

Corporation of the City of Cornwall

# Municipal Class Environmental Assessment for the Proposed Improvement and Extension of Lemay Street

**Prepared by:**

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September 6, 2016

Mr. Steve Wintle, C.E.T.  
City Project Manager  
City of Cornwall  
1225 Ontario Street  
Cornwall, Ontario  
K6H 5T9

Dear Mr. Wintle:

**Project No: 60337734**  
**Regarding: Municipal Class Environmental Assessment for the Proposed Improvement and Extension of Lemay Street**

I am sending you the final version of the Environmental Study Report. Thank you for the opportunity to work on this project.

Sincerely,  
**AECOM Canada Ltd.**



Vanessa Skelton, P. Eng.  
Senior Transportation Engineer  
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# Quality Information

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# Executive Summary

The City of Cornwall undertook a Schedule “C” Municipal Class Environmental Assessment (Class EA study) for the proposed improvement and extension of Lemay Street. The City’s Official Plan and 2006 Critical Infrastructure Review identified the need to extend Lemay Street to provide additional east-west capacity and improve access to the municipal works yard on Ontario Street. Additionally, emergency services vehicles that are fueled at the municipal works yard will have better connections to the road network with another link to McConnell Avenue.

The project limits included the corridor of Lemay Street and Thirteenth Street from Pitt Street to McConnell Avenue. The existing City of Cornwall municipal works yard is located south of Lemay Street and east of St. Michel Avenue.

The Class EA process encourages effective consultation as a key component of EA planning. To meet this objective, notifications were provided to the public, interested parties and affected agencies and Aboriginal communities. In addition to formal notices, two Public Information Centres were held for this project, there was a media release and web site posting of information, public review of study documentation and a presentation was made to the City of Cornwall municipal council.

Existing conditions in the study area were investigated, which included review of the social, natural, cultural and physical environments. This involved data collection, a review of previous studies, secondary source data collection, and field inventories of the natural, social, and cultural environments. Further site investigations recommended during this Class EA study will be completed as required during the detailed design phase.

Based on the existing conditions information, alternative solutions were identified and evaluated according to criteria related to transportation, natural environment, socio-cultural environment, infrastructure/utilities, and cost. The evaluation of alternative solutions was presented at Public Information Centre #1. Connecting Lemay Street was identified as the preferred alternative solution and it was carried forward for further study. Public Information Centre #2 presented the evaluation of the alternative design concepts as well as the preliminary preferred alternative design.

The preferred alternative design selected involves a straight connection between the two sections of Lemay Street as well as cycling lanes and sidewalks. Two intersections will be converted to full access roundabouts: at Thirteenth Street East/ Reneal Street/ Lemay Street/Sydney Street and at Lemay Street/ McConnell Avenue. Some property and utility impacts are identified and are addressed in the mitigation measures included with this report.

The proposed alternative design solution satisfies the project’s needs and opportunities by improving traffic operations at the intersection of Thirteenth Street/Lemay Street at Sydney Street and improves the accessibility to the municipal works yard. It also provides residents of Cornwall with more choice of roads in the east-west direction, improves emergency response time and enhances connectivity for active transportation with the addition of cycling lanes and sidewalks. The recommended plan is illustrated on the drawings in Appendix A.

# Table of Contents

	page
<b>1. Introduction .....</b>	<b>1</b>
1.1 Study Purpose .....	1
1.2 Study Area .....	1
1.3 Environmental Assessment Requirements .....	1
<b>2. Consultation .....</b>	<b>3</b>
2.1 Consultation Process .....	3
2.2 Notices .....	3
2.3 Public Information Centres .....	3
2.3.1 Public Information Centre #1 .....	3
2.3.2 Public Information Centre #2 .....	4
2.3.3 Media Release .....	4
2.4 Aboriginal Consultation .....	5
<b>3. Project Need and Opportunities .....</b>	<b>5</b>
3.1 Existing Transportation .....	5
3.1.1 Road Network Overview .....	5
3.1.2 Roads .....	6
3.1.3 Intersections .....	7
3.1.4 Traffic Volumes .....	7
3.1.5 Traffic Operations .....	10
3.1.6 Cycling and Pedestrians .....	11
3.1.7 Transit .....	11
3.1.8 Safety .....	11
3.2 Future Traffic Conditions .....	13
3.2.1 Future Traffic Volumes .....	13
3.2.2 Future Traffic Operations .....	15
3.3 Yard Accessibility .....	15
3.4 Network Connectivity .....	16
3.5 Project Need and Opportunities Conclusion .....	16
<b>4. Existing Conditions .....</b>	<b>17</b>
4.1 Introduction .....	17
4.2 Natural Environment .....	17
4.2.1 Aquatic Habitat and Setting .....	17
4.2.2 Terrestrial and Wetland Habitats Summary .....	18
4.2.3 Wildlife .....	19
4.2.4 Flora .....	19
4.3 Land Use and Noise .....	19
4.4 Geotechnical and Hydrogeological .....	22
4.4.1 Background Studies .....	22
4.4.2 Description of Site .....	22

4.5	Drainage and Stormwater Management.....	23
4.6	Utilities .....	24
4.6.1	Water Services .....	24
4.6.2	Sanitary Sewer System .....	24
4.6.3	Hydro .....	24
4.6.4	Bell Aliant.....	24
4.7	Contamination .....	25
4.8	Archaeology/Heritage .....	26
4.8.1	Stage 1 Archaeological Assessment .....	26
4.8.2	Stage 2 Archaeological Assessment .....	27
<b>5.</b>	<b>Alternative Solutions .....</b>	<b>29</b>
5.1	Description.....	29
5.2	Evaluation.....	32
5.3	Preferred Solution.....	35
<b>6.</b>	<b>Alternative Designs .....</b>	<b>35</b>
6.1	Thirteenth Street between Pitt Street and Sydney Street.....	35
6.2	Intersection of Lemay Street / Thirteenth Street and Sydney Street / Reneal Street .....	36
6.3	Lemay Street Connection .....	38
6.4	Intersection of Lemay Street and McConnell Avenue .....	38
6.5	Evaluation of Alternative Designs.....	40
6.6	Selection of the Technically Preferred Alternative.....	46
<b>7.</b>	<b>Project Description .....</b>	<b>46</b>
7.1	Description of the Recommended Plan .....	46
7.2	Property Impacts .....	49
7.3	Municipal Services.....	50
7.4	Drainage and Stormwater Management.....	50
7.5	Geotechnical and Hydrogeological.....	50
7.6	Utilities .....	51
7.7	Cost .....	51
<b>8.</b>	<b>Impacts and Proposed Mitigation Measures .....</b>	<b>52</b>
8.1	Natural Environment.....	52
8.1.1	Species at Risk (SAR) .....	52
8.1.2	Terrestrial.....	53
8.1.3	Aquatic Wildlife and Habitat.....	54
8.2	Noise .....	54
8.3	Landscaping .....	54
8.4	Property Impacts .....	54
8.5	Drainage and Stormwater Management.....	54
8.6	Utilities and Services .....	55
8.7	Contamination .....	55
8.8	Archaeology/Heritage .....	55
8.9	Potential Impacts during Construction.....	55

## List of Figures

Figure 1-1. Project Study Area .....	1
Figure 1-2. Municipal Class EA Process .....	2
Figure 3-1. Key Corridors in the City of Cornwall .....	6
Figure 3-2. Existing Traffic Volumes .....	9
Figure 3-3. Collisions within Study Area .....	12
Figure 3-4. Future (2020) Traffic Volumes.....	14
Figure 3-5. Location of City of Cornwall Municipal Works Yard .....	16
Figure 4-1. Natural Heritage Study Area .....	18
Figure 4-2. Existing Land Use in Study Area .....	21
Figure 4-3. Archaeological Potential in Study Area .....	28
Figure 5-1. East-West Corridor Options .....	30
Figure 5-2. Lemay Street EA Noise Impacts .....	31

## List of Tables

Table 3-1. Level of Service Criteria .....	10
Table 3-2. Existing Intersection Operations.....	10
Table 3-3. Collision History.....	11
Table 3-4. Actual Collisions vs Expected Collisions .....	12
Table 3-5. Future (2020) Intersection Operations .....	15
Table 4-1. Potential Environmental Concerns .....	26
Table 5-1. Evaluation Criteria Rationale and Measures.....	32
Table 5-2. Evaluation of Alternative Solutions.....	34
Table 6-1. Lemay Street at Sydney Street Operational Results for 2020 .....	37
Table 6-2. Lemay Street at McConnell Avenue Operational Results for 2020.....	39
Table 6-3. Description of Evaluation Criteria .....	41
Table 6-4. Evaluation of Alternative Designs for Thirteenth Street between Sydney Street and Pitt Street.....	42
Table 6-5. Evaluation of Alternative Designs for intersection of Lemay Street / Thirteenth Street and Sydney Street .....	43
Table 6-6. Evaluation of Alternative Designs for Lemay Street road connection.....	44
Table 6-7. Evaluation of Alternative Designs for Intersection of Lemay Street and McConnell Avenue .....	45
Table 8-1. Potential Effects and Mitigation Measures .....	57

## Appendices

Appendix A.	Recommended Plan
Appendix B.	Summary of Consultation
Appendix C.	Natural Environment Report
Appendix D.	Phase 1 Environmental Site Assessment
Appendix E.	Archaeological Assessment

# 1. Introduction

## 1.1 Study Purpose

The City of Cornwall undertook a Schedule “C” Municipal Class Environmental Assessment (Class EA) study for the proposed improvement and extension of Lemay Street. The study was initiated because there is a need for updated and improved facilities within the City of Cornwall Municipal Works Yard on Ontario Street and the redevelopment of the municipal works yard provides an opportunity to construct a connection between the east and west sections of Lemay Street. The City’s Official Plan and 2006 Critical Infrastructure Review identified the need to extend Lemay Street. This connection will provide additional east-west capacity and facilitate provision of service from the municipal works yard. Additionally, emergency services vehicles that are fueled at the municipal works yard will have better connections to the road network with another link to McConnell Avenue. AECOM, in association with Bowfin Environmental Consulting and LRL Associates Ltd were retained to undertake this study.

## 1.2 Study Area

The primary study area is illustrated in **Figure 1-1**. It includes the corridor of Lemay Street and Thirteenth Street from Pitt Street to McConnell Avenue. The existing City of Cornwall municipal works yard is located south of Lemay Street and east of St. Michel Avenue.

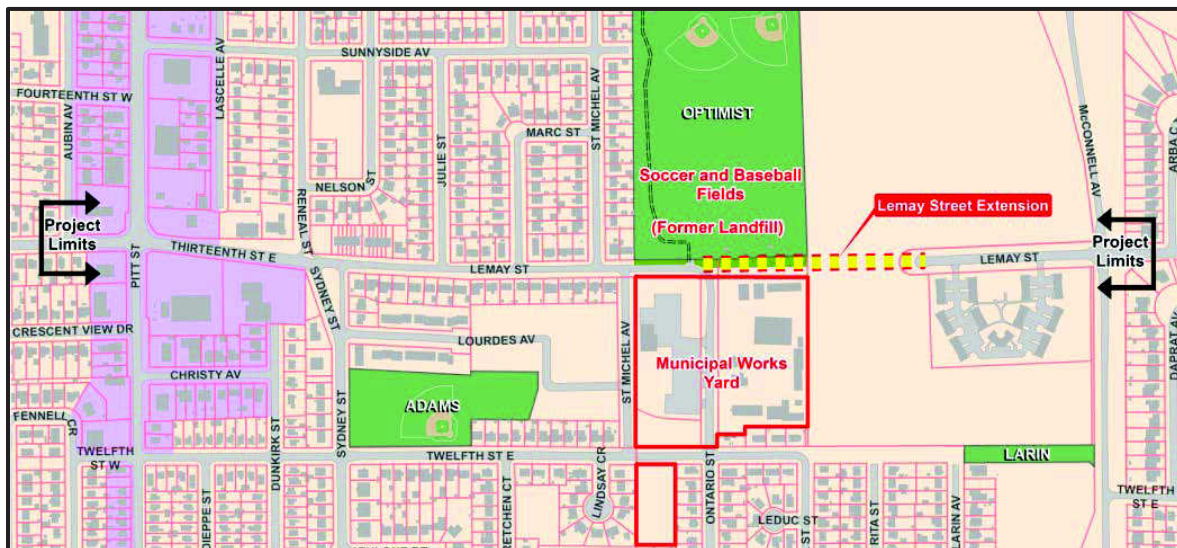


Figure 1-1 Project Study Area

## 1.3 Environmental Assessment Requirements

This study is being carried out in accordance with the requirements of a Schedule ‘C’ project under the *Municipal Class Environmental Assessment* (October 2000, as amended in 2007 & 2011) document, which falls under the *Environmental Assessment Act* (EAA) provisions. The Municipal Class EA process consists of five phases:

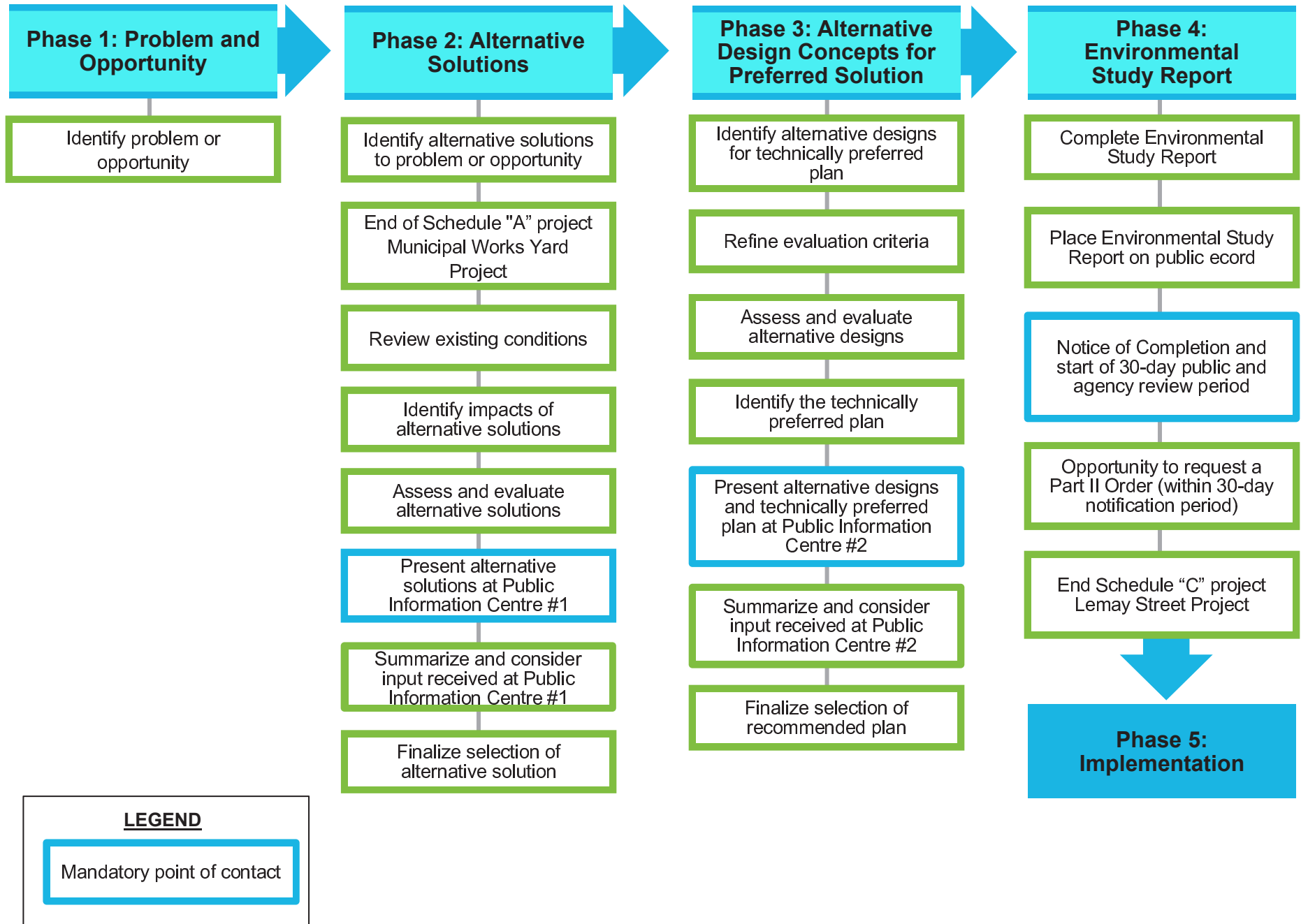


Figure 1-2. Municipal Class EA Process

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## 2. Consultation

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### 2.1 Consultation Process

The Class EA process encourages effective consultation as a key component of EA planning. A minimum of three mandatory points of contact are identified for Schedule 'C' projects. For this project, points of contact were: two Public Information Centres, media release and web site posting, formal public review of study documentation and a presentation to the City of Cornwall municipal council.

Summary reports for each round of consultation are provided in **Appendix B**.

### 2.2 Notices

One of the key objectives of the environmental planning process is to provide the public, interested parties and affected agencies with the opportunities for meaningful input. To meet this objective, comprehensive public and agency notification of Public Information Centres (PIC) were undertaken.

The Notice of Study Commencement and PIC were sent to interested parties the week of May 4, 2015 including agencies, Aboriginal groups and local property owners. The notice was also included in the City bulletin that is published in the Cornwall Standard Freeholder newspaper.

The notice for Public Information Centre #2 was sent on October 7, 2015 to interested parties, including agencies, Aboriginal groups and local property owners.

A notice of completion will be published and sent to the study contact list at the start of the 30 day public review period.

### 2.3 Public Information Centres

#### 2.3.1 Public Information Centre 1

The first Public Information Centre (PIC) was held at the Municipal Works Division Office on Thursday, May 21, 2015 from 4:00 PM to 7:00 PM.

The purpose of the PIC was to:

- Introduce the project;
- Review the Project Need and Existing Conditions;
- Consult on the proposed evaluation criteria;
- Identify the alternative solutions; and
- Review Next Steps.

The displays presented at the Information Centre are provided in **Appendix B**.

The PIC provided an opportunity for members of the public to view the display material and to discuss the project with City of Cornwall and consultant representatives. Attendees were encouraged to provide written comments.

Some points that were raised during discussions at the Public Information Centre related to safety, future traffic volumes on Lemay Street, and traffic signals.

Twelve people signed the attendance sheet and no comment sheets were received at the PIC.

## 2.3.2 Public Information Centre 2

The second Public Information Centre (PIC) was held at the Municipal Works Division Office on Wednesday, October 21, 2015 from 4:00 PM to 7:00 PM.

The purpose of the PIC was to:

- Review the study background and Municipal Class EA Process;
- Consult on the alternative design evaluations and the preferred design for the Lemay Street extension;
- Review the proposed municipal works yard design;
- Review the costs of the Lemay Street extension and municipal works yard; and,
- Review next steps.

The displays presented at the Information Centre are provided in **Appendix B**.

The PIC provided an opportunity for members of the public to view the display material and to discuss the project with City of Cornwall and consultant representatives. Attendees were encouraged to provide written comments.

Some points that were discussed at the Public Information Centre and mentioned on comment sheets were:

- Lemay Street connection will permit the introduction of a transit route
- Since on-street parking on Lemay Street will be removed, additional parking for Optimist Park will be required
- A privacy fence or landscaping along the future municipal works yard should be considered
- Preference for roundabouts
- Preference for traffic signals
- Speed of vehicles on Lemay Street

One comment was received in advance of the PIC. Seven people signed the attendance sheet and five comment sheets were received at the PIC and two additional comments were received following the PIC. The comments can be found in **Appendix B**.

## 2.3.3 Media Release

The recommended plan was posted on the City of Cornwall website and the City issued a media release about the recommended plan. Local news outlets including the Cornwall Seaway News, the Standard Freeholder and Cornwall Newswatch published stories about the project, which helped publicize the recommended plan. The media release requested comments to be submitted through the City's website. Twenty-four comments were received via the website. The comments received are summarized below:

- Support for the plan (7)
- The study is unnecessary, the roads/Municipal Works Yard are fine as is (2)

- The cost of the plan is very high, specifically the Municipal Works Yard (4)
- Preference for lights or a stop sign at Sydney and McConnell (3)
- Bike lanes should be moved to the one way streets east and west, north of 2<sup>nd</sup> street
- Prefer not to include roundabouts (6)
- Concerns about property affected by the plan (2)
- Relocate the Works Yard
- Do not like the plan (2)
- The new roundabouts and the one on Brookdale should all have the same design – fix Brookdale (2)
- Additional parking needed for Optimist Park (2)
- Extend 12<sup>th</sup> street instead of Lemay

The comments received can be found in **Appendix B**.

## 2.4 Aboriginal Consultation

The following aboriginal group representatives were contacted during the study:

- Grand Chief Michael Kanentakeron Mitchell, Mohawk Council of Akwesasne (May, 2015)
- Grand Chief Abram Benedict, Mohawk Council of Akwesasne (October, 2015)
- Mr. Aly N. Alibhai, Métis Nation of Ontario

Notices for each Public Information Centre were sent to the representatives on May 7, 2015 and October 13, 2015.

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# 3. Project Need and Opportunities

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## 3.1 Existing Transportation

### 3.1.1 Road Network Overview

The City of Cornwall has five key north-south road corridors: Boundary Road, McConnell Avenue, Pitt Street, Brookdale Avenue and Power Dam Drive. There are five key east-west corridors: Montreal Road, Second Street, Ninth Street/Marleau Avenue, Tollgate Road and Cornwall Centre Road/South Branch Road. These corridors are shown in **Figure 3-1**.

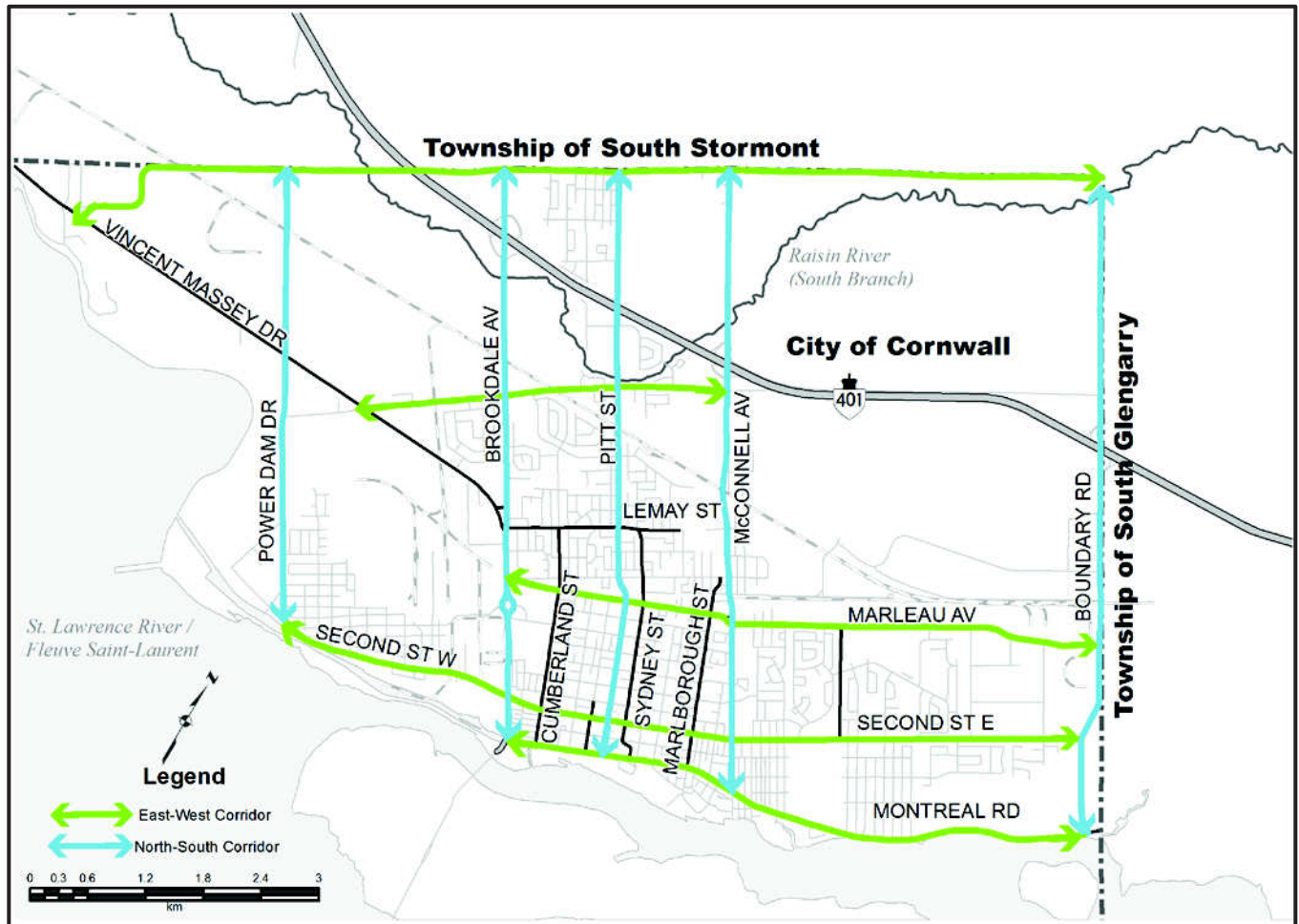


Figure 3-1. Key Corridors in the City of Cornwall

### 3.1.2 Roads

**Lemay Street** is an east-west collector street in two sections that is separated by a forested area. The eastern section of the street is a cul-de-sac that extends 200m west from McConnell Avenue. The western section is approximately 400m between Sydney Street and Optimist Park. Lemay Street is a two-lane roadway with a rural cross-section (no curbs) and no sidewalks or cycling facilities in the western section. In the eastern section, the two lane roadway has curbs and a sidewalk on the north side separated from the roadway by a boulevard.

**Thirteenth Street** is an east-west arterial street that extends from Brookdale Avenue to Sydney Street. West of Sydney Street, Thirteenth Street becomes Lemay Street. East of Pitt Street, Thirteenth Street has a four lane cross-section with two westbound lanes, one eastbound lane and a centre two-way left turn lane. The roadway has an urban cross-section with sidewalks on both sides of the street, but no cycling facilities. West of Pitt Street, Thirteenth Street has a two lane urban cross-section. There are sidewalks on both sides of the street from Pitt Street to Aubin Avenue, and a sidewalk on the south side of the street west of Aubin Avenue.

**Sydney Street** is a one-way north-south arterial street that extends from Montreal Road to Thirteenth Street/Lemay Street with traffic that travels in the northbound direction. In the study area, Sydney Street is a three-lane roadway. A two lane section connects to Thirteenth Street and is separated by a green space from a single lane section that

connects to Lemay Street. The road has an urban cross-section with sidewalks on both sides of the street and no cycling facilities.

**McConnell Avenue** is a north-south arterial street at the eastern extent of the study area. McConnell Avenue extends from the St. Lawrence River to the northern boundaries of the Cornwall city limits. Through the study area, McConnell Avenue is a two-way, two-lane road with a rural cross-section with gravel shoulders. There is a sidewalk on the eastern side of the roadway but no cycling facilities and a posted speed limit of 50 km/h.

### 3.1.3 Intersections

**McConnell Avenue at Lemay Street/Arba Court** is a four-leg stop controlled intersection with uninterrupted traffic on McConnell Avenue. The northbound approach has a through lane and a left turn lane with a 30 metre storage bay. The southbound approach has a through lane, a right turn lane with a 15 metre storage bay and a left turn lane with a 20 metre storage bay. The eastbound and westbound approaches each have one lane, which is a shared lane for right turn movements, through movements and left turn movements. There are no marked pedestrian crossings at this intersection.

The intersection of **Lemay Street and Thirteenth Street/Sydney Street** has a complex layout and unique traffic control with stop signs on the eastbound, westbound and southbound approaches as well as for the northbound traffic headed for Lemay Street or Reneal Street. The northbound left turning traffic flows freely through the intersection.

The eastbound approach has one through lane. The westbound approach has one through lane and one right turn lane with a 15 metre storage bay. The southbound approach has a raised island that prevents direct access from Thirteenth Street and Sydney Street. One of the northbound approaches has two left turn lanes for traffic destined for Thirteenth Street. A separate northbound approach has one lane for traffic destined for Lemay Street or Reneal Street. There are marked pedestrian crossings across Sydney Street, Lemay Street and Reneal Street.

There is a traffic signal at the intersection of **Pitt Street and Thirteenth Street**. The westbound approach to the intersection has a through lane, a right turn lane, and a left turn lane with a 35 metre storage bay. The eastbound approach to the intersection has a shared through-right lane and a left turn lane with a 45 metre storage bay. Pitt Street has a four lane cross-section north of the intersection with two lanes in the northbound direction and two lanes in the southbound direction. South of the intersection, Pitt Street is a one-way street southbound with a three lane cross-section.

Along the western portion of Lemay Street, there are stop signs for the southbound approaches on Julie Street and Marc Street and for the southbound and northbound approaches on St-Michel Avenue.

### 3.1.4 Traffic Volumes

Existing vehicular turning movement counts were provided by the City of Cornwall. The traffic data was collected during AM and PM peak hours in 2011 at the intersection of Lemay Street and St. Michel Avenue and in 2014 at the remaining intersections:

- Pitt Street and Thirteenth Street
- Pitt Street and Eleventh Street
- Sydney Street / Reneal Street and Thirteenth Street / Lemay Street
- Sydney Street and Eleventh Street
- Lemay Street and St. Michel Avenue

- Ontario Street and Eleventh Street
- McConnell Avenue and Eleventh Street
- McConnell Avenue and Lemay Street / Arba Court

The existing traffic volumes are shown in **Figure 3-2**.

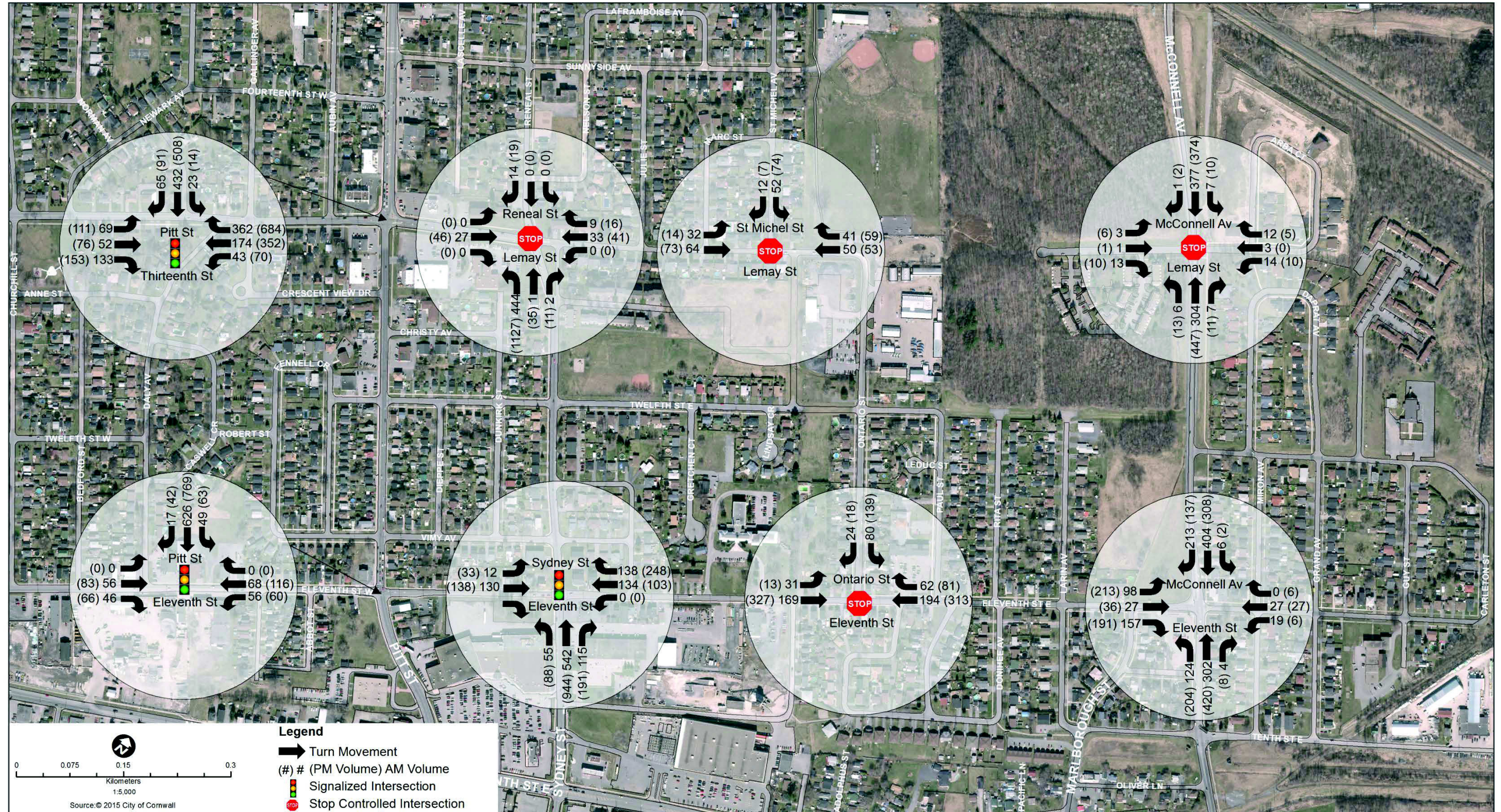


Figure 3-2. Existing Traffic Volumes

### 3.1.5 Traffic Operations

The existing roadway traffic conditions are described in terms of the level of service (LOS) provided during peak traffic periods. At an intersection, the level of service is determined based on the average delay that a vehicle experiences in passing through an intersection. LOS 'A' designates an excellent level of service with little delay, while LOS 'F' indicates a poor level of service and significant delay. LOS is defined in terms of average control delay per vehicle, according to the criteria of the Highway Capacity Manual. The length of delay related to a particular level of service at a stop-controlled intersection is less than the length of delay at an intersection controlled by traffic signals. The vehicle delay time and the corresponding level of service are shown in **Table 3-1**.

**Table 3-1. Level of Service Criteria**

LOS	Control Delay Per Vehicle (seconds)	
	Signalized Intersections	Stop Controlled Intersections
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

The intersections in the study area were analyzed with the existing traffic volumes for the AM and PM peak hours using Synchro 9 modelling software following the Highway Capacity Manual 2010 (HCM 2010) methodology. The analysis determined the level of service and delay for the intersection as well as any critical movements, which are defined as movements with a LOS of 'D' or worse. The results of the intersection analysis are summarised in **Table 3-2**.

**Table 3-2. Existing Intersection Operations**

Intersection	Overall Intersection LOS		Movement	Critical Movements			
	Peak Hour			AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	Delay	LOS	Delay
<b>Thirteenth St. at Pitt St.</b>	B	C	-	-	-	-	-
<b>Lemay St. at McConnell Ave.</b>	A	A	-	-	-	-	-

The intersections of Thirteenth Street at Pitt Street and Lemay Street at McConnell Avenue operate with acceptable levels of service in the AM and PM peak hours. Neither intersection has any critical movements. Delays and congestion are not expected at either of these intersections.

Due to the unorthodox configuration of the intersection of Thirteenth Street/Lemay Street and Sydney Street, the Synchro traffic modelling software cannot accurately determine the traffic delays at this intersection. The high volume of northbound traffic on Sydney Street provides limited gaps for eastbound and westbound vehicles. However, the traffic signals at the intersection of Sydney Street and Eleventh Street create a gap in the northbound traffic, which allows vehicles at the intersection of Thirteenth Street/Lemay Street to cross Sydney Street. This gap in northbound traffic occurs once per traffic signal cycle. In effect, the eastbound and westbound vehicles on Thirteenth Street and Lemay Street have a 60 second delay, which corresponds to a LOS 'E' at a stop controlled intersection. This project provides an opportunity to improve the traffic operations at the intersection of Thirteenth Street/Lemay Street at Sydney Street.

### 3.1.6 Cycling and Pedestrians

The western section of Lemay Street has no sidewalks or cycling facilities. The eastern section of Lemay Street has a sidewalk on the south side of the roadway but no cycling facilities. The sidewalk continues to McConnell Avenue where pedestrians can connect to the sidewalk on the eastern side of McConnell Avenue; however, there is no controlled pedestrian crossing at this location. There are sidewalks on both sides of Thirteenth Street and Sydney Street but no cycling facilities on either street.

The City's Bicycle and Pedestrian Master Plan, which was completed in 2010, recommends bicycle lanes on Lemay Street and Thirteenth Street. West of Optimist Park, a sidewalk on both sides of Lemay Street is recommended, while no changes are recommended for Lemay Street east of Optimist Park. This study presents an opportunity to provide cycling and sidewalk infrastructure in the corridor that was recommended in the Bicycle and Pedestrian Master Plan.

### 3.1.7 Transit

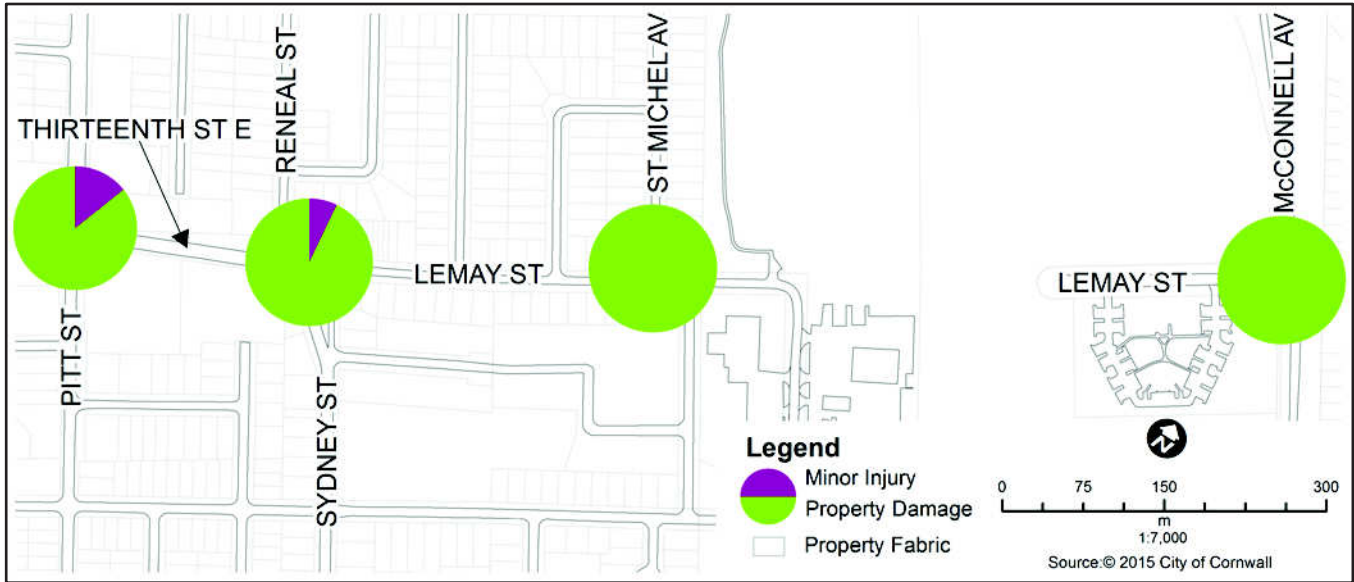
Cornwall Transit Route #1 travels through the study area northbound on Sydney Street to Thirteenth Street. At Thirteenth Street, the route travels westbound to Pitt Street and then continues north on Pitt Street to Cornwall Centre Road.

### 3.1.8 Safety

Collision data from 2009-2013 was provided by the City of Cornwall. Collisions occurred at the intersections indicated in **Figure 3-3**. There were no collisions involving fatalities. The majority of collisions resulted in property damage only, which represents 89% of the total collisions in the study area. **Table 3-3** and **Figure 3-3** display the collision statistics from 2009 to 2013.

**Table 3-3. Collision History**

Year	Thirteenth St. at Pitt St.	Thirteenth St./Lemay St. at Sydney St.	Lemay St. at St. Michel Ave.	Lemay St. at McConnell Ave.
2009	11	4	0	0
2010	8	3	0	4
2011	5	3	1	2
2012	9	2	2	0
2013	9	2	0	0
<b>Total</b>	42	14	3	6



**Figure 3-3. Collisions within Study Area**

Using the methods described in the Highway Safety Manual 2010, the predicted number of collisions per year was calculated for the intersections of Thirteenth Street at Pitt Street and Lemay Street at McConnell Avenue. The predictive method “provides a structured methodology to estimate the expected average collision frequency” at a given intersection or section of roadway. Collision modification factors (CMFs) were applied to the intersections along the roadway to account for specific features related to the study area. CMFs that were applicable to the intersections in the study area were lane width, shoulder width and type, roadside design, and lighting. CMFs were taken from the *Highway Safety Manual 2010, Volume 2*.

The predicted number of collisions was adjusted based on the existing collision experience to determine the expected collision frequency. In the table below, the expected collision frequency for 2009 to 2013 is compared to the collision data from 2009 to 2013. An intersection with a higher observed value than an expected value is considered a problematic intersection.

**Table 3-4. Actual Collisions vs Expected Collisions**

Collisions	Thirteenth St. at Pitt St.	Lemay St. at McConnell Ave.
<b>Observed Collisions</b>	42	6
<b>Expected Collisions</b>	46	6

The results of this study show that the actual collisions were equal to or lower than the expected collisions at the intersections of Thirteenth Street at Pitt Street and Lemay Street at McConnell Avenue. Improvements are not required at these intersections.

## 3.2 Future Traffic Conditions

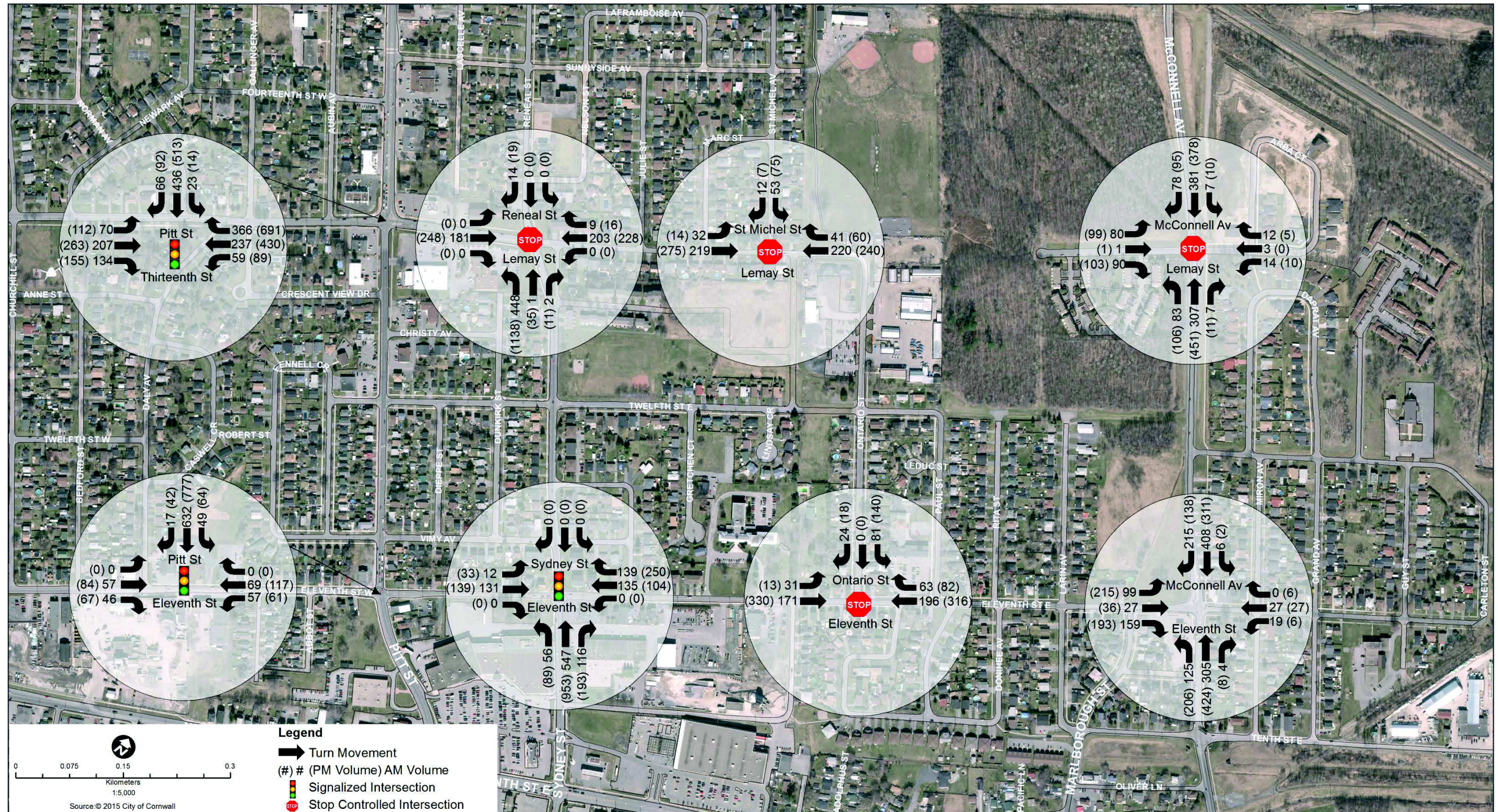
### 3.2.1 Future Traffic Volumes

The Official Plan of the Corporation of the City of Cornwall (2004) states that 0.2% is the expected population growth rate. This growth rate was used to estimate the background growth of traffic in the City of Cornwall. The growth rate was applied to all turning movements in the study area.

To estimate the additional future traffic volumes on Lemay Street, the number of vehicles expected to divert to Lemay Street from adjacent streets after completion of the Lemay Street extension was calculated.

Vehicles are expected to be diverted from Ninth Street and Eleventh Street. Since Eleventh Street is closer to Lemay Street than Ninth Street, a larger percentage of vehicles will be diverted from Eleventh Street. It was assumed that 40% of traffic from Eleventh Street and 1% of traffic from Ninth Street will be diverted to Lemay Street.

The estimated turning movement volumes for the horizon year of 2020 are shown in **Figure 3-4**.



### 3.2.2 Future Traffic Operations

The intersections in the study area were analyzed with the future traffic volumes and existing intersection configurations for the AM and PM peak hours. The analysis used Synchro 9 modelling software following the Highway Capacity Manual 2010 (HCM 2010) methodology. The analysis determined the level of service and delay for the intersection as well as any critical movements, which are defined as movements with a LOS of 'D' or worse. The results of the intersection analysis are summarised in **Table 3-5**.

**Table 3-5. Future (2020) Intersection Operations**

Intersection	Overall Intersection LOS		Movement	Critical Movements			
	Peak Hour			AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	Delay	LOS	Delay
Thirteenth St. at Pitt St.	B	C	-	-	-	-	-
Lemay St. at McConnell Ave.	A	B	EB Lane WB Lane	D -	28.8 s -	F D	70.5 s 29.7 s

The intersections of Thirteenth Street at Pitt Street and Lemay Street at McConnell Avenue operate with acceptable levels of service in the AM and PM peak hours. There are no critical movements at the intersection of Thirteenth Street and Pitt Street. Delays and congestion are not expected at this intersection.

The eastbound lane at Lemay Street and McConnell Avenue has a LOS 'D' in the AM peak hour and a LOS 'F' in the PM peak hour. There is a single lane on the eastbound approach, which impacts the ability of right-turning vehicles to avoid the queue of left-turning vehicles. The westbound lane at this intersection has a LOS 'D' in the PM peak hour.

As indicated previously, the traffic modelling software cannot accurately determine traffic delays at the intersection of Thirteenth Street/Lemay Street and Sydney Street. In the future it is expected that the traffic signals at Sydney Street and Eleventh Street will continue to create a gap in northbound traffic, which will result in a 60 second delay for eastbound and westbound vehicles on Thirteenth and Lemay Street. This corresponds to a LOS 'E' at a stop controlled intersection.

### 3.3 Yard Accessibility

The Critical Infrastructure Study completed in 2006<sup>1</sup> indicated that there is a need to provide additional access to the municipal works yard. The municipal works yard is at 1225 Ontario Street, which is centrally located in the city. Currently, access to the municipal works yard is provided from Ontario Street, which connects with Eleventh Street and Lemay Street. This study provides an opportunity to improve the accessibility to the municipal works yard. The chosen alternative for this project should improve the accessibility to the municipal works yard by providing easier access to a key travel corridor in the city, such as McConnell Avenue or Ninth Street. The location of the municipal works yard in the City of Cornwall is shown in **Figure 3-5**.

<sup>1</sup> City of Cornwall – Critical Infrastructure Review Study, Dillon Consulting Limited, December 2006

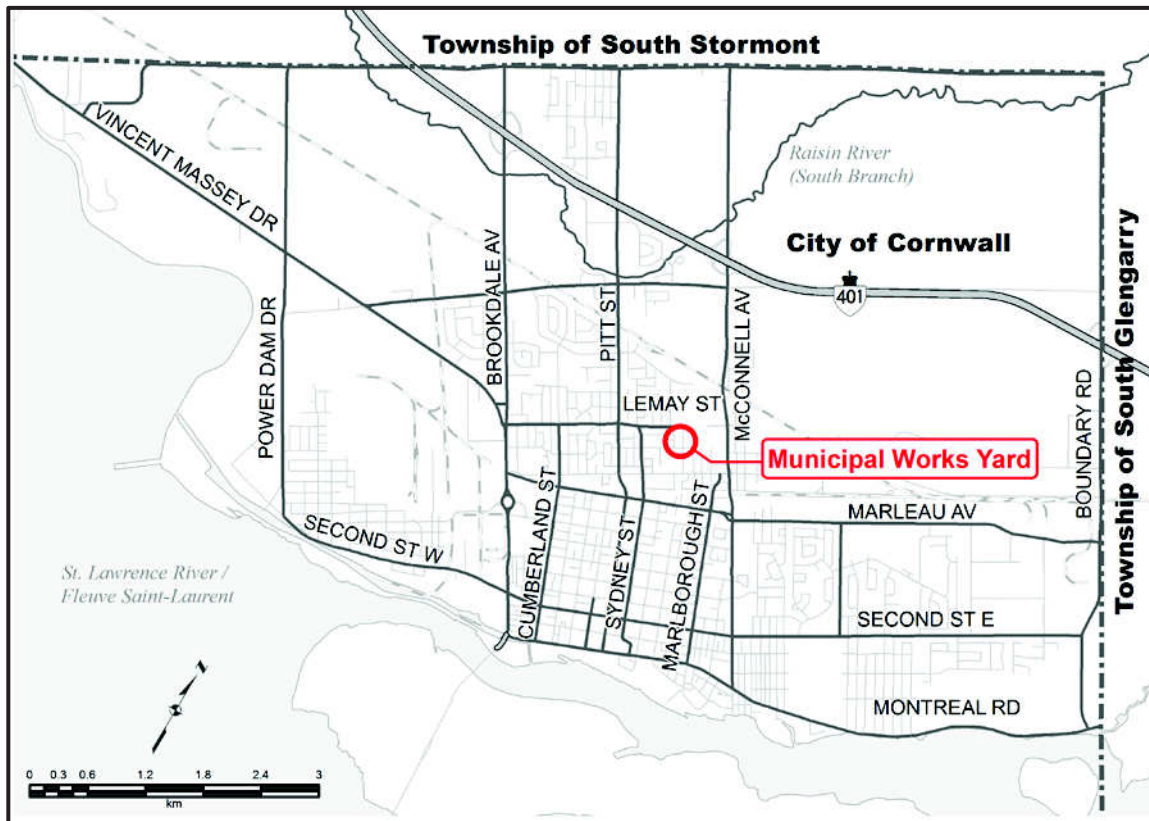


Figure 3-5. Location of City of Cornwall Municipal Works Yard

### 3.4 Network Connectivity

This project provides an opportunity to improve the connectivity of the road network. There are currently four east-west road corridors that connect Brookdale Avenue and McConnell Avenue. The preferred alternative should provide residents of Cornwall with another road in the east-west direction between Ninth Street and Tollgate Road.

Additional road network connectivity will improve response time for emergency vehicles in the city. A road network with more connections between the major routes of Brookdale Avenue and McConnell Avenue will reduce the distance to travel to an emergency. McConnell Avenue is reserved for emergency vehicle use only in serious emergency conditions so providing additional connection to McConnell Avenue is important. As mentioned in the Critical Infrastructure Review Study, a closure of Eleventh Street could have a serious impact on the ability of emergency vehicles to reach McConnell Avenue; therefore, an alternative nearby route will be important.

### 3.5 Project Need and Opportunities Conclusion

The long delay for eastbound and westbound vehicles at the intersection of Thirteenth Street/Lemay Street at Sydney Street is due to the intermittent gaps in northbound traffic that allow vehicles to cross the intersection. The preferred alternative should provide an opportunity to improve the traffic operations at this intersection.

This study provides an opportunity to improve the accessibility to the municipal works yard; therefore, the chosen alternative for this project should provide easier access to the municipal works yard from a key travel corridor in the city, such as McConnell Avenue or Ninth Street.

The preferred alternative should provide residents of Cornwall with more choice of roads in the east-west direction, which will also improve the emergency response time.

This study presents an opportunity to provide cycling and sidewalk infrastructure in the corridor. The preferred alternative should address the recommendations from the 2010 Bicycle and Pedestrian Master Plan.

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## 4. Existing Conditions

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### 4.1 Introduction

Existing conditions in the study area were investigated, which included review of the social, natural, cultural and physical environments. This involved data collection, a review of previous studies, secondary source data collection, and field inventories of the natural, social, and cultural environments.

### 4.2 Natural Environment

While the project includes more than just the road extension, the road extension is the only portion that occurs within a natural area. The remainder of the lands in the study area are developed or maintained as manicured lawns. As such, the focus for the natural environment review was the natural habitat within the proposed road extension alignment (study area) and the surrounding 120 m, referred to as the influence area. Bowfin Environmental Consulting undertook an assessment of the natural environment. The following section highlights key points from their report, which is provided in **Appendix C**.

The proposed extension may result in direct impacts to the habitats along a length of 125 m and width of 20 m. These lands are primarily forested with some small wetland features.

Information provided directly from Ministry of Natural Resources and Forestry (MNRF) Kemptville indicated that there were no known natural heritage features in or near the study area. MNRF Kemptville also indicated the potential for three species at risk (butternut, chimney swift and little brown bat) along with potential for one special concern species (snapping turtle) to occur in the general area. The Land Information Ontario (LIO) database maps identified Lake View Marsh (a non-evaluated wetland) as being outside of the study area but within the influence area and significant woodlands as being both in and adjacent to the study area. The Official Plan schedules do not identify these woodland areas as being significant.

Five field visits were completed in May-July 2015 and investigations were completed for both the aquatic and terrestrial habitats. Inventories completed included the collection of data on the flora and birds. Incidental observations of other wildlife species were also noted.

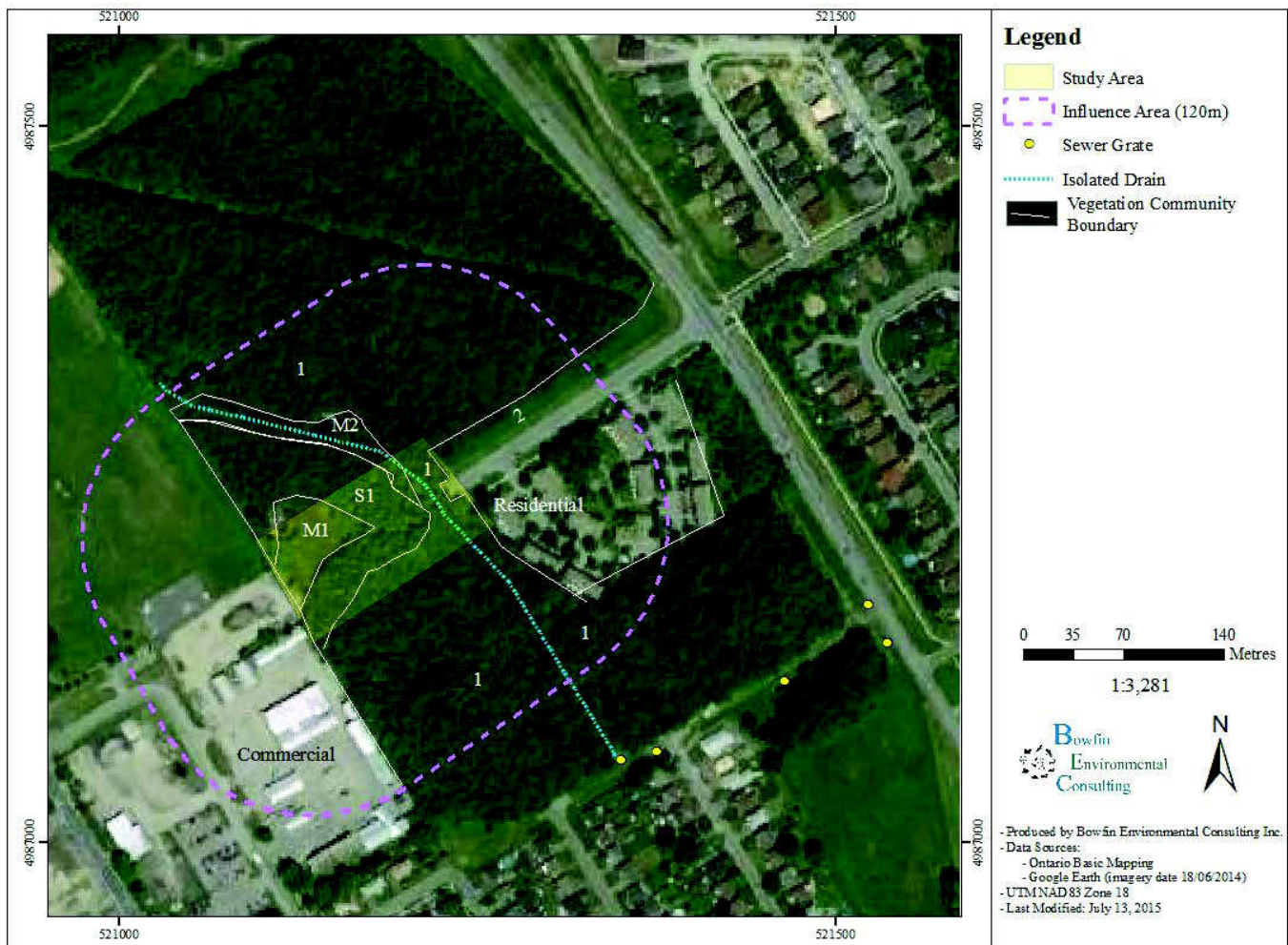
#### 4.2.1 Aquatic Habitat and Setting

Aquatic habitat investigations were undertaken on July 8, 2015 and aquatic habitat descriptions were completed. Fish sampling was not performed as the feature was dry during the visits.

A small drainage feature flows from north to south near the east edge of the proposed alignment and enters the sewer system approximately 430 m downstream. The feature consists of an entrenched, straightened and isolated drain. The drainage feature has an average channel width of 3.2 m and bankfull depth of 28 cm. The substrate consists of fines. There was an occasional aquatic plant (common reed) and small woody debris in the channel. Signs of erosion were not noted. The entire drain was dry, or nearly so, during all of the site visits.

## 4.2.2 Terrestrial and Wetland Habitats Summary

The terrestrial and wetland habitat communities that were encountered in or within 120 m of the Lemay Street extension are shown in **Figure 4-1**.



**Figure 4-1. Natural Heritage Study Area**

### Upland Communities

**Community 1** – This is an upland forested habitat that is a Deciduous Forest with 100% tree cover consisting of deciduous trees with a few scattered white pines. The community was disturbed by access roads and a small drainage feature.

**Community 2** - This community is at the northeast of the study area and is an upland meadow. Portions of this community that are closer to Lemay Street were mowed.

### **Wetland Communities**

A portion of the proposed alignment and influence area consists of a wetland (1.6 ha). The wetland includes two marshes and one swamp.

Marsh 1 (M1) – The first marsh consists of a marsh with a single vegetation form – robust-emergent. It is strongly dominated by common reed. This community is situated within the alignment.

Marsh 2 (M2) - The second marsh is to the northeast of the influence area and is outside of the proposed road alignment. There are two vegetation forms in the marsh: robust emergent and herbaceous plants. A small drain, with some standing water, runs through this community.

Swamp 1 (S1) - The deciduous swamp includes lands in the proposed road alignment and in the influence area. The swamp has deciduous trees and an herbaceous layer.

### **4.2.3 Wildlife**

During the site visits, any wildlife observations were recorded. Incidental observations included observations of an individual, its tracks, burrows, feces and/or kill sights. A list of wildlife observations for the project area is located in **Appendix C**. All species that were observed are considered to be common species.

Two types of breeding bird surveys were conducted: daytime breeding bird and night time species-at-risk survey for whip-poor-will. Note there was no grassland breeding bird habitat present since open areas are all manicured grass. The night time breeding bird surveys did not find any evidence of whip-poor-will in or within hearing distance of the subject lands. The breeding bird survey results included all common species. No species at risk or special concern species were found. No raptors or their nests were observed during the initial site visit.

There is the potential for bat species at risk to occur within the general area. The potential for suitable bat maternity sites was evaluated during the leaf-off period by completing a cavity survey. Few suitable cavities were identified. During the site visits it was determined that no hibernacula sites were present.

### **4.2.4 Flora**

Plants were identified in the field or were collected for a more detailed examination in the laboratory. A list of plant species that were observed within the study area is provided in **Appendix C**. A total of 100 species were identified of which 69% were native. The number of native species is indicative of the level of disturbance of a site. This site is considered to have an average level of disturbance. All of the species found are common and remnants of rare vegetation communities were not encountered.

A butternut tree inventory was completed by a qualified Butternut Health Assessor. This inventory consisted of searching the study area in and within 25 m of the road extension. No butternut trees were found.

## **4.3 Land Use and Noise**

The study area includes residential land, commercial land, open space and parks. The existing land use plan identifies areas to the east of Optimist Park as residential land but housing developments are not present within this area. The land is currently a wooded area. Schedule 5 in the City of Cornwall Official Plan identifies the connection of Lemay Street as a proposed future collector street.

Commercial establishments are located in the vicinity of the intersection of Thirteenth Street and Pitt Street. The businesses in the study area are:

- Dairy Queen
- Home Hardware
- Medical Centre (includes various medical services)
- Mac's Convenience Store
- Splash N' Go car wash

The municipal works yard is located on the south side of Lemay Street in the centre of the study area. Optimist Park is situated just north of the municipal works yard and is one of the largest municipal parks within the city. A trail runs through the west side of the park originating at Ontario Street where it continues north through Optimist Park.

Existing noise conditions for noise sensitive areas are within an acceptable range in the study area. **Figure 4-2** illustrates the municipal works yard and adjacent land use and features.

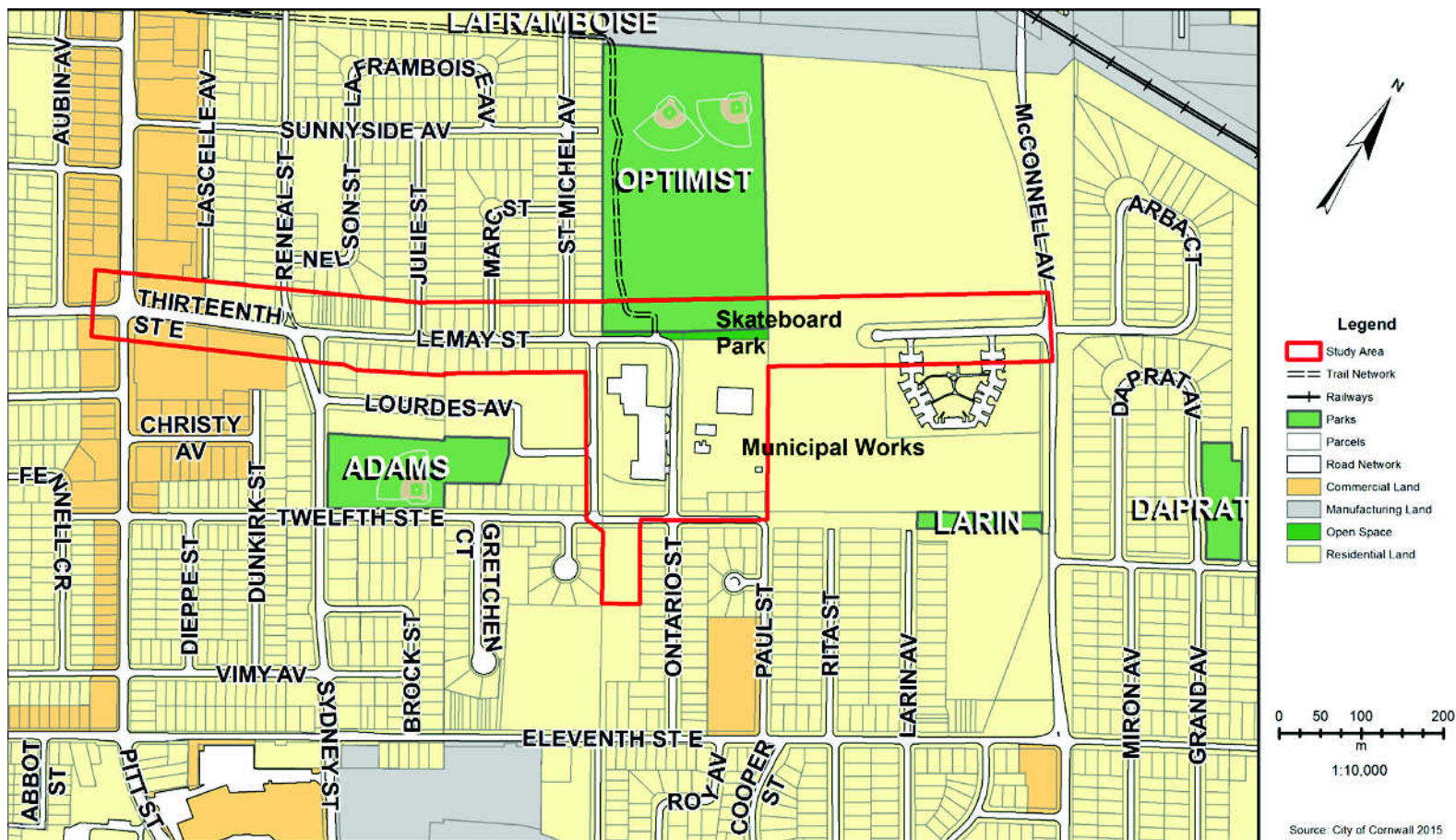


Figure 4-2. Existing Land Use in Study Area

## 4.4 Geotechnical and Hydrogeological

### 4.4.1 Background Studies

The City of Cornwall has completed several studies that have helped to identify the subsurface characteristics in the study area and the possible implications for the Lemay Street project:

In 2002, the Thompson Rosemount Group (TRG) completed a soils and groundwater investigation on the west side of Optimist Park. This investigation identified silty sand and sand in the upper levels of soils. Silty sand/sand allows groundwater to flow more easily than the silty clay and clay layer below. More investigations were undertaken because of the concern that any lowering of groundwater could result in consolidation of the silty sand and sand. This in turn could result in settlement of buildings and municipal infrastructure in the area.

Following the TRG study, J.D. Paterson and Associates Ltd. (JDP) completed a series of settlement tests to assess the risks associated with lowering of groundwater in the area. The tests revealed that activities that result in substantially lowering of the groundwater could have an effect on neighbouring residences and other structures.

In 2004, St. Lawrence Testing and Inspection Co. Ltd. completed a soils and groundwater investigation along Lemay Street. Waste material from the former waste disposal site in Optimist Park was found in one borehole. Groundwater was found beneath the granular materials supporting the road (about 1.6m below the surface).

In 2005, JDP completed more settlement assessment work with a view to recommending measures to control groundwater. Four boreholes were drilled. Testing was completed and the analysis concluded that the subsurface material has sufficient strength so that there would not be significant settlements even with groundwater lowering.

Watermain construction along Lemay Street was undertaken in 2008 and as-built drawings indicated the presence of landfill material within Lemay Street immediately west of Ontario Street. The waste extended over about 6m and was 2m deep.

The former landfill site in Optimist Park was operational from the 1940's to the late 1950's. The park was then developed in the mid 1980's. TRG have been investigating and reporting on the environmental impacts of the former landfill to the City since 2002. A sub-drain was installed along the west side of the park to help control groundwater and runoff. Sixteen groundwater monitoring wells were constructed and a monitoring program established. The most recent Groundwater Quality Investigation for Optimist Park available to this EA study was completed in 2009. Calculations of the travel time for groundwater through the landfill area indicates that the leachate from the landfill has by now migrated off the Optimist Park property. The sub-drain has helped to intercept the leachate and lower groundwater levels on the west side of the park.

### 4.4.2 Description of Site

The topography of the area of the Lemay Street extension and the Municipal Works Yard slopes gently towards the south. The majority of the site is flat with the exception of a slope from the northern portion of the municipal works yard that extends west along Lemay Street and Ontario Street. It is suspected that the raised portion of the site may be an extension of the waste mound to the north at Optimist Park, the former landfill site.

Surficial maps of the area identify that a majority of the area consists of medium- to fine-grained sand. The southern portion of the Works Yard consists of clay, silty clay and silt. Immediately east of the area consists of sand and silty compact glacial till. Based on well records in the area, the depth of clay ranges from between 3.6m to 8.5m,

depending on the location. Below the clay is a layer of till, from a depth of 9.3m to 22.2m. Bedrock is located below the till.

Based on a review of the geological map, well records, borehole/monitoring well logs and previous hydrogeological and geotechnical investigation reports, there is a perched water table to the north of Lemay Street. The water table is located within the surficial fill material and former landfill mound. The perched groundwater table appears to be limited by the clay layer under the silty and/sand layer.

Further investigation (groundwater monitoring well installation and slug tests) will be required to undertake the detailed design of roadworks and site re-development. The need for a permit to take water (PTTW) during construction activities will be determined at that time.

## 4.5 Drainage and Stormwater Management

The study area limits are located within the watershed boundaries represented by the Raisin River Conservation Authority. Lemay Street between Pitt Street and the municipal works yard is generally flat with what appear to be minimal longitudinal slopes (<1%). Lemay Street located northeast of the municipal works yard drains from southwest to northeast towards McConnell Avenue and is also relatively flat with minimal longitudinal slopes (<1%).

Lemay Street on the west side of the municipal works yard is currently serviced by catch basins and storm sewers. Stormwater captured between Pitt Street and Julie Street is conveyed to storm sewers which drain into a storm sewer flowing from north to south on Sydney Street. These concrete pipe sewers range in size from 300 mm in diameter to 1350 mm in diameter. The catchment area for the sewers on Lemay Street appears to include areas up to and beyond Balmoral Avenue.

The storm sewer on Sydney Street is connected to the Fly Creek Storm Diversion Sewer (Fly Creek SDS), which runs parallel to or within the Twelfth Street right-of-way. Fly Creek is an open drainage channel that was diverted into a large underground stormwater channel constructed in the 1990s and 2000s, referred to as the Fly Creek Storm Diversion Sewer (SDS). The Fly Creek SDS and stormwater management pond (SWMP) were constructed as part of a flood control project undertaken by the Raisin River Conservation Authority. The Fly Creek SWMP is located approximately 1.5 km east of the municipal works yard, while the underground municipal drain runs parallel to or within the Twelfth Street East right-of-way.

A separate storm sewer network within Lemay Street runs from Marc Street to the utility corridor parallel to Ontario Street. These concrete pipe sewers are 450 mm and 675 mm in diameter and discharge into a north-south 750 mm diameter storm sewer located in the utility corridor. The catchment area for these Lemay Street sewers appears to include areas up to and beyond Balmoral Avenue. The storm sewer located within the utility corridor appears to be directly connected to the 1050 mm diameter sanitary sewer located within the utility corridor.

Some sections of Lemay Street appear to be serviced by both underground storm sewers and shallow swales/culverts; however, the direction of flow of the swale and culvert system is not apparent from the available data. The swales and culverts observed do not appear to have undergone regular maintenance, which suggests that they may be obsolete.

Lemay Street on the east side of the municipal works yard is currently serviced by a 900 mm diameter concrete storm sewer that drains from southwest to northeast. A manhole located near the eastern entrance of the residential crescent appears to direct runoff southeast into a 300 mm diameter PVC sewer. A 900 mm diameter overflow appears to discharge into a wooded area located just north of Lemay Street. The 300 mm diameter sewer drains into

larger diameter sewers to the south and east and eventually discharges into a ditch on the west side of McConnell Avenue. These sewers range in size from 300 mm to 600 mm.

An intermittent stream is located west of the Lemay Street cul-de-sac and east of the municipal works yard. The stream flows from north to south and discharges into the Fly Creek SDS where it intersects Twelfth Street.

The municipal works yard is serviced by an underground stormwater collection network. Most of the stormwater captured is directed to the Fly Creek SDS; however, there appear to be some direct connections to the sanitary sewer on Ontario Street.

## **4.6 Utilities**

### **4.6.1 Water Services**

Several watermains have been identified within the study limits. Currently, a watermain runs north-south on the western edge of Ontario Street through the municipal works yard and continues into Optimist Park. The watermain on Lemay Street is located on the south side of the road and has connections from all adjacent streets. Typical pipe diameter is 150mm, with the exception of Lemay Street east which has a diameter of 200mm.

### **4.6.2 Sanitary Sewer System**

The sanitary sewer system runs parallel with the city's road network and into the municipal works yard via Ontario Street, connecting to Twelfth Street in the south. Pipe sizes range from 150mm to 1050mm, with a 450mm pipe entering the municipal works yard from Ontario Street. The sanitary sewer system is located on the north side of Lemay Street through the western section of the study area. The pipe size through the residential neighbourhood has been identified at 250mm.

### **4.6.3 Hydro**

Detailed drawings of the hydro network were provided by Cornwall Electric. The information provided illustrates overhead power lines running parallel with city streets servicing the residential neighbourhood along Lemay Street in the west and east sections of the study area. The municipal works yard is serviced by multiple overhead and underground lines connecting to Ontario Street. Currently, underground services connect to the public works building (administration), the traffic shop and MW garage. The remaining buildings are serviced via the overhead power line network.

### **4.6.4 Bell Aliant**

Fibre optic cables are located in the vicinity of Ontario Street and Lemay Street within the study area. The underground fibre optic cable enters the study area from the south at Twelfth Street. The cable continues to the north along the east and west side of the Ontario Street right-of-way to just south of Lemay Street. The service has also been identified on the north side of Lemay Street to the east of the study limits and services the residential area. This section of cable is approximately 185 metres. Similarly the cable runs on the north side of Lemay Street to in the western section of the study limits also services the residential areas.

## 4.7 Contamination

LRL Associates Ltd. (LRL) was retained to complete a Phase I Environmental Site Assessment (ESA) on the property located at 1225 and 1246 Ontario Street in Cornwall, Ontario as well as the adjacent vacant parcel of land south of 1246 Ontario Street following Twelfth Street East. The ESA report is provided in **Appendix D**.

The initial phase of the environmental assessment indicates potential to intersect historical landfilling activities. Historical aerial photos indicate landfilling in the area of the road extension in the vicinity of the northern section of the municipal works yards. Other areas of concern in the study area include the unknown condition of excavated materials, salt storage and the equipment storage area within the northern section of the municipal works yard. **Table 4-1** below provides an overview of all potential environmental concerns.

**Table 4-1. Potential Environmental Concerns**

Potential Environmental Concern	Location	Comments	Contaminants of Potential Concern	Media Potentially Impacted
<b>1225 Ontario Street</b>				
Fuel dispensing equipment/ installations	Along the west perimeter of the property, approximately midway north-south	Consists of three (3) UST containing gasoline and diesel and an associated pump island. Installed in 1987.	VOC, PHC	Soil and groundwater
Waste Oil UST	Along north face of repair garage	900 L capacity.	VOC, PHC	Soil and groundwater
Stationary in-ground hoists	In repair garage	One (1) observed at the time of the Site visit	VOC, PHC	Soil and groundwater
General repair garage activities and waste generated	Approximately center of the property	Minor surface staining observed across the garage	VOC, PHC, Metals, SVOC	Soil and groundwater
MgCl storage	Northern portion of property, between salt storage sheds	15000 L capacity, used for road de-icing	Metals	Soil
Snow and Soil disposal	Northern portion of property	Temporary storage and disposal yard for snow, soil and hydro-Vac activities	Metals, PHC, VOC	Soil and groundwater
<b>1246 Ontario Street</b>				
Former Mobile Home	Southern portion of property	Potential for former oil heating tank and buried waste from removal	VOC, PHC, Metals	Soil and groundwater
<b>Neighbouring Properties within 250 m of the Site</b>				
Former Landfill Site	Immediately north of Lemay Street	Potentially encroached onto 1225 Ontario Street and across Lemay Street based on topographic observations and information provided by the client	Metals, VOC, General Inorganics	Soil and groundwater

## 4.8 Archaeology/Heritage

Archaeology work undertaken by AECOM is documented in Appendix E and summarized below.

### 4.8.1 Stage 1 Archaeological Assessment

The Stage 1 Archaeological Assessment documents the geographic, archaeological and land use history of lands identified within the study area in order to assess their potential for the recovery of archaeological resources.

The background study demonstrates that the study area exhibits a high potential for the recovery of Pre-Contact and historical sites. This evaluation is based on the presence of historic structures, the proximity of historic roads, the access to a water body with a navigable trade route, the proximity to other pre-contact sites, and the physiographic features in the study area. However, the review of aerial photographs dated to the mid-twentieth century demonstrates that portions of the study area have been disturbed.

For lands within the study area that will be impacted by the proposed development, AECOM makes the following recommendations:

1. A Stage 2 Archaeological Assessment should be conducted by a licenced consultant archaeologist for areas to be impacted by the future development using the test pit survey method at 5m intervals in areas which have not recently been ploughed or do not have appropriate conditions for pedestrian survey at the time of the Stage 2 assessment. The Stage 2 Archaeological Assessment will follow the requirements set out in the 2011 *Standards and Guidelines for Consultant Archaeologists* (Ministry of Tourism, Culture and Sport, 2011).
2. No further archaeological assessments are recommended for areas that are marked in red hatch in **Figure 4-3**, as these areas are disturbed.

## 4.8.2 Stage 2 Archaeological Assessment

To address the recommendation for a Stage 2 Archaeological Assessment, field work was completed on November 4, 2015. The study area of about 3 hectares included a street corridor (portion of 13<sup>th</sup> Street), a forested lot (between the two segments of Lemay Street) and a connection from a parking lot to Sydney Street.

The forested lot was test pitted at 5 m intervals and other areas were visually inspected. Areas of steep slope and low, wet areas were not assessed. Test pits were dug along the street to document the extent of disturbance due to installation of services and roadworks.

No evidence of cultural features or artifacts was found during the investigation. The Stage 2 Archaeological Assessment was submitted to the Ontario Ministry of Tourism, Culture and Sport for approval.

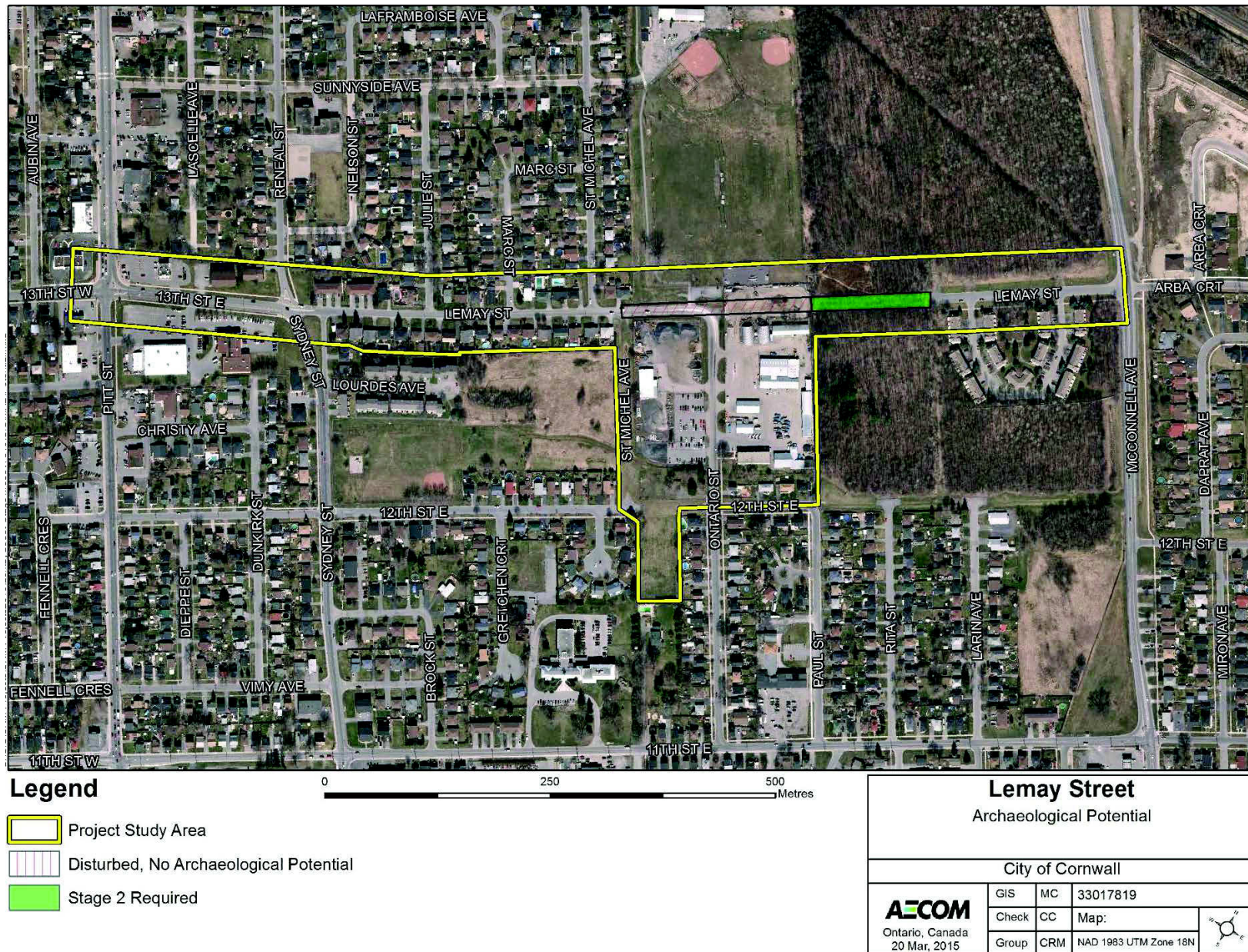


Figure 4-3. Archaeological Potential in Study Area

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## 5. Alternative Solutions

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The Municipal Class EA process requires consideration of a reasonable range of alternatives and their effects on the environment. The alternatives considered in the process are the “alternatives to the undertaking” (also called alternative solutions). These are functionally different ways of addressing the project needs and opportunities.

In order to address the needs and opportunities identified, several alternative solutions were developed. The issues identified previously were the opportunity to improve yard accessibility and the opportunity to improve the connectivity of the City of Cornwall road network.

### 5.1 Description

For the identified issues, the possible solutions considered were:

- Do nothing
- Enhance other transportation modes and/or manage travel demand
- Provide a new east-west corridor

#### Do Nothing

The “Do nothing” option is always considered as the base case scenario against which the other solutions are compared.

#### Enhance Other Transportation Modes

There are two north-south transit routes near Lemay Street, one on McConnell Avenue and one on Sydney Street/Pitt Street. The closest east-west transit line is a morning-only route that runs eastbound on Ninth Street with a final destination at the Cornwall Business Park.

This alternative will add a new east-west transit route located on Eleventh Street. Another east-west transit route will provide another route option for commuters to select transit as their mode of transportation.

The continued implementation of the City of Cornwall Bicycle and Pedestrian Master Plan (July 2010) will increase the number of residents who use active transportation as a means of commuting. The City of Cornwall Bicycle and Pedestrian Master Plan recommends the introduction of bicycle lanes on numerous streets throughout the city in short, medium and long-term phases. In addition, pedestrian improvements are recommended in short, medium and long-term phases. Where there is no room for new cycling and pedestrian facilities on the road network, multi-use trails are recommended throughout the city to connect the active transportation network.

#### Provide a New East-West Corridor

This alternative will extend an existing east-west street to connect McConnell Avenue to Pitt Street. This will provide a new east-west corridor for the road network. The street will be located between Ninth Street and Tollgate Road. There are three possible options for the new east-west corridor, listed below and illustrated in **Figure 1-1**.

- Extend Sunnyside Avenue to McConnell Avenue, through Optimist Park
- Connect the western portion of Lemay Street with the eastern portion of Lemay Street
- Extend Twelfth Street to connect with McConnell Avenue.

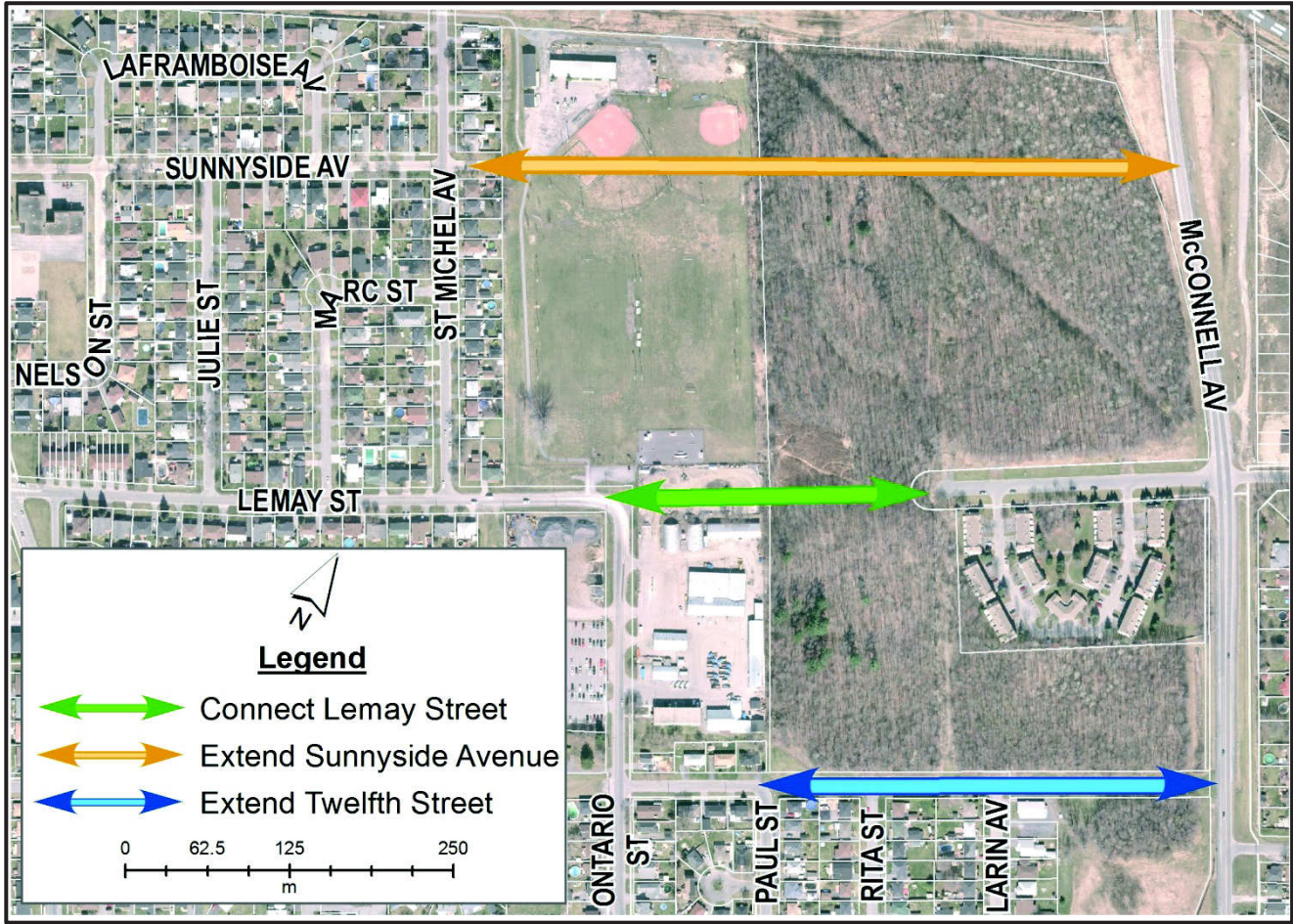
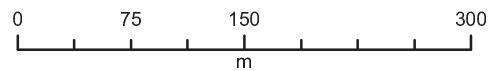
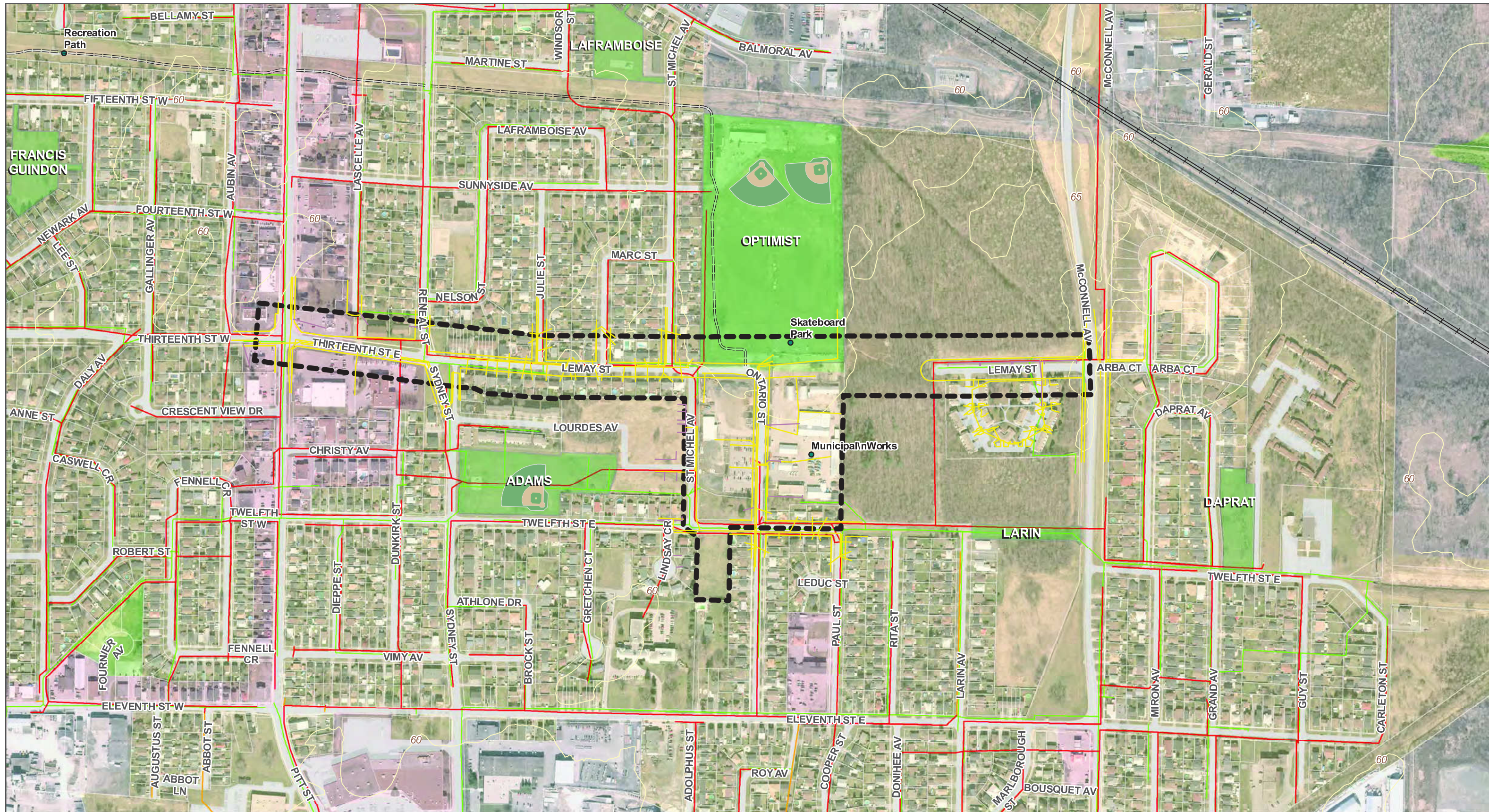


Figure 5-1. East-West Corridor Options

The noise impacts for each alternative route are indicated in Figure 5-2.



1:5,000

Source: © 2015 City of Cornwall and Land Information Ontario

### Legend

- |                        |              |                   |               |
|------------------------|--------------|-------------------|---------------|
| Railways               | Cornwall POI | Hydro Underground | Commercial    |
| Study Area             | Sewer - COM  | Hydro Overhead    | Manufacturing |
| Contours               | Sewer - SAN  | Cornwall_Parks    | Open Space    |
| Cornwall Trail Network | Sewer - STM  | Cornwall Streets  | Residential   |

### Study Area - Base Map

Lemay Street and Design of the Municipal Works Yard Facility



## 5.2 Evaluation

The Municipal Class EA process, described in Section 1, requires consideration of a reasonable range of alternatives and their effects on the environment. The evaluation of alternatives during the EA process must be systematic, leading progressively to the identification of the preferred. To achieve this, evaluation criteria are developed to compare the alternatives. These criteria need to reflect an understanding of the existing conditions, the nature of the proposed project and the issues related to the project.

In the evaluation of the alternative solutions, the first consideration is whether or not they address the identified problems and opportunities. The second consideration is the impacts that have been identified. The identified impacts are described with reference to the evaluation criteria. A set of criteria were developed to compare the alternative solutions listed above. The evaluation criteria were related to the following categories:

- Transportation
- Natural Environment
- Socio-Cultural Environment
- Infrastructure/Utilities
- Cost

The criteria categories and the specific criteria used in the evaluation of alternatives are listed in **Table 5-1** together with the rationale for the selection of the criteria. The table also provides the measures proposed under each of the criteria specific to the evaluation of alternative solutions.

**Table 5-1. Evaluation Criteria Rationale and Measures**

<b>Evaluation Criteria</b>	<b>Rationale for Evaluation</b>	<b>Measure of Evaluation</b>
<b>1.0 Transportation</b>		
Yard Accessibility	Ability of alternative to improve access to the municipal works yard site.	Number of access points to local road network
Network Connectivity	Ability of alternative to increase connections between road corridors of the existing City of Cornwall road network.	Length (km) of new east-west connection
Traffic Operations	Ability of alternative to improve the intersection operations at Lemay Street/Thirteenth Street and Sydney Street.	Level of service for drivers
<b>2.0 Natural Environment</b>		
Natural environment and species at risk	Species at Risk and their habitat are protected. Considers disturbance of lands that are currently undeveloped	Area of currently undisturbed land impacted
<b>3.0 Socio-Cultural Environment</b>		
Land Use	Residential land use and park land within the study area may be impacted by the alternative	Area impacted
Noise	Outdoor living spaces and noise sensitive areas are located adjacent to and near the study area, since Lemay Street passes through a residential neighbourhood.	Number of noise sensitive areas within 25 metres of centreline

Evaluation Criteria	Rationale for Evaluation	Measure of Evaluation
Archaeology	Undisturbed areas with medium to high archaeological potential must be identified for investigation prior to construction.	Area of archaeological potential (m <sup>2</sup> ) impacted
<b>4.0 Infrastructure/Utilities</b>	Conflicts between proposed construction of an alternative and existing and planned utilities must be included in the consideration of impacts	Number of conflicts with underground and above ground utilities
<b>5.0 Cost</b>	Capital cost	Relative cost based on area of pavement, structures and other major items required

Based on the above criteria selected, the alternatives were analysed and then ranked according to whether their impacts or benefits (when compared to other alternatives) were better, worse or the same. A relative comparison and “reasoned argument” approach was used. **Table 5-2** provides an assessment and evaluation of the alternative solutions.

**Table 5-2. Evaluation of Alternative Solutions**

Evaluation Criteria	Alternative 1 Do Nothing	Alternative 2 Enhance Other Transportation Modes	Alternative 3 (a) Extend Sunnyside Avenue	Alternative 3 (b) Connect Lemay Street	Alternative 3 (c) Extend Twelfth Street
Does it address the identified needs?					
<b>1.0 Transportation</b>					
Yard Accessibility	Accessibility to the yard will remain the same as in existing conditions.  x	Reconfiguration of a transit line will bring a bus closer to the municipal works yard, but will not provide direct access. Improvements to the bicycle and pedestrian network will encourage more active transportation trips for commuters; however city vehicles are usually used during the work day.  -	Doesn't provide direct access for vehicles to the municipal works yard.  x	Provides direct access for vehicles to the municipal works yard off of Lemay Street.  ✓	Doesn't provide direct access for vehicles to the municipal works yard.  x
Network Connectivity	The road network will be unchanged in the do nothing scenario.  x	The road network will be unchanged in this scenario.  x	Will provide a 1.1 kilometre east-west corridor between McConnell Avenue and Pitt Street.  -	Provides a 2.2 kilometre east-west corridor between McConnell Avenue and Brookdale Avenue. West of Brookdale Avenue, Thirteenth Street becomes Vincent Massey Drive which continues west to the city limits.  ✓	The extension of Twelfth Street will provide a 1.1 kilometre east-west corridor between McConnell Avenue and Pitt Street.  -
Traffic Operations	No opportunity to improve the intersection at Lemay Street/Thirteenth Street and Sydney Street.  x	No opportunity to improve the intersection at Lemay Street/Thirteenth Street and Sydney Street.  x	No opportunity to improve the intersection at Lemay Street/Thirteenth Street and Sydney Street.  x	Provides opportunity to improve the intersection at Lemay Street/Thirteenth Street and Sydney Street.  ✓	No opportunity to improve the intersection at Lemay Street/Thirteenth Street and Sydney Street.  x
Preliminary identified impacts?					
<b>2.0 Natural Environment</b>	No impacts on wildlife habitat, forested areas, and no additional stormwater runoff generated.  ✓	Development of bicycle and pedestrian paths will have minimal impact on wildlife habitat and forested areas.  -	Will impact 500 metres of parkland and wooded area, including two baseball diamonds in Optimist Park. New surface area will generate additional stormwater runoff.  x	Will impact 150 metres of parkland and wooded area. New surface area will generate additional stormwater runoff.  -	This road extension will impact 350 metres of parkland and wooded area. New surface area will generate additional stormwater runoff.  x
<b>3.0 Socio-Cultural Environment</b>	No impacts to noise levels, archaeological resources, or residential/park property.  ✓	New transit route will have noise impacts along its route. Development of bicycle and pedestrian paths could have minimal impact on archaeological resources but will not affect residential/manufacturing property.  -	6 to 9 dB increase in noise levels and some potential to impact undisturbed land (archaeological resources). Will affect undeveloped residential property and park land.  x	3 to 7 dB increase in noise levels and some potential to impact undisturbed land (archaeological resources). Will affect undeveloped residential property and park land.  x	8 to 10 dB increase in noise levels and some potential to impact undisturbed land (archaeological resources). Will affect undeveloped residential property and park land.  x
<b>4.0 Infrastructure/Utilities</b>	No impacts to utilities.  ✓	No impacts to utilities.  ✓	Utility relocation may be required.  -	Utility relocation may be required.  -	Utility relocation may be required.  -
<b>5.0 Cost</b>	No construction costs. No change in operational/maintenance costs.  ✓	Cost of construction/maintenance for new bicycle and pedestrian paths. Cost for changes to the existing bus routes in the City of Cornwall.  -	Cost of construction, maintenance and operation for 500 metres of new roadway connecting Sunnyside Avenue to McConnell Avenue.  x	Cost of construction, maintenance and operation for 150 metres of new roadway connecting the east and west sides of Lemay Street.  x	Cost of construction, maintenance and operation for 350 metres of new roadway connecting Twelfth Street to McConnell Avenue  x
<b>Results</b>	<b>Does not address the identified problem or opportunities. Carried forward for comparison.</b>	<b>Does not address the identified problem or opportunities. Will not be carried forward.</b>	<b>Does not address the identified problem. Addresses some opportunities. Has more impacts. Not carried forward.</b>	<b>Addresses the identified problem. Addresses the most opportunities. Will be carried forward.</b>	<b>Does not address the identified problem. Addresses some opportunities. Has more impacts. Not carried forward.</b>

## 5.3 Preferred Solution

The preferred solution is the connection of Lemay Street through Optimist Park. This alternative will improve the accessibility to the municipal works yard by providing access from McConnell Avenue, a key corridor in the road network. This alternative will also add a new 2.3 kilometre east-west connection for the City of Cornwall, between McConnell Avenue and Brookdale Avenue. It also provides an opportunity for traffic control improvements at the intersection of Lemay Street/Thirteenth Street and Sydney Street.

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# 6. Alternative Designs

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Based on the project need and future traffic conditions, independent design alternatives were identified for the following specific locations in the study area associated with the preferred solution of connecting Lemay Street through Optimist Park:

- Thirteenth Street between Pitt Street and Sydney Street
- Intersection of Lemay Street/Thirteenth Street and Sydney Street/Reneal Street
- Lemay Street connection
- Intersection of Lemay Street and McConnell Avenue

## 6.1 Thirteenth Street between Pitt Street and Sydney Street

The existing section of Thirteenth Street between Pitt Street and Sydney Street has a single eastbound lane, a two-way left turn lane and two westbound lanes. The eastbound lane continues to the intersection of Sydney Street and Lemay Street, where eastbound vehicles can only travel straight through the intersection. One westbound lane becomes a right turn lane at the intersection of Pitt Street and Thirteenth Street that enables vehicles to travel north on Pitt Street. The other westbound lane is a through lane at the intersection of Pitt Street and Thirteenth Street. At the intersection of Pitt Street and Thirteenth Street, the two-way left turn lane becomes a 35 metre storage lane for left turning vehicles.

Two alternative designs, as illustrated below, were considered on this section of road. The first alternative adds cycling lanes to both sides of Thirteenth Street and maintains the existing road width. The two-way left turn lane and the westbound left turn lane are removed and the westbound through lane at the intersection of Pitt Street and Thirteenth Street is converted to a shared through-left turn lane.



The second alternative adds cycling lanes while maintaining the existing lane arrangement. This design requires the widening of the road to accommodate the addition of cycling lanes.



## 6.2 Intersection of Lemay Street / Thirteenth Street and Sydney Street / Reneal Street

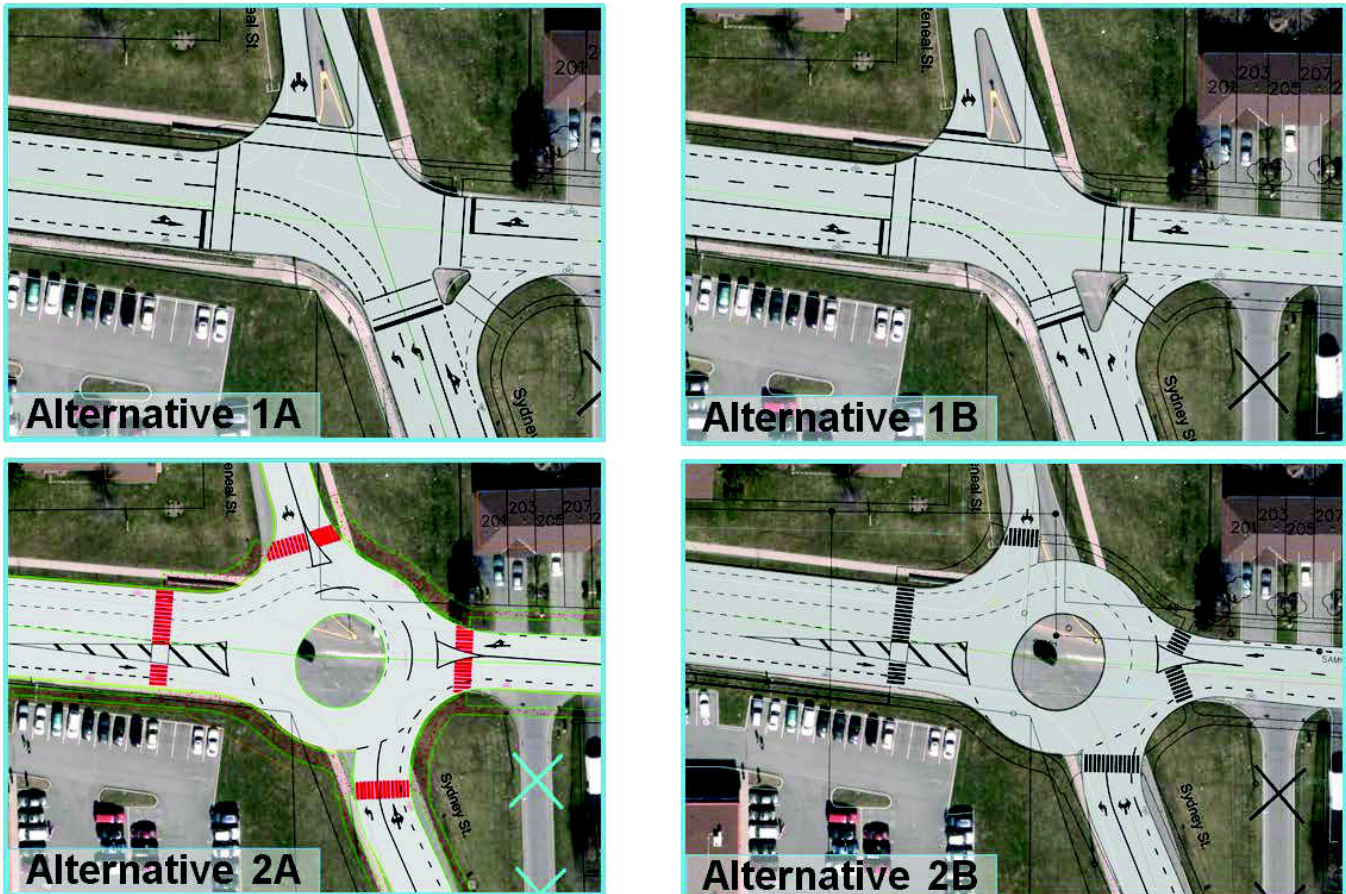
The existing traffic operations at the intersection of Lemay Street and Sydney Street have critical movements in the AM and PM peak hours for the vehicles on Lemay Street and Thirteenth Street. The two alternatives for improvements to this intersection each have two different intersection configurations: Alternative 1A and 1B include traffic signals at the intersection while Alternative 2A and 2B reconfigure the intersection for a roundabout.

Alternative 1A adds traffic signals and a northbound through lane while Alternative 1B adds traffic signals without a northbound through lane. A northbound through lane will allow traffic to directly access Reneal Street otherwise; traffic headed for Reneal Street will have to find an alternative route.

Alternative 2A includes a roundabout with full access to all streets at the intersection. Alternative 2B includes a roundabout with restricted access at Reneal Street so southbound vehicles on Reneal Street will be able to access the intersection but vehicles destined for Reneal Street will have to find an alternative route.

The four alternatives are illustrated below.

The traffic operations at the intersection of Lemay Street and Sydney Street were assessed for a horizon year of 2020 with the two traffic control alternatives of traffic signals and a roundabout. The results of the analysis are shown in **Table 6-1**.



**Table 6-1. Lemay Street at Sydney Street Operational Results for 2020**

Alternative	Overall Intersection LOS		Critical Movements				
	Peak Hour		Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	Delay	LOS	Delay
<b>Traffic Signals</b>	C	C	SB-L	D	37.6 s	D	43.1 s
<b>Roundabout</b>	A	A	-	-	-	-	-

The intersection performs well in the AM and PM peak hours with traffic signals. The only critical movement is a LOS ‘D’ for the southbound left turn movement in the AM and PM peak hours. This movement is not possible in existing conditions; therefore, it cannot be compared with the stop control results. A LOS ‘D’ is acceptable for this movement since there are 15 vehicles making a southbound left turn, which is a relatively small volume compared to the rest of the intersection.

A roundabout at this intersection will operate with a LOS ‘A’ in the AM and PM peak hours with no critical movements. Both the roundabout and the traffic signal operations are an improvement over the existing stop control intersection.

## 6.3 Lemay Street Connection

Two alternatives were considered for the design of the Lemay Street connection. For both alternatives, the Lemay Street connection will be a two lane road, with cycling lanes and sidewalks on both sides of the street. Alternative 1 is a straight road connecting the east and west ends of Lemay Street. Alternative 2 is a road with horizontal deflection to the north, providing curvature to the road. The two alternatives are illustrated below.

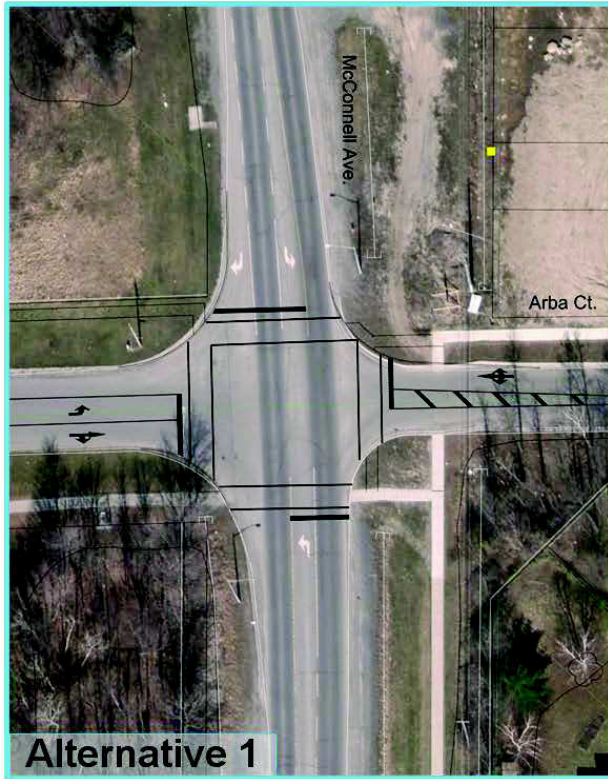


Both designs have a wider right-of-way than the existing Lemay Street, which will require driveways along Lemay Street to be shortened by up to 5.5 metres on the south side and up to 3 metres on the north side. Lemay Street will also be located 1.7 metres closer to homes on the south side. The construction of the sidewalk will impact the hydro poles on the north side of Lemay Street; therefore, they will require relocation. There is currently a sanitary sewer just north of the north edge of the pavement and a water main at the edge of pavement on the south side. The replacement of the underground infrastructure and the inclusion of a storm sewer will be coordinated with the road construction.

## 6.4 Intersection of Lemay Street and McConnell Avenue

The existing traffic operations at the intersection of Lemay Street and McConnell Avenue are a LOS 'A' in the AM and PM peak hours. Once the Lemay Street connection is constructed, it is anticipated that there will be more vehicles using this intersection to access Lemay Street. Therefore, the traffic operations at the intersection were analysed with estimated future traffic volumes in the horizon year of 2020. The alternatives evaluated at this intersection were stop control, traffic signals and a roundabout. The results of the operations analysis are shown in

**Table 6-2.** The layout for the traffic signal and roundabout alternatives are illustrated below. A left turn lane and a shared through/right lane were assumed for the alternative with traffic signals.



**Table 6-2. Lemay Street at McConnell Avenue Operational Results for 2020**

Alternative	Movement	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
<b>Two-way stop control</b>	Northbound approach	A	1.8 s	A	1.6 s
	Southbound approach	A	0.1 s	A	0.2 s
	Eastbound approach	D	28.8 s	F	70.5 s
	Westbound approach	C	20.3 s	D	29.7 s
	<b>Overall Intersection</b>	<b>A</b>	<b>5.9 s</b>	<b>B</b>	<b>12.4 s</b>
<b>Traffic signals (Separate eastbound left turn lane)</b>	Northbound approach	B	11.1 s	B	11.9 s
	Southbound approach	B	10.5 s	A	9.7 s
	Eastbound approach	B	17.8 s	B	18.9 s
	Westbound approach	B	16.6 s	B	17.2 s
	<b>Overall Intersection</b>	<b>B</b>	<b>12.0 s</b>	<b>B</b>	<b>12.2 s</b>
<b>Roundabout</b>	Northbound approach	A	5.9 s	A	6.0 s
	Southbound approach	A	5.7 s	A	5.2 s
	Eastbound approach	A	6.1 s	B	10.2 s
	Westbound approach	A	5.1 s	B	10.6 s
	<b>Overall Intersection</b>	<b>A</b>	<b>0.8 s</b>	<b>A</b>	<b>6.4 s</b>

The intersection performs well in the AM and PM peak hours with traffic signals or a roundabout and is an improvement when compared to the intersection with stop control.

## 6.5 Evaluation of Alternative Designs

The assessment and evaluation of the alternative designs was undertaken in a qualitative and quantitative manner.

A description of the evaluation criteria used to assess the design alternatives is shown in **Table 6-3**. Evaluation criteria that had the same impact for the alternatives were screened out.

The details of the evaluation and the selection of the preferred design alternative for the section of Thirteenth Street between Sydney Street and Pitt Street are provided in **Table 6-4**. The details of the evaluation and the selection of the preferred design alternative for the intersection of Lemay Street/Thirteenth Street and Sydney Street are provided in **Table 6-5**. The evaluation and the selection of the preferred design alternative for the construction of the Lemay Street connection are documented in **Table 6-6**. The details of the evaluation and the selection of the preferred design alternative for the intersection of Lemay Street and McConnell Avenue/Arba Court are provided in **Table 6-7**.

A reasoned argument for the selection of the preferred alternative is provided in Section 6.6 following the evaluation tables.

All designs accommodate WB-20 trucks and all design alternatives will require the lowering of the existing ground level adjacent to the municipal works yard.

**Table 6-3. Description of Evaluation Criteria**

CRITERIA	DESCRIPTION OF CRITERIA	MEASURE USED IN THE EVALUATION
<b>1.0 TRANSPORTATION</b>		
Network Connectivity	Ability of the alternative to connect with the local transportation network (roads, cycling lanes, sidewalks)	Connections to existing transportation facilities Restrictions to available turning movements at intersections
Safety	Potential for the alternative to improve safety	Design features that will improve or reduce safety of the roadway
Active Transportation	Ability of the alternative to accommodate pedestrians and cyclists	Availability of active transportation infrastructure
Operations	Ability of the alternative to accommodate future traffic volumes	Level of service
<b>2.0 LAND USE</b>		
Yard Access	Ability of the alternative to improve access to the municipal works yard	Access points/potential access points to municipal works yard
Yard Design	Ability of the alternative to increase the property available for the municipal works yard	Area or property available
Property Access	Potential for the alternative to improve access to adjacent residential and commercial properties	Impact on accesses for each alternative Out-of-way travel for residents to access their property
Property Impacts	Approximate property requirements for each design alternative	Area of property required
<b>3.0 INFRASTRUCTURE/UTILITIES</b>		
Surface water and drainage	Changes in the location of drainage outlets and stormwater management requirements resulting from the alternative designs	Area of pavement and potential change in runoff
Utilities	Conflicts between proposed construction of an alternative and existing and planned utilities	Number of conflicts with underground and above ground utilities
<b>4.0 IMPLEMENTATION</b>		
Construction Cost	Capital costs	Estimated construction cost (2015 dollars)

- ✓ Better in Comparison
- Neutral in Comparison
- ✗ Worse in Comparison

**Table 6-4. Evaluation of Alternative Designs for Thirteenth Street between Sydney Street and Pitt Street**

EVALUATION CRITERIA	ALTERNATIVE 1 Add cycling lanes and convert two-way left turn lane to a shared through/left lane at Pitt Street	ALTERNATIVE 2 Add cycling lanes to existing lane configuration
<b>1.0 TRANSPORTATION</b>		
Network Connectivity	Alternatives have the same network connectivity <b>SCREENED OUT</b>	
Safety	Additional conflicts with left turning vehicles in through lane ✗	Left turning vehicles in separate lane ✓
Active Transportation	Cycling lanes on this segment connect to cycling lanes on Lemay Street. ✗	Cycling lanes on this segment connect to cycling lanes on Lemay Street and extend beyond Pitt Street ✓
Operations	Intersection of Pitt Street at Thirteenth Street operates with a LOS 'B' in AM peak hour and LOS 'C' in PM peak hour. Delay may be incurred by traffic queuing behind vehicles turning left into driveways from the through lane. ✗	Intersection of Pitt Street at Thirteenth Street operates with a LOS 'B' in AM peak hour and LOS 'C' in PM peak hour. ✓
<b>2.0 LAND USE</b>		
Yard Access and Design	Alternatives are not in the vicinity of the works yard. <b>SCREENED OUT</b>	
Property Access	No changes to location of existing property access. Left turns required from through lane ✗	No changes to property access. ✓
Property Impacts	No property impacts. ✓	Property impacts on south side of Thirteenth Street east and west of Pitt Street. Impacts to nine parking spaces at Home Hardware. Area required at Mac's: 1 m strip along the street, at Home Hardware: 2m strip along the street, at Medical Centre: 2m strip along the street. ✗
<b>3.0 INFRASTRUCTURE/UTILITIES</b>		
Surface water and drainage	No additional pavement area. ✓	Additional pavement area will result in increased runoff. ✗
Utilities	No utility impacts. <b>SCREENED OUT</b>	
<b>4.0 IMPLEMENTATION</b>		
Construction cost	Cost for repainting of lines on roadway (centre line, cycling lanes) and updating signal timing at the intersection of Pitt Street and Thirteenth Street. ✓	Additional cost for widening of roadway and reconstruction of sidewalks and storm drain system. ✗
<b>RESULTS</b>	<b>✗</b>	<b>✓</b>

- ✓ Better in Comparison
- Neutral in Comparison
- ✘ Worse in Comparison

**Table 6-5. Evaluation of Alternative Designs for intersection of Lemay Street / Thirteenth Street and Sydney Street**

EVALUATION CRITERIA	ALTERNATIVE 1A Traffic Signals with Northbound Through Lane	ALTERNATIVE 1B Traffic Signals with No Northbound Through Lane	ALTERNATIVE 2A Roundabout with Full Access	ALTERNATIVE 2B Roundabout with Restricted Access
<b>1.0 TRANSPORTATION</b>				
Network Connectivity	All turning movements are possible. Reneal Street access kept. ✓	Northbound through movement is restricted, preventing through traffic to Reneal Street. –	All turning movements are possible. Reneal Street access kept. ✓	Northbound through, eastbound left turn and westbound right turn movements to Reneal Street are restricted. ✘
Safety	Collisions associated with signalized intersections are typically more severe than collisions at roundabouts ✘	Collisions associated with signalized intersections are typically more severe than collisions at roundabouts ✘	Collisions associated with roundabouts are typically less severe than collisions at signalized intersections ✓	Collisions associated with roundabouts are typically less severe than collisions at signalized intersections ✓
Active transportation	All intersection designs provide an opportunity for pedestrians and cyclists to cross all roads at the intersection. SCREENED OUT			
Operations	LOS 'C' in AM and PM peak hours –	LOS 'C' in AM and PM peak hours –	LOS 'A' in the AM and PM peak hours ✓	LOS 'A' in the AM and PM peak hours ✓
<b>2.0 LAND USE</b>				
Yard Access and Design	Alternatives are not in the vicinity of the works yard. SCREENED OUT			
Property Access	One access driveway to Medical Arts Building from Thirteenth Street. No change to access for Reneal Street properties. –	One access driveway to Medical Arts Building from Thirteenth Street. Northbound traffic must take a circuitous route to access Reneal Street. –	An additional access to the Medical Arts Pharmacy parking lot is provided from Sydney Street. No change to access for Reneal Street properties. ✓	An additional access to the Medical Arts Pharmacy parking lot is provided from Sydney Street. Northbound, eastbound and westbound traffic must take a circuitous route to access Reneal Street. –
Property Impacts	No property impacts. ✓	No property impacts. ✓	A roundabout will require property at the southwest corner of the intersection. In compensation, property may be provided in exchange. –	A roundabout will require property at the southwest corner of the intersection. In compensation, property may be provided in exchange. –
<b>3.0 INFRASTRUCTURE/ UTILITIES</b>				
Surface water and drainage	Similar pavement area and runoff to be managed SCREENED OUT			
Utilities	No impacts or negligible impacts to utilities SCREENED OUT			
<b>4.0 IMPLEMENTATION</b>				
Construction Cost	The costs for the intersection upgrades are similar SCREENED OUT			
<b>RESULTS</b>	✘	–	✓	✘

Table 6-6. Evaluation of Alternative Designs for Lemay Street road connection

- |                         |
|-------------------------|
| ✓ Better in Comparison  |
| – Neutral in Comparison |
| ✘ Worse in Comparison   |

EVALUATION CRITERIA	ALTERNATIVE 1 Straight Road Connection	ALTERNATIVE 2 Road Connection with Horizontal Deflection
<b>1.0 TRANSPORTATION</b>		
Network Connectivity	Both the straight road connection and the road connection with horizontal deflection will provide the same level of network connectivity. SCREENED OUT	
Safety	A straight road provides no benefit regarding speed reduction. –	The horizontal deflection may encourage drivers to select a slower travel speed; however a retaining wall is likely required in the clear zone to maintain the skateboard park, which is a safety impact. ✘
Active Transportation	Both alternatives will include cycling lanes and sidewalks. SCREENED OUT	
Operations	Both alternatives will have the same number of lanes and characteristics. SCREENED OUT	
<b>2.0 LAND USE</b>		
Yard Design	A straight road does not provide additional property for the municipal works yard; however additional property is not required for the design of the municipal works yard. –	A road connection with horizontal deflection provides additional property if needed for the municipal works yard. ✓
Yard Access	Both alternatives will have ability to provide access to the works yard. SCREENED OUT	
Property Access	Both alternatives will have ability to provide property access. SCREENED OUT	
Property Impacts	No additional impacts. ✓	Impacts Optimist Park: the parking lot and the skateboard park. ✘
<b>3.0 INFRASTRUCTURE/UTILITIES</b>		
Surface water and Drainage	Construction of the new road requires remediation of the existing subsurface landfill material to address potential contamination issues. Both alternatives cross drainage channel/ intermittent creek. –	The road with horizontal deflection will require additional remediation of the existing subsurface landfill. Both alternatives cross drainage channel/ intermittent creek. ✘
Utilities	The road alignment appears to avoid further utility poles in the works yard. ✓	There may be additional utility poles to be relocated in the vicinity of the works yard with a curved alignment ✘
<b>4.0 IMPLEMENTATION</b>		
Construction cost	Construction costs for both road designs are similar. SCREENED OUT	
<b>RESULTS</b>	✓	✘

- ✓ Better in Comparison
- Neutral in Comparison
- ✗ Worse in Comparison

**Table 6-7. Evaluation of Alternative Designs for Intersection of Lemay Street and McConnell Avenue**

EVALUATION CRITERIA	ALTERNATIVE 1 Traffic Signals	ALTERNATIVE 2 Roundabout
<b>1.0 TRANSPORTATION</b>		
Network Connectivity	Both alternatives will provide the same level of network connectivity. SCREENED OUT	
Safety	No speed reduction on McConnell Avenue on a green signal for northbound and southbound traffic.  ✗	Gateway feature provides speed reduction for northbound and southbound traffic on McConnell Avenue. A roundabout provides a speed zone transition from 70 km/h to 50 km/h.  ✓
Active transportation	Both options provide the opportunity for pedestrians and cyclists to cross at the intersection. SCREENED OUT	
Operations	Overall intersection LOS 'B' in the AM and PM peak hours. LOS 'B' for eastbound traffic in PM peak hour.  ✗	Overall intersection LOS 'A' in the AM and PM peak hours. LOS 'A' for eastbound traffic in PM peak hour.  ✓
<b>2.0 LAND USE</b>		
Yard Access and Design	Alternatives are not in the vicinity of the works yard. SCREENED OUT	
Property Access	Both alternatives will provide property access. SCREENED OUT	
Property Impacts	No property impacts for either alternative. SCREENED OUT	
<b>3.0 INFRASTRUCTURE/UTILITIES</b>		
Surface water and drainage	Both alternatives have similar pavement areas and drainage requirements. SCREENED OUT	
Utilities	No impacts or negligible impacts to utilities. SCREENED OUT	
<b>4.0 IMPLEMENTATION</b>		
Construction cost	\$210k ✓	\$485k ✗
<b>RESULTS</b>	<b>✗</b>	<b>✓</b>

## 6.6 Selection of the Technically Preferred Alternative

The evaluation process identified the preferred alternative for four locations in the study area described in the previous evaluation tables. The reasoned arguments for the selection of the preferred are as follows:

For Thirteenth Street between Sydney Street and Pitt Street, the preferred alternative adds cycling lanes to the existing lane configuration. Although this alternative requires additional cost and additional property, the alternative best satisfies the transportation criteria by providing an opportunity to install new cycling lanes that could connect to other future cycling lanes on Lemay Street and Pitt Street and by avoiding traffic delays associated with left turning vehicles blocking through traffic.

The preferred design alternative for the intersection of Lemay Street/Thirteenth Street and Sydney Street is a roundabout providing full access. This alternative improves traffic operations during morning and evening peak hours, enhances safety, maintains residential property access and provides additional commercial property access. Increased traffic volumes may occur on Reneal Street by allowing access from the south and west; however, other alternatives require a circuitous route to access this street, which is not preferred. Additional property is required for the roundabout with potential compensation identified.

The preferred design alternative for the Lemay Street road connection is a straight connection. This alternative avoids the need for a retaining wall close to the road, which is a potential safety hazard, and avoids property impacts to the nearby skate park and parking lot. The straight connection reduces the amount of landfill impacted and may avoid the relocation of some utility poles.

The preferred design alternative for the intersection of Lemay Street and McConnell Avenue / Arba Court is the construction of a roundabout. The roundabout offers better traffic operations with a LOS "A". Although it has a higher cost, the roundabout provides a gateway feature for the speed zone transition from 70 km/h to 50 km/h. Northbound and southbound traffic on McConnell Avenue will be required to slow down through the roundabout, which helps to manage vehicular speeds.

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# 7. Project Description

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## 7.1 Description of the Recommended Plan

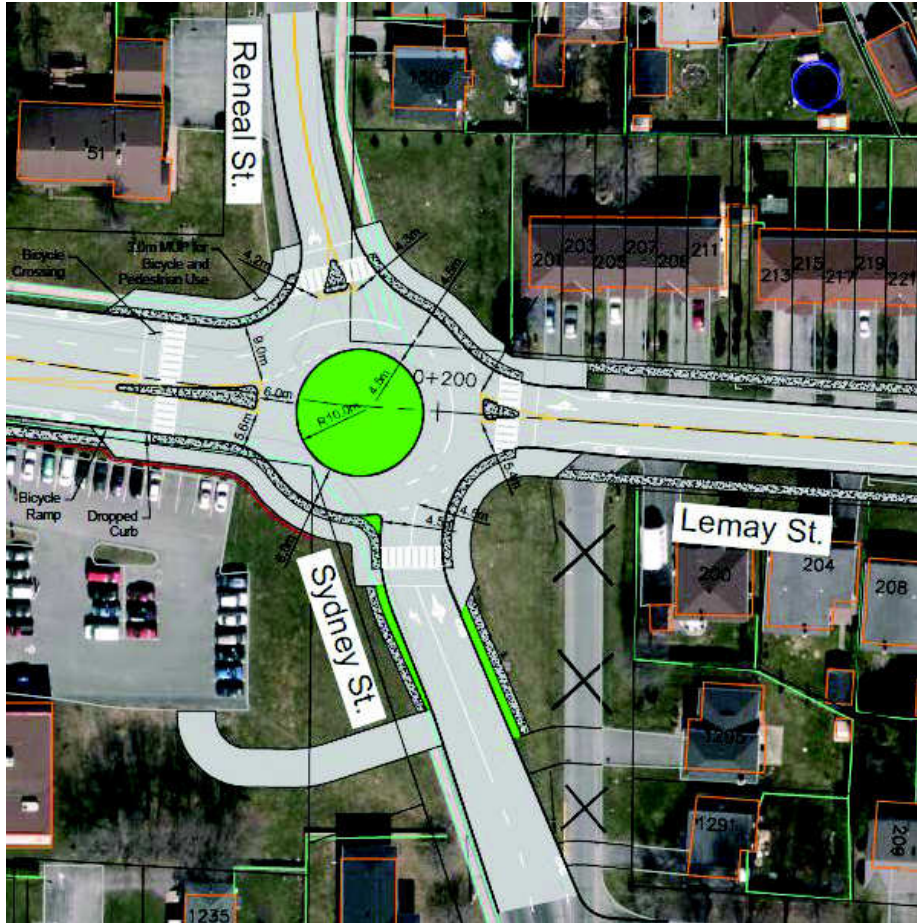
The recommended plan is illustrated on the drawings in Appendix A. The road concept was prepared using the information in MTO's *Geometric Design Standards for Ontario Highways* and the Transportation Association of Canada's *Geometric Design Guidelines for Canadian Roads*. For the roundabout concepts, the National Cooperative Highway Research Program (NCHRP) Report 672 was used since there is no Canadian design guide at present.

The design includes the widening of Thirteenth Street between Pitt Street and Sydney Street and shifting sidewalks to the south to provide cycling lanes. The cycling lanes extend across the intersection of Pitt Street/ Thirteenth Street to the west side of Pitt Street where they terminate at Aubin Avenue. The cycling lanes are 1.5m wide and a boulevard is provided between the cycling lanes and the 1.5m wide sidewalks. On Thirteenth Street between Pitt Street and Sydney Street, there are two westbound lanes and one eastbound lane as well a centre two-way left turn lane which becomes a westbound left turn lane at the intersection.

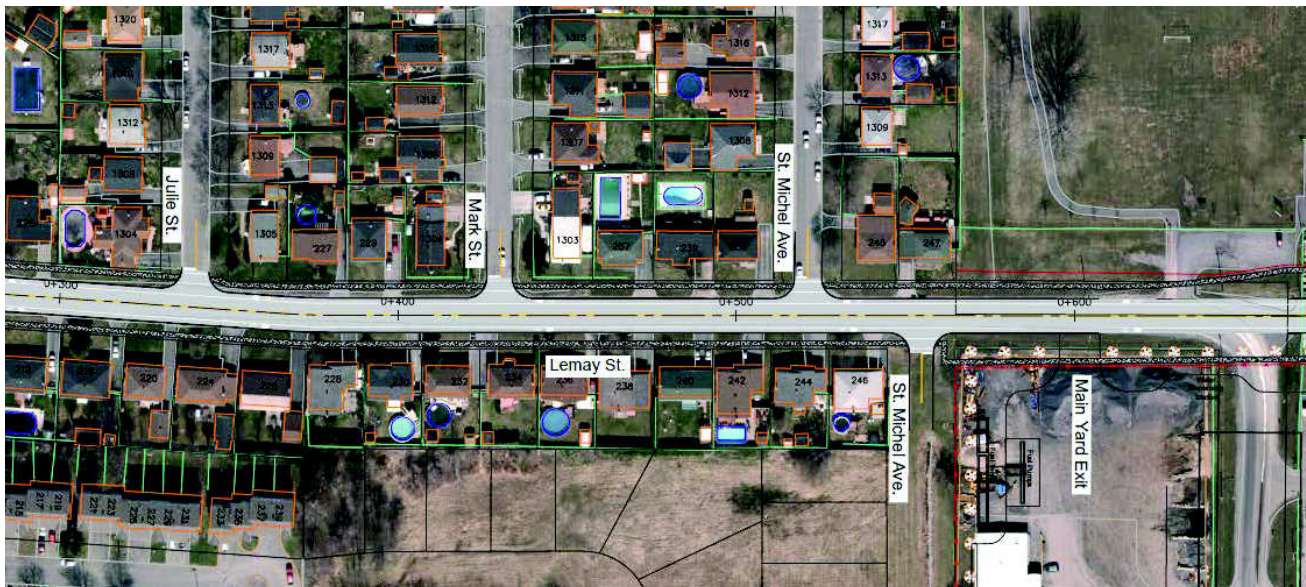


The intersection of Lemay Street / Thirteenth Street and Sydney Street / Reneal Street will be reconstructed as a full access roundabout to improve operations and access to neighbourhoods from all directions. The two northbound lanes on Sydney Street lead to two circulating lanes of 4.5m in the roundabout from Sydney Street to Thirteenth Street. A single circulatory lane of 6.0m is provided opposite the eastbound approach. Design elements such as entry lane widths, entry and exit curb radii, circulatory lane widths and inner circle diameter should be confirmed through the detailed design process and should take into account performance checks related to fastest path and sight distances.

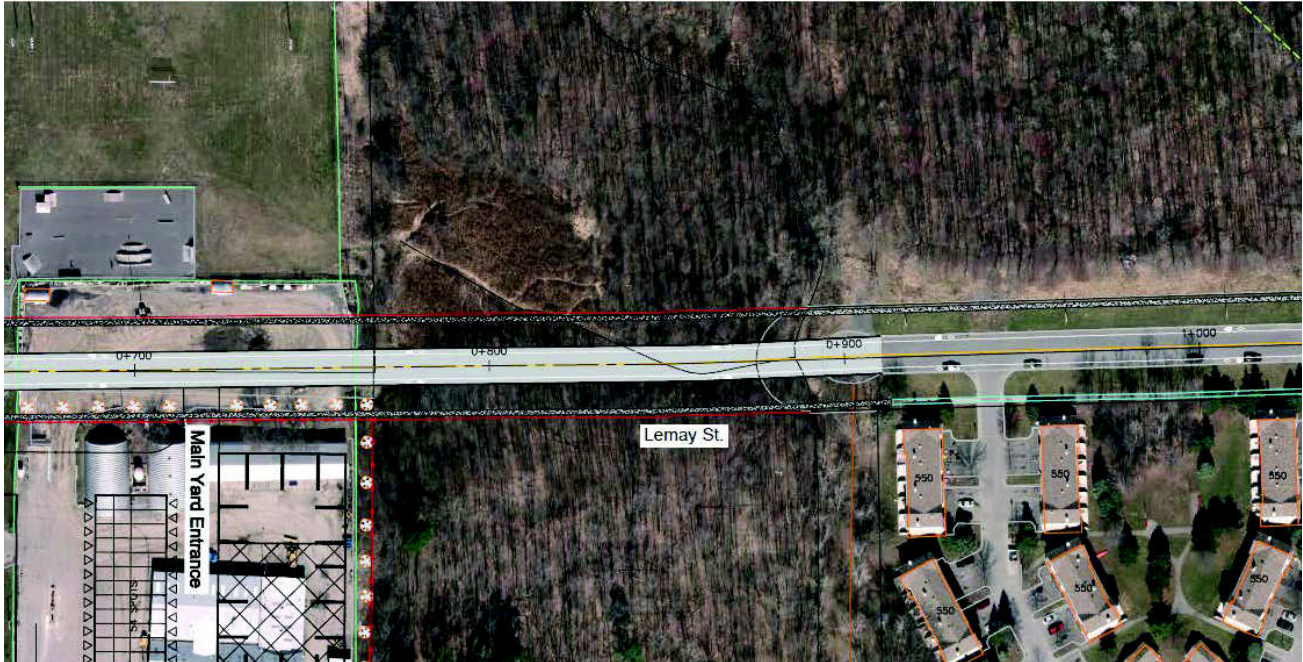
Additional access from to the Medical Arts Pharmacy is provided from Sydney Street. Pedestrian and cycling crossings are also incorporated into the design. A ramp from the cycling lane is provided to the multi-use path to allow cyclists to ride around the roundabout. Cycling crossings are provided adjacent to the pedestrian crosswalks. A portion of Sydney Street, which formerly connected to Lemay Street, will be closed since the roundabout provides access to all connecting roads at the intersection. The residential driveways will be extended to meet Sydney Street.



The design for Lemay Street involves widening the roadway to allow for the construction of cycling lanes, boulevards and sidewalks from Sydney Street to the McConnell Avenue. The cycling lanes are 1.5m wide and a 2.75m grassy boulevard is provided between the cycling lanes and the 1.5m wide sidewalks. There is one 3.5m vehicular lane in each direction.



The west and east sections of Lemay Street will be connected with a 240m straight segment of road. Cycling lanes will end at McConnell Avenue but sidewalks will connect with existing sidewalks on the east side of McConnell Avenue and on Arba Court.



The intersection at Lemay Street and McConnell Avenue will be reconstructed as a roundabout. The roundabout will provide a gateway feature and will require northbound and southbound traffic on McConnell Avenue to slow down to travel through the roundabout. This is an ideal location for a roundabout given the speed zone transition from 70 km/h to 50 km/h to the north of Lemay Street. Pedestrian crossings are incorporated into the design.



## 7.2 Property Impacts

On Thirteenth Street East between Pitt Street and Sydney Street the project will have property impacts on the south side of Thirteenth Street to the east and west of Pitt Street. At the southwest corner of Pitt Street and Thirteenth Street, the maximum width required is approximately 1m across the Mac's property along Thirteenth Street. A strip varying in width from 2m to 4m along Thirteenth Street at Home Hardware is required, which affects 9 parking spaces, and a strip varying in width from 1m to 2m along Thirteenth Street at the Medical Arts Pharmacy is required.

Some property, that is currently manicured lawn, is required in the southwest quadrant of the intersection of Lemay Street / Thirteenth Street and Sydney Street / Reneal Street to construct the roundabout and sidewalks.

Although the design of Lemay Street is contained within the existing right-of-way, the additional of cycling lanes and sidewalks will require that driveways along Lemay Street be shortened by a maximum of 5.5 metres on the south side and 3 metres on the north side. Lemay Street will also be located 1.7 metres closer to homes on the south side.

East of the municipal works yard, additional right-of-way will be required to accommodate the new Lemay Street connection, cycling lanes and sidewalks. A right-of-way width of 30 m has been selected to match City of Cornwall standards for a collector road.

### **7.3 Municipal Services**

There is currently a sanitary sewer just north of the north edge of the pavement and a water main at the edge of pavement on the south side. The replacement of the underground infrastructure and the inclusion of a storm sewer will be coordinated with the road construction.

### **7.4 Drainage and Stormwater Management**

A new storm sewer will be built to serve Lemay Street so existing stormwater infrastructure will be removed. The recommended plan involves some upgrades to the stormwater collection and conveyance infrastructure. Along existing road segments to be widened, the ability of the existing storm system to accommodate additional flows must be determined. The new Lemay road connection will impact 130m of wooded area and the additional pavement area will generate additional stormwater runoff. The condition of the storm sewers in Lemay Street should be assessed during preliminary design to determine whether existing storm sewer (some of which are more than 40 years old) should be replaced during the roadway improvements. Consideration should also be given to sewer separation where the existing storm sewer discharges into the sanitary sewer in the utility easement.

During detail design, the need for measures to control the quantity and quality of storm run-off will require analysis and consultation with agencies. The overland drainage flow pattern will be maintained. Cross-drainage culvert(s) will be included in the design of the new road connection at low point(s) to convey drainage from outside the road area under the road embankment. The number and size of culverts will be determined in detail design.

The reconstructed and extended roadway will be fully curbed. Curb inlet catchbasins will be required to capture stormwater and direct it to the storm sewers. As noted in existing conditions, the storm sewers on Lemay Street typically discharge to the Fly Creek Storm Diversion Sewer and to the sanitary sewer system. It is expected that stormwater quantity management will be required to limit the peak flows discharged to the downstream infrastructure, *i.e.* the Fly Creek SDS and the sanitary sewers. Storage is expected to be required to deal with excess flows. The boulevards located between the curbs and sidewalks could be constructed with underground storage such as clear stone trenches with perforated pipes and inlet control devices.

### **7.5 Geotechnical and Hydrogeological**

Pavement design and geotechnical requirements will be subject to further work during preliminary and detailed design to confirm the nature of the materials underlying the planned roadway. Typical pavement structure in the City of Cornwall includes the following:

Surface course asphalt	40 mm
Base course asphalt	40-50 mm
Granular A (crushed stone)	150 mm
Granular B (crushed stone)	300-450 mm

Suitable cut and fill slopes for roadway construction as well as for the installation of underground storm sewers need to be determined. Areas with unsuitable foundation materials for roadway construction, such as waste material from the former landfill site, will require removal or special treatment.

The impact of construction on groundwater must also be confirmed during preliminary and detailed design. This work will assess the need to obtain a Permit to Take Water for excavation work. An Environmental Compliance Approval from the Ministry of the Environment and Climate Change will also be required.

## 7.6 Utilities

Hydro poles on the north side of Lemay Street will need to be relocated to accommodate sidewalk construction. Other locations where construction may conflict with utility poles will be confirmed in preliminary design

## 7.7 Cost

The total cost estimate for the Lemay Street connection is indicated in the table below.

Construction Required	Total Cost
<b>Roadwork</b> Reconstruction/construction of two lane road between Pitt Street and McConnell Avenue, roundabouts at McConnell Avenue and Sydney Street, sidewalks, bicycle lanes, boulevards	\$2,905,000
<b>Landscaping</b> Sodding and topsoil	
<b>Storm Sewers</b>	
<b>Contingency</b>	\$581,000
<b>Total Cost</b>	\$3,486,000

Construction timing is dependent on the availability of funding and City priorities.

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## 8. Impacts and Proposed Mitigation Measures

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The addition of sidewalks and cycling lanes, the connection to McConnell Avenue and intersection improvements will benefit community development and traffic operations. There will be some impacts to the environment, which can be addressed through mitigation measures, both during construction and through design.

The significance of the potential impacts stemming from this project can be measured using four different criteria:

1. Area affected:
  - local
  - regional
2. Nature of Impact:
  - negative or positive
  - direct or indirect
3. Duration of the impact:
  - short term (construction period, or 1-2 years)
  - medium term (3-4 years)
  - long term (>4 years)
  - permanent
4. Magnitude of the impact:
  - negligible - the impact is not noticeable
  - minor - the impacts are perceivable and require mitigation
  - moderate - the impacts are perceivable and require mitigation as well as monitoring and/or compensation
  - major - the impacts are severe

### 8.1 Natural Environment

#### 8.1.1 Species at Risk (SAR)

The potential SAR list used for this project included information from the NHIC database, data obtained directly from MNRFP Kemptville and species added based on our experience. The resulting list was comprised of eleven species; 1 fish (cutlip minnow), 6 birds (eastern whip-poor-will, chimney swift, barn swallow, loggerhead shrike, bobolink and eastern meadowlark), 3 mammals (all bats) (little brown myotis, northern myotis, and eastern small-footed bat), and 1 plant (butternut).

There was no fish habitat within or adjacent to the study area so the one fish species, cutlip minnow, is not discussed and neither is the loggerhead shrike since its preferred habitat is not present. The five remaining birds species listed as potentially occurring are: eastern whip-poor-will, chimney swift, barn swallow, bobolink and eastern meadowlark. One daytime and one nighttime visit was completed. While this is not sufficient to meet MNRFP protocols for SAR surveys, they do provide an indication of which species are present. No whip-poor-wills were heard calling during the nighttime visit. Without additional surveys the presence/absence of this species cannot be

confirmed. Should whip-poor-wills or their generalized habitat be documented in the area, then permitting will be required from MNRF prior to any work. Note that permitting typically requires a minimum of 6 months to obtain. The chimney swift, barn swallow, bobolink and eastern meadowlark are considered absent from the area since appropriate habitat is not present.

The potential mammal SAR within the general area are three bats: eastern small-footed myotis, little brown myotis and northern long-eared myotis. These species prefer to hibernate in caves or mines or buildings. No potential bat hibernacula were found within the study area.

A survey for Butternuts was completed by BHA 281 and none were found. This species is absent from the study area.

Of the potential SAR, only one species was considered as potentially occurring; eastern whip-poor-will. In order to confirm its absence, three nighttime surveys during the appropriate time of year as per MNRF protocols would be required.

## 8.1.2 Terrestrial

### Terrestrial Vegetation and Wildlife

The loss of vegetation considers the loss of any woody or wetland habitats. The loss of manicured grass within the developed portions of the study area is not considered significant ecologically, other than the potential for erosion. The habitat that will be impacted consisted of wetland and forest communities. The assessment of these found that they did not provide any significant form or function. The direct impact to vegetation due to the road construction project has been confined to the road right of way. Indirectly, the woody vegetation not intended to be removed could be harmed by construction equipment. The soil around the base of the trees could become compacted (affecting the roots) or branches could be harmed.

Being situated in an urban area, the impacted area is not considered to be highly sensitive, and is home to common species based on the wildlife and bird surveys. Breeding bird surveys were conducted and common species were identified.

Prior to mitigation, the impacts associated with the terrestrial vegetation are defined as local, direct and indirect, negative, long-term to permanent and minor unless whip-poor-will is present in which case the magnitude would be moderate.

Following the completion of whip-poor-will surveys and provided that these confirm the absence of this species and with the proper implementation of the mitigation measures and the application best practises during construction, the impacts to terrestrial habitat and species are considered to be local, short term to permanent and negligible.

### Wetlands

Small marsh and swamp areas were identified within the proposed road extension alignment. These areas are dominated by reeds. There are no provincially or locally significant wetlands within 120 m of the study area.

There were unevaluated wetland communities consisting of two marsh communities and one swamp of which all were on the west side of the study area. As the wetlands on-site are less than 2.0 ha and do not contain any unique forms or functions, they are considered insignificant.

Prior to mitigation, the impacts associated with a potential decrease in surface water quality would be local, short term in duration and negligible in magnitude. Project sediment and erosion control measures (ie. silt fencing) will be used to prevent the movement of suspended sediments outside of the work area.

Following the proper implementation of the mitigation measures, including monitoring, it is anticipated that the potential impacts to the surface water quality would be local, negative, short term in duration and negligible in magnitude.

### **8.1.3 Aquatic Wildlife and Habitat**

A small drainage feature was identified; however, this area was dry when surveyed over multiple site visits. Based on the lack of aquatic habitat identified during the existing conditions research, potential effects to aquatic wildlife and habitat were considered negligible.

## **8.2 Noise**

The extension of Lemay Street and the related roadway construction is not predicted to have significant future noise impacts at the nearest noise sensitive areas. Therefore, noise mitigation is not required for the proposed roadway upgrades.

## **8.3 Landscaping**

The recommended landscape design is intended to align with existing land uses, as much of the land within or adjacent to the right of way consists of manicured lawns. Disturbed ground will be re-seeded following construction activities.

Tree removal will be required for the new Lemay Street connection through the woodland area and will be limited to the right of way required. Impacts are expected to be local, direct, permanent and minor.

## **8.4 Property Impacts**

On Thirteenth Street East between Pitt Street and Sydney Street the project will have property impacts on the south side of Thirteenth Street to the east and west of Pitt Street. At the southwest corner of Pitt Street and Thirteenth Street, the maximum width required is approximately 1m across the Mac's property along Thirteenth Street. A strip varying in width from 2m to 4m along Thirteenth Street at Home Hardware is required, which affects 9 parking spaces, and a strip varying in width from 1m to 2m along Thirteenth Street at the Medical Arts Pharmacy is required. Some property, that is currently manicured lawn, is required in the southwest quadrant of the intersection of Lemay Street / Thirteenth Street and Sydney Street / Reneal Street to construct the roundabout and sidewalks. Impacts are expected to be local, direct, permanent and minor.

East of the municipal works yard, additional right-of-way will be required to accommodate the new Lemay Street connection, cycling lanes and sidewalks. A right-of-way width of 30 m has been selected to match City of Cornwall standards for a collector road. Impacts are expected to be local, direct, permanent and moderate.

## **8.5 Drainage and Stormwater Management**

During preliminary and detail design, drainage and stormwater management will need to be investigated including:

- Impacts to the existing storm drainage system
- Suitable locations within the right-of-way for new storm drains
- Suitable discharge locations for new storm drains
- Need for quantity control prior to discharge into existing downstream drains
- Need for quality controls
- Locations for culverts under the roadway embankment to accommodate existing flow patterns

Impacts are expected to be local, permanent and minor (negligible following mitigation).

## 8.6 Utilities and Services

Buried gas mains, hydro cables, and fibre optic cables must be protected when undertaking roadwork in the project study area. Communication with utility companies and locates prior to construction will be necessary during the detailed design phase.

Construction of sidewalk will require relocation of hydro poles on the north side of Lemay Street. The location of the new access to the municipal works yard and its impact on pole(s) will be addressed during the detailed design phase.

With the application of mitigation measures, no impacts to the underground municipal services are anticipated. Possible measures to address impacts to above ground utilities will be reviewed with utility companies and could include adjustment of slopes, installation of new poles, or stabilization of existing poles.

## 8.7 Contamination

The environmental site assessment study completed as part of this project recommends that a Phase II ESA be conducted during the preliminary design phase to provide further information and delineation regarding potential sources of contamination in the project area. Any excavation or groundwater pumping must consider the potential for groundwater contamination in the general area. Testing will be required to determine where pumped water needs to be discharged to the sanitary sewer system. Disposal of excavated contaminated material must be at a suitably licensed facility. Any clean-up required as a result of this project will be a positive impact to the local area.

## 8.8 Archaeology/Heritage

While much of the project area has been disturbed due to human use, a Stage 2 Archaeological Assessment was required for the new connection between the east and west portion of Lemay Street. Based on the results of the Stage 2 Archaeological Assessment, it is recommended that study area be cleared of further archaeological concern, as no archaeological materials were found.

## 8.9 Potential Impacts during Construction

Table 8-1 identifies the potential effects, mitigation measures and requirements for follow-up work listed by Environmental components including (in alphabetical order):

- Air Quality
- Contamination Potential (soil, groundwater and/or surface water)
- Geotechnical (soils)
- Groundwater

- Noise
- Property Access and Egress
- Surface water
- Terrestrial Habitat, Wetlands and Wildlife
- Traffic Level of Service Traffic Safety
- Vegetation and Landscaping

The significance of potential environmental effects, before and after the application of mitigation measures, was identified as follows:

- Significant (S) means that a potential effect may be:
  - Widespread;
  - Permanent loss of features or habitat;
  - Permanent alteration to the community;
  - Permanent reduction in species diversity or population; or
  - Transcendence or contravention of legislation, standards, or environmental guidelines.
- Insignificant (I) means that a potential effect may be:
  - Not widespread; or
  - Temporary or short term duration if recurring (not permanent).
- Negligible (N) means that a potential effect may be:
  - Nearly zero or hardly discernible effect; or
  - Affecting a small proportion of the population/group in a localized area or over a short period of time such that it would not affect the population/group as a whole.
- Positive (P) means that the effect may result in a benefit.

Table 8-1. Potential Effects and Mitigation Measures

Construction Phase					
Environmental Component	Potential Environmental Effect	Potential Significance (sig.)	Recommended Mitigation Measures	Level of sig. following Mitigation	Follow-up
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>Emissions from construction machinery and generation of dust (particulate matter) with resulting effects on living things</li> </ul>	I	<ul style="list-style-type: none"> <li>Construction contract will include requirements for implementation of an emissions management plan. Some best practices include:                             <ul style="list-style-type: none"> <li>Covered loads when hauling fine-grained materials.</li> <li>Prompt cleaning of paved streets/roads where tracking of soil, mud or dust has occurred.</li> <li>Covered stockpiles of soil, sand and aggregate as necessary.</li> </ul> </li> </ul>	I	<ul style="list-style-type: none"> <li>Prepare Emissions Management Plan</li> </ul>
<b>Contamination Potential</b>	<ul style="list-style-type: none"> <li>Construction activities may disturb soil/groundwater/ surface water contamination</li> </ul>	S	<ul style="list-style-type: none"> <li>Complete a Phase II ESA and undertake follow-up work were needed</li> <li>Send samples of any excess soils generated for analysis to determine appropriate disposal options</li> </ul>	I	<ul style="list-style-type: none"> <li>Complete Phase II ESA along with follow-up work if needed</li> </ul>
<b>Geotechnical</b>	<ul style="list-style-type: none"> <li>Potential impacts during temporary excavations.</li> </ul>	S	<ul style="list-style-type: none"> <li>Carry out a geotechnical investigation to better establish the current subsurface conditions and develop design recommendations.</li> </ul>		<ul style="list-style-type: none"> <li>Undertake site-specific geotechnical investigations</li> </ul>
<b>Groundwater</b>	<ul style="list-style-type: none"> <li>Groundwater may be impacted during temporary excavations needed to prepare subgrade soils.</li> </ul>	S	<ul style="list-style-type: none"> <li>Undertake groundwater monitoring well installation and slug tests across the proposed Lemay Street extension to better establish hydrogeological features of the site and determine whether a permit to take water (PTTW) will be required to control groundwater levels during construction.</li> </ul>		<ul style="list-style-type: none"> <li>Review at Detail Design and obtain PTTW if necessary</li> </ul>
<b>Noise</b>	<ul style="list-style-type: none"> <li>Impacts to wildlife as a result of noise during construction.</li> </ul>	I	<ul style="list-style-type: none"> <li>Construction contract will include requirements for all equipment to be properly maintained to limit noise emissions. As such, all construction equipment will be operated with effective muffling devices that are in good working order.</li> </ul>	I	<ul style="list-style-type: none"> <li>Include operational constraints in construction contract</li> </ul>
<b>Property Access and Egress</b>	<ul style="list-style-type: none"> <li>Access disruptions during construction</li> </ul>	I	<ul style="list-style-type: none"> <li>Maintain access to businesses during construction.</li> <li>Provide advance notice of temporary closures.</li> <li>Provide emergency access during construction.</li> </ul>	I	<ul style="list-style-type: none"> <li>Prepare Traffic Management and Communications Plans</li> </ul>
<b>Surface Water Quality and Quantity</b>	<ul style="list-style-type: none"> <li>Heavy machinery or construction materials contaminating surface water.</li> </ul>	I	<ul style="list-style-type: none"> <li>All machinery must be properly maintained to prevent leakage of possible contaminants. Maintenance must be undertaken a minimum of 30 m away from any watercourse/wetland</li> <li>Proper management of concrete products, dust suppression, effluent. No introduction of deleterious substances into the watercourse</li> </ul>	I	<ul style="list-style-type: none"> <li>Include operational constraints in construction contract</li> <li>Develop Spills Emergency Response Plan</li> </ul>
<b>Terrestrial Habitat including Species at Risk, Wetlands and Wildlife</b>	<ul style="list-style-type: none"> <li>Disturbance to the deciduous woodland and small wetland features due to construction and clearing the right of way;</li> <li>Potential disturbance to wildlife due to construction</li> </ul>	S	<p>Use environmental best practices such as:</p> <ul style="list-style-type: none"> <li>Store stock piles of soil or fill material at least 30 m from the wetland and protect by silt fencing.</li> <li>Maintenance on construction equipment such as refueling, oil changes or lubrication will only be permitted in designated area located at a minimum of 30 m from the ditches and outside of the drip line of trees and in an area where sediment erosion control measures and all precautions have been made to prevent oil, grease, antifreeze or other materials from inadvertently entering the ground or the surface water flow.</li> <li>No equipment should enter watercourses/wetlands outside of the grading limits. To minimize the spread of invasive species, all equipment should be thoroughly cleaned with water before it is moved from one area to another.</li> <li>Stabilize any waste materials removed from the work site to prevent them from entering the watercourse</li> <li>To minimize the impact of accidental spills (should they occur), spills will be isolated and cleaned up immediately. An Emergency Response Plan (ERP) will be developed to include a spill response plan. Spill response equipment will be readily available</li> </ul> <p><b>Birds</b></p> <ul style="list-style-type: none"> <li>No trees will be removed until hip-poor-will surveys are completed</li> </ul> <p>Undertake clearing activities outside the bird nesting season of April 15 to August 15 unless a qualified avian biologist has searched the site for nests and concluded that no nests are present, no more than 2 days prior to clearing. If nesting activities are observed during clearing/construction, works in that area should cease and the MNRF should be contacted immediately</p> <p><b>Wildlife</b></p> <ul style="list-style-type: none"> <li>When possible work should be completed during daylight. If nighttime lights are used, install them to illuminate the work area only to minimize impacts to nighttime activities of wildlife.</li> </ul> <p><b>Woodland</b></p> <ul style="list-style-type: none"> <li>Minimize the removal of natural vegetation</li> </ul>	I	<ul style="list-style-type: none"> <li>Include operational constraints in construction contract</li> <li>Develop Spills Emergency Response Plan</li> </ul>

Environmental Component	Potential Environmental Effect	Potential Significance (sig.)	Recommended Mitigation Measures	Level of sig. following Mitigation	Follow-up
			<ul style="list-style-type: none"> <li>No butternut trees were identified. If a butternut tree is found and construction activities occur within 25 m, the Kemptville District MNRF Species at Risk Biologist should be contacted.</li> </ul> <p><b>Wetlands</b> No work will occur until the appropriate sediment and erosion control measures have been properly implemented. These will be designed to prevent the movement of suspended sediments outside of the work area. They could include the following items and steps:</p> <ul style="list-style-type: none"> <li>Properly installed sediment fencing along the edge of the work area to contain any particles which may enter the ditches.</li> <li>Monitoring of sedimentation outside of the sediment fencing will occur throughout the day. The contractor will be responsible to ensure that the measures chosen are appropriate for the site and are functioning as intended.</li> <li>Should dust particles be created during construction they will be suppressed using the appropriate method (i.e. water spraying).</li> </ul>		
<b>Traffic Level of Service</b>	<ul style="list-style-type: none"> <li>Potential traffic delays during construction, creating potential idling.</li> </ul>	I	<ul style="list-style-type: none"> <li>Traffic staging and detours will be determined before construction to minimize potential disruptions to traffic flow.</li> <li>City of Cornwall staff and contractor staff will communicate with the community and road users through the media and construction signage to provide advance notice of activities.</li> </ul>	I	<ul style="list-style-type: none"> <li>Prepare construction staging plan</li> <li>Prepare Traffic Management and Communications Plans</li> </ul>
<b>Traffic Safety (all modes)</b>	<ul style="list-style-type: none"> <li>Reduced safety during construction</li> </ul>	I	<ul style="list-style-type: none"> <li>Design construction staging and detours to enhance safety during construction for the travelling public, including non-automobile modes and for workers.</li> </ul>	I	<ul style="list-style-type: none"> <li>Prepare Traffic Management and Communications Plans</li> </ul>
<b>Vegetation and Landscaping</b>	<ul style="list-style-type: none"> <li>Damage to/removal of roadside vegetation during construction</li> <li>Landscaping will be disturbed in various areas</li> </ul>		<ul style="list-style-type: none"> <li>Prepare landscape/vegetation consistent with adjacent land use plan.</li> <li>Protect vegetation not slated for removal; provide tree barrier protection in accordance with OPSS 801 for the Protection of Trees.</li> <li>Delineate vegetation clearing zones and vegetation retention zones clearly in construction specifications and in the field.</li> <li>Remove vegetation during the winter months to avoid impact to soil, if possible.</li> <li>Remove cleared vegetation or wood chips from the site.</li> </ul>	I	<ul style="list-style-type: none"> <li>Include provisions for the removal, protection and re-establishment of vegetation in the contract documents</li> </ul>

**Operations Phase (following construction)**

Environmental Component	Potential Environmental Effect	Potential Significance (sig.)	Recommended Mitigation Measures	Level of sig. following Mitigation	Follow-up
<b>Surface Water</b>	<ul style="list-style-type: none"> <li>Increased flooding and/or reduced runoff quality due to additional paved surface</li> </ul>	S	<ul style="list-style-type: none"> <li>Runoff will be directed to storm sewers. Preferred mitigation methods will be determined in detail design to suit requirements including subsurface material characteristics.</li> </ul>	N	<ul style="list-style-type: none"> <li>Maintain any stormwater management facilities, storm drain system and culverts</li> </ul>
<b>Traffic Level of Service</b>	<ul style="list-style-type: none"> <li>Improved traffic flow</li> </ul>	P	<ul style="list-style-type: none"> <li>Provide additional sidewalks, cycling lanes and intersection improvements</li> </ul>	P	<ul style="list-style-type: none"> <li>Monitor traffic for future adjustments to pavement markings and signage</li> </ul>
<b>Traffic Safety (all modes)</b>	<ul style="list-style-type: none"> <li>Improved safety</li> </ul>	P	<ul style="list-style-type: none"> <li>Design roadway features to accommodate pedestrian crossings and cycling lanes to encourage active transportation options.</li> <li>Design roundabouts according to best practices for safe entry and exit for vehicles.</li> </ul>	P	<ul style="list-style-type: none"> <li>Monitor collisions following improvements</li> </ul>