24SCS120                                INTENSITY   15 min.
  3CHI002              3CHI002                                 INTENSITY   10 min.
  3CHI005              3CHI005                                 INTENSITY   10 min.
  3CHI010              3CHI010                                 INTENSITY   10 min.
  3CHI025              3CHI025                                 INTENSITY   10 min.
  3CHI050              3CHI050                                 INTENSITY   10 min.
  3CHI100              3CHI100                                 INTENSITY   10 min.
  3CHI120              3CHI120                                 INTENSITY   10 min.
  Rainfall             24SCS100                                INTENSITY   15 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage
Outlet
  -------------------------------------------------------------------------------
----------------------------
  S1                         1.09    105.40     30.00    2.0930 Rainfall
OF7
  S10                      238.02   1690.00      0.30    1.5500 Rainfall
J2
  S2                         6.53    132.49      1.55    4.9800 Rainfall
OF4
  S3                         1.89    190.34      7.39    7.6200 Rainfall
OF1
  S4                        12.51    343.23      0.00    9.7400 Rainfall
OF2
  S5                         4.99    137.91      2.51    8.6900 Rainfall
OF3
  S6                        23.09    368.32      0.67    5.7800 Rainfall
OF5
  S9                        17.82    217.02     20.44    5.4400 Rainfall
OF6


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow
  -------------------------------------------------------------------------------
  J2                   JUNCTION             45.78      1.00       0.0
  OF1                  OUTFALL               0.00      1.00       0.0
  OF2                  OUTFALL               0.00      0.00       0.0
  OF3                  OUTFALL               0.00      0.00       0.0
  OF4                  OUTFALL               0.00      0.00       0.0
  OF5                  OUTFALL               0.00      0.00       0.0
  OF6                  OUTFALL              49.00      0.00       0.0
  OF7                  OUTFALL              53.24      0.00       0.0


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length
%Slope Roughness
  -------------------------------------------------------------------------------
--------------
  C1               J2               OF1              CONDUIT           46.5
575.8969    0.0100


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of
Full
  Conduit          Shape               Depth     Area     Rad.    Width  Barrels
Flow
  -------------------------------------------------------------------------------
--------
  C1               CIRCULAR             1.00     0.79     0.25     1.00        1
74.81


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/2000 00:00:00
  Ending Date .............. 01/02/2000 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 5.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001524 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......        31.573       103.200
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........        28.854        94.311
  Surface Runoff ...........         2.718         8.884
  Final Storage ............         0.010         0.033
  Continuity Error (%) .....        -0.026


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         2.717        27.174
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         2.717        27.174
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....        -0.000


  ***************************
  Time-Step Critical Elements
  ***************************
  Link C1 (37.56%)


  ********************************
  Highest Flow Instability Indexes
  ********************************
  All links are stable.


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.94 sec
  Average Time Step           :     3.67 sec
  Maximum Time Step           :     5.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
     5.000 -  3.155 sec       :    64.30 %
     3.155 -  1.991 sec       :     4.09 %
     1.991 -  1.256 sec       :    10.16 %
     1.256 -  0.792 sec       :    21.44 %
     0.792 -  0.500 sec       :     0.00 %


  ***************************
  Subcatchment Runoff Summary
  ***************************

  -------------------------------------------------------------------------------
----------------------------------------------
                                Total      Total      Total      Total     Imperv
Perv       Total       Total     Peak  Runoff
                               Precip      Runon       Evap      Infil     Runoff
Runoff      Runoff      Runoff   Runoff   Coeff
  Subcatchment                     mm         mm         mm         mm         mm
mm          mm    10^6 ltr      CMS
  -------------------------------------------------------------------------------
----------------------------------------------
  S1                           103.20       0.00       0.00      56.52      30.53
15.85       46.37       0.50     0.21   0.449
  S10                          103.20       0.00       0.00      97.70       0.30
5.20        5.50       13.09     2.33  0.053
  S2                           103.20       0.00       0.00      87.52       1.57
14.14       15.71       1.03     0.30   0.152
  S3                           103.20       0.00       0.00      73.33       7.51
22.48       29.99       0.57     0.35   0.291
  S4                           103.20       0.00       0.00      85.08       0.00
18.21       18.21       2.28     0.91   0.176
  S5                           103.20       0.00       0.00      83.08       2.55
17.61       20.16       1.01     0.39   0.195
  S6                           103.20       0.00       0.00      89.40       0.68
13.15       13.84       3.19     0.88   0.134
  S9                           103.20       0.00       0.00      72.00      20.77
10.14       30.91       5.51     1.63   0.300


  ******************
  Node Depth Summary
  ******************

  -------------------------------------------------------------------------------
--
                                 Average  Maximum  Maximum  Time of Max
Reported
                                   Depth    Depth      HGL   Occurrence      Max
Depth
  Node                 Type       Meters   Meters   Meters  days hr:min
Meters
  -------------------------------------------------------------------------------
--
  J2                   JUNCTION     0.05     0.16    45.94     0  12:00
0.16
  OF1                  OUTFALL      0.04     0.12     0.12     0  12:00
0.12
  OF2                  OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  OF3                  OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  OF4                  OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  OF5                  OUTFALL      0.00     0.00     0.00     0  00:00
0.00
  OF6                  OUTFALL      0.00     0.00    49.00     0  00:00
0.00
  OF7                  OUTFALL      0.00     0.00    53.24     0  00:00
0.00


  *******************
  Node Inflow Summary
  *******************

  -------------------------------------------------------------------------------
------------------
                                  Maximum  Maximum                  Lateral
Total        Flow
                                  Lateral    Total  Time of Max      Inflow
Inflow     Balance
                                   Inflow   Inflow   Occurrence      Volume
Volume       Error
  Node                 Type           CMS      CMS  days hr:min    10^6 ltr
10^6 ltr     Percent
  -------------------------------------------------------------------------------
------------------
  J2                   JUNCTION     2.332    2.332     0  12:00        13.1
13.1      -0.001
  OF1                  OUTFALL      0.349    2.682     0  12:00       0.568
13.7       0.000
  OF2                  OUTFALL      0.910    0.910     0  12:00        2.28
2.28       0.000
  OF3                  OUTFALL      0.387    0.387     0  12:00        1.01
1.01       0.000
  OF4                  OUTFALL      0.305    0.305     0  12:00        1.03
1.03       0.000
  OF5                  OUTFALL      0.880    0.880     0  12:00        3.19
3.19       0.000
  OF6                  OUTFALL      1.629    1.629     0  12:00        5.51
5.51       0.000
  OF7                  OUTFALL      0.208    0.208     0  12:00       0.504
0.504       0.000


  **********************
  Node Surcharge Summary
  **********************

  No nodes were surcharged.
```

```
  ********************
  Node Flooding Summary
  ********************

  No nodes were flooded.

  **********************
  Outfall Loading Summary
  **********************

  -----------------------------------------------------------
                         Flow       Avg       Max       Total
                         Freq      Flow      Flow      Volume
  Outfall Node           Pcnt       CMS       CMS    10^6 ltr
  -----------------------------------------------------------
  OF1                   96.90     0.514     2.682      13.661
  OF2                   30.16     0.309     0.910       2.277
  OF3                   96.86     0.040     0.387       1.006
  OF4                   96.84     0.041     0.305       1.026
  OF5                   96.89     0.129     0.880       3.195
  OF6                   96.89     0.161     1.629       5.505
  OF7                   96.79     0.015     0.208       0.504
  -----------------------------------------------------------
  System                87.33     1.208     6.998      27.174

  ********************
  Link Flow Summary
  ********************

  -----------------------------------------------------------------------------
                                 Maximum  Time of Max   Maximum    Max/    Max/
                                  |Flow|   Occurrence   |Veloc|    Full    Full
  Link                 Type          CMS  days hr:min     m/sec    Flow   Depth
  -----------------------------------------------------------------------------
  C1                   CONDUIT     2.334     0  12:00     35.11    0.03    0.14

  ***************************
  Flow Classification Summary
  ***************************

  -------------------------------------------------------------------------------
------
                     Adjusted    ---------- Fraction of Time in Flow Class -----
-----
                      /Actual         Up    Down  Sub   Sup   Up    Down  Norm
Inlet
  Conduit              Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd
Ctrl
  -------------------------------------------------------------------------------
------
  C1                     1.00   0.04  0.00  0.00  0.00  0.95  0.00  0.00  0.00
0.00

  *************************
  Conduit Surcharge Summary
  *************************

  No conduits were surcharged.

  Analysis begun on:  Mon Nov 20 16:48:21 2023
  Analysis ended on:  Mon Nov 20 16:48:21 2023
  Total elapsed time: < 1 sec
```



Legend

- Junctions
- Outfalls

Storages

- On-Site Storage
- Stormwater Management Facility
- Storm Manhole
- Conduits
- Overland Flow Path (Weir)

Subcatchments

- Existing Condition Land Use
- SWM block
- Business Park
- Residential
- Commercial

N

0.5 km

PROJECT:

ROCKLAND WEST SECONDARY STUDY
Rockland, ON

DRAWING:

Proposed Stormwater Management - Option 1

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	ID	JLR NO.:	31097-000
DRAWN:	ID	DRAWING NO.:	FIGURE 2
CHECKED:	BP		

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/02/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              18

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Rainfall         INTENSITY 0:15     1.0      TIMESERIES 24SCS100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width
%Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- ---
----- -------- ----------------
S1               Rainfall         St_SU2           3.4858   92.857   784.305  2
0
S10              Rainfall         J2               218.3856 0.296    1690
1.55     0
S11              Rainfall         St_SU3           19.0164  92.857   4278.69  2
0
S12              Rainfall         St_SU9           1.1894   64.3     267.618  2
0
S14              Rainfall         St_SU6           2.4349   92.857   547.852  2
0
S15              Rainfall         SWMF-3           0.5004   28.571   112.59   3
0
S17              Rainfall         SWMF-4           0.2195   28.571   49.388   3
0
S18              Rainfall         St_SU7           4.6318   92.857   1042.155 2
0
S19              Rainfall         St_SU4           1.527    78.571   343.575  2
0
S2               Rainfall         OF4              0.1218   1.546    132.493
4.98     0
S2_1             Rainfall         STM-7            3.3857   1.546    132.493
4.98     0
S21              Rainfall         St_SU1           6.902    92.857   1552.95  2
0
S22              Rainfall         St_SU5           2.1149   78.571   475.852  2
0
S23              Rainfall         St_SU8           2.8376   64.3     638.466  2
0
S3               Rainfall         OF1              0.7641   7.391    190.345
7.62     0
S4_2             Rainfall         STM-15           8.4446   0        325.221
9.705    0
S4_3             Rainfall         OF2              0.290336 0        11.182
9.705    0
S5               Rainfall         STM-14           1.2699   2.511    137.91
8.69     0
S6               Rainfall         OF5              23.0913  0.671    368.322
5.78     0
S7               Rainfall         SWMF-1           0.7517   28.571   169.133  3
0
S8               Rainfall         SWMF-2           0.6072   28.571   136.62   3
0
S9               Rainfall         STM-13           4.3245   20.441   217.02
5.44     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------
- ----------
S1               0.013      0.25       1.57       4.67       0          PERVIOUS
20
S10              0.013      0.25       1.57       4.67       0          OUTLET
S11              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S12              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S14              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S15              0.013      0.25       1.57       4.67       0          PERVIOUS
100
S17              0.013      0.25       1.57       4.67       0          PERVIOUS
100
S18              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S19              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S2               0.013      0.25       1.57       4.67       0          OUTLET
S2_1             0.013      0.25       1.57       4.67       0          OUTLET
S21              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S22              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S23              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S3               0.013      0.25       1.57       4.67       0          OUTLET
S4_2             0.013      0.25       1.57       4.67       0          OUTLET
S4_3             0.013      0.25       1.57       4.67       0          OUTLET
S5               0.013      0.25       1.57       4.67       0          OUTLET
S6               0.013      0.25       1.57       4.67       0          OUTLET
S7               0.013      0.25       1.57       4.67       0          PERVIOUS
100
S8               0.013      0.25       1.57       4.67       0          PERVIOUS
100
S9               0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S1               76.2       13.2       4.14       7          0
S10              76.2       13.2       4.14       7          0
S11              76.2       13.2       4.14       7          0
S12              76.2       13.2       4.14       7          0
S14              76.2       13.2       4.14       7          0
S15              76.2       13.2       4.14       7          0
S17              76.2       13.2       4.14       7          0
S18              76.2       13.2       4.14       7          0
S19              76.2       13.2       4.14       7          0
S2               76.2       13.2       4.14       7          0
S2_1             76.2       13.2       4.14       7          0
S21              76.2       13.2       4.14       7          0
S22              76.2       13.2       4.14       7          0
S23              76.2       13.2       4.14       7          0
S3               76.2       13.2       4.14       7          0
S4_2             76.2       13.2       4.14       7          0
S4_3             76.2       13.2       4.14       7          0
S5               76.2       13.2       4.14       7          0
S6               76.2       13.2       4.14       7          0
S7               76.2       13.2       4.14       7          0
S8               76.2       13.2       4.14       7          0
S9               76.2       13.2       4.14       7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J2               45.521     4.5        0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              43.921     FREE                        NO
OF2              53.617     FREE                        NO
OF3              53.605     FREE                        NO
OF4              50.646     FREE                        NO
OF5              50.624     FREE                        NO
OF6              51.352     FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
SurDepth Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ---------- ---------------------
------- -------- -------- -------- --------
St_SU1           52.799   0.5        0          FUNCTIONAL 0         0
1500     0        0
St_SU2           52.985   0.5        0          FUNCTIONAL 0         0
500      0        0
St_SU3           54.024   0.5        0          FUNCTIONAL 0         0
3500     0        0
St_SU4           52.829   0.5        0          FUNCTIONAL 0         0
220      0        0
St_SU5           54.434   0.5        0          FUNCTIONAL 0         0
302.129  0        0
St_SU6           55.485   0.5        0          FUNCTIONAL 0         0
347.843  0        0
St_SU7           59.5     0.5        0          FUNCTIONAL 0         0
662.571  0        0
St_SU8           59       0.5        0          FUNCTIONAL 0         0
472.933  0        0
St_SU9           58       0.5        0          FUNCTIONAL 0         0
154.071  0        0
STM-1            52.62    3.301      0          FUNCTIONAL 0         0
1.13     0        0
STM-10           52.49    3.495      0          FUNCTIONAL 0         0
1.13     0        0
STM-12           52.729   2.832      0          FUNCTIONAL 0         0
1.13     0        0
STM-13           53.227   3.079      0          FUNCTIONAL 0         0
1.13     0        0
STM-14           53.825   3.691      0          FUNCTIONAL 0         0
1.13     0        0
STM-15           54.443   4.132      0          FUNCTIONAL 0         0
1.13     0        0
STM-16           54.866   4.313      0          FUNCTIONAL 0         0
1.13     0        0
STM-2            48.412   3.921      0          FUNCTIONAL 0         0
1.13     0        0
STM-2A           49.223   4.076      0          FUNCTIONAL 0         0
1.13     0        0
STM-3            53.987   2.437      0          FUNCTIONAL 0         0
1.13     0        0
STM-4            50.216   3.269      0          FUNCTIONAL 0         0
1.13     0        0
STM-5            49.4     3.929      0          FUNCTIONAL 0         0
1.13     0        0
STM-6            49.821   2.726      0          FUNCTIONAL 0         0
1.13     0        0
STM-7            50.824   3.7        0          FUNCTIONAL 0         0
1.13     0        0
STM-8            51.789   3.145      0          FUNCTIONAL 0         0
1.13     0        0
STM-9            52.097   2.892      0          FUNCTIONAL 0         0
1.13     0        0
STMH-1           48.366   4.055      0          FUNCTIONAL 0         0
1.13     0        0
STMH-3           50.003   2.921      0          FUNCTIONAL 0         0
1.13     0        0
SWMF-1           48.255   1.5        0          PYRAMIDAL  63        63        3
0        0
SWMF-2           49.24    1.5        0          PYRAMIDAL  93        93        3
0        0
SWMF-3           51.5     1.5        0          PYRAMIDAL  53        53        3
0        0
SWMF-4           54.496   1.5        0          PYRAMIDAL  8         8         3
0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- --------
-- ---------- ---------- ----------
C1               STMH-1           SWMF-1           31.803     0.013      48.366
48.255     0          0
C10              STM-10           STM-9            112.412    0.013      52.49
52.097     0          0
C11              STM-14           STM-13           127.964    0.013      53.825
53.377     0          0
C12              STM-15           STM-14           176.443    0.013      54.443
53.825     0          0
C13              STM-13           STM-12           99.383     0.013      53.227
52.879     0          0
C14              STM-12           STM-9            180.704    0.013      52.729
52.097     0          0
C15              STM-16           STM-15           120.875    0.013      55.166
54.743     0          0
C2               STM-2            STMH-1           13.136     0.013      48.412
48.366     0          0
C3               J2               OF1              35.05      0.035      45.521
43.921     0          0
C3_1             STMH-3           STM-2A           188.688    0.013      50.033
49.373     0          0
C3_2             STM-2A           STM-2            188.741    0.013      49.223
48.562     0          0
C4               STM-4            STMH-3           9.357      0.013      50.216
50.183     0          0
C5               STM-5            SWMF-2           45.799     0.013      49.4
49.24      0          0
C6               STM-6            STM-5            120.279    0.013      49.821
49.4       0          0
C7               STM-7            STM-6            243.631    0.013      50.824
49.971     0          0
C8               STM-8            SWMF-3           82.465     0.013      51.789
51.5       0          0
C9               STM-9            STM-8            88.08      0.013      52.097
51.789     0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff
Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ------
---- -------- ----------
```

```
OR1             SWMF-1          J2              SIDE        48.255     0.6
NO        0
OR2             SWMF-2          J2              SIDE        49.24      0.6
NO        0
OR3             SWMF-3          OF6             SIDE        51.5       0.6
NO        0
OR4             SWMF-4          OF3             SIDE        54.496     0.6
NO        0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff
Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ---------- ------
---- -------- -------- ---------- ---------- ---------- ---------- -------------
--
W3              St_SU4          SWMF-2          TRANSVERSE  53.079     1.84
NO        0      0          NO
W5              St_SU5          SWMF-3          TRANSVERSE  54.684     1.84
NO        0      0          NO
W6              St_SU8          SWMF-4          TRANSVERSE  59.25      1.84
NO        0      0          NO
W7              St_SU9          SWMF-4          TRANSVERSE  58.25      1.84
NO        0      0          NO

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------- --
-------------- ---------- --------
OL1             St_SU1          STM-2A          52.799     TABULAR/HEAD
OL1                        NO
OL2             ST_SU2          STM-4           52.985     TABULAR/HEAD
OL2                        NO
OL3             St_SU3          STM-7           54.024     TABULAR/HEAD
OL3                        NO
OL4             St_SU4          STM-5           52.829     TABULAR/HEAD
OL4                        NO
OL5             St_SU5          STM-8           54.434     TABULAR/HEAD
OL5                        NO
OL6             St_SU6          STM-10          55.485     TABULAR/HEAD
OL6                        NO
OL7             St_SU7          STM-13          59.5       TABULAR/HEAD
OL7                        NO
OL8             St_SU8          STM-15          59         TABULAR/DEPTH
OL8                        NO
OL9             St_SU9          STM-16          58         TABULAR/DEPTH
OL9                        NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- -
--------- ----------
C1              CIRCULAR     1.2              0          0          0          1
C10             CIRCULAR     0.75             0          0          0          1
C11             CIRCULAR     1.05             0          0          0          1
C12             CIRCULAR     1.05             0          0          0          1
C13             CIRCULAR     1.2              0          0          0          1
C14             CIRCULAR     1.35             0          0          0          1
C15             CIRCULAR     0.75             0          0          0          1
C2              CIRCULAR     1.2              0          0          0          1
C3              TRAPEZOIDAL  1                3          3          3          1
C3_1            CIRCULAR     0.9              0          0          0          1
C3_2            CIRCULAR     1.05             0          0          0          1
C4              CIRCULAR     0.75             0          0          0          1
C5              CIRCULAR     1.5              0          0          0          1
C6              CIRCULAR     1.5              0          0          0          1
C7              CIRCULAR     1.35             0          0          0          1
C8              CIRCULAR     1.35             0          0          0          1
C9              CIRCULAR     1.35             0          0          0          1
OR1             CIRCULAR     0.16             0          0          0
OR2             CIRCULAR     0.22             0          0          0
OR3             RECT_CLOSED  0.525            1.05       0          0
OR4             CIRCULAR     0.35             0          0          0
W3              RECT_OPEN    0.25             5          0          0
W5              RECT_OPEN    0.25             10         0          0
W6              RECT_OPEN    0.25             5          0          0
W7              RECT_OPEN    0.25             10         0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
C1              0          0.5        0          NO         0
C10             0          1.064      0          NO         0
C11             0          1.319      0          NO         0
C12             0          0.032      0          NO         0
C13             0          0.02       0          NO         0
C14             0          0.02       0          NO         0
C15             0          1.319      0          NO         0
C2              0          0.21       0          NO         0
C3_2            0          0.63       0          NO         0
C4              0          0.02       0          NO         0
C5              0          0.5        0          NO         0
C6              0          0.391      0          NO         0
C7              0          0.032      0          NO         0
C8              0          0.5        0          NO         0
C9              0          0.051      0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL1             Rating     0          0
OL1                        0.001      1.699
OL1                        0.35       1.709
OL1                        0.5        1.709

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL2             Rating     0          0
OL2                        0.001      0.858
OL2                        0.35       0.868
OL2                        0.5        0.868

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL3             Rating     0          0
OL3                        0.001      4.682
OL3                        0.35       4.692
OL3                        0.5        4.692

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL4             Rating     0          0
OL4                        0.001      0.266
OL4                        0.35       0.276
OL4                        0.5        0.276

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL5             Rating     0          0
OL5                        0.001      0.368
OL5                        0.35       0.378
OL5                        0.5        0.378

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL6             Rating     0          0
OL6                        0.001      0.599
OL6                        0.35       0.599
OL6                        0.5        0.599

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL7             Rating     0          0
OL7                        0.001      1.14
OL7                        0.35       1.15
OL7                        0.5        1.15
```

```
;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL8             Rating     0          0
OL8                        0.001      0.429
OL8                        0.35       0.434
OL8                        0.5        0.439

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL9             Rating     0          0
OL9                        0.001      0.18
OL9                        0.35       0.185
OL9                        0.5        0.19

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
24SCS002        01/01/2000 00:00:00   0.72
24SCS002        01/01/2000 00:15:00   0.72
24SCS002        01/01/2000 00:30:00   0.72
24SCS002        01/01/2000 00:45:00   0.72
24SCS002        01/01/2000 01:00:00   0.336
24SCS002        01/01/2000 01:15:00   0.336
24SCS002        01/01/2000 01:30:00   0.336
24SCS002        01/01/2000 01:45:00   0.336
24SCS002        01/01/2000 02:00:00   0.624
24SCS002        01/01/2000 02:15:00   0.624
24SCS002        01/01/2000 02:30:00   0.624
24SCS002        01/01/2000 02:45:00   0.624
24SCS002        01/01/2000 03:00:00   0.624
24SCS002        01/01/2000 03:15:00   0.624
24SCS002        01/01/2000 03:30:00   0.624
24SCS002        01/01/2000 03:45:00   0.624
24SCS002        01/01/2000 04:00:00   0.816
24SCS002        01/01/2000 04:15:00   0.816
24SCS002        01/01/2000 04:30:00   0.816
24SCS002        01/01/2000 04:45:00   0.816
24SCS002        01/01/2000 05:00:00   0.72
24SCS002        01/01/2000 05:15:00   0.72
24SCS002        01/01/2000 05:30:00   0.72
24SCS002        01/01/2000 05:45:00   0.72
24SCS002        01/01/2000 06:00:00   0.96
24SCS002        01/01/2000 06:15:00   0.96
24SCS002        01/01/2000 06:30:00   0.96
24SCS002        01/01/2000 06:45:00   0.96
24SCS002        01/01/2000 07:00:00   0.96
24SCS002        01/01/2000 07:15:00   0.96
24SCS002        01/01/2000 07:30:00   0.96
24SCS002        01/01/2000 07:45:00   0.96
24SCS002        01/01/2000 08:00:00   1.296
24SCS002        01/01/2000 08:15:00   1.296
24SCS002        01/01/2000 08:30:00   1.296
24SCS002        01/01/2000 08:45:00   1.296
24SCS002        01/01/2000 09:00:00   1.536
24SCS002        01/01/2000 09:15:00   1.536
24SCS002        01/01/2000 09:30:00   1.728
24SCS002        01/01/2000 09:45:00   1.728
24SCS002        01/01/2000 10:00:00   2.208
24SCS002        01/01/2000 10:15:00   2.208
24SCS002        01/01/2000 10:30:00   2.976
24SCS002        01/01/2000 10:45:00   2.976
24SCS002        01/01/2000 11:00:00   4.608
24SCS002        01/01/2000 11:15:00   4.608
24SCS002        01/01/2000 11:30:00   19.968
24SCS002        01/01/2000 11:45:00   52.992
24SCS002        01/01/2000 12:00:00   6.912
24SCS002        01/01/2000 12:15:00   6.912
24SCS002        01/01/2000 12:30:00   3.552
24SCS002        01/01/2000 12:45:00   3.552
24SCS002        01/01/2000 13:00:00   2.592
24SCS002        01/01/2000 13:15:00   2.592
24SCS002        01/01/2000 13:30:00   2.016
24SCS002        01/01/2000 13:45:00   2.016
24SCS002        01/01/2000 14:00:00   1.536
24SCS002        01/01/2000 14:15:00   1.536
24SCS002        01/01/2000 14:30:00   1.536
24SCS002        01/01/2000 14:45:00   1.536
24SCS002        01/01/2000 15:00:00   1.344
24SCS002        01/01/2000 15:15:00   1.344
24SCS002        01/01/2000 15:30:00   1.344
24SCS002        01/01/2000 15:45:00   1.344
24SCS002        01/01/2000 16:00:00   1.056
24SCS002        01/01/2000 16:15:00   1.056
24SCS002        01/01/2000 16:30:00   1.056
24SCS002        01/01/2000 16:45:00   1.056
24SCS002        01/01/2000 17:00:00   1.104
24SCS002        01/01/2000 17:15:00   1.104
24SCS002        01/01/2000 17:30:00   1.104
24SCS002        01/01/2000 17:45:00   1.104
24SCS002        01/01/2000 18:00:00   0.72
24SCS002        01/01/2000 18:15:00   0.72
24SCS002        01/01/2000 18:30:00   0.72
24SCS002        01/01/2000 18:45:00   0.72
24SCS002        01/01/2000 19:00:00   0.576
24SCS002        01/01/2000 19:15:00   0.576
24SCS002        01/01/2000 19:30:00   0.576
24SCS002        01/01/2000 19:45:00   0.576
24SCS002        01/01/2000 20:00:00   0.816
24SCS002        01/01/2000 20:15:00   0.816
24SCS002        01/01/2000 20:30:00   0.816
24SCS002        01/01/2000 20:45:00   0.816
24SCS002        01/01/2000 21:00:00   0.528
24SCS002        01/01/2000 21:15:00   0.528
24SCS002        01/01/2000 21:30:00   0.528
24SCS002        01/01/2000 21:45:00   0.528
24SCS002        01/01/2000 22:00:00   0.48
24SCS002        01/01/2000 22:15:00   0.48
24SCS002        01/01/2000 22:30:00   0.48
24SCS002        01/01/2000 22:45:00   0.48
24SCS002        01/01/2000 23:00:00   0.48
24SCS002        01/01/2000 23:15:00   0.48
24SCS002        01/01/2000 23:30:00   0.48
24SCS002        01/01/2000 23:45:00   0.48
24SCS002        01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS005        01/01/2000 00:00:00   0.936
24SCS005        01/01/2000 00:15:00   0.936
24SCS005        01/01/2000 00:30:00   0.936
24SCS005        01/01/2000 00:45:00   0.936
24SCS005        01/01/2000 01:00:00   0.4368
24SCS005        01/01/2000 01:15:00   0.4368
24SCS005        01/01/2000 01:30:00   0.4368
24SCS005        01/01/2000 01:45:00   0.4368
24SCS005        01/01/2000 02:00:00   0.8112
24SCS005        01/01/2000 02:15:00   0.8112
24SCS005        01/01/2000 02:30:00   0.8112
24SCS005        01/01/2000 02:45:00   0.8112
24SCS005        01/01/2000 03:00:00   0.8112
24SCS005        01/01/2000 03:15:00   0.8112
24SCS005        01/01/2000 03:30:00   0.8112
24SCS005        01/01/2000 03:45:00   0.8112
24SCS005        01/01/2000 04:00:00   1.0608
24SCS005        01/01/2000 04:15:00   1.0608
24SCS005        01/01/2000 04:30:00   1.0608
24SCS005        01/01/2000 04:45:00   1.0608
24SCS005        01/01/2000 05:00:00   0.936
24SCS005        01/01/2000 05:15:00   0.936
24SCS005        01/01/2000 05:30:00   0.936
24SCS005        01/01/2000 05:45:00   0.936
24SCS005        01/01/2000 06:00:00   1.248
24SCS005        01/01/2000 06:15:00   1.248
24SCS005        01/01/2000 06:30:00   1.248
24SCS005        01/01/2000 06:45:00   1.248
24SCS005        01/01/2000 07:00:00   1.248
24SCS005        01/01/2000 07:15:00   1.248
24SCS005        01/01/2000 07:30:00   1.248
```

```
24SCS005         01/01/2000 07:45:00   1.248
24SCS005         01/01/2000 08:00:00   1.6848
24SCS005         01/01/2000 08:15:00   1.6848
24SCS005         01/01/2000 08:30:00   1.6848
24SCS005         01/01/2000 08:45:00   1.6848
24SCS005         01/01/2000 09:00:00   1.9968
24SCS005         01/01/2000 09:15:00   1.9968
24SCS005         01/01/2000 09:30:00   2.2464
24SCS005         01/01/2000 09:45:00   2.2464
24SCS005         01/01/2000 10:00:00   2.8704
24SCS005         01/01/2000 10:15:00   2.8704
24SCS005         01/01/2000 10:30:00   3.8688
24SCS005         01/01/2000 10:45:00   3.8688
24SCS005         01/01/2000 11:00:00   5.9904
24SCS005         01/01/2000 11:15:00   5.9904
24SCS005         01/01/2000 11:30:00   25.9584
24SCS005         01/01/2000 11:45:00   68.8896
24SCS005         01/01/2000 12:00:00   8.9856
24SCS005         01/01/2000 12:15:00   8.9856
24SCS005         01/01/2000 12:30:00   4.6176
24SCS005         01/01/2000 12:45:00   4.6176
24SCS005         01/01/2000 13:00:00   3.3696
24SCS005         01/01/2000 13:15:00   3.3696
24SCS005         01/01/2000 13:30:00   2.6208
24SCS005         01/01/2000 13:45:00   2.6208
24SCS005         01/01/2000 14:00:00   1.9968
24SCS005         01/01/2000 14:15:00   1.9968
24SCS005         01/01/2000 14:30:00   1.9968
24SCS005         01/01/2000 14:45:00   1.9968
24SCS005         01/01/2000 15:00:00   1.7472
24SCS005         01/01/2000 15:15:00   1.7472
24SCS005         01/01/2000 15:30:00   1.7472
24SCS005         01/01/2000 15:45:00   1.7472
24SCS005         01/01/2000 16:00:00   1.3728
24SCS005         01/01/2000 16:15:00   1.3728
24SCS005         01/01/2000 16:30:00   1.3728
24SCS005         01/01/2000 16:45:00   1.3728
24SCS005         01/01/2000 17:00:00   1.4352
24SCS005         01/01/2000 17:15:00   1.4352
24SCS005         01/01/2000 17:30:00   1.4352
24SCS005         01/01/2000 17:45:00   1.4352
24SCS005         01/01/2000 18:00:00   0.936
24SCS005         01/01/2000 18:15:00   0.936
24SCS005         01/01/2000 18:30:00   0.936
24SCS005         01/01/2000 18:45:00   0.936
24SCS005         01/01/2000 19:00:00   0.7488
24SCS005         01/01/2000 19:15:00   0.7488
24SCS005         01/01/2000 19:30:00   0.7488
24SCS005         01/01/2000 19:45:00   0.7488
24SCS005         01/01/2000 20:00:00   1.0608
24SCS005         01/01/2000 20:15:00   1.0608
24SCS005         01/01/2000 20:30:00   1.0608
24SCS005         01/01/2000 20:45:00   1.0608
24SCS005         01/01/2000 21:00:00   0.6864
24SCS005         01/01/2000 21:15:00   0.6864
24SCS005         01/01/2000 21:30:00   0.6864
24SCS005         01/01/2000 21:45:00   0.6864
24SCS005         01/01/2000 22:00:00   0.624
24SCS005         01/01/2000 22:15:00   0.624
24SCS005         01/01/2000 22:30:00   0.624
24SCS005         01/01/2000 22:45:00   0.624
24SCS005         01/01/2000 23:00:00   0.624
24SCS005         01/01/2000 23:15:00   0.624
24SCS005         01/01/2000 23:30:00   0.624
24SCS005         01/01/2000 23:45:00   0.624
24SCS005         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS010         01/01/2000 00:00:00   1.08
24SCS010         01/01/2000 00:15:00   1.08
24SCS010         01/01/2000 00:30:00   1.08
24SCS010         01/01/2000 00:45:00   1.08
24SCS010         01/01/2000 01:00:00   0.504
24SCS010         01/01/2000 01:15:00   0.504
24SCS010         01/01/2000 01:30:00   0.504
24SCS010         01/01/2000 01:45:00   0.504
24SCS010         01/01/2000 02:00:00   0.936
24SCS010         01/01/2000 02:15:00   0.936
24SCS010         01/01/2000 02:30:00   0.936
24SCS010         01/01/2000 02:45:00   0.936
24SCS010         01/01/2000 03:00:00   0.936
24SCS010         01/01/2000 03:15:00   0.936
24SCS010         01/01/2000 03:30:00   0.936
24SCS010         01/01/2000 03:45:00   0.936
24SCS010         01/01/2000 04:00:00   1.224
24SCS010         01/01/2000 04:15:00   1.224
24SCS010         01/01/2000 04:30:00   1.224
24SCS010         01/01/2000 04:45:00   1.224
24SCS010         01/01/2000 05:00:00   1.08
24SCS010         01/01/2000 05:15:00   1.08
24SCS010         01/01/2000 05:30:00   1.08
24SCS010         01/01/2000 05:45:00   1.08
24SCS010         01/01/2000 06:00:00   1.44
24SCS010         01/01/2000 06:15:00   1.44
24SCS010         01/01/2000 06:30:00   1.44
24SCS010         01/01/2000 06:45:00   1.44
24SCS010         01/01/2000 07:00:00   1.44
24SCS010         01/01/2000 07:15:00   1.44
24SCS010         01/01/2000 07:30:00   1.44
24SCS010         01/01/2000 07:45:00   1.44
24SCS010         01/01/2000 08:00:00   1.944
24SCS010         01/01/2000 08:15:00   1.944
24SCS010         01/01/2000 08:30:00   1.944
24SCS010         01/01/2000 08:45:00   1.944
24SCS010         01/01/2000 09:00:00   2.304
24SCS010         01/01/2000 09:15:00   2.304
24SCS010         01/01/2000 09:30:00   2.592
24SCS010         01/01/2000 09:45:00   2.592
24SCS010         01/01/2000 10:00:00   3.312
24SCS010         01/01/2000 10:15:00   3.312
24SCS010         01/01/2000 10:30:00   4.464
24SCS010         01/01/2000 10:45:00   4.464
24SCS010         01/01/2000 11:00:00   6.912
24SCS010         01/01/2000 11:15:00   6.912
24SCS010         01/01/2000 11:30:00   29.952
24SCS010         01/01/2000 11:45:00   79.488
24SCS010         01/01/2000 12:00:00   10.368
24SCS010         01/01/2000 12:15:00   10.368
24SCS010         01/01/2000 12:30:00   5.328
24SCS010         01/01/2000 12:45:00   5.328
24SCS010         01/01/2000 13:00:00   3.888
24SCS010         01/01/2000 13:15:00   3.888
24SCS010         01/01/2000 13:30:00   3.024
24SCS010         01/01/2000 13:45:00   3.024
24SCS010         01/01/2000 14:00:00   2.304
24SCS010         01/01/2000 14:15:00   2.304
24SCS010         01/01/2000 14:30:00   2.304
24SCS010         01/01/2000 14:45:00   2.304
24SCS010         01/01/2000 15:00:00   2.016
24SCS010         01/01/2000 15:15:00   2.016
24SCS010         01/01/2000 15:30:00   2.016
24SCS010         01/01/2000 15:45:00   2.016
24SCS010         01/01/2000 16:00:00   1.584
24SCS010         01/01/2000 16:15:00   1.584
24SCS010         01/01/2000 16:30:00   1.584
24SCS010         01/01/2000 16:45:00   1.584
24SCS010         01/01/2000 17:00:00   1.656
24SCS010         01/01/2000 17:15:00   1.656
24SCS010         01/01/2000 17:30:00   1.656
24SCS010         01/01/2000 17:45:00   1.656
24SCS010         01/01/2000 18:00:00   1.08
24SCS010         01/01/2000 18:15:00   1.08
24SCS010         01/01/2000 18:30:00   1.08
24SCS010         01/01/2000 18:45:00   1.08
24SCS010         01/01/2000 19:00:00   0.864
24SCS010         01/01/2000 19:15:00   0.864
24SCS010         01/01/2000 19:30:00   0.864
24SCS010         01/01/2000 19:45:00   0.864
24SCS010         01/01/2000 20:00:00   1.224
24SCS010         01/01/2000 20:15:00   1.224
24SCS010         01/01/2000 20:30:00   1.224
24SCS010         01/01/2000 20:45:00   1.224
24SCS010         01/01/2000 21:00:00   0.792
24SCS010         01/01/2000 21:15:00   0.792
24SCS010         01/01/2000 21:30:00   0.792
24SCS010         01/01/2000 21:45:00   0.792
24SCS010         01/01/2000 22:00:00   0.72
24SCS010         01/01/2000 22:15:00   0.72
24SCS010         01/01/2000 22:30:00   0.72
24SCS010         01/01/2000 22:45:00   0.72
24SCS010         01/01/2000 23:00:00   0.72
24SCS010         01/01/2000 23:15:00   0.72
24SCS010         01/01/2000 23:30:00   0.72
24SCS010         01/01/2000 23:45:00   0.72
24SCS010         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS025         01/01/2000 00:00:00   1.26
24SCS025         01/01/2000 00:15:00   1.26
24SCS025         01/01/2000 00:30:00   1.26
24SCS025         01/01/2000 00:45:00   1.26
24SCS025         01/01/2000 01:00:00   0.588
24SCS025         01/01/2000 01:15:00   0.588
24SCS025         01/01/2000 01:30:00   0.588
24SCS025         01/01/2000 01:45:00   0.588
24SCS025         01/01/2000 02:00:00   1.092
24SCS025         01/01/2000 02:15:00   1.092
24SCS025         01/01/2000 02:30:00   1.092
24SCS025         01/01/2000 02:45:00   1.092
24SCS025         01/01/2000 03:00:00   1.092
24SCS025         01/01/2000 03:15:00   1.092
24SCS025         01/01/2000 03:30:00   1.092
24SCS025         01/01/2000 03:45:00   1.092
24SCS025         01/01/2000 04:00:00   1.428
24SCS025         01/01/2000 04:15:00   1.428
24SCS025         01/01/2000 04:30:00   1.428
24SCS025         01/01/2000 04:45:00   1.428
24SCS025         01/01/2000 05:00:00   1.26
24SCS025         01/01/2000 05:15:00   1.26
24SCS025         01/01/2000 05:30:00   1.26
24SCS025         01/01/2000 05:45:00   1.26
24SCS025         01/01/2000 06:00:00   1.68
24SCS025         01/01/2000 06:15:00   1.68
24SCS025         01/01/2000 06:30:00   1.68
24SCS025         01/01/2000 06:45:00   1.68
24SCS025         01/01/2000 07:00:00   1.68
24SCS025         01/01/2000 07:15:00   1.68
24SCS025         01/01/2000 07:30:00   1.68
24SCS025         01/01/2000 07:45:00   1.68
24SCS025         01/01/2000 08:00:00   2.268
24SCS025         01/01/2000 08:15:00   2.268
24SCS025         01/01/2000 08:30:00   2.268
24SCS025         01/01/2000 08:45:00   2.268
24SCS025         01/01/2000 09:00:00   2.688
24SCS025         01/01/2000 09:15:00   2.688
24SCS025         01/01/2000 09:30:00   3.024
24SCS025         01/01/2000 09:45:00   3.024
24SCS025         01/01/2000 10:00:00   3.864
24SCS025         01/01/2000 10:15:00   3.864
24SCS025         01/01/2000 10:30:00   5.208
24SCS025         01/01/2000 10:45:00   5.208
24SCS025         01/01/2000 11:00:00   8.064
24SCS025         01/01/2000 11:15:00   8.064
24SCS025         01/01/2000 11:30:00   34.944
24SCS025         01/01/2000 11:45:00   92.736
24SCS025         01/01/2000 12:00:00   12.096
24SCS025         01/01/2000 12:15:00   12.096
24SCS025         01/01/2000 12:30:00   6.216
24SCS025         01/01/2000 12:45:00   6.216
24SCS025         01/01/2000 13:00:00   4.536
24SCS025         01/01/2000 13:15:00   4.536
24SCS025         01/01/2000 13:30:00   3.528
24SCS025         01/01/2000 13:45:00   3.528
24SCS025         01/01/2000 14:00:00   2.688
24SCS025         01/01/2000 14:15:00   2.688
24SCS025         01/01/2000 14:30:00   2.688
24SCS025         01/01/2000 14:45:00   2.688
24SCS025         01/01/2000 15:00:00   2.352
24SCS025         01/01/2000 15:15:00   2.352
24SCS025         01/01/2000 15:30:00   2.352
24SCS025         01/01/2000 15:45:00   2.352
24SCS025         01/01/2000 16:00:00   1.848
24SCS025         01/01/2000 16:15:00   1.848
24SCS025         01/01/2000 16:30:00   1.848
24SCS025         01/01/2000 16:45:00   1.848
24SCS025         01/01/2000 17:00:00   1.932
24SCS025         01/01/2000 17:15:00   1.932
24SCS025         01/01/2000 17:30:00   1.932
24SCS025         01/01/2000 17:45:00   1.932
24SCS025         01/01/2000 18:00:00   1.26
24SCS025         01/01/2000 18:15:00   1.26
24SCS025         01/01/2000 18:30:00   1.26
24SCS025         01/01/2000 18:45:00   1.26
24SCS025         01/01/2000 19:00:00   1.008
24SCS025         01/01/2000 19:15:00   1.008
24SCS025         01/01/2000 19:30:00   1.008
24SCS025         01/01/2000 19:45:00   1.008
24SCS025         01/01/2000 20:00:00   1.428
24SCS025         01/01/2000 20:15:00   1.428
24SCS025         01/01/2000 20:30:00   1.428
24SCS025         01/01/2000 20:45:00   1.428
24SCS025         01/01/2000 21:00:00   0.924
24SCS025         01/01/2000 21:15:00   0.924
24SCS025         01/01/2000 21:30:00   0.924
24SCS025         01/01/2000 21:45:00   0.924
24SCS025         01/01/2000 22:00:00   0.84
24SCS025         01/01/2000 22:15:00   0.84
24SCS025         01/01/2000 22:30:00   0.84
24SCS025         01/01/2000 22:45:00   0.84
24SCS025         01/01/2000 23:00:00   0.84
24SCS025         01/01/2000 23:15:00   0.84
24SCS025         01/01/2000 23:30:00   0.84
24SCS025         01/01/2000 23:45:00   0.84
24SCS025         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS050         01/01/2000 00:00:00   1.404
24SCS050         01/01/2000 00:15:00   1.404
24SCS050         01/01/2000 00:30:00   1.404
24SCS050         01/01/2000 00:45:00   1.404
24SCS050         01/01/2000 01:00:00   0.6552
24SCS050         01/01/2000 01:15:00   0.6552
24SCS050         01/01/2000 01:30:00   0.6552
24SCS050         01/01/2000 01:45:00   0.6552
24SCS050         01/01/2000 02:00:00   1.2168
24SCS050         01/01/2000 02:15:00   1.2168
24SCS050         01/01/2000 02:30:00   1.2168
24SCS050         01/01/2000 02:45:00   1.2168
24SCS050         01/01/2000 03:00:00   1.2168
24SCS050         01/01/2000 03:15:00   1.2168
24SCS050         01/01/2000 03:30:00   1.2168
24SCS050         01/01/2000 03:45:00   1.2168
24SCS050         01/01/2000 04:00:00   1.5912
24SCS050         01/01/2000 04:15:00   1.5912
24SCS050         01/01/2000 04:30:00   1.5912
24SCS050         01/01/2000 04:45:00   1.5912
24SCS050         01/01/2000 05:00:00   1.404
24SCS050         01/01/2000 05:15:00   1.404
24SCS050         01/01/2000 05:30:00   1.404
24SCS050         01/01/2000 05:45:00   1.404
24SCS050         01/01/2000 06:00:00   1.872
24SCS050         01/01/2000 06:15:00   1.872
24SCS050         01/01/2000 06:30:00   1.872
24SCS050         01/01/2000 06:45:00   1.872
24SCS050         01/01/2000 07:00:00   1.872
24SCS050         01/01/2000 07:15:00   1.872
24SCS050         01/01/2000 07:30:00   1.872
24SCS050         01/01/2000 07:45:00   1.872
```

```
24SCS050            01/01/2000 08:00:00    2.5272
24SCS050            01/01/2000 08:15:00    2.5272
24SCS050            01/01/2000 08:30:00    2.5272
24SCS050            01/01/2000 08:45:00    2.5272
24SCS050            01/01/2000 09:00:00    2.9952
24SCS050            01/01/2000 09:15:00    2.9952
24SCS050            01/01/2000 09:30:00    3.3696
24SCS050            01/01/2000 09:45:00    3.3696
24SCS050            01/01/2000 10:00:00    4.3056
24SCS050            01/01/2000 10:15:00    4.3056
24SCS050            01/01/2000 10:30:00    5.803199
24SCS050            01/01/2000 10:45:00    5.803199
24SCS050            01/01/2000 11:00:00    8.9856
24SCS050            01/01/2000 11:15:00    8.9856
24SCS050            01/01/2000 11:30:00    38.9376
24SCS050            01/01/2000 11:45:00    103.3344
24SCS050            01/01/2000 12:00:00    13.4784
24SCS050            01/01/2000 12:15:00    13.4784
24SCS050            01/01/2000 12:30:00    6.9264
24SCS050            01/01/2000 12:45:00    6.9264
24SCS050            01/01/2000 13:00:00    5.0544
24SCS050            01/01/2000 13:15:00    5.0544
24SCS050            01/01/2000 13:30:00    3.9312
24SCS050            01/01/2000 13:45:00    3.9312
24SCS050            01/01/2000 14:00:00    2.9952
24SCS050            01/01/2000 14:15:00    2.9952
24SCS050            01/01/2000 14:30:00    2.9952
24SCS050            01/01/2000 14:45:00    2.9952
24SCS050            01/01/2000 15:00:00    2.6208
24SCS050            01/01/2000 15:15:00    2.6208
24SCS050            01/01/2000 15:30:00    2.6208
24SCS050            01/01/2000 15:45:00    2.6208
24SCS050            01/01/2000 16:00:00    2.0592
24SCS050            01/01/2000 16:15:00    2.0592
24SCS050            01/01/2000 16:30:00    2.0592
24SCS050            01/01/2000 16:45:00    2.0592
24SCS050            01/01/2000 17:00:00    2.1528
24SCS050            01/01/2000 17:15:00    2.1528
24SCS050            01/01/2000 17:30:00    2.1528
24SCS050            01/01/2000 17:45:00    2.1528
24SCS050            01/01/2000 18:00:00    1.404
24SCS050            01/01/2000 18:15:00    1.404
24SCS050            01/01/2000 18:30:00    1.404
24SCS050            01/01/2000 18:45:00    1.404
24SCS050            01/01/2000 19:00:00    1.1232
24SCS050            01/01/2000 19:15:00    1.1232
24SCS050            01/01/2000 19:30:00    1.1232
24SCS050            01/01/2000 19:45:00    1.1232
24SCS050            01/01/2000 20:00:00    1.5912
24SCS050            01/01/2000 20:15:00    1.5912
24SCS050            01/01/2000 20:30:00    1.5912
24SCS050            01/01/2000 20:45:00    1.5912
24SCS050            01/01/2000 21:00:00    1.0296
24SCS050            01/01/2000 21:15:00    1.0296
24SCS050            01/01/2000 21:30:00    1.0296
24SCS050            01/01/2000 21:45:00    1.0296
24SCS050            01/01/2000 22:00:00    0.936
24SCS050            01/01/2000 22:15:00    0.936
24SCS050            01/01/2000 22:30:00    0.936
24SCS050            01/01/2000 22:45:00    0.936
24SCS050            01/01/2000 23:00:00    0.936
24SCS050            01/01/2000 23:15:00    0.936
24SCS050            01/01/2000 23:30:00    0.936
24SCS050            01/01/2000 23:45:00    0.936
24SCS050            01/02/2000 00:00:00    0

;Rainfall (mm/hr)
24SCS100            01/01/2000 00:00:00    1.548
24SCS100            01/01/2000 00:15:00    1.548
24SCS100            01/01/2000 00:30:00    1.548
24SCS100            01/01/2000 00:45:00    1.548
24SCS100            01/01/2000 01:00:00    0.7224
24SCS100            01/01/2000 01:15:00    0.7224
24SCS100            01/01/2000 01:30:00    0.7224
24SCS100            01/01/2000 01:45:00    0.7224
24SCS100            01/01/2000 02:00:00    1.3416
24SCS100            01/01/2000 02:15:00    1.3416
24SCS100            01/01/2000 02:30:00    1.3416
24SCS100            01/01/2000 02:45:00    1.3416
24SCS100            01/01/2000 03:00:00    1.3416
24SCS100            01/01/2000 03:15:00    1.3416
24SCS100            01/01/2000 03:30:00    1.3416
24SCS100            01/01/2000 03:45:00    1.3416
24SCS100            01/01/2000 04:00:00    1.7544
24SCS100            01/01/2000 04:15:00    1.7544
24SCS100            01/01/2000 04:30:00    1.7544
24SCS100            01/01/2000 04:45:00    1.7544
24SCS100            01/01/2000 05:00:00    1.548
24SCS100            01/01/2000 05:15:00    1.548
24SCS100            01/01/2000 05:30:00    1.548
24SCS100            01/01/2000 05:45:00    1.548
24SCS100            01/01/2000 06:00:00    2.064
24SCS100            01/01/2000 06:15:00    2.064
24SCS100            01/01/2000 06:30:00    2.064
24SCS100            01/01/2000 06:45:00    2.064
24SCS100            01/01/2000 07:00:00    2.064
24SCS100            01/01/2000 07:15:00    2.064
24SCS100            01/01/2000 07:30:00    2.064
24SCS100            01/01/2000 07:45:00    2.064
24SCS100            01/01/2000 08:00:00    2.7864
24SCS100            01/01/2000 08:15:00    2.7864
24SCS100            01/01/2000 08:30:00    2.7864
24SCS100            01/01/2000 08:45:00    2.7864
24SCS100            01/01/2000 09:00:00    3.3024
24SCS100            01/01/2000 09:15:00    3.3024
24SCS100            01/01/2000 09:30:00    3.7152
24SCS100            01/01/2000 09:45:00    3.7152
24SCS100            01/01/2000 10:00:00    4.7472
24SCS100            01/01/2000 10:15:00    4.7472
24SCS100            01/01/2000 10:30:00    6.3984
24SCS100            01/01/2000 10:45:00    6.3984
24SCS100            01/01/2000 11:00:00    9.9072
24SCS100            01/01/2000 11:15:00    9.9072
24SCS100            01/01/2000 11:30:00    42.9312
24SCS100            01/01/2000 11:45:00    113.9328
24SCS100            01/01/2000 12:00:00    14.8608
24SCS100            01/01/2000 12:15:00    14.8608
24SCS100            01/01/2000 12:30:00    7.6368
24SCS100            01/01/2000 12:45:00    7.6368
24SCS100            01/01/2000 13:00:00    5.5728
24SCS100            01/01/2000 13:15:00    5.5728
24SCS100            01/01/2000 13:30:00    4.3344
24SCS100            01/01/2000 13:45:00    4.3344
24SCS100            01/01/2000 14:00:00    3.3024
24SCS100            01/01/2000 14:15:00    3.3024
24SCS100            01/01/2000 14:30:00    3.3024
24SCS100            01/01/2000 14:45:00    3.3024
24SCS100            01/01/2000 15:00:00    2.8896
24SCS100            01/01/2000 15:15:00    2.8896
24SCS100            01/01/2000 15:30:00    2.8896
24SCS100            01/01/2000 15:45:00    2.8896
24SCS100            01/01/2000 16:00:00    2.2704
24SCS100            01/01/2000 16:15:00    2.2704
24SCS100            01/01/2000 16:30:00    2.2704
24SCS100            01/01/2000 16:45:00    2.2704
24SCS100            01/01/2000 17:00:00    2.3736
24SCS100            01/01/2000 17:15:00    2.3736
24SCS100            01/01/2000 17:30:00    2.3736
24SCS100            01/01/2000 17:45:00    2.3736
24SCS100            01/01/2000 18:00:00    1.548
24SCS100            01/01/2000 18:15:00    1.548
24SCS100            01/01/2000 18:30:00    1.548
24SCS100            01/01/2000 18:45:00    1.548
24SCS100            01/01/2000 19:00:00    1.2384
24SCS100            01/01/2000 19:15:00    1.2384
24SCS100            01/01/2000 19:30:00    1.2384
24SCS100            01/01/2000 19:45:00    1.2384
24SCS100            01/01/2000 20:00:00    1.7544
24SCS100            01/01/2000 20:15:00    1.7544
24SCS100            01/01/2000 20:30:00    1.7544
24SCS100            01/01/2000 20:45:00    1.7544
24SCS100            01/01/2000 21:00:00    1.1352
24SCS100            01/01/2000 21:15:00    1.1352
24SCS100            01/01/2000 21:30:00    1.1352
24SCS100            01/01/2000 21:45:00    1.1352
24SCS100            01/01/2000 22:00:00    1.032
24SCS100            01/01/2000 22:15:00    1.032
24SCS100            01/01/2000 22:30:00    1.032
24SCS100            01/01/2000 22:45:00    1.032
24SCS100            01/01/2000 23:00:00    1.032
24SCS100            01/01/2000 23:15:00    1.032
24SCS100            01/01/2000 23:30:00    1.032
24SCS100            01/01/2000 23:45:00    1.032
24SCS100            01/02/2000 00:00:00    0

;Rainfall (mm/hr)
24SCS120            01/01/2000 00:00:00    1.8576
24SCS120            01/01/2000 00:15:00    1.8576
24SCS120            01/01/2000 00:30:00    1.8576
24SCS120            01/01/2000 00:45:00    1.8576
24SCS120            01/01/2000 01:00:00    0.86688
24SCS120            01/01/2000 01:15:00    0.86688
24SCS120            01/01/2000 01:30:00    0.86688
24SCS120            01/01/2000 01:45:00    0.86688
24SCS120            01/01/2000 02:00:00    1.60992
24SCS120            01/01/2000 02:15:00    1.60992
24SCS120            01/01/2000 02:30:00    1.60992
24SCS120            01/01/2000 02:45:00    1.60992
24SCS120            01/01/2000 03:00:00    1.60992
24SCS120            01/01/2000 03:15:00    1.60992
24SCS120            01/01/2000 03:30:00    1.60992
24SCS120            01/01/2000 03:45:00    1.60992
24SCS120            01/01/2000 04:00:00    2.10528
24SCS120            01/01/2000 04:15:00    2.10528
24SCS120            01/01/2000 04:30:00    2.10528
24SCS120            01/01/2000 04:45:00    2.10528
24SCS120            01/01/2000 05:00:00    1.8576
24SCS120            01/01/2000 05:15:00    1.8576
24SCS120            01/01/2000 05:30:00    1.8576
24SCS120            01/01/2000 05:45:00    1.8576
24SCS120            01/01/2000 06:00:00    2.4768
24SCS120            01/01/2000 06:15:00    2.4768
24SCS120            01/01/2000 06:30:00    2.4768
24SCS120            01/01/2000 06:45:00    2.4768
24SCS120            01/01/2000 07:00:00    2.4768
24SCS120            01/01/2000 07:15:00    2.4768
24SCS120            01/01/2000 07:30:00    2.4768
24SCS120            01/01/2000 07:45:00    2.4768
24SCS120            01/01/2000 08:00:00    3.34368
24SCS120            01/01/2000 08:15:00    3.34368
24SCS120            01/01/2000 08:30:00    3.34368
24SCS120            01/01/2000 08:45:00    3.34368
24SCS120            01/01/2000 09:00:00    3.96288
24SCS120            01/01/2000 09:15:00    3.96288
24SCS120            01/01/2000 09:30:00    4.45824
24SCS120            01/01/2000 09:45:00    4.45824
24SCS120            01/01/2000 10:00:00    5.69664
24SCS120            01/01/2000 10:15:00    5.69664
24SCS120            01/01/2000 10:30:00    7.67808
24SCS120            01/01/2000 10:45:00    7.67808
24SCS120            01/01/2000 11:00:00    11.88864
24SCS120            01/01/2000 11:15:00    11.88864
24SCS120            01/01/2000 11:30:00    51.51744
24SCS120            01/01/2000 11:45:00    136.7193
24SCS120            01/01/2000 12:00:00    17.83296
24SCS120            01/01/2000 12:15:00    17.83296
24SCS120            01/01/2000 12:30:00    9.16416
24SCS120            01/01/2000 12:45:00    9.16416
24SCS120            01/01/2000 13:00:00    6.68736
24SCS120            01/01/2000 13:15:00    6.68736
24SCS120            01/01/2000 13:30:00    5.20128
24SCS120            01/01/2000 13:45:00    5.20128
24SCS120            01/01/2000 14:00:00    3.96288
24SCS120            01/01/2000 14:15:00    3.96288
24SCS120            01/01/2000 14:30:00    3.96288
24SCS120            01/01/2000 14:45:00    3.96288
24SCS120            01/01/2000 15:00:00    3.46752
24SCS120            01/01/2000 15:15:00    3.46752
24SCS120            01/01/2000 15:30:00    3.46752
24SCS120            01/01/2000 15:45:00    3.46752
24SCS120            01/01/2000 16:00:00    2.72448
24SCS120            01/01/2000 16:15:00    2.72448
24SCS120            01/01/2000 16:30:00    2.72448
24SCS120            01/01/2000 16:45:00    2.72448
24SCS120            01/01/2000 17:00:00    2.84832
24SCS120            01/01/2000 17:15:00    2.84832
24SCS120            01/01/2000 17:30:00    2.84832
24SCS120            01/01/2000 17:45:00    2.84832
24SCS120            01/01/2000 18:00:00    1.8576
24SCS120            01/01/2000 18:15:00    1.8576
24SCS120            01/01/2000 18:30:00    1.8576
24SCS120            01/01/2000 18:45:00    1.8576
24SCS120            01/01/2000 19:00:00    1.48608
24SCS120            01/01/2000 19:15:00    1.48608
24SCS120            01/01/2000 19:30:00    1.48608
24SCS120            01/01/2000 19:45:00    1.48608
24SCS120            01/01/2000 20:00:00    2.10528
24SCS120            01/01/2000 20:15:00    2.10528
24SCS120            01/01/2000 20:30:00    2.10528
24SCS120            01/01/2000 20:45:00    2.10528
24SCS120            01/01/2000 21:00:00    1.36224
24SCS120            01/01/2000 21:15:00    1.36224
24SCS120            01/01/2000 21:30:00    1.36224
24SCS120            01/01/2000 21:45:00    1.36224
24SCS120            01/01/2000 22:00:00    1.2384
24SCS120            01/01/2000 22:15:00    1.2384
24SCS120            01/01/2000 22:30:00    1.2384
24SCS120            01/01/2000 22:45:00    1.2384
24SCS120            01/01/2000 23:00:00    1.2384
24SCS120            01/01/2000 23:15:00    1.2384
24SCS120            01/01/2000 23:30:00    1.2384
24SCS120            01/01/2000 23:45:00    1.2384
24SCS120            01/02/2000 00:00:00    0

;Rainfall (mm/hr)
3CHI002             01/01/2000 00:00:00    2.491
3CHI002             01/01/2000 00:10:00    2.966
3CHI002             01/01/2000 00:20:00    3.696
3CHI002             01/01/2000 00:30:00    4.976
3CHI002             01/01/2000 00:40:00    7.828
3CHI002             01/01/2000 00:50:00    19.966
3CHI002             01/01/2000 01:00:00    76.805
3CHI002             01/01/2000 01:10:00    22.777
3CHI002             01/01/2000 01:20:00    11.852
3CHI002             01/01/2000 01:30:00    8.025
3CHI002             01/01/2000 01:40:00    6.096
3CHI002             01/01/2000 01:50:00    4.938
3CHI002             01/01/2000 02:00:00    4.165
3CHI002             01/01/2000 02:10:00    3.613
3CHI002             01/01/2000 02:20:00    3.197
3CHI002             01/01/2000 02:30:00    2.873
3CHI002             01/01/2000 02:40:00    2.613
3CHI002             01/01/2000 02:50:00    2.4
3CHI002             01/01/2000 03:00:00    0

;Rainfall (mm/hr)
3CHI005             01/01/2000 00:00:00    3.256
3CHI005             01/01/2000 00:10:00    3.881
3CHI005             01/01/2000 00:20:00    4.844
3CHI005             01/01/2000 00:30:00    6.532
3CHI005             01/01/2000 00:40:00    10.308
3CHI005             01/01/2000 00:50:00    26.792
3CHI005             01/01/2000 01:00:00    103.93
3CHI005             01/01/2000 01:10:00    30.286
3CHI005             01/01/2000 01:20:00    15.655
3CHI005             01/01/2000 01:30:00    10.568
3CHI005             01/01/2000 01:40:00    8.013
3CHI005             01/01/2000 01:50:00    6.482
```

```
3CHI005          01/01/2000 02:00:00   5.462
3CHI005          01/01/2000 02:10:00   4.733
3CHI005          01/01/2000 02:20:00   4.186
3CHI005          01/01/2000 02:30:00   3.76
3CHI005          01/01/2000 02:40:00   3.418
3CHI005          01/01/2000 02:50:00   3.137
3CHI005          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI010          01/01/2000 00:00:00   3.755
3CHI010          01/01/2000 00:10:00   4.478
3CHI010          01/01/2000 00:20:00   5.593
3CHI010          01/01/2000 00:30:00   7.551
3CHI010          01/01/2000 00:40:00   11.936
3CHI010          01/01/2000 00:50:00   30.856
3CHI010          01/01/2000 01:00:00   122.142
3CHI010          01/01/2000 01:10:00   35.237
3CHI010          01/01/2000 01:20:00   18.159
3CHI010          01/01/2000 01:30:00   12.238
3CHI010          01/01/2000 01:40:00   9.269
3CHI010          01/01/2000 01:50:00   7.492
3CHI010          01/01/2000 02:00:00   6.309
3CHI010          01/01/2000 02:10:00   5.465
3CHI010          01/01/2000 02:20:00   4.831
3CHI010          01/01/2000 02:30:00   4.338
3CHI010          01/01/2000 02:40:00   3.942
3CHI010          01/01/2000 02:50:00   3.617
3CHI010          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI025          01/01/2000 00:00:00   4.358
3CHI025          01/01/2000 00:10:00   5.202
3CHI025          01/01/2000 00:20:00   6.506
3CHI025          01/01/2000 00:30:00   8.801
3CHI025          01/01/2000 00:40:00   13.954
3CHI025          01/01/2000 00:50:00   36.302
3CHI025          01/01/2000 01:00:00   144.693
3CHI025          01/01/2000 01:10:00   41.479
3CHI025          01/01/2000 01:20:00   21.286
3CHI025          01/01/2000 01:30:00   14.308
3CHI025          01/01/2000 01:40:00   10.818
3CHI025          01/01/2000 01:50:00   8.732
3CHI025          01/01/2000 02:00:00   7.345
3CHI025          01/01/2000 02:10:00   6.356
3CHI025          01/01/2000 02:20:00   5.615
3CHI025          01/01/2000 02:30:00   5.038
3CHI025          01/01/2000 02:40:00   4.576
3CHI025          01/01/2000 02:50:00   4.197
3CHI025          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI050          01/01/2000 00:00:00   4.828
3CHI050          01/01/2000 00:10:00   5.766
3CHI050          01/01/2000 00:20:00   7.214
3CHI050          01/01/2000 00:30:00   9.763
3CHI050          01/01/2000 00:40:00   15.496
3CHI050          01/01/2000 00:50:00   40.401
3CHI050          01/01/2000 01:00:00   161.471
3CHI050          01/01/2000 01:10:00   46.17
3CHI050          01/01/2000 01:20:00   23.66
3CHI050          01/01/2000 01:30:00   15.89
3CHI050          01/01/2000 01:40:00   12.006
3CHI050          01/01/2000 01:50:00   9.687
3CHI050          01/01/2000 02:00:00   8.146
3CHI050          01/01/2000 02:10:00   7.047
3CHI050          01/01/2000 02:20:00   6.224
3CHI050          01/01/2000 02:30:00   5.583
3CHI050          01/01/2000 02:40:00   5.07
3CHI050          01/01/2000 02:50:00   4.649
3CHI050          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI100          01/01/2000 00:00:00   5.339
3CHI100          01/01/2000 00:10:00   6.376
3CHI100          01/01/2000 00:20:00   7.977
3CHI100          01/01/2000 00:30:00   10.797
3CHI100          01/01/2000 00:40:00   17.136
3CHI100          01/01/2000 00:50:00   45.128
3CHI100          01/01/2000 01:00:00   178.107
3CHI100          01/01/2000 01:10:00   51.056
3CHI100          01/01/2000 01:20:00   26.163
3CHI100          01/01/2000 01:30:00   17.571
3CHI100          01/01/2000 01:40:00   13.277
3CHI100          01/01/2000 01:50:00   10.712
3CHI100          01/01/2000 02:00:00   9.008
3CHI100          01/01/2000 02:10:00   7.793
3CHI100          01/01/2000 02:20:00   6.883
3CHI100          01/01/2000 02:30:00   6.174
3CHI100          01/01/2000 02:40:00   5.607
3CHI100          01/01/2000 02:50:00   5.142
3CHI100          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI120          01/01/2000 00:00:00   6.406801
3CHI120          01/01/2000 00:10:00   7.6512
3CHI120          01/01/2000 00:20:00   9.572401
3CHI120          01/01/2000 00:30:00   12.9564
3CHI120          01/01/2000 00:40:00   20.5632
3CHI120          01/01/2000 00:50:00   54.1536
3CHI120          01/01/2000 01:00:00   213.7284
3CHI120          01/01/2000 01:10:00   61.2672
3CHI120          01/01/2000 01:20:00   31.3956
3CHI120          01/01/2000 01:30:00   21.0852
3CHI120          01/01/2000 01:40:00   15.9324
3CHI120          01/01/2000 01:50:00   12.8544
3CHI120          01/01/2000 02:00:00   10.8096
3CHI120          01/01/2000 02:10:00   9.351601
3CHI120          01/01/2000 02:20:00   8.259601
3CHI120          01/01/2000 02:30:00   7.4088
3CHI120          01/01/2000 02:40:00   6.7284
3CHI120          01/01/2000 02:50:00   6.170401
3CHI120          01/01/2000 03:00:00   0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   S1               Business_Park
Subcatch   S10              Existing
Subcatch   S11              Commercial
Subcatch   S12              Residential
Subcatch   S14              Commercial
Subcatch   S15              SWM_Block
Subcatch   S17              SWM_Block
Subcatch   S18              Commercial
Subcatch   S19              Residential
Subcatch   S2               Existing
Subcatch   S2_1             Existing
Subcatch   S21              Business_Park
Subcatch   S22              Residential
Subcatch   S23              Residential
Subcatch   S3               Existing
Subcatch   S4_2             Existing
Subcatch   S4_3             Existing
Subcatch   S5               Existing
Subcatch   S6               Existing
Subcatch   S7               SWM_Block
Subcatch   S8               SWM_Block
Subcatch   S9               Existing
Node       St_SU1           On-Site_Storage
Node       STM-1            Storm_Manhole
Node       STM-10           Storm_Manhole
Node       STM-12           Storm_Manhole
Node       STM-13           Storm_Manhole
Node       STM-14           Storm_Manhole
Node       STM-15           Storm_Manhole
Node       STM-16           Storm_Manhole
Node       STM-2            Storm_Manhole
Node       STM-2A           Storm_Manhole
Node       STM-3            Storm_Manhole
Node       STM-4            Storm_Manhole
Node       STM-5            Storm_Manhole
Node       STM-6            Storm_Manhole
Node       STM-7            Storm_Manhole
Node       STM-8            Storm_Manhole
Node       STM-9            Storm_Manhole
Node       STMH-1           Storm_Manhole
Node       STMH-3           Storm_Manhole
Node       SWMF-1           SWM_Facility
Node       SWMF-2           SWM_Facility
Node       SWMF-3           SWM_Facility
Node       SWMF-4           SWM_Facility
Link       C1               Storm_Sewer
Link       C10              Storm_Sewer
Link       C11              Storm_Sewer
Link       C12              Storm_Sewer
Link       C13              Storm_Sewer
Link       C14              Storm_Sewer
Link       C15              Storm_Sewer
Link       C2               Storm_Sewer
Link       C3               Ditch
Link       C3_1             Storm_Sewer
Link       C3_2             Storm_Sewer
Link       C4               Storm_Sewer
Link       C5               Storm_Sewer
Link       C6               Storm_Sewer
Link       C7               Storm_Sewer
Link       C8               Storm_Sewer
Link       C9               Storm_Sewer

[MAP]
DIMENSIONS       474269.92365     5039753.75065    476642.45535     5042358.49235
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

......
Too many subcatchment entities (22 in total).

;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 22
  Number of nodes ........... 38
  Number of links ........... 34
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                       Data      Recording
  Name                 Data Source                     Type      Interval
  ------------------------------------------------------------------------
  Rainfall             24SCS100                        INTENSITY   15 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage
Outlet
  -------------------------------------------------------------------------
---------------------------
  S1                         3.49    784.30     92.86    2.0000 Rainfall
ST_SU2
  S10                      218.39   1690.00      0.30    1.5500 Rainfall
J2
  S11                       19.02   4278.69     92.86    2.0000 Rainfall
St_SU3
  S12                        1.19    267.62     64.30    2.0000 Rainfall
St_SU9
  S14                        2.43    547.85     92.86    2.0000 Rainfall
St_SU6
  S15                        0.50    112.59     28.57    3.0000 Rainfall
SWMF-3
  S17                        0.22     49.39     28.57    3.0000 Rainfall
SWMF-4
  S18                        4.63   1042.15     92.86    2.0000 Rainfall
St_SU7
  S19                        1.53    343.57     78.57    2.0000 Rainfall
St_SU4
  S2                         0.12    132.49      1.55    4.9800 Rainfall
OF4
  S2_1                       3.39    132.49      1.55    4.9800 Rainfall
STM-7
  S21                        6.90   1552.95     92.86    2.0000 Rainfall
St_SU1
  S22                        2.11    475.85     78.57    2.0000 Rainfall
St_SU5
  S23                        2.84    638.47     64.30    2.0000 Rainfall
St_SU8
  S3                         0.76    190.34      7.39    7.6200 Rainfall
OF1
  S4_2                       8.44    325.22      0.00    9.7050 Rainfall
STM-15
  S4_3                       0.29     11.18      0.00    9.7050 Rainfall
OF2
  S5                         1.27    137.91      2.51    8.6900 Rainfall
STM-14
  S6                        23.09    368.32      0.67    5.7800 Rainfall
OF5
  S7                         0.75    169.13     28.57    3.0000 Rainfall
SWMF-1
  S8                         0.61    136.62     28.57    3.0000 Rainfall
SWMF-2
  S9                         4.32    217.02     20.44    5.4400 Rainfall
STM-13


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow
  -------------------------------------------------------------------------------
  J2                   JUNCTION             45.52      4.50       0.0
  OF1                  OUTFALL              43.92      1.00       0.0
  OF2                  OUTFALL              53.62      0.00       0.0
  OF3                  OUTFALL              53.60      0.00       0.0
  OF4                  OUTFALL              50.65      0.00       0.0
  OF5                  OUTFALL              50.62      0.00       0.0
  OF6                  OUTFALL              51.35      0.00       0.0
  St_SU1               STORAGE              52.80      0.50       0.0
  ST_SU2               STORAGE              52.98      0.50       0.0
  St_SU3               STORAGE              54.02      0.50       0.0
  St_SU4               STORAGE              52.83      0.50       0.0
  St_SU5               STORAGE              54.43      0.50       0.0
  St_SU6               STORAGE              55.48      0.50       0.0
  St_SU7               STORAGE              59.50      0.50       0.0
  St_SU8               STORAGE              59.00      0.50       0.0
  St_SU9               STORAGE              58.00      0.50       0.0
  STM-1                STORAGE              52.62      3.30       0.0
  STM-10               STORAGE              52.49      3.50       0.0
  STM-12               STORAGE              52.73      2.83       0.0
  STM-13               STORAGE              53.23      3.08       0.0
  STM-14               STORAGE              53.83      3.69       0.0
  STM-15               STORAGE              54.44      4.13       0.0
  STM-16               STORAGE              54.87      4.31       0.0
  STM-2                STORAGE              48.41      3.92       0.0
  STM-2A               STORAGE              49.22      4.08       0.0
  STM-3                STORAGE              53.99      2.44       0.0
  STM-4                STORAGE              50.22      3.27       0.0
  STM-5                STORAGE              49.40      3.93       0.0
  STM-6                STORAGE              49.82      2.73       0.0
  STM-7                STORAGE              50.82      3.70       0.0
  STM-8                STORAGE              51.79      3.14       0.0
  STM-9                STORAGE              52.10      2.89       0.0
  STMH-1               STORAGE              48.37      4.05       0.0
  STMH-3               STORAGE              50.00      2.92       0.0
  SWMF-1               STORAGE              48.26      1.50       0.0
  SWMF-2               STORAGE              49.24      1.50       0.0
  SWMF-3               STORAGE              51.50      1.50       0.0
  SWMF-4               STORAGE              54.50      1.50       0.0


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length
%Slope Roughness
  -------------------------------------------------------------------------
--------------
  C1               STMH-1           SWMF-1           CONDUIT           31.8
0.3490    0.0130
  C10              STMH-10          STM-9            CONDUIT          112.4
0.3496    0.0130
  C11              STM-14           STM-13           CONDUIT          128.0
0.3501    0.0130
  C12              STM-15           STM-14           CONDUIT          176.4
0.3503    0.0130
  C13              STM-13           STM-12           CONDUIT           99.4
0.3502    0.0130
  C14              STM-12           STM-9            CONDUIT          180.7
0.3497    0.0130
  C15              STM-16           STM-15           CONDUIT          120.9
0.3500    0.0130
  C2               STM-2            STMH-1           CONDUIT           13.1
0.3502    0.0130
  C3               J2               OF1              CONDUIT           35.0
4.5697    0.0350
  C3_1             STMH-3           STM-2A           CONDUIT          188.7
0.3498    0.0130
  C3_2             STM-2A           STM-2            CONDUIT          188.7
0.3502    0.0130
  C4               STM-4            STMH-3           CONDUIT            9.4
0.3527    0.0130
  C5               STM-5            SWMF-2           CONDUIT           45.8
0.3494    0.0130
  C6               STM-6            STM-5            CONDUIT          120.3
0.3500    0.0130
  C7               STM-7            STM-6            CONDUIT          243.6
0.3501    0.0130
  C8               STM-8            SWMF-3           CONDUIT           82.5
0.3505    0.0130
  C9               STM-9            STM-8            CONDUIT           88.1
0.3497    0.0130
  OR1              SWMF-1           J2               ORIFICE
  OR2              SWMF-2           J2               ORIFICE
  OR3              SWMF-3           OF6              ORIFICE
  OR4              SWMF-4           OF3              ORIFICE
  W3               St_SU4           SWMF-2           WEIR
  W5               St_SU5           SWMF-3           WEIR
  W6               St_SU8           SWMF-4           WEIR
  W7               St_SU9           SWMF-4           WEIR
  OL1              St_SU1           STM-2A           OUTLET
  OL2              ST_SU2           STM-4            OUTLET
  OL3              St_SU3           STM-7            OUTLET
  OL4              St_SU4           STM-5            OUTLET
  OL5              St_SU5           STM-8            OUTLET
  OL6              St_SU6           STM-10           OUTLET
  OL7              St_SU7           STM-13           OUTLET
  OL8              St_SU8           STM-15           OUTLET
  OL9              St_SU9           STM-16           OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of
Full
  Conduit          Shape               Depth     Area     Rad.    Width  Barrels
Flow
  ---------------------------------------------------------------------------------
--------
  C1               CIRCULAR             1.20     1.13     0.30     1.20        1
2.30
  C10              CIRCULAR             0.75     0.44     0.19     0.75        1
0.66
  C11              CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C12              CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C13              CIRCULAR             1.20     1.13     0.30     1.20        1
2.31
  C14              CIRCULAR             1.35     1.43     0.34     1.35        1
3.16
  C15              CIRCULAR             0.75     0.44     0.19     0.75        1
0.66
  C2               CIRCULAR             1.20     1.13     0.30     1.20        1
2.31
  C3               TRAPEZOIDAL          1.00     6.00     0.64     9.00        1
27.32
  C3_1             CIRCULAR             0.90     0.64     0.23     0.90        1
1.07
  C3_2             CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C4               CIRCULAR             0.75     0.44     0.19     0.75        1
0.66
  C5               CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C6               CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C7               CIRCULAR             1.35     1.43     0.34     1.35        1
3.16
  C8               CIRCULAR             1.35     1.43     0.34     1.35        1
3.16
  C9               CIRCULAR             1.35     1.43     0.34     1.35        1
3.16


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/2000 00:00:00
  Ending Date .............. 01/02/2000 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 1.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......        31.610       103.200
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........        25.638        83.704
  Surface Runoff ...........         5.921        19.330
  Final Storage ............         0.076         0.248
  Continuity Error (%) .....        -0.079


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         5.919        59.192
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         3.959        39.587
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         1.951        19.512
  Continuity Error (%) .....         0.158


  *************************
  Highest Continuity Errors
  *************************
  Node STM-2A (1.95%)
  Node STM-4 (1.65%)
  Node STM-10 (1.60%)
  Node STM-7 (1.39%)
  Node STM-13 (1.27%)


  ***************************
  Time-Step Critical Elements
  ***************************
```

```
  None


  ********************************
  Highest Flow Instability Indexes
  ********************************
  Link OL3 (79)
  Link OL1 (77)
  Link OL9 (74)
  Link OL8 (73)
  Link OL5 (72)


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.10 sec
  Average Time Step           :     1.00 sec
  Maximum Time Step           :     1.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
     1.000 -  0.871 sec       :    99.54 %
     0.871 -  0.758 sec       :     0.11 %
     0.758 -  0.660 sec       :     0.06 %
     0.660 -  0.574 sec       :     0.05 %
     0.574 -  0.500 sec       :     0.24 %


  ***************************
  Subcatchment Runoff Summary
  ***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	103.20	0.00	0.00	13.36	94.49	12.94	88.54	3.09	1.09	0.858
S10	103.20	0.00	0.00	97.35	0.30	5.56	5.86	12.79	2.31	0.057
S11	103.20	0.00	0.00	13.36	94.49	12.94	88.54	16.84	5.97	0.858
S12	103.20	0.00	0.00	34.26	65.42	15.87	68.21	0.81	0.35	0.661
S14	103.20	0.00	0.00	13.36	94.49	12.94	88.54	2.16	0.76	0.858
S15	103.20	0.00	0.00	70.55	29.04	32.53	32.53	0.16	0.12	0.315
S17	103.20	0.00	0.00	70.55	29.04	32.53	32.53	0.07	0.05	0.315
S18	103.20	0.00	0.00	13.36	94.49	12.94	88.54	4.10	1.45	0.858
S19	103.20	0.00	0.00	24.29	79.96	13.95	77.92	1.19	0.47	0.755
S2	103.20	0.00	0.00	74.16	1.57	28.10	29.67	0.04	0.03	0.287
S2_1	103.20	0.00	0.00	83.57	1.57	18.13	19.70	0.67	0.27	0.191
S21	103.20	0.00	0.00	13.36	94.49	12.94	88.54	6.11	2.17	0.858
S22	103.20	0.00	0.00	24.29	79.96	13.95	77.92	1.65	0.65	0.755
S23	103.20	0.00	0.00	34.26	65.42	15.87	68.21	1.94	0.84	0.661
S3	103.20	0.00	0.00	71.09	7.52	24.89	32.40	0.25	0.19	0.314
S4_2	103.20	0.00	0.00	83.21	0.00	20.12	20.12	1.70	0.80	0.195
S4_3	103.20	0.00	0.00	83.21	0.00	20.12	20.12	0.06	0.03	0.195
S5	103.20	0.00	0.00	76.88	2.55	23.99	26.54	0.34	0.24	0.257
S6	103.20	0.00	0.00	89.40	0.68	13.15	13.84	3.19	0.88	0.134
S7	103.20	0.00	0.00	70.55	29.04	32.53	32.53	0.24	0.19	0.315
S8	103.20	0.00	0.00	70.55	29.04	32.53	32.53	0.20	0.15	0.315
S9	103.20	0.00	0.00	65.37	20.80	16.85	37.64	1.63	0.66	0.365

```
  ******************
  Node Depth Summary
  ******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
J2	JUNCTION	0.06	0.28	45.80	0	12:00	0.28
OF1	OUTFALL	0.06	0.28	44.20	0	12:00	0.28
OF2	OUTFALL	0.00	0.00	53.62	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	53.60	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	50.65	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	50.62	0	00:00	0.00
OF6	OUTFALL	0.00	0.00	51.35	0	00:00	0.00
St_SU1	STORAGE	0.00	0.17	52.97	0	12:01	0.17
ST_SU2	STORAGE	0.00	0.26	53.24	0	12:01	0.26
St_SU3	STORAGE	0.00	0.20	54.23	0	12:01	0.20
St_SU4	STORAGE	0.00	0.33	53.15	0	12:00	0.33
St_SU5	STORAGE	0.00	0.31	54.74	0	12:00	0.31
St_SU6	STORAGE	0.00	0.26	55.75	0	12:01	0.26
St_SU7	STORAGE	0.00	0.26	59.76	0	12:01	0.26
St_SU8	STORAGE	0.00	0.36	59.36	0	12:00	0.36
St_SU9	STORAGE	0.00	0.29	58.29	0	12:00	0.29
STM-1	STORAGE	0.00	0.00	52.62	0	00:00	0.00
STM-10	STORAGE	0.10	1.66	54.15	0	12:07	1.65
STM-12	STORAGE	0.13	1.52	54.25	0	12:07	1.52
STM-13	STORAGE	0.14	1.57	54.79	0	12:06	1.57
STM-14	STORAGE	0.10	1.49	55.32	0	12:05	1.49
STM-15	STORAGE	0.09	1.26	55.70	0	12:05	1.26
STM-16	STORAGE	0.33	0.88	55.74	0	12:06	0.88
STM-2	STORAGE	0.72	1.41	49.82	0	12:07	1.40
STM-2A	STORAGE	0.33	2.46	51.69	0	12:07	2.45
STM-3	STORAGE	0.00	0.00	53.99	0	00:00	0.00
STM-4	STORAGE	0.10	2.02	52.23	0	12:07	1.93
STM-5	STORAGE	0.74	1.60	51.00	0	12:07	1.59
STM-6	STORAGE	0.52	1.89	51.71	0	12:07	1.88
STM-7	STORAGE	0.20	2.93	53.76	0	12:07	2.93
STM-8	STORAGE	0.19	1.57	53.36	0	12:08	1.57
STM-9	STORAGE	0.16	1.63	53.73	0	12:07	1.62
STMH-1	STORAGE	0.74	1.39	49.75	0	15:09	1.39
STMH-3	STORAGE	0.13	2.09	52.09	0	12:07	2.08
SWMF-1	STORAGE	0.79	1.50	49.75	0	15:12	1.50
SWMF-2	STORAGE	0.79	1.49	50.73	0	16:02	1.49
SWMF-3	STORAGE	0.17	1.47	52.97	0	12:18	1.47
SWMF-4	STORAGE	0.01	1.02	55.51	0	12:03	1.01

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  *******************
  Node Inflow Summary
  *******************
```

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J2	JUNCTION	2.310	2.452	0	12:00	12.8	21.7	0.016
OF1	OUTFALL	0.192	2.640	0	12:00	0.248	21.9	0.000
OF2	OUTFALL	0.028	0.028	0	12:00	0.0584	0.0584	0.000
OF3	OUTFALL	0.000	0.235	0	12:03	0	0.26	0.000
OF4	OUTFALL	0.034	0.034	0	12:00	0.0361	0.0361	0.000
OF5	OUTFALL	0.880	0.880	0	12:00	3.19	3.19	0.000
OF6	OUTFALL	0.000	1.608	0	12:18	0	14.1	0.000
St_SU1	STORAGE	2.166	2.166	0	12:00	6.11	6.11	-0.278
ST_SU2	STORAGE	1.094	1.094	0	12:00	3.09	3.09	-1.621
St_SU3	STORAGE	5.968	5.968	0	12:00	16.8	16.8	-0.263
St_SU4	STORAGE	0.469	0.469	0	12:00	1.19	1.19	0.223
St_SU5	STORAGE	0.649	0.649	0	12:00	1.65	1.65	0.221
St_SU6	STORAGE	0.764	0.764	0	12:00	2.15	2.15	-1.563
St_SU7	STORAGE	1.454	1.454	0	12:00	4.1	4.1	-1.625
St_SU8	STORAGE	0.835	0.835	0	12:00	1.93	1.93	0.394
St_SU9	STORAGE	0.350	0.350	0	12:00	0.811	0.811	0.012
STM-1	STORAGE	0.000	0.000	0	00:00	0	0	0.000 ltr
STM-10	STORAGE	0.000	0.599	0	11:49	0	2.19	1.623
STM-12	STORAGE	0.000	3.111	0	12:00	0	10.3	-0.005
STM-13	STORAGE	0.661	3.155	0	12:00	1.63	10.4	1.281
STM-14	STORAGE	0.236	1.561	0	12:10	0.337	4.59	-1.172
STM-15	STORAGE	0.804	1.422	0	12:00	1.7	4.24	-0.263
STM-16	STORAGE	0.000	0.184	0	12:00	0	0.743	0.852
STM-2	STORAGE	0.000	2.522	0	12:05	0	9.02	0.148
STM-2A	STORAGE	0.000	2.550	0	12:04	0	9.2	1.984
STM-3	STORAGE	0.000	0.000	0	00:00	0	0	0.000 ltr
STM-4	STORAGE	0.000	0.865	0	12:01	0	3.14	1.678
STM-5	STORAGE	0.000	5.192	0	12:01	0	18.4	0.652
STM-6	STORAGE	0.000	4.934	0	12:01	0	17.3	-0.095
STM-7	STORAGE	0.266	4.954	0	12:00	0.667	17.5	1.411
STM-8	STORAGE	0.000	3.861	0	12:04	0	14	0.016
STM-9	STORAGE	0.000	3.511	0	11:58	0	12.5	0.031
STMH-1	STORAGE	0.000	2.506	0	12:04	0	9.01	0.295
STMH-3	STORAGE	0.000	0.864	0	12:02	0	3.08	0.277
SWMF-1	STORAGE	0.187	2.649	0	12:02	0.245	9.22	0.211
SWMF-2	STORAGE	0.151	5.498	0	12:00	0.198	18.6	0.212
SWMF-3	STORAGE	0.124	4.086	0	12:01	0.163	14.3	-0.015
SWMF-4	STORAGE	0.055	0.553	0	12:00	0.0714	0.26	0.001

```
  **********************
  Node Surcharge Summary
  **********************

  No nodes were surcharged.

  *********************
  Node Flooding Summary
  *********************

  No nodes were flooded.

  **********************
```

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
St_SU1	0.002	0.2	0.0	0.0	0.259	34.5	0 12:01	1.704
St_SU2	0.001	0.4	0.0	0.0	0.129	51.5	0 12:01	0.865
St_SU3	0.005	0.3	0.0	0.0	0.714	40.8	0 12:01	4.688
St_SU4	0.001	0.7	0.0	0.0	0.072	65.0	0 12:00	0.465
St_SU5	0.001	0.6	0.0	0.0	0.094	62.0	0 12:00	0.646
St_SU6	0.001	0.4	0.0	0.0	0.092	52.9	0 12:01	0.599
St_SU7	0.001	0.4	0.0	0.0	0.172	51.9	0 12:01	1.147
St_SU8	0.002	0.8	0.0	0.0	0.171	72.2	0 12:00	0.775
St_SU9	0.001	0.7	0.0	0.0	0.045	58.6	0 12:00	0.348
STM-1	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.000
STM-10	0.000	2.8	0.0	0.0	0.002	47.4	0 12:07	0.597
STM-12	0.000	4.8	0.0	0.0	0.002	53.6	0 12:07	2.936
STM-13	0.000	4.6	0.0	0.0	0.002	50.9	0 12:06	3.111
STM-14	0.000	2.7	0.0	0.0	0.002	40.4	0 12:05	1.686
STM-15	0.000	2.2	0.0	0.0	0.001	30.5	0 12:05	1.456
STM-16	0.000	7.8	0.0	0.0	0.001	20.3	0 12:06	0.275
STM-2	0.001	18.3	0.0	0.0	0.002	36.0	0 12:07	2.506
STM-2A	0.000	8.1	0.0	0.0	0.003	60.4	0 12:07	2.522
STM-3	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.000
STM-4	0.000	3.2	0.0	0.0	0.002	61.7	0 12:07	0.864
STM-5	0.001	18.9	0.0	0.0	0.002	40.6	0 12:07	5.172
STM-6	0.001	19.2	0.0	0.0	0.002	69.3	0 12:07	4.917
STM-7	0.000	5.4	0.0	0.0	0.003	79.3	0 12:07	4.934
STM-8	0.000	6.1	0.0	0.0	0.002	50.0	0 12:08	3.849
STM-9	0.000	5.6	0.0	0.0	0.002	56.5	0 12:07	3.485
STMH-1	0.001	18.3	0.0	0.0	0.002	34.2	0 15:09	2.502
STMH-3	0.000	4.5	0.0	0.0	0.002	71.6	0 12:07	0.910
SWMF-1	3.549	51.9	0.0	0.0	6.824	99.7	0 15:12	0.064
SWMF-2	7.399	51.9	0.0	0.0	14.172	99.3	0 16:02	0.119
SWMF-3	0.519	10.4	0.0	0.0	4.839	97.4	0 12:18	1.608
SWMF-4	0.001	0.6	0.0	0.0	0.127	52.0	0 12:03	0.235

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	95.74	0.269	2.640	21.944
OF2	8.63	0.008	0.028	0.058
OF3	11.79	0.027	0.235	0.260
OF4	12.56	0.003	0.034	0.036
OF5	95.78	0.040	0.880	3.195
OF6	93.81	0.176	1.608	14.094
System	53.05	0.524	5.007	39.587

Link Flow Summary

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.502	0 12:04	2.63	1.09	1.00
C10	CONDUIT	0.597	0 12:05	1.35	0.91	1.00
C11	CONDUIT	1.686	0 12:08	2.02	1.04	1.00
C12	CONDUIT	1.456	0 12:10	1.80	0.90	1.00
C13	CONDUIT	3.111	0 12:00	2.84	1.35	1.00
C14	CONDUIT	2.936	0 11:59	2.20	0.93	1.00
C15	CONDUIT	0.275	0 12:09	1.23	0.42	0.88
C2	CONDUIT	2.506	0 12:04	2.26	1.09	1.00
C3	CONDUIT	2.451	0 12:00	2.27	0.09	0.28
C3_1	CONDUIT	0.848	0 12:05	1.33	0.79	1.00
C3_2	CONDUIT	2.522	0 12:05	2.91	1.56	1.00
C4	CONDUIT	0.864	0 12:02	2.30	1.31	1.00
C5	CONDUIT	5.172	0 12:01	4.01	1.24	0.94
C6	CONDUIT	4.917	0 12:01	2.82	1.18	1.00
C7	CONDUIT	4.934	0 12:01	3.45	1.56	1.00
C8	CONDUIT	3.849	0 12:04	3.42	1.22	1.00
C9	CONDUIT	3.485	0 12:04	2.44	1.10	1.00
OR1	ORIFICE	0.064	0 15:12			1.00
OR2	ORIFICE	0.119	0 16:02			1.00
OR3	ORIFICE	1.608	0 12:18			1.00
OR4	ORIFICE	0.235	0 12:03			1.00
W3	WEIR	0.189	0 12:00			0.30
W5	WEIR	0.269	0 12:00			0.24
W6	WEIR	0.341	0 12:00			0.44
W7	WEIR	0.164	0 12:00			0.17
OL1	DUMMY	1.704	0 12:01			
OL2	DUMMY	0.865	0 12:01			
OL3	DUMMY	4.688	0 12:01			
OL4	DUMMY	0.275	0 12:00			
OL5	DUMMY	0.377	0 12:00			
OL6	DUMMY	0.599	0 11:49			
OL7	DUMMY	1.147	0 12:01			
OL8	DUMMY	0.434	0 12:00			
OL9	DUMMY	0.184	0 12:00			

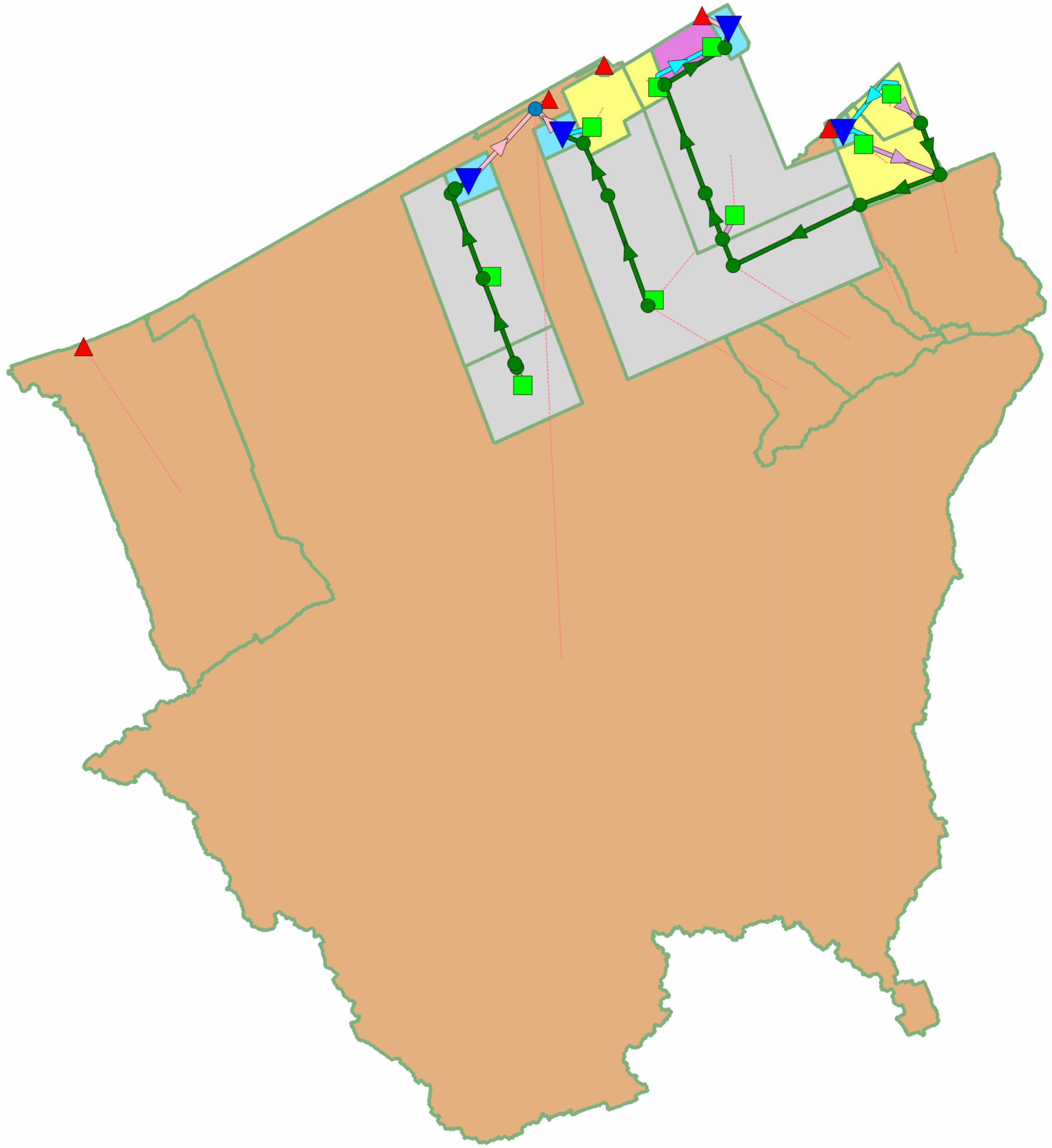
Flow Classification Summary

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class -----								
C1	1.00	0.04	0.00	0.00	0.81	0.15	0.00	0.00	0.10	0.00
C10	1.00	0.04	0.00	0.00	0.95	0.00	0.00	0.00	0.89	0.00
C11	1.00	0.04	0.00	0.00	0.03	0.00	0.00	0.93	0.00	0.00
C12	1.00	0.04	0.00	0.00	0.95	0.00	0.00	0.00	0.87	0.00
C13	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.95	0.00	0.00
C14	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.91	0.00
C15	1.00	0.05	0.00	0.00	0.02	0.00	0.00	0.92	0.01	0.00
C2	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.01	0.00
C3	1.00	0.04	0.00	0.00	0.21	0.75	0.00	0.00	0.03	0.00
C3_1	1.00	0.05	0.00	0.00	0.52	0.00	0.00	0.43	0.50	0.00
C3_2	1.00	0.04	0.00	0.00	0.51	0.00	0.00	0.45	0.00	0.00
C4	1.00	0.04	0.00	0.00	0.01	0.00	0.00	0.94	0.00	0.00
C5	1.00	0.04	0.00	0.00	0.73	0.23	0.00	0.00	0.00	0.00
C6	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.31	0.00
C7	1.00	0.04	0.00	0.00	0.51	0.00	0.00	0.45	0.49	0.00
C8	1.00	0.04	0.00	0.00	0.22	0.74	0.00	0.00	0.06	0.00
C9	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.89	0.00

Conduit Surcharge Summary

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	11.86	11.97	11.88	0.25	0.03
C10	0.41	0.41	0.84	0.01	0.27
C11	0.17	0.23	0.18	0.03	0.15
C12	0.13	0.13	0.23	0.01	0.01
C13	0.13	0.18	0.13	0.31	0.12
C14	0.13	0.13	0.20	0.01	0.01
C15	0.01	0.01	0.13	0.01	0.01
C2	11.29	11.34	11.97	0.25	0.13
C3_1	0.30	0.30	0.35	0.01	0.01
C3_2	0.19	0.35	11.34	0.36	0.18
C4	0.30	0.30	0.30	0.33	0.29
C5	0.01	0.09	0.01	0.31	0.01
C6	0.09	0.30	0.09	0.30	0.09
C7	0.29	0.33	0.30	0.34	0.29
C8	0.07	0.23	0.46	0.29	0.04
C9	0.19	0.20	0.23	0.22	0.15

Analysis begun on: Tue Nov 21 14:53:41 2023
Analysis ended on: Tue Nov 21 14:53:43 2023
Total elapsed time: 00:00:02



Legend

- Junctions
- Outfalls

Storages

- On-Site Storage
- Stormwater Management Facility
- Storm Manhole
- Conduits
- Overland Flow Path (Weir)

Subcatchments

- Existing Condition Land Use
- SWM block
- Business Park
- Residential
- Commercial

N

0.5 km

PROJECT:

ROCKLAND WEST SECONDARY STUDY
Rockland, ON

DRAWING:

Proposed Stormwater Management - Option 2

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

DESIGN:	ID	JLR NO.:	31097-000
DRAWN:	ID	DRAWING NO.:	FIGURE 3
CHECKED:	BP		

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/03/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              18

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Rainfall         INTENSITY 0:15     1.0      TIMESERIES 24SCS100

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    ---
%Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- ---
----- -------- ----------------
S1               Rainfall         St_SU2           3.4858   92.857   784.305  2
0
S10              Rainfall         J2               218.3856 0.296    1690
1.55     0
S11              Rainfall         St_SU3           17.4162  92.857   3918.645 2
0
S12              Rainfall         St_SU8           2.5784   64.3     580.14   2
0
S14              Rainfall         St_SU5           1.0916   92.857   245.61   2
0
S15              Rainfall         SWMF-3           0.5004   28.571   112.59   3
0
S16              Rainfall         SWMF-4           0.2592   28.571   58.32    3
0
S17              Rainfall         St_SU9           1.1894   64.3     267.618  2
0
S18              Rainfall         St_SU6           8.9681   92.857   2017.822 2
0
S19              Rainfall         St_SU7           0.6488   64.3     145.98   2
0
S2               Rainfall         OF4              0.1218   1.546    132.493
4.98     0
S2_1             Rainfall         STM-7            3.3857   1.546    132.493
4.98     0
S21              Rainfall         St_SU1           6.902    92.857   1552.95  2
0
S22              Rainfall         St_SU4           1.8199   64.3     409.478  2
0
S3               Rainfall         OF1              0.7641   7.391    190.345
7.62     0
S4_2             Rainfall         STM-14           8.4446   0        325.221
9.705    0
S4_3             Rainfall         OF2              0.290336 0        11.182
9.705    0
S5               Rainfall         STM-13           1.2699   2.511    137.91
8.69     0
S6               Rainfall         OF5              23.0913  0.671    368.322
5.78     0
S7               Rainfall         SWMF-1           0.7517   28.571   169.133  3
0
S8               Rainfall         SWMF-2           0.6072   28.571   136.62   3
0
S9               Rainfall         STM-12           4.3245   20.441   217.02
5.44     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------
- ----------
S1               0.013      0.25       1.57       4.67       0          PERVIOUS
20
S10              0.013      0.25       1.57       4.67       0          OUTLET
S11              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S12              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S14              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S15              0.013      0.25       1.57       4.67       0          PERVIOUS
100
S16              0.013      0.25       1.57       4.67       0          PERVIOUS
100
S17              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S18              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S19              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S2               0.013      0.25       1.57       4.67       0          OUTLET
S2_1             0.013      0.25       1.57       4.67       0          OUTLET
S21              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S22              0.013      0.25       1.57       4.67       0          PERVIOUS
20
S3               0.013      0.25       1.57       4.67       0          OUTLET
S4_2             0.013      0.25       1.57       4.67       0          OUTLET
S4_3             0.013      0.25       1.57       4.67       0          OUTLET
S5               0.013      0.25       1.57       4.67       0          OUTLET
S6               0.013      0.25       1.57       4.67       0          OUTLET
S7               0.013      0.25       1.57       4.67       0          PERVIOUS
100
S8               0.013      0.25       1.57       4.67       0          PERVIOUS
100
S9               0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S1               76.2       13.2       4.14       7          0
S10              76.2       13.2       4.14       7          0
S11              76.2       13.2       4.14       7          0
S12              76.2       13.2       4.14       7          0
S14              76.2       13.2       4.14       7          0
S15              76.2       13.2       4.14       7          0
S16              76.2       13.2       4.14       7          0
S17              76.2       13.2       4.14       7          0
S18              76.2       13.2       4.14       7          0
S19              76.2       13.2       4.14       7          0
S2               76.2       13.2       4.14       7          0
S2_1             76.2       13.2       4.14       7          0
S21              76.2       13.2       4.14       7          0
S22              76.2       13.2       4.14       7          0
S3               76.2       13.2       4.14       7          0
S4_2             76.2       13.2       4.14       7          0
S4_3             76.2       13.2       4.14       7          0
S5               76.2       13.2       4.14       7          0
S6               76.2       13.2       4.14       7          0
S7               76.2       13.2       4.14       7          0
S8               76.2       13.2       4.14       7          0
S9               76.2       13.2       4.14       7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J2               45.521     4.5        0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              43.921     FREE                        NO
OF2              53.617     FREE                        NO
OF4              50.646     FREE                        NO
OF5              50.624     FREE                        NO
OF6              51.352     FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
SurDepth Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ---------- ----------------------
------- -------- -------- -------- -------- --------
St_SU1           52.799   0.5        0          FUNCTIONAL 0          0
1500     0        0
ST_SU2           52.985   0.5        0          FUNCTIONAL 0          0
500      0        0
St_SU3           54.024   0.5        0          FUNCTIONAL 0          0
3500     0        0
St_SU4           52.829   0.5        0          FUNCTIONAL 0          0
220      0        0
St_SU5           56.832   0.5        0          FUNCTIONAL 0          0
155.943  0        0
St_SU6           57.242   0.5        0          FUNCTIONAL 0          0
1281.157 0        0
St_SU7           57.042   0.5        0          FUNCTIONAL 0          0
92.686   0        0
St_SU8           59       0.5        0          FUNCTIONAL 0          0
429.733  0        0
St_SU9           58.679   0.5        0          FUNCTIONAL 0          0
198.233  0        0
STM-1            52.62    3.301      0          FUNCTIONAL 0          0
1.13     0        0
STM-10           52.99    3.316      0          FUNCTIONAL 0          0
1.13     0        0
STM-11           53.348   3.471      0          FUNCTIONAL 0          0
1.13     0        0
STM-12           54.005   3.261      0          FUNCTIONAL 0          0
1.13     0        0
STM-13           55.029   2.487      0          FUNCTIONAL 0          0
1.13     0        0
STM-14           55.652   2.923      0          FUNCTIONAL 0          0
1.13     0        0
STM-15           56.05    3.129      0          FUNCTIONAL 0          0
1.13     0        0
STM-2            48.412   3.921      0          FUNCTIONAL 0          0
1.13     0        0
STM-2A           49.223   4.076      0          FUNCTIONAL 0          0
1.13     0        0
STM-3            53.987   2.437      0          FUNCTIONAL 0          0
1.13     0        0
STM-4            50.216   3.269      0          FUNCTIONAL 0          0
1.13     0        0
STM-5            49.4     3.929      0          FUNCTIONAL 0          0
1.13     0        0
STM-6            49.821   2.726      0          FUNCTIONAL 0          0
1.13     0        0
STM-7            50.824   3.7        0          FUNCTIONAL 0          0
1.13     0        0
STM-8            51.636   2.737      0          FUNCTIONAL 0          0
1.13     0        0
STM-9            52.148   2.953      0          FUNCTIONAL 0          0
1.13     0        0
STMH-1           48.366   4.055      0          FUNCTIONAL 0          0
1.13     0        0
STMH-3           50.003   2.921      0          FUNCTIONAL 0          0
1.13     0        0
SWMF-1           48.255   1.5        0          PYRAMIDAL  63         63         3
0        0
SWMF-2           49.24    1.5        0          PYRAMIDAL  89         89         3
0        0
SWMF-3           51.5     1.5        0          PYRAMIDAL  56         56         3
0        0
SWMF-4           57.433   1.5        0          PYRAMIDAL  4          4          3
0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- --------
-- ---------- ---------- ----------
C1               STMH-1           SWMF-1           31.803     0.013      48.366
48.255     0          0
C10              STM-10           STM-9            240.64     0.013      52.99
52.148     0          0
C11              STM-11           STM-10           102.421    0.013      53.348
52.99      0          0
C12              STM-12           STM-11           59.208     0.013      54.005
53.798     0          0
C13              STM-13           STM-12           292.5      0.013      55.029
54.005     0          0
C14              STM-14           STM-13           178.106    0.013      55.652
55.029     0          0
C15              STM-15           STM-14           113.827    0.013      56.35
55.952     0          0
C2               STM-2            STMH-1           13.136     0.013      48.412
48.366     0          0
C3               J2               OF1              35.05      0.035      45.521
43.921     0          0
C3_1             STMH-3           STM-2A           188.688    0.013      50.033
49.373     0          0
C3_2             STM-2A           STM-2            188.741    0.013      49.223
48.562     0          0
C4               STM-4            STMH-3           9.357      0.013      50.216
50.183     0          0
C5               STM-5            SWMF-2           45.799     0.013      49.4
49.24      0          0
C6               STM-6            STM-5            120.279    0.013      49.821
49.4       0          0
C7               STM-7            STM-6            243.631    0.013      50.824
49.971     0          0
C8               STM-8            SWMF-3           38.75      0.013      51.636
51.5       0          0
C9               STM-9            STM-8            146.187    0.013      52.148
51.636     0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff
Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ------
---- -------- ----------
OR1              SWMF-1           J2               SIDE         48.255     0.6
NO       0
```

```
OR2             SWMF-2          J2              SIDE        49.24      0.6
NO      0
OR3             SWMF-3          OF6             SIDE        51.5       0.6
NO      0
OR5             SWMF-4          OF2             SIDE        57.433     0.6
NO      0

[WEIRS]
;;Name          From Node       To Node         Type         CrestHt    Qcoeff
Gated    EndCon  EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ---------- ------
---- -------- -------- ---------- ---------- ---------- ---------- -------------
--
W1              St_SU7          St_SU5          TRANSVERSE   57.292     1.84
NO      0        0          NO
W3              St_SU4          SWMF-2          TRANSVERSE   53.079     1.84
NO      0        0          NO
W6              St_SU8          SWMF-4          TRANSVERSE   59.25      1.84
NO      0        0          NO
W7              St_SU9          SWMF-4          TRANSVERSE   58.929     1.84
NO      0        0          NO

[OUTLETS]
;;Name          From Node       To Node         Offset     Type
QTable/Qcoeff   Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------- --
-------------- ---------- --------
OL1             St_SU1          STM-2A          52.799     TABULAR/HEAD
OL1                        NO
OL2             ST_SU2          STM-4           52.985     TABULAR/HEAD
OL2                        NO
OL3             St_SU3          STM-7           54.024     TABULAR/HEAD
OL3                        NO
OL4             St_SU4          STM-5           52.829     TABULAR/HEAD
OL4                        NO
OL5             St_SU5          STM-8           56.832     TABULAR/HEAD
OL5                        NO
OL6             St_SU6          STM-11          57.242     TABULAR/HEAD
OL6                        NO
OL7             St_SU7          STM-9           57.042     TABULAR/DEPTH
OL7                        NO
OL8             St_SU8          STM-14          59         TABULAR/DEPTH
OL8                        NO
OL9             St_SU9          STM-15          58.679     TABULAR/DEPTH
OL9                        NO

[XSECTIONS]
;;Link          Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- -
--------- ----------
C1              CIRCULAR     1.2              0          0          0          1
C10             CIRCULAR     1.5              0          0          0          1
C11             CIRCULAR     1.5              0          0          0          1
C12             CIRCULAR     1.05             0          0          0          1
C13             CIRCULAR     1.05             0          0          0          1
C14             CIRCULAR     1.05             0          0          0          1
C15             CIRCULAR     0.75             0          0          0          1
C2              CIRCULAR     1.2              0          0          0          1
C3              TRAPEZOIDAL  1                3          3          3          1
C3_1            CIRCULAR     0.9              0          0          0          1
C3_2            CIRCULAR     1.05             0          0          0          1
C4              CIRCULAR     0.75             0          0          0          1
C5              CIRCULAR     1.5              0          0          0          1
C6              CIRCULAR     1.5              0          0          0          1
C7              CIRCULAR     1.35             0          0          0          1
C8              CIRCULAR     1.5              0          0          0          1
C9              CIRCULAR     1.5              0          0          0          1
OR1             CIRCULAR     0.165            0          0          0
OR2             CIRCULAR     0.22             0          0          0
OR3             RECT_CLOSED  0.525            1.05       0          0
OR5             CIRCULAR     0.31             0          0          0
W1              RECT_OPEN    0.25             10         0          0
W3              RECT_OPEN    0.25             5          0          0
W6              RECT_OPEN    0.3              10         0          0
W7              RECT_OPEN    0.25             10         0          0

[LOSSES]
;;Link          Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
C1              0          0.5        0          NO         0
C10             0          1.064      0          NO         0
C11             0          0.02       0          NO         0
C12             0          0.032      0          NO         0
C13             0          1.319      0          NO         0
C14             0          0.032      0          NO         0
C15             0          1.319      0          NO         0
C2              0          0.21       0          NO         0
C3_2            0          0.63       0          NO         0
C4              0          0.02       0          NO         0
C5              0          0.5        0          NO         0
C6              0          0.391      0          NO         0
C7              0          0.032      0          NO         0
C8              0          0.5        0          NO         0
C9              0          0.461      0          NO         0

[CURVES]
;;Name          Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL1             Rating     0          0
OL1                        0.001      1.699
OL1                        0.35       1.709
OL1                        0.5        1.709

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL2             Rating     0          0
OL2                        0.001      0.858
OL2                        0.35       0.868
OL2                        0.5        0.868

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL3             Rating     0          0
OL3                        0.001      4.682
OL3                        0.35       4.692
OL3                        0.5        4.692

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL4             Rating     0          0
OL4                        0.001      0.275
OL4                        0.35       0.285
OL4                        0.5        0.285

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL5             Rating     0          0
OL5                        0.001      0.269
OL5                        0.35       0.279
OL5                        0.5        0.279

;Capture rate 1:5-year flow calulated using rational method and Tc of 10 min as
per Clarence Rockland Design Guidelines
OL6             Rating     0          0
OL6                        0.001      2.208
OL6                        0.35       2.218
OL6                        0.5        2.218

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL7             Rating     0          0
OL7                        0.001      0.098
OL7                        0.35       0.108
OL7                        0.5        0.108

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL8             Rating     0          0
OL8                        0.001      0.389
OL8                        0.35       0.399
OL8                        0.5        0.399

;Capture rate 1:5-year flow calulated using rational method and Tc of 15 min as
per Clarence Rockland Design Guidelines
OL9             Rating     0          0
OL9                        0.001      0.18
OL9                        0.35       0.185
OL9                        0.5        0.19

[TIMESERIES]
;;Name          Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
24SCS002        01/01/2000 00:00:00   0.72
24SCS002        01/01/2000 00:15:00   0.72
24SCS002        01/01/2000 00:30:00   0.72
24SCS002        01/01/2000 00:45:00   0.72
24SCS002        01/01/2000 01:00:00   0.336
24SCS002        01/01/2000 01:15:00   0.336
24SCS002        01/01/2000 01:30:00   0.336
24SCS002        01/01/2000 01:45:00   0.336
24SCS002        01/01/2000 02:00:00   0.624
24SCS002        01/01/2000 02:15:00   0.624
24SCS002        01/01/2000 02:30:00   0.624
24SCS002        01/01/2000 02:45:00   0.624
24SCS002        01/01/2000 03:00:00   0.624
24SCS002        01/01/2000 03:15:00   0.624
24SCS002        01/01/2000 03:30:00   0.624
24SCS002        01/01/2000 03:45:00   0.624
24SCS002        01/01/2000 04:00:00   0.816
24SCS002        01/01/2000 04:15:00   0.816
24SCS002        01/01/2000 04:30:00   0.816
24SCS002        01/01/2000 04:45:00   0.816
24SCS002        01/01/2000 05:00:00   0.72
24SCS002        01/01/2000 05:15:00   0.72
24SCS002        01/01/2000 05:30:00   0.72
24SCS002        01/01/2000 05:45:00   0.72
24SCS002        01/01/2000 06:00:00   0.96
24SCS002        01/01/2000 06:15:00   0.96
24SCS002        01/01/2000 06:30:00   0.96
24SCS002        01/01/2000 06:45:00   0.96
24SCS002        01/01/2000 07:00:00   0.96
24SCS002        01/01/2000 07:15:00   0.96
24SCS002        01/01/2000 07:30:00   0.96
24SCS002        01/01/2000 07:45:00   0.96
24SCS002        01/01/2000 08:00:00   1.296
24SCS002        01/01/2000 08:15:00   1.296
24SCS002        01/01/2000 08:30:00   1.296
24SCS002        01/01/2000 08:45:00   1.296
24SCS002        01/01/2000 09:00:00   1.536
24SCS002        01/01/2000 09:15:00   1.536
24SCS002        01/01/2000 09:30:00   1.728
24SCS002        01/01/2000 09:45:00   1.728
24SCS002        01/01/2000 10:00:00   2.208
24SCS002        01/01/2000 10:15:00   2.208
24SCS002        01/01/2000 10:30:00   2.976
24SCS002        01/01/2000 10:45:00   2.976
24SCS002        01/01/2000 11:00:00   4.608
24SCS002        01/01/2000 11:15:00   4.608
24SCS002        01/01/2000 11:30:00   19.968
24SCS002        01/01/2000 11:45:00   52.992
24SCS002        01/01/2000 12:00:00   6.912
24SCS002        01/01/2000 12:15:00   6.912
24SCS002        01/01/2000 12:30:00   3.552
24SCS002        01/01/2000 12:45:00   3.552
24SCS002        01/01/2000 13:00:00   2.592
24SCS002        01/01/2000 13:15:00   2.592
24SCS002        01/01/2000 13:30:00   2.016
24SCS002        01/01/2000 13:45:00   2.016
24SCS002        01/01/2000 14:00:00   1.536
24SCS002        01/01/2000 14:15:00   1.536
24SCS002        01/01/2000 14:30:00   1.536
24SCS002        01/01/2000 14:45:00   1.536
24SCS002        01/01/2000 15:00:00   1.344
24SCS002        01/01/2000 15:15:00   1.344
24SCS002        01/01/2000 15:30:00   1.344
24SCS002        01/01/2000 15:45:00   1.344
24SCS002        01/01/2000 16:00:00   1.056
24SCS002        01/01/2000 16:15:00   1.056
24SCS002        01/01/2000 16:30:00   1.056
24SCS002        01/01/2000 16:45:00   1.056
24SCS002        01/01/2000 17:00:00   1.104
24SCS002        01/01/2000 17:15:00   1.104
24SCS002        01/01/2000 17:30:00   1.104
24SCS002        01/01/2000 17:45:00   1.104
24SCS002        01/01/2000 18:00:00   0.72
24SCS002        01/01/2000 18:15:00   0.72
24SCS002        01/01/2000 18:30:00   0.72
24SCS002        01/01/2000 18:45:00   0.72
24SCS002        01/01/2000 19:00:00   0.576
24SCS002        01/01/2000 19:15:00   0.576
24SCS002        01/01/2000 19:30:00   0.576
24SCS002        01/01/2000 19:45:00   0.576
24SCS002        01/01/2000 20:00:00   0.816
24SCS002        01/01/2000 20:15:00   0.816
24SCS002        01/01/2000 20:30:00   0.816
24SCS002        01/01/2000 20:45:00   0.816
24SCS002        01/01/2000 21:00:00   0.528
24SCS002        01/01/2000 21:15:00   0.528
24SCS002        01/01/2000 21:30:00   0.528
24SCS002        01/01/2000 21:45:00   0.528
24SCS002        01/01/2000 22:00:00   0.48
24SCS002        01/01/2000 22:15:00   0.48
24SCS002        01/01/2000 22:30:00   0.48
24SCS002        01/01/2000 22:45:00   0.48
24SCS002        01/01/2000 23:00:00   0.48
24SCS002        01/01/2000 23:15:00   0.48
24SCS002        01/01/2000 23:30:00   0.48
24SCS002        01/01/2000 23:45:00   0.48
24SCS002        01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS005        01/01/2000 00:00:00   0.936
24SCS005        01/01/2000 00:15:00   0.936
24SCS005        01/01/2000 00:30:00   0.936
24SCS005        01/01/2000 00:45:00   0.936
24SCS005        01/01/2000 01:00:00   0.4368
24SCS005        01/01/2000 01:15:00   0.4368
24SCS005        01/01/2000 01:30:00   0.4368
24SCS005        01/01/2000 01:45:00   0.4368
24SCS005        01/01/2000 02:00:00   0.8112
24SCS005        01/01/2000 02:15:00   0.8112
24SCS005        01/01/2000 02:30:00   0.8112
24SCS005        01/01/2000 02:45:00   0.8112
24SCS005        01/01/2000 03:00:00   0.8112
24SCS005        01/01/2000 03:15:00   0.8112
24SCS005        01/01/2000 03:30:00   0.8112
24SCS005        01/01/2000 03:45:00   0.8112
24SCS005        01/01/2000 04:00:00   1.0608
24SCS005        01/01/2000 04:15:00   1.0608
24SCS005        01/01/2000 04:30:00   1.0608
24SCS005        01/01/2000 04:45:00   1.0608
24SCS005        01/01/2000 05:00:00   0.936
24SCS005        01/01/2000 05:15:00   0.936
24SCS005        01/01/2000 05:30:00   0.936
24SCS005        01/01/2000 05:45:00   0.936
24SCS005        01/01/2000 06:00:00   1.248
24SCS005        01/01/2000 06:15:00   1.248
24SCS005        01/01/2000 06:30:00   1.248
24SCS005        01/01/2000 06:45:00   1.248
24SCS005        01/01/2000 07:00:00   1.248
24SCS005        01/01/2000 07:15:00   1.248
24SCS005        01/01/2000 07:30:00   1.248
24SCS005        01/01/2000 07:45:00   1.248
```

```
24SCS005         01/01/2000 08:00:00   1.6848
24SCS005         01/01/2000 08:15:00   1.6848
24SCS005         01/01/2000 08:30:00   1.6848
24SCS005         01/01/2000 08:45:00   1.6848
24SCS005         01/01/2000 09:00:00   1.9968
24SCS005         01/01/2000 09:15:00   1.9968
24SCS005         01/01/2000 09:30:00   2.2464
24SCS005         01/01/2000 09:45:00   2.2464
24SCS005         01/01/2000 10:00:00   2.8704
24SCS005         01/01/2000 10:15:00   2.8704
24SCS005         01/01/2000 10:30:00   3.8688
24SCS005         01/01/2000 10:45:00   3.8688
24SCS005         01/01/2000 11:00:00   5.9904
24SCS005         01/01/2000 11:15:00   5.9904
24SCS005         01/01/2000 11:30:00   25.9584
24SCS005         01/01/2000 11:45:00   68.8896
24SCS005         01/01/2000 12:00:00   8.9856
24SCS005         01/01/2000 12:15:00   8.9856
24SCS005         01/01/2000 12:30:00   4.6176
24SCS005         01/01/2000 12:45:00   4.6176
24SCS005         01/01/2000 13:00:00   3.3696
24SCS005         01/01/2000 13:15:00   3.3696
24SCS005         01/01/2000 13:30:00   2.6208
24SCS005         01/01/2000 13:45:00   2.6208
24SCS005         01/01/2000 14:00:00   1.9968
24SCS005         01/01/2000 14:15:00   1.9968
24SCS005         01/01/2000 14:30:00   1.9968
24SCS005         01/01/2000 14:45:00   1.9968
24SCS005         01/01/2000 15:00:00   1.7472
24SCS005         01/01/2000 15:15:00   1.7472
24SCS005         01/01/2000 15:30:00   1.7472
24SCS005         01/01/2000 15:45:00   1.7472
24SCS005         01/01/2000 16:00:00   1.3728
24SCS005         01/01/2000 16:15:00   1.3728
24SCS005         01/01/2000 16:30:00   1.3728
24SCS005         01/01/2000 16:45:00   1.3728
24SCS005         01/01/2000 17:00:00   1.4352
24SCS005         01/01/2000 17:15:00   1.4352
24SCS005         01/01/2000 17:30:00   1.4352
24SCS005         01/01/2000 17:45:00   1.4352
24SCS005         01/01/2000 18:00:00   0.936
24SCS005         01/01/2000 18:15:00   0.936
24SCS005         01/01/2000 18:30:00   0.936
24SCS005         01/01/2000 18:45:00   0.936
24SCS005         01/01/2000 19:00:00   0.7488
24SCS005         01/01/2000 19:15:00   0.7488
24SCS005         01/01/2000 19:30:00   0.7488
24SCS005         01/01/2000 19:45:00   0.7488
24SCS005         01/01/2000 20:00:00   1.0608
24SCS005         01/01/2000 20:15:00   1.0608
24SCS005         01/01/2000 20:30:00   1.0608
24SCS005         01/01/2000 20:45:00   1.0608
24SCS005         01/01/2000 21:00:00   0.6864
24SCS005         01/01/2000 21:15:00   0.6864
24SCS005         01/01/2000 21:30:00   0.6864
24SCS005         01/01/2000 21:45:00   0.6864
24SCS005         01/01/2000 22:00:00   0.624
24SCS005         01/01/2000 22:15:00   0.624
24SCS005         01/01/2000 22:30:00   0.624
24SCS005         01/01/2000 22:45:00   0.624
24SCS005         01/01/2000 23:00:00   0.624
24SCS005         01/01/2000 23:15:00   0.624
24SCS005         01/01/2000 23:30:00   0.624
24SCS005         01/01/2000 23:45:00   0.624
24SCS005         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS010         01/01/2000 00:00:00   1.08
24SCS010         01/01/2000 00:15:00   1.08
24SCS010         01/01/2000 00:30:00   1.08
24SCS010         01/01/2000 00:45:00   1.08
24SCS010         01/01/2000 01:00:00   0.504
24SCS010         01/01/2000 01:15:00   0.504
24SCS010         01/01/2000 01:30:00   0.504
24SCS010         01/01/2000 01:45:00   0.504
24SCS010         01/01/2000 02:00:00   0.936
24SCS010         01/01/2000 02:15:00   0.936
24SCS010         01/01/2000 02:30:00   0.936
24SCS010         01/01/2000 02:45:00   0.936
24SCS010         01/01/2000 03:00:00   0.936
24SCS010         01/01/2000 03:15:00   0.936
24SCS010         01/01/2000 03:30:00   0.936
24SCS010         01/01/2000 03:45:00   0.936
24SCS010         01/01/2000 04:00:00   1.224
24SCS010         01/01/2000 04:15:00   1.224
24SCS010         01/01/2000 04:30:00   1.224
24SCS010         01/01/2000 04:45:00   1.224
24SCS010         01/01/2000 05:00:00   1.08
24SCS010         01/01/2000 05:15:00   1.08
24SCS010         01/01/2000 05:30:00   1.08
24SCS010         01/01/2000 05:45:00   1.08
24SCS010         01/01/2000 06:00:00   1.44
24SCS010         01/01/2000 06:15:00   1.44
24SCS010         01/01/2000 06:30:00   1.44
24SCS010         01/01/2000 06:45:00   1.44
24SCS010         01/01/2000 07:00:00   1.44
24SCS010         01/01/2000 07:15:00   1.44
24SCS010         01/01/2000 07:30:00   1.44
24SCS010         01/01/2000 07:45:00   1.44
24SCS010         01/01/2000 08:00:00   1.944
24SCS010         01/01/2000 08:15:00   1.944
24SCS010         01/01/2000 08:30:00   1.944
24SCS010         01/01/2000 08:45:00   1.944
24SCS010         01/01/2000 09:00:00   2.304
24SCS010         01/01/2000 09:15:00   2.304
24SCS010         01/01/2000 09:30:00   2.592
24SCS010         01/01/2000 09:45:00   2.592
24SCS010         01/01/2000 10:00:00   3.312
24SCS010         01/01/2000 10:15:00   3.312
24SCS010         01/01/2000 10:30:00   4.464
24SCS010         01/01/2000 10:45:00   4.464
24SCS010         01/01/2000 11:00:00   6.912
24SCS010         01/01/2000 11:15:00   6.912
24SCS010         01/01/2000 11:30:00   29.952
24SCS010         01/01/2000 11:45:00   79.488
24SCS010         01/01/2000 12:00:00   10.368
24SCS010         01/01/2000 12:15:00   10.368
24SCS010         01/01/2000 12:30:00   5.328
24SCS010         01/01/2000 12:45:00   5.328
24SCS010         01/01/2000 13:00:00   3.888
24SCS010         01/01/2000 13:15:00   3.888
24SCS010         01/01/2000 13:30:00   3.024
24SCS010         01/01/2000 13:45:00   3.024
24SCS010         01/01/2000 14:00:00   2.304
24SCS010         01/01/2000 14:15:00   2.304
24SCS010         01/01/2000 14:30:00   2.304
24SCS010         01/01/2000 14:45:00   2.304
24SCS010         01/01/2000 15:00:00   2.016
24SCS010         01/01/2000 15:15:00   2.016
24SCS010         01/01/2000 15:30:00   2.016
24SCS010         01/01/2000 15:45:00   2.016
24SCS010         01/01/2000 16:00:00   1.584
24SCS010         01/01/2000 16:15:00   1.584
24SCS010         01/01/2000 16:30:00   1.584
24SCS010         01/01/2000 16:45:00   1.584
24SCS010         01/01/2000 17:00:00   1.656
24SCS010         01/01/2000 17:15:00   1.656
24SCS010         01/01/2000 17:30:00   1.656
24SCS010         01/01/2000 17:45:00   1.656
24SCS010         01/01/2000 18:00:00   1.08
24SCS010         01/01/2000 18:15:00   1.08
24SCS010         01/01/2000 18:30:00   1.08
24SCS010         01/01/2000 18:45:00   1.08
24SCS010         01/01/2000 19:00:00   0.864
24SCS010         01/01/2000 19:15:00   0.864
24SCS010         01/01/2000 19:30:00   0.864
24SCS010         01/01/2000 19:45:00   0.864
24SCS010         01/01/2000 20:00:00   1.224
24SCS010         01/01/2000 20:15:00   1.224
24SCS010         01/01/2000 20:30:00   1.224
24SCS010         01/01/2000 20:45:00   1.224
24SCS010         01/01/2000 21:00:00   0.792
24SCS010         01/01/2000 21:15:00   0.792
24SCS010         01/01/2000 21:30:00   0.792
24SCS010         01/01/2000 21:45:00   0.792
24SCS010         01/01/2000 22:00:00   0.72
24SCS010         01/01/2000 22:15:00   0.72
24SCS010         01/01/2000 22:30:00   0.72
24SCS010         01/01/2000 22:45:00   0.72
24SCS010         01/01/2000 23:00:00   0.72
24SCS010         01/01/2000 23:15:00   0.72
24SCS010         01/01/2000 23:30:00   0.72
24SCS010         01/01/2000 23:45:00   0.72
24SCS010         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS025         01/01/2000 00:00:00   1.26
24SCS025         01/01/2000 00:15:00   1.26
24SCS025         01/01/2000 00:30:00   1.26
24SCS025         01/01/2000 00:45:00   1.26
24SCS025         01/01/2000 01:00:00   0.588
24SCS025         01/01/2000 01:15:00   0.588
24SCS025         01/01/2000 01:30:00   0.588
24SCS025         01/01/2000 01:45:00   0.588
24SCS025         01/01/2000 02:00:00   1.092
24SCS025         01/01/2000 02:15:00   1.092
24SCS025         01/01/2000 02:30:00   1.092
24SCS025         01/01/2000 02:45:00   1.092
24SCS025         01/01/2000 03:00:00   1.092
24SCS025         01/01/2000 03:15:00   1.092
24SCS025         01/01/2000 03:30:00   1.092
24SCS025         01/01/2000 03:45:00   1.092
24SCS025         01/01/2000 04:00:00   1.428
24SCS025         01/01/2000 04:15:00   1.428
24SCS025         01/01/2000 04:30:00   1.428
24SCS025         01/01/2000 04:45:00   1.428
24SCS025         01/01/2000 05:00:00   1.26
24SCS025         01/01/2000 05:15:00   1.26
24SCS025         01/01/2000 05:30:00   1.26
24SCS025         01/01/2000 05:45:00   1.26
24SCS025         01/01/2000 06:00:00   1.68
24SCS025         01/01/2000 06:15:00   1.68
24SCS025         01/01/2000 06:30:00   1.68
24SCS025         01/01/2000 06:45:00   1.68
24SCS025         01/01/2000 07:00:00   1.68
24SCS025         01/01/2000 07:15:00   1.68
24SCS025         01/01/2000 07:30:00   1.68
24SCS025         01/01/2000 07:45:00   1.68
24SCS025         01/01/2000 08:00:00   2.268
24SCS025         01/01/2000 08:15:00   2.268
24SCS025         01/01/2000 08:30:00   2.268
24SCS025         01/01/2000 08:45:00   2.268
24SCS025         01/01/2000 09:00:00   2.688
24SCS025         01/01/2000 09:15:00   2.688
24SCS025         01/01/2000 09:30:00   3.024
24SCS025         01/01/2000 09:45:00   3.024
24SCS025         01/01/2000 10:00:00   3.864
24SCS025         01/01/2000 10:15:00   3.864
24SCS025         01/01/2000 10:30:00   5.208
24SCS025         01/01/2000 10:45:00   5.208
24SCS025         01/01/2000 11:00:00   8.064
24SCS025         01/01/2000 11:15:00   8.064
24SCS025         01/01/2000 11:30:00   34.944
24SCS025         01/01/2000 11:45:00   92.736
24SCS025         01/01/2000 12:00:00   12.096
24SCS025         01/01/2000 12:15:00   12.096
24SCS025         01/01/2000 12:30:00   6.216
24SCS025         01/01/2000 12:45:00   6.216
24SCS025         01/01/2000 13:00:00   4.536
24SCS025         01/01/2000 13:15:00   4.536
24SCS025         01/01/2000 13:30:00   3.528
24SCS025         01/01/2000 13:45:00   3.528
24SCS025         01/01/2000 14:00:00   2.688
24SCS025         01/01/2000 14:15:00   2.688
24SCS025         01/01/2000 14:30:00   2.688
24SCS025         01/01/2000 14:45:00   2.688
24SCS025         01/01/2000 15:00:00   2.352
24SCS025         01/01/2000 15:15:00   2.352
24SCS025         01/01/2000 15:30:00   2.352
24SCS025         01/01/2000 15:45:00   2.352
24SCS025         01/01/2000 16:00:00   1.848
24SCS025         01/01/2000 16:15:00   1.848
24SCS025         01/01/2000 16:30:00   1.848
24SCS025         01/01/2000 16:45:00   1.848
24SCS025         01/01/2000 17:00:00   1.932
24SCS025         01/01/2000 17:15:00   1.932
24SCS025         01/01/2000 17:30:00   1.932
24SCS025         01/01/2000 17:45:00   1.932
24SCS025         01/01/2000 18:00:00   1.26
24SCS025         01/01/2000 18:15:00   1.26
24SCS025         01/01/2000 18:30:00   1.26
24SCS025         01/01/2000 18:45:00   1.26
24SCS025         01/01/2000 19:00:00   1.008
24SCS025         01/01/2000 19:15:00   1.008
24SCS025         01/01/2000 19:30:00   1.008
24SCS025         01/01/2000 19:45:00   1.008
24SCS025         01/01/2000 20:00:00   1.428
24SCS025         01/01/2000 20:15:00   1.428
24SCS025         01/01/2000 20:30:00   1.428
24SCS025         01/01/2000 20:45:00   1.428
24SCS025         01/01/2000 21:00:00   0.924
24SCS025         01/01/2000 21:15:00   0.924
24SCS025         01/01/2000 21:30:00   0.924
24SCS025         01/01/2000 21:45:00   0.924
24SCS025         01/01/2000 22:00:00   0.84
24SCS025         01/01/2000 22:15:00   0.84
24SCS025         01/01/2000 22:30:00   0.84
24SCS025         01/01/2000 22:45:00   0.84
24SCS025         01/01/2000 23:00:00   0.84
24SCS025         01/01/2000 23:15:00   0.84
24SCS025         01/01/2000 23:30:00   0.84
24SCS025         01/01/2000 23:45:00   0.84
24SCS025         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS050         01/01/2000 00:00:00   1.404
24SCS050         01/01/2000 00:15:00   1.404
24SCS050         01/01/2000 00:30:00   1.404
24SCS050         01/01/2000 00:45:00   1.404
24SCS050         01/01/2000 01:00:00   0.6552
24SCS050         01/01/2000 01:15:00   0.6552
24SCS050         01/01/2000 01:30:00   0.6552
24SCS050         01/01/2000 01:45:00   0.6552
24SCS050         01/01/2000 02:00:00   1.2168
24SCS050         01/01/2000 02:15:00   1.2168
24SCS050         01/01/2000 02:30:00   1.2168
24SCS050         01/01/2000 02:45:00   1.2168
24SCS050         01/01/2000 03:00:00   1.2168
24SCS050         01/01/2000 03:15:00   1.2168
24SCS050         01/01/2000 03:30:00   1.2168
24SCS050         01/01/2000 03:45:00   1.2168
24SCS050         01/01/2000 04:00:00   1.5912
24SCS050         01/01/2000 04:15:00   1.5912
24SCS050         01/01/2000 04:30:00   1.5912
24SCS050         01/01/2000 04:45:00   1.5912
24SCS050         01/01/2000 05:00:00   1.404
24SCS050         01/01/2000 05:15:00   1.404
24SCS050         01/01/2000 05:30:00   1.404
24SCS050         01/01/2000 05:45:00   1.404
24SCS050         01/01/2000 06:00:00   1.872
24SCS050         01/01/2000 06:15:00   1.872
24SCS050         01/01/2000 06:30:00   1.872
24SCS050         01/01/2000 06:45:00   1.872
24SCS050         01/01/2000 07:00:00   1.872
24SCS050         01/01/2000 07:15:00   1.872
24SCS050         01/01/2000 07:30:00   1.872
24SCS050         01/01/2000 07:45:00   1.872
24SCS050         01/01/2000 08:00:00   2.5272
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```
24SCS050         01/01/2000 08:15:00   2.5272
24SCS050         01/01/2000 08:30:00   2.5272
24SCS050         01/01/2000 08:45:00   2.5272
24SCS050         01/01/2000 09:00:00   2.9952
24SCS050         01/01/2000 09:15:00   2.9952
24SCS050         01/01/2000 09:30:00   3.3696
24SCS050         01/01/2000 09:45:00   3.3696
24SCS050         01/01/2000 10:00:00   4.3056
24SCS050         01/01/2000 10:15:00   4.3056
24SCS050         01/01/2000 10:30:00   5.803199
24SCS050         01/01/2000 10:45:00   5.803199
24SCS050         01/01/2000 11:00:00   8.9856
24SCS050         01/01/2000 11:15:00   8.9856
24SCS050         01/01/2000 11:30:00   38.9376
24SCS050         01/01/2000 11:45:00   103.3344
24SCS050         01/01/2000 12:00:00   13.4784
24SCS050         01/01/2000 12:15:00   13.4784
24SCS050         01/01/2000 12:30:00   6.9264
24SCS050         01/01/2000 12:45:00   6.9264
24SCS050         01/01/2000 13:00:00   5.0544
24SCS050         01/01/2000 13:15:00   5.0544
24SCS050         01/01/2000 13:30:00   3.9312
24SCS050         01/01/2000 13:45:00   3.9312
24SCS050         01/01/2000 14:00:00   2.9952
24SCS050         01/01/2000 14:15:00   2.9952
24SCS050         01/01/2000 14:30:00   2.9952
24SCS050         01/01/2000 14:45:00   2.9952
24SCS050         01/01/2000 15:00:00   2.6208
24SCS050         01/01/2000 15:15:00   2.6208
24SCS050         01/01/2000 15:30:00   2.6208
24SCS050         01/01/2000 15:45:00   2.6208
24SCS050         01/01/2000 16:00:00   2.0592
24SCS050         01/01/2000 16:15:00   2.0592
24SCS050         01/01/2000 16:30:00   2.0592
24SCS050         01/01/2000 16:45:00   2.0592
24SCS050         01/01/2000 17:00:00   2.1528
24SCS050         01/01/2000 17:15:00   2.1528
24SCS050         01/01/2000 17:30:00   2.1528
24SCS050         01/01/2000 17:45:00   2.1528
24SCS050         01/01/2000 18:00:00   1.404
24SCS050         01/01/2000 18:15:00   1.404
24SCS050         01/01/2000 18:30:00   1.404
24SCS050         01/01/2000 18:45:00   1.404
24SCS050         01/01/2000 19:00:00   1.1232
24SCS050         01/01/2000 19:15:00   1.1232
24SCS050         01/01/2000 19:30:00   1.1232
24SCS050         01/01/2000 19:45:00   1.1232
24SCS050         01/01/2000 20:00:00   1.5912
24SCS050         01/01/2000 20:15:00   1.5912
24SCS050         01/01/2000 20:30:00   1.5912
24SCS050         01/01/2000 20:45:00   1.5912
24SCS050         01/01/2000 21:00:00   1.0296
24SCS050         01/01/2000 21:15:00   1.0296
24SCS050         01/01/2000 21:30:00   1.0296
24SCS050         01/01/2000 21:45:00   1.0296
24SCS050         01/01/2000 22:00:00   0.936
24SCS050         01/01/2000 22:15:00   0.936
24SCS050         01/01/2000 22:30:00   0.936
24SCS050         01/01/2000 22:45:00   0.936
24SCS050         01/01/2000 23:00:00   0.936
24SCS050         01/01/2000 23:15:00   0.936
24SCS050         01/01/2000 23:30:00   0.936
24SCS050         01/01/2000 23:45:00   0.936
24SCS050         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS100         01/01/2000 00:00:00   1.548
24SCS100         01/01/2000 00:15:00   1.548
24SCS100         01/01/2000 00:30:00   1.548
24SCS100         01/01/2000 00:45:00   1.548
24SCS100         01/01/2000 01:00:00   0.7224
24SCS100         01/01/2000 01:15:00   0.7224
24SCS100         01/01/2000 01:30:00   0.7224
24SCS100         01/01/2000 01:45:00   0.7224
24SCS100         01/01/2000 02:00:00   1.3416
24SCS100         01/01/2000 02:15:00   1.3416
24SCS100         01/01/2000 02:30:00   1.3416
24SCS100         01/01/2000 02:45:00   1.3416
24SCS100         01/01/2000 03:00:00   1.3416
24SCS100         01/01/2000 03:15:00   1.3416
24SCS100         01/01/2000 03:30:00   1.3416
24SCS100         01/01/2000 03:45:00   1.3416
24SCS100         01/01/2000 04:00:00   1.7544
24SCS100         01/01/2000 04:15:00   1.7544
24SCS100         01/01/2000 04:30:00   1.7544
24SCS100         01/01/2000 04:45:00   1.7544
24SCS100         01/01/2000 05:00:00   1.548
24SCS100         01/01/2000 05:15:00   1.548
24SCS100         01/01/2000 05:30:00   1.548
24SCS100         01/01/2000 05:45:00   1.548
24SCS100         01/01/2000 06:00:00   2.064
24SCS100         01/01/2000 06:15:00   2.064
24SCS100         01/01/2000 06:30:00   2.064
24SCS100         01/01/2000 06:45:00   2.064
24SCS100         01/01/2000 07:00:00   2.064
24SCS100         01/01/2000 07:15:00   2.064
24SCS100         01/01/2000 07:30:00   2.064
24SCS100         01/01/2000 07:45:00   2.064
24SCS100         01/01/2000 08:00:00   2.7864
24SCS100         01/01/2000 08:15:00   2.7864
24SCS100         01/01/2000 08:30:00   2.7864
24SCS100         01/01/2000 08:45:00   2.7864
24SCS100         01/01/2000 09:00:00   3.3024
24SCS100         01/01/2000 09:15:00   3.3024
24SCS100         01/01/2000 09:30:00   3.7152
24SCS100         01/01/2000 09:45:00   3.7152
24SCS100         01/01/2000 10:00:00   4.7472
24SCS100         01/01/2000 10:15:00   4.7472
24SCS100         01/01/2000 10:30:00   6.3984
24SCS100         01/01/2000 10:45:00   6.3984
24SCS100         01/01/2000 11:00:00   9.9072
24SCS100         01/01/2000 11:15:00   9.9072
24SCS100         01/01/2000 11:30:00   42.9312
24SCS100         01/01/2000 11:45:00   113.9328
24SCS100         01/01/2000 12:00:00   14.8608
24SCS100         01/01/2000 12:15:00   14.8608
24SCS100         01/01/2000 12:30:00   7.6368
24SCS100         01/01/2000 12:45:00   7.6368
24SCS100         01/01/2000 13:00:00   5.5728
24SCS100         01/01/2000 13:15:00   5.5728
24SCS100         01/01/2000 13:30:00   4.3344
24SCS100         01/01/2000 13:45:00   4.3344
24SCS100         01/01/2000 14:00:00   3.3024
24SCS100         01/01/2000 14:15:00   3.3024
24SCS100         01/01/2000 14:30:00   3.3024
24SCS100         01/01/2000 14:45:00   3.3024
24SCS100         01/01/2000 15:00:00   2.8896
24SCS100         01/01/2000 15:15:00   2.8896
24SCS100         01/01/2000 15:30:00   2.8896
24SCS100         01/01/2000 15:45:00   2.8896
24SCS100         01/01/2000 16:00:00   2.2704
24SCS100         01/01/2000 16:15:00   2.2704
24SCS100         01/01/2000 16:30:00   2.2704
24SCS100         01/01/2000 16:45:00   2.2704
24SCS100         01/01/2000 17:00:00   2.3736
24SCS100         01/01/2000 17:15:00   2.3736
24SCS100         01/01/2000 17:30:00   2.3736
24SCS100         01/01/2000 17:45:00   2.3736
24SCS100         01/01/2000 18:00:00   1.548
24SCS100         01/01/2000 18:15:00   1.548
24SCS100         01/01/2000 18:30:00   1.548
24SCS100         01/01/2000 18:45:00   1.548
24SCS100         01/01/2000 19:00:00   1.2384
24SCS100         01/01/2000 19:15:00   1.2384
24SCS100         01/01/2000 19:30:00   1.2384
24SCS100         01/01/2000 19:45:00   1.2384
24SCS100         01/01/2000 20:00:00   1.7544
24SCS100         01/01/2000 20:15:00   1.7544
24SCS100         01/01/2000 20:30:00   1.7544
24SCS100         01/01/2000 20:45:00   1.7544
24SCS100         01/01/2000 21:00:00   1.1352
24SCS100         01/01/2000 21:15:00   1.1352
24SCS100         01/01/2000 21:30:00   1.1352
24SCS100         01/01/2000 21:45:00   1.1352
24SCS100         01/01/2000 22:00:00   1.032
24SCS100         01/01/2000 22:15:00   1.032
24SCS100         01/01/2000 22:30:00   1.032
24SCS100         01/01/2000 22:45:00   1.032
24SCS100         01/01/2000 23:00:00   1.032
24SCS100         01/01/2000 23:15:00   1.032
24SCS100         01/01/2000 23:30:00   1.032
24SCS100         01/01/2000 23:45:00   1.032
24SCS100         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
24SCS120         01/01/2000 00:00:00   1.8576
24SCS120         01/01/2000 00:15:00   1.8576
24SCS120         01/01/2000 00:30:00   1.8576
24SCS120         01/01/2000 00:45:00   1.8576
24SCS120         01/01/2000 01:00:00   0.86688
24SCS120         01/01/2000 01:15:00   0.86688
24SCS120         01/01/2000 01:30:00   0.86688
24SCS120         01/01/2000 01:45:00   0.86688
24SCS120         01/01/2000 02:00:00   1.60992
24SCS120         01/01/2000 02:15:00   1.60992
24SCS120         01/01/2000 02:30:00   1.60992
24SCS120         01/01/2000 02:45:00   1.60992
24SCS120         01/01/2000 03:00:00   1.60992
24SCS120         01/01/2000 03:15:00   1.60992
24SCS120         01/01/2000 03:30:00   1.60992
24SCS120         01/01/2000 03:45:00   1.60992
24SCS120         01/01/2000 04:00:00   2.10528
24SCS120         01/01/2000 04:15:00   2.10528
24SCS120         01/01/2000 04:30:00   2.10528
24SCS120         01/01/2000 04:45:00   2.10528
24SCS120         01/01/2000 05:00:00   1.8576
24SCS120         01/01/2000 05:15:00   1.8576
24SCS120         01/01/2000 05:30:00   1.8576
24SCS120         01/01/2000 05:45:00   1.8576
24SCS120         01/01/2000 06:00:00   2.4768
24SCS120         01/01/2000 06:15:00   2.4768
24SCS120         01/01/2000 06:30:00   2.4768
24SCS120         01/01/2000 06:45:00   2.4768
24SCS120         01/01/2000 07:00:00   2.4768
24SCS120         01/01/2000 07:15:00   2.4768
24SCS120         01/01/2000 07:30:00   2.4768
24SCS120         01/01/2000 07:45:00   2.4768
24SCS120         01/01/2000 08:00:00   3.34368
24SCS120         01/01/2000 08:15:00   3.34368
24SCS120         01/01/2000 08:30:00   3.34368
24SCS120         01/01/2000 08:45:00   3.34368
24SCS120         01/01/2000 09:00:00   3.96288
24SCS120         01/01/2000 09:15:00   3.96288
24SCS120         01/01/2000 09:30:00   4.45824
24SCS120         01/01/2000 09:45:00   4.45824
24SCS120         01/01/2000 10:00:00   5.69664
24SCS120         01/01/2000 10:15:00   5.69664
24SCS120         01/01/2000 10:30:00   7.67808
24SCS120         01/01/2000 10:45:00   7.67808
24SCS120         01/01/2000 11:00:00   11.88864
24SCS120         01/01/2000 11:15:00   11.88864
24SCS120         01/01/2000 11:30:00   51.51744
24SCS120         01/01/2000 11:45:00   136.7193
24SCS120         01/01/2000 12:00:00   17.83296
24SCS120         01/01/2000 12:15:00   17.83296
24SCS120         01/01/2000 12:30:00   9.16416
24SCS120         01/01/2000 12:45:00   9.16416
24SCS120         01/01/2000 13:00:00   6.68736
24SCS120         01/01/2000 13:15:00   6.68736
24SCS120         01/01/2000 13:30:00   5.20128
24SCS120         01/01/2000 13:45:00   5.20128
24SCS120         01/01/2000 14:00:00   3.96288
24SCS120         01/01/2000 14:15:00   3.96288
24SCS120         01/01/2000 14:30:00   3.96288
24SCS120         01/01/2000 14:45:00   3.96288
24SCS120         01/01/2000 15:00:00   3.46752
24SCS120         01/01/2000 15:15:00   3.46752
24SCS120         01/01/2000 15:30:00   3.46752
24SCS120         01/01/2000 15:45:00   3.46752
24SCS120         01/01/2000 16:00:00   2.72448
24SCS120         01/01/2000 16:15:00   2.72448
24SCS120         01/01/2000 16:30:00   2.72448
24SCS120         01/01/2000 16:45:00   2.72448
24SCS120         01/01/2000 17:00:00   2.84832
24SCS120         01/01/2000 17:15:00   2.84832
24SCS120         01/01/2000 17:30:00   2.84832
24SCS120         01/01/2000 17:45:00   2.84832
24SCS120         01/01/2000 18:00:00   1.8576
24SCS120         01/01/2000 18:15:00   1.8576
24SCS120         01/01/2000 18:30:00   1.8576
24SCS120         01/01/2000 18:45:00   1.8576
24SCS120         01/01/2000 19:00:00   1.48608
24SCS120         01/01/2000 19:15:00   1.48608
24SCS120         01/01/2000 19:30:00   1.48608
24SCS120         01/01/2000 19:45:00   1.48608
24SCS120         01/01/2000 20:00:00   2.10528
24SCS120         01/01/2000 20:15:00   2.10528
24SCS120         01/01/2000 20:30:00   2.10528
24SCS120         01/01/2000 20:45:00   2.10528
24SCS120         01/01/2000 21:00:00   1.36224
24SCS120         01/01/2000 21:15:00   1.36224
24SCS120         01/01/2000 21:30:00   1.36224
24SCS120         01/01/2000 21:45:00   1.36224
24SCS120         01/01/2000 22:00:00   1.2384
24SCS120         01/01/2000 22:15:00   1.2384
24SCS120         01/01/2000 22:30:00   1.2384
24SCS120         01/01/2000 22:45:00   1.2384
24SCS120         01/01/2000 23:00:00   1.2384
24SCS120         01/01/2000 23:15:00   1.2384
24SCS120         01/01/2000 23:30:00   1.2384
24SCS120         01/01/2000 23:45:00   1.2384
24SCS120         01/02/2000 00:00:00   0

;Rainfall (mm/hr)
3CHI002          01/01/2000 00:00:00   2.491
3CHI002          01/01/2000 00:10:00   2.966
3CHI002          01/01/2000 00:20:00   3.696
3CHI002          01/01/2000 00:30:00   4.976
3CHI002          01/01/2000 00:40:00   7.828
3CHI002          01/01/2000 00:50:00   19.966
3CHI002          01/01/2000 01:00:00   76.805
3CHI002          01/01/2000 01:10:00   22.777
3CHI002          01/01/2000 01:20:00   11.852
3CHI002          01/01/2000 01:30:00   8.025
3CHI002          01/01/2000 01:40:00   6.096
3CHI002          01/01/2000 01:50:00   4.938
3CHI002          01/01/2000 02:00:00   4.165
3CHI002          01/01/2000 02:10:00   3.613
3CHI002          01/01/2000 02:20:00   3.197
3CHI002          01/01/2000 02:30:00   2.873
3CHI002          01/01/2000 02:40:00   2.613
3CHI002          01/01/2000 02:50:00   2.4
3CHI002          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI005          01/01/2000 00:00:00   3.256
3CHI005          01/01/2000 00:10:00   3.881
3CHI005          01/01/2000 00:20:00   4.844
3CHI005          01/01/2000 00:30:00   6.532
3CHI005          01/01/2000 00:40:00   10.308
3CHI005          01/01/2000 00:50:00   26.792
3CHI005          01/01/2000 01:00:00   103.93
3CHI005          01/01/2000 01:10:00   30.286
3CHI005          01/01/2000 01:20:00   15.655
3CHI005          01/01/2000 01:30:00   10.568
3CHI005          01/01/2000 01:40:00   8.013
3CHI005          01/01/2000 01:50:00   6.482
3CHI005          01/01/2000 02:00:00   5.462
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3CHI005          01/01/2000 02:10:00   4.733
3CHI005          01/01/2000 02:20:00   4.186
3CHI005          01/01/2000 02:30:00   3.76
3CHI005          01/01/2000 02:40:00   3.418
3CHI005          01/01/2000 02:50:00   3.137
3CHI005          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI010          01/01/2000 00:00:00   3.755
3CHI010          01/01/2000 00:10:00   4.478
3CHI010          01/01/2000 00:20:00   5.593
3CHI010          01/01/2000 00:30:00   7.551
3CHI010          01/01/2000 00:40:00   11.936
3CHI010          01/01/2000 00:50:00   30.856
3CHI010          01/01/2000 01:00:00   122.142
3CHI010          01/01/2000 01:10:00   35.237
3CHI010          01/01/2000 01:20:00   18.159
3CHI010          01/01/2000 01:30:00   12.238
3CHI010          01/01/2000 01:40:00   9.269
3CHI010          01/01/2000 01:50:00   7.492
3CHI010          01/01/2000 02:00:00   6.309
3CHI010          01/01/2000 02:10:00   5.465
3CHI010          01/01/2000 02:20:00   4.831
3CHI010          01/01/2000 02:30:00   4.338
3CHI010          01/01/2000 02:40:00   3.942
3CHI010          01/01/2000 02:50:00   3.617
3CHI010          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI025          01/01/2000 00:00:00   4.358
3CHI025          01/01/2000 00:10:00   5.202
3CHI025          01/01/2000 00:20:00   6.506
3CHI025          01/01/2000 00:30:00   8.801
3CHI025          01/01/2000 00:40:00   13.954
3CHI025          01/01/2000 00:50:00   36.302
3CHI025          01/01/2000 01:00:00   144.693
3CHI025          01/01/2000 01:10:00   41.479
3CHI025          01/01/2000 01:20:00   21.286
3CHI025          01/01/2000 01:30:00   14.308
3CHI025          01/01/2000 01:40:00   10.818
3CHI025          01/01/2000 01:50:00   8.732
3CHI025          01/01/2000 02:00:00   7.345
3CHI025          01/01/2000 02:10:00   6.356
3CHI025          01/01/2000 02:20:00   5.615
3CHI025          01/01/2000 02:30:00   5.038
3CHI025          01/01/2000 02:40:00   4.576
3CHI025          01/01/2000 02:50:00   4.197
3CHI025          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI050          01/01/2000 00:00:00   4.828
3CHI050          01/01/2000 00:10:00   5.766
3CHI050          01/01/2000 00:20:00   7.214
3CHI050          01/01/2000 00:30:00   9.763
3CHI050          01/01/2000 00:40:00   15.496
3CHI050          01/01/2000 00:50:00   40.401
3CHI050          01/01/2000 01:00:00   161.471
3CHI050          01/01/2000 01:10:00   46.17
3CHI050          01/01/2000 01:20:00   23.66
3CHI050          01/01/2000 01:30:00   15.89
3CHI050          01/01/2000 01:40:00   12.006
3CHI050          01/01/2000 01:50:00   9.687
3CHI050          01/01/2000 02:00:00   8.146
3CHI050          01/01/2000 02:10:00   7.047
3CHI050          01/01/2000 02:20:00   6.224
3CHI050          01/01/2000 02:30:00   5.583
3CHI050          01/01/2000 02:40:00   5.07
3CHI050          01/01/2000 02:50:00   4.649
3CHI050          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI100          01/01/2000 00:00:00   5.339
3CHI100          01/01/2000 00:10:00   6.376
3CHI100          01/01/2000 00:20:00   7.977
3CHI100          01/01/2000 00:30:00   10.797
3CHI100          01/01/2000 00:40:00   17.136
3CHI100          01/01/2000 00:50:00   45.128
3CHI100          01/01/2000 01:00:00   178.107
3CHI100          01/01/2000 01:10:00   51.056
3CHI100          01/01/2000 01:20:00   26.163
3CHI100          01/01/2000 01:30:00   17.571
3CHI100          01/01/2000 01:40:00   13.277
3CHI100          01/01/2000 01:50:00   10.712
3CHI100          01/01/2000 02:00:00   9.008
3CHI100          01/01/2000 02:10:00   7.793
3CHI100          01/01/2000 02:20:00   6.883
3CHI100          01/01/2000 02:30:00   6.174
3CHI100          01/01/2000 02:40:00   5.607
3CHI100          01/01/2000 02:50:00   5.142
3CHI100          01/01/2000 03:00:00   0

;Rainfall (mm/hr)
3CHI120          01/01/2000 00:00:00   6.406801
3CHI120          01/01/2000 00:10:00   7.6512
3CHI120          01/01/2000 00:20:00   9.572401
3CHI120          01/01/2000 00:30:00   12.9564
3CHI120          01/01/2000 00:40:00   20.5632
3CHI120          01/01/2000 00:50:00   54.1536
3CHI120          01/01/2000 01:00:00   213.7284
3CHI120          01/01/2000 01:10:00   61.2672
3CHI120          01/01/2000 01:20:00   31.3956
3CHI120          01/01/2000 01:30:00   21.0852
3CHI120          01/01/2000 01:40:00   15.9324
3CHI120          01/01/2000 01:50:00   12.8544
3CHI120          01/01/2000 02:00:00   10.8096
3CHI120          01/01/2000 02:10:00   9.351601
3CHI120          01/01/2000 02:20:00   8.259601
3CHI120          01/01/2000 02:30:00   7.4088
3CHI120          01/01/2000 02:40:00   6.7284
3CHI120          01/01/2000 02:50:00   6.170401
3CHI120          01/01/2000 03:00:00   0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   S1               Business_Park
Subcatch   S10              Existing
Subcatch   S11              Business_Park
Subcatch   S12              Residential
Subcatch   S14              Commercial
Subcatch   S15              SWM_Block
Subcatch   S16              SWM_Block
Subcatch   S17              Residential
Subcatch   S18              Business_Park
Subcatch   S19              Residential
Subcatch   S2               Existing
Subcatch   S2_1             Existing
Subcatch   S21              Business_Park
Subcatch   S22              Residential
Subcatch   S3               Existing
Subcatch   S4_2             Existing
Subcatch   S4_3             Existing
Subcatch   S5               Existing
Subcatch   S6               Existing
Subcatch   S7               SWM_Block
Subcatch   S8               SWM_Block
Subcatch   S9               Existing
Node       St_SU1           On-Site_Storage
Node       STM-1            Storm_Manhole
Node       STM-10           Storm_Manhole
Node       STM-11           Storm_Manhole
Node       STM-12           Storm_Manhole
Node       STM-13           Storm_Manhole
Node       STM-14           Storm_Manhole
Node       STM-15           Storm_Manhole
Node       STM-2            Storm_Manhole
Node       STM-2A           Storm_Manhole
Node       STM-3            Storm_Manhole
Node       STM-4            Storm_Manhole
Node       STM-5            Storm_Manhole
Node       STM-6            Storm_Manhole
Node       STM-7            Storm_Manhole
Node       STM-8            Storm_Manhole
Node       STM-9            Storm_Manhole
Node       STMH-1           Storm_Manhole
Node       STMH-3           Storm_Manhole
Node       SWMF-1           SWM_Facility
Node       SWMF-2           SWM_Facility
Node       SWMF-3           SWM_Facility
Node       SWMF-4           SWM_Facility
Link       C1               Storm_Sewer
Link       C10              Storm_Sewer
Link       C11              Storm_Sewer
Link       C12              Storm_Sewer
Link       C13              Storm_Sewer
Link       C14              Storm_Sewer
Link       C15              Storm_Sewer
Link       C2               Storm_Sewer
Link       C3               Ditch
Link       C3_1             Storm_Sewer
Link       C3_2             Storm_Sewer
Link       C4               Storm_Sewer
Link       C5               Storm_Sewer
Link       C6               Storm_Sewer
Link       C7               Storm_Sewer
Link       C8               Storm_Sewer
Link       C9               Storm_Sewer

[MAP]
DIMENSIONS       474269.92365     5039753.75065    476642.45535     5042358.49235
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 22
  Number of nodes ........... 37
  Number of links ........... 34
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                           Data       Recording
  Name                 Data Source                         Type       Interval
  ------------------------------------------------------------------------
  Rainfall             24SCS100                            INTENSITY   15 min.


  ********************
  Subcatchment Summary
  ********************
  Name                          Area     Width   %Imperv    %Slope Rain Gage
Outlet
  ----------------------------------------------------------------------------
----------------------------
  S1                            3.49    784.30     92.86    2.0000 Rainfall
ST_SU2
  S10                         218.39   1690.00      0.30    1.5500 Rainfall
J2
  S11                          17.42   3918.64     92.86    2.0000 Rainfall
St_SU3
  S12                           2.58    580.14     64.30    2.0000 Rainfall
St_SU8
  S14                           1.09    245.61     92.86    2.0000 Rainfall
St_SU5
  S15                           0.50    112.59     28.57    3.0000 Rainfall
SWMF-3
  S16                           0.26     58.32     28.57    3.0000 Rainfall
SWMF-4
  S17                           1.19    267.62     64.30    2.0000 Rainfall
St_SU9
  S18                           8.97   2017.82     92.86    2.0000 Rainfall
St_SU6
  S19                           0.65    145.98     64.30    2.0000 Rainfall
St_SU7
  S2                            0.12    132.49      1.55    4.9800 Rainfall
OF4
  S2_1                          3.39    132.49      1.55    4.9800 Rainfall
STM-7
  S21                           6.90   1552.95     92.86    2.0000 Rainfall
St_SU1
  S22                           1.82    409.48     64.30    2.0000 Rainfall
St_SU4
  S3                            0.76    190.34      7.39    7.6200 Rainfall
OF1
  S4_2                          8.44    325.22      0.00    9.7050 Rainfall
STM-14
  S4_3                          0.29     11.18      0.00    9.7050 Rainfall
OF2
  S5                            1.27    137.91      2.51    8.6900 Rainfall
STM-13
  S6                           23.09    368.32      0.67    5.7800 Rainfall
OF5
  S7                            0.75    169.13     28.57    3.0000 Rainfall
SWMF-1
  S8                            0.61    136.62     28.57    3.0000 Rainfall
SWMF-2
  S9                            4.32    217.02     20.44    5.4400 Rainfall
STM-12


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow
  ----------------------------------------------------------------------------
  J2                   JUNCTION             45.52      4.50       0.0
  OF1                  OUTFALL              43.92      1.00       0.0
  OF2                  OUTFALL              53.62      0.00       0.0
  OF4                  OUTFALL              50.65      0.00       0.0
  OF5                  OUTFALL              50.62      0.00       0.0
  OF6                  OUTFALL              51.35      0.00       0.0
  St_SU1               STORAGE              52.80      0.50       0.0
  ST_SU2               STORAGE              52.98      0.50       0.0
  St_SU3               STORAGE              54.02      0.50       0.0
  St_SU4               STORAGE              52.83      0.50       0.0
  St_SU5               STORAGE              56.83      0.50       0.0
  St_SU6               STORAGE              57.24      0.50       0.0
  St_SU7               STORAGE              57.04      0.50       0.0
  St_SU8               STORAGE              59.00      0.50       0.0
  St_SU9               STORAGE              58.68      0.50       0.0
  STM-1                STORAGE              52.62      3.30       0.0
  STM-10               STORAGE              52.99      3.32       0.0
  STM-11               STORAGE              53.35      3.47       0.0
  STM-12               STORAGE              54.00      3.26       0.0
  STM-13               STORAGE              55.03      2.49       0.0
  STM-14               STORAGE              55.65      2.92       0.0
  STM-15               STORAGE              56.05      3.13       0.0
  STM-2                STORAGE              48.41      3.92       0.0
  STM-2A               STORAGE              49.22      4.08       0.0
  STM-3                STORAGE              53.99      2.44       0.0
  STM-4                STORAGE              50.22      3.27       0.0
  STM-5                STORAGE              49.40      3.93       0.0
  STM-6                STORAGE              49.82      2.73       0.0
  STM-7                STORAGE              50.82      3.70       0.0
  STM-8                STORAGE              51.64      2.74       0.0
  STM-9                STORAGE              52.15      2.95       0.0
  STMH-1               STORAGE              48.37      4.05       0.0
  STMH-3               STORAGE              50.00      2.92       0.0
  SWMF-1               STORAGE              48.26      1.50       0.0
  SWMF-2               STORAGE              49.24      1.50       0.0
  SWMF-3               STORAGE              51.50      1.50       0.0
  SWMF-4               STORAGE              57.43      1.50       0.0


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length
%Slope Roughness
  ----------------------------------------------------------------------------
--------------
  C1               STMH-1           SWMF-1           CONDUIT           31.8
0.3490    0.0130
  C10              STM-10           STM-9            CONDUIT          240.6
0.3499    0.0130
  C11              STM-11           STM-10           CONDUIT          102.4
0.3495    0.0130
  C12              STM-12           STM-11           CONDUIT           59.2
0.3496    0.0130
  C13              STM-13           STM-12           CONDUIT          292.5
0.3501    0.0130
  C14              STM-14           STM-13           CONDUIT          178.1
0.3498    0.0130
  C15              STM-15           STM-14           CONDUIT          113.8
0.3497    0.0130
  C2               STM-2            STMH-1           CONDUIT           13.1
0.3502    0.0130
  C3               J2               OF1              CONDUIT           35.0
4.5697    0.0350
  C3_1             STMH-3           STM-2A           CONDUIT          188.7
0.3498    0.0130
  C3_2             STM-2A           STM-2            CONDUIT          188.7
0.3502    0.0130
  C4               STM-4            STMH-3           CONDUIT            9.4
0.3527    0.0130
  C5               STM-5            SWMF-2           CONDUIT           45.8
0.3494    0.0130
  C6               STM-6            STM-5            CONDUIT          120.3
0.3500    0.0130
  C7               STM-7            STM-6            CONDUIT          243.6
0.3501    0.0130
  C8               STM-8            SWMF-3           CONDUIT           38.8
0.3510    0.0130
  C9               STM-9            STM-8            CONDUIT          146.2
0.3502    0.0130
  OR1              SWMF-1           J2               ORIFICE
  OR2              SWMF-2           J2               ORIFICE
  OR3              SWMF-3           OF6              ORIFICE
  OR5              SWMF-4           OF2              ORIFICE
  W1               St_SU7           St_SU5           WEIR
  W3               St_SU4           SWMF-2           WEIR
  W6               St_SU8           SWMF-4           WEIR
  W7               St_SU9           SWMF-4           WEIR
  OL1              St_SU1           STM-2A           OUTLET
  OL2              ST_SU2           STM-4            OUTLET
  OL3              St_SU3           STM-7            OUTLET
  OL4              St_SU4           STM-5            OUTLET
  OL5              St_SU5           STM-8            OUTLET
  OL6              St_SU6           STM-11           OUTLET
  OL7              St_SU7           STM-9            OUTLET
  OL8              St_SU8           STM-14           OUTLET
  OL9              St_SU9           STM-15           OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of
Full
  Conduit          Shape               Depth     Area     Rad.    Width  Barrels
Flow
  ---------------------------------------------------------------------------
--------
  C1               CIRCULAR             1.20     1.13     0.30     1.20        1
2.30
  C10              CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C11              CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C12              CIRCULAR             1.05     0.87     0.26     1.05        1
1.61
  C13              CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C14              CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C15              CIRCULAR             0.75     0.44     0.19     0.75        1
0.66
  C2               CIRCULAR             1.20     1.13     0.30     1.20        1
2.31
  C3               TRAPEZOIDAL          1.00     6.00     0.64     9.00        1
27.32
  C3_1             CIRCULAR             0.90     0.64     0.23     0.90        1
1.07
  C3_2             CIRCULAR             1.05     0.87     0.26     1.05        1
1.62
  C4               CIRCULAR             0.75     0.44     0.19     0.75        1
0.66
  C5               CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C6               CIRCULAR             1.50     1.77     0.38     1.50        1
4.18
  C7               CIRCULAR             1.35     1.43     0.34     1.35        1
3.16
  C8               CIRCULAR             1.50     1.77     0.38     1.50        1
4.19
  C9               CIRCULAR             1.50     1.77     0.38     1.50        1
4.18


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/2000 00:00:00
  Ending Date .............. 01/03/2000 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 1.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......        31.610       103.200
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........        25.649        83.740
  Surface Runoff ...........         5.919        19.325
  Final Storage ............         0.065         0.213
  Continuity Error (%) .....        -0.076


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         5.919        59.193
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         5.308        53.080
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.603         6.033
  Continuity Error (%) .....         0.135


  *************************
  Highest Continuity Errors
  *************************
  Node St_SU5 (-1.74%)
  Node STM-4 (1.70%)
  Node STM-2A (1.54%)
  Node STM-7 (1.44%)
  Node STM-11 (1.05%)


  ***************************
  Time-Step Critical Elements
  ***************************
```

None

```
*******************************
Highest Flow Instability Indexes
*******************************
Link OL1 (39)
Link OL4 (38)
Link OL7 (37)
Link OL8 (36)
Link OL9 (36)
```

```
*********************************
Most Frequent Nonconverging Nodes
*********************************
Convergence obtained at all time steps.
```

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.00
% of Steps Not Converging   :     0.00
Time Step Frequencies       :
    1.000 -  0.871 sec      :    99.77 %
    0.871 -  0.758 sec      :     0.04 %
    0.758 -  0.660 sec      :     0.05 %
    0.660 -  0.574 sec      :     0.03 %
    0.574 -  0.500 sec      :     0.11 %
```

```
***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	103.20	0.00	0.00	13.42	94.70	12.94	88.70	3.09	1.09	0.860
S10	103.20	0.00	0.00	97.35	0.30	5.56	5.86	12.79	2.31	0.057
S11	103.20	0.00	0.00	13.42	94.70	12.94	88.70	15.45	5.47	0.860
S12	103.20	0.00	0.00	34.29	65.53	15.87	68.30	1.76	0.76	0.662
S14	103.20	0.00	0.00	13.42	94.70	12.94	88.70	0.97	0.34	0.860
S15	103.20	0.00	0.00	70.60	29.06	32.53	32.53	0.16	0.12	0.315
S16	103.20	0.00	0.00	70.60	29.06	32.53	32.53	0.08	0.06	0.315
S17	103.20	0.00	0.00	34.29	65.53	15.87	68.30	0.81	0.35	0.662
S18	103.20	0.00	0.00	13.42	94.70	12.94	88.70	7.96	2.81	0.860
S19	103.20	0.00	0.00	34.29	65.53	15.87	68.30	0.44	0.19	0.662
S2	103.20	0.00	0.00	74.16	1.57	28.10	29.67	0.04	0.03	0.287
S2_1	103.20	0.00	0.00	83.57	1.57	18.13	19.70	0.67	0.27	0.191
S21	103.20	0.00	0.00	13.42	94.70	12.94	88.70	6.12	2.17	0.860
S22	103.20	0.00	0.00	34.29	65.53	15.87	68.30	1.24	0.54	0.662
S3	103.20	0.00	0.00	71.09	7.52	24.89	32.41	0.25	0.19	0.314
S4_2	103.20	0.00	0.00	83.21	0.00	20.12	20.12	1.70	0.80	0.195
S4_3	103.20	0.00	0.00	83.21	0.00	20.12	20.12	0.06	0.03	0.195
S5	103.20	0.00	0.00	76.88	2.55	23.99	26.54	0.34	0.24	0.257
S6	103.20	0.00	0.00	89.40	0.68	13.15	13.84	3.19	0.88	0.134
S7	103.20	0.00	0.00	70.60	29.06	32.53	32.53	0.24	0.19	0.315
S8	103.20	0.00	0.00	70.60	29.06	32.53	32.53	0.20	0.15	0.315
S9	103.20	0.00	0.00	65.37	20.83	16.85	37.68	1.63	0.66	0.365

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J2	JUNCTION	0.06	0.28	45.80	0 12:00	0.28
OF1	OUTFALL	0.05	0.28	44.20	0 12:00	0.28
OF2	OUTFALL	0.00	0.00	53.62	0 00:00	0.00
OF4	OUTFALL	0.00	0.00	50.65	0 00:00	0.00
OF5	OUTFALL	0.00	0.00	50.62	0 00:00	0.00
OF6	OUTFALL	0.00	0.00	51.35	0 00:00	0.00
St_SU1	STORAGE	0.00	0.17	52.97	0 12:01	0.17
ST_SU2	STORAGE	0.00	0.26	53.24	0 12:01	0.26
St_SU3	STORAGE	0.00	0.11	54.13	0 12:01	0.11
St_SU4	STORAGE	0.00	0.34	53.17	0 12:00	0.34
St_SU5	STORAGE	0.00	0.42	57.26	0 12:02	0.42
St_SU6	STORAGE	0.00	0.26	57.50	0 12:01	0.26
St_SU7	STORAGE	0.00	0.28	57.32	0 12:00	0.28
St_SU8	STORAGE	0.00	0.32	59.32	0 12:00	0.32
St_SU9	STORAGE	0.00	0.29	58.97	0 12:00	0.29
STM-1	STORAGE	0.00	0.00	52.62	0 00:00	0.00
STM-10	STORAGE	0.08	1.63	54.62	0 12:07	1.62
STM-11	STORAGE	0.08	1.58	54.93	0 12:07	1.58
STM-12	STORAGE	0.05	1.19	55.19	0 12:02	1.18
STM-13	STORAGE	0.04	1.09	56.12	0 12:04	1.09
STM-14	STORAGE	0.04	0.74	56.39	0 12:00	0.74
STM-15	STORAGE	0.32	0.59	56.64	0 11:52	0.59
STM-2	STORAGE	0.70	1.41	49.82	0 12:07	1.39
STM-2A	STORAGE	0.19	2.46	51.68	0 12:07	2.45
STM-3	STORAGE	0.00	0.00	53.99	0 00:00	0.00
STM-4	STORAGE	0.05	2.01	52.22	0 12:07	1.92
STM-5	STORAGE	0.73	1.58	50.98	0 12:05	1.57
STM-6	STORAGE	0.41	1.87	51.69	0 12:05	1.86
STM-7	STORAGE	0.10	2.92	53.74	0 12:05	2.91
STM-8	STORAGE	0.11	1.49	53.12	0 12:08	1.48
STM-9	STORAGE	0.09	1.51	53.66	0 12:07	1.51
STMH-1	STORAGE	0.73	1.37	49.74	0 15:02	1.37
STMH-3	STORAGE	0.08	2.09	52.09	0 12:07	2.08
SWMF-1	STORAGE	0.81	1.48	49.74	0 15:04	1.48
SWMF-2	STORAGE	0.83	1.49	50.73	0 15:06	1.49
SWMF-3	STORAGE	0.10	1.48	52.98	0 12:20	1.48
SWMF-4	STORAGE	0.01	1.48	58.91	0 12:03	1.48

```
*******************
Node Inflow Summary
*******************
```

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J2	JUNCTION	2.310	2.456	0 12:00	12.8	33.7	0.007
OF1	OUTFALL	0.192	2.644	0 12:00	0.248	33.9	0.000
OF2	OUTFALL	0.028	0.256	0 12:03	0.0584	0.317	0.000
OF4	OUTFALL	0.034	0.034	0 12:00	0.0361	0.0361	0.000
OF5	OUTFALL	0.880	0.880	0 12:00	3.19	3.19	0.000
OF6	OUTFALL	0.000	1.620	0 12:20	0	15.6	0.000
St_SU1	STORAGE	2.166	2.166	0 12:00	6.12	6.12	-0.339
ST_SU2	STORAGE	1.094	1.094	0 12:00	3.09	3.09	-1.676
St_SU3	STORAGE	5.465	5.465	0 12:00	15.4	15.4	-0.385
St_SU4	STORAGE	0.536	0.536	0 12:00	1.24	1.24	-0.068
St_SU5	STORAGE	0.343	0.427	0 12:00	0.968	1	-1.711
St_SU6	STORAGE	2.814	2.814	0 12:00	7.95	7.95	-1.710
St_SU7	STORAGE	0.191	0.191	0 12:00	0.443	0.443	0.015
St_SU8	STORAGE	0.759	0.759	0 12:00	1.76	1.76	0.332
St_SU9	STORAGE	0.350	0.350	0 12:00	0.812	0.812	0.268
STM-1	STORAGE	0.000	0.000	0 00:00	0	0	0.000 ltr
STM-10	STORAGE	0.000	4.105	0 12:02	0	14	0.025
STM-11	STORAGE	0.000	4.149	0 12:00	0	14.2	1.058
STM-12	STORAGE	0.661	2.080	0 12:00	1.63	6.07	-0.204
STM-13	STORAGE	0.236	1.590	0 12:00	0.337	4.43	-0.097
STM-14	STORAGE	0.804	1.386	0 12:00	1.7	4.09	-0.258
STM-15	STORAGE	0.000	0.184	0 12:00	0	0.754	0.471
STM-2	STORAGE	0.000	2.522	0 12:05	0	9.09	-0.749
STM-2A	STORAGE	0.000	2.550	0 12:04	0	9.23	1.561
STM-3	STORAGE	0.000	0.000	0 00:00	0	0	0.000 ltr
STM-4	STORAGE	0.000	0.865	0 12:01	0	3.14	1.728
STM-5	STORAGE	0.000	5.189	0 12:00	0	17.2	0.144
STM-6	STORAGE	0.000	4.930	0 12:01	0	15.9	-0.830
STM-7	STORAGE	0.266	4.951	0 12:00	0.667	16.2	1.464
STM-8	STORAGE	0.000	4.367	0 12:03	0	15.5	0.092
STM-9	STORAGE	0.000	4.152	0 12:02	0	14.4	-0.019
STMH-1	STORAGE	0.000	2.507	0 12:04	0	9.15	0.070
STMH-3	STORAGE	0.000	0.864	0 12:02	0	3.09	0.212
SWMF-1	STORAGE	0.187	2.648	0 12:02	0.245	9.39	0.058
SWMF-2	STORAGE	0.151	5.556	0 12:00	0.198	17.5	0.066
SWMF-3	STORAGE	0.124	4.422	0 12:03	0.163	15.6	-0.003
SWMF-4	STORAGE	0.064	0.571	0 12:00	0.0843	0.258	0.002

```
*********************
Node Surcharge Summary
*********************

No nodes were surcharged.
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********************
Node Flooding Summary
********************

No nodes were flooded.
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*********************
Storage Volume Summary
*********************
```

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
St_SU1	0.001	0.1	0.0	0.0	0.259	34.5	0 12:01	1.704
ST_SU2	0.000	0.2	0.0	0.0	0.129	51.5	0 12:01	0.865
St_SU3	0.001	0.1	0.0	0.0	0.376	21.5	0 12:01	4.685
St_SU4	0.000	0.4	0.0	0.0	0.075	67.8	0 12:00	0.529
St_SU5	0.000	0.3	0.0	0.0	0.066	84.7	0 12:02	0.279
St_SU6	0.001	0.2	0.0	0.0	0.335	52.3	0 12:01	2.215
St_SU7	0.000	0.3	0.0	0.0	0.026	55.5	0 12:00	0.190
St_SU8	0.001	0.4	0.0	0.0	0.138	64.1	0 12:00	0.743
St_SU9	0.000	0.3	0.0	0.0	0.058	58.6	0 12:00	0.348
STM-1	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.000
STM-10	0.000	2.4	0.0	0.0	0.002	49.1	0 12:07	4.047
STM-11	0.000	2.3	0.0	0.0	0.002	45.6	0 12:07	4.105
STM-12	0.000	1.7	0.0	0.0	0.001	36.4	0 12:02	2.182
STM-13	0.000	1.8	0.0	0.0	0.001	43.8	0 12:04	1.512
STM-14	0.000	1.5	0.0	0.0	0.001	25.4	0 12:00	1.368
STM-15	0.000	10.1	0.0	0.0	0.001	19.0	0 11:52	0.190
STM-2	0.001	17.8	0.0	0.0	0.002	35.9	0 12:07	2.507
STM-2A	0.000	4.7	0.0	0.0	0.003	60.4	0 12:07	2.522
STM-3	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.000
STM-4	0.000	1.6	0.0	0.0	0.002	61.4	0 12:07	0.864
STM-5	0.001	18.6	0.0	0.0	0.002	40.2	0 12:05	5.165
STM-6	0.000	15.2	0.0	0.0	0.002	68.6	0 12:05	4.904
STM-7	0.000	2.6	0.0	0.0	0.003	78.9	0 12:05	4.930
STM-8	0.000	3.9	0.0	0.0	0.002	54.3	0 12:08	4.329
STM-9	0.000	2.9	0.0	0.0	0.002	51.1	0 12:07	4.088
STMH-1	0.001	18.1	0.0	0.0	0.002	33.9	0 15:02	2.503
STMH-3	0.000	2.8	0.0	0.0	0.002	71.5	0 12:07	0.907
SWMF-1	3.585	52.4	0.0	0.0	6.765	98.8	0 15:04	0.067
SWMF-2	7.123	54.3	0.0	0.0	12.988	99.0	0 15:06	0.119
SWMF-3	0.326	5.9	0.0	0.0	5.432	98.8	0 12:20	1.620
SWMF-4	0.000	0.4	0.0	0.0	0.115	97.4	0 12:03	0.231

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	97.87	0.203	2.644	33.934
OF2	4.48	0.043	0.256	0.317
OF4	6.29	0.003	0.034	0.036
OF5	48.26	0.040	0.880	3.195
OF6	96.73	0.095	1.620	15.598
System	50.72	0.383	5.001	53.079

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.503	0 12:04	2.64	1.09	1.00
C10	CONDUIT	4.047	0 12:02	2.32	0.97	1.00
C11	CONDUIT	4.105	0 12:02	2.39	0.98	1.00
C12	CONDUIT	2.182	0 12:08	2.68	1.35	1.00
C13	CONDUIT	1.512	0 12:09	1.90	0.94	1.00
C14	CONDUIT	1.368	0 12:00	1.92	0.85	0.85
C15	CONDUIT	0.190	0 11:56	1.23	0.29	0.48
C2	CONDUIT	2.507	0 12:04	2.27	1.09	1.00
C3	CONDUIT	2.456	0 12:00	2.27	0.09	0.28
C3_1	CONDUIT	0.848	0 12:05	1.33	0.79	1.00
C3_2	CONDUIT	2.522	0 12:05	2.91	1.56	1.00
C4	CONDUIT	0.864	0 12:02	2.30	1.31	1.00
C5	CONDUIT	5.165	0 12:00	3.98	1.24	0.94
C6	CONDUIT	4.904	0 12:00	2.81	1.17	1.00
C7	CONDUIT	4.930	0 12:01	3.44	1.56	1.00
C8	CONDUIT	4.329	0 12:03	3.48	1.03	0.96
C9	CONDUIT	4.088	0 12:03	2.50	0.98	1.00
OR1	ORIFICE	0.067	0 15:04			1.00
OR2	ORIFICE	0.119	0 15:06			1.00
OR3	ORIFICE	1.620	0 12:20			1.00
OR5	ORIFICE	0.231	0 12:03			1.00
W1	WEIR	0.084	0 12:00			0.11
W3	WEIR	0.245	0 12:00			0.36
W6	WEIR	0.344	0 12:00			0.24
W7	WEIR	0.163	0 12:00			0.17
OL1	DUMMY	1.704	0 12:01			
OL2	DUMMY	0.865	0 12:01			
OL3	DUMMY	4.685	0 12:01			
OL4	DUMMY	0.285	0 12:00			
OL5	DUMMY	0.279	0 11:59			
OL6	DUMMY	2.215	0 12:01			
OL7	DUMMY	0.106	0 12:00			
OL8	DUMMY	0.398	0 12:00			
OL9	DUMMY	0.184	0 12:00			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class -----								
C1	1.00	0.02	0.00	0.00	0.90	0.08	0.00	0.00	0.05	0.00
C10	1.00	0.05	0.09	0.00	0.86	0.00	0.00	0.00	0.41	0.00
C11	1.00	0.02	0.01	0.00	0.96	0.02	0.00	0.00	0.44	0.00
C12	1.00	0.02	0.00	0.00	0.01	0.00	0.00	0.97	0.00	0.00
C13	1.00	0.02	0.30	0.00	0.68	0.00	0.00	0.00	0.95	0.00
C14	1.00	0.03	0.01	0.00	0.95	0.01	0.00	0.00	0.68	0.00
C15	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
C2	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.11	0.87	0.00	0.00	0.01	0.00
C3_1	1.00	0.02	0.00	0.00	0.36	0.00	0.00	0.62	0.35	0.00
C3_2	1.00	0.02	0.01	0.00	0.74	0.00	0.00	0.23	0.33	0.00
C4	1.00	0.02	0.00	0.00	0.01	0.00	0.00	0.97	0.00	0.00
C5	1.00	0.02	0.00	0.00	0.87	0.11	0.00	0.00	0.00	0.00
C6	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.22	0.00
C7	1.00	0.02	0.02	0.00	0.57	0.00	0.00	0.38	0.65	0.00
C8	1.00	0.02	0.16	0.00	0.48	0.34	0.00	0.00	0.50	0.00
C9	1.00	0.05	0.01	0.00	0.94	0.00	0.00	0.00	0.65	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	11.88	11.98	14.61	0.25	0.03
C10	0.01	0.13	0.01	0.01	0.01
C11	0.11	0.11	0.13	0.01	0.01
C12	0.11	0.13	0.11	0.28	0.11
C13	0.08	0.08	0.13	0.01	0.01
C14	0.01	0.01	0.08	0.01	0.01
C2	10.17	10.22	11.98	0.25	0.13
C3_1	0.30	0.30	0.35	0.01	0.01
C3_2	0.18	0.35	10.22	0.36	0.18
C4	0.30	0.30	0.30	0.33	0.29
C5	0.01	0.06	0.01	0.27	0.01
C6	0.06	0.25	0.06	0.26	0.06
C7	0.24	0.28	0.25	0.30	0.24
C8	0.01	0.01	0.01	0.12	0.01
C9	0.01	0.01	0.01	0.01	0.01

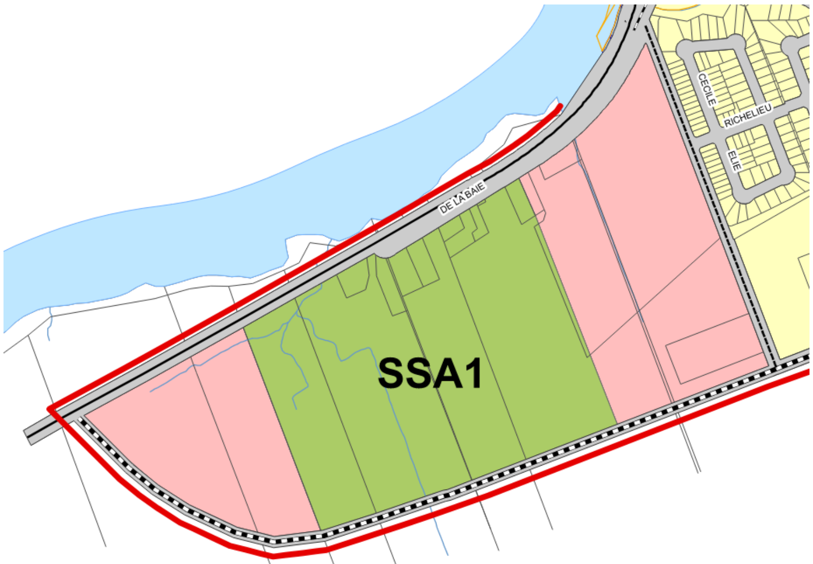
Analysis begun on: Mon Nov 27 09:33:13 2023
Analysis ended on: Mon Nov 27 09:33:18 2023
Total elapsed time: 00:00:05

Appendix L

Stakeholder Consultation

Notice of Study Commencement

Rockland West Secondary Plan



Dear resident(s),

The City is currently undergoing a Secondary Plan exercise for the “Rockland West Secondary Plan” lands of Rockland, which are located south of Highway 17, west of Poupart Road, in which your property is located. The City of Clarence-Rockland has initiated a Municipal Class Environmental Assessment (Class EA) to complete a Secondary Plan for the development of Special Study Area 1. J.L. Richards and Associates Ltd. were hired by the City to undertake such a study that will be completed at the end of 2021.

Meeting Date: Wednesday, December 22nd, 2021 from 5:00pm - 6:00 pm via Teams Meeting invite. This meeting will be used to discuss how the EA and Secondary Plan process may affect your lands. Due to the current COVID-19 Pandemic, the meeting will need to occur online. Please reply by-email to Marc Rivet or Marie-Eve Belanger for a link to the Teams Meeting Invite, by Monday, December 20th, at the the latest. Contact information for Marc and Marie-Eve is provided below.

How Will This Affect Me?

A Secondary Plan guides how Official Plan policies are put in place key areas of the City. A Secondary Plan will provide specific schedules and policies for the expansion lands where we need a detailed direction for land use, infrastructure, transportation, environment, urban design and similar matters that are required beyond the general framework by the Official Plan.

The study area comprises approximately 36 hectares of lands and is designated as Special Study Area 1. The Official Plan requires the preparation of special studies to determine the lands’ future development potential. The Secondary Plan will follow the Municipal Class EA and Planning Act process to establish a coordinated planning solution for the development of this area.

The purpose of the study is to create a long-term infrastructure plan for water, wastewater, stormwater, and transportation servicing for the development of Special Study Area 1. This process will help to identify system requirements and assist with long-term capital planning.

Public and agency consultation is a key element of the process and input will be sought throughout the study to inform the evaluation and selection of the preferred servicing strategy.

How Do I Get More Information?

A mailing list for notification of study status and opportunities for public input is being compiled. If you wish to add your contact information to the study mailing list, or if you have any questions regarding the study, please contact one of the people listed below. Project information will also be available to the public on the City's website at a later date.

Study updates and Notices will be posted on the City's website and advertised in local media throughout the process. A Public Open House is anticipated for Spring 2022.

Mark Rivet, RPP, MCIP	**Marie-Eve Belanger**
Senior Planner J.L. Richards & Associates Limited 864 Lady Ellen Place Ottawa, Ontario K1Z 5M2 Phone: 343-803-4533 Email: mrivet@jlrichards.ca	Manager of Development City of Clarence-Rockland 1560 Laurier Street Rockland, Ontario K4K 1P7 Phone: 613-446-6022 ext. 2250 Email: mbelanger@clarence-rockland.com

This study is being conducted according to the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment which is an approved process under the Environmental Assessment Act. This notice originally issued December 10th, 2021.

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

City of Clarence-Rockland Rockland West Secondary Plan

Landowners Meeting

Presented by: Marc Rivet, MCIP, RPP
Date: December 22, 2021
JLR No.: 31097-000

Secondary Plan and Class EA Integration

- What is a secondary plan
  - A Secondary Plan is an area-specific land use plan prepared as an amendment to the Official Plan
  - The proposed development of these lands will be approved by an amendment to the Official Plan prior to any development
  - The Secondary Plan will follow the Municipal Class Environmental Assessment (EA) and Planning Act process to establish a coordinated planning solution for development of this area
- How EA's fit within secondary plan framework
  - Develop a Master Servicing Plan for water, wastewater, stormwater, and transportation services needed to support developing the lands
  - Confirms both on-site and off-site servicing needs, including required upgrades to existing infrastructure potentially impacted by the new development (e.g., "upstream" or "downstream" of connection points)
  - The Master Plan will guide future infrastructure projects in the area

Anticipated Schedule & Opportunities for Input

December 2021*	April 2022	August 2022	January 2023
Stage 1 – Existing Conditions	Stage 2 – Develop Planning and Design Options	Stage 3 – Preparation of Secondary Plan	Stage 4 - Implementation

Public Consultation

1 Public Information Centre #1

2 Public Information Centre #2

3 Public Information Centre #3

* In process, currently undertaking background studies (market needs, environmental constraints)

Public Information Centres (PICs) will be held regarding preliminary alternatives (1), the evaluation process (2), and the preliminary preferred solution (3)

Types of Class EA Projects

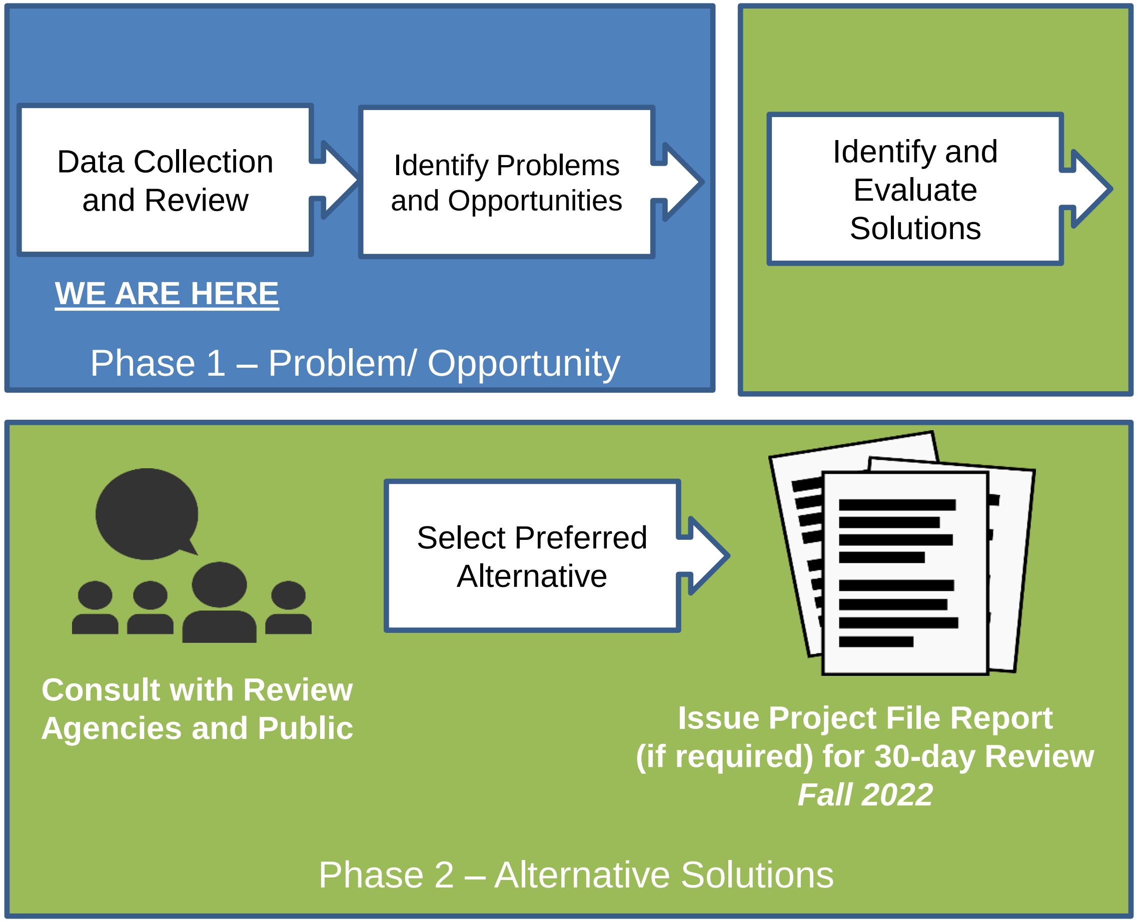
Municipal Projects can involve:

Water projects	Wastewater projects
Stormwater projects	Road and transit projects

Projects have various levels of complexity:

- **Schedule A** projects are limited in scale and are pre-approved.
  - They have minimal adverse effects and often involve normal operation and maintenance activities.
- **Schedule A+** projects are pre-approved with public notification.
- **Schedule B** projects have the potential for some adverse impacts.
  - There is mandatory contact with public and review agencies to ensure they are aware of the project and that their concerns are addressed.
  - E.g., expanding an existing sewage pumping station.
- **Schedule C** projects have the potential for significant adverse impacts.
  - There is mandatory full screening process including filing of an Environmental Study Report (ESR).
  - Generally, for construction of new facilities and major expansions.
  - E.g., constructing a new wastewater treatment plant.

Municipal Class EA Process Overview



- Under the Environmental Assessment Act, municipalities <u>must</u> consider potential environmental effects before a potential infrastructure project begins.
- The streamlined MEA Class EA process allows municipalities to consider impacts without having to obtain project-specific approval under the Environmental Assessment Act.
- This study is being conducted in accordance with **Phases 1 and 2** of the MEA Class EA process to fulfill the requirements for **<u>Schedule B</u>** projects

For more information on the Class Environmental Assessment Process visit the Government of Ontario website (https://www.ontario.ca/page/class-environmental-assessments-approved-class-ea-information).

Planning Framework

- Current Context
  - The Official Plan currently designates the lands **Special Study Area** (SSA1)
  - A **Secondary Plan** is required to permit development (land use mix undetermined)
  - To implement the Secondary Plan, an **Official Plan Amendment** (OPA) will be required, in accordance with Planning Act Requirements

- Drafting Secondary Plan
  - **Background research** required to determine the appropriate land use and servicing needs to support the development
  - **Alternatives** will be proposed for the land use of the Secondary Plan
  - **Public Consultations** at various stages including statutory meeting for OPA

- The Official Plan Amendment
  - The Official Plan Amendment will amend the **City of Clarence-Rockland's Urban Area Official Plan** to add the Secondary Plan
  - This amendment will be forwarded to the **United Counties of Prescott and Russell** for approval

Next Steps

Complete Stage 1

- Market Needs Study (Barry Nabatian, Shore-Tanner & Associates) – in process
- Natural Environment Report (Michelle Lavictoire, Bowfin Environmental Consulting)
- Seek direction on land use mix from City of Clarence-Rockland City Council
- Servicing Study
- Transportation Impact Study
- Opportunities and Constraints Analysis
- Existing conditions background report

Consultation

If you have any questions regarding the study, please contact one of the people listed below. We welcome your feedback.

Marc Rivet, RPP, MCIP	Marie-Eve Belanger
Senior Planner J.L. Richards & Associates Limited 864 Lady Ellen Place Ottawa, ON K1Z 5M2 Phone: 613-867-8528 Email: mrivet@jlrichards.ca	Manager of Development City of Clarence-Rockland 1560 Laurier Street Rockland, Ontario K4K 1P7 Phone: 613-446-6022 ext. 2250 Email: mbelanger@clarence-rockland.com

Questions?

Contact Information:
Marc Rivet
Senior Planner
613-867-8528
mrivet@jlrichards.ca

Thank you!

Contact Information:
Marc Rivet
Senior Planner
613-867-8528
mrivet@jlrichards.ca

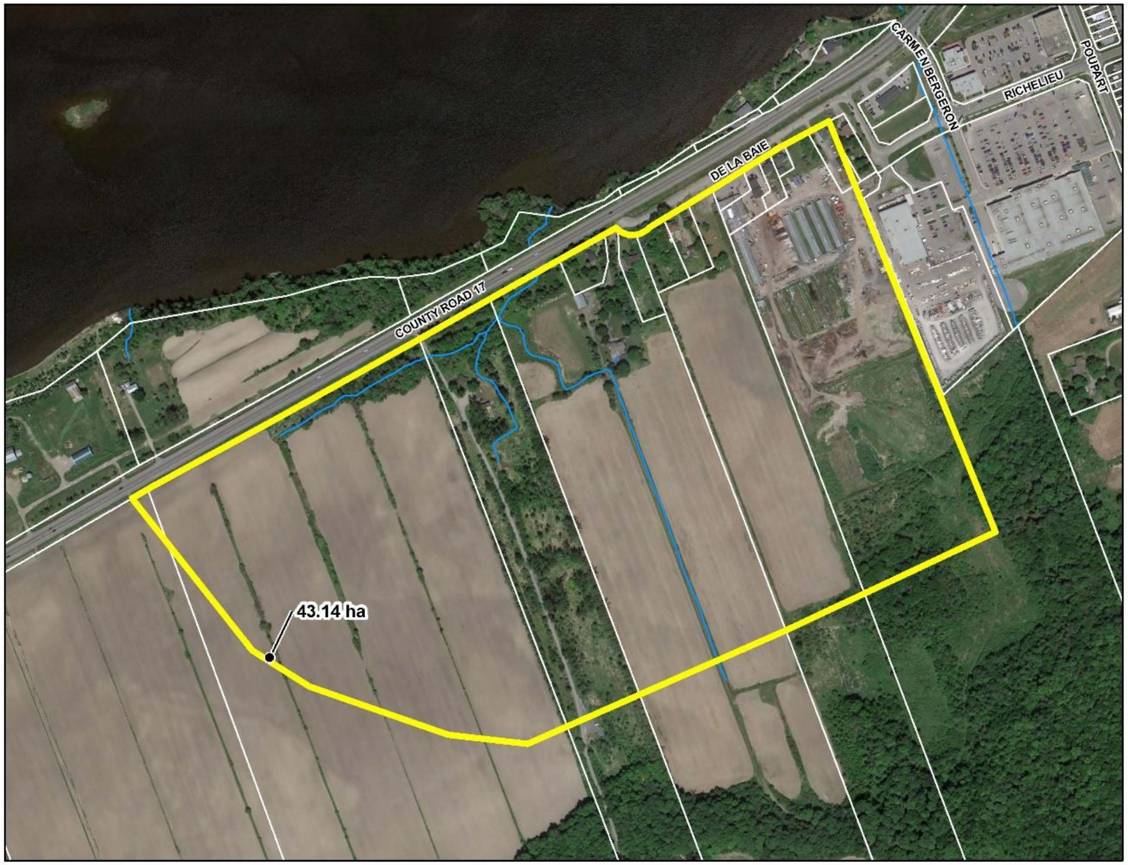
Cité de Clarence-Rockland City
Rockland West Secondary Plan / Plan secondaire Rockland - Est

Landowners Meeting / Rencontre avec les propriétaires

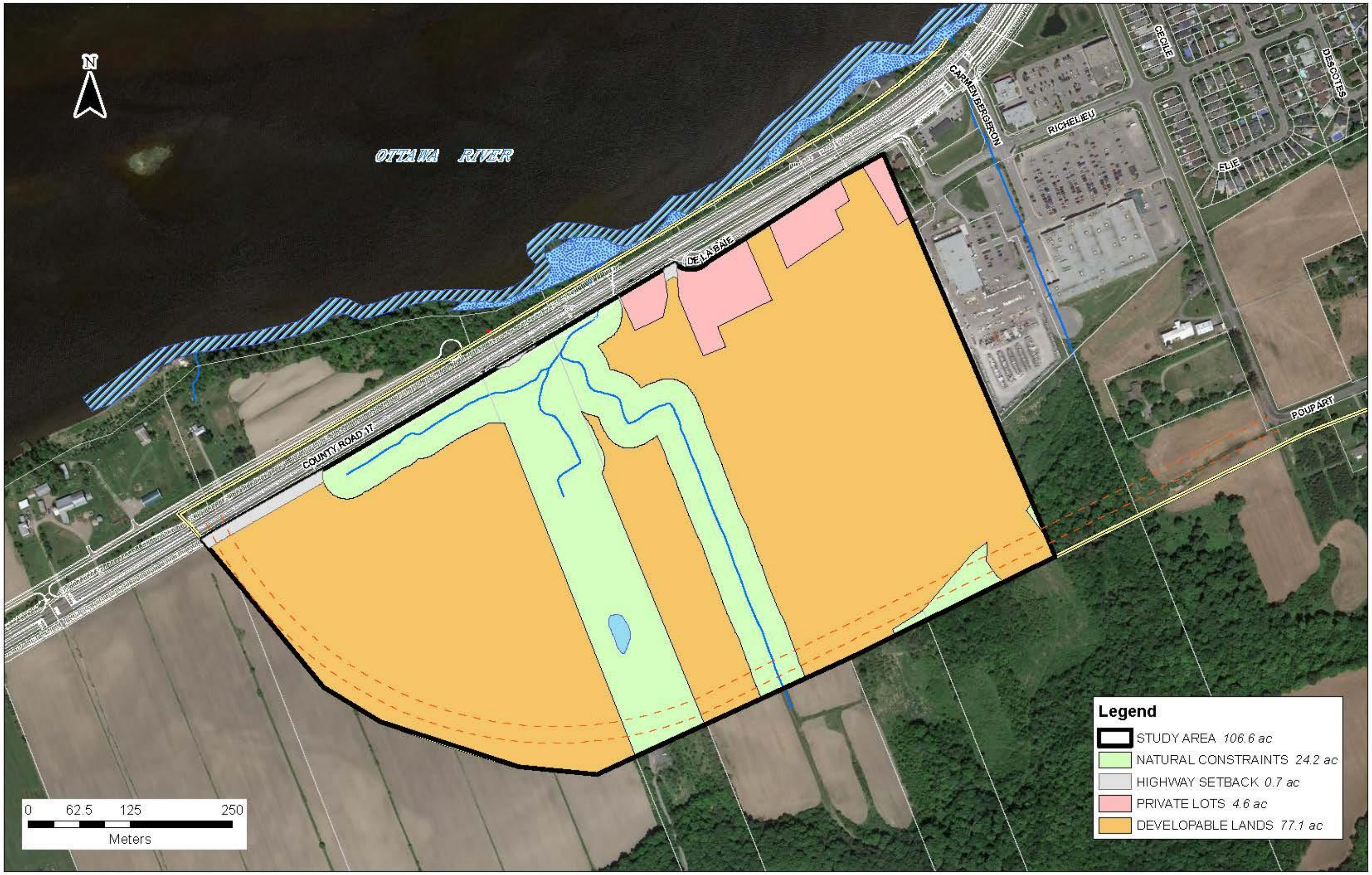
Presented by / Présenté par: Marc Rivet, Alex Elgin and Eric Forhan
Date: April 07, 2022
JLR No.: 31097-000

The purpose of this meeting / But de la rencontre

1. Overview of the Rockland West Secondary Plan (RWSP) Lands / Aperçu des terrains du plan secondaire – East de Rockland
2. Overview of the MCEA and Secondary Plan Process and Project Status / Aperçu du processus EE et du plan secondaire et état du projet
3. Summary of comments from Landowners Meeting #1 / Résumé des commentaires de la première réunion avec les propriétaires
4. Presentation of the Market Needs Study / Présentation de l'étude de besoin du marché
5. Recommended Land Uses / Utilisations du sol recommandées
6. Next steps – Planning Committee (May 4, 2022) / Prochaine étapes - Comité d'aménagement (4 mai 2022)



Constraints Mapping – Developable Area
Cartographie des contraintes – Zone aménageable



Municipal Class EA Process Overview / Aperçu du processus d'évaluation environnementale municipale de portée générale

Data Collection and Review

Identify Problems and Opportunities

Phase 1 – Problem/ Opportunity

Identify and Evaluate Solutions

Consult with Review Agencies and Public

Select Preferred Alternative

Issue Project File Report (if required) for 30-day Review *Fall 2022*

Phase 2 – Alternative Solutions

- Under the Environmental Assessment Act, municipalities must consider potential environmental effects before a potential infrastructure project begins. / En vertu de la Loi sur les évaluations environnementales, les municipalités doivent tenir compte des effets environnementaux potentiels avant le début d'un projet d'infrastructure.
- The streamlined MEA Class EA process allows municipalities to consider impacts without having to obtain project-specific approval under the Environmental Assessment Act. / Le processus simplifié d'évaluation environnementale de portée générale permet aux municipalités de prendre en compte les impacts sans avoir à obtenir une approbation spécifique au projet en vertu de la Loi sur les évaluations environnementales.
- This study is being conducted in accordance with **Phases 1 and 2** of the MEA Class EA process to fulfill the requirements for **Schedule B** projects / Cette étude est menée conformément aux phases 1 et 2 du processus d'évaluation environnementale de portée générale afin de répondre aux exigences des projets de l'annexe B.

For more information on the Class Environmental Assessment Process visit the Government of Ontario website (https://www.ontario.ca/page/class-environmental-assessments-approved-class-ea-information).

Secondary Plan – Planning Act process
Plan Secondaire – Loi sur l'aménagement du territoire - processus

Drafting Secondary Plan

- **Background research** required to determine the appropriate land use and servicing needs to support the development
- Staff are seeking Council direction on the desired land uses.
- **Alternatives** will be proposed for the land use of the Secondary Plan
- **Public Consultations** at various stages including statutory meeting for OPA

The Official Plan Amendment

- Follow *Planning Act* requirements for Public Meetings, Notices etc.
- The Official Plan Amendment will amend the **City of Clarence-Rockland's Urban Area Official Plan** to add the Secondary Plan
- This amendment will be forwarded to the **United Counties of Prescott and Russell** for approval

Rédaction du plan secondaire

- Recherche de base nécessaire pour déterminer l'utilisation appropriée des terrains et les besoins en services pour soutenir le développement.
- Le personnel cherche à obtenir l'avis du Conseil sur les utilisations du sol souhaitées.
- Des alternatives seront proposées pour l'utilisation des terrains du plan secondaire.
- Consultations publiques à différentes étapes, y compris la réunion statutaire pour l'APO.

La modification du plan officiel

- Respecter les exigences de la Loi sur l'aménagement du territoire en matière de réunions publiques, d'avis, etc.
- La modification du plan officiel modifiera le plan officiel de l'aire urbaine de la Cité de Clarence-Rockland pour y ajouter le plan secondaire.
- Cette modification sera transmise aux Comtés unis de Prescott et Russell pour approbation.

For more information on the Class Environmental Assessment Process visit the Government of Ontario website (https://www.ontario.ca/page/class-environmental-assessments-approved-class-ea-information).

Schedule & Opportunities for Input / Calendrier prévu et possibilités de participation

December- June 2021*

Stage 1 – Existing Conditions

1. Landowner's Meeting – April 7th
2. Planning Committee (Public Invited) – May 7th
3. Committee of the Whole / Council – May 16th
4. Complete Draft of Existing Conditions Report
5. 1st Working Group Session (June)
6. Finalize Existing Conditions Report – EA Phase 1 (June)

July-Sept 2022*

Stage 2 – Develop Planning and Design Options

1. Develop alternative concepts (July)
2. 2nd Working Group Session (August)
3. 1st Public Information Centre (August)
4. Finalize alternative concepts (Sept)
5. Complete Phase 2 of EA (Sept)

Sept-December 2022

Stage 3 – Preparation of Secondary Plan

1. Notice of Completion
2. 2nd Working Group
3. 2nd Public Information Centre
4. Complete Phase 3 of the EA
5. Draft Secondary Plan Policy – schedule and text
6. Statutory Public Meeting (Planning Act)

January 2023

Stage 4 - Implementation

1. Council Approval
2. Notice of Adoption

We are here … We are seeking Council's approval of uses based on the market needs study, to complete the existing conditions background studies (still in process).
Nous sommes ici... Nous cherchons à obtenir l'approbation du conseil sur l'étude de marché afin de compléter les études nécessaires.

Summary of Comments from Landowners Meeting #1
Sommaire des commentaires reçus de la rencontre no. 1 avec les propriétaires

Theme	Comments/ Questions	Response
Secondary Plan Area (Background) Market Study	Has the study area changed?	The designation is Special Study Area 1 and the boundary was confirmed during the 5-year review of the Official Plan (OPA-16)
	Why is the area shaped as is?	The shapes originates from the previous Official Plan document. The shape derives from a planned bypass road that reflects the topographical conditions.
	Is there a proposed road on the lands?	The Official Plan's schedule shows a Collector Road but, the preferred location will be confirmed through the Environmental Assessment and Secondary Plan process.
Market Study	Who is the Consultant?	Shore Tanner & Associates (previous Secondary Plan experience in Rockland)

Summary of Comments from Landowners Meeting #1

Theme	Comments/ Questions	Response
Land Use	Will there be one recommend land use for the study area?	There will be a variety of land uses and they will be distributed on the lands as recommended by the Market Needs Study and the remaining background studies (environmental, servicing). There is sufficient residential land, and a shortfall of employment type uses. Development will need to align with the Secondary Plan.
	What will the land uses be?	
Property Ownership	How many fields belong to a specific landowner?	Parcel boundaries and details are found on UCPR's mapping software.
	What input do landowners have in the process?	Landowners have rights under the Environmental Assessment Act and Planning Act (e.g. appeal process). The public can participate in statutory meetings and workshop sessions (tbd) and provide written comments.

Summary of Comments from Landowners Meeting #1

Theme	Comments/ Questions	Response
Financial, Taxation and Valuation	What are the tax impacts of the study for landowners?	Tax evaluation is based on existing use not based on future uses or zoning.
	What is the value of residential land versus employment land?	The value varies with market demand. Generally, serviced industrial lands are higher value (e.g. MPAC assessment can assist with confirmation).
	Will the City pay for a stormwater pond on a landowner's property?	This will depend on how the lands are development (e.g. developers or City involvement) are beyond the scope of the Secondary Plan.

Background Studies / Études de base

- Since December, 2021, as a part of Phase 1 of the EA, we have been investigating:
  a. Market Demand and desirable land uses
  b. Environmental Conditions (Natural Constraints)
  c. Existing servicing
  d. Transportation conditions and options.
- Council approval of the land uses is required to complete Phase 1 of the EA process (Existing conditions).
- Next Step: Phase 2 of EA - Alternative Concepts.

- Depuis décembre 2021, dans le cadre de la phase 1 de l'évaluation environnementale, nous avons mené des recherches sur:

  a. La demande de marché et les utilisations souhaitables des terres.

  b. Les conditions environnementales (contraintes naturelles)

  c. Les services existants

  d. Les conditions et les options de transport
- L'approbation des utilisations du sol par le Conseil est nécessaire pour achever la phase 1 du processus d'évaluation environnementale (conditions existantes).
- Prochaine étape : Phase 2 de L'EE – concepts alternatif


SHORE TANNER & ASSOCIATES MARKET STUDY – ÉTUDE DE MARCHÉ

Shore Tanner & Associates Market Study – Étude de marché

Major Findings:

- Businesses will direct to more affordable land options in nearby urban centres, such as the City of Clarence-Rockland
- Urban growth will need to be supported by a variety of industries, especially knowledge-based and innovative businesses.
- Industrial businesses, which are less compatible with sensitive land use and rely on efficient business logistics and transport, are most suitable due to its location at the edge (within) the urban area and its proximity to County Road 17.
- Creating more land for employment use (e.g. business park, office, innovation).
- Creating more demand for additional retail uses

Following land uses for inclusion in the RWSP lands, in the order of priority:

- **Industrial/Business Park**
- **Office Buildings**
- **Shopping Destination (Retail)**

Principales constatations :

- Les entreprises se dirigeront vers des options de terrains plus abordables dans les centres urbains voisins, comme la Cité de Clarence-Rockland.
- La croissance urbaine devra être soutenue par une variété d'industries, en particulier les entreprises fondées sur le savoir et l'innovation.
- Les entreprises industrielles, qui sont moins compatibles avec une utilisation sensible des terres et qui dépendent d'une logistique et d'un transport efficaces, sont les plus appropriées en raison de leur emplacement à la limite (à l'intérieur) de la zone urbaine et de leur proximité avec le chemin de Comté 17.
- La création d'un plus grand nombre de terrains destinés à l'emploi (par exemple, parc d'affaires, bureaux, innovation).
- Création d'une demande accrue pour des utilisations commerciales supplémentaires

Les utilisations du sol suivantes à inclure dans les terrains du RWSP, par ordre de priorité :

- Zone industrielle/parc d'affaires
- Immeubles de bureaux
- Destination commerciale (détail)

PLANNING ANALYSIS
ANALYSE URBANISTIQUE

Recommended Land Uses / Utilisation du sol recommandé

Considering other factors, stemming from our review of policy, guidelines, on-going environmental assessments, and the environmental background report:

- *Provincial Policy Statement (PPS) 2020*
- *The Ministry of the Environment, Conservation and Parks Land Use Compatibility D-6 Compatibility Guideline*
- *UCPR Official Plan*
- *The Official Plan (OP) of the Urban Area of the City of Clarence Rockland*

Figure 2 Priority Economic Drivers. Source: Economic Development Strategy

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Recommended Land Uses / Utilisation du sol recommandée

- Section 8.1.1 of the City's OP requires the completion of a Secondary Plan prior to any development being approved in the Special Study Area 1.
- Through this Secondary Plan, Staff aim to align the land use designations with the land use designations already found in the City's OP/ Expansion Lands Secondary Plan
- The following designations from the City's OP are being considered and recommended for integration through the RWSP:
  - **Business Park**
  - **Service Commercial**
  - **Tourist Recreation Commercial**
  - **Environmental Protection Area**
  - **Major Open Space**

- La section 8.1.1 du plan officiel de la Cité exige la réalisation d'un plan secondaire avant l'approbation de tout aménagement dans la zone d'étude spéciale 1.
- Par le biais de ce plan secondaire, le personnel vise à harmoniser les désignations d'utilisation du sol avec celles qui figurent déjà dans le plan secondaire du PO/terrains d'expansion de la ville.
- Les désignations suivantes du plan officiel de la Cité sont prises en compte et il est recommandé de les intégrer dans le plan secondaire des terrains d'expansion :
  - Parc d'affaires
  - Service commercial
  - Commerces touristiques et récréatifs
  - Zone de protection de l'environnement
  - Espace ouvert majeur

CITY OF CLARENCE-ROCKLAND ECONOMIC DEVELOPMENT STRATEGY / ÉTUDE DE DÉVELOPPEMENT ÉCONOMIQUE

Aligning with the Economic Development Strategy
Aligner avec la Stratégie de développement économique

Economic Development Priorities:

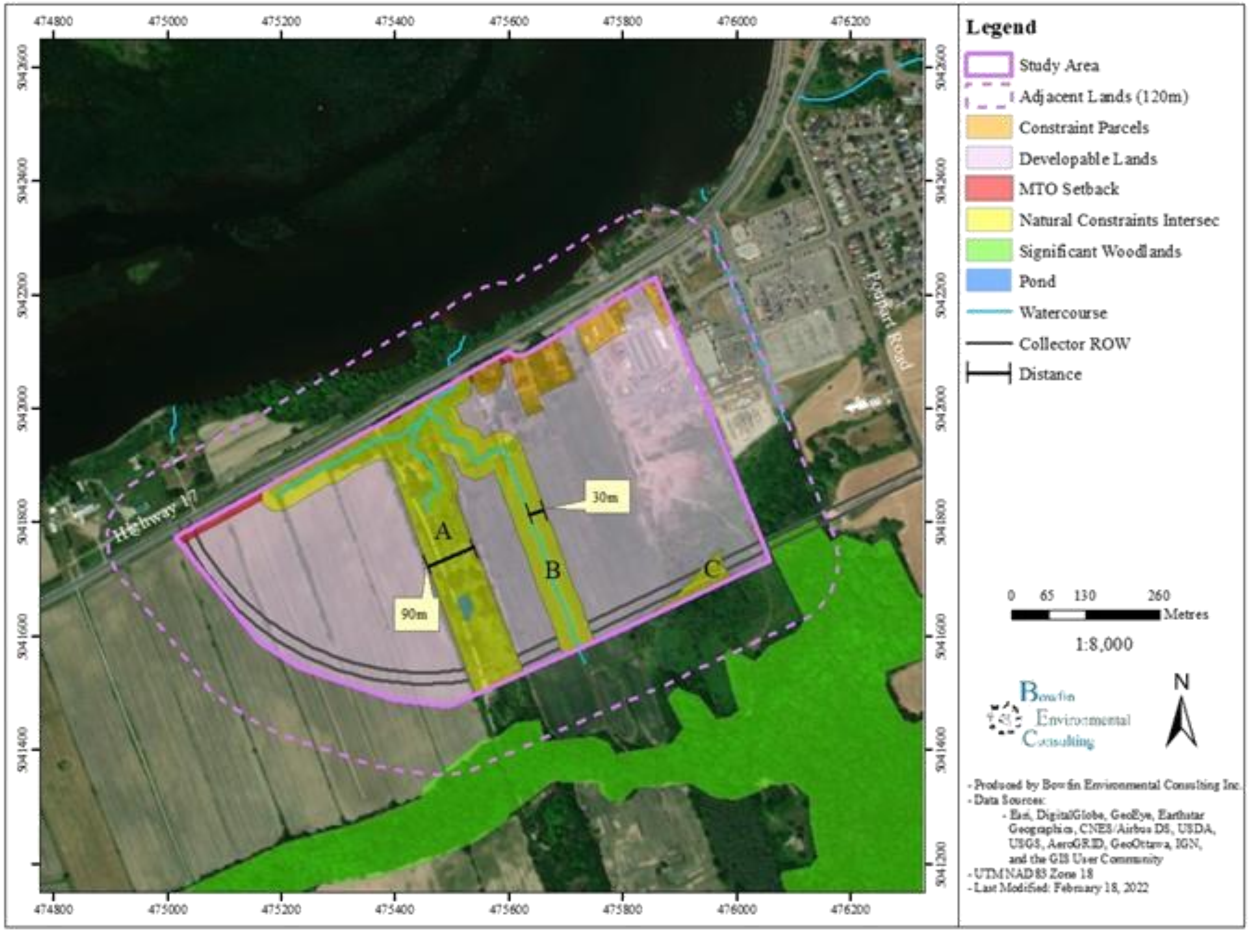
- **Hospitality and Tourism, and Retail Trade (High Priority)**
- **Professional, Scientific and Technical Services (Medium Priority)**
- **Value-Added Agriculture**
- **Light Industrial (Medium Priority)**
- **Construction**

Priorité du développement économique:

- Hôtellerie, tourisme et commerce de détail (priorité élevée)
- Services professionnels, scientifiques et techniques (priorité moyenne)
- Agriculture à valeur ajoutée
- Industrie légère (priorité moyenne)
- Construction

PRELIMINARY FINDINGS FROM BOWFIN ENVIRONMENTAL CONSULTING INC / RÉSULTATS PRÉLIMINAIRES DE L'ÉTUDE DE BOWFIN

Preliminary Environmental Conditions Report



- Environmental / Natural Features found on-site / Caractéristiques environnementales et naturelles sur le site:
  - Fish Habitat / Habitat de poisson
  - Cultural Thickets / Forests (e.g. butter nut)
- Bowfin Environmental Consulting Inc. offers three (3) opportunities for enhancement, including integration with an Urban Part type landscape. / Bowfin offre 3 possibilités de mise en valeur, y compris l'integration à un paysage de type urbanine.
- Parks and Open Space and Environmental Protection Area designations. / Parcs et espaces ouverts et zones de protection de l'environnement

Figure 5- Enhancement Opportunity Areas, Rockland West Secondary Plan lands, prepared by Bowfin Environmental Consulting Inc.


SUMMARY / SOMMAIRE

Land use designation / Utilisation du sol


PRECEDENTS / PRÉCÉDENTS

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Business Park – Parc d’affaire

CANADA'S BEST MANAGED COMPANIES

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Service Commercial – Commerce de service

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Tourist Recreation Commercial – Touristique récréatif commercial

CANADA'S BEST MANAGED COMPANIES

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Major open space – Escape ouvert


NEXT STEPS- PROCHAINE ÉTAPES
Consultation

Next Steps

- Seek Council direction on the desired land uses stemming from Shore Tanner's Report / Background Research (April/ May).
- Complete Phase 1 of the EA background studies / existing conditions.
- Working Group Meeting (County, Municipal, Conservation Authority).
- Proceed with Phase 2 of the EA – alternative concepts.
- The public will continue to be notified and involved in accordance with the statutory requirements of the Municipal Class EA and Planning Act approvals process for public meetings.

- Demander l'avis du Conseil sur les utilisations souhaitées du sol découlant du rapport de Shore Tanner et des recherches de base (avril/mai).
- Achever la phase 1 des études de base de l'évaluation environnementale et des conditions existantes.
- Réunion du groupe de travail (comté, municipalité, office de protection de la nature).
- Passer à la phase 2 de l'EE - concepts alternatifs.
- Le public continuera d'être informé et de participer conformément aux exigences légales du processus d'approbation de l'ÉE municipale de portée générale et de la Loi sur l'aménagement du territoire pour les réunions publiques.

Consultation

If you have any questions regarding the study, please contact one of the people listed below. We welcome your feedback.
Si vous avez des questions concernant l'étude, svp contacter une des personnes listées ci-bas. Nous apprécions vos commentaires.

Marc Rivet, RPP, MCIP	Marie-Eve Bélanger
Senior Planner J.L. Richards & Associates Limited 864 Lady Ellen Place Ottawa, ON K1Z 5M2 Phone: 613-867-8528 Email: mrivet@jlrichards.ca	Manager of Development City of Clarence-Rockland 1560 Laurier Street Rockland, Ontario K4K 1P7 Phone: 613-446-6022 ext. 2250 Email: mbelanger@clarence-rockland.com

Questions?

Contact Information:
Marc Rivet
Senior Planner
613-867-8528
mrivet@jlrichards.ca

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Thank you!

Contact Information:
Marc Rivet
Senior Planner
613-867-8528
mrivet@jlrichards.ca

Clarence-Rockland

CITY OF CLARENCE-ROCKLAND ROCKLAND WEST SECONDARY PLAN

INTEGRATED PLANNING ACT AND ENVIRONMENTAL ASSESSMENT ACT PROCESS

NOTICE OF PUBLIC MEETING #1

Wednesday, May 4th, 2022, 7:00pm
VIA ZOOM MEETING OR FACEBOOK LIVE

An integrated Planning Act and Environmental Assessment Act process has been initiated for the Clarence-Rockland Rockland West Secondary Plan. The study area is located south of County Road 17, west of Poupart Road.

The purpose of the Secondary Plan process is to detail the land use, transportation, and servicing infrastructure related to this area. The Secondary Plan will be implemented through an Official Plan Amendment to guide future development within the study area.

At this public meeting, Staff will recommend to Planning Committee a list of land uses that are appropriate for the Secondary Plan lands based on the findings of the Market Needs Study, the site's physical conditions, and City of Clarence's Rockland's policies and strategic direction for economic development. There will be a short presentation which will be used to outline the report and explain the recommended land uses: **Business Park**, **Service Commercial**, **Tourist Recreational Commercial**, **Environmental Protection** and **Major Open Space**.

The market study is available for review online at www.clarence-rockland.com/en/hotel-de-ville/Plan_Secondaire___Ouest_de_Rockland.aspx or with the following shortened link https://bit.ly/3JB0ZRf

Public consultation is an important part of the process. We are interested in hearing your comments and feedback. If you would like to be added to the mailing list for this project or would like to attend the zoom meeting, please contact the Project Leads:

Marie-Eve Bélanger, Manager of Development
City of Clarence-Rockland
1560, Laurier Street
Rockland, ON K4K 1P7
613-446-6022 ext: 2250
Email: mbelanger@clarence-rockland.com

Marc Rivet, RPP, MCIP
Senior Planner
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, Ontario K1Z 5M2
Phone: 343-803-4533
Email: mrivet@jlrichards.ca

CITÉ DE CLARENCE-ROCKLAND

PLAN SECONDAIRE - OUEST DE ROCKLAND

PROCESSUS INTÉGRÉ EN VERTU DE LA LOI SUR L'AMÉNAGEMENT DU TERRITOIRE ET DE LA LOI SUR LES ÉVALUATIONS ENVIRONNEMENTALES

AVIS DE RÉUNION PUBLIQUE No. 1

Le mercredi 4 mai 2022, 19h00
RENCONTRE SUR ZOOM OU FACEBOOK LIVE

Le processus intégré en vertu de la Loi sur l'aménagement du territoire et de la Loi sur les évaluations environnementales pour la création d'un Plan Secondaire pour l'ouest de Rockland fut enclenché. Le secteur à l'étude comprend généralement les terrains au sud du chemin de Comté 17 et à l'ouest de la montée Poupart.

Le but du présent projet vise à détailler les l'utilisation des terrains, le système de transport et l'infrastructure de viabilisation pour les terrains en question. Le Plan secondaire sera implémenté à partir d'un amendement au Plan Officiel et visera à orienter l'aménagement de ce secteur.

Lors de cette réunion publique…

L'étude de marché peut être consulté en ligne sur notre site à www.clarence-rockland.com/fr/hotel-de-ville/Plan_Secondaire___Ouest_de_Rockland.aspx ou avec le lien court suivant : https://bit.ly/3NXvyDR

La consultation du public représente une partie importante du projet et vos commentaires nous sont appréciés. Si vous désirez être ajouté à la liste d'envoi pour ce projet ou si vous souhaitez participer à la rencontre zoom, veuillez communiquer avec les chargées de projet :

Marie-Eve Bélanger, MCIP, RPP
Gestionnaire du développement
Cité de Clarence-Rockland
1560 rue Laurier
Rockland, ON K4K 1P7
Tel: 613-446-6022 ext: 2250
mbelanger@clarence-rockland.com

Marc Rivet, RPP, MCIP
Urbaniste sénior
J.L. Richards & Associates Limited
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Ottawa, Ontario K1Z 5M2
Tel: 343-803-4533
mrivet@jlrichards.ca

Appendix M

Public Information Centre

CITY OF CLARENCE-ROCKLAND ROCKLAND WEST SECONDARY PLAN

INTEGRATED PLANNING ACT AND ENVIRONMENTAL ASSESSMENT ACT PROCESS

NOTICE OF PUBLIC INFORMATION CENTER

Tuesday, December 5th, 2023, 5:00pm-8:00pm
Optimist Performance Hall, 1535 Du Parc Avenue, Rockland, ON K4K 1C3

An integrated Planning Act and Environmental Assessment Act process has been initiated for the Clarence-Rockland Rockland West Secondary Plan. The study area is located south of County Road 17, west of Poupart Road.

The purpose of the Secondary Plan process is to detail the land use, transportation, and servicing infrastructure related to this area. The Secondary Plan will be implemented through an Official Plan Amendment to guide future development within the study area over the next 20 years. J.L. Richards & Associates Limited has been retained to complete the Class EA Secondary Plan.

Public and agency consultation is a key component throughout the Class EA process. The City is planning to conduct one Public Information Centre to present the work undertaken to date, including recommendations as to the preferred land uses and proposed servicing solutions for the area. All those interested in the project are invited to attend the Public Information Center.

Public consultation is an important part of the process. We are interested in hearing your comments and feedback. If you would like to be added to the mailing list for this project, please contact the Project Leads:

Marie-Eve Bélanger, Manager of Development
City of Clarence-Rockland
1560, Laurier Street
Rockland, ON K4K 1P7
613-446-6022 ext: 2250
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Marc Rivet, RPP, MCIP
Senior Planner
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, Ontario K1Z 5M2
Phone: 343-803-4533
Email: mrivet@jlrichards.ca

December 5th, 2023

Clarence-Rockland

The City of Clarence-Rockland
Rockland West Secondary Plan

BEST MANAGED COMPANIES Platinum member

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

5 décembre, 2023

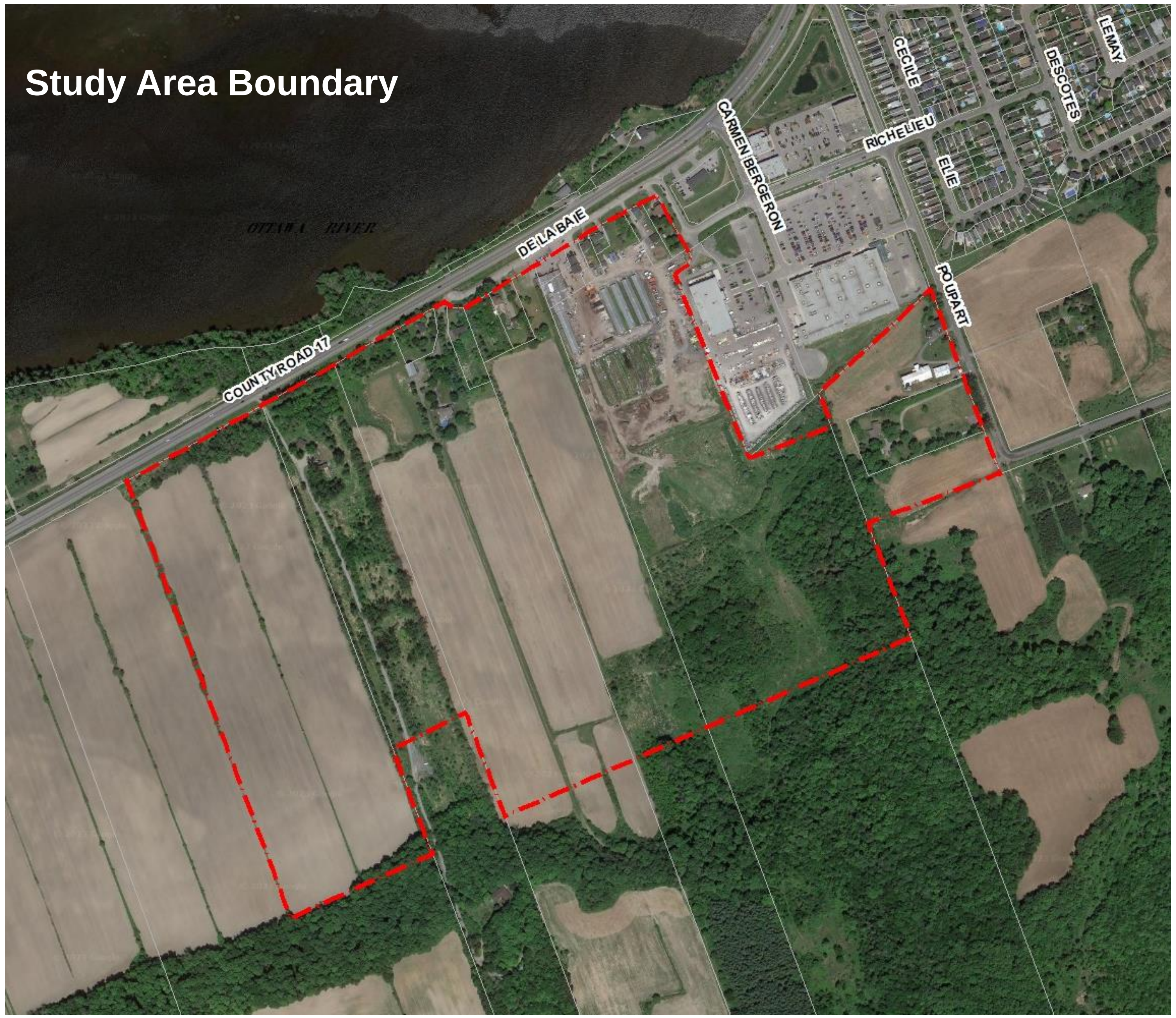
Clarence-Rockland

La Cité de Clarence-Rockland
Plan secondaire de Rockland-Ouest

BEST MANAGED COMPANIES
CANADA
Platinum member

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Introduction



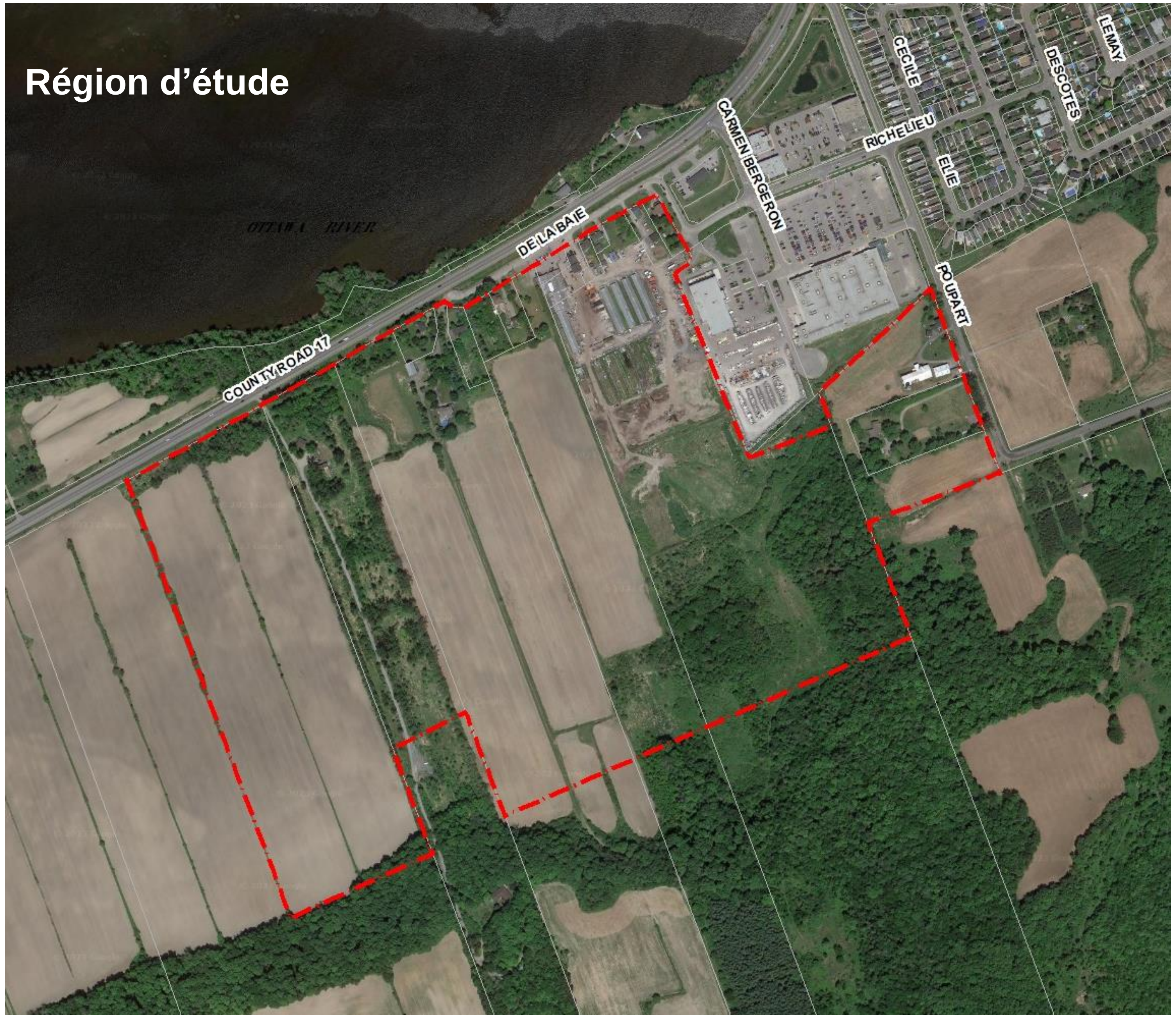
Objectives:

- Establish a policy framework for the lands
- Provide the basis for future development
- Ensure the efficient use of the land and infrastructure

Main Issues to be Considered:

- Preferred land-use zones for current growth trends
- Existing transportation and servicing infrastructure capabilities
- Environmental considerations

Introduction



Objectifs :

- Établir un cadre stratégique pour les terrains
- Fournir la base pour un développement futur
- Assurer l'utilisation efficace du terrain et de l'infrastructure

Principales questions à prendre en considération:

- Zones d'utilisation des sols privilégiées pour les tendances de croissance actuelles
- Capacités existantes en matière d'infrastructures de transport et de services
- Considérations environnementales

Secondary Plan Class EA Process

Phase 1
Identification of Problem or Opportunity

Phase 2
Evaluation of Alternative Solutions and Identification of Recommended Solutions

Selection of Preferred Solution Following Consultation Activities

Phase 2 Report

Notice of Study Commencement
July 2021

Ongoing Public and Agency Consultation Throughout Study

Public Information Centre
December 2023

WE ARE HERE

Notice of Study Completion

✓**Phase 1 Report** evaluated existing systems and proposed alternative solution concepts for the Rockland West Secondary Plan lands

✓**Alternative Solutions Concepts** shortlisted and reviewed against an evaluation matrix.

✓Preliminary assessment of **Costing** for each alternative solution.

✓**Public Consultation** with general public, stakeholder agencies and City staff.

Processus d'Étude Environnementale du Plan Secondaire

Phase 1
Identification d'un problème ou d'une opportunité

Phase 2
Évaluation des solutions alternatives et identification des solutions recommandées

Sélection de la solution privilégiée à la suite d'activités de consultation

Rapport de la phase 2

Avis de début d'étude
Juillet 2021

Consultation continue du public et des organismes tout au long de l'étude

Centre d'information du public
Décembre 2023

NOUS SOMMES LÀ

Avis d'achèvement de l'étude

✓**Rapport de la phase 1** a évalué les systèmes existants et proposés des solutions alternative pour les terrains du Plan secondaire de Rockland Ouest ;

✓**Concepts de solutions alternatives** présélectionnés et examinés en fonction d'une matrice d'évaluation.

✓Évaluation préliminaire des **Coûts** pour chaque solution alternative.

✓**Consultation publique** avec le grand public, les agences et le personnel de la Cité.

Phase 1 – Problem/Opportunity Statement

“The Secondary Plan will follow the Municipal Class Environmental Assessment (EA) and Planning Act process to establish a coordinated planning solution for development of this area.

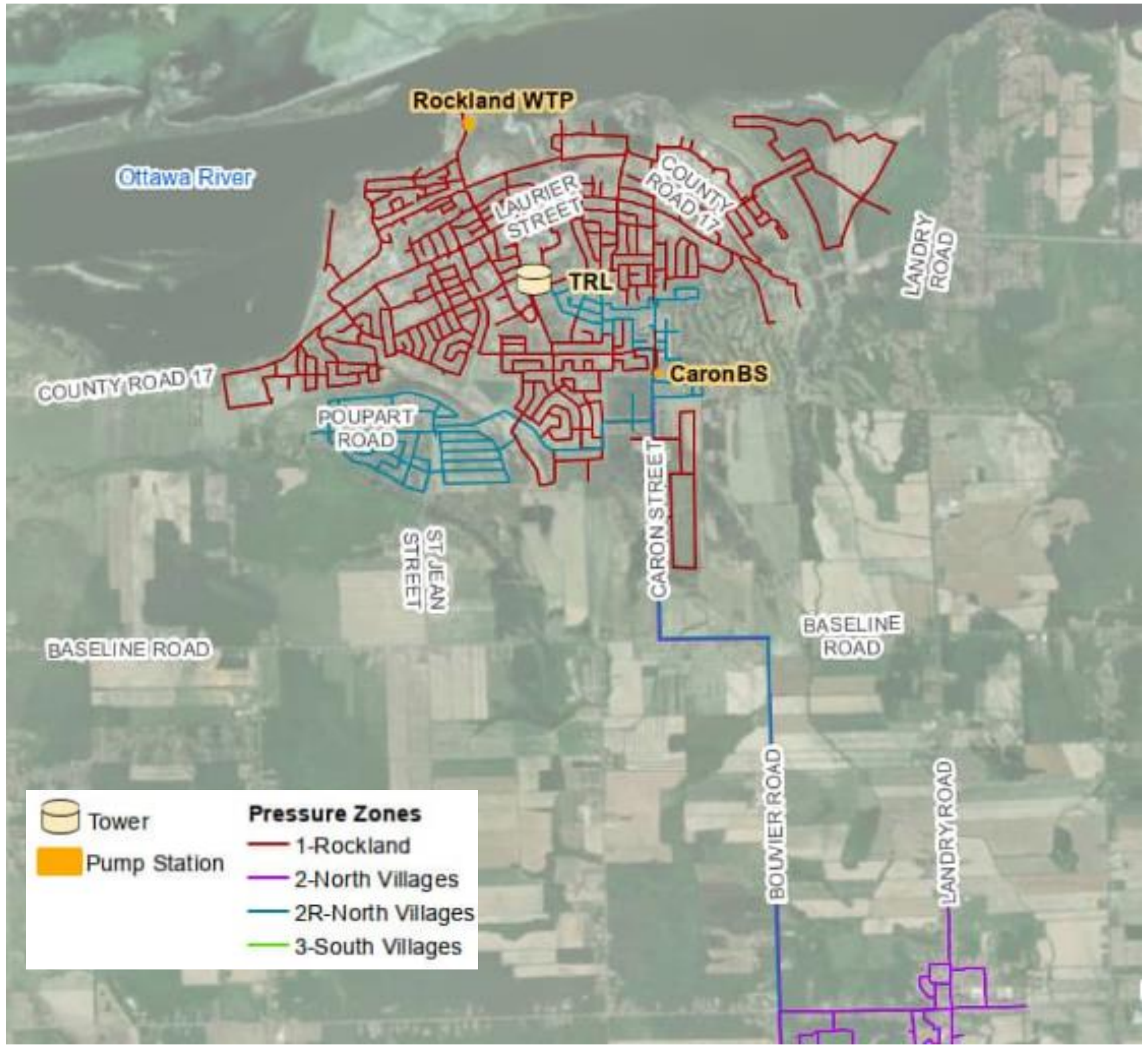
A Secondary Plan could present economic opportunities for the city and its residents through the establishment of acceptable land use designations leading to an increase in business and commerce in the region. In developing the Secondary Plan, there is an opportunity to consider impacts to neighboring properties, impacts to natural and social environment, climate change, and growth opportunities.”

Phase 1 – Énoncé du problème ou de l'occasion

"Le plan secondaire suivra le processus d'évaluation environnementale municipale de portée générale (EE) et de la Loi sur l'aménagement du territoire afin d'établir une solution de planification coordonnée pour l'aménagement de ce secteur.

Un plan secondaire pourrait offrir des possibilités économiques à la ville et à ses résidents grâce à l'établissement de désignations acceptables de l'utilisation des terres, ce qui entraînerait une augmentation des affaires et du commerce dans la région. Lors de l'élaboration du plan secondaire, il est possible de tenir compte des répercussions sur les propriétés voisines, des répercussions sur l'environnement naturel et social, des changements climatiques et des possibilités de croissance."

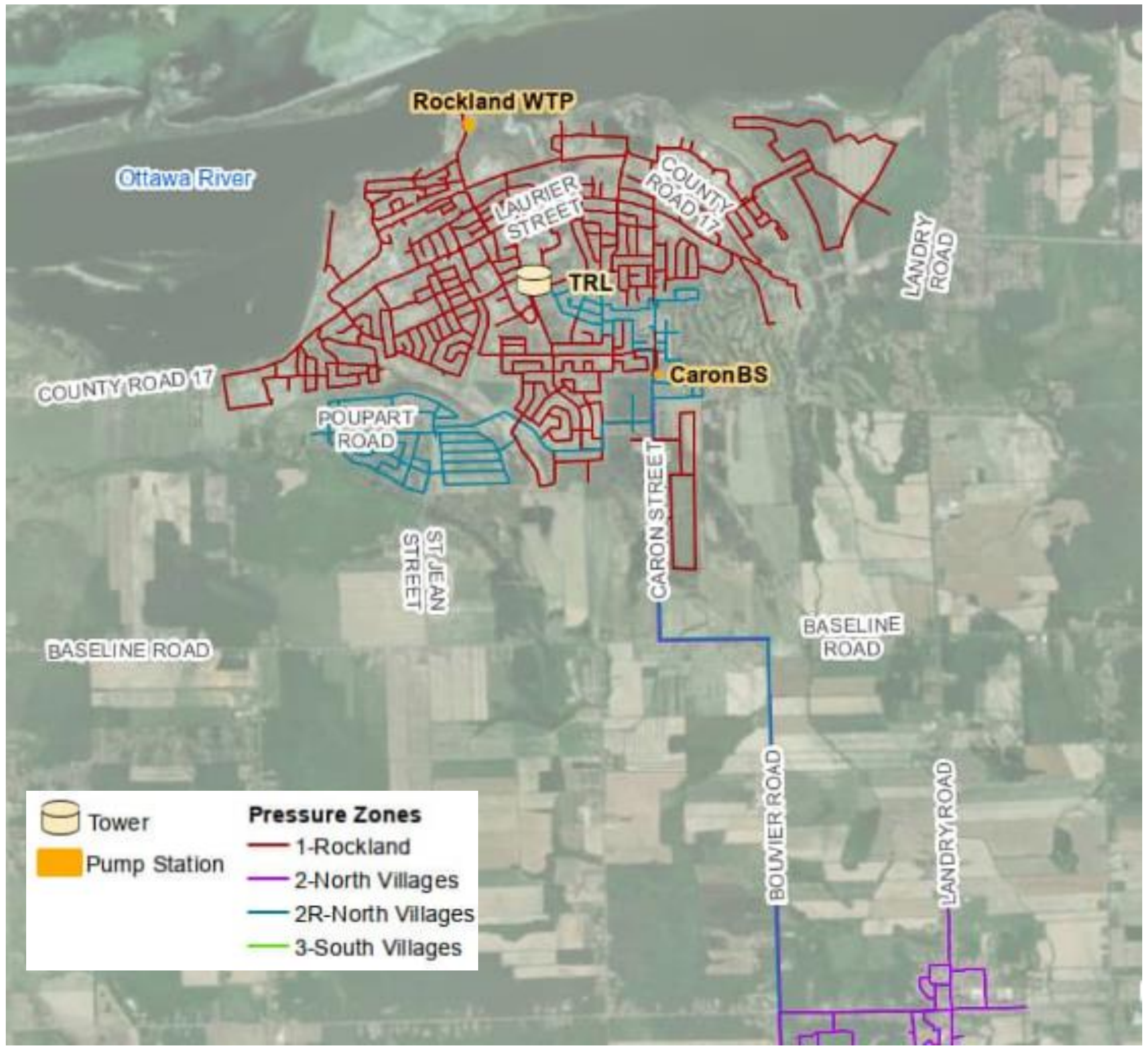
Phase 1 – Existing Water, Sanitary & Stormwater Servicing



Rockland to Clarence Water Distribution System Pressure Zones

- Next to Pressure Zone 1, receives potable water from the Rockland Water Treatment Plant
- One sanitary sewer, two pump stations and forcemains, privately owned sewers in commercial developments
- Storm water runoff is overland via sheet flow or drainage ditch to downstream receivers

Phase 1 – Services d’eau, sanitaires et d’eaux pluviales existants

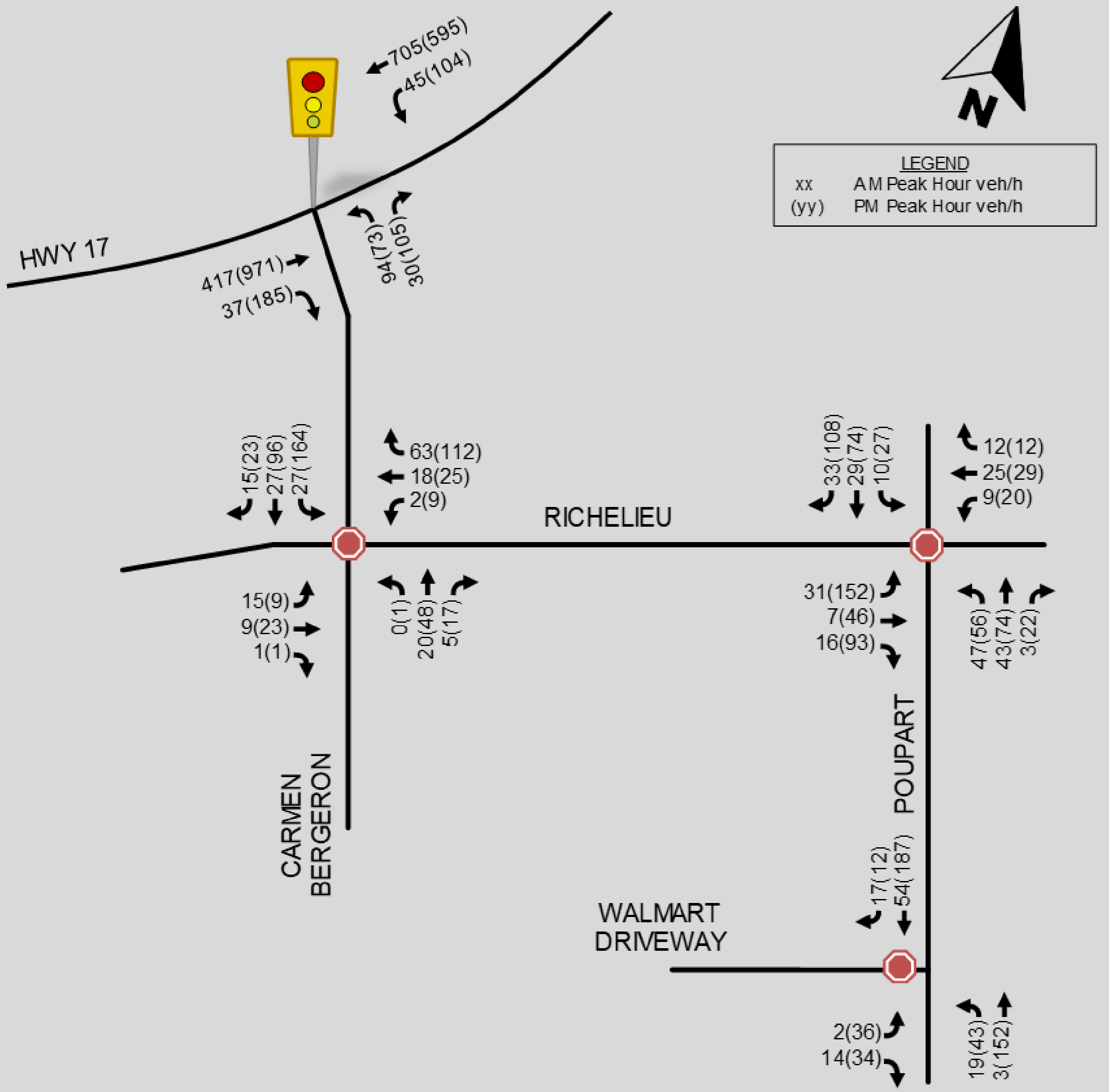


Zones de pression du réseau de distribution d’eau de Rockland à Clarence

- À côté de la zone de pression 1, reçoit de l’eau potable de l’usine de traitement de l’eau de Rockland
- Un égout sanitaire, deux stations de pompage et des conduites de refoulement, des égouts privés dans les développements commerciaux
- Le ruissellement des eaux pluviales se fait par voie terrestre via l’écoulement de surface ou fossé de drainage jusqu’aux récepteurs en aval

Phase 1 – Existing Transportation

Existing Vehicular Volumes

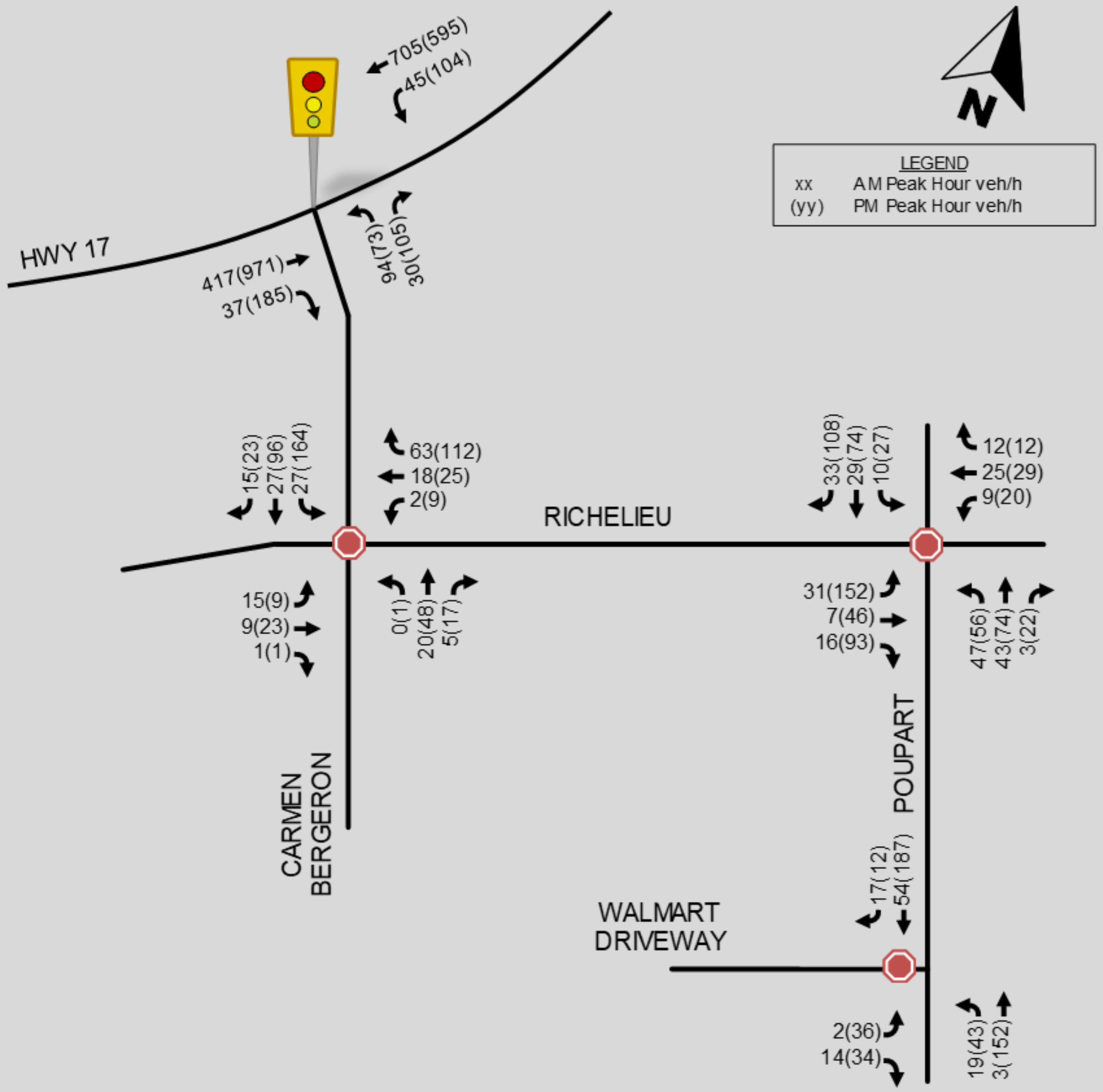


Existing Intersections :

- County Road 17 /Carmen Bergeron
- Carmen Bergeron/Richelieu
- Richelieu/Poupart
- Poupart/Walmart Driveway

Phase 1 – Transport Existant

Volumes de véhicules existants



Intersections Existantes:

- chemin de Comté 17 /Carmen Bergeron
- Carmen Bergeron/Richelieu
- Richelieu/Poupart
- Poupart/ Allée Walmart

Phase 1 – Environmental and Land-use Considerations

Low potential for disruption to the natural environment, recommendations to minimize environmental impact:

- Develop water feature setback
- Use cultural thickets for endangered and threatened species habitat

Recommended land-uses for Study Area:

- Industrial/Business Park
- Office Building
- Shopping

Desktop Vegetation Community Analysis (Bowfin Environmental Impact Study, 2022)

Phase 1 – Considérations relatives à l'environnement et à l'utilisation des terres

Faible potentiel de perturbation de l'environnement naturel, recommandations pour minimiser l'impact sur l'environnement :

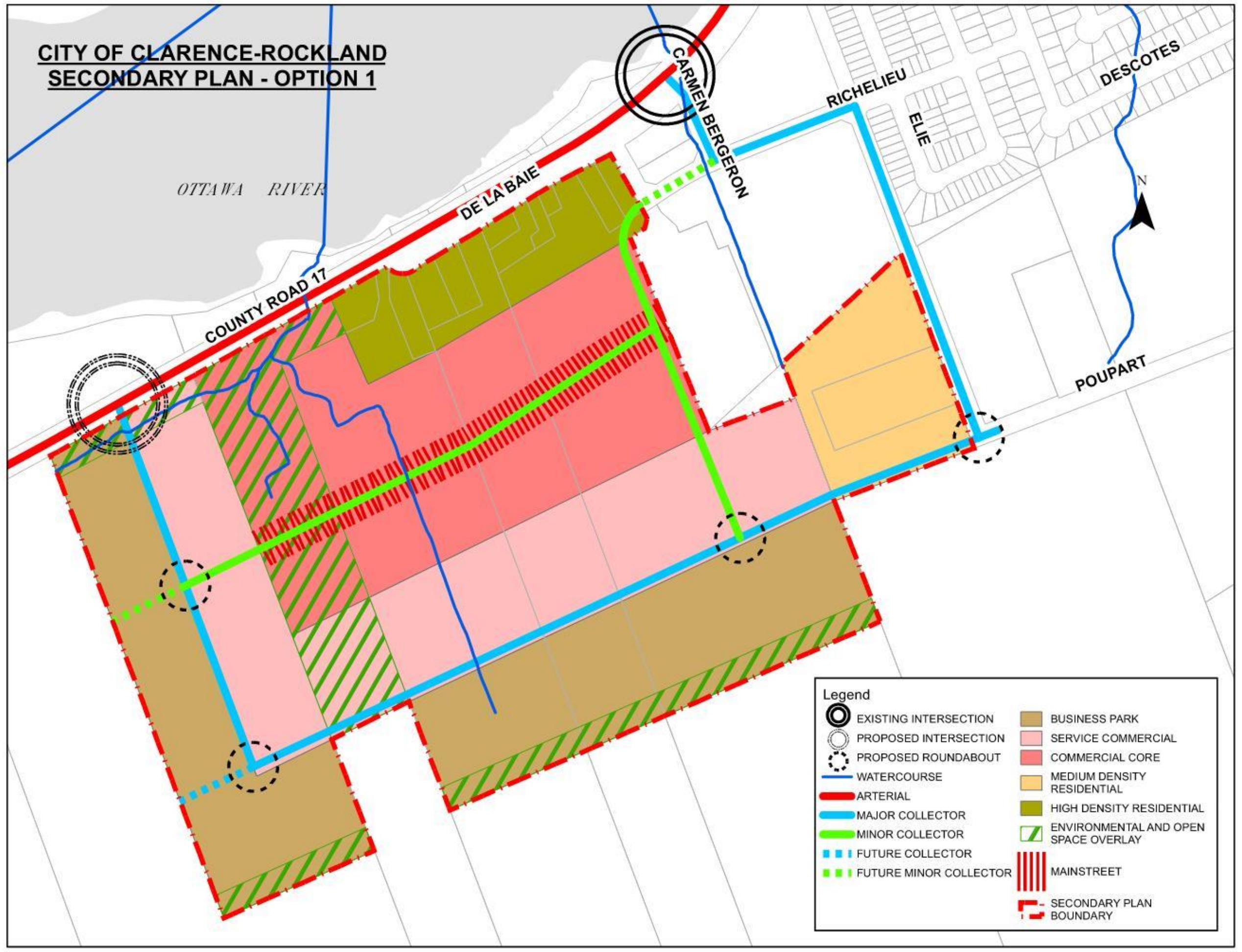
- Développer une marge de recul pour les cours d'eau
- Utiliser des fourrés naturels pour l'habitat d'espèces en voie de disparition et menacées

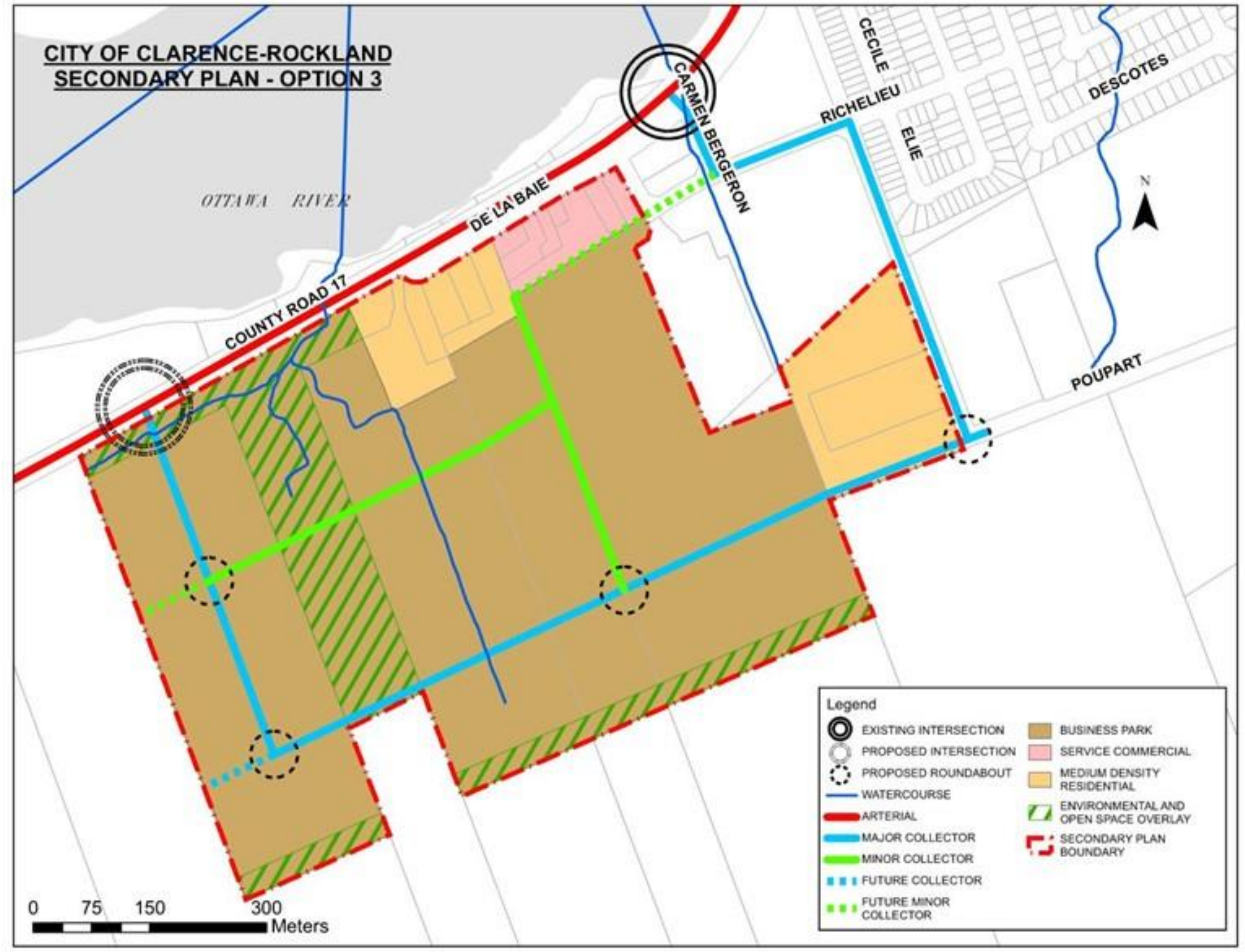
Utilisations recommandées des terres pour la zone d'étude:

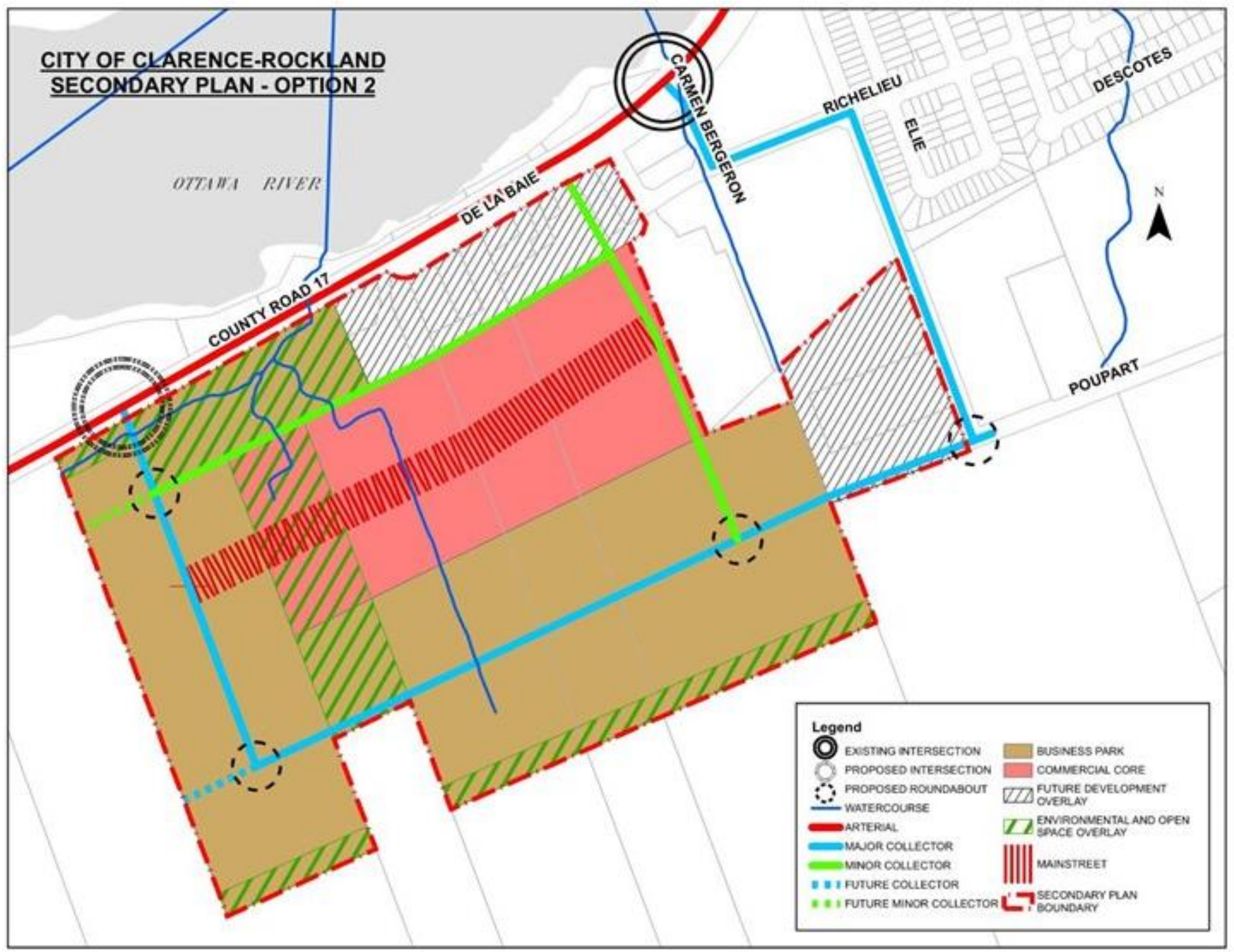
- Parc Industriel /d'affaires
- Immeubles de bureaux
- Magasin de détail

Analyse des communautés végétales (étude d'impact environnemental par Bowfin, 2022)

Phase 1 – Concept Options

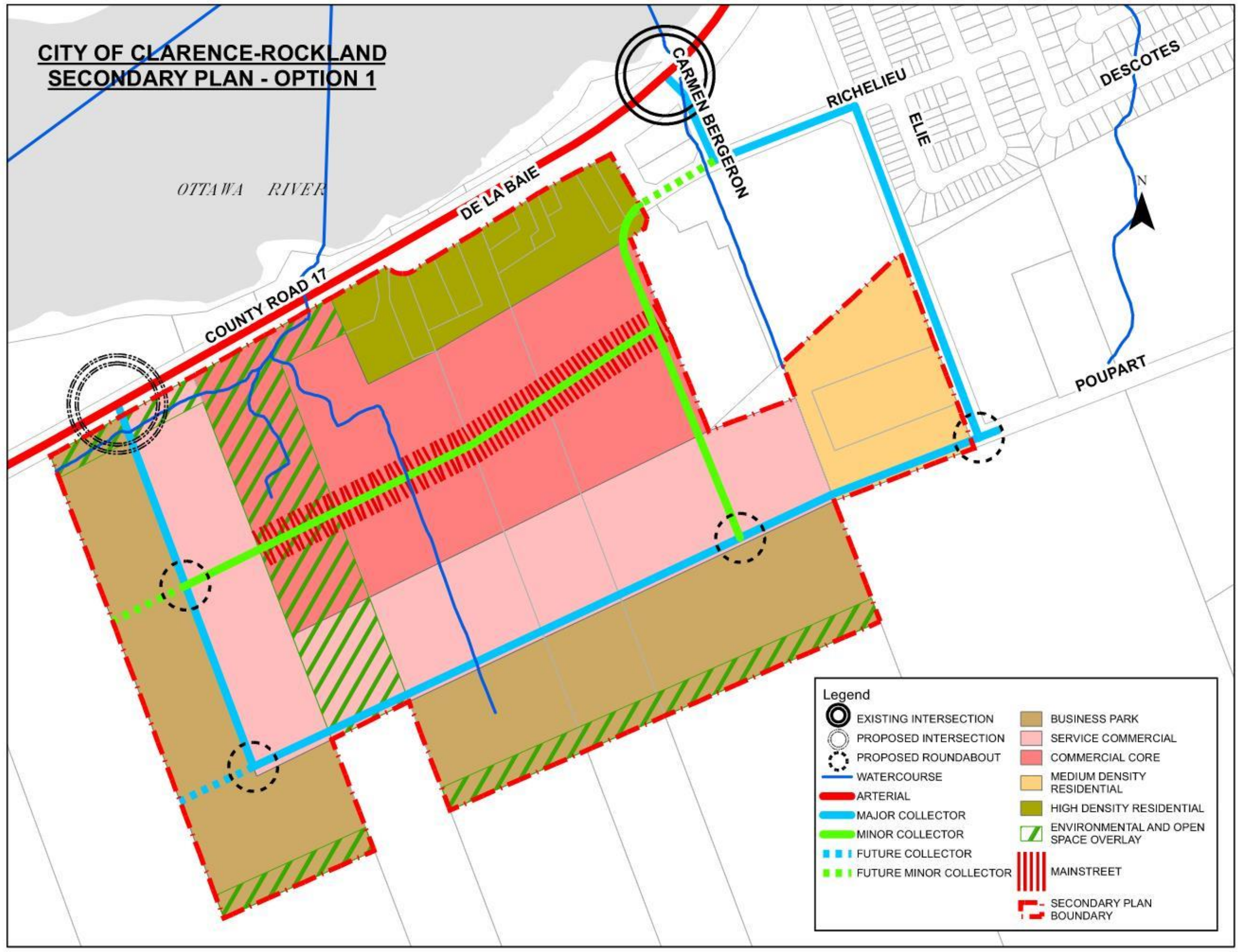


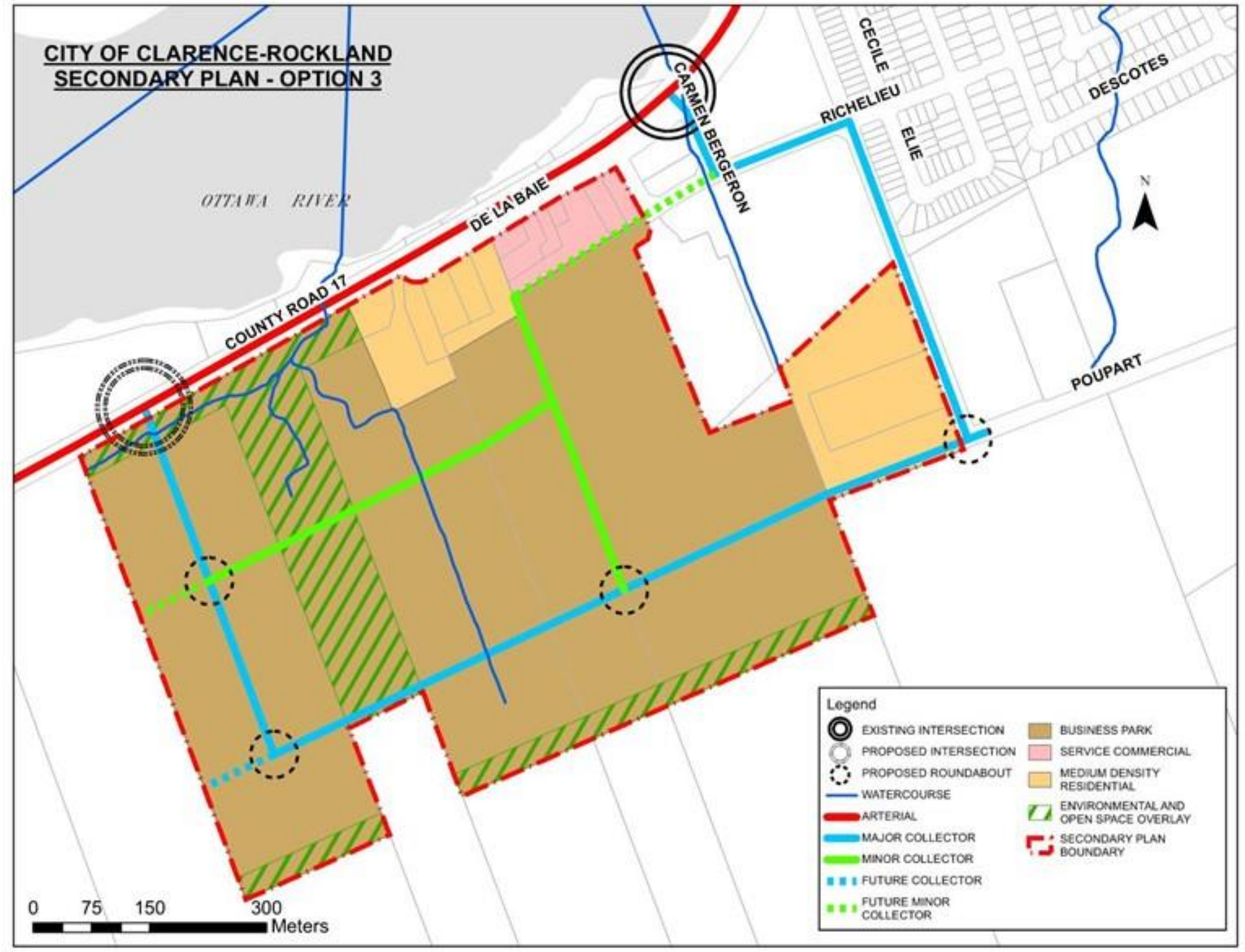


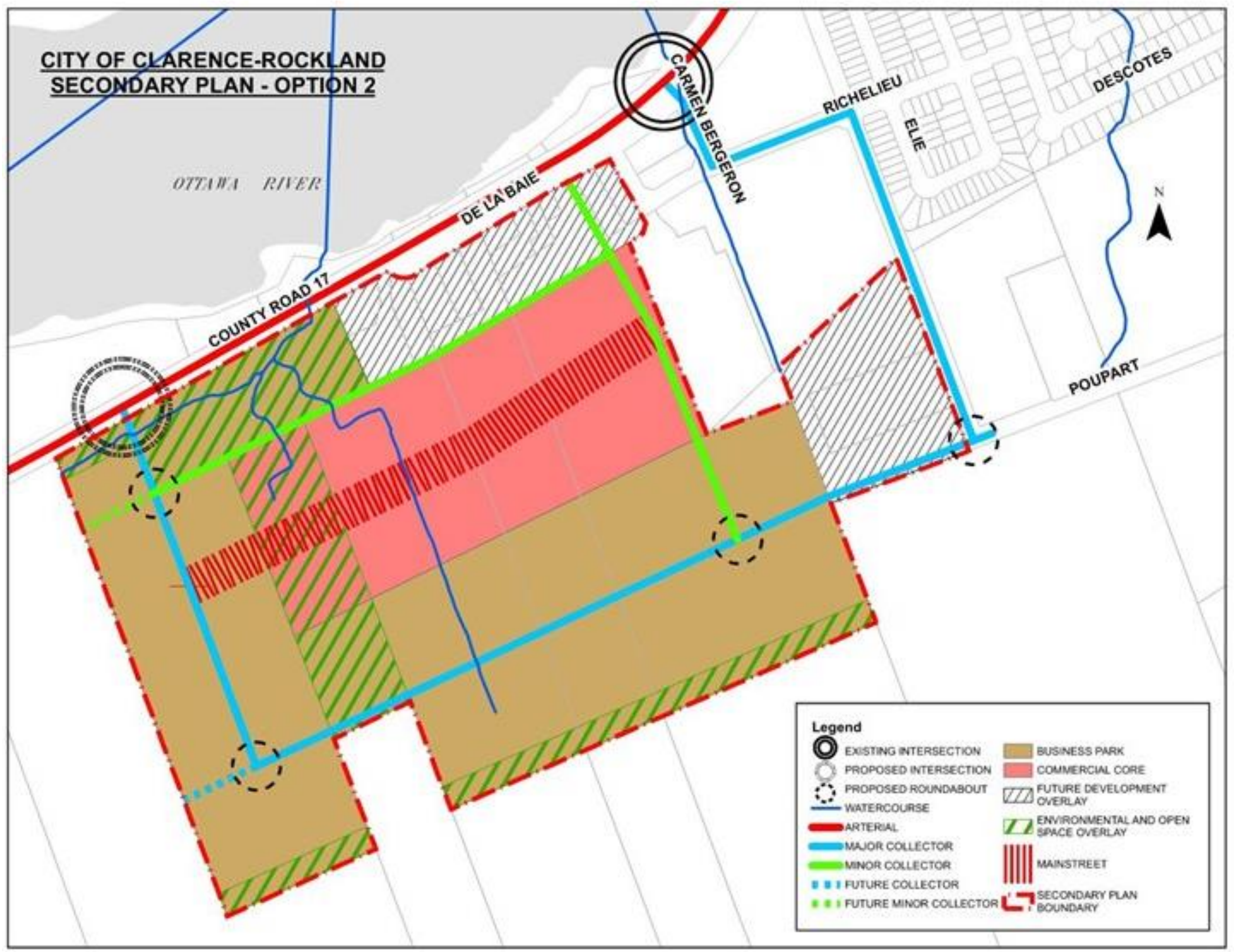


Option 4 – "Do Nothing"
The "Do Nothing" option was investigated per MCEA planning process specifications

Phase 1 – Options conceptuelles







Option 4 – "Ne rien faire"
L'option « Ne rien faire » a été étudiée conformément aux spécifications du processus de planification MCEA

Phase 1 – Concept Option Shortlisting

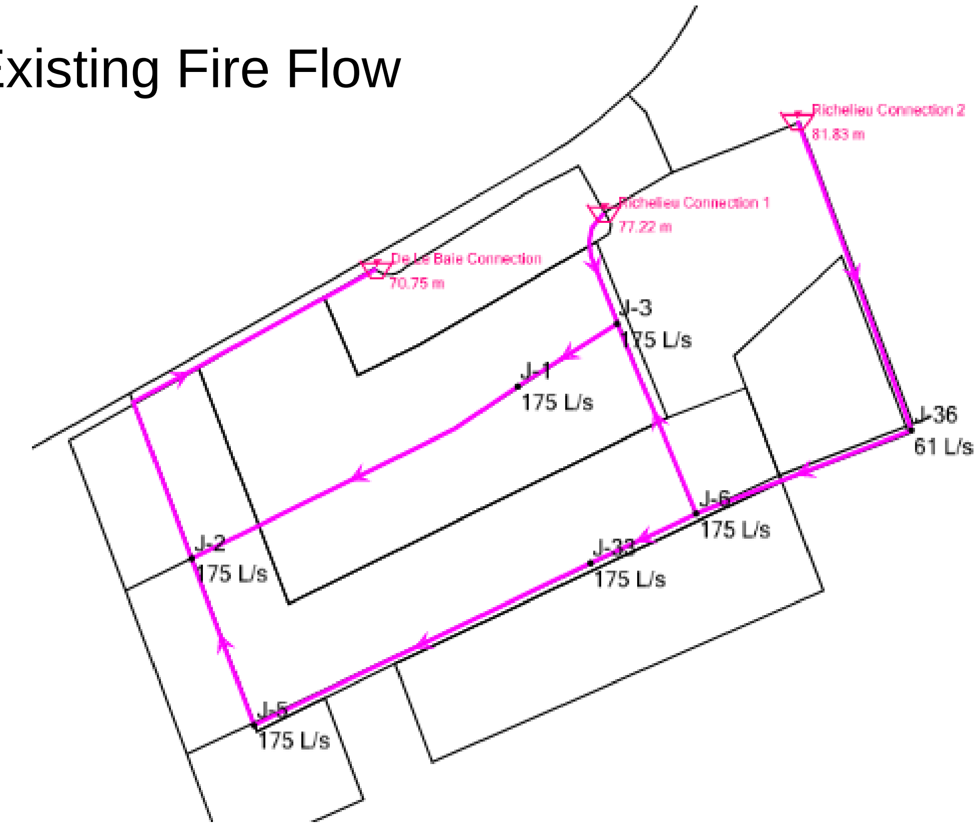
Description	Avantages	Disadvantages	Carried Forward?
Option 1	• Preserves natural waterway corridor • Addition of business park, service commercial, commercial core, and high and medium density residential land use zones • High land-use diversity • Pedestrian focused main street included in commercial core	• Comparatively complex traffic flow • Increase in traffic with the addition of major and minor collector roads	✓
Option 2	• Largest percent of environmental overlay • Addition of business park and commercial core land use zones • Pedestrian focused main street included in commercial core	• Small environmental and open space overlay • Increase in traffic with the addition of major and minor collector roads • Least land-use diversity • No land allotted to residential land use • Comparatively complex traffic flow • Future development overlay does not specify immediate land use	✗
Option 3	• Preserves natural waterway corridor • Addition of business park, service commercial land, and medium density residential land use • Comparatively simple traffic flow • Largest percent of high-demand business park land use	• No pedestrian focused commercial core • Increase in traffic with the addition of major and minor collector roads • Minimal land-use diversity	✓
Option 4 – Do Nothing	• Preserves the natural environment of SSA1	• Does not support economic, social, or cultural growth in the City • Does not align with Secondary Plan problem statement	✗

Phase 1 – Présélection d’options conceptuelles

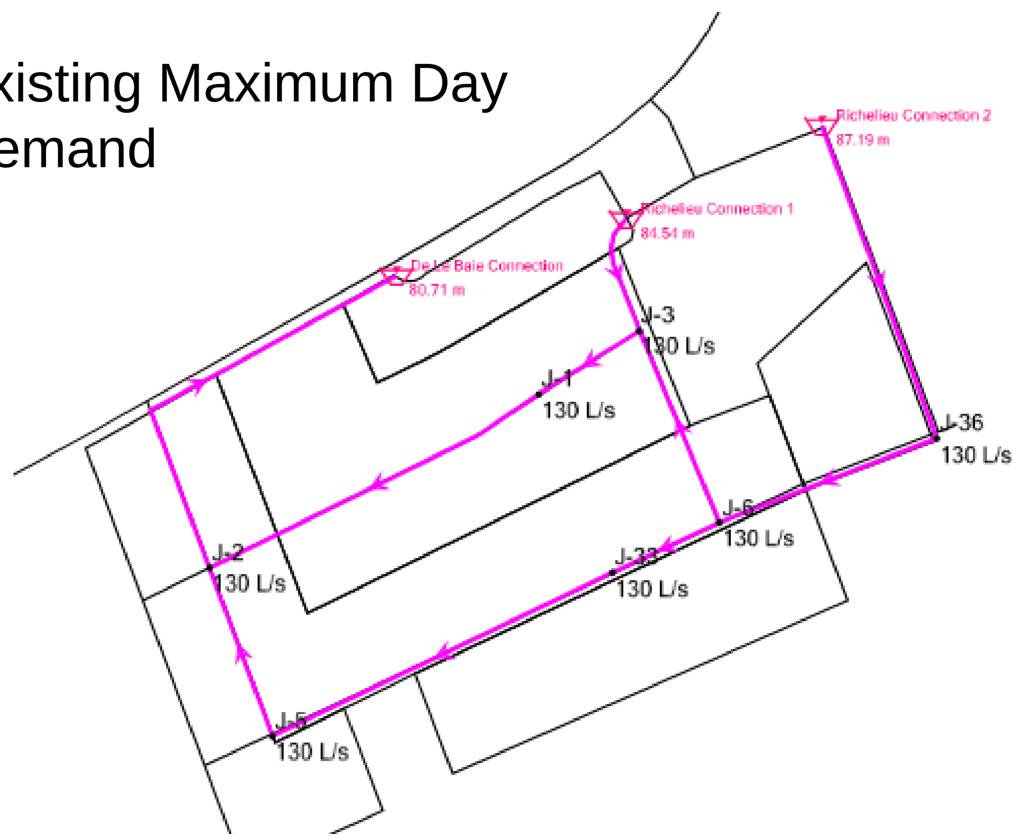
Description	Avantages	Inconvénients	Reporté?
Option 1	• Préserve le corridor naturel de la voie navigable • Ajout d’un parc d’affaires, d’un parc commercial de services, d’un noyau commercial et de zones d’utilisation du sol résidentielles à haute et moyenne densité • Grande diversité d’utilisation des terres • Rue principale axée sur les piétons inclus dans le noyau commercial	• Flux de trafic relativement complexe • Augmentation de la circulation avec l’ajout de routes collectrices principales et secondaires	✓
Option 2	• Le plus grand pourcentage de superposition environnementale • Ajout d’un parc d’affaires et de zones d’utilisation du sol central commercial • Rue principale axée sur les piétons inclus dans le noyau commercial	• Superposition de petits espaces environnementaux et ouverts • Augmentation de la circulation avec l’ajout de routes collectrices principales et secondaires • Diversité minimale de l’utilisation des terres • Aucun terrain n’est alloué à l’usage résidentiel • Flux de trafic relativement complexe • La superposition des aménagements futurs ne précise pas l’utilisation immédiate des terres	✘
Option 3	• Préserve le corridor naturel des cours d’eau • Ajout d’un parc d’affaires, d’un terrain commercial de service et d’une utilisation résidentielle de densité moyenne • Flux de trafic relativement simple • Le plus grand pourcentage d’utilisation des terres des parcs d’affaires à forte demande	• Pas de centre commercial axé sur les piétons • Augmentation de la circulation avec l’ajout de routes collectrices principales et secondaires • Diversité minimale de l’utilisation des terres	✓
Option 4 – Ne rien faire	• Préserve l’environnement naturel de SSA1	• Ne soutient pas la croissance économique, sociale ou culturelle de la ville • Ne correspond pas à l’énoncé du problème du plan secondaire	✘

Phase 2 – Water Servicing Evaluation

Existing Fire Flow



Existing Maximum Day Demand

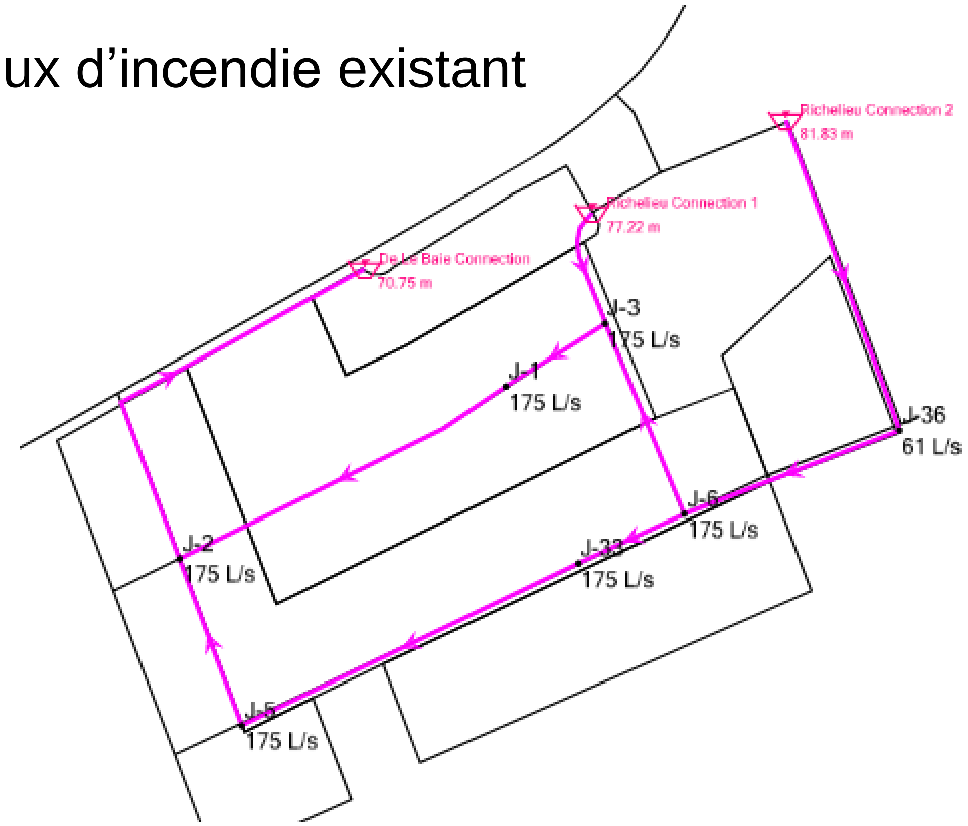


Analysis for concept options 1 & 3:

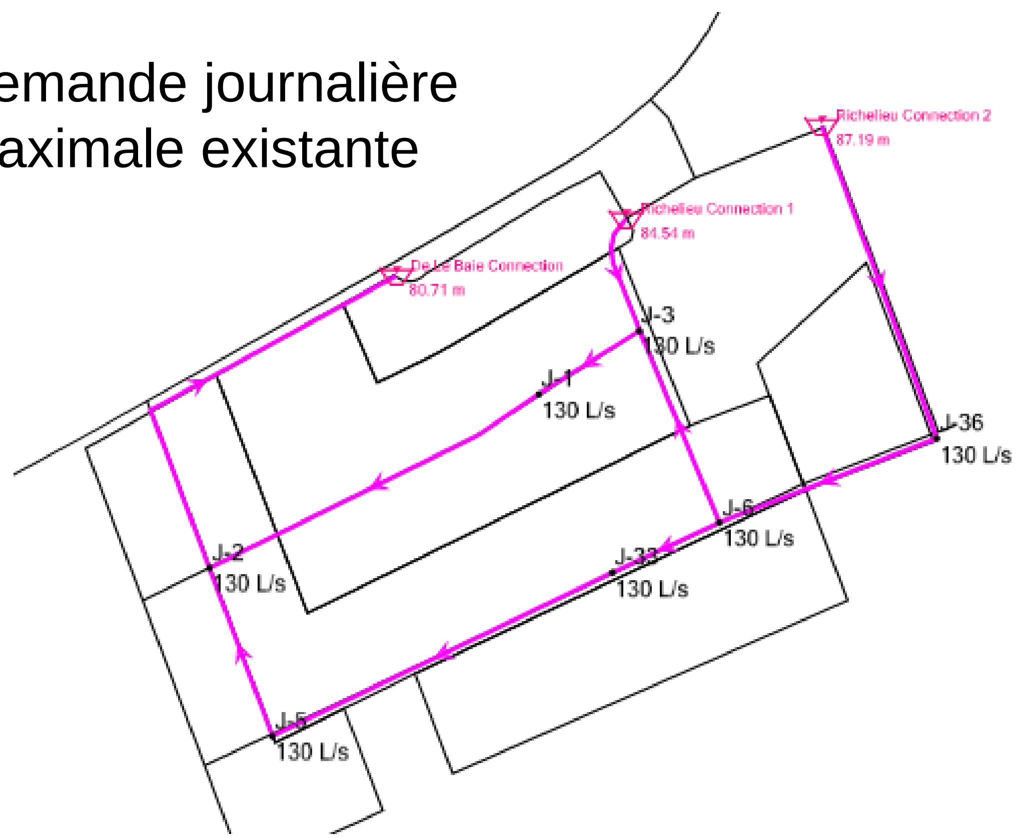
- 300 mm watermain loop proposed
- Three proposed connections to the existing distribution system:
    - Easterly cul-de-sac on De La Baie Rd.
    - East of Richelieu St. +/- 40 m south of De La Baie Rd.
    - Intersection of Richelieu St. and Poupart Rd.
- 175 L/s is available everywhere with existing system except southeast corner (high elevation)
- 283 L/s required to reach target fire flow
- Pressures are within MECP guidelines for average and maximum day demand

Phase 2 – Évaluation du réseau d’eau

Flux d’incendie existant



Demande journalière maximale existante



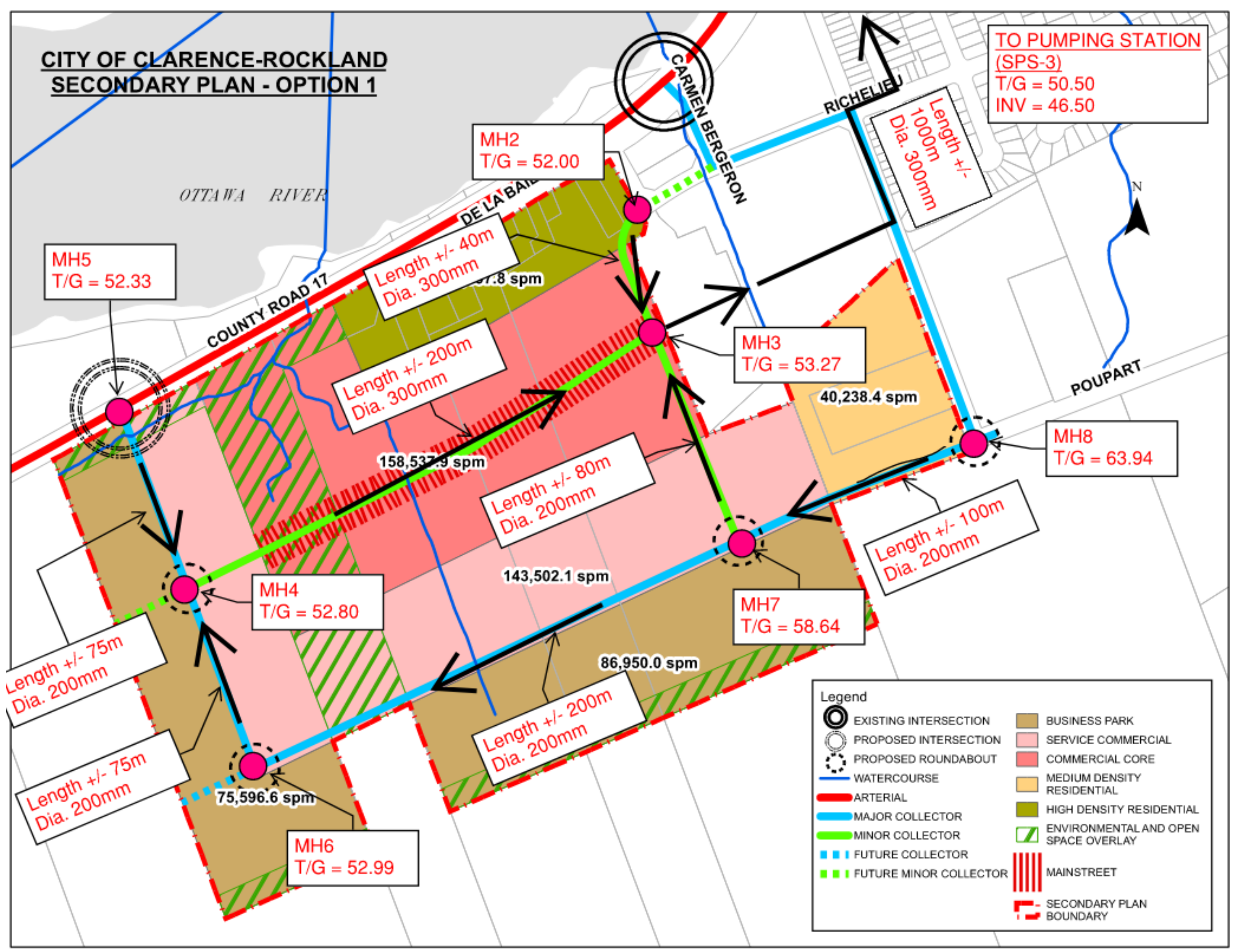
Analyse des options de concept 1 et 3 :

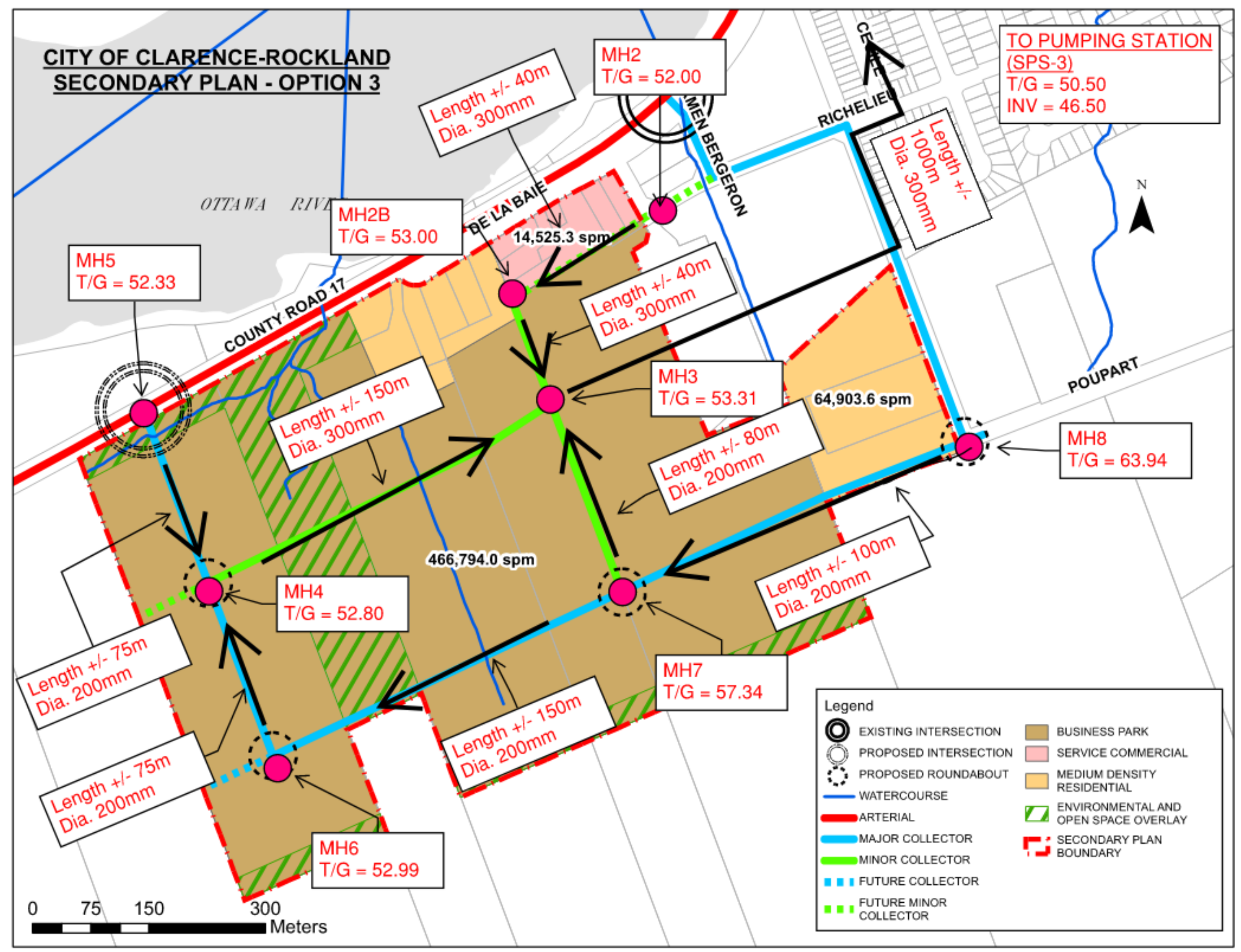
- Boucle d’aqueduc de 300 mm proposée
- Trois projets de raccordement au réseau de distribution existant :
    - Cul-de-sac vers l’est sur le chemin De La Baie
    - À l’est de la rue Richelieu, +/- 40 m au sud du chemin De La Baie
    - Intersection de la rue Richelieu et du chemin Poupart
- 175 L/s est disponible partout avec le système existant, sauf dans le coin sud-est (haute élévation)
- 283 L/s nécessaires pour atteindre le débit ciblé
- Les pressions sont conformes aux lignes directrices du MECP pour la demande journalière moyenne et maximale

Phase 2 – Sanitary Servicing Evaluation

Analysis for concept options 1 & 3:

- Wastewater discharges to pumping station northeast of Laurier St. and Laporte St. (SPS-3)
- Wastewater to be conveyed through 200 mm and 300 mm pipes, with smaller diameters upstream
- Invert elevation of +/- 46.5m was set at the pumping station to have sufficient cover upstream

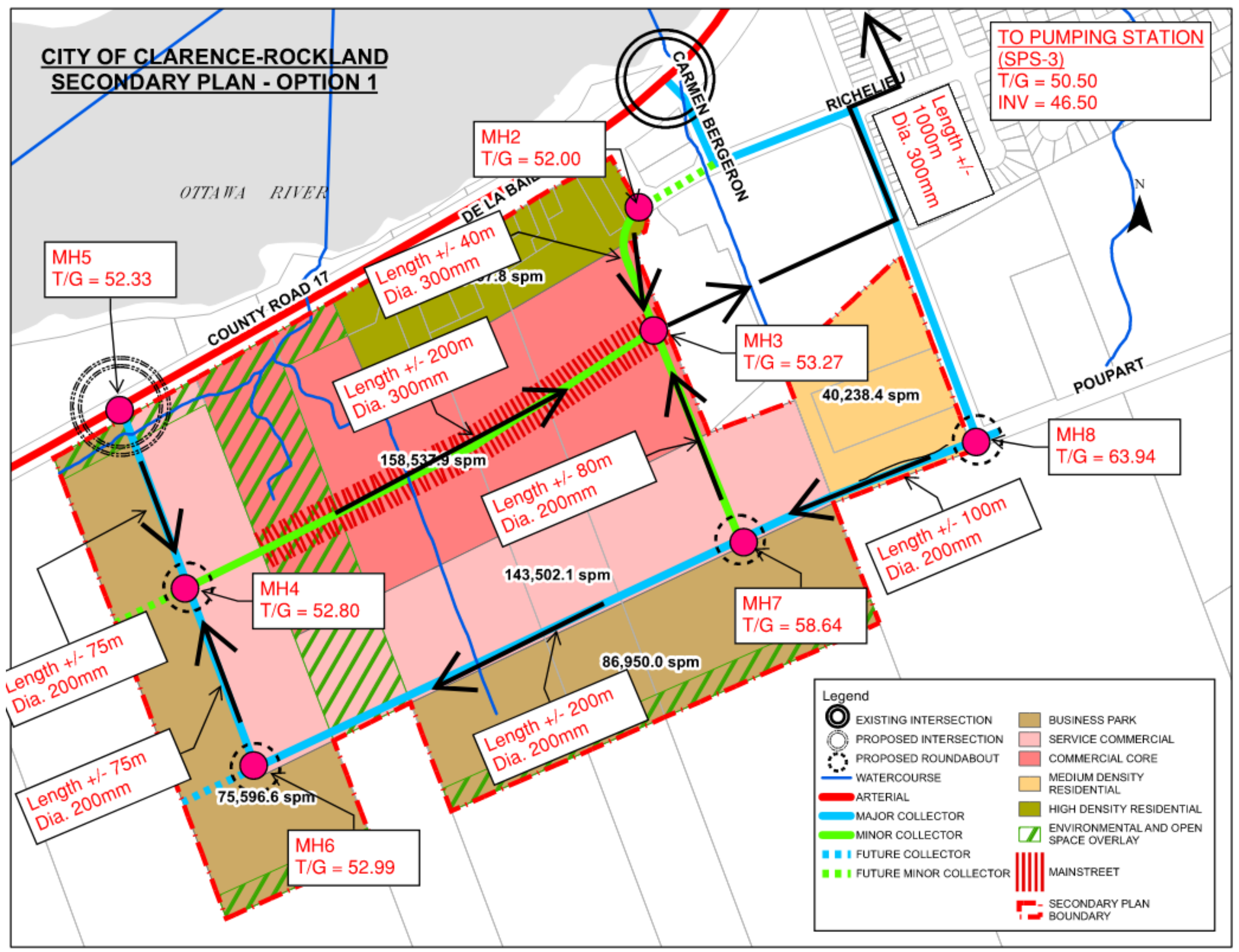


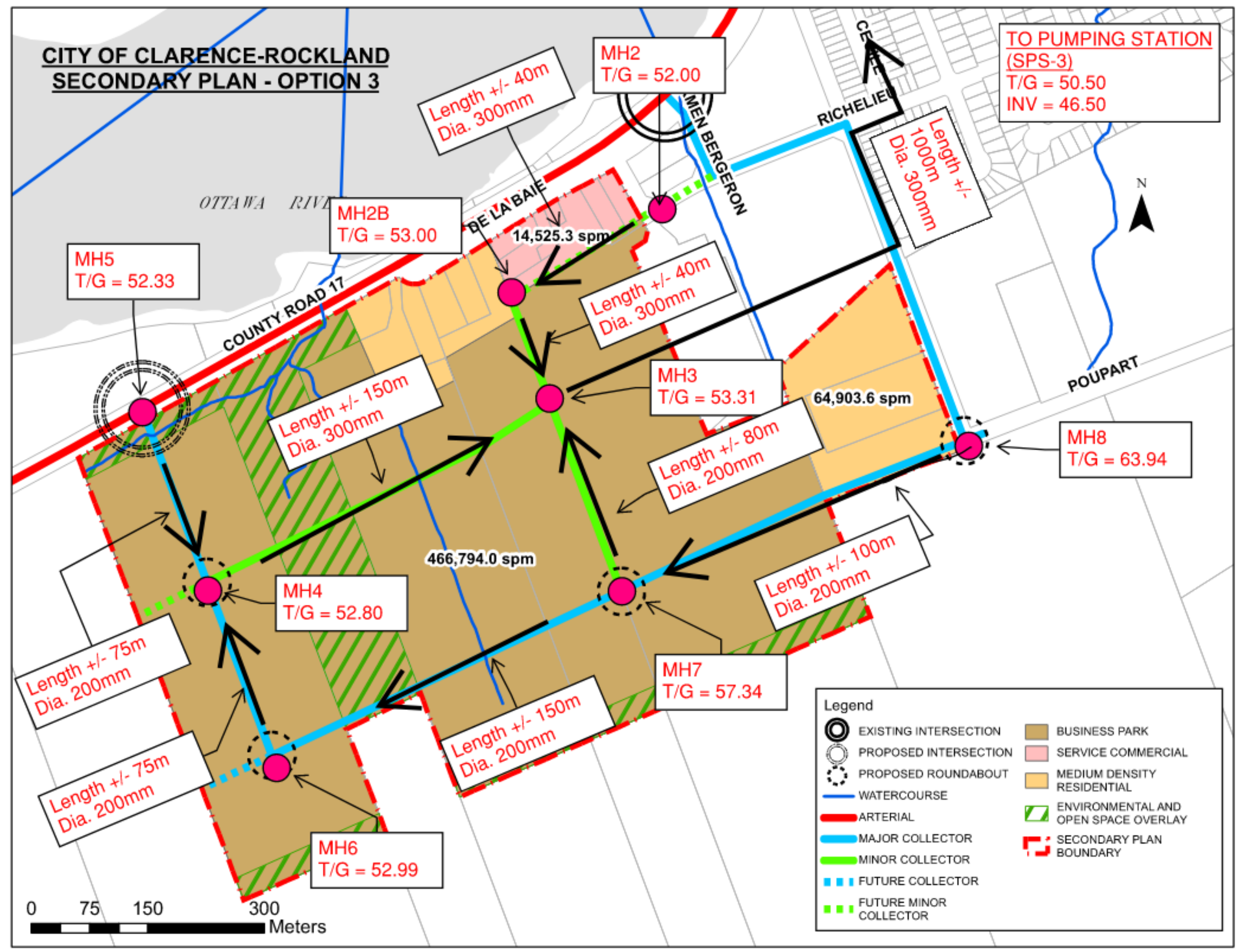


Phase 2 – Évaluation du réseau sanitaire

Analyse des options de concept 1 et 3 :

- Rejets d’eaux usées à la station de pompage au nord-est des rues Laurier et Laporte (SPS-3)
- Les eaux usées doivent être acheminées par des tuyaux de 200 mm et 300 mm, avec des diamètres plus petits en amont
- Une élévation de +/- 46,5 m a été fixée à la station de pompage afin d’avoir une couverture suffisante en amont





Phase 2 – Storm Water Evaluation

Analysis for concept options 1 & 3:

- Business Park and Commercial areas to release to the minor system and detain the 1:100 year on-site
- Residential areas to have dual drainage with minor system and major overland flow system
- Three wet ponds for quantity and quality control and one dry pond for quantity control only proposed
- Minor piped system varies up to 1500 mm diameter sewer

Phase 2 – Évaluation des eaux pluviales

Analyse des options de concept 1 et 3 :

- Le parc d'affaires et les zones commerciales seront libérés dans le système mineur et détiendront le 1:100 ans sur le site.
- Les zones résidentielles doivent être dotées d'un double système de drainage avec un système mineur et un système d'écoulement de surface majeur
- Trois étangs humides pour le contrôle de la quantité et de la qualité et un étang sec pour le contrôle de la quantité seulement est proposés
- Le système de canalisations mineures varie jusqu'à 1500 mm de diamètre d'égout pluvial.

Phase 2 – Transportation Evaluation

Proposed Roundabout Level of Service

Street 1/Street 2 (single lane)

Street 1 / Street 2	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	F(F)	218.2(312.6)	NBL(NBL)	186.8(178.2)	F(F)
Option 3	A(A)	9.8(9.1)	WBL(WBL)	5.2(4.6)	A(A)

Street 1/Street 2 (two lane)

Street 1 / Street 2	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	C(B)	26.9(16.0)	EBL(EBL)	11.0(7.5)	B(A)

Street 1/Street 3 (single lane)

Street 1 / Street 3	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	B(B)	11.5(10.6)	EBL(EBL)	5.6(5.3)	A(A)
Option 3	A(A)	8.2(7.9)	EBL(EBL)	5.3(4.5)	A(A)

Street 3/Street 4 (single lane)

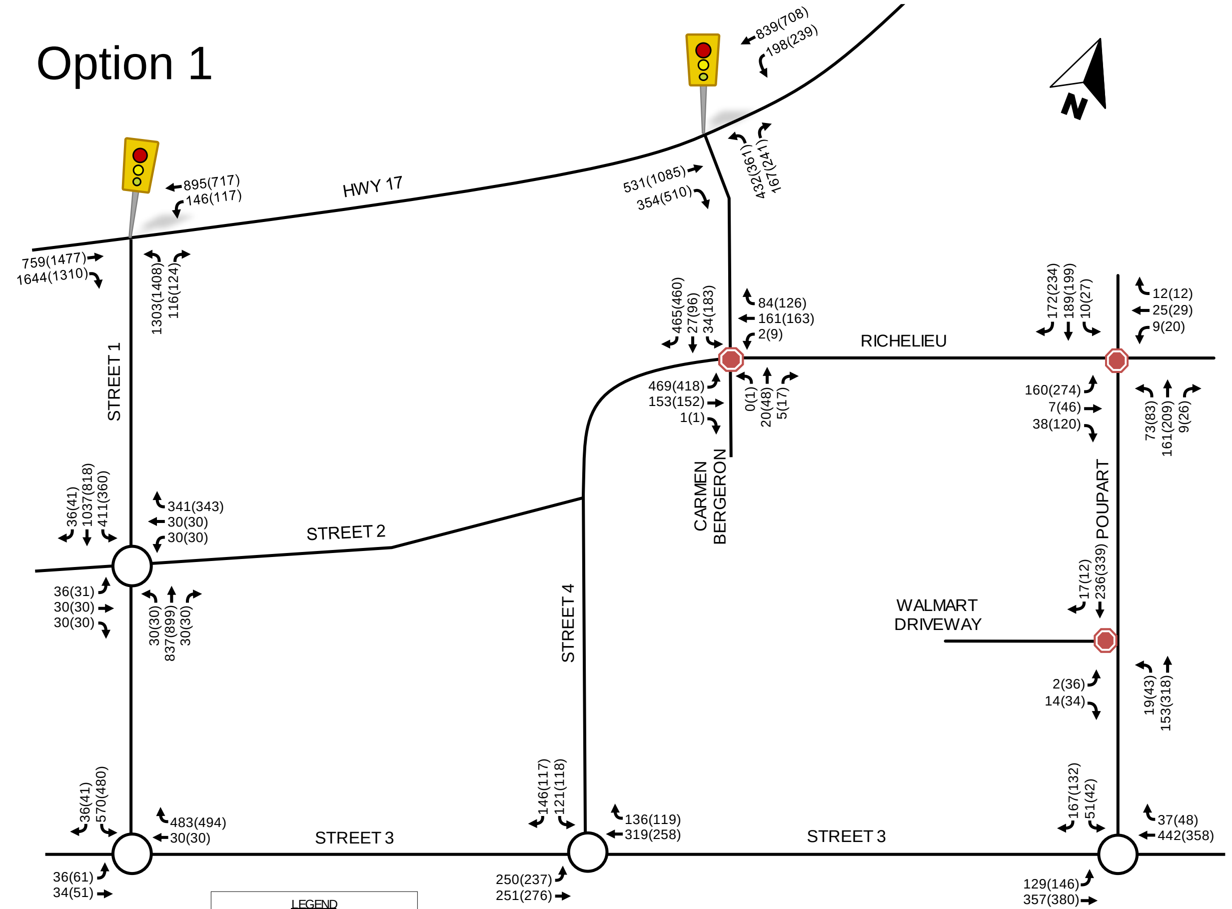
Street 3 / Street 4	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	A(A)	9.8(9.2)	SBL(SBL)	6.0(5.8)	A(A)
Option 3	A(A)	7.7(7.6)	SBL(SBL)	4.5(4.4)	A(A)

Street 3/Poupart (single lane)

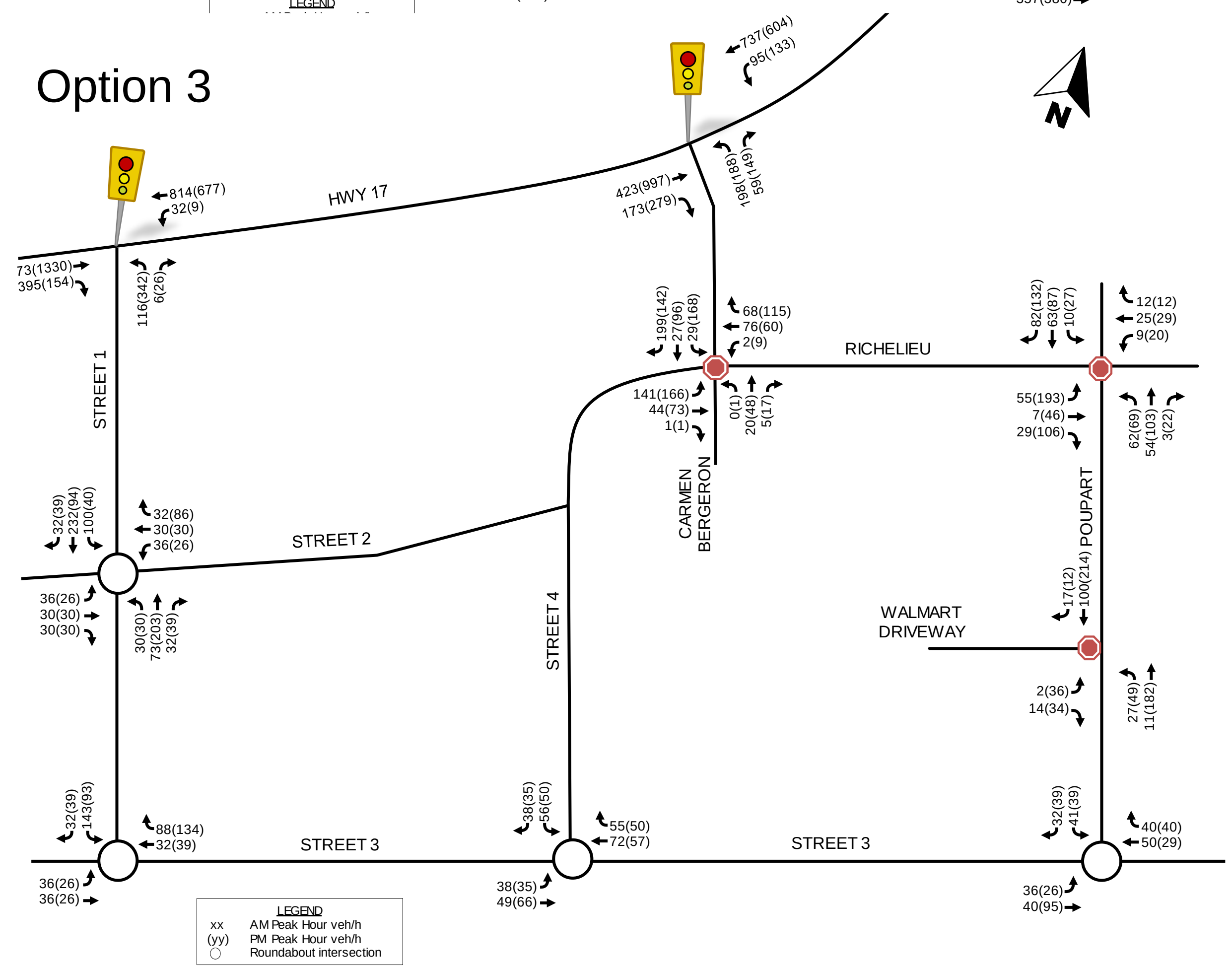
Street 3 / Poupart	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	B(B)	10.8(10.0)	SBL(SBL)	4.6(4.5)	A(A)
Option 3	A(A)	7.6(7.5)	SBL(SBL)	4.5(4.1)	A(A)

Projected Peak Hour Traffic Volumes

Option 1



Option 3



Phase 2 – Évaluation des transports

Niveau de service proposé pour les carrefours giratoires

Rue 1/Rue 2 (voie unique)

Street 1 / Street 2	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	F(F)	218.2(312.6)	NBL(NBL)	186.8(178.2)	F(F)
Option 3	A(A)	9.8(9.1)	WBL(WBL)	5.2(4.6)	A(A)

Rue 1/Rue 2 (deux voies)

Street 1 / Street 2	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	C(B)	26.9(16.0)	EBL(EBL)	11.0(7.5)	B(A)

Rue 1/Rue 3 (voie unique)

Street 1 / Street 3	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	B(B)	11.5(10.6)	EBL(EBL)	5.6(5.3)	A(A)
Option 3	A(A)	8.2(7.9)	EBL(EBL)	5.3(4.5)	A(A)

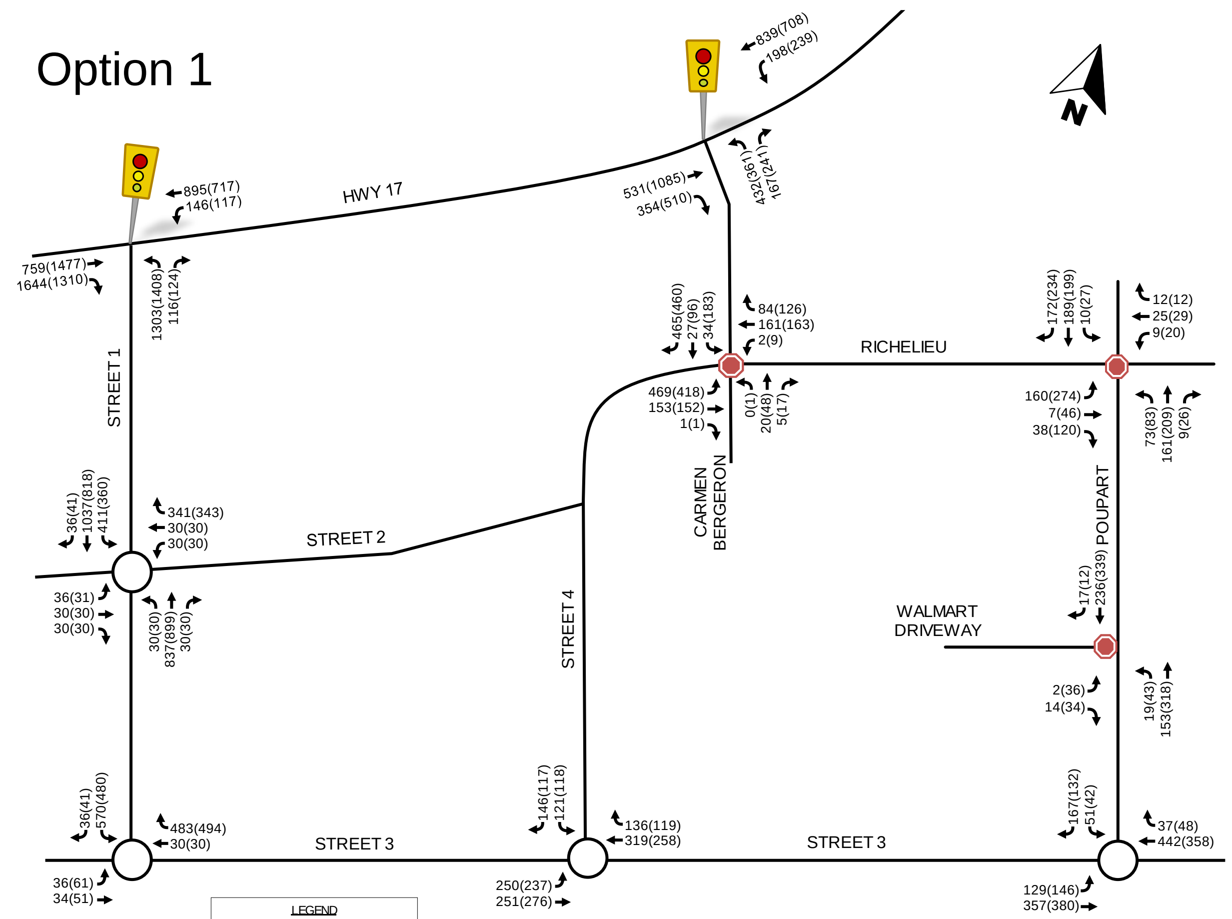
Rue 3/Rue 4 (voie unique)

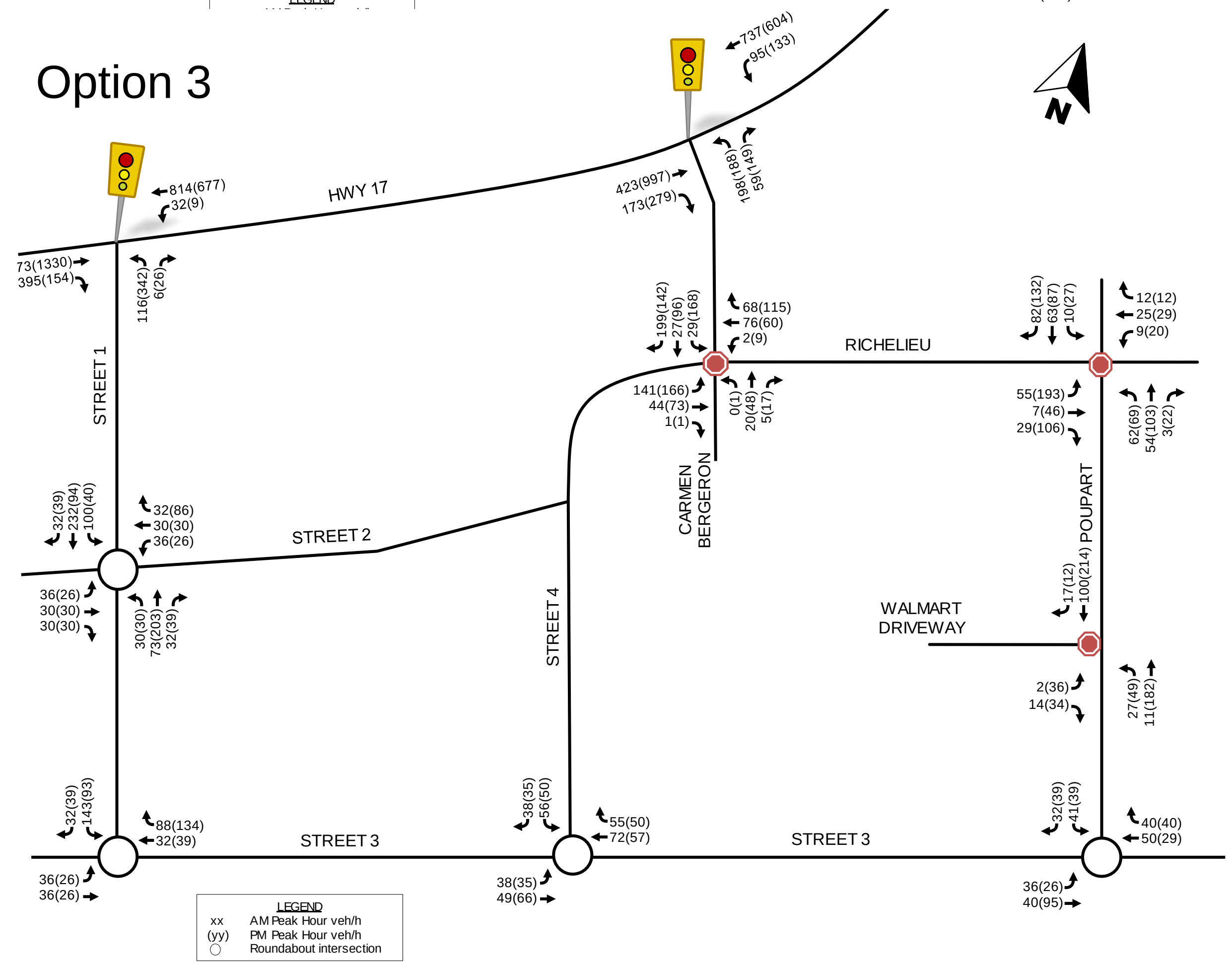
Street 3 / Street 4	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	A(A)	9.8(9.2)	SBL(SBL)	6.0(5.8)	A(A)
Option 3	A(A)	7.7(7.6)	SBL(SBL)	4.5(4.4)	A(A)

Rue 3/Poupart (voie unique)

Street 3 / Poupart	AM Peak (PM Peak)				
	Critical Movement			Intersection	
	LOS	avg. delay (s)	Movement	Delay (s)	LOS
Option 1	B(B)	10.8(10.0)	SBL(SBL)	4.6(4.5)	A(A)
Option 3	A(A)	7.6(7.5)	SBL(SBL)	4.5(4.1)	A(A)

Volumes de trafic prévus aux heures de pointe





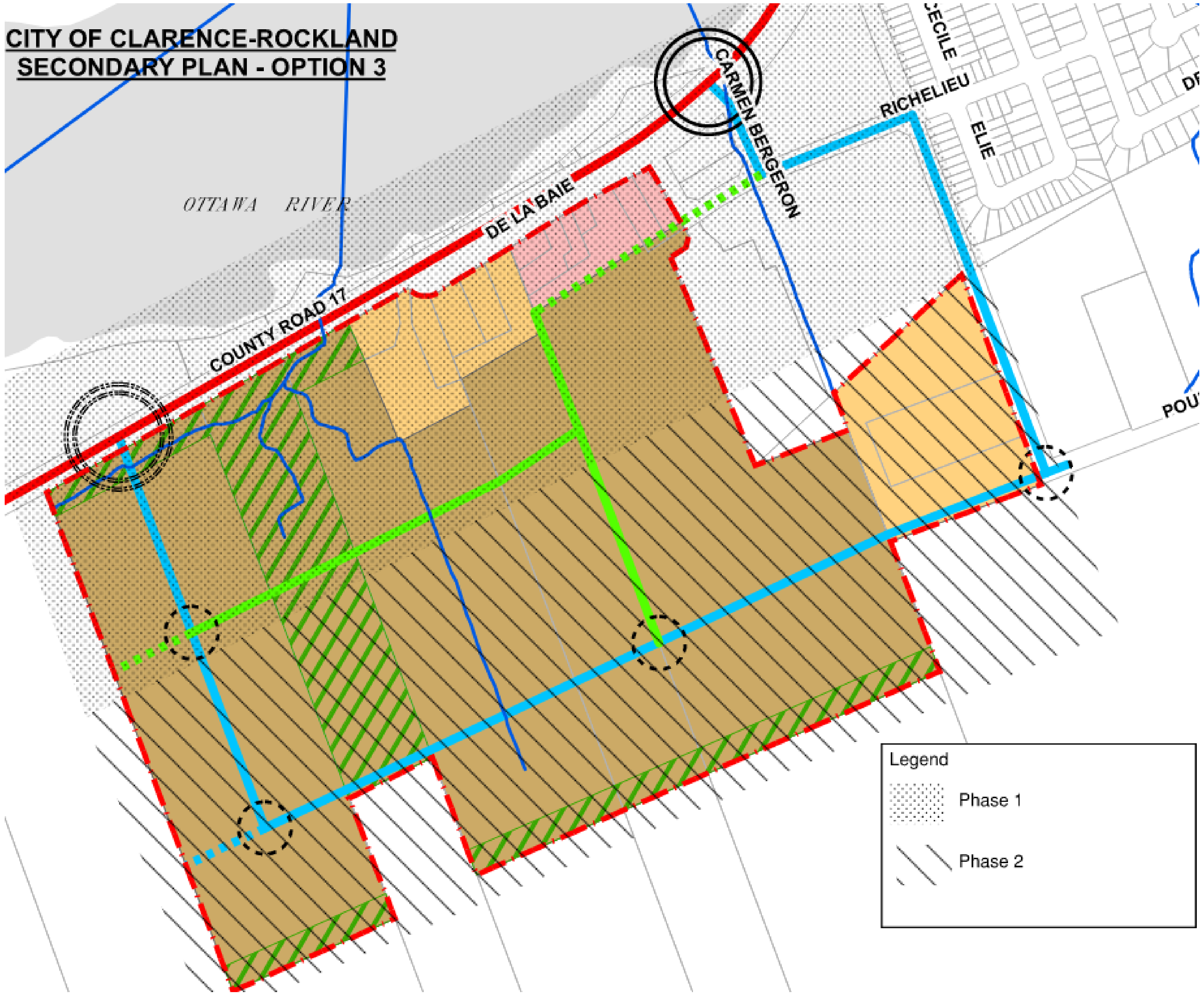
Phase 2 – Evaluation Matrix

	Option 1	Option 3
Natural Environment	•Greater waste generation and air and noise pollution (due to higher populations) •Minimal potential impact to natural heritage environment •Inclusion of environmental and open space overlay	•Minimal potential impact to natural heritage environment •Inclusion of environmental and open space overlay
Evaluation	**Less Preferred**	**Preferred**
Social and Cultural Environment	•Highest increase in traffic through Study Area •Inclusion of pedestrian friendly commercial main corridor (lesser demand land use)	•Greatest increase in highest-demand business park area
Evaluation	**Less Preferred**	**Preferred**
Technical Feasibility	•Three (3) water connections to existing distribution system •Expected max day water demand plus fire flow that the existing distribution system can accomplish is less than required fire flow target •Residential areas will require dual drainage with minor system and major overland flow system for storm water •Business Park and Commercial areas will release to the minor system and detain the 1:100 year on-site •Four (4) stormwater ponds required •Single-lane roundabouts to manage traffic at all intersections except street 1/street 2 •Two-lane intersection to manage projected traffic at street 1/street 2	•Three (3) water connections to existing distribution system •Expected max day water demand plus fire flow that the existing distribution system can accomplish is less than required fire flow target •Residential areas will require dual drainage with minor system and major overland flow system for storm water •Business Park and Commercial areas will release to the minor system and detain the 1:100 year on-site •Four (4) stormwater ponds required •Single-lane roundabouts to manage traffic at all intersections
Evaluation	**Less Preferred**	**Preferred**
Financial Considerations	•Increase in economic activity in region •High servicing and transit network capital cost	•Increase in economic activity in region •High servicing and transit network capital cost
Evaluation	**Less Preferred**	**Less Preferred**
Overall Evaluation	**Less Preferred**	**Preferred**

Phase 2 – Matrice d'évaluation

	Option 1	Option 3
Environnement naturel	•Augmentation de la production de déchets et de la pollution atmosphérique et sonore (en raison de l'augmentation de la population) •Impact potentiel minimal sur l'environnement du patrimoine naturel •Inclusion d'une superposition d'environnement et d'espace ouvert	•Impact potentiel minimal sur l'environnement du patrimoine naturel •Inclusion d'une superposition d'environnement et d'espace ouvert
Évaluation	**Moins Préféré**	**Préféré**
Environnement social et culturel	•Plus forte augmentation de la circulation dans la zone d'étude •Inclusion d'un corridor principal commercial convivial pour les piétons (utilisation du sol à faible demande)	•Plus forte augmentation de la demande dans la zone de parc d'affaire
Évaluation	**Moins Préféré**	**Préféré**
Faisabilité technique	•Trois (3) raccordements d'eau au réseau de distribution existant •La demande maximale d'eau par jour et le débit d'incendie que le réseau de distribution existant peut atteindre sont inférieurs à l'objectif de débit d'incendie requis •Les zones résidentielles nécessiteront un double système de drainage avec un système mineur et un système d'écoulement de surface majeur pour les eaux pluviales •Le parc d'affaires et les zones commerciales seront libérés dans le système mineur et conserveront le 1:100 ans sur le site •Quatre (4) bassins d'eaux pluviales requis •Carrefours giratoires à voie unique pour gérer la circulation à toutes les intersections, à l'exception de la rue 1 et de la rue 2 •Intersection à deux voies pour gérer la circulation prévue à l'intersection de la rue 1 et de la rue 2	•Trois (3) raccordements d'eau au réseau de distribution existant •La demande maximale d'eau par jour et le débit d'incendie que le réseau de distribution existant peut atteindre sont inférieurs à l'objectif de débit d'incendie requis •Les zones résidentielles nécessiteront un double système de drainage avec un système mineur et un système d'écoulement de surface majeur pour les eaux pluviales •Le parc d'affaires et les zones commerciales seront libérés dans le système mineur et conserveront le 1:100 ans sur le site •Quatre (4) bassins d'eaux pluviales requis •Des carrefours giratoires à voie unique pour gérer la circulation à toutes les intersections
Évaluation	**Moins Préféré**	**Préféré**
Considérations financières	•Augmentation de l'activité économique dans la région •Coûts d'investissement élevés pour l'entretien et le réseau de transport en commun	•Augmentation de l'activité économique dans la région •Coûts d'investissement élevés pour l'entretien et le réseau de transport en commun
Évaluation	**Moins Préféré**	**Moins Préféré**
Évaluation globale	**Moins Préféré**	**Préféré**

Phase 2 – Proposed Project Phasing



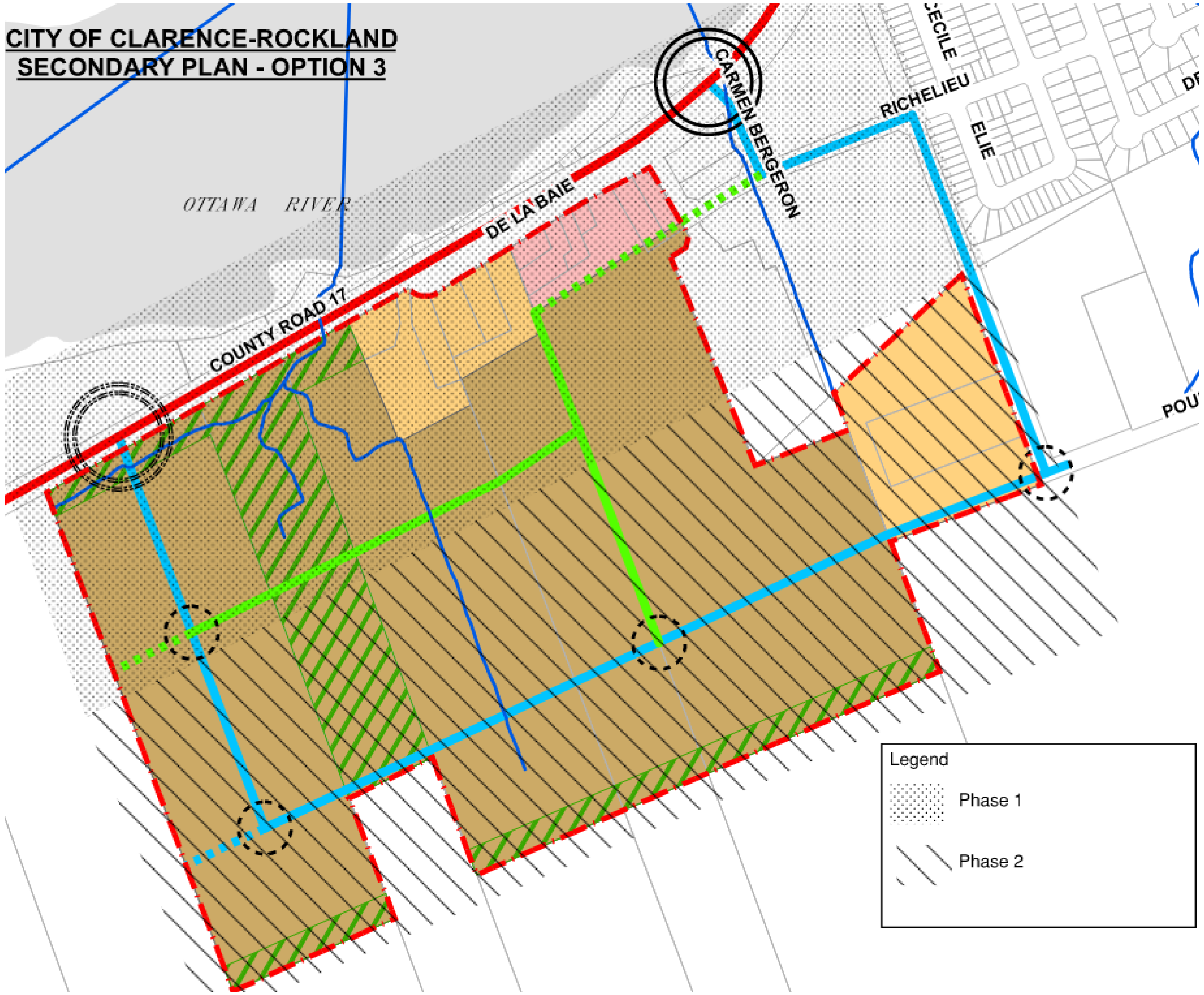
Phase 1:

- North of Street 2
- All roadways, watermains, sewers in area
- All water connections
- Connection to SPS-3
- All storm water ponds

Phase 2:

- South of Street 2
- Remaining roadways, watermains and sewers

Phase 2 – Phasage du projet proposé



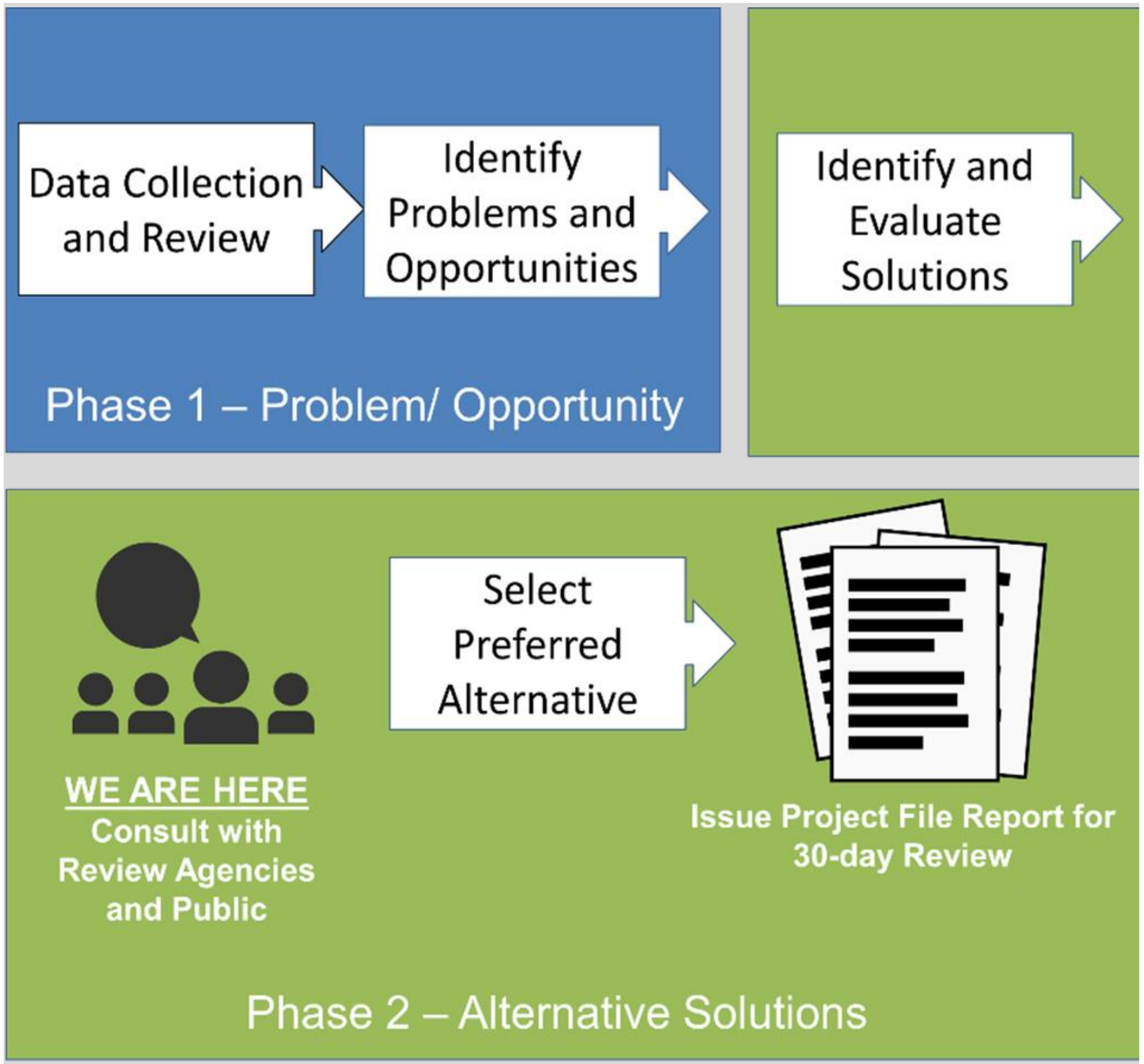
Phase 1:

- Au nord de la rue 2
- Toutes les routes, les conduites d’eau principales, les égouts dans le secteur
- Tous les raccordements d’eau
- Connexion à SPS-3
- Tous les bassins d’eaux pluviales

Phase 2:

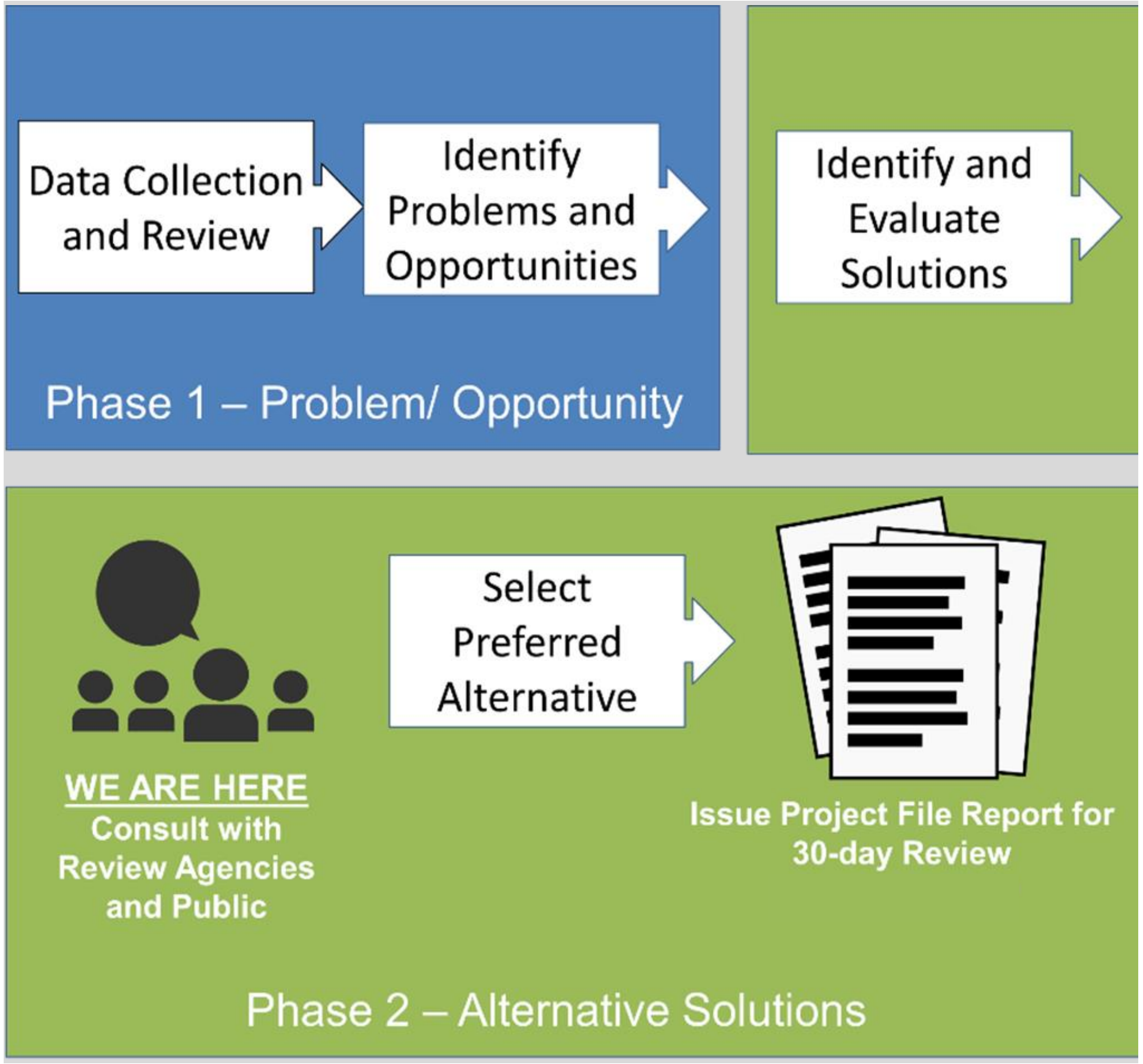
- Au sud de la rue 2
- Routes, conduites d’eau principales et égouts restants

Next Steps



- Finalize Phase 1 & 2 of the Master Plan process. This includes:
  - ✓ The identification and in-depth evaluation of the preferred strategies and actions to address the problems and opportunities identified in Phase 1
  - ✓ Obtain and evaluate public, stakeholders and agency comments and confirm preferred solution.
- Prepare Official Plan Amendment to the City of Clarence-Rockland's Urban Area Official Plan for inclusion of the Secondary Plan.
- Issue Notice of Completion.
- Finalize Class EA after 30-day public review period.

Prochaines étapes



- Finaliser les phases 1 et 2 du processus du plan directeur. Il s'agit notamment de:
  - ✓ L'identification et l'évaluation approfondie des stratégies et des actions privilégiées pour résoudre les problèmes et les opportunités identifiés dans la Phase 1
  - ✓ Recueillir et évaluer les commentaires du public, des agences et des organismes et confirmer la solution préférée.
- Préparer la modification du Plan officiel au Plan officiel de l'aire urbaine de la Cité de Clarence-Rockland en vue de l'inclusion du Plan secondaire.
- Émettre un avis d'achèvement.
- Finaliser l'évaluation environnementale de portée générale après une période d'examen public de 30 jours.

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